Storm Generated Erosion

Storm generated erosion ranges over periods of hours (tropical cyclones) to several days (nor'easters). Although the storm events are short-lived, the resulting erosion can be equivalent to *decades* of long-term erosion. The actual quantity of sediment eroded from the coast is a function of storm tide elevation relative to land elevation, the duration of the storm and the characteristics of the storm waves. During severe coastal storms, it is not uncommon for the entire *berm* (dry beach above the normal high water line) and part of the dune to be removed from the beach (Figure 4).

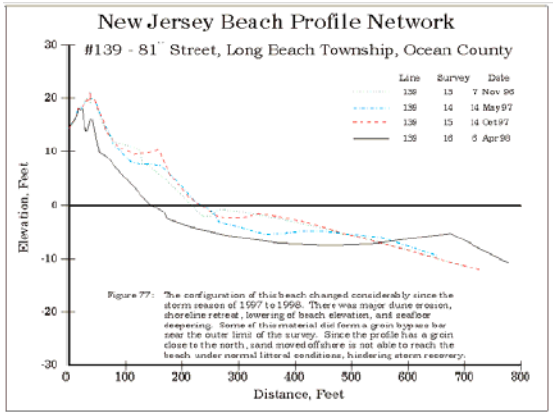

Figure 4. Erosion of the cross-shore beach profile due to a severe coastal storm in February 1998. Courtesy of the Coastal Research Center, Richard Stockton College of NJ.

The amount of erosion is also dependent on the pre-storm width and elevation of the beach. If the beach has been left vulnerable to erosion due to the effects of recent storms, increased erosion is likely. The time necessary for the beach to naturally recover form significant erosion can often be on the order of years to decades.

Regional Sand Management

The amount of sand offshore and along the New Jersey Coast is limited. In order to sustain our limited coastal sand resources, coastal decision makers, managers and stakeholders need to recognize the regional patterns of sediment motion along the coast and develop sand management solutions that will work with the system. By recycling sediment form downdrift inlets and impoundment zones back to regions that supply sand, cost –effective and sustainable shore protection can be achieved.

The Stevens – New Jersey Cooperative Extension in Coastal Processes

The Stevens Institute of Technology -New Jersey Sea Grant Cooperative Extension in Coastal Processes has been created to promote the sustainability and wise use of our coastal resources that provide the basis of a strong coastal economy. The Cooperative Extension strives to achieve science literacy in coastal processes among all citizens through public outreach, contribute solutions to coastal issues, foster science-based management decisions, and promote balanced growth with environmental stewardship.

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NEW JERSEY MARINE SCIENCES CONSORTIUM

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COASTAL PROCESSES COOPERATIVE EXTENSION

Where's the Beach?

photo by Nelson Amey

Basics and Background of New Jersey's Regional Sediment Transport

The coast is a landscape of constant change; evolving gradually on a scale of days, weeks, months or seasons, and sometimes occurring nearly instantaneously in response to violent winds, tides or waves generated by storms. However, the continual movement of sand along the coast is not purely random but instead follows specific long-term and seasonal patterns.

Long-Term Sand Movement

The geography of the New York Bight, the area of ocean south of Long Island and north of Cape May, plays a significant role in regional movement of sand along the New Jersey coast. During the winter months when large coastal storms, Nor'easters, are prevalent, Long Island shelters the northern NJ coast from large waves from the Northeast. However, these large waves directly impact the southern New Jersey coast south of Manasquan Inlet. During the summer and fall, the entire coast is subject to less energetic waves from the southeast and occasionally southeasterly swell generated by tropical storms.

The net result of the variation in the direction of wave energy along the coast is a long-term regional sand transport pattern that is from the south to north along the Monmouth County shoreline and from north to south, south of Manasquan Inlet (Figure 1). This pattern of sand movement is readily evident by looking at which side of a coastal groin or jetty has more sand piled up against the structure (Figure 2).

Another way to determine the net direction of sand movement along the coast is to look at the average size of the sand grains. Larger sand grains are always found close to the source of sand in motion. In New Jersey the largest grains are found near Manasquan Inlet (0.78 mm) and the finest in Sandy Hook to the north (0.34 mm) and Wildwood (0.20 mm) to the south.

Figure 1. Arrows indicating the net direction of sand movement along the coast of New Jersey.

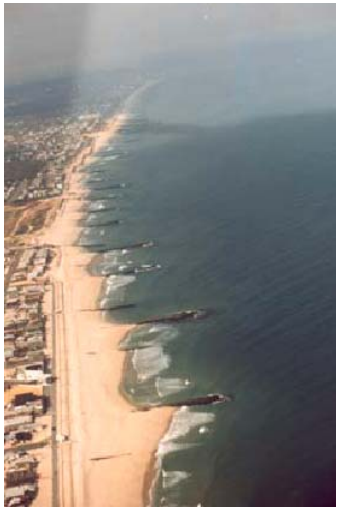

photo by Ken Cadmus

Figure 2. Groin field along the Manasquan shoreline showing sand build up on south side of the structures, indicating a net sand movement to the north.

Seasonal Sand Movement

Changes in weather patterns from summer to winter are accompanied by changes in the wave climate along the New Jersey coast. In the winter, the large storm waves generated by frequent coastal storms erode the dry portion of the beach and deposit the sand along the offshore sandbar. During the summer, the coast is exposed to less frequent smaller storms and long period ocean swell that transport the sand from the offshore sandbar back onto the dry beach (Figure 3).

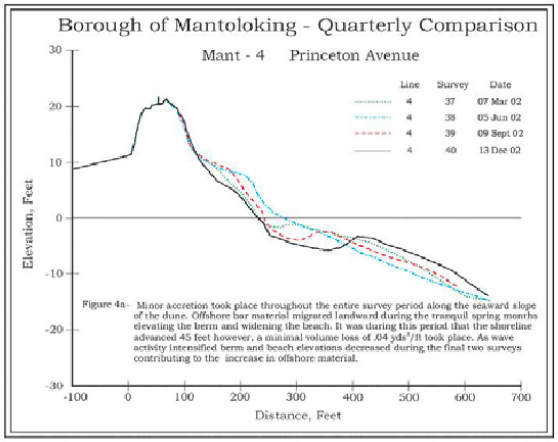

Figure 3. Seasonal variation of the cross-shore beach profile. Courtesy of the Coastal Research Center, Richard Stockton College of NJ.

During a typical seasonal cycle, the beaches along the New Jersey coast can retreat between 75 to 100 feet and experience a change in elevation of 8 to 10 feet. It is important to remember that although these season fluctuations seem rather large, the change in beach width is not considered erosion since the material removed from the beach in the winter is re-deposited back on the beach in the summer.