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Erosion Control Structures Can Amplify Problems of Beaches

"Indiscriminate use of beach erosion control structures, such as groins, jetties, and the like, can result in an ever-expanding erosion problem," according to Dr. Warren E. Yasso and Elliott M. Hartman, Jr., authors of the first in a series of publications describing important aspects of New York Bight.

Although many of the Bight's beaches are classified as critically eroding, "action to preserve them should be undertaken only following a comprehensive plan that considers the erosion problems of the entire shoreline," Yasso and Hartman say.

This monograph -- "Beach Forms and Coastal Processes" -- and 29 others scheduled to be issued in 1975 eventually will form part of a comprehensive MESA New York Bight Atlas. The publications are being produced through a cooperative effort of the National Oceanic and Atmospheric Administration's MESA (Marine Ecosystems Analysis) program and the New York Sea Grant Institute. The Institute administers the State University of New York/Cornell University Sea Grant College program supported by the Commerce Department agency's Office of Sea Grant.

The MESA program directed by NOAA's Environmental Research Laboratories, was established in 1972 to examine man's effects on coastal and offshore regions, determine what can be done to correct past mistakes, and learn how to predict the environmental consequences of future actions. The seven-year study of New York Bight, which began in July 1973, is the first major MESA investigation.

Bordered by Long Island on one side and New Jersey on the other, the 15,000-square-mile New York Bight is the most urbanized coastal ocean in the world. A major commercial, industrial, and recreational resource, it is also the site of the nation's largest ocean dumping operation. Of all the U.S. sewage sludge and industrial wastes disposed of at sea, an

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estimated 80 percent is dumped in the waters of the New York Bight. The MESA studies there are designed to gain better understanding of the Bight's ecosystem and provide the information needed for rational management.

Together, the monographs and the atlas will constitute the first comprehensive presentation of current knowledge of the New York Bight's marine environment and the impacts of human activities on it. They will provide vital information for the scientists, government officials, and interested citizens whose decisions affect the present and future of the Bight's waters.

In the initial monograph, Yasso, associate professor in the Science Education Department at Teachers College, Columbia University, and Hartman, associate professor in Westchester Community College's Science Department, describe the types of landforms along the New York Bight shoreline, the natural processes that change them, and man's often futile attempts to control these changes.

Partly because their underlying geologic structure is similar, the beaches of Long Island and New Jersey are much alike, the authors note. The 245-mile shoreline from the eastern tip of Long Island to the southern tip of New Jersey exhibits only four major coastal forms: headlands, or bluffs with narrow beaches at their bases; barrier complexes formed by sequences of long, narrow barrier islands and bars, separated from the mainland coast by lagoons or salt marshes; barrier spits, formed when transported sand builds sediment projections into deep bays; and estuaries, where rivers empty directly into the Bight.

Because of prevailing wind directions, Yasso and Hartman point out, all deep-water wave energy behind water hitting Long Island beaches pushes the sand westward. Along the New Jersey coast, deep-water wave energy moves beach sediment in opposite directions -- north and south from the Dover Township shore about 29 miles south of Sandy Hook; north of Dover Township, sand moves northward toward Sandy Hook; south of the town, it moves south toward Cape May.

To slow this natural sand movement and protect coastal structures, countless bulkheads, seawalls, groins, and jetties have been built along the Bight's coastline. But since "the beach is the most complex physical environment on earth," the authors point out, "we know little in most cases about the short-term effects of coastal engineering structures and practically nothing about the long-term effects."

"Attempts to halt erosion and to trap sand along a limited stretch of beach are difficult, costly in the long run, and often ineffective," they state. As an example, Yasso and Hartman cite groins, which are rocky projections built at right angles from the shore into the water to slow the longshore drift of sand. Although groins do impound sand and extend the beach area on their updrift sides, they accelerate erosion on the other side. Thus, building one groin may make it necessary to build another, then another and another. At Long Branch, N.J., construction of hundreds of groins -- one after the other, as far as the eye can see -- has reduced northward sand movement only about 12 percent.

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On the other hand, Yasso and Hartman believe, "artificial beach nourishment (adding sand from other areas) is beneficial not only to the local shoreline but also to the adjacent shores." The costs of artificial nourishment, they say, compare favorably to those of building protective structures.

"Beach Forms and Coastal Processes," as well as the second monograph in the series, "Demographic Patterns," by Charles T. Koebel and Dr. Donald A. Krueckeberg of Rutgers University, are available for $4.00 each from the New York Sea Grant Institute, State University of New York, 99 Washington Avenue, Albany, N.Y. 12210. The entire series of 30 monographs in the MESA New York Bight Atlas can be ordered for $102.

Subsequent publications in the series will cover: temperature, salinity, and density; chemical properties; circulation; tides and sea-level changes; wave conditions; storm surge; marine climatology; regional geology; gravity, magnetics, and seismicity; surficial sediments; plankton production; plankton systematics and distribution; benthic fauna; fish distribution; fisheries; aquaculture; artificial fishing reefs; recreation; port facilities and commerce; sand and gravel; governmental jurisdictions; transportation; electricity generation and oil refining; waste disposal; water quality; air quality; the lower bay complex; and industrial wastes.

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