



"New Jerseyization" in Monmouth Beach, N.J. Sand has built up around the jetty in the background, while the beach in front of the sea wall no longer exists.

Hold That Line!

For years, shore dwellers, engineers and developers have been trying to stabilize beaches. Environmentalists say it can't and shouldn't be done.

BY JOANNE SILBERNER

January 1, 1980. On 30 U.S. beaches, ecology-minded people kicked off the "Year of the Coast" with walks along the nation's shores. During the next 12 months, conferences and scientific seminars were held, bills to protect barrier islands—the low sand ribbons that line the Gulf and East coasts—were introduced in Congress, Californians staged a surf festival in honor of the coast and the U.S. Army Corps of Engineers won the "most durable sandcastle" division in a challenge match against conservationists. Durable or not, the sandcastles were gone the next day, the barrier island bills were lost in the shuffle of a dying Congress and the shoreline continued to erode.

The question facing scientists, planners and the millions of people who visit or live near the 91,000 miles of ocean and Great Lakes coastline is whether to stand in the way of nature. And whether or not something is done, it will be expensive—the Corps of Engineers estimated in 1971 that it would take \$1.8 billion to protect the 3,000 miles of coast suffering what the Corps considers "critical" erosion; both developers and environmentalists agree that if nothing is done to stop the encroaching sea, there will be millions of dollars of property damage.

And the sea is indeed encroaching.

- Seven thousand years ago, Martha's Vineyard and Nantucket Island were connected by a land bridge. The link is now covered with water. Cape Cod, behind the islands, is listed on the Corps of Engineers'

list of critically eroding areas. The ocean side of the cape is eroding at the rate of one to eight feet per year.

- In New Jersey, a Rutgers University archaeological study found that one island migrated its own width—700 feet—since colonial times. Brigantine Island, just north of Atlantic City, has moved 4,500 feet in 6,000 years. A convention hall in Asbury Park, once 200 feet from the water's edge, is now separated from the lapping waves by only 50 feet of beach.

- A house in Nags Head, N.C., has been moved back from the water's edge three times in one hundred years, 200 feet each time.

- On the West Coast, Oregon State University researcher Paul Komar tells of Bayocean Park. This Oregon town was developed in the early 1900s on a sand spit and at one time boasted a large hotel, many homes and bungalows and an indoor heated saltwater pool. A 1939 storm washed over the island and destroyed many of the buildings as well as the pool. By 1952 only six persons lived in the few remaining buildings. A walk on the spit now, says Komar, reveals "pipes, bottles, some foundations. It's pretty much all gone."

- In southern California, erosion had so bitten into a rail bed alongside the ocean

that in 1941 a freight train was left hanging in midair. New tracks were built further from the cliff's edge, but by 1977 the tracks were only seven feet from the edge and once again traffic was halted.

- A 1942 U.S. Geological Survey map shows the town of Broadwater on Hog Island in the Chesapeake Bay. Today, the town is no longer on the barrier island—its foundations are underwater. Storms pushed the island right out from under the town.

There are other examples. Uneven erosion and accretion are enlarging some beaches, while others have disappeared. Inlets, where unimpeded, march up and down the United States' 295 barrier islands, and, like Hog Island, the islands are moving as well.

"The coast illumined by the 'rockets' red glare' is not the coast of our Bicentennial," noted progressive real estate developer Wallace Kaufman and Duke University geologist Orrin Pilkey, in their book *The Beaches are Moving* (1979, Anchor Pr/Doubleday—see p. 46). "From map to map islands change shape, inlets appear and disappear, shoals sink or grow and capes of land stretch further and further out to sea. To know the beaches is to know the beaches are moving."

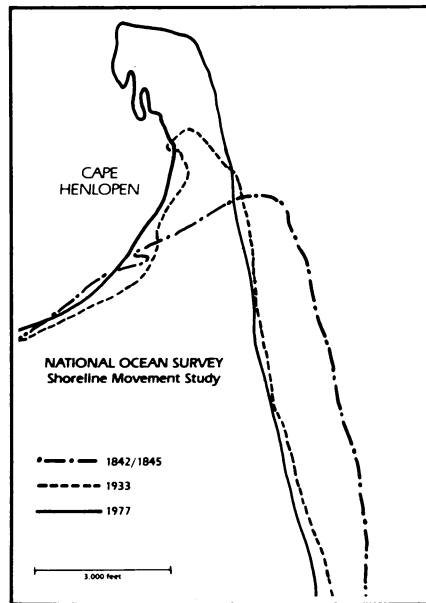
At the heart of the erosion is a rise in sea level. While most scientists agree the rise is real, they disagree about the rate and cause. But even a small rise can translate into a large loss. Pilkey notes that in coastal plains states, where beach slopes are

often as mild as one fiftieth of one degree, a one-inch sea level rise means a shoreline retreat of one hundred to one thousand times that distance. Chris Craft, head of the geology department at the University of Delaware, estimates that sea level rise in Delaware is roughly six inches per century, while the land is sinking another six inches per century.

The sea level rise is not the only thing nibbling away at our beaches. Waves, wind and sinking land masses also rob the beach of sand. Human efforts have resulted in a loss of sand accretion. Sand is normally deposited by river sediment, longshore currents and wave action. But many sand-bearing rivers have been dammed and carry less sand, longshore currents are often interrupted by groins or jetties and breakwaters halt wave action. Without these traditional sand sources, there is nothing to counter natural losses from wind and storms.

But as many conservationists point out, all this wouldn't be a problem if people didn't live within a breaking wave of the beach — it is residential and commercial development that turns erosion into a costly, destructive menace. Kaufman notes, "The struggle to 'defend' the coast is the acting out of an understandable human sentimentality, hedonism, and faith in technology."

Our predecessors knew better. Atlantic City was sold for four cents an acre (in 1690) at the same time inland property went for ten times that amount. And while



While oceanfront beach has receded, sand movement has built up at land's end, a common occurrence on barrier islands.

people clustered near good harbors, they avoided settling on broad, sandy expanses, say Kaufman and Pilkey.

Early attempts to break the power of the sea proved futile. Kaufman and Pilkey tell of the experience of Wick Bay, Scotland. In 1872, the town built a breakwater of cottage-sized blocks, 80 to 100 tons each, topped by an 800-ton cement cap and pierced by 3½-inch-thick rods. Waves

broke up the cap and rods, and the breakwater was rebuilt in 1877 with a 2,600-ton cap. Again it was broken. An engineer estimated the wave force at 6,340 pounds per square foot.

But despite the evidence of the sea's power, there are still many people who want a house on the beach, developers who will build them that house and towns that will permit building in hazardous areas. Larry Rockefeller of the Natural Resources Defense Council claims that barrier islands are "urbanizing" at twice the rate of the mainland. And with all the construction comes the need for engineering solutions to protect the investment. In Miami Beach, the Corps of Engineers is spending \$64 million to pump sand onto a 10-mile stretch of beach that eroded right up to sea-side hotels. In Miami Beach, as elsewhere, the engineering solution is not permanent — \$5 million worth of replenishment will be needed every four to five years. Jetties and sea walls, often built atop the debris of previous jetties and sea walls, offer at best a short-term solution. Jetties, for example, block the delivery of sand via longshore currents, allowing unfettered erosion next to the jetty. The solution — another jetty to hang on to the remaining sand.

Short-term solutions can lead to what Pilkey ominously terms "New Jerseyization." "Not to make fun of New Jersey," he says, "but to take advantage of its lessons."

"New Jerseyization occurs when you have a massive sea wall on the ocean side

How to live near the coast

"Men cannot build houses upon sand and expect them to stand now any more than they could in olden times . . .," wrote the Raleigh Observer in 1870. The same holds true today. Those million-dollar Malibu beachfront homes are not as desirable as they look if you're interested in a place you can pass on to your children. Orrin Pilkey and Wallace Kaufman, authors of *The Beaches are Moving*, say these houses are as well located "as a baby sitting on the line of scrimmage at a football game." The researchers offer six tips for shore living.

- Don't live on Oceanfront Avenue. There is no Sixth Street, and no Fifth St. anymore in Encinitas, Calif., despite maps to the contrary.
- Avoid near-shore construction at low elevations. While a concrete pillbox would weather a violent storm, consequent shoreline erosion would leave it at sea. Even houses on pilings are often knocked down by a storm.
- Towns should enact strict building codes, and people should follow them. While even the most sturdy ocean-side house will not survive a major storm, near-shore homes, properly built at sufficient elevations, will.
- Believe the weather forecasters when they recommend evacuation, even if they've been wrong before — better safe than sorry isn't a bad idea when it concerns your life. In 1969, 25 guests at the three-story Richelieu apartments in Pass Christian, Miss., threw a party to celebrate Hurricane Camille, while 70,000 others fled the approaching storm. Two of the revelers survived.
- Get a good insurance policy, and make sure it covers all



Eight months after \$500,000 sand replacement, 700 sandbags, two tons apiece, were placed on this Cape Hatteras beach. Within two months, the bags were destroyed.

possible forms of damage.

- Don't let down your guard. Surviving a hurricane one year doesn't mean you'll breeze through the next one — hurricanes can vary greatly in intensity. While the Atlantic coast has gone 20 years without a major storm, forecasters believe such a storm is long overdue. Many say it's a pity there haven't been major storms recently to keep people from building sub-standard housing in storm-prone areas.

of a barrier island, the beach is narrow, gone, or covered with rubble from a previous sea wall, and groins and jetties have been destroyed," Pilkey explains. In parts of New Jersey the view from a second floor of a beach house is blocked by a sea wall and there is a steep drop to a narrow ribbon of beach. "There's no alternative left but to build a larger sea wall, because the beach is too steep to pump sand. It has become a fortress," he says.

"Once New Jerseyization has arrived, I'm beginning to think there's nothing we can do," says Pilkey. In Cape May, where erosion has stripped a once-expansive beach, an offshore breakwater has been proposed to limit the power of incoming waves. "Ridiculous," scoffs Pilkey. "It's just getting in deeper and deeper. Why not pave the whole intercontinental coast?"

People who live far from the shore have reason to be concerned about coast construction, because they are paying for some of it. Tom Tobin of the California Coastal Commission estimates that 90 percent of the \$18 million spent in repairing damages to coastal areas in 1978 was borne by the public: \$12 million in damage to public facilities and \$4 million in subsidized loans to private citizens.

Many shore dwellers also get public-subsidized insurance through the National Flood Insurance Program. The program, begun in 1968, was set up to provide insurance where private companies wouldn't, while encouraging flood-safe construction.

Conservationists, such as Gloria Helfand of the Natural Resources Defense Council, complain that communities attempt to stay in the preliminary period of the program, with its insurance benefits and less rigid construction strictures, rather than entering the more stringent regular program. Helfand also believes that the availability of insurance encourages development. Proponents of the program counter that at least the communities must recognize and enforce safety standards. "It's leverage to force communities to do what they should," says Mike Plaxico of the Federal Flood Insurance Agency. And it's better than paying disaster aid for damage after the fact.

As for the future, some conservationists are optimistic. Though the barrier island bill, which would have prohibited government-financed development on the islands, did not come to a vote, it will be reintroduced in the 97th Congress. John Clark of the Coastal Foundation estimates the bill will save the government \$10 billion in the next 20 years in construction and disaster costs; conservationists hope the potential savings will sway a conservative Congress.

Other federal agencies are finding that it is cheaper and more sensible to let nature have its way. Struck by the futility of fighting erosion, and beset by diminished funds, the National Park Service adopted a hands-off policy for all its coastal lands



Barrier island near Cape Canaveral. Low elevation, subject to overwash during even mild storms, is typical of barrier islands.



Cape Hatteras after 1973 storm. Overwash destroyed road and built up bayside.

five years ago. Shoreline erosion, sand deposition and dune and inlet formation are now allowed to proceed naturally, except in cases where they would endanger life or property in areas next to the Park Service's 6.3 million coastal acres.

The Corps of Engineers, builders of many of the jetties, groins and breakwaters that offend the conservationists, may be turning away from costly engineering solutions. Though its 1971 study categorized about 25 percent of the nation's shoreline as suffering "significant" erosion, the Corps' cost/benefit analysis concluded that action to halt erosion was justified for only about 10 percent of that area. And since the Corps does only what is mandated and financed by Congress, the cooling economy may limit its construction activities.

There's hope for New Jersey, too. A master plan the state recently had drawn up by an engineering firm recommends no construction in coastal areas likely to be affected by a major storm, and suggests that the state acquire the rapidly changing tips of barrier islands to prevent construction.

Turning the beaches and barrier islands into fortresses with jetties and sea walls as buttresses is not a good idea, say conservationists. The shore is a buffer zone that absorbs the worst the sea has to offer, and should not be shackled with development and the consequent protection devices, they say. "Along the Gulf and East coasts the sand beaches do not turn back the sea; they defend by strategic retreat," say Kaufman and Pilkey. When that retreat is blocked by hotels, roads and homes, the coast is left with no front line. □