'Sand is like gold.' The pricey race to restore Florida beaches before the next hurricane

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Florida's sandy beaches aren't just beautiful and one of the biggest money-makers in the state's tourism-based economy. They're also the first line of defense against storm surge flooding during hurricanes.

Now, after hits on both coasts during the 2022 hurricane season that ended Wednesday, those beaches are in desperate need of repair. Even before hurricane season began on June 1, 426 of Florida's 825 miles of sandy beaches were listed as "critically eroded" in a June report from the state's Department of Environmental Protection.

Then, hurricanes Ian and Nicole delivered a one-two punch of beach-shredding wind and waves. The damage to beaches was severe, particularly along the the northeast Florida coast.

"Our dune system is a coastal protection system," said Jonathan Lord, the emergency management director for Flagler County in northeast Florida. "Because the dunes were so damaged from Ian, it didn't take much for Nicole to further damage them and cause flooding in many neighborhoods."

For decades, Florida has been restoring its beaches by dredging or trucking in more sand. But the practice is becoming more challenging—and expensive, thanks to the rising cost of beach-quality sand. Offshore sand deposits, especially on Florida's southeast coast, are dwindling after decades of repeated beach restoration projects. As local governments squabble over the right to use the remaining sand, its price is rising.

"Sand is like gold," said Michelle Hamor, the planning chief for the U.S. Army Corps of Engineers' office in Norfolk, Virginia, which is leading the effort to develop a $6 billion plan to protect Miami-Dade County from storm surge. "There are a lot of projects that rely on it, and it's a limited resource."

And looming sea level rise, which quickens the pace of beach erosion on developed coastlines, will only make Florida's future efforts to protect its beaches more complicated and costly.

The scarcity of sand

There's plenty of sand sitting in relatively shallow water on the continental shelf that rings Florida. But not all of it is good enough for the state's beaches. Sand that has the wrong color or grain type can harm plants and animals, like the sea turtles that build their nests along the Florida coast.

There are economic considerations, too: Florida spends billions of dollars a year advertising its pristine, white-sand beaches to tourists. Loading the shoreline up with inferior quality sand could make the state a less attractive vacation destination.

Since 1935, Florida has dredged or dug up about half a trillion tons of high-quality sand to maintain its eroding beaches, according to the National Beach Nourishment Database developed by the American Shore and Beach Preservation Association and the Army Corps. But the state's supply of good sand is running low—and once those deposits are gone, they won't come back any time soon, according to Stephen Leatherman, a professor of coastal science at Florida International University.

"For all practical purposes, they're used up," Leatherman said. New sand takes thousands of years to form, and existing sand is hard to reuse. Once beach-quality sand gets eroded away from the shoreline, it winds up scattered across the continental shelf in thin layers that are too skimpy to dredge again.

Erosion woes in Miami Beach

Miami Beach may offer a vision of Florida's future. In 1968, the Army Corps began a beach restoration project for about a dozen miles of

shoreline in Miami Beach, Surfside and Bal Harbour that is still running. But Miami-Dade County, which sits on an exceptionally narrow stretch of continental shelf that is just a mile and a half wide in some places, exhausted its offshore sand supply in 2014.

Ever since, Miami Beach has had to rely on sand trucked in from Central Florida, which is more expensive. Several mines are scattered along an inland sand deposit known as the Cypresshead Formation, a stretch of extinct beach that runs west of Lake Okeechobee up toward Jacksonville along what used to be Florida's coastline. Dump trucks haul the sand from Central Florida down to Miami Beach, trundling along Collins Avenue before dropping about a dozen cubic yards of sand onto the eroding beach.

The Army Corps is currently spending $40 million to truck in 835,000 cubic yards of sand to restore about two miles of shoreline in Miami Beach, a project that will require tens of thousands of truck trips. The budget comes out to a little less than $50 per cubic yard of sand—a once unthinkable price for beach restoration.

"For sand, you're now spending $30 to $50 a cubic yard," said Karyn Erickson, president of Erickson Consulting Engineers, a Sarasota-based firm that has been working on beach restorations in Florida for three decades. "In the mid-90s, we thought it was expensive if we were paying $12 per cubic yard. $10 to $12 was the standard rate."

Sea level rise amps up beach erosion

In the future, under current projections, Florida's beaches will likely erode more quickly thanks to climate change. "Sea level rise is responsible for beach erosion," said Leatherman. "There's no way around it."

Sea level rise threatens beaches in two ways. First, higher sea levels mean water will cover more of the beach. On empty, undeveloped coastlines, the sand from the beach would get pushed inland, causing the beach to retreat. But much of Florida's coastline is built up with homes, hotels, streets, seawalls and other structures that prevent the beach from moving backward. So instead of migrating, the beach will just get thinner, Leatherman says.

Meanwhile, higher sea levels also amplify the effect of waves and storm surge. Rising sea levels destabilize existing beaches and allow eroding sand to get pulled further out to sea, according to Leatherman. That way, when a storm comes, it can do more damage to the beach.

All that means Florida's erosion challenges are only going to get harder. Adding sand back to the beaches can offer the state some temporary relief, Leatherman said. "But you're just treating the symptoms, not curing the disease," he said. "The disease is sea level rise."

The cost of beach restoration

Over the past 87 years, Florida has spent at least $1.9 billion on beach nourishment, according to the National Beach Nourishment Database. The state government now spends about $30 million to $50 million a year maintaining its beaches, and local governments contribute about the same amount.

After a hurricane, the state and counties can usually convince the federal government to foot the bill for beach restoration. But outside of emergencies, the Army Corps only picks up a fraction of the tab, leaving Florida counties and the state to devote tens of millions of dollars of their budgets to beach nourishment.

State and local officials, however, have few other choices. Erickson, the

coastal engineer, says Florida should build erosion-preventing infrastructure like coastal groins on more of its beaches. Lord, the Flagler County emergency manager, says Floridians may have to move away from the coasts eventually. But no one believes Florida and its local governments can just stop spending money on beach restoration.

"The answer is, yes, we're going to have to do it over and over again. As long as we want to protect what we've got," Leatherman said. "There's over a trillion dollars of real estate in Southeast Florida along the shore. Who's going to walk away from all that?"