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WESTCHESTER

Giant Wiffle ball-shaped reefs aim to combat erosion of Long Island Sound shoreline

Along with stabilizing the shoreline, the project intends to improve water quality and restore fish and wildlife habitats.

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Key Points

- About 40 feet of shoreline near Playland Park has been lost to erosion in the last decade.
- In 2020, high-tide floods along U.S. coastlines increased at a rate twice what it was 2 decades ago.

In the shadows of Playland Park, a stretch of shoreline has already receded, another product of climate change.

Westchester County officials estimate up to 40 feet has been lost in the last decade with repeated storms battering the Long Island Sound shoreline, located in the Edith G. Read Wildlife Sanctuary in Rye.

“It’s accelerating, too,” said Robert Doscher, the principal environmental planner for Westchester, as he stood above a crumbling embankment on a recent cold, gusty Thursday. “That’s the downside.”

Local climate advocacy: Hudson Valley to get hearing for New York state's climate change plan

Rising waters: In Mamaroneck's Flats neighborhood, residents adjust to floods, climate change

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Scientists say such effects seen along the Long Island Sound are due to climate change. There are more frequent and severe storms, increased coastal flooding, and sea levels are rising.

Eight months ago, Doscher said, the remnants of Hurricane Ida put the area about 4 feet underwater.

But officials may have a possible solution for this stretch of New York shoreline. They hope artificial concrete reefs that look like giant Wiffle balls cut in half can mitigate the effects of climate change. These unusual structures, they say, can also help restore fish and wildlife habitats.

“It’s like a belt-and-suspenders type of approach,” Doscher said. “It’s different layers that will break up the waves and help the shoreline stabilize.”

The reef balls are one piece in an overall larger project referred to as a living shoreline, which restores natural habitats and builds coastal resilience. Coastal communities along the Atlantic Coast are building living shorelines to help mitigate the effects of climate change.

The reef ball project replicates techniques in Connecticut, the Chesapeake Bay and Florida.

In Rye, officials expect to place reef balls in early 2023. The living shoreline will be constructed the following spring along 750 feet of coast.

While still in the design phase, the project – estimated to cost around $1.5 million – is threefold, Doscher explained. Along with stabilizing the shoreline, it intends to improve water quality and restore fish and wildlife habitats.

The site is currently low-lying and manmade using material dredged from the area now known as Playland Lake, just feet inland. Doscher worries consistent erosion could create a permanent inlet to the lake.

Salt marsh and tidal creeks once connected to the Long Island Sound. In the 1920s, the county created the existing lake when Playland was built. The amusement park and parking lot paved over wetlands.

In 1992, a nor'easter damaged the area, prompting the county to add a brim of concrete and asphalt to protect the access road between lake and sound as a quick fix, Doscher said. About a decade later, the county replaced that with sand dunes reaching 10 feet high that covered the stretch of the new living shoreline site.

Several tropical storms damaged the dunes, Doscher said, then Hurricane Sandy in 2011 added "the final blow."

Officials learned from past mistakes, he added. Rather than allowing waves to hit shore, they aim to break them.

The county commissioned modeling to see how waves arrive, then used that information to determine where rocks and reef balls should be placed as wave breaks in the planned living shoreline.

A series of rock clusters will be placed furthest offshore by about 100 feet. About 40 reef balls ranging anywhere from 4 to 6 feet tall, weighing between 3,000 to 6,000 pounds, will be placed closer to shore and will be visible at low tide. Behind that a swath of smooth cordgrass will be planted to help reestablish a tidal marsh.

How it works

The project aims to do the job once handled by millions of oysters and marsh that reduced wave energy and retained coastlines.

Oyster reefs once thrived on Northeastern shores before humans decimated oysters in the early 1800s, according to Jennifer Mattei, a professor of biology at Sacred Heart University. Oysters built on top of one another as each one died, creating a solid structure.

The reefs filtered water and removed algae. They also broke waves.

Native spartina fostered tidal marshland that reduced flooding and slowed waves that eroded coasts. But this was cleared, and without reefs protecting them, waves uprooted the plants.

In 2014, Mattei placed 64 reef balls for oyster, blue mussel and other shellfish habitats at Stratford Point, Connecticut, about an hour drive along the Long Island Sound from Rye. Two years later, 273 more were placed.

The goal was to reduce wave energy that took shore sediment, causing erosion. Behind the reefs, researchers planted a few acres of spartina.

"The key term is resilience," Mattei said. "How quickly does it go back to normal? How much shoreline was saved and not lost?"

Results have been promising.

The Connecticut Institute for Resilience and Climate Adaptation partnered with Mattei's team to study the Stratford Point living shoreline. James O'Donnell, the institute's executive director and a professor of marine sciences at the University of Connecticut, said the reef balls have reduced wave heights by half.

Traditional approaches to shoreline management, such as seawalls, have had negative effects on wildlife, O'Donnell added. Connecticut has limited their use unless there are threats to structures. A living shoreline is an alternative.

"If we don't take that cost on, then we won't learn as much as we should," O'Donnell said. "The next one will be more expensive, because the likelihood of making mistakes is higher if we don't learn from the ones we have."

Northeast faces special challenges

Melting ice caps and expanding seawater with heat wrought by global warming from greenhouse gas emissions are projected to increase sea level at least a foot by mid-century and 2 feet by 2100.

In February, a National Oceanic and Atmospheric Administration (NOAA) report indicated that rise is accelerating, and will exponentially increase flooding.

In 2020, high-tide floods, a tangible sign of sea-level rise, along U.S. coastlines increased at a rate twice what it was two decades ago, a NOAA flooding report from July said. By 2030, this is supposed to increase two to three times the current rate, and five to 15 times by 2050.

This poses significant risks to coastal communities. Living shorelines take on different concepts, but they need to be tested as the effects of climate change become more dire.

Along the Thames River off the Long Island Sound, Connecticut College biology professor Maria Rosa placed smaller reef balls weighing in range from around 150, 200 and 600 pounds in October. The goal is to see how smaller concrete reefs affect erosion.

Since placing them parallel to the shoreline to mimic breakwater, Rosa and her team of researchers have seen decreased erosion, with sand building back up behind the reef balls. In May, they will see which fish and wildlife are settling in the area. Later, they aim to plant marshland as part of the living shoreline.

“This is a nature-based solution to a man-made problem,” she said. “It can look very different depending on where you are.”

The nonprofit Reef Ball Foundation developed the balls used in both Connecticut projects. In Rye, Westchester officials consulted the foundation, which originally pioneered the concrete balls' use to restore coral reefs in Florida.

The Northeast presents challenges with temperate climates, winter ice, and storms such as Nor’easters. The tide also fluctuates far more drastically than the Southeast.

In addition to developing concrete for the reef balls that withstood ice, the Reef Ball Foundation also had to account for larger tidal ranges, according to Jason Krumholz, the nonprofit's scientific coordinator.

Eventually, the hope is shellfish and other organisms attach themselves to the ball to create a reef that lasts beyond the concrete decaying, which could take decades.

Krumholz calls these efforts a move from gray, like seawalls, to green, like ecologically friendly living shorelines. It’s a balance of mitigating the effects of climate change on homes, roads and other infrastructure, while also sustaining habitats.

“The reef balls are trying to move the restoration from gray to green and move how humans interface with the shoreline,” Krumholz said. “We have to adapt, right?”

In response to Hurricane Ida's damage in New York, state Sen. Shelley Mayer, a Yonkers Democrat, introduced legislation alongside Assemblyman Steven Otis, a Democrat from Rye, to direct the Department of Environmental Conservation to add more regulatory preference toward nature-based solutions, like living shorelines, as the state addresses climate change.

“The old building a wall against the sound and the ocean is just not going to be adequate,” she said. “We must learn from other states.”

Up the shore from Playland, Doscher pointed to a lone boulder. The coastline was otherwise barren and cobbly.

But behind the boulder, shrubs of phragmites, an invasive reed, stuck out.

While the boulder and the pesky reed are vestiges of the sand dunes, it showed how much waves battered the area. And how the rock protected it.

It's akin to what the reef balls aim to do.

"It's protecting that vegetation and land from erosion," he said. "It's like a little micro-environment."

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