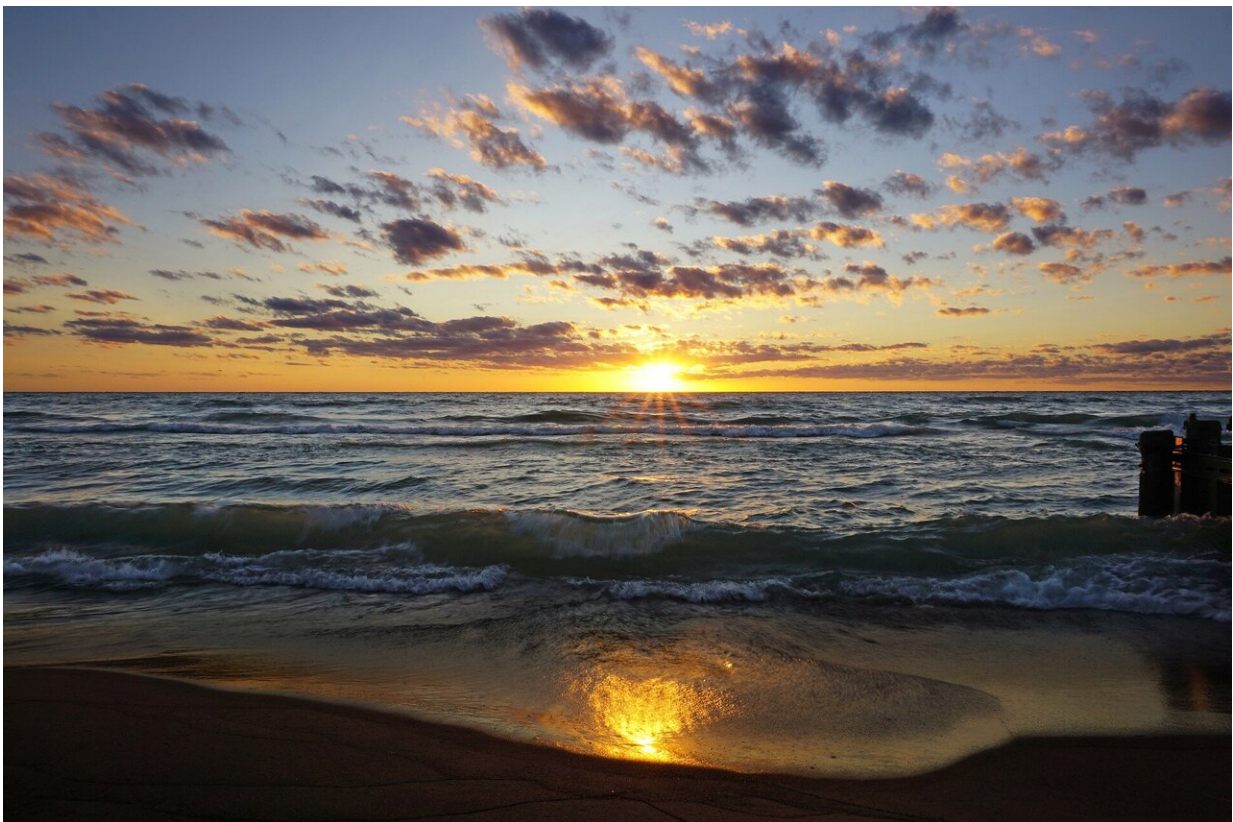


How bitter cold winter blasts and a warming planet will chew up the Lake Michigan shoreline

January 20 2020, by Morgan Greene



Credit: CC0 Public Domain

On a tucked-away South Shore beach, there once were cool shallows to swim and buried shells to dig up. For those living feet away, there was

the sound of the water, the constant, gentle splash on sand.

Then the lake began to rise. With each inch came nearly 790 billion gallons of water. The beach disappeared. Its music changed.

"Once upon a time, you could stand on the deck out there and see fish. It was so clear and the water was low," said Charlotte Mitchell, who has lived in a nearby condo building for four decades. "Not now."

Since 2013, the lake has risen nearly 6 feet, going from a record low to near-record high levels last summer. On Saturday, waves nearing 20 feet pummeled an already drowning shoreline.

A 3-foot wave can pack the power of a small car. A 20-foot wave? Maybe a freight train.

As scientists predict more extreme weather fueled by climate change, Chicago is trying to keep its lakefront intact.

Powerful storms in recent years have punched holes in a large-scale shoreline project that was authorized more than two decades ago and is nearly complete. Other parts of the lakefront that fall outside the project—like some areas in Rogers Park and South Shore—are vulnerable. And some of the emergency work undertaken in the past two months failed to withstand last weekend's storm.

Long-term solutions—dependent on more studies, additional funding and a complicated bureaucratic dance—are uncertain.

Meanwhile, beaches have been consumed. A South Side portion of the Lakefront Trail was shut down after a storm on Veterans Day and isn't expected to reopen until spring. At one [community meeting](#) about erosion, a science teacher stood at the microphone and called the

situation a "five-alarm fire."

During last weekend's storm that closed portions of South Shore Drive, water surged above the retaining wall near the garage of Mitchell's home, sending up towering spouts exploded by the wind. Mitchell's husband, John Hayes, who remembered cars floating in the garage after a monster 1987 storm, said Saturday's storm was "in a different category altogether."

"The sound, the sound was so loud," Mitchell said. "With the waves crashing up against the terrace."

Last year, the U.S. Army Corps of Engineers received 31 requests for technical assistance relating to shoreline protection by July, with 29 alone coming from the Chicago Park District—an increase that Army Corps Outreach Manager David Bucaro called "unprecedented."

In recent months, beaches were filled with boulders. More than 5,000 feet of jersey barriers and 1,000 feet of sandbags were installed along the shore to protect roadways from flooding.

The Chicago Department of Transportation is evaluating the impacts of the storm at Morgan Shoal from 48th to 50th streets and working with the Army Corps to install boulders, according to spokesman Michael Claffey. The work is expected to begin in the coming months.

"In the meantime, the City will continue to monitor and assess the situation to implement proactive measures and respond appropriately in the event of extreme weather," Claffey said in an email.

On a freezing afternoon in late December, heaps of lopsided stone and poking rebar slouched against the city's skyline. That stretch, a sunken graveyard, is what more of the shoreline would look like without the

protections implemented in the last two decades, Bucaro said.

"The amount of erosion and, really, failure of that existing revetment is pretty profound," Bucaro said, referring to the protective structure. "And if we wouldn't have implemented this project, that would be pervasive up and down the shoreline. It would be in really, really tough shape."

Three unprotected North Side beaches experienced severe damage following two fall storms. Emergency work estimated at \$3 million was completed at Juneway and Howard beaches, with Rogers Beach almost completed.

After last weekend's storm, Juneway looked largely the same as it did on a mild afternoon in early December. The horizon glowed above the murky water and boulders were piled up where the beach used to be. The triangular Quantum Dee sculpture stood upright.

But additional protections are now planned for Rogers and Howard beaches, where the shoreline was hammered again. Like Juneway, these beaches will now be replaced with rock, and work is expected to be completed in February.

"Standing at Rogers was like standing in a wind tunnel. It was just a constant, howling gale," said Alderman Maria Hadden.

"It was a different type of storm," Hadden said. "Different direction. Different waves. Areas that hadn't been as impacted before were severely impacted."

Tom Elliott had one of his first dates with his fiancée at Rogers Beach, and they later rented a nearby unit. Now they're reconsidering whether they should try to buy in the building—at a time when the lake is rising and first-floor residents have put up materials like plexiglass and

plywood to keep windows from breaking and water from coming in.

"And it just makes you wonder if this is climate change literally knocking at our back door—telling us this is a serious issue, you should pay attention to what's going on in the world," Elliott said. "Or if this is more of an ebb and flow that happens over a period of time."

Some shoreline protections, revetments of stone blocks and wooden posts constructed a century ago, eventually collapsed and rotted. Areas bolstered with steel sheeting fared better, but most of the shoreline was built with the fatal mix that failed to account for Lake Michigan's fluctuations. Without the walls, The Chicago Tribune reported in the years leading up to the large-scale protection project, 20 feet of land could disappear each year.

As lake levels rose to record highs in the mid-1980s and the revetments failed, the Tribune reported on studies from the Army Corps in January 1987 warning that within the decade, Chicago could lose parts of Lake Shore Drive, first to flooding and then erosion.

A month later a storm with 14-foot waves shut down parts of the expressway.

"A foot of water in a bathtub isn't much," Mike Royko wrote. "But in a giant lake, it's more than enough to float all the world's rubber ducks."

In the following decade, the Army Corps tested more than a dozen models, simulating harrowing storms like one from February 1979 with oceanlike waves. Revetments with steel sheet piles were eventually chosen as a solution that was more access-friendly and visually appealing than rubble mounds.

Meanwhile, the shoreline struggled.

"It looks terrible," a chief planner in the Army Corps' Chicago office told the Tribune in 1993 about the South Side's Burnham Park, one of the hardest hit locations. "The North Side is falling apart, but the South Side has already failed."

In 1996, Congress authorized the Chicago Shoreline Protection Project and three years later, the federal and local partnership began work across more than 9 miles of the lakefront to protect Lake Shore Drive from flooding and the shoreline from erosion.

The protection project was expected to be completed in less than 10 years, the Tribune reported, and came with a price tag of \$300 million.

The Army Corps finished the federal share of the project in 2014 but two decades later, Morgan Shoal and Promontory Point are still incomplete. Morgan Shoal is one of the longest reaches in the project and is costly, officials said, while Promontory Point encountered opposition from the community over the revetment's design.

The entire project's cost has risen to \$536 million, but officials estimate its annual benefits at \$194 million.

Now there's a push for a study that reevaluates the shoreline, backed by local and federal agencies, along with congressional representatives, which could potentially bring aid to unprotected areas including the Rogers Park beaches and South Side locations like La Rabida Children's Hospital.

U.S. Rep. Bobby Rush, a Chicago Democrat, who convened a recent community meeting to provide information and address concerns about erosion, is among the officials advocating for the study—and for renewed attention on some South Side locations he said were not prioritized.

Hadden agreed. "We need to make sure that we've got an equitable plan as we move forward in this next assessment," the alderman said, "... not solely weighted on North Side, or even, in this case, central downtown communities, which is kind of what happened last time."

They'll find out next month if funding will be approved.

If the study is funded this year, the best-case scenario is that construction would start in four to five years, the Army Corps' Bucaro said.

"We're doing the best we can with what we've been given," Bucaro said. "We have been seeking to do this study for at least six years now. And when the lake levels were low, there was no interest in doing preemptive planning to address these issues."

Human activity is changing the planet's climate faster than at any time in modern civilization, heralding costly and, in some cases, life-threatening consequences, scientists concluded in a comprehensive 2018 report by the National Oceanic and Atmospheric Administration. For every 1 degree of warming, the atmosphere can hold 4% more water vapor that can turn into precipitation.

As the planet warms and additional moisture sticks in the air, we could see more frequent and stronger storms.

"They're coming more often and when they arrive, they're huge," said Guy Meadows, professor of sustainable marine engineering at the Great Lakes Research Center at Michigan Technological University.

Storms raise lake levels and allow towering waves to hit farther up on the beach, causing erosion. As sand clears out, the lake bed deepens, allowing for even taller waves, continuing the cycle. For areas already hit by erosion, it's a one-two punch.

"You're talking about enormous forces," Meadows said—like Saturday's waves and surges that cracked trees, dislodged asphalt and upended sediment.

"Even if you're getting hit by a 3-foot wave," Meadows said, "It's the equivalent of getting hit by a Volkswagen."

In addition, hardened shorelines, like those in Chicago, can decrease the dissipation of bigger waves. When waves hit a structure like a sea wall, they bounce back, creating higher energy.

The worst storms typically come in the fall and winter seasons, Meadows said.

"I think we're going to see much more variability in the next few decades," Meadows said. "So what can you do about it? You just need to be prepared for big rainstorms, big floods, big shoreline erosion, big waves. Followed by episodes where all the equipment you bought last year sits in the barn and you wait for it to happen again."

The National Oceanic and Atmospheric Administration expects Lake Michigan levels to remain high over the next several months and to potentially break monthly records in January and February.

Lake levels fluctuate on multiple scales, but climate change could be contributing to more pronounced variations, according to University of Michigan associate professor Drew Gronewold.

Global effects on precipitation are almost impossible to predict a year out, Gronewold said.

But as temperatures and precipitation increase annually, "the oscillations between water levels and extremes are likely to change in ways that we

haven't seen before," Gronewold said. He pointed to the more than 4-foot swing from 2013 to 2016, one of the highest rates of water level rise during a three-year period ever for Lake Michigan. Above-average precipitation was the dominant factor in the increase, but below-average evaporation was also a factor—which can be caused by the freezing of the lake from a polar vortex.

"Does it make a difference to a community or to a planning group or to someone putting in infrastructure if you hit high water conditions every 10 to 15 years, or if you hit them every two to five years?" Gronewold said. "At what point does it become too frequent for people to tolerate?"

The Park District is sharing drone footage of the shoreline with other agencies to verify what residents and workers are seeing on the ground.

"No one agency can really tackle this on our own," said Heather Gleason, the Park District's director of planning and development. "So we need to partner up with everyone."

The footage, collected over sunny summer days and expected to be shared at future community meetings, shows the general stability of newer revetments—and what's happened to those that are unguarded.

The city's Transportation Department is also working with the Park District and the Army Corps to assess the impacts of last weekend's storm and determine how the existing shoreline protection plans need to be adjusted, said Claffey, the department spokesman.

There is also the Great Lakes Coastal Resiliency Study, which would look at future variability and design parameters to use going forward across all the Great Lakes, also backed by the Army Corps, but it has yet to be federally funded.

"We recognize that variability is going to be a challenge going forward, and we want to get ahead of it," Bucaro said.

Even if a new study is approved, residents like Charlotte Mitchell who live on swaths of private property in South Shore and Rogers Park have been told they're largely on their own. Their condo boards are hiring engineers and beginning permit processes and have been given contact information for the Federal Emergency Management Agency.

Joyce Brown, a resident in Mitchell's building, showed up at a recent community meeting exasperated. She was frustrated with the lack of answers on how the board could raise the retaining wall to prevent flooding, and felt that the South Side was being neglected.

"I left that meeting more concerned than when I walked through the door," Brown said. "It might be a little easier for me to pack up and move, but not for everybody in this building. We've got a lot of seniors who are retired now, bought their condos years ago."

Juanita Irizarry, of Friends of the Parks, which has advocated for a public lakefront, said there's a balance between the beauty and privilege of living on the water and what comes with that. "Friends of the Parks certainly wants to be sensitive to people's immediate pain, but we also hope that this is an opportunity to engage people about what [climate change](#) might mean in the long term and what we might want to do for long-term planning for that space," she said.

Bucaro said the Army Corps' mission has always been to address public infrastructure and federal funds can only be spent on public property. If residents want to place material below the ordinary high-water mark, it requires a permit from the corps. But there will be expedited permitting for affected residents.

But some residents worry time is running out.

At Richard Carthew's Rogers Park condo, sandbag barriers and a fence were wiped out by Saturday's storm. Waves crashed over the retaining wall, washed up on to the terrace and filled the garage, soaking multiple cars.

"The driveway acted like a giant bathtub," he said.

Carthew said there's an irony to private property owners having to work through the Army Corps if they want to place something in the water.

"They have the authority to control the water, even if it's privately owned, but they're no longer taking responsibility for protection of that shoreline," he said.

The building's management is now in talks with engineering firms to find a solution, Carthew said, but the building's proximity to a public beach—which they can't touch—poses a challenge. Carthew worried any potential permits could get held up with red tape.

But his larger fear came true Saturday—"That we're going to have one heck of a bad storm and it's going to cause great damage. And, really, there's very little we can do about it."

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