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NEWS

Armored homes, rising water: What to know about Great Lakes flood patterns

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Robert Burr loves his home he's owned for 42 years with its picturesque views of South Haven, Michigan's drawbridge and marinas. He enjoys being able to step out his back door, get into his boat and do one of his favorite things: salmon fish.

What the former mayor doesn't love is the flooding he's had to deal with increasingly in recent years along the Black River just off of Lake Michigan. So he made a drastic choice.

"I elected to tear it down and start over," Burr says of half of his home—the portion below the flood plain.

On a persistently rainy afternoon in October, he stood where his kitchen, living area, furnace room and bathrooms had been. The section of the house will be rebuilt 9 inches higher.

Rising water has plagued South Haven as it has done in many lakeside communities around the Great Lakes, from Minnesota to New York.

Over the last three years, all of the Great Lakes—Superior, Michigan, Huron, Erie and Ontario—have hit record high levels. Along the lake system's 10,210 miles of shoreline, water threatens homes, public beaches, harbors and marinas, businesses and public infrastructure.

Governments and private property owners are taking action:

Wisconsin is building an artificial reef to save the Kenosha Dunes.

New York is spending \$2.67 million to improve flood resiliency at Irondequoit Bay State Marine Park.

Millions in federal and state dollars have been spent in Pennsylvania to replenish sand lost to Lake Erie at Presque Isle State Park.

Spring and summer in Michigan saw \$5 million in emergency roadwork along the shoreline.

And homes are being "armored" against the elements along the shorelines. In some cases, residences are even being slid away from encroaching water or taken apart in sections and rebuilt elsewhere.

It was almost a year ago that Patricia Gancer in Montague, Michigan, got the news that her family's 130-year-old lakeside cottage had fallen down a Lake Michigan bluff. She was attempting to raise enough money to protect it, but a series of nasty storms spelled defeat before she could raise the funds.

"I grew up there in the summers," Gancer told the Battle Creek Enquirer last January. "I would run wild there, and swim, and it was the freest and my favorite place on Earth."

In South Haven, the city had to close a popular park and one of the city's busiest marinas. Brian Dissette, former city manager of South Haven and now administrator of neighboring Berrien County, watched fearfully this year as water inched closer to a water treatment plant in the community.

It threatened to back up the entire system—which could spill raw sewage directly into the Black River and ultimately Lake Michigan.

"We're basically taking it at triage," Dissette says, a sentiment becoming all-too-common along lakeshore areas.

A recent deviation from a long-held pattern

Since official records began to be kept in 1918, the lakes have followed a natural pattern of oscillating between multiple decades of highs and multiple decades of lows, scientists say.

But, lately, the lakes are bucking that pattern, according to experts such as Drew Gronewold, an associate professor at the School for Environment and Sustainability at the University of Michigan.

"We've had a pretty remarkable surge in water levels across the entire Great Lakes system," says Gronewold, who has studied lakes around the world but spends most of his time studying the Great Lakes.

"Lake Ontario shattered its all-time record in 2017 and 2019—that's not supposed to happen. Lake Ontario is regulated. That is part of the story about why we think something different has been happening the last 10 years."

How different?

On March 7, 1986, the Los Angeles Times ran the article: “Highest in more than century: Rising Great Lakes levels threaten floods, erosion.”

Levels up.

Twenty-seven years later, on Feb. 6, 2013, The Associated Press wrote: “Two Great Lakes hit lowest water level on record.”

Levels down.

But today -- just seven years after record lows --, we're back to headlines like: “Record-high Michigan water levels are a nightmare for homeowners, state,” appearing in the Detroit Free Press in July.

What is happening?

'And farther below, Lake Ontario...'

First, you might need a little lesson on this system, which contains about 6 quadrillion gallons of water—20 percent of Earth's freshwater. If you were to suck all that water up and dump it on the lower 48 states, it would cover the 3 million square miles in 10 feet of water.

The lakes work like this: Most of the water comes from precipitation falling on the lakes, the rest from run-off over land and from the lakes' tributaries.

The water follows a journey immortalized in Gordon Lightfoot's "Wreck of the Edmund Fitzgerald."

It flows east from the most northwestern lake, Lake Superior, which is about 600 feet above sea level. The water descends from Lake Michigan and Huron (considered the same lake by scientists because they rise and fall together), onto Lake Erie, then over Niagara Falls into Lake Ontario.

Finally, the water heads up the St. Lawrence River into Canada, then through the Gulf of St. Lawrence to the Atlantic Ocean.

It can take years—even decades—for water to make it through the system, Gronewold says.

Precipitation more plentiful in lakes region

Lake levels rise and fall on a seasonal basis, with higher levels typically in the spring and summer months due to increased precipitation and decreased evaporation; and lower levels typically in the winter and fall months due to decreased precipitation and increased evaporation.

What's changed is the extremely wet period the Great Lakes are going through, says Deanna Apps, a physical scientist in the Detroit District of the U.S. Army Corps of Engineers.

From 1901 to 2015, annual precipitation in the United States increased 4 percent, but in the Great Lakes precipitation increased by 10 percent, according to an Assessment of the Impacts of Climate Change on the Great Lakes.

The assessment was commissioned by the Environmental Law and Policy Center and the Chicago Council on Global Affairs and written by 18 leading scientists and experts from universities and institutions in the Great Lakes region.

Scientists don't know exactly why the Great Lakes region is warming faster, though it is believed to have to do with a warming Arctic creating volatility in the jet stream that typically holds colder air north of the Midwest.

Warmer winters are causing reduced rates of evaporation because the water needs to be warmer than the air for the process to occur. There is still a lot of debate about the impact of ice cover, which has been declining on the lakes, as well.

But increased precipitation and decreased evaporation are having an impact on levels, Apps says.

'Continue to prepare for high water'

Part of Apps' job is to put together a six-month forecast for lake levels on all the lakes.

"Those struggling against high water should stay vigilant," Apps says.

While each of the lakes experienced some drier conditions this past spring and summer, compared to 2017 and 2019, Apps says, it won't be enough to bring levels down.

"The lakes are in their seasonal decline now, but throughout 2020 and 2021, those on the Great Lakes should continue to prepare for high water and take the necessary measures you need to protect property and whatever else is on the shoreline," Apps says. "High water is

going to continue until we see significantly drier conditions in the basin over months to years.”

The Army Corps’ forecast consults several factors, one being the three-month seasonal outlooks issued by the Climate Prediction Center, a federal agency. From January through July 2021, the center predicts above normal rates of precipitation across the Great Lakes region.

“Mother Nature really is in charge,” Apps says.

What does the future hold for lake levels on the Great Lakes?

But, then again, the Great Lakes are dynamic, Apps says. Recent torrential rain events have shown how quickly they can rise, but, she adds, “water levels could be at record lows again six to seven years from now.”

Very simply, Gronewold says, we don’t know what will happen in the long-term with lake levels, though he, too, expects levels to remain high for the foreseeable future because the ground is so saturated. And it takes a long time for water to move through the system.

However, a polar vortex or a dramatic swing to drier weather could—and most certainly will—one day bring lake levels back down, Gronewold says.

Rising average temperatures in the region are another important factor, says Richard Rood, a core faculty member at Great Lakes Integrated Sciences and Assessments (GLISA), a partnership between the University of Michigan and Michigan State University.

GLISA is one of 11 regional centers funded by the U.S. National Oceanic and Atmospheric Administration. Its role is to build the Great Lakes’ capacity to manage risks from climate change.

The center has calculated that the basin’s average annual temperature has increased by 2.3 degrees since 1951. Winter is warming faster, with an increase of 2.8 degrees over that time.

“There is no reason to expect this trend to cease in our lifetimes or in our children’s lifetimes,” Rood says. Although the Great Lakes are currently experiencing both increased precipitation and more extreme precipitation, a dry period with increased temperatures would increase the risk of drought.

“Variability is the right way to plan—we anticipate sustained periods of flood and drought in the coming decades,” Rood says. “When I got into this business, moving up from NASA in 2005, there was a narrative that climate change would make the lake levels go down, it was known to be too naïve a statement, but it echoed around the region.”

And when water was low, and was expected to stay that way, people began to build closer to the water.

The rise of 'armoring' on Great Lakes shorelines

Jerrod Sanders is drowning, not in water but in permit applications for shoreline work to protect homes and public infrastructure along Michigan’s coast by "armoring" them against the elements.

As assistant director for the Water Resources Division at the Michigan Department of Environment, Great Lakes and Energy, Sanders’ office grants permission to build lake armaments:

The U.S. Federal Emergency Management Agency describes armoring as building "shore protection structures" and "erosion control structures" that include seawalls, bulkheads and revetments "that are typically installed to stabilize bluffs and banks and protect property along the lakefront."

Armoring is on a dramatic upswing in recent years.

In all of 2014, the department processed 264 permit applications, Sanders says. They are on pace to issue roughly 2,500 this year.

“There is really not a corner of the state that has not been hit by this,” Sanders says. “We are just overwhelmed with the emergency stuff.”

And that’s just Michigan.

The Great Lakes basin includes parts of eight states—Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin—as well as the Canadian province of Ontario.

It is home to 8 percent of the American population and 32 percent of the Canadian population.

The region is important to national economy and U.S. trade, with seaports and world-class recreational opportunities—regional fisheries represent a \$7 billion a year industry and

tourism generates \$16 billion alone.

'Can we engineer our way out of this?'

Everyone everywhere is clamoring for answers to high-water problems, says David Fay, senior engineering advisor to the International Joint Commission, a bi-national organization established by the governments of the United States and Canada under the Boundary Waters Treaty of 1909.

“Can we engineer our way out of this? I get the question often,” Fay says. “The short answer to this question is no.”

And he'll tell you why. There are some manmade controls that affect the level of Lake Ontario and the St. Lawrence River, the first at Sault Ste Marie, between Lake Superior and Lake Michigan/Huron, and the second at Moses-Saunders Dam near Massena, New York, and Cornwall, Ontario.

The dams at Sault Ste. Marie and Massena-Cornwall are regulated, and the International Joint Commission can direct the operators to release or hold back water.

But only the Moses-Saunders dam on the river downstream of Lake Ontario has the capacity to make a significant difference in water levels, the University of Michigan's Gronewold says.

As much water as possible—without hurting people and property downstream—has been let out of Moses-Saunders during these years of high water, the IJC's Fay says.

“This reduced the worst of the flooding on Lake Ontario by more than a foot, compared to what would have happened without the dam in place,” Fay says.

The US Army Corps of Engineers Water Level Update forecast that the Lake Ontario water levels Dec. 11 would be a little over 244 feet, 15 inches below the level on the same date in 2019. That level is 23 inches lower than the highest monthly average of record for December. Three inches of water were forecast to be added by Jan. 11.

Controlling the flow from Lake Superior has reduced the peak levels a bit on both Lake Superior and Lake Michigan/Huron. But there's been flooding and erosion on the lakes' shores, so either holding back or increasing the Lake Superior flow would make the problem worse on one lake or the other, Fay says.

Lake Ontario bears brunt of water's impact

What's happening on Lake Ontario is further proof of what's happening in the Great Lakes system, Gronewold says. In 1986, when all of the other lakes hit record highs, regulators were able to keep Lake Ontario at fairly average levels by releasing water.

Now, with so much water draining through the system—and Lake Ontario at the end of the chain—they can't release enough without doing damage elsewhere in the system.

The regulatory plan for management of the dam and water release is overseen by the IJC and is called Plan 2014. It's a hot-button issue across the Great Lakes and, in particular, in the Lake Ontario basin.

The New York state Department of Environmental Conservation filed a lawsuit against the IJC in 2019 for failing to implement its flood protocol and to protect landowners up and down stream.

The IJC's Fay contests: "It's not the plan—it's the weather."

Whatever the larger causes, those with investments at risk along a Great Lakes shoreline are standing up and fighting.

"Armoring—that's what's really happening in a big way on the Great Lakes shoreline," says Richard Norton, a community planner, lawyer and faculty member at the University of Michigan in Urban and Regional Planning.

Needs of homeowners vs. fate of natural habitats

But what is the cost of armaments? Norton asks.

He displays a photo of a home on a peninsula. Sloped walls of riprap have been built around it, to stave off anymore erosion--keeping it from sliding into Lake Michigan. For now, at least.

"Most people look at the house and say, 'Oh, think of that property owner, and how dangerous and precarious that house is—understandably so,'" Norton says. "But I would say, too, look at the beach. Look at what's happening to the Great Lakes shoreline."

With any kind of armament, the beach can't readjust with the seasons and the lake's natural ups and downs, Norton says. Natural habitats are destroyed, and the public can lose beach access, an individual right, according to Michigan law.

Armaments can negatively impact neighboring properties, as well.

“We know that armoring the shoreline has long-term consequences,” says Sanders, who issues permits for such work. “But there is a balance with private property rights. They might have built too close, but they built there legally. The important thing for the future is that we make better decisions about how we develop the shoreline.”

Norton, a legal expert, says he doesn’t envy Sanders and the state’s position in trying to make everyone happy and do what’s right.

Back in South Haven, Michigan, a new city manager continues work that Dissette started, banding together with other lakeside communities to try to convince people it’s a good idea to set new zoning rules -- something city officials know will be controversial.

But they want to avoid their new reality, Dissette says. The city’s south side is developed and now has “walls and walls and walls.” There may still be a way to better protect the beach on the city’s developing north side, however.

“We can’t prevent people from making bad decisions but codifying it through a zoning ordinance might mitigate some of those bad decisions,” Dissette says. “We’re trying very hard to educate people for when the lake levels go back down, and there is temptation to build.”

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