86% of Great Lakes litter is plastic, 20-year study shows: And the plastic is 'just getting smaller and smaller."

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Heads down and attentively scanning the ground, a small group of schoolchildren walked through an expanse of grass dotted with yellow

dandelions and toward the concrete steps leading to Lake Michigan.

Andrew Scarpelli, a biologist, ambassador for the Alliance for the Great Lakes and guide for this cleanup effort, asked the children if they had a favorite animal that lived around the lake.

"Cardinals!" "Seagulls!" "Woodpeckers!" "Owls!" the kids yelled out.

"We're doing this for them," Scarpelli said.

Using data from more than 14,000 beach cleanups over 20 years, a new report from the nonprofit Alliance for the Great Lakes found that 86% of litter entering the Great Lakes in a given year is either partially or fully composed of plastic. Previous estimates and computer simulations indicated that 22 million pounds of plastic debris entered the lakes annually, at that time making up 80% of shoreline litter.

Large plastic products left behind on beaches, including single-use bags, straws, wrappers, takeout containers and utensils, eventually break down into smaller plastic particles. The tiniest of these—less than 5 millimeters long or the size of a pencil eraser—are known as microplastics and have been found in drinking water and human blood, organs and breast milk.

"There's that tangible thing with the story of the sea turtle and the straw," said Krystyna Meyer, coordinator of conservation action at the Shedd Aquarium, referring to a 2015 viral video of a straw being removed from a turtle's nose. "But it's the stuff that we don't see that's actually causing much bigger issues."

For decades, plastic pollution of different shapes and sizes has been steadily flowing into the world's largest freshwater system, which provides drinking water for more than 30 million people. It threatens the

health of humans and wildlife, and the well-being of the region's aquatic habitats and green spaces.

For volunteers and researchers, quantifying this pollution is the first step toward pressuring politicians and industry players to enact changes at the source.

"Plastic is not disappearing—it's just getting smaller and smaller," said Olivia Reda, author of the report and volunteer engagement manager at the alliance. "I think finding these pieces of tiny trash is definitely sort of eye-opening to folks, to start thinking about the smaller things. … What happens when you can't even see them anymore?"

Ripples through ecosystems

The Great Lakes are home to about 3,500 species of plants and animals, some of which can only be found in this region.

On Earth Day, Scarpelli met the children, who are part of a local micro-school, or homeschooling co-op, and their mothers at Belmont Harbor to scout for litter.

"All the things you're going to find today are going to be saving the lives of different fish and other organisms in the lake," Scarpelli said.

Small plastic litter, for instance, looks very much like fish eggs, which can confuse predators such as larger fish, he said. Then, aquatic birds eat the fish and the plastic makes its way out of the lake and into their systems. Meyer said birds also eat bright pieces of colorful plastic, consuming them until their stomachs feel full and they starve to death.

Under the glittering surface of the lake, the round edge of a big container could be seen between the rocks. "Guys, I found an entire trash

can in the water!" shouted a giddy Gus Roderick, 8.

"You might be looking for big garbage, but now I need you to use those eyes and look for the little garbage, OK?" said his mom, Sara Black, after coaxing him back to the dirt path where more trash could be found.

"Tiny trash"—plastic, foam and glass pieces measuring approximately 1 inch or less—accounts for 40% of litter found in the Great Lakes, the alliance report said.

In the last decade, volunteers with the alliance have picked up over 1.7 million individual tiny pieces of plastic from shorelines across the eight surrounding states. Tiny plastic alone has been the most prevalent type of litter found, followed by cigarette butts, tiny foam pieces, plastic bottle caps and food wrappers.

A recent study in Lake Superior and Lake Ontario found the highest concentration of microplastics ever recorded in bony fish, with a few even having more than 900 microplastic particles in their stomachs. In Lake Erie and Lake Michigan, algae amass and absorb large amounts of synthetic microfibers, a type of microplastics originating from textiles released in washing machines and then discharged by water treatment plants.

Some of the extremely small pieces of microplastics are known as "nurdles," beads or pellets the size of a lentil formed during the raw production of plastic. Meyer said it takes over 600 nurdles to make one single-use plastic bottle. After the manufacturing process is completed, unused nurdles can blow into the many shipping containers transporting products across the Great Lakes, which is how they can enter surface waters.

"I really like to think of the Great Lakes as the heart of our country, and

our river system as kind of acting as those arteries and those veins that bring us to all other areas in the world," Meyer said. "So (if) we're finding these nurdles and other broken-down microplastics in these spaces, they're making it not just to the Great Lakes, but to water bodies far beyond that."

Often organizing action days through the aquarium, Meyer said she trains volunteers on how to find these smaller and more inconspicuous forms of plastics during beach cleanups.

"Volunteers are familiar with seeing small bits of Styrofoam," Meyer said, "but it's like you're peeling back the curtain on this thing that they'd never noticed before that's right there in front of their eyes. And they never unsee it."

Human health impacts

Experts say it's likely that current water filtration systems are not equipped to handle microplastics, which means that many local sources of tap and bottled water are contaminated.

A 2018 study discovered microplastics were present in samples from a dozen brands of beer brewed with water from the Great Lakes.

"Like with a lot of environmental issues, if it's not something that impacts your daily life, it's maybe harder to feel connected to it," Reda said. "I think once you sort of talk about the public health aspect of it, it's very difficult not to feel connected."

According to a 2021 study, humans consume 0.1 to 5 grams—or an amount similar to the size of a credit card—of tiny plastics every week.

"I about peed my pants when I learned that," Black said, eyes wide.

With hands-on nature-based learning, Black and the other parents are hoping to equip their children to face these hard realities head-on.

"You got to get them young to care for the planet," said Kathy Aguilar, one of the other mothers at the cleanup.

While difficult to detect, studies have discovered microplastics in various parts of the human body, including the bloodstream, lungs, liver, heart tissues, and even in placenta and breast milk. But research into how microplastics affect the human body is still in its early stages.

"What we don't know is, once they get there, to what extent the plastics or the things attached to them cause inflammation or interfere with cellular processes in other ways," said Katrina Korfmacher, co-director of the new Lake Ontario Center for Microplastics and Human Health in a Changing Environment, a collaboration between the University of Rochester and the Rochester Institute of Technology in New York.

The importance of the Great Lakes extends far beyond drinking water. According to the Great Lakes Commission, tourism, transportation, and recreational and commercial fishing help drive a $6 trillion regional economy. In addition, lake water is also used for irrigation and food processing.

The possibility of consuming fish with plastic in their bodies might be concerning enough, but the problem of microplastic accumulation goes beyond fish and aquatic life. Other animals that humans consume for protein—as well as alternatives such as tofu and veggie burgers—can also contain high levels of microplastics likely due to processing steps such as packaging.

An Ocean Conservancy study released in February found that 88% of samples of 16 commonly consumed protein products contained

microplastics, from freshly caught fish to highly processed meats. On average, 74 microplastics were in one serving of any given protein, with no significant differences tied to their source; for instance, seafood, terrestrial and plant-based proteins all carried the same concentration.

What makes microplastics even more enduring, however, is that they act as a sponge for other chemicals and toxins, including pesticides and oils. So even the physical removal of small plastic particles might not be enough to remedy contamination in animal meat or even a body of water.

"We might be able to open up a fish to use for sustenance and we might physically see some of that plastic in their system, but we're not able to see the toxins from those microplastics that are actually staying within that fish," Meyer said. "And then they're being processed and eaten by humans, causing some issues that we're aware of and some that we're not quite aware of yet."

Climate change complications

Over 99% of plastic products are made from fossil fuels such as coal, oil and gas, which when burned emit greenhouse gases like carbon dioxide that trap heat and increase global temperatures. Scientists expect plastic production will be responsible for up to 13% of carbon emissions from human activities worldwide by 2050. However, plastic products also cause these harmful emissions throughout their life cycle. Waste management processes such as recycling, landfilling and incineration all, in some way or another, release greenhouse gases.

Just as plastic production can affect climate, researchers are also trying to understand how climate change might complicate the ubiquity of microplastics, causing even more devastating effects on human and environmental health. At the new interdisciplinary center in Rochester,

scientists will study whether and how changes in water levels, precipitation patterns, temperature, acidity and ice cover in Lake Ontario can, in turn, affect the movement and characteristics of microplastics in the water.

Also a professor of environmental medicine at the University of Rochester Medical Center, Korfmacher said future research should also focus on whether different communities may be more exposed to and affected by microplastics.

"That's where we're still steep on the learning curve," she said. "We're increasing our understanding of how much there is in different water sources, and whether that matters."

In its report, the Alliance of the Great Lakes acknowledged plastic pollution disparities, citing a study from the United Nations Environment Program that linked environmental injustices to plastic production, the extraction and manufacture of raw materials and the consumption and disposal of plastics.

"It is very important to note that not everyone is impacted equally by the injustices of plastic production and pollution. From Illinois and Michigan to Louisiana and Texas, petrochemical and plastics plants are predominantly located in low-income communities and communities of color," according to the alliance report.

"Residents living near these facilities bear a disproportionate and ever-accumulating burden of health impacts from chemicals known to be toxic and harmful to human health, causing increased cancer, asthma, and other chronic life-shortening health conditions."

Citizen power

Though the recent report only analyzes data collected since 2003, the Alliance for the Great Lakes has organized beach cleanups since 1991. Over 200,000 volunteers have participated in these efforts, removing over 9.7 million individual pieces and over half a million pounds of litter from shorelines.

The organization's official spring cleanup season kicks off this weekend, but events take place year-round; a full list can be found on the website at adopt.greatlakes.org/s/find-a-cleanup.

Reda said the report doesn't show significant annual fluctuations in how much litter entering the lakes is made of plastic; the percentage has remained between 80% to 90% each year for the last two decades. But taking a step back and realizing not much has changed reveals the problematic permanency of plastic contamination.

"When we look at it as a whole, that's when the most meaningful story comes to light, in terms of putting some numbers and data analysis to something that we probably all know is happening," she said. "And of course, all of these individual actions are great, but we do need actions that go well beyond that."

Reda added that grassroots and public involvement is essential in applying pressure on government, businesses and manufacturers to enact systemic change.

In 2023, the Illinois General Assembly passed several bills to reduce reliance on single-use plastic and unrecyclable products. One of these banned foam food containers from state facilities, which this year proponents of the Styrofoam bill HB 2376 are hoping to build upon in order to ban all retailers and restaurants from using disposable foam foodware.

A new plastic bag bill introduced this year, HB 4448, would ban all plastic single-use bags in stores and restaurants.

A bill also passed last year requires the Illinois Environmental Protection Agency to carry out a statewide needs assessment for packaging and paper products, a big step toward establishing a policy that would hold producers accountable across the life cycle of their products, design and materials to waste management.

On the global stage, negotiations resumed Tuesday in Canada with delegates from over 170 countries putting their heads together to draw up a treaty to address pollution from plastic throughout its entire life cycle. The theme of this year's Earth Day centered around a 60% reduction of plastic production worldwide by 2040.

Remaining hopeful

At Belmont Harbor, Aguilar carried a clipboard and tallied the trash the micro-school students picked up along the lakefront.

"Cardboard!" a kid would yell.

"Cigarette! Cigarette!" another one would chant.

"You guys are going to be astonished to see the results," Aguilar said, offering a peek of her clipboard to the children. "Look at the chart, what's the thing we've found most?"

It was cigarette butts, closely followed by small pieces of plastic. At the tail end of the cleanup, volunteer ambassador Scarpelli weighed the trash bags with a handheld scale. The group had collected 15 pounds of litter in less than two hours.

"For any environmental issue of this scale, it takes real effort to remain hopeful about it," Reda said. "But, for myself, being surrounded by so many volunteers who care about this stuff … that matters, and that creates movement."