Great Lakes' latest pollution threat: Microplastics

August 12 2019, by Jennifer Bjorhus

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A new contaminant has turned up in western Lake Superior—tiny snarls, tangles and shreds of plastic that are appearing by the hundreds of thousands, mystifying scientists and Minnesota pollution regulators.

While the level of debris doesn't approach the microplastic soup found near Hawaii, a gyre known as the Great Pacific Garbage Patch, it does exceed what's been found in the north Atlantic Ocean. The discovery has prompted researchers at the University of Minnesota, Duluth to expand testing to other Minnesota lakes and the fish that inhabit them.

The exact source of the microplastics remains something of a puzzle, and it's not clear yet how to gauge their impact on people, aquatic life and the environment. "It's on the earliest slope of emerging as an environmental issue," said Catherine Neuschler, a manager at the Minnesota Pollution Control Agency.

But plastics are very slow to degrade, meaning they could survive in nature indefinitely.

"This is a huge issue," said Rep. Rick Hansen, DFL-South St. Paul, an influential legislator on environmental issues. "I have yet to find one person who wants to drink plastics."

Researchers at UMD's Large Lakes Observatory published their findings last year in the journal *Environmental Science & Technology*. They've just launched a new study of inland lakes and fish, which were not part of the Lake Superior research.

Partnering with the state Department of Natural Resources (DNR), they'll spend two years studying water, sediment and fish from four Minnesota lakes: White Iron, Ten Mile, Elk and Peltier. They'll see whether fish are ingesting the microplastics and if so, what types they're most vulnerable to.

"Depending on the chemistry of the particles, they not only enter the food web, but they could also absorb other pollutants, and those pollutants could also enter the food web," said Kathryn Schreiner, the

environmental chemist leading the project.

A recent afternoon found Schreiner in a DNR boat, bobbing in the middle of White Iron Lake near Ely, as a team of DNR employees lowered a gang of fish nets. They're after cisco, a type of herring favored as prey by walleye, muskie and pike that has been declining partly because climate change is warming lakes.

Schreiner will stash some of the cisco, along with samples of bluegill, in a lab freezer to examine their stomach contents over the winter.

Yoga Pant Plastics

Microplastics range in size from 5 millimeters, about the size of a pencil eraser, down to 300 microns, about the diameter of three human hairs. They come from hundreds of types of plastic such as polyethylene, polyvinyl and polystyrene, or Styrofoam.

Schreiner's team did not find significant quantities of microbeads, which emerged as a pollutant of concern in the past decade from consumer products such as exfoliating facial cleansers and toothpaste. The United States recently banned rinse-off cosmetics and other products containing microbeads.

Most of what they found, she said, were fibers from polyethylene polymers. The fibers come from many sources—synthetic fabrics such as the nylon and polyester in yoga pants and polar fleece; the breakdown of larger pieces of plastic; and recreational products such as fishing line.

"They kind of look like little threads," Schreiner said.

Western Lake Superior, they found, averaged 20,000 particles per square kilometer. That's significantly more than what's been recorded in

eastern Lake Superior, Lake Michigan or Lake Huron, although it's much less than Lake Erie, their study showed.

No one is sure where the tiny particle cloud is coming from. Much of it is probably drifting in the air and ends up in the lake water, according to the UMD study. But Schreiner's team suspects that another key source is household laundry: Fabrics break down in the wash but washing machines, unlike clothes dryers, don't have lint filters. Unlike cotton, wool and other conventional fabrics, these fibers don't break down in the water.

Fibers from washing machines escape down the drain to wastewater treatment plants, which were designed to treat water for organic wastes and not slippery microplastics. The bits wind up in the treated water discharged into the environment, and in the sludge that some plants turn into biosolids spread on fields as fertilizer.

Washing machines actually produce more lint than clothes dryers, said Sara Heger, a research engineer at the U's Water Resources Center.

"No one thinks about it," Heger said.

Another culprit, she noted, are flushable hygiene wipes, which contain plastic fibers that don't degrade.

A 2015 survey of four wastewater treatment facilities by the State University of New York at Plattsburgh showed the plants discharged an average of 214 pounds of microplastics a day, or 39 tons per year.

Marianne Bohren, executive director of the Western Lake Superior Sanitary District in Duluth, which discharges into Lake Superior, said she's following the UMD research with interest but that it's too early to know how to address microplastics.

It's unlikely that treatment plants can be modified to address the issue fully, Bohren said. "A lot of this is going to involve pollution prevention efforts, education and change of products."

Bohren said the plant just spent $11 million upgrading its screening for debris entering the plant. "It's amazing what can make it down a sewer line," she said. "If people can flush it or put it in a manhole, it happens."

Future research

Hansen, who chairs the House Environment and Natural Resources Finance Division, tried unsuccessfully this year to secure millions of dollars for regulators to tackle the problem.

The Legislature did approve $440,000 for the state Department of Health to collaborate with other regulators on dealing with microplastics. "It wasn't the comprehensive analysis we were looking for, but it's more than any other state is doing right now," Hansen said.

The Health Department has just begun to examine the question, a spokesman said.

Heger would like to see Minnesota work on reducing the plastic bits at the source—upgrading wastewater treatment plants and septic systems, and getting consumers to buy aftermarket filters for their washing machines.

"Are we going to convince people to all start wearing cotton again?" she asked. "I think very few people have thought about that."

Brian Koski has. Koski's Wexco Environmental in Milaca manufactures a reusable filter, called Filtrol, that attaches to the discharge hose of a washing machine. The company is working on a disposable filter that

will be available soon and catch even more laundry discharge, he said.

He keeps photos of wet lint from washing machines—clumps that resemble an oversized hairball coughed up by a cat. That's eight to 10 loads of "my clothes," he said of one glob.

Koski's core customers are still rural homeowners seeking to protect septic systems, but he's had growing interest from environmentalists.

Koski said he was shocked to learn how the plastic fibers are slipping out into nature. He noticed that his two young daughters had all kinds of items decorated with glitter—another plastic. He suggested banning glitter in the house.

Not a popular move.

Koski said he's eager for more research into the impacts of consuming microplastics on humans and wildlife.

"It really opened my eyes," he said. "It's like, everywhere."