

The Helm

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Illinois-Indiana Sea Grant



Plastic fibers emerge as Lake Michigan pollutant

Preliminary results from the first-ever plastics study in southern Lake Michigan give a whole new meaning to the phrase “it all comes out in the wash.”

Microbeads have drawn a lot of public and political attention since 2012, when researchers from New York and Wisconsin discovered millions of the tiny particles in several Great Lakes. But this new study suggests microfibers may be an even larger concern in at least a few areas.

The small fibers are most likely from our clothes, particularly ones made with polyester or polyurethane. With every wash cycle, thousands of these colorful synthetic fibers are flushed down the drain, through sewage treatment systems, and into local rivers and lakes.

That’s exactly what’s happened in southern Lake Michigan. There, microfibers from clothing and other sources have been found in higher concentrations than any other so-called “microplastic,” setting it apart from the other Great Lakes.

“This isn’t surprising,” said Sam Mason, a chemist from State University of New York at Fredonia. “Lake Michigan is cold, and its coasts are heavily populated. And to top it off, its unique currents trap pollutants in the lake for long periods of time. It’s a perfect storm of factors that could lead to high levels of microfibers.”

Mason discovered the unusually high number of microfibers after examining the results of a 2013 sampling trip conducted by her lab, Illinois-Indiana Sea Grant

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Editor-in-Chief | Irene Miles
Writer | Anjanette Riley
Creative/Design | Joel Davenport

FROM SPIN TO LAB

Understanding plastic sampling in the Great Lakes



1 Wash cycle shakes loose thousands of fibers too small to be filtered out by wastewater treatment plants.



2 Trawl skims natural and artificial materials from lake surface and traps them in a fine-mesh net.



3 Field workers wash material into a sieve and spoon everything into a bottle to be analyzed back in the lab.

(IISG), and the plastics research group 5 Gyres. The team spent three days traversing the southern tip of the lake, collecting a total of 16 water samples. Final results are still to come, but Mason's initial analysis found plastic pieces in every sample.

Of course, they weren't all microfibers. The highest number—roughly 45,000 pieces per square kilometer—were fragments slightly smaller than a bottle cap. Plastic microbeads, wrappers, pellets, and foam were also found all across southern Lake Michigan.

“The results in southern Lake Michigan really drive home the need for more research on plastic pollution in the Great Lakes,” said Laura Kammin, IISG pollution prevention program specialist and part of the 2013 sampling team. “We’re getting a handle on how much is in the lakes, but we still have a lot to learn about where the plastics are coming from, how they are breaking down, and how they are affecting the food webs.”

Years of ocean research give some insight into the potential environmental impacts of plastic pollution. For example, chemical contaminants and bacteria can latch onto floating pieces of plastic and hitch a ride to new ecosystems. And, if fish and other wildlife mistake the pieces for food, plastic pollution could also alter feeding behaviors and transfer the toxins they carry into food webs.

Early research in the Great Lakes, led by University of Wisconsin-Superior's Lorena Rios Mendoza, has already shown that polycyclic aromatic hydrocarbons created by burning fossil fuels build up on plastics in Lake Erie. In high levels, these PAHs can be a threat to both wildlife and human health. And anglers and state agencies across the region have reported finding plastic in the stomachs of fish and birds. Researchers are still investigating how widespread and significant these impacts are.

In the meantime, several states are looking to limit future plastic pollution through legislation. Earlier this year, in fact, Illinois became the first state to ban the sale of personal care products containing microbeads. The law will take full effect in 2019. ❤️



4 Researchers separate out plastic particles and analyze each to determine its size and type.



Researchers can now dip into years of Great Lakes data

Environmental data from across the Great Lakes region is now just a click away with a new web application created by IISG and the National Center for Supercomputing Applications (NCSA). Great Lakes Monitoring makes it easy to view and analyze decades of nutrient, contaminant, and water characteristic data collected by universities and government agencies, including the U.S. EPA Great Lakes National Program Office.

“Access to high-quality, continuous data has historically been a major hurdle to Great Lakes research,” said Brian Miller, director of IISG. “What used to take months to find and retrieve now takes minutes.”

The first step for users is an interactive map that provides a quick glance at monitoring locations and the parameters measured at each site. From the Explore Trends view, users can also see basin-wide patterns for environmental characteristics like phosphorus, chlorophyll a, nitrogen, and mercury.

Researchers can delve deeper by examining the detailed data profile for each monitoring site or comparing results across multiple sites. Menus and slider bars at the top of each page make it possible to quickly hone in on specific parameters, monitoring seasons, and years.

“We designed these data views with different users in mind,” said Paris Collingsworth, IISG Great Lakes ecosystem specialist. “A higher-level manager may find the basin-scale views of the Explore Trends interesting, whereas a researcher may want more specific time-series information about a particular parameter at a specific location.”

The cutting-edge site also makes it easy for researchers and agencies to create and download their own data sets or to share data with the public.

“The tool was designed to be as flexible as possible. It wasn’t built for specific sources or data types,” said Luigi Marini, senior research programmer at NCSA. “All we need is access to an organization’s server to include their data in the tool.”

Great Lakes Monitoring was developed in collaboration with Barbara Minsker and her lab at the University of Illinois Department of Civil and Environmental Engineering. Funding for the project comes from the Great Lakes Restoration Initiative. 🍷

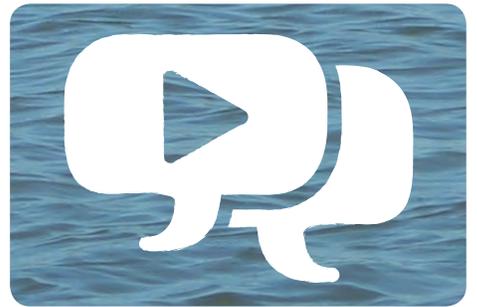


Photo courtesy of PA Sea Grant



Video chats stream shipboard scientists to K-12 classrooms

The lights are dim in a Charleston, IL elementary school, and students are crowded around a large projector screen. It's a common enough scene, but what's happening on screen is far from ordinary. These sixth graders aren't watching a movie or sitting through a presentation. They're taking a guided tour aboard the *R/V Lake Guardian*.

And they're not alone. Twenty-six classes throughout the Great Lakes basin have taken a break from their regular activities to video chat with the scientists behind the EPA research vessel's annual monitoring cruises. Some, like the Charleston class, caught the crew while they were on board collecting and analyzing samples. Others talked with EPA Great Lakes National Program Office (GLNPO) scientists from their offices. But for all the students, it was a once-in-a-lifetime chance to discuss everything from water quality to food webs to what it's like to live and work on a ship.

"It felt like I was actually there," said an Ohio high school student after taking a tour with

scientist Beth Hinchey Malloy. "It gave us students an in-depth look at something we are learning about in class."

"It's these types of experiences that turn kids on to science and hopefully spur them to pursue a career in a science field," said Steve Park, a seventh grade teacher in Indiana.

The *R/V Lake Guardian* has docked for the winter, but roughly 30 more classes from across the basin are expected to talk with EPA scientists before the school year is through.

Video chats are just one part of a joint effort by IISG and GLNPO to connect educators and students with Great Lakes science. A core piece of this effort is the Limno Loan program, which allows classes to collect water quality data of their own with monitoring equipment similar to the sensors used aboard the research vessel. The Hydrolab has helped students monitor variations in water characteristics first-hand and investigate the complicated connection between water quality and man-made landscapes.

"The Limno Loan program has become one of the highlights of our curriculum," said Wisconsin teacher Lynn Kurth. "It has provided me with an avenue to reach students who are not otherwise interested in science."

The latest addition to the effort is a website that combines educational resources with information on ongoing research projects and fun facts about the ship. Created with a grant from the Great Lakes Restoration Initiative, LakeGuardian.org lets viewers take a virtual tour of the ship, monitor its movement across the lake, and learn more about the equipment used to collect water and sediment samples. Visitors can even get answers to their Great Lakes questions with the "Ask a Scientist" feature.

The website is also home to a video series that takes students behind the scenes with Lake Guardian crew and researchers to learn more about marine career opportunities. Shot on-location by IISG, the interviews and photos bring Great Lakes monitoring alive and provide a rare look at life on the water. ♡

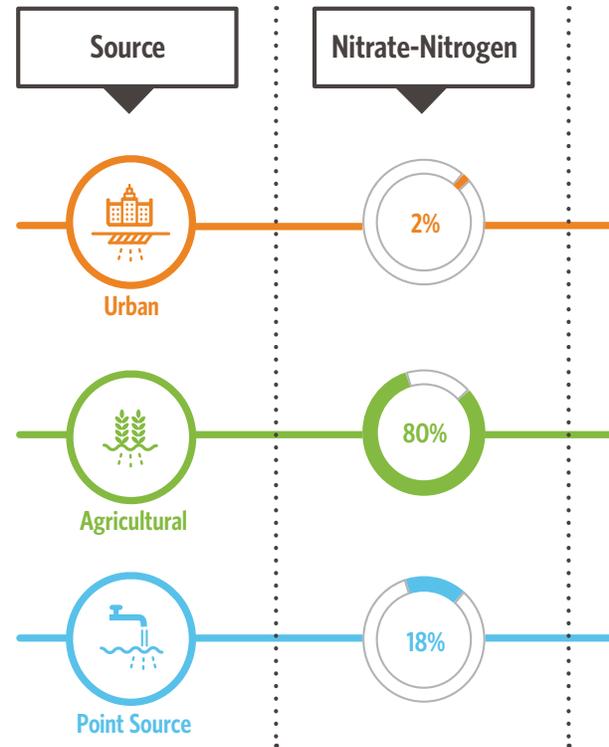
■ *New Illinois plan will reduce nutrient pollution in the Gulf*

Illinois may be hundreds of miles from the Gulf of Mexico, but it's a key player in the "dead zone," a swath of water the size of Connecticut that forms every summer and is all but devoid of oxygen. The culprit is millions of pounds of nutrients from farm fields, city streets, and wastewater treatment plants carried to the Gulf each year through the Mississippi River system. Fortunately, Illinois now has a plan to keep those nutrients out of the water.

The Illinois Nutrient Loss Reduction Strategy outlines a suite of voluntary and mandatory practices for reducing phosphorus and nitrogen losses—the primary drivers of algal blooms that lower oxygen levels—from both urban and agricultural sources. By targeting the most critical watersheds and building on existing state and industry programs, these practices are expected to ultimately reduce the amount of nutrients reaching Illinois waterways by 45 percent.

"It's the most comprehensive and integrated approach to nutrient loss reduction in the state's history," said Brian Miller, director of IISG and the Illinois Water Resources Center (IWRC). "But what really sets the plan apart is how it was developed. State agencies, agriculture, non-profit organizations, scien-

Continued on page 8 >>



Breakdown of nutrient loads leaving the state in rivers from the 2013 science assessment.



Brandon Beatty
Web Designer/Web Developer

Brandon Beatty's work focuses on the Tipping Points Planner, a web tool that uses cutting-edge technology and research to help watershed planning groups effectively balance community growth and environmental health. Brandon holds a Bachelor's in computer graphics technology from Purdue University. His extensive experience in design and web development earned him an American Advertising Award in 2009.



Michael Brennen
Water Quality Outreach Specialist

Michael Brennen is a water quality outreach specialist with IISG and the National Great Rivers Research and Education Center. His work focuses on improving understanding of nutrient pollution in the Mississippi River Basin and its effects on water quality. Prior to joining IISG, Michael was an Oak Ridge Institute for Science and Education (ORISE) fellow at U.S. EPA. He holds a Master's in environmental science from Indiana University.



Adrienne Gulley
Pollution Prevention Outreach Specialist

Adrienne Gulley works with communities to establish and promote medicine take-back programs. Her efforts help boost awareness of the impacts of pharmaceutical pollution and the role proper disposal plays in protecting water quality and aquatic habitats. Adrienne has a Master's in agricultural communications from Southern Illinois University Carbondale, where she also worked as an academic advisor and instructor.

Total Phosphorus

4%

48%

48%

Staff Updates



Joel Davenport
Graphic Arts Specialist

Joel Davenport helps shape the look of the program. He works closely with the communication team and program specialists to produce our newsletter, flyers, displays, and other print and online outreach materials. Joel brings seven years of experience in publication design, organizational branding, illustration, and web design. He holds a Bachelor's in communication with an emphasis on marketing.



Kirstin Hope Walker
Environmental Educator

Kirsten Hope Walker works with IISG specialists and teachers to develop classroom materials, curriculum, and websites that boost environmental literacy across the Great Lakes region. Kirsten has more than 20 years of education experience, including eight years teaching high school science and two with the Illinois Sustainable Technology Center. Kirsten holds Master's in secondary education and curriculum and instruction from Roosevelt University and Northern Illinois University.



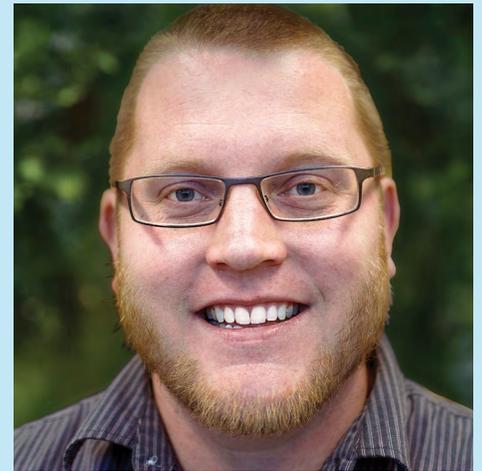
Erin Knowles
Pollution Prevention Media Specialist

Erin Knowles works to expand the Unwanted Meds program and increase public awareness of pharmaceutical pollution through social media, video, and other avenues. Before joining the team, Erin worked on public health and sustainability initiatives at the Department of Health and Human Services and University Illinois Extension. Erin holds a Master's in public health from Boston University.



Allison Neubauer
Sea Grant Educator

Allison Neubauer works closely with the education team to plan and facilitate training workshops and develop classroom resources. Allison began her tenure at IISG in 2013 as a summer intern and later served as the program's education assistant. She holds two Bachelor's degrees from the University of Illinois, one in geographic information sciences and a second in earth, society, and the environment.

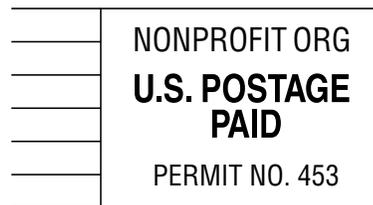


Jarrod Doucette
GIS/Database Specialist

Jarrod Doucette oversees the design and development of web tools. Jarrod played a key role in the development of the tipping points tool and is the co-creator of a web app that uses historical fish data to help anglers target specific species in Lake Michigan. Jarrod has extensive experience as a GIS specialist and web developer working with universities and state agencies. He has a Master's in geospatial information systems from State University of New York.

The Helm

University of Illinois at Urbana-Champaign
Illinois-Indiana Sea Grant College Program
374 NSRC, MC-635
1101 W. Peabody Dr.
Urbana, IL 61801



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Illinois-Indiana Sea Grant is one of more than 30 programs of the National Sea Grant College Program created by Congress in 1966. Sea Grant is a partnership of universities, government, business, and industry that addresses marine and Great Lakes needs to enhance sustainable coastal economic development. Funding is provided by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA Grant # NA140AR4170095), Office of Sea Grant, University of Illinois at Urbana-Champaign, and Purdue University. The University of Illinois and Purdue University offer equal opportunities in programs and employment.

New Illinois plan will reduce nutrient pollution in the Gulf *(Continued from page 6)*

tists, and wastewater treatment professionals were all at the table working together to create this strategy.”

The collaborative effort began over a year ago in response to the federal 2008 Gulf of Mexico Action Plan, which calls for all 12 states in the Mississippi River Basin to develop plans to reduce nutrient loading to the Gulf. The state process was spearheaded by the Illinois Environmental Protection Agency (Illinois EPA) and the Department of Agriculture (IDOA) and facilitated by IWRC and IISG.

At the heart of the strategy is a scientific assessment that used state and federal data to calculate Illinois’ current nutrient loads and determine where they’re coming from. Led by researchers at the University of Illinois, the study also uncovered numerous cost-effective practices for reducing nutrient losses.

The plan for wastewater treatment plants is relatively straightforward. The state has already begun to cap the amount of phosphorus they are allowed to release, restrictions that will likely be expanded under the new plan. The strategy also calls for improved watershed planning and requires sewage plants to investigate new treatment technologies that could lower phosphorus levels enough to prevent algal blooms in nearby waterways.

For farmers, feedlot operators, and others working in agriculture, the options are a little broader. Most of the recommended practices, such as installing buffer strips along stream banks to filter runoff, planting cover crops to absorb nutrients, and adjusting nitrogen fertilizing practices, are already used successfully in Illinois by some farmers.

“There is no silver bullet for reducing nutrients,” said Mark David, a University of Illinois biogeochemist and one of the researchers behind the scientific assessment. “It is going to take at least one new management practice on every acre of agricultural land to meet the state’s reduction goals.”

Officials at Illinois EPA and IDOA will begin implementing the new strategy in early 2015. In the meantime, the agencies are asking Illinois residents to review and respond to the plan. The complete strategy and instructions for providing public comment can be found online—search for Illinois Nutrient Loss Reduction Strategy. 📄