

Lake Michigan shoreline water is a medicine cocktail

By Michael Peterson

During his research to measure pharmaceutical abundance along the shorelines of Lake Michigan, Ball State University biologist Thomas Lauer said he and his fellow researchers found chemical compounds “practically everywhere.”

With funding from Illinois-Indiana Sea Grant (IISG,) Lauer and Melody Bernot, also a Ball State University biologist, took samples from Lake Michigan in August and November of 2010.

They found antibiotics, caffeine, mood-stabilizing drugs, pain-relievers, antibacterials, and more. “To get large, measurable numbers—consistently—in all those places was a bit surprising to us,” Lauer said. “It is an intimidating thought, considering how big the lake is.”

While the chemical concentrations are not toxic to humans, they can be a concern if these medications enter our drinking water. A 2008 Associated Press investigation found pharmaceuticals in the drinking water supplies of at least 41 million Americans. In addition, there is a long list of negative effects the chemicals can have on aquatic organisms. For example, medicines have been shown to disrupt reproductive development in frogs, cause irreversible fish masculinization, and impair predator avoidance in minnow and shrimp.

The Lake Michigan study focused on Michigan City and East Chicago, Indiana; St. Joseph, Michigan; and Chicago. At each



Chicago students take on medicine disposal **PAGE 3**

Great Lakes Legacy Act fosters riverfront revitalization **PAGE 4**

Forecasting the fate of Lake Michigan storms **PAGE 6**

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2

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Continued from page 1

site samples were taken near drinking water intake points, as well as at the mouth of incoming rivers at two different depths. The next step for these researchers is to expand on that data to see how this specifically affects aquatic organisms.

This study reinforces the need for IISG's efforts to help communities develop local medicine collection programs. Through workshops and the program's toolkit, *Disposal of Unwanted Medicines: A Resource for Action in Your Community*, IISG provides information and support so that collection projects are safe and successful.

This study is one of many funded as development or "seed" grants for researchers to begin start-up studies that may grow into something larger, or to finish ongoing projects. The following are results from more IISG-funded seed grant projects.

Recreation reduces Karner blue butterfly reproduction

Purdue University ecologist Patrick Zollner studied how people walking on nature trails can affect the reproduction habits of the Karner blue butterfly, which is a federally endangered species.

Resource managers are under increasing pressure to implement strategies that address the negative effects of outdoor recreational activities on wildlife. The study shows that human recreation can disrupt the breeding patterns of Karner blue butterflies, as well as other species.



Courtesy of Patrick Zollner

Using a simulation model, the project found that significantly fewer eggs are laid by Karner blue butterfly females in sites at the Indiana Dunes National Park that are 10-15 meters from the trail. Plants that are farthest away have the most eggs. Zollner suggests that habitat patches be at least 25 meters from the trail.

"Depending on the circumstances, about 17 percent of the females are only laying half of their potential eggs because of human disturbance," Zollner said.

Zollner has studied how traffic affects Indiana wildlife and has submitted a proposal to study how the Huron-Manistee National Forest equestrian population impacts Karner blue butterflies.

Continued on page 6

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Chicago students take on medicine disposal in IISG-Earth Force partnership

As middle school students get to the age where personal appearance becomes an ever-pressing concern, many increase their use of products such as hair-spray, body wash, and moisturizer. However, personal-care products and medicines can be harmful if they are disposed of incorrectly and end up in local water sources. To educate and empower Chicago students to help address this environmental issue, IISG is working with Windy City Earth Force, a non-profit program through the Field Museum, focused on schools in the Calumet region.

“We are encouraging students to explore the effects that personal-care products and pharmaceuticals have on our watersheds,” said Angie Viands, Field Museum community conservation specialist.

The students use a six-step, problem-solving process to create an environmentally-focused project. Steps include gathering information about environmental assets and issues, selecting a policy or community practice to change, and creating and carrying out a plan for action.

“We are delighted to work with Earth Force educators Angie Viands and Kirk Anne Taylor, who incorporate an exemplary service-learning model and involve Chicago public school teachers through their established network,” said Robin Goettel, IISG associate director of education. “The community outreach that resulted from student-developed stewardship projects was quite effective in getting the sensible disposal message to the public.”

Students from Niños Héroes Elementary focused on the negative effects of medicines and personal-care products in our waters after Goettel and Terri Hallesy, IISG education specialist, talked to teacher Laura Senteno’s combined 7th- and 8th-grade class. The students made posters and fliers, gave presentations to other students, and created a public service announcement.

Senteno said the students appreciated the hands-on nature of the program, as well as the freedom to choose the topic. “Everything was generated from the students. No textbooks or lectures—just their ideas,” she said, adding that she plans on continuing to work with IISG and Windy City Earth Force. “I don’t see how teach-

ers couldn’t get involved in this. There are so many resources available. To me, that is a big deal, because typically it isn’t easy to find them.”

Students at George M. Pullman Elementary School took steps to educate others about the proper disposal of medicines. The youth created an informational banner, made educational brochures, and spoke to the local school council and students.



Angie Viands, Field Museum community conservation specialist, teaches George M. Pullman Elementary School students about the community stewardship process.

“Students find this issue very interesting because many of them have not heard of or ever thought about it,” Viands said. “Last year’s class was really concerned about personal-care products because the students are in a stage in their life where they are using them.”

The partnership between IISG and Windy City Earth Force is supported through 2012 by the U.S. EPA Great Lakes Restoration Initiative. “We cannot wait to see what exciting projects are developed by teachers and students in the next year of our project,” Goettel said.

Great Lakes Legacy Act fosters riverfront revitalization

The Great Lakes Legacy Act (GLLA) helps communities reconnect with once thriving waterways that over time have become degraded by toxic chemicals and other pollutants. Throughout the process of restoration, IISG works closely with local residents to ensure that their questions are answered and to help the community make the most of this

In Milwaukee, the Lincoln Park project is underway right now. The park is intersected by Lincoln Creek and the Milwaukee River, which provides an opportunity for fishing and other activities. It also has a golf course, picnic areas, a water park, and trails for walking, biking, and cross country skiing. Local residents use this expansive park to its fullest.

was part of the process and that residents had ample opportunities to learn about what was taking place and why. At town meetings, U.S. EPA and state of Wisconsin representatives explained the project and provided information on specific concerns. Questions were addressed both in a follow-up meeting and a publication.

To ensure that anyone visiting the park can learn about the project, the team developed two 3-sided signs. The three panels include guidance on local fish advisories; a description of how this project connects to other cleanup projects in the region and other Areas of Concern; and specifics about the Lincoln Park project including the activities that will occur, a timeline, and a weekly update. A dump truck that fills up over time illustrates the project progress.

In northwest Indiana, the Grand Calumet River cleanup has reached a milestone. The first two phases of the project are done and 148,000 cubic yards of contaminated sediment were removed or capped.

The Grand Cal runs through what once was one of the most industrialized regions in the country, including the cities of Gary, East Chicago, and Hammond. Now that most of that industry is gone, it left behind a river contaminated with what sounds like a toxic soup: PCBs, PAHs, heavy metals, fecal coliform bacteria, suspended solids, oil, grease, and more.

Nonetheless, amazingly, small



U.S. EPA employees, left to right, Marc Tuchman, Ajit Vaidya, and John Perrecone inspect the three-sided sign in Milwaukee's Lincoln Park. This side provides updates to the public about ongoing remediation.

chance to turn the waterfront environment and economy around.

Signed into law in 2002, and reauthorized in 2008, the GLLA provides cost-sharing opportunities to clean up contaminated sediments in U.S. EPA Great Lakes Areas of Concern. So far, 10 Great Lakes sites have been cleaned up, totaling 1.3 million cubic yards remediated, with many more in progress.

"When it was announced that contaminated sediment in a section of the river was going to be cleaned up through the Legacy Act, residents had many questions—they wanted to understand what was going to be happening in their park," said Susan Boehme, IISG former coastal sediment specialist.

IISG, working with all the project partners, developed a plan to ensure that the community

patches of remaining habitat support rare plant and animal species including the black-crowned night heron. With restoration as an important component of this project, IISG has been there to help manage public expectations. "Restoration takes time, and the process doesn't necessarily reflect the outcome, so people have questions and concerns when they see large-scale removals of plants that are actually invasive species," said Caitie McCoy, IISG social scientist.

project is in progress—the clean-up of nearby Roxanna Marsh, a former shorebird nesting area, including the removal of invasive species as well as contaminated sediment.

In Milwaukee, the Kinnickinnic River demonstrates the after image in an environmental makeover. But, since the



The West Branch Grand Calumet River in Hammond, Indiana has undergone remediation through the Great Lakes Legacy Act.

The third phase of this GLLA

cleanup, which was completed in 2009, economic benefits have bloomed as well.

In 2007, American Rivers magazine called the KK River one of the most troubled in the nation. About 158,000 cubic yards of contaminated sediment later, the riverfront is in the midst of resurgence.

"Since the cleanup, a riverfront restaurant has expanded five-fold with a new boardwalk and boat piers, plus an expanded patio with volleyball courts and riverfront seating. A nearby marina has expanded 2-3 times and can now accommodate larger boats," said David Ferron of the Paul Davis Restoration Company, which is building a \$5 million industrial complex along the river.

"For each of the GLLA projects, it has been critical that project partners and the public be strongly invested in its success," said McCoy. "Communities take ownership of their lakes and rivers through this cooperative process, ensuring local environmental stewardship in the future long after the cleanups are finished."

Social science brings public perceptions to light

Social science is the study of people's attitudes, processes, and behaviors. And despite the stereotype, IISG Social Scientist Caitie McCoy says there is much more to it than just handing out surveys.

"When people think of social science and understanding the public, often they think, 'Let's do a survey,'" McCoy said. "However, there are so many other methods for data collection that might be more appropriate."

McCoy has started a Great Lakes network to share with Sea Grant specialists how to implement social science into their daily practices. The network is still in its pilot stage, but she hopes to expand the program if it is successful.

"Sea Grant is engaged in education and outreach on a daily basis, so social science is very applicable and intuitive to our work," McCoy said. "At our first meeting, we decided that we wanted to be an action-oriented group. Our goal is to apply social sciences to our programs to improve communication and educational outreach efforts within local communities."

One example of social science application is a case study that involves those who live near the Sheboygan River in Wisconsin, which is undergoing sediment remediation. "We want to better understand the benefits of remediation from the Sheboygan community's perspective," McCoy said. "We also want to look at the challenges a community might face during the cleanup process and how the public overcomes them."

Forecasting the fate of Lake Michigan storms

University of Illinois atmospheric scientist David Kristovich tested a mobile sounding system that might help predict the fate of storms that move across Lake Michigan. This system measures temperature, humidity, and atmospheric pressure.

“The Great Lakes make it difficult to predict summer weather. One problem weather forecasters face is determining what will happen when massive storms reach one side of the lake.

It is hard to figure out if those storms will make it across to the other side and cause severe weather,”

Kristovich said. “We don’t have a lot of information. On the lake, we don’t have people taking observations all over the place like we do on land.”

The device they used is called a rawinsonde, which is attached to a weather balloon with a parachute. Because the system is connected to a balloon, researchers were also able to record the wind direction and speed.

Kristovich said having a test run

for the device was critical for ironing out issues for future projects.



Graduate students Joe Wegman, left, and Luke Bard prepare to launch a rawinsonde near Lake Michigan.

Courtesy of David Kristovich

Alum can clean up phosphorus from manure spills

Accidental manure spills in the United States have been occurring more frequently in the past 20 years due to the increase in the number of livestock hogs. As the primary treatment, first-responders usually remove the water column, but they often do not wait to see what has happened to the sediment.

Soil scientists Shalamar Armstrong of Illinois State University and Phillip Owens of Purdue University studied the fate of nutrients in this process. “We wanted to see if the response was effective, and if phosphorous and nitrogen were being treated,” said Armstrong.

They documented that, after a spill, phosphorous is stored temporarily in the sediment and then is released into the water. In the samples taken, phosphorous in the water columns were at concentrations that exceeded the EPA criteria.

“Algae begins to grow rapidly in bodies of water where there is phosphorous,” Armstrong said. “Then microorganisms feed on algae, which depletes the oxygen source in the water column.”

The researchers also experimented with a solution. They showed that when alum is applied to some types of sediment, phosphorous is reduced enough to be below EPA limits.



Sea Grant Staff Update



Molly Woloszyn is the program's new extension climatologist. She has a joint position with the Illinois State Water Survey, which offers the opportunity to pair Sea Grant extension expertise with the survey's climate science. Woloszyn is located at the Midwestern Regional Climate Center in Champaign, Illinois. Woloszyn received a B.S. from Northern Illinois University's meteorology program. She went on to earn an M.S. at Colorado State University and has been teaching at community colleges for the last few years.



Sarah Zack is the new aquatic invasive species (AIS) specialist. She works closely with Pat Charlebois, the program's AIS coordinator, located at the Chicago Botanic Garden in Glencoe, Illinois. Zack is responsible for outreach to recreational water users and will be responsible for researching and developing AIS best management practices for tournament anglers. She comes to IISG from Loyola University Chicago where she was a biology instructor. Zack has a B.S. in zoology from the University of Wisconsin-Madison and an M.S. in biology with an emphasis on aquatic ecology from Loyola.



Danielle Hilbrich is the new AIS assistant. Hilbrich will be working on all aspects of AIS outreach, including helping to develop risk assessment tools for the Great Lakes. Previously, she was a research fellow for the Oak Ridge Institute for Science and Education and was appointed to the U.S. EPA Great Lakes National Program Office where she contributed to the Asian Carp Regional Coordinating Committee. She has a B.A. in environmental science and geography from Carthage College in Kenosha, Wisconsin.



Jason Brown is a new IISG media specialist, focused on social media and other online communication. Brown will be working to keep the public informed and engaged through posts, tweets, and more. Brown received his B.A. in creative writing at the University of Illinois and has extensive experience in writing and editing for a variety of outlets. He also has several years of experience in the radio industry, and he has developed web content and social media strategies for other environmental organizations.

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Social science brings public perceptions to light

Continued from page 5

McCoy interviewed community members and key stakeholders about their reactions to the project. She will use her findings to create education and outreach materials, such as posters, brochures, or a presentation.

McCoy is also developing training sessions with Chris Ellis, a social scientist and trainer for the NOAA Coastal Services Center. The first event was a webinar on how to create effective surveys.

“If you have limited social science exposure, these webinars can help teach you the basics and how to work more effectively with social science professionals to create products that will better meet your needs,” Ellis said. In addition, in late-January or early-February there will be a follow-up training session on selecting appropriate data-collection methods.

“There is the old adage that you can’t tell a fish where to swim,” Ellis said. “But social science is more about understanding human behavior and, to an extent, trying to influence what humans are doing so we can create positive changes within the natural environment.”