

The Helm

Illinois-Indiana Sea Grant // October 2022

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CHICAGO AREA COMMUNITIES TAP INTO WATER SUPPLY DATA TO PLAN FOR SUSTAINABILITY AND AFFORDABILITY

IN THE GREATER CHICAGO REGION, Illinois-Indiana Sea Grant (IISG) and key partners are working with communities to help ensure safe, reliable, and affordable water supplies. With access to data, research, and forecasts, local water managers are making informed decisions about water sustainability and affordability.

It may be hard to imagine that the Chicago region would face water supply challenges, sitting along the shores of Lake Michigan. But the lake is not just an open spigot—legal constraints limit Illinois’ use of it as a water resource. Miles away from the lake, growing suburbs that depend on groundwater risk depleting these resources, affecting not just water availability, but its quality as well.

Going forward, having reliable estimates of future water demand in light of availability can motivate communities to take action—to conserve water, protect the supply, or even pursue alternative water sources. So, IISG, along with the Chicago Metropolitan Agency for Planning (CMAP) and the Illinois State Water Survey (ISWS), are combining data and expertise to create models that do just that for northeastern Illinois.

For starters, the water survey keeps track of the state’s water supply. Scientists monitor hydrogeology—in other words, the status of groundwater aquifers—as well as other water sources in Illinois. ISWS is also the repository of withdrawal data—water users, such as communities throughout the state, regularly report these numbers. This data helps the water survey to create models that explore the health of the water supply throughout Illinois.

“We also try to understand which counties or regions are most at risk with their water supply,” said Daniel Abrams, ISWS associate research scientist.

However, to estimate future water demand, the models need more data.

CMAP, the comprehensive planning organization for the seven counties that comprise the greater Chicago region, helps flesh out the forecast with data that paints the picture of population, employment, and land use trends.

The third piece of the puzzle is economic modeling—Illinois-Indiana Sea Grant’s role is as a technical advisor to CMAP, allowing the agency to use economic analysis to strengthen water demand forecasts by incorporating data on water demand drivers.

“For example, price is a factor—we can expect that when rates go up, water demand will go down,” said Margaret Schneemann, IISG water resource economist. “As another example, we expect water demand to fluctuate as land use patterns change.”

Part of economic analysis is connecting water use data to the relevant factors that drive demand for each water user—communities, industrial or commercial businesses, and private well owners. For the ISWS team, having this analysis allows them to be specific in their recommendations—such as, in siting new wells.

“As water scientists, we work with Margaret and her team to understand the economic data—what they do is essential for the water survey modeling,” said Abrams. “We have interesting dialogues back and forth about the data and about the model results.”

As part of the ON TO 2050 regional comprehensive plan, IISG led a research project with CMAP to provide a water demand model and forecast up to the year 2050 for 245 communities, as well as other water users, in northeastern Illinois. Demand drivers included in the model are current and projected population and employment, land use intensity, water conservation trends, water pricing, income, and other factors that can affect future water demand.

IISG and CMAP also created the

first-of-its-kind water data tool—the [CMAP Data Hub](#)—showing past water use, forecasted demand, and water and sewer rates for municipalities in the region. Another resource, the [Northeast Illinois Water and Wastewater Rates Dashboard](#), allows over 200 communities in the Chicago area to benchmark their water rates more easily and set comparisons to similar communities.

These tools and the guidance provided by IISG, CMAP, and ISWS are having an impact.



The Northwest Water Planning Alliance is a group of more than 80 communities in DeKalb, Kane, Kendall, Lake, and McHenry counties focused on ensuring sustainable water supplies. In these counties, water comes from deep groundwater aquifers and other sources, including the Fox River. The regional group is working toward developing a water supply sustainability plan. In 2021, the project team secured funding from the Illinois Department of Natural Resources to establish water use reduction goals.

In McHenry County, specifically, water managers and local decision makers used the water demand forecast to develop a Water Resources Action Plan. This action plan lays out implementation steps to protect the county’s water supply.

Southwest of Chicago, ISWS used the water demand data to model sustainability for 12 suburbs, revealing that

the aquifer serving these communities would likely be unable to meet demand by 2030. Illinois Governor JB Pritzker signed a bill enabling the creation of a regional water commission for these communities to pursue sustainable drinking water sources.

As a result, Joliet, one of most populous cities in Illinois, will switch from tapping into a deep aquifer that these suburbs have been relying on for the last century and begin using Lake Michigan water. For this to happen, a 31-mile pipeline needs to be built by 2030 when the switch happens.

While this decision will ease pressure on the groundwater resource, it will likely increase pressure on Joliet water managers to raise water prices to pay for the pipeline, the delivery, and the water itself. How much will depend on many factors, but as a community with over 10% of the population below the poverty level, the cost of water for consumers matters.

In general, water affordability is a concern in the greater Chicago region. The need to catch up with decades of deferred, costly water infrastructure repairs and replacements has led to escalating water bills that disproportionately burden communities of color. In fact, from 2008 to 2018, the average residential monthly water rate almost doubled while household income was essentially stagnant, particularly for working class wages.

Sea Grant set about addressing this issue using a similar approach as with sustainability—joining forces with key partners to provide data and other resources. This time, IISG collaborated with the Metropolitan Planning Council and Elevate to gather information and provide guidance.

Water rate data that IISG has collected over the past 10 years—the most comprehensive in the state—allowed the partners to analyze rate trends in relation to income growth. They also researched water affordability



Photo by Irene Miles



strategies and developed case studies from around the country that Chicago-area water managers might adopt to help make water more affordable to those who struggle to pay.

As part of this effort, the project team also developed the Northeastern Illinois Water Affordability Dashboard, which breaks down water affordability statistics by municipalities in the Chicago area.

These resources were critical to the City of Chicago as it developed an ordinance to help low-income residents keep up with water bills. Enacted in 2020, the Utility Billing Relief program provides reduced water and sewer rates, eliminates late payment fees, and provides debt relief for those who qualify. As of 2022, the program has led to over \$21 million in savings for over 20,000 families that might otherwise have had trouble affording their water bills.

In 2021, IISG provided technical assistance to Evanston, a city of 74,000 residents just north of Chicago, in developing an affordable water rate.

“We reached out to Sea Grant, MPC, and Elevate to help us by developing modeling scenarios,” said Darrell King, Evanston water production bureau chief. “They presented us with five different affordable rates for us to consider using here in Evanston.”

The Evanston City Council subsequently passed an ordinance creating a new affordable water and sewer rate program to help ensure water access for all. Beginning this year, those who qualify for federal energy assistance programs can enroll in Evanston’s Affordable Water and Sewer Rate Program. [👉](#)

[👉 https://iiseagrant.org/work/water-supply/](https://iiseagrant.org/work/water-supply/)



IISG celebrates 40 YEARS of research, outreach, and education

THIS YEAR, ILLINOIS-INDIANA SEA GRANT IS CELEBRATING 40 YEARS of service to southern Lake Michigan communities. Started in 1982 by Robert Espeseth and Jim Peterson as a collaboration between the National Oceanic and Atmospheric Administration (NOAA), University of Illinois, and Purdue University, the program has flourished as funding and partnerships have grown over the years.

Director Tomas Höök joined IISG in 2010 as associate director of research and in 2018, when his predecessor, Brian Miller, retired, Höök was asked to step up as director. During this transition, IISG also switched its administrative base from University of Illinois to Purdue University.

IISG has seen substantial growth throughout the past 40 years—especially the breadth of issues the program addresses, the technology employed, and, most significantly, increased funding. Höök credits much of the program’s growth to Miller, who sought out partnerships with outside agencies.

Due to the boost in funding, IISG has been able to grow its staff, fund more research, and expand extension and community programs. One area of

focus that has grown considerably is community and environmental resiliency. Due to climate change, the Great Lakes have experienced more dramatic fluctuations in water levels. High water levels result in erosion, flooding, and washed-out roads while low levels create mud flats, disrupt transport, and potentially harm wildlife.

“We’ve been doing more work to educate people about changing lake levels and impacts of climate change while also trying to educate decision makers, like city planners or state park managers, on how to address it. So, we develop resources that are accessible to managers and that can also be used by more people,” Höök explained.

Improving accessibility to underserved communities is another area in which IISG has been intentional about expanding. Traditionally, IISG has focused much of its community outreach on recreational boaters and fishers, who tend to be more affluent than most of the populations around Lake Michigan.

“We’re trying to do more outreach, K-12 education programs, and research that serve the diversity of the citizens and communities in southern Lake Michigan, including programs to get kids

interested and excited about the lake.”

The program has also seen significant growth to the IISG Scholars Program, which provides one-year grants to support graduate student and faculty research. According to Höök, the scholars program also aims to educate participants about Lake Michigan issues while training them on how to conduct applied research.

Höök takes pride in the culture and work environment at IISG and credits the program personnel for continued success. As director, he takes more of a “behind the scenes” approach, which fosters autonomy and opens the door to new possibilities.

“People seem to enjoy working at Sea Grant and tend to feel like the work that they do has meaning. They’re winning awards and bringing in grant money, and I often receive emails and feedback from partners telling me how much they appreciate the work the people in our program are doing.”

Going forward, IISG plans to continue expanding its research and community outreach. After 40 years of serving Great Lakes communities, the future of Illinois-Indiana Sea Grant only looks bright. 🍀

GREAT LAKES ONBOARD EDUCATOR WORKSHOPS OFFER SCIENTISTS LEARNING OPPORTUNITIES TOO



EVERY YEAR, when possible, the U.S. EPA research vessel, the *Lake Guardian*, sets sail on one of the Great Lakes with about 15 teachers onboard. They spend a week engaging with scientists, doing research, and working together. The goal is for educators to dive into the world of aquatic science and bring this new knowledge and experience back to their classrooms and students.

Many teachers have revealed in surveys and interviews that taking part in the *Lake Guardian* workshops has indeed bolstered their confidence for teaching science and has inspired them to tap into new ways to engage their students. But, what about the scientists who participate in these workshops? Does the Shipboard Science Workshop benefit them?

Four scientists share their experiences. For starters, they talked about highlights of engaging with the educators.

Emily Tyner, who was a graduate student at University of Wisconsin-Milwaukee in 2015 when she joined a crew of scientists taking part in the Lake Michigan workshop, appreciated the bonding experience. “Our team of

four were working overnight troubleshooting, coming up with a presentation, and sharing results. It was fun to get to know teachers in this kind of intense environment over a week. I got to know them pretty well.”

The teachers typically come aboard with lots of enthusiasm for learning, and their excitement for even the everyday work of science can be inspiring. Typical tasks can become new and exciting.

“To show them zooplankton under a microscope for the first time was awesome for me,” said Beth Whitmore, a research technician at Cornell University who joined the 2019 Lake Erie educator workshop. “I’ve seen millions, but for the educators to see zooplankton and say—Whoa, what is that? That’s so weird looking. Wait, am I drinking these if I drink water?—that was great.”

Joel Hoffman, a supervisory biologist with EPA, who has frequently participated in the Lake Superior workshops, highlighted that it’s also an opportunity for scientists to learn new skills.

“Most of the educators do not have a background in limnology or ocean-

ography so we have 12 hours or so to bring them up to speed in an efficient, articulate way about why this research is important—and to get them personally, scientifically, intellectually invested in the project,” said Hoffman. “That’s a huge challenge for scientists. It really stretches our communication abilities, in a very good way.”

Zac Driscoll, who was also a graduate student at University of Wisconsin-Milwaukee while on the 2015 Lake Michigan workshop, was inspired by how he saw the experience impacting the teachers. “A huge thing that I learned on the teacher cruise is that there’s a difference between learning something in the classroom or in the laboratory and actually getting out on the water and seeing it for yourself. In this real-world experience aboard the *Lake Guardian*, the teachers actually got to be out on Lake Michigan and see how research is done. It really triggers something in your brain—it not only helps connect the dots, but also helps drive the passion for research and conservation.”

In fact, for Driscoll, this experience led to a change in his priorities. He spent the next several years working



Top left to right: 1) Zac Driscoll (right) and educators are about to measure quagga mussel lengths, 2) Joel Hoffman (wearing green) demonstrates fish dissection procedures, 3) Scientist Tim Hollein (right) and a marine technician are sampling with a plankton net. Bottom left to right: 1) Scientists and educators wait for the multicore deployment 2) Emily Tyner (center) and educators discuss the sample collected in the multicore tube, 3) Beth Whitmore (left) and fellow scientists George Bullerjahn and Lorena Rios Mendoza enjoy their thank you gifts from Sea Grant. (Photo by Jenny Busch)

for Milwaukee Riverkeeper, a nonprofit organization, where he trained about 100 volunteers to engage in community science. They collected water quality data from the Milwaukee River.

“That career choice was a direct impact of being on the teacher cruise,” he said. “I realized I really like communicating science and data.”

The experience working with the teachers aboard the Lake Guardian also helped redirect Tyner’s doctoral research.

“I started my PhD on a mostly ecology focused track, but now I’m looking at human dimensions of natural resource management, particularly the impact of GLRI (Great Lakes Restoration Initiative) spending,” said Tyner. “I took a more social science approach to my research after working in several communication settings, which was kicked off by that *Lake Guardian* trip. These experiences helped me to redefine my dissertation and my career trajectory.”

Tyner is currently working for the University of Wisconsin-Green Bay as the director of freshwater strategy. With a shift to doing work that is more people focused, she is developing and managing partnerships as part of the process to establish a NOAA National Estuarine Research Reserve in Green Bay.

While zooplankton are still her first love, Whitmore now plans to also focus on public education as part of her master’s degree at Cornell. “It’s hard to communicate science to the public and I think going through that experience with teachers has made me realize how vital that is, especially as a scientist.”

Finally, Hoffman, who leads a research team at EPA, shares that his team’s experiences with the educators aboard the Lake Guardian led them to expand opportunities for research participation.

“We’ve been very oriented toward community science and getting wider groups of the public engaged in re-

search,” said Hoffman. “I think I was very open to those ideas because we’ve done the educator workshop cruises—we understood the value of bringing in people interested in science into the research. I knew that we could, with the assistance of these participants, deliver gold standard science that met the highest level of peer review.”

He also expressed similar thoughts as the others on the value of learning to communicate science to a broader audience. “By the time you’re a PhD, you’ve spent 10 to 12 years in intensely and increasingly narrow training—you’re in this very rarefied world of expensive instruments and extremely unique skill sets,” said Hoffman. “It’s really grounding in many ways for scientists to come back to basics. What do we need to tell students in terms of what matters in the Great Lakes and environmental science? What are the compelling questions that we need to answer for society, and why?”

What factors contribute to revitalization in cleaned up Great Lakes Areas of Concern?

IT'S NOT SURPRISING that communities alongside polluted waterways can benefit in many ways when these rivers and lakes are cleaned up. For some, it's like a new lease on life with environmental restoration, economic development, and new opportunities to engage with the waterfront.

A new Illinois-Indiana Sea Grant study looked at three Great Lakes Areas of Concern (AOCs) to assess what drives revitalization in these communities. Factors that can make a difference, researchers found, include having a large (or anchor) institution, such as a college or hospital in the community, local events, and outdoor recreation opportunities.

Historically, the Great Lakes region was a center of industry—steel, leather and lumber, to name a few. Eventually, many manufacturers shut down or moved elsewhere as economies and priorities changed. Left behind in these waters was a soup of contamination, leaving degraded waterways and depressed communities.

In the United States and Canada,



dozens of sites were identified as AOCs in the 1987 Great Lakes Water Quality Agreement, and over the years, many have undergone remediation. Funding is often a partnership between the U.S. EPA, in the form of the Great Lakes Legacy Act (now through the Great Lakes Restoration Initiative), and state, regional, and local stakeholders.

“Many communities along remediated waterways experience improvement in people’s livelihoods and general wellbeing,” said Rebecca Nixon, an environmental social scientist at the University of Delaware. “Revitalization can encompass economic factors such

as housing and business development, but it can also include social aspects that support residents’ connections to the area such as an increase in local events, public access to the waterfront, and opportunities to participate in decision making.”

Nixon, who took part in this study during her time as an IISG postdoc at Purdue University, was joined by IISG Assistant Director Stuart Carlton and Zhao Ma, a Purdue University environmental social scientist.

They engaged in case studies of both Muskegon Lake and White Lake AOC communities in Michigan and those along the Grand Calumet River AOC in Indiana.

“These three Lake Michigan AOCs are at different stages of the remediation process—White Lake has been delisted, Muskegon Lake is finished with remediation, and work on the Grand Calumet River is in progress. We purposely chose to have diversity in terms of the environmental cleanup progress,” said Nixon. The American Community Survey as well as local planning documents provided data to inform the team’s findings.



Photo credit: Lakeshore Art Festival



In addition to the environmental cleanup itself spurring revitalization, hospitals and universities in AOC communities can also be a force. They provide employment, buy goods and services, and, in some cases, support local programming and education efforts. These institutions can serve to connect the cleanup of the local waterway back to the community.

Local events, such as art shows and festivals, that draw more people to the river or lake also are a revitalization driver. They can serve to celebrate success during the cleanup process, but also to change perceptions of the status of the waterway, which often, for many years has been viewed by the public as polluted and degraded.

For example, in Muskegon the annual Lakeshore Art Festival as well as the weekly farmers market now take place in a downtown area near the lake—the community is attracting residents and visitors to the newly restored Muskegon Lake and the city’s downtown.

In additional interviews of several formal and informal community leaders, Nixon found that trust is critical among the various partners working to improve the AOC

in terms of revitalization moving forward.

“To connect the environmental cleanup to community improvements, it’s important to have ongoing dialogue—these different sectors need to communicate about project planning and implementation, as well as expected and realized outcomes,” said Nixon. “For that to happen, over time, trust needs to be built.”

While this study identified revitalization drivers, Nixon doesn’t see outcomes as one-size-fits-all.

“Each AOC is unique—they all have different goals and priorities around revitalization and different environmental challenges. One of the main questions to ask is what do residents experience and want to see in terms of revitalization outcomes?”

Next, Nixon is developing a factsheet that lays out strategies to support revitalization in AOCs. Information in this publication, which shares some lessons learned for local leaders involved in AOC remediation, restoration, and revitalization efforts, is gleaned from the case studies, additional interviews, and other resources.

IISG has also developed a new [video](#)

[series](#) that features five cities along AOCs that are in various stages of the cleanup process and are experiencing revitalization. The videos feature [Duluth](#), Minnesota; [Muskegon](#), Michigan; [Sheboygan](#), Wisconsin; [Ashtabula](#), Ohio; and [Buffalo](#), New York, which have had some or all of their contaminated sites cleaned up and ecosystems restored. Local government representatives, business owners and residents share the impact of this work on recreation, tourism, economic development, housing and quality of life in the area. [👉](#)

https://bit.ly/AOC_revitalization_stories

In growing numbers, Chicago area local decision makers are taking action on climate change

AS THE WORLD GETS MEASURABLY HOTTER EVERY YEAR, many of us are experiencing the effects of climate change. A recent Illinois-Indiana Sea Grant [climate planning survey](#) of elected officials, natural resource managers, and other relevant professionals in the greater Chicago area reveals that they agree.

An overwhelming 90% of survey respondents reported that the climate in their location is changing, and more than 70% said that they are either extremely or very sure about that. This survey, which was sent out in 2020, repeated a survey from 2012, thereby providing insight into evolving attitudes and actions of local officials. Then, 61% of respondents reported that their local climate was changing. Both times the survey was sent to professionals in Cook, Lake, Will, DuPage, Kane, McHenry, and Kendall counties in Illinois and Lake, LaPorte,

and Porter in Indiana. In 2020, each of these counties was represented in the 144 responses.

“In terms of local climate change concerns, flooding, which can also include storm intensity and runoff, was rated the highest,” said Veronica Fall, IISG climate extension specialist. “And it has increased over time—in 2020, 76% said information related to flooding was extremely important, which is notably higher than 56% in 2012.”

But local decision makers were not just concerned about flooding—the majority ranked 17 of 20 possible factors as extremely important, with land use planning and zoning, water infrastructure, climate adaptation costs, invasive species, and economic vulnerability also near the top of the list.

“One encouraging result regarded climate adaptation planning,” said Fall. “In 2012, about 60% of the respon-

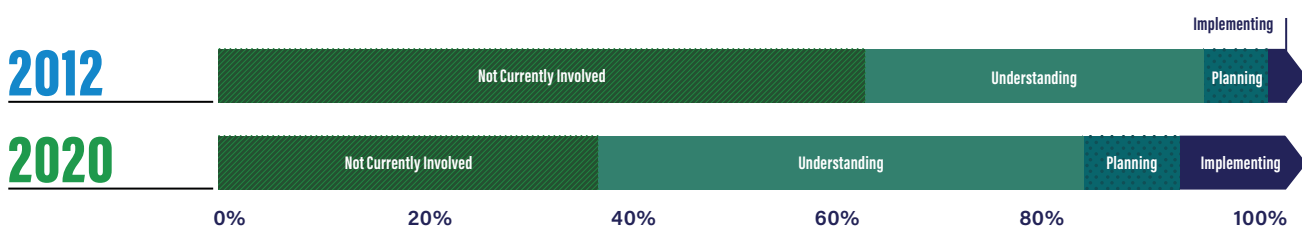
dents were not involved in climate adaptation planning at all, whereas in 2020, the largest group was in the understanding phase—doing assessments and developing plans. And the percentage of respondents that were implementing an adaptation plan also increased since 2012.”

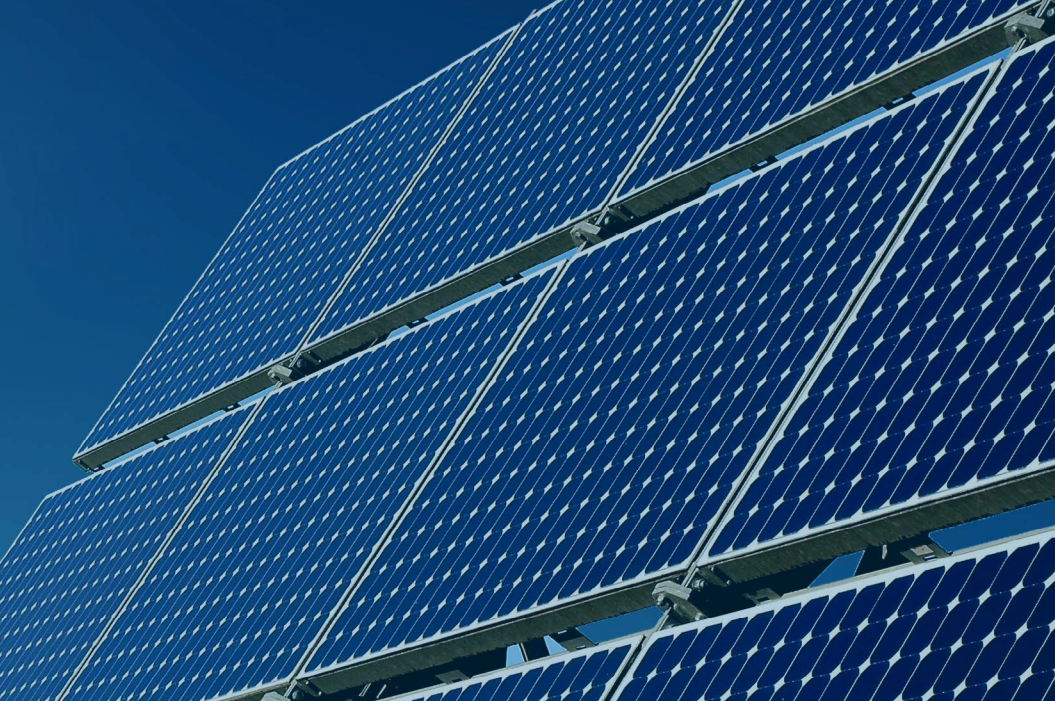
Fall was encouraged to see that nearly all survey participants felt that everyone should be involved in responding to climate change impacts, including government, other agencies, non-profits, and more. And they felt that climate change should be considered in all decisions.

“Local officials are starting to understand that it’s going to touch every aspect of society,” said Fall.

The survey also provided some insights into local needs in terms of information and resources. For Fall, this is helping her direct her efforts

Which of the following best describes your current phase of climate change adaptation planning and implementation?





Local Indiana leaders address on-the-ground climate risks with limited resources

to where they can be the most helpful.

“One point that really jumped out to me was this—survey participants understood that temperature and flooding are going to increase, but Lake Michigan water levels were at a record low in 2012 and record high in 2020 so expectations of climate change impacts on lake level results from the two survey mirrored these occurrences.

“When it comes to Great Lakes water levels, it turns out that variability is the name of the game,” said Fall. “I’m trying to do more to share this information, to convey what it will look like in our region where we can expect higher highs and lower lows over the next few decades.”

She also discovered that many communities still need basic information on climate change and climate impacts. For instance, 41% of respondents reported that they only have some of what they need with regards to information on expected local impacts.

And as more decision makers understand that they need to create an adaptation plan, many are looking for a roadmap of how to do it. “In fact, 57% expressed

a need for case studies based on communities that have already implemented their climate change adaptation plans,” said Fall.

To learn more information about extreme and variable Lake Michigan water levels, including community strategies and case studies, visit the IISG website. [👉](#)

<https://iiseagrant.org/work/climate-ready-communities/>



THROUGH THE IISG SCHOLARS PROGRAM, William Bianco, a political scientist at Indiana University, along with his team of six students, interviewed local officials throughout Indiana to assess community attitudes and actions with regards to climate change. Through the Environmental Resilience Institute’s Hoosier Resilience Index, the students gathered insight into local motivations, needs, and resources, while also raising awareness of climate risks as well as additional resources.

The interviews revealed that in preparing for climate change impacts, regardless of what side of the political fence they land, local decision makers in Indiana work toward being good stewards of their communities. Climate risks may not be considered relevant by some local officials, but flooding problems, for example, definitely are. The study also showed that whether a community in Indiana is preparing for the impacts of climate change depends on their access to resources. [👉](#)



Notre Dame researchers developed a better way to measure PFAS in sportfish

MORE THAN 5,000 COMPOUNDS make up PFAS, or per- and polyfluoroalkyl substances, and they are used everywhere—from industrial applications to cookware to makeup on our faces. Found in air, soil, and water, concern grows for their health impacts on organisms and ecosystems. As part of an IISG-funded project to assess the extent and type of PFAS in southern Lake Michigan sportfish, University of Notre Dame scientists Gary Lamberti and Graham Peaslee led a team that developed and optimized a new screening tool for analyzing PFAS in fish tissues.

Particle induced gamma-ray emission (PIGE) is a tool that has been used to measure PFAS levels in other applications, but now PIGE can much more quickly, accurately, and thoroughly identify PFAS compounds in sportfish than by using standard technology. With one measurement, PIGE can quantify a key indicator in more than 5,000 PFAS compounds as opposed to 70 compounds, which is less than 1% of what might be there. 📌

The Chicago waterways electric barrier may have mixed results in stopping invasive invertebrates

THE LARGEST ELECTRIC BARRIER SYSTEM IN THE WORLD is in the Chicago River System to prevent the spread of invasive carp. But does the barrier stop other species, particularly invasive invertebrates moving up or down the waterway?

With IISG funding, Loyola University biologist Reuben Keller and two graduate students assessed the effectiveness of an electric field designed to match the parameters of the electric barrier in Chicago waterways in affecting the behaviors of two invertebrate species, the red swamp crayfish, *Procambarus clarkii*, and the amphipod *Hyaella azteca*. They constructed this electric field in a laboratory tank and documented the effects on the two species.


The researchers found that the barrier may not slow or prevent spread of invasive amphipods and crayfish if their movements are passive—for example, attached to boats or barges or through downstream drift. On the other hand, the barriers may prevent spread of these species if they are actively moving upstream. 📌





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Quick Splashes

Aquaculture Family Coloring Book

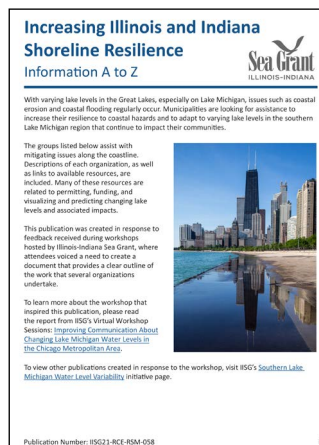
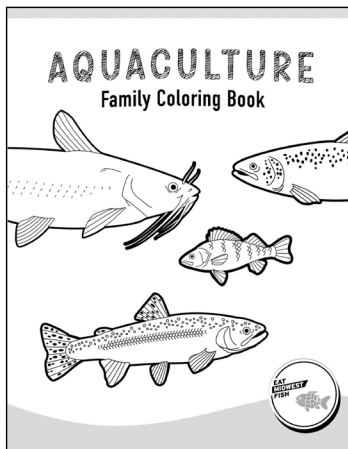
This print-your-own coloring book provides a fun way to learn about the aquatic animals that are raised on farms for aquaculture. Each spread highlights one species, pairing a beautifully illustrated coloring page with text for both beginner and advanced readers with information about aquaculture, fisheries, recreational fishing, and cooking tips.

Increasing Illinois and Indiana Shoreline Resilience: Information A to Z

Following our 2020 workshop focused on lake level variability and communication, participants identified needed resources, including a list of where to get information on funding, permitting, and other general needs. This guide provides a comprehensive list of how federal, state, and non-governmental organizations can assist coastal communities.

Climate Change and Sustainable Development

Energy-intensive development practices that became standard in a post-World War II world contribute to climate change. This publication features 10 strategies for local decision makers to plan and develop in their communities with lower energy use in mind.



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