

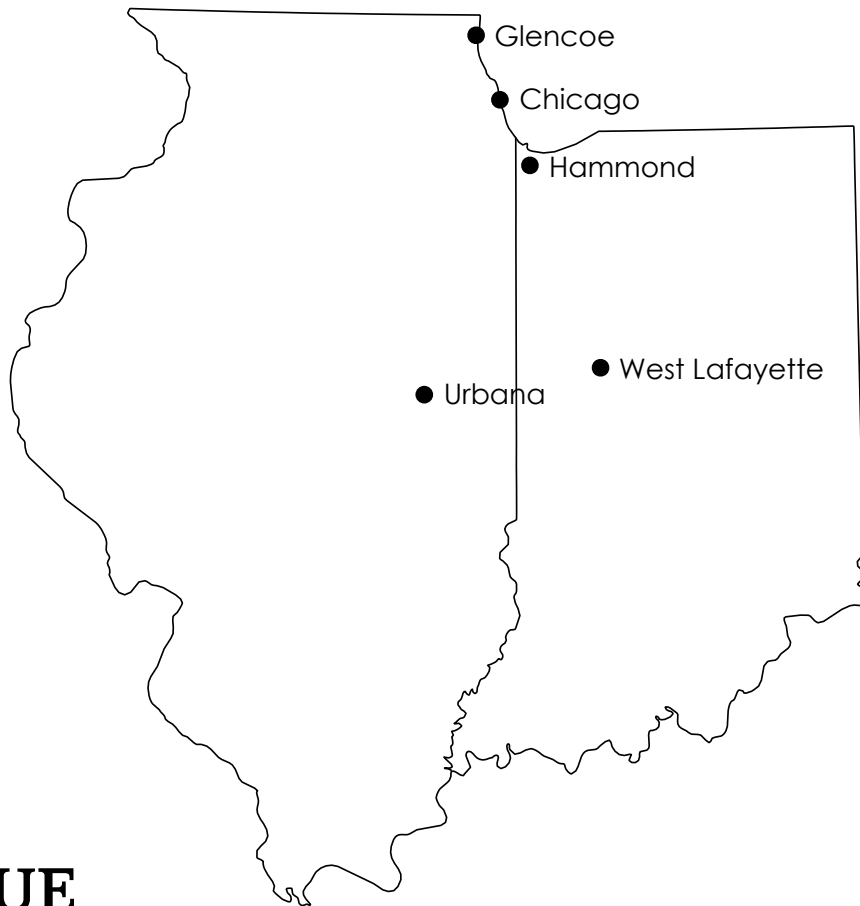
# IMPACTS 2016

*two great states caring for one great lake*



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*two great states caring for one great lake*



**PURDUE**  
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**I ILLINOIS**

**Sea Grant**  
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Funding is provided by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA Grant #COM NA14OAR4170095). Office of Sea Grant, University of Illinois at Urbana-Champaign and Purdue University, West Lafayette, Indiana. University of Illinois and Purdue University offer equal opportunities in programs and employment. IISG-17-013

Dear Friends,

It is with great pride that I share with you the impacts Illinois-Indiana Sea Grant (IISG) has had in our region in 2016. Our work is helping communities conserve water supplies, create sustainable plans, and grow economically and ecologically resilient. We have helped mitigate invasive species, pharmaceuticals, and algae-feeding nutrients in our local waters, the Great Lakes, and the Gulf of Mexico. And we are fostering a life-long sense of place as well as knowledge about coastal habitats in elementary and middle school students.


This is a chance for me to thank our partners—we work together to achieve common goals. IISG is administratively housed in and shares positions with University of Illinois Extension, Purdue University Extension, and several Purdue University academic departments. We share positions with University of Illinois Prairie Research Institute, Midwest Regional Climate Center, and Purdue University Northwest.

The U.S. EPA Great Lakes National Program Office provides support, with the assistance of the U.S. Geological Survey, for specialists, educators, and communicators who help to bring EPA science to the public. The Chicago Metropolitan Agency for Planning, Chicago Botanic Garden, McHenry County Extension, and Loyola University Chicago provide office space and administrative support for our specialists as well.

We also share personnel and coordinate programming with the USGS-sponsored Illinois Water Resources Center. This partnership has well served both organizations over the last 20 years and is now a national model for efficient use of federal resources. Our partners, and the federal and state funding they help us leverage, support our specialists, educators, and communicators as they collaborate with researchers to connect communities and stakeholders with the latest science.

I hope you enjoy reading this publication. If you have ideas for future ventures or partnership, or if you see a natural resource problem that our research and outreach capabilities could address, please let us know.

With warm regards,

A handwritten signature in black ink that reads "Brian K. Miller". The signature is written in a cursive, flowing style.

Brian K. Miller  
*Director*

# CONTENTS

01

Illinois strategy implementation contributes to a 10 percent drop in nitrate-nitrogen pollution

07

Two new Illinois take-back programs help keep 24,330 pounds of medicine out of waterways

02

Illinois green infrastructure program leads to reductions in polluted runoff

08

Illinois-Indiana Sea Grant interns get invaluable working world experience

03

Peoria, Illinois is addressing stormwater problems through green infrastructure

09

Purdue aquatic ecology class leads students to professional and personal opportunities

04

Kokomo, Indiana now has watershed action strategies in its comprehensive plan

10

Great Lakes climate summaries prove to be useful planning tools for local officials

05

Public spaces program helps two Indiana communities update long-term park and recreation master plans

11

New techniques are helping analyze Great Lakes sensor data and answer management questions

06

Rain garden training is helping Indiana address flooding and water quality concerns

12

Limno Loan Program brings science and technology to more than 1500 students



13

Shipboard workshop helps educators enhance Great Lakes science in the classroom

14

Grand Calumet River Stewardship Day leads 70 students to feel a sense of place

15

The sediment clean-up project of River Raisin in Michigan is complete

16

Students are engaged and the community stays informed as another section of the Grand Calumet River is cleaned up

17

Eight Indiana shrimp producers save more than \$56,000 in production costs

18

Through one-on one guidance, an Indiana aquaponics facility is built and a life is transformed



Illinois strategy implementation contributes to a 10 percent drop in nitrate-nitrogen pollution

### **Relevance**

By most estimates, Illinois is the largest contributor of nutrients to the Gulf of Mexico hypoxia. More than 400 million pounds of nitrate-nitrogen and 38 million pounds of phosphorus from Illinois farm fields, city streets, and wastewater treatment plants are carried to the Gulf each year by the Mississippi River system. Every summer, these nutrients spur algal blooms that leave an area roughly the size of Connecticut all but devoid of oxygen and marine life.

### **Response**

Illinois-Indiana Sea Grant joined with scientists and representatives from government agencies, non-profit groups, agriculture groups, and wastewater treatment to develop and implement a plan for reducing nutrient pollution from point and non-point sources in priority watersheds. The Illinois Nutrient Loss Reduction Strategy, released in 2015, outlined best management practices to reduce the amount of nitrogen and phosphorus reaching Illinois waterways by 45 percent.

### **Results**

To implement the strategy, numerous partnerships leveraged resources and retargeted efforts to the nutrient loss goal. As a result, nitrate-nitrogen loads from 2011-2015 decreased by 10 percent when compared to baseline 1980-1996 load data. A key factor in this decrease is the growing number of agricultural producers using best management practices.



Illinois green infrastructure program leads to reductions in polluted runoff

### **Relevance**

In urban and suburban areas much of the land is covered by buildings, pavement, and compacted terrain that do not allow rain and snowmelt to soak into the ground. These impervious surfaces greatly increase the volume and velocity of stormwater runoff. As it flows over urban land surfaces, stormwater also picks up pollutants, which can change both water quality and quantity and adversely affect the health of lakes or streams.

### **Response**

Illinois-Indiana Sea Grant was funded by the Illinois Environmental Protection Agency to study the standards and costs of green infrastructure as a possible replacement or supplement to conventional urban stormwater infrastructure. The study found that, on average, green infrastructure practices are just as effective as conventional stormwater infrastructure, and are less expensive. IISG presented recommendations to the Illinois General Assembly.

### **Results**

From 2011 through 2014, the Illinois Green Infrastructure Grant (IGIG) program funded 40 projects, investing nearly \$20 million. Projects addressed combined sewer overflow, stormwater retention and infiltration, and more. With some large projects still in progress in 2015, Illinois EPA reported that annual reduction of pollutants flowing into waterways, and attributable to IGIG, included 196 pounds of nitrogen, 17.3 pounds of phosphorus, 25,376 pounds of total suspended solids, and 1,000 pounds of sediment.



Peoria, Illinois is addressing stormwater problems through green infrastructure

### **Relevance**

Peoria, Illinois is working to address a water resource problem that has plagued the city for years. When large storms or snow melt overwhelm the city's infrastructure, its system of combined sewer overflow (CSO) can lead to raw sewage flowing into the Illinois River. In fact, U.S. EPA has mandated that the city develop a long-term plan to eliminate its CSOs.

### **Response**

Illinois-Indiana Sea Grant led Peoria stakeholder groups through the Tipping Point Planner process to identify community values and assets, provide education on stormwater and green infrastructure best practices, and identify the most appropriate strategies for the community. IISG's Tipping Point Planner is a data-driven decision tool that communities can use to develop cost-effective strategies and implementation plans that move their watersheds to a healthier state.

### **Results**

Peoria is the first city in the nation working to address its CSO problems using 100 percent green infrastructure. Through its comprehensive watershed planning, the Peoria Innovation Team is defining strategies to meet the U.S. EPA long-term requirements to maintain and restore healthy water conditions. As a result, Peoria is installing rain gardens and bioswales, has passed a stormwater utility fee, and is now embarking on education initiatives to raise community awareness about the new green infrastructure practices.





# 04

Kokomo, Indiana now has watershed action strategies in its comprehensive plan

## **Relevance**

Watershed managers, land use planners, and community leaders require data and decision-making tools to identify land use limits, evaluate the environmental impacts of proposed land use scenarios, and identify critical areas requiring protection or restoration to improve ecosystem health in a watershed.

## **Response**

In 2016, Kokomo, Indiana convened a steering committee and brought in the Tipping Point Planner team to support the update of the city's comprehensive plan. Illinois-Indiana Sea Grant's Tipping Point Planner is a web-based decision support system to explore policy and management interventions to keep aquatic ecosystems from reaching critical tipping points and moving to unstable conditions.

## **Results**

The Tipping Points team designed and led public input efforts for Kokomo's land use and environmental quality working group. This initiative, bringing together conservation professionals, city officials, and nonprofit organization representatives, led to action strategies for three watersheds that are now in the city's final plan.



Public spaces program helps two Indiana communities update long-term park and recreation master plans

### **Relevance**

Parks, greenways, and town centers define a sense of place and provide sites where residents experience social interactions, explore nature, and purchase goods and services. Public space management decisions made by policymakers, business owners, and residents impact the well-being and livelihood of the community as a whole.

### **Response**

Illinois-Indiana Sea Grant and Purdue Extension developed a curriculum and facilitation guide for local leaders to help them evaluate community public spaces. The Enhancing the Value of Public Spaces program (EVPS) combines data with public involvement to guide the design of an action plan that will improve public spaces and, ultimately, enhance quality of life.

### **Results**

The EVPS team collaborated with decision makers in Kokomo, Indiana to support their citywide comprehensive plan update. The working group visioning and feedback session resulted in park and recreation strategies that are now in the updated plan. And in West Lafayette, the EVPS team helped facilitate public participation as part of updating the parks and recreation master plan. Through visioning sessions and a survey, public input in the plan was enhanced.



Rain garden training is helping Indiana address flooding and water quality concerns

### **Relevance**

When rainwater hits pavement and quickly flows into drains and then to rivers, streams, or lakes, this runoff takes with it valuable soil and pollutants—like pesticides or motor oil. On the other hand, rainwater that is slowly absorbed into the soil through a rain garden doesn't take that quick ride. It is soaked into the ground where it falls. Pollutants that are brought down in raindrops end up filtered by plant roots.

### **Response**

Illinois-Indiana Sea Grant continues to collaborate with Purdue Extension on the Rainscaping Education Program. In 2016, program training continued, including a two-day session in Lake County in Indiana for 22 representatives from organizations and agencies throughout the state, including Master Gardeners, landscape contractors, and staff members from stormwater utilities and soil and water conservation districts.

### **Results**

The Lake County training led to the creation of a 150 square-foot demonstration garden in front of the Merrillville Stormwater Utility office. Three other demonstration rain gardens were installed as part of 2015 training sessions. In addition, some workshop participants have organized plantings in their communities—at least 10 new rain gardens have been installed.



Two new Illinois take-back programs help keep 24,330 pounds of medicine out of waterways

### **Relevance**

How we choose to use and dispose of pharmaceuticals and personal care products impacts water quality—the water that we drink, bathe in, and use for recreation. Most of us do not use all of the medication that we buy. But using the toilet or trash to dispose of medicine can put people, animals, and the environment at risk.

### **Response**

In 2016, two new permanent medicine collection programs were started in Illinois—both in Clinton County. Illinois-Indiana Sea Grant provided technical assistance on how to start a take-back program and purchased the collection boxes, which are available in local law enforcement offices.

### **Results**

These new medicine take back sites brings the number of permanent collection programs in Illinois, Indiana, Wisconsin, and Michigan that are supported by IISG to 51. Altogether, these programs collected and properly disposed of 24,330 pounds of medication in 2016.



## Illinois-Indiana Sea Grant interns get invaluable working world experience

### **Relevance**

It is often difficult for undergraduates to get experience that helps build their resumes and provides real world knowledge. Also, students aren't always aware of job possibilities beyond traditional science and extension positions.

### **Response**

Illinois-Indiana Sea Grant established a summer internship program five years ago for undergraduate students to work closely with program specialists on their ongoing projects.

### **Results**

In 2016, four interns worked directly with IISG specialists in water resources, community development, and communication. These interns helped author publications on Great Lakes ecosystem services and public green spaces. All 28 IISG interns have expressed that outreach experience—talking with community groups, sharing ideas with citizens and government officials—has been invaluable. One example of the program's success—a student who continued to work with IISG after her 2015 internship, graduated in computer science, and with her IISG-learned web and GIS skills, secured a two-year paid internship at General Electric.





Purdue aquatic ecology class leads students to professional and personal opportunities

### **Relevance**

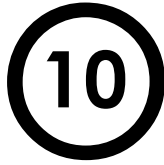
The Great Lakes face many threats, whether it is invasive species, pollutants, or climate change, to name a few. A more literate citizenry leads to better stewards of this resource as residents are more inspired to play a role and can make informed decisions.

### **Response**

Illinois-Indiana Sea Grant introduced aquatic ecology to 22 Purdue University Northwest seniors. This semester-long course covers water quality, hydrology, nutrients, aquatic life, and more. The students engaged in fieldwork at the campus wetland, putting classroom knowledge into action.

### **Results**

With support from IISG, this course opened doors for these students. One student who developed curricula as part of a class project, secured a position as a high school AP biology teacher after graduation. Three students were hired as interns with the National Wildlife Habitat Council. And several students introduced the Hoosier River Watch, a citizen stewardship organization, to the class and recruited two more volunteers.



Great Lakes climate summaries prove to be useful planning tools for local officials

### **Relevance**

Climate plays a large role in environmental, economic, and public health in the Great Lakes region. To ensure that communities are prepared for escalating climate challenges, it is critical that local officials are up-to-date on recent impacts and understand near-term outlooks.

### **Response**

A team of Great Lakes partners created four *Great Lakes Region: Quarterly Climate Impacts and Outlook* reports in 2016, with Illinois-Indiana Sea Grant as a co-lead. The reports provide a climate summary, information on significant events and climate impacts for the previous season, as well as an outlook for the upcoming season.

### **Results**

Local governments and U.S. EPA, as well as three U.S. legislators, use these reports as a tool to better understand climate challenges in the region. A local decision maker reported relying heavily on these summaries to develop climate adaptation plans, and an organization in the region uses the report to predict water levels, which is critical for scheduling construction of large-scale habitat restoration projects.





New techniques are helping analyze Great Lakes sensor data and answer management questions

### **Relevance**

Sensor-based data is now frequently used to augment traditional water quality monitoring programs. While these data can increase the time and spatial extent of the overall monitoring program, the sheer volume of data generated by the sensors is a logistical challenge for traditional analytical techniques.

### **Response**

Illinois-Indiana Sea Grant has collaborated with the National Center for Supercomputing Applications at the University of Illinois to develop algorithms to process sensor-based data collected by the U.S. EPA Great Lakes National Program Office (GLNPO). Using open-source software and state of the art statistical algorithms, the new techniques can manipulate large data sets, automate the quality control process, and perform initial data analyses and visualizations in near-real time.

### **Results**

These techniques are now in routine use, analyzing data streams from key GLNPO monitoring equipment and data loggers. The algorithms are also assisting other agencies and entities to address Great Lakes management concerns. For example, the U.S. Geological Survey Great Lakes Science Center is determining how day-to-day fluctuations in the hypoxic layer of Lake Erie influence commercial fishing catches. In addition, one algorithm is helping GLNPO contractors to develop a long-term database from regular Great Lakes monitoring surveys.





Limno Loan Program brings science and technology to more than 1500 students

### **Relevance**

Exposing students to aquatic science, technology, and science careers is an important step in creating a Great Lakes literate population. Students who are able to collect and analyze real water-quality data with actual equipment used by scientists in the field are especially well served.

### **Response**

In partnership with U.S. EPA GLNPO, Illinois-Indiana Sea Grant has coordinated the Limno Loan program for six years. Through this program, educators can borrow a Hydrolab, which is water monitoring equipment used by scientists, for classroom and field use. Along with the equipment, they have access to training and website resources.

### **Results**

In 2016, 25 educators borrowed the Hydrolab, reaching over 1500 students. Nearly all these educators integrated Great Lakes information into their classroom work and many increased the time spent studying aquatic science—up to 2½ weeks. Some educators have made the Hydrolab an on-going and key component of their water lessons. One Ohio educator describes that because students have ownership of this real data, they are more interested in understanding it compared to analyzing random numbers. She reported that students who work with the Hydrolab also show improvement in graphing data and interpreting graphs, and in the ability to relate multiple parameters (e.g. temperature, dissolved oxygen, and algae).



## Shipboard workshop helps educators enhance Great Lakes science in the classroom

### **Relevance**

The Great Lakes are under-represented in school textbooks and other educational resources. In addition, due to a lack of experience or exposure, many educators are neither comfortable with nor confident in teaching about the Great Lakes and aquatic science nor about the scientific method.

### **Response**

The Center for Great Lakes Literacy, a consortium of seven Sea Grant programs, conducts an annual week-long workshop that provides educators an opportunity to work side-by-side with scientists on the U.S. EPA R/V *Lake Guardian*. Teachers explore lake ecology, geology, geography, and chemistry. They learn about resources to help bring Great Lakes and ocean literacy activities to their classroom, and build networks with educators and scientists. Illinois-Indian Sea Grant is a part of the planning team, helping provide continuity each year and passing along lessons learned to make each workshop better than before.

### **Results**

In 2006, 15 educators from across the Great Lakes participated in the Lake Superior workshop. All participants reported gaining new knowledge and increased confidence about Great Lakes concepts, and all planned to integrate these concepts into lessons in the coming school year, potentially reaching 8,500 students. Their knowledge of the scientific research process increased as well as their confidence in explaining scientific concepts and research. In a follow up evaluation, educators described organizing field trips, incorporating new curriculum, and bringing real-world Great Lakes issues to the classroom.





Grand Calumet River Stewardship Day leads 70 student to feel a sense of place

### **Relevance**

The Grand Calumet River was once called the most polluted river in America. Through Great Lakes Legacy Act funding, almost 2 million cubic yards of river and wetland sediment have been removed or capped and 84 acres of habitat have been restored. However, many school children who live near this natural area have not spent time exploring it.

### **Response**

Illinois-Indiana Sea Grant co-hosted the Grand Calumet River Stewardship Day with The Nature Conservancy. As part of a school field trip, about 70 fourth and sixth graders visited nearby Roxana Marsh to experience science in the outdoors, participating in four stewardship stations.

### **Results**

Evaluated before and after the visit, the students clearly developed a “sense of place” related to the Grand Calumet River. Sense of place is a well-established social science concept that captures a person’s place attachment. People are more likely to perform stewardship activities, vote in favor of environmental protection, and give money to protect places they are attached to. Increasing sense of place provides additional assurance that a \$184 million government investment in restoration will be cared for in the present and maintained for the future.



The sediment clean-up project of River Raisin in Michigan is complete

### **Relevance**

The City of Monroe is home to the only Michigan port on Lake Erie, serving industrial and recreational boating needs for over a century. However, the Lake Erie and River Raisin shorelines have been crowded with steel manufacturing plants, power production, and other industry since the early 1900s. Because waste disposal was unregulated at that time, industrial pollutants like PCBs were dumped directly into the water.

### **Response**

The Great Lakes Legacy Act cleanup of River Raisin took place in Monroe's port, one mile upstream of Lake Erie. The project took place in two phases with a first field effort in 2012-2013 and a follow-up field effort in 2016. Throughout the process, Illinois-Indiana Sea Grant helped inform the community, especially recreational water users, about the project and its progress through meetings, flyers, videos, press events, and more.

### **Results**

A cleanup to remediate 51,000 cubic yards of sediment in the River Raisin was completed in October 2016. This is the final management action required to delist the River Raisin as a Great Lakes Area of Concern. Through many restoration activities and sediment cleanups, people and wildlife can now safely use the River Raisin. Already, new fish species, including steelhead trout, are showing up. The restoration of the River Raisin has revitalized the economic and ecological future of the Monroe area.



Students are engaged and the community stays informed as another section of the Grand Calumet River is cleaned up

### **Relevance**

At its worst, the Grand Calumet River has been called the most polluted river in America. Indeed, it's the only Great Lakes Area of Concern site that claimed all 14 beneficial use impairments. This degraded river flows through a very populous and economically struggling area in northwest Indiana.

### **Response**

Through the Great Lakes Legacy Act, this waterbody is undergoing a significant clean-up. Illinois-Indiana Sea Grant is helping keep the community informed throughout the process, communicating with community leaders and the media, through classroom activities, and at public events.

### **Results**

Another section of the clean-up process is complete—about 46,000 cubic yards of contaminated sediment were remediated from the Stateline of the Grand Calumet River in Hammond, Indiana. The cleanup is helping to bring back fish populations and is lowering exposure to contaminants for those who eat fish from the Great Lakes. And improvements to the shoreline—like removing weedy invasive plants—help improve the view and provide fish and wildlife habitat.







Eight Indiana shrimp producers save more than \$56,000 in production costs

### **Relevance**

Indiana aquaculture producers must entice customers who can easily find more affordable imported seafood. While these producers are creating niche markets for their fresh fish and shrimp, having the most up-to-date knowledge and technology can help ensure the profitability of their businesses. Feedback from a 2014 workshop suggested that shrimp farmers needed more information on some technical issues in the industry.

### **Response**

Illinois-Indiana Sea Grant conducted a study on the economics of raising Pacific white shrimp indoors that revealed that marine shrimp are more profitable if grown to at least 26–30-count per pound. The program's aquaculture marketing specialist worked with a consultant for eight shrimp farms in Indiana to determine appropriate stocking sizes of shrimp post larvae and the effect on shrimp harvests.

### **Results**

IISG helped draft a plan that was implemented at all eight shrimp farms. Within one year, these shrimp farmers realized a total savings of more than \$56,000 through an improved post-larval stocking program.



Through one-on-one guidance, an Indiana aquaponics facility is built and a life is transformed

### **Relevance**

The Congressional report, *Rising Above the Gathering Storm*, states that building a workforce literate in science, technology, engineering and mathematics is crucial to maintaining America's competitiveness in a rapidly changing global economy.

### **Response**

Illinois-Indiana Sea Grant engages in training and provides guidance for potential and on-going aquaculture and aquaponics producers. This training takes the form of workshops, publications, and one-on-one counseling.

### **Results**

IISG's aquaculture specialist provided one-on-one advice as a \$3.5 million aquaponics facility was being planned and built in 2012. His contact, who helped build and manage the facility, is a former drug addict, and at the time, was recently released from prison. This project was a life-changing experience—he is now the owner of two businesses, a husband, and a father. He also employs at-risk young people to help provide them guidance and direction.



