

Strategies for water conservation: Is the price right?

By Jason Peterson

Northeast Illinois water suppliers are faced with a challenge: water demand in the area is increasing in the midst of growing limits on water supply.



“The 11-county water planning region is served by hundreds of public water supply systems, with no overarching regional water authority,” said Illinois Indiana Sea Grant (IISG) water resource economist Margaret Schneemann. “We are relying on the individual decisions of hundreds of utilities to implement conservation strategies to meet future water demand. Some may choose to implement these strategies, some may not. The question is what are the incentives leading to a decision one way or the other?”

Schneemann is leading a study of current residential rate structures to determine and recommend conservation pricing methods that promote sound regional water management. Her research is based on findings from a review of almost 300 water systems that collectively serve a population of 8.2 million in the region.

The current state of water in northeast Illinois is the result of a popular misconception about the region's resources. The historical perception is that water supply is unlimited, which is simply not the case. In fact, the amount of Lake Michigan water available for use is limited by a U.S. Supreme Court decree.

Meanwhile, according to the Illinois State Water Survey, portions of the deep bedrock aquifer are being drained and cannot be relied on to meet all future demand scenarios. As for the shallow aquifers, these ecosystems are vulnerable to pollution and depletion, which may be further exacerbated by climate change.

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Illinois-Indiana Sea Grant

Two States Caring for One Great Lake

Brian Miller, Director

374 NSRC, 1101 W. Peabody
Urbana, IL 61801
217-333-6444

Assistant Director

Lisa Merrifield

lmorrisn@illinois.edu
217-333-0045

Research Coordinator

John Epifanio

epifanio@illinois.edu
217-244-6916

Associate Director for Education

Robin Goettel

217-333-9448
goettel@illinois.edu

Aquaculture Marketing **Kwamena Quagrainie**

765-494-4200
kquagrai@purdue.edu

Aquatic Ecology **Leslie Dorworth**

219-989-2726
dorworth@calumet.purdue.edu

Aquatic Invasive Species **Patrice Charlebois**

847-242-6441
charlebo@illinois.edu

Coastal Sediments **Susan Boehme**

312-353-4383
boehme.susan@epa.gov

Communication **Irene Miles**

217-333-8055
miles@illinois.edu

Environmental Planning **Martin Jaffe**

312-996-8933
mjaffe@uic.edu

Great Lakes Ecosystem **Beth Hinchey Malloy**

312-886-3451
Hinchey.Elizabeth@epa.gov

Planning with POWER **Robert McCormick**

765-494-3627
rmccormi@purdue.edu

Water Resource Economist **Margaret Schneemann**

312-676-7456
MSchneemann@cmapp.illinois.gov

Setting the right price for water conservation

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“A primary aim of conservation-oriented pricing,” said Schneemann, “is to incorporate the full cost of water and thereby move the region to water prices that send correct signals to water users.”

For example, if the full cost of deep bedrock aquifer water is incorporated into pricing, it may become more cost-effective for water suppliers to draw from inland rivers or Lake Michigan, thereby allowing the aquifer to recover. In turn, Lake Michigan water users would be further prompted to continue the trend toward more efficient resource use.

Another aspect of conservation pricing is to create incentives for users to curb consumption without affecting prices on water necessary to survive. One strategy, called seasonal pricing, is to increase water rates during the summer, when water use is at its peak, in an effort to discourage excessive use.

“Residential water users often drive system capacity,” Schneemann said. “A decrease in consumption during peak periods will delay or prevent costly water system expansion.” The most important task, however, is to improve water billing and education. “If people do not understand what they are being billed for and do not monitor their use and water rates, the effectiveness of conservation programs will be compromised,” she added.

This study is a part of a larger effort by Chicago Metropolitan Agency for Planning and other Illinois-based agencies to provide regional coordination on water supply. As Illinois is required to comply with Great Lakes water conservation provisions, state funding and regional coordination will be critical.

“Without that coordination, you have hundreds of separate water systems making decisions based on their own interests. Regional water supply planning and conservation-oriented pricing provide incentives for sustainable water management that is both locally preferred and regionally optimal,” said Schneemann.

The
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Irene Miles—**Editor**

Susan White—**Graphic Designer**

Jacqueline Adams, Beth Hinchey Malloy, Jason Peterson—**Writers**

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Wingspread Accord expands its reach

The Wingspread Accord, originally signed in 2002, was a historic agreement in which planning agencies from Illinois, Indiana, and Wisconsin joined forces to tackle environmental and economic issues in the southern Lake Michigan region. Recently, an updated accord was signed with a Michigan planning agency on board—encompassing more people, land, and municipalities and an even broader vision.

The Southwest Michigan Planning Commission joined the Chicago Metropolitan Agency for Planning, the Northwestern Indiana Regional Planning Commission (NIRPC), and the Southeastern Wisconsin Regional Planning Commission in this new agreement to plan more comprehensively in the region.

The original accord led to a number of collaborative efforts, including research on regional integration of



modes of travel, an analysis of the region's inter-dependent economy, and the birth of the Lake Michigan Watershed

Academy, a project that brings together resources and partners to improve land use planning in the watershed. The accord also brought regional water supply planning front and center through the creation of the Tri-State Water Supply Consortium.

“In the new accord, we are focused on areas of cooperation, where staff members are already in place to move projects forward,” said Sarah Nerenberg, a NIRPC water resource engineer, who helped coordinate the accord. Regional trail development is high on the list—this effort will connect pathways across state borders, ultimately connecting the four states. Also, water resource planning continues to be a focus, both in terms of water quality and quantity.

“Agency directors are focusing efforts on regional water supply plans and other initiatives, including conservation best management practices,” said Martin Jaffe, IISG environmental planning specialist. “In fact, NIRPC has already developed a water conservation tool kit for local officials and may address other water supply issues as part of its 2040 comprehensive plans.”



The water resources working committee will also develop a riparian corridor management guide to build on existing regional initiatives regarding water quality management planning. The guide will emphasize the importance of riparian buffers for stormwater and floodplain management and will provide direction on the preservation of terrestrial and aquatic systems.

“Given the concern regarding global climate change impacts, mitigation, and adaptation, the agencies agreed that energy planning will become increasingly important over the next few years,” said Jaffe. While on sabbatical from the University of Illinois at Chicago, where he is an associate professor, Jaffe will get the ball rolling by gathering information on how municipalities handle energy planning and look for ways that the regional planning agencies might move efforts forward.

Throughout the Wingspread process, Illinois-Indiana Sea Grant has provided expertise and support. “The program’s contribution has been crucial,” said Nerenberg. “Brian Miller (IISG director) has provided vision and guidance that helped bring the agencies together. He and Martin Jaffe helped crystallize the connection between urban environments and local waterways.”



Restoration master plans build on community clean ups

Restoration along Ruddiman Creek and Muskegon Lake in Muskegon, Michigan is kicking into high gear. With an ecological master plan and \$10 million in funding to get the ball rolling, local stakeholder efforts may erase years of accumulated industrial waste, create healthy habitat for wildlife and increase opportunities for public access and recreation.

Several other Great Lakes Areas of Concern (as designated by the U.S. EPA) are following a similar path, including Hog Island and Newton Creek in Wisconsin. Through Great Lakes Legacy Act funding, contaminated sediment has been removed from these sites, leaving lakes, rivers and shorelines ripe for follow-up restoration.

“These shorelines still suffer from habitat loss and degraded wildlife populations,” said Susan Boehme, IISG coastal sediment specialist.

The first step in the process is developing a plan. With support and expertise from the U.S. EPA Great Lakes National Program Office and Biohabitats, an ecological design firm, stakeholders in these regions developed ecological master plans with specific goals that came about through public discussion.

“In Muskegon, Illinois-Indiana Sea Grant provided support in publicizing local meetings and helping to bring some critical local landowners to the table,” said Kathy Evans, a program manager with the West Michigan Shoreline Regional Development Commission (WMSRDC), who is closely involved with restoration efforts.

“Often one-on-one conversations are very effective in getting to the bottom of any concerns.”

“Through public participation in the planning process, the goals become more universally accepted,” said Evans. “The public is more willing to see the process go to the next level, and in some cases, land owners are inspired to restore their own property.”

The Muskegon Ecological Master Plan provides “a suite of restoration actions and management recommendations for the restoration of fish, wildlife, benthos and wetland habitats; and human uses in the project area.” The work plan schedules restoration efforts over the course of a decade and involves many partners and stakeholders, including local volunteers.

Right off the bat, the master plan has provided a helpful blueprint for securing funding for restoration efforts along Muskegon waterways. The Great Lakes Commission, in partnership with WMSRDC, has received a \$10 million grant from NOAA through the American Recovery and Reinvestment Act to restore 10,000 feet of shoreline that has been buried in several decades of broken concrete, foundry slag, sheet metal and other materials. This project will kick off in the spring with the money scheduled to be spent by the end of the year.

“We are planning to have shovels in the ground as soon as weather permits,” said Evans. “Lake Muskegon is a magnificent freshwater lake so this is a great opportunity for the community and the Great Lakes region.”



Courtesy of Kathy Evans

SOLEC spotlights Great Lakes nearshore conditions



Over the last decade, the continued rapid growth of urban and suburban areas is the single most significant land use change (about 60 percent) in the

U.S. portion of the Great Lakes basin, according to a new publication, *Nearshore Areas of the Great Lakes 2009*, released by U.S. EPA and Environment Canada. Much of the newly-developed land was converted from agricultural or early-successional vegetation lands.

The report describes Great Lakes nearshore area environmental conditions. It documents changes in these areas since 1996, and suggests management implications related to nearshore issues. "Great Lakes nearshore areas are where land-based activities can impact water quality and where humans generally interact with the Great Lakes," said Paul Bertram, environmental scientist with the U.S. EPA Great Lakes National Program Office (GLNPO) and co-editor of the report.

Experts in the United States and Canada contributed to this report, which was prepared for the State of the Lakes Ecosystem Conference (SOLEC) 2008 in Niagara Falls, Ontario. Illinois-Indiana Sea Grant, in partnership with U.S. EPA GLNPO, will help distribute the report to congressional staff members, state and municipal officials, local decision-makers, educators, and interested public.

Here are more findings: Nuisance growth of *Cladophora*, a native, filamentous, green alga that

accumulates on beaches, will influence the public's perception of water quality and therefore, play a role in related decisions. *Cladophora* in nearshore regions of Lake Erie, Lake Michigan, and Lake Ontario has drawn the attention of those involved in public recreation, operation of utilities, and water quality management.

The growth of *Cladophora* may be linked with type E botulism outbreaks since the decaying algal mats create environmental conditions thought to promote botulism toxin production. The frequency and severity of botulism outbreaks have cycled over the last several decades—recently, affected areas and species have increased and expanded, particularly in



Courtesy of Milwaukee Metropolitan Sewerage District



Courtesy of Scott Higgins

Cladophora accumulation along the shoreline of Bradford Beach on Lake Michigan (top photo) and Rock Point Provincial Park along Lake Erie (bottom photo).

Lake Michigan. In 2007, botulism outbreaks caused an estimated 17,000 avian mortalities in the Great Lakes region.

Harmful algal blooms (HABs) have recently resurged in the Great Lakes and so has concern about their

toxins or harmful metabolites, especially in coastal waters. Lake Erie has the most extensive nearshore region because it's so shallow, so toxic HABs are of particular concern there and the focus of several current studies.

The report also includes information on nearshore terrestrial ecosystems, coastal wetlands, nutrients, viral hemorrhagic septicemia (VHS), aquatic invasive species, human health, nearshore habitats, and nearshore physical processes.

The report is timely in that 2010 will be an intensive year for nearshore monitoring. U.S. EPA National Coastal Assessment (NCA) will survey conditions of the nation's coastal resources by creating an integrated, comprehensive monitoring program among coastal states. NCA sampling will take place in all Great Lakes states. Also, intensive monitoring of Lake Michigan's nearshore will occur as part of the U.S. EPA and Environment Canada Cooperative Science and Monitoring Initiative.

"We anticipate that the nearshore report will be used by federal and state agencies to help guide the intensive coastal monitoring work that will take place in 2010 in Lake Michigan and throughout the Great Lakes," said Paul Horvatin, U.S. EPA GLNPO monitoring, indicators, and reporting chief.

As part of the SOLEC Executive Committee, IISG's Great Lakes specialists Beth Hinchey Malloy and Jacqueline Adams helped organize the conference as well as helped write and edit the report. You can download the report at http://binational.net/solec/sogl2009_e.html.

Invasive hydroid may strain food source of young fish

As if Lake Michigan fish don't have enough competition for resources. An Illinois-Indiana Sea Grant study has found that the diet of an invasive freshwater hydroid includes organisms that are an important food source for young-of-the-year and bottom-dwelling fish.

"*Cordylophora caspia* typically eats larval zebra and quagga mussels," said Nadine Folino-Rorem, Wheaton College biologist. "However, when those sources are not readily available, the hydroid can feed on other invertebrates, which potentially affects prey availability for fish." Folino-Rorem, along with Martin Berg, a Loyola University Chicago biologist, studied the distribution and diet of *C. caspia* in Lake Michigan.

The hydroid lives in freshwater, brackish, or slightly salty habitats. The freshwater colonial hydroid is na-

fact, the population of the freshwater hydroid is growing in Lake Michigan. Folino-Rorem speculates that this may be due in part to street salts washing into the lake and changing water quality. "*C. caspia* thrives in higher salinity," she explained.

The researchers also found that the freshwater hydroid can eat organisms—chironomids—that are two to three times its size. "This was often accomplished by working together," said Folino-Rorem. "When one polyp gets a hold of a chironomid, the organism can continue to thrash about until another polyp latches onto it too. The two polyps engulf the chironomid, sometimes meeting in the middle."

C. caspia is limited in its range due to its need to colonize on hard surfaces—Lake Michigan's muddy bottom does not provide a hospitable habitat. However,

the recent spread of quagga mussels may increase the amount of available substrate for attachment. Unlike zebra mussels, quagga mussels can colonize the soft, muddy bottoms found in deeper areas. According to Tom Nalepa, a NOAA biologist at the Great Lakes Environmental Research Laboratory, 99 percent of what his team finds when sampling offshore in southern Lake Michigan waters is quagga mussels.

Courtesy of Nadine Folino-Rorem



C. caspia colonizes on hard surfaces, such as the shells of quagga mussels.

tive to the Caspian and Black Seas. *C. caspia* colonies consist of several polyps approximately one millimeter long that are interconnected by their gastrovascular cavities. Colonies grow on hard surfaces; in southern Lake Michigan, *C. caspia* can be found in harbors on rocks, piers, pilings, and on clusters of zebra and quagga mussels.

The researchers found *C. caspia* in all eight Chicago harbors sampled as well as at two offshore sites. In

"They are more efficient than zebra mussels in using food resources," he said. "And they tolerate cooler temperatures. We found that the number of quagga mussels in deep and in shallow waters far exceeds zebra mussel numbers even at their peak."

For *C. caspia*, the spread of quagga mussels may prove beneficial in terms of expanding their range to offshore waters. For fish populations, this may prove to be more bad news.

Staff Update

Dr. Farnsworth goes to Washington

Rick Farnsworth, who has been the program's outreach coordinator for the past two years, has taken a new position in Washington D.C. in the Natural Resources Conservation Service. As a senior

agricultural economist, he is now providing advice on policy and the implications of federal actions, such as soil and water conservation programs.

IISG plants funding seeds to grow new research projects

IISG has awarded \$84,000 in seed, supplemental, and doctoral project grants to faculty and graduate students at three institutions. Topics include fisheries, green infrastructure, contaminants, aquaculture, the Karner blue butterfly, and more.

University of Illinois

Yang Cao

Modeling the 10-year changes of juvenile fish assemblages in Lake Michigan nearshore waters

Brian Deal

An Illinois green infrastructure and ecosystem services valuation tool

Michael Plewa

Toxic byproducts generated in disinfected drinking water contaminated with pharmaceuticals

Zachary Blevins (graduate project)

The effects of land use patterns on physiology of freshwater fish

Purdue University

Maria Selpulveda

*Utilization of genomic signatures from *Hyalella azteca* as a way to quickly evaluate toxicity and need of sediment remediation in the Great Lakes basin*

Patrick Zollner

Simulating the implications of recreational disturbance on Karner blue butterflies at the Indiana Dunes National Lakeshore

Antony Acushla (graduate project)

A web-based tool to measure environmental quality standards for phosphorous in water in Lake Erie

Shalmar Armstrong (graduate project)

Evaluation of phosphorus loading following a manure spill and an in-stream sediment amendment to reduce phosphorous desorption

Southern Illinois University

Jesse Trushenski

Increasing the availability of veterinarians to Indiana and Illinois aquaculture

Brian Gause (graduate project)

Replacement of fish meal in hybrid striped bass diets with proteinaceous fermentation biomass



Courtesy of David Riecks, UIUC-ACES-ITCS

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



WATCH for Asian carp



Now that Asian carp DNA has been detected beyond the electric barrier—a mere seven miles from Lake Michigan—it's even more important for anglers and boaters to watch out for these fishes and help reduce their numbers. "People who spend time out on lakes and rivers are usually the first

to spot new species," said Pat Charlebois, IISG aquatic invasives specialist. "To know with certainty whether the carp are beyond the barrier, we're really counting on their help in reporting any sightings."

If you are fishing downstream of the barrier where Asian carp are plentiful, you can do your part to reduce their numbers by catching them. But don't stop there, the meat is good to eat. For more information on catching, cleaning and cooking Asian carp, visit www.iiseagrant.org/asiancarps. To order a free *Bighead and Silver*

Carp WATCH card, which provides general characteristics of these fishes, including both photographs and drawings, contact Susan White at white2@illinois.edu.

To report any sightings in the Chicago area, contact IISG at 847-242-6440 or the Illinois Department of Natural Resources (309-968-7531) or the Indiana Department of Natural Resources (317-234-3883). Note the exact location and if possible, freeze the specimen in a sealed plastic bag.