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UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

INSIDE:



*Sailing a Tall Ship With
Kathy Kline*

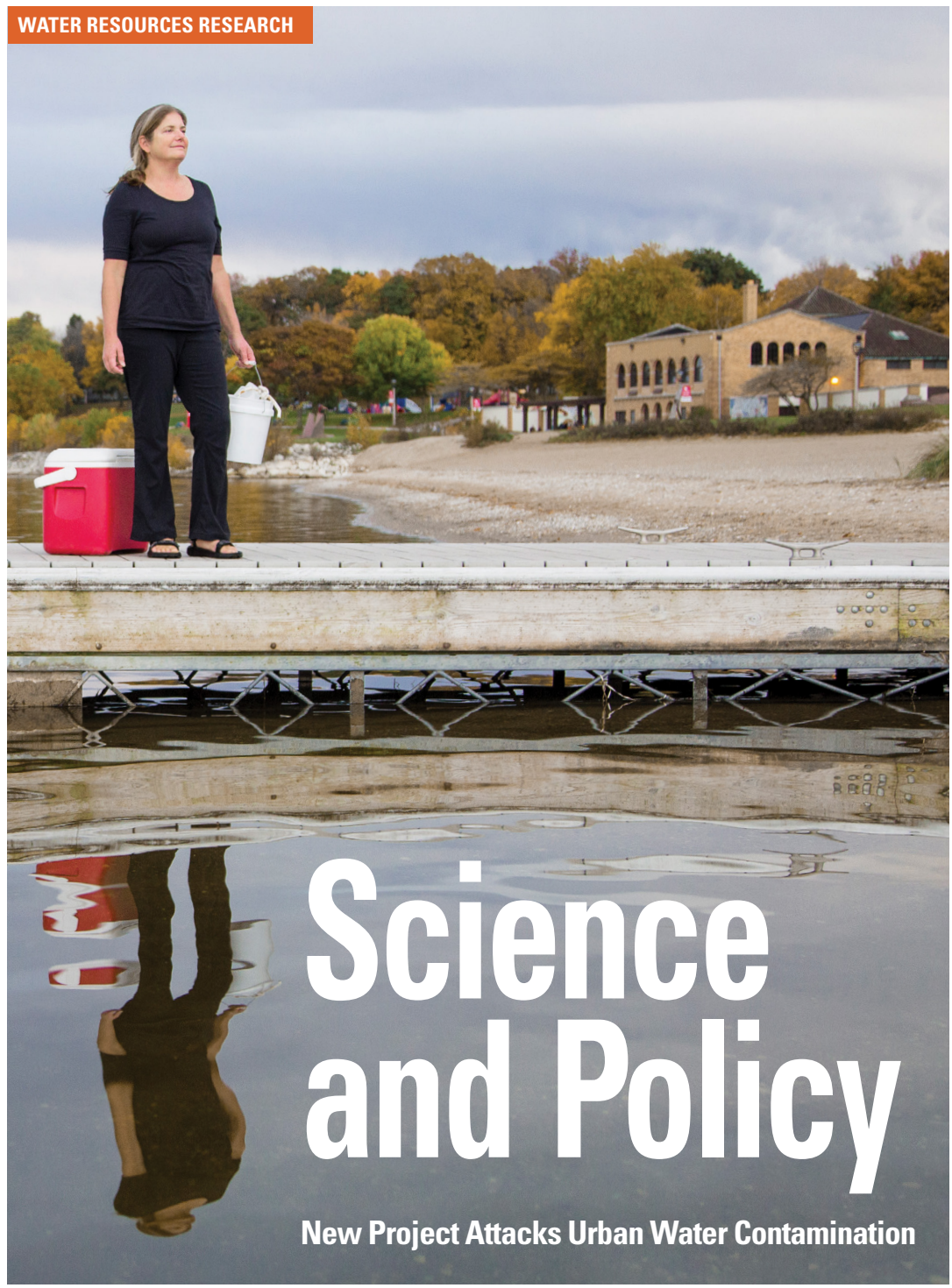


*It's Not Easy Being
Green Infrastructure*



Fresh Wisconsin Salmon

WATER RESOURCES RESEARCH



Sara Stathas

Science and Policy

New Project Attacks Urban Water Contamination

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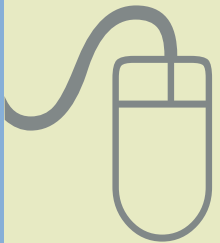
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FEATURED SOCIAL MEDIA

Trending Now
WRI and Sea Grant Social Media Channels
@UWiscSeaGrant



Trending. In today’s social-media-ized world, trending is a familiar verb. Of course, it means that a topic becomes hot, catching the attention of many interested people. Often, it’s a phenomenon mentioned in the context of Twitter but can also refer to what’s getting noticed on Facebook.

While following the social media channels of the University of Wisconsin Water Resources Institute (WRI) and Sea Grant Institute doesn’t yield the mega-trends of, say, a Kardashian, you can still latch on to plenty of water science and outreach news.

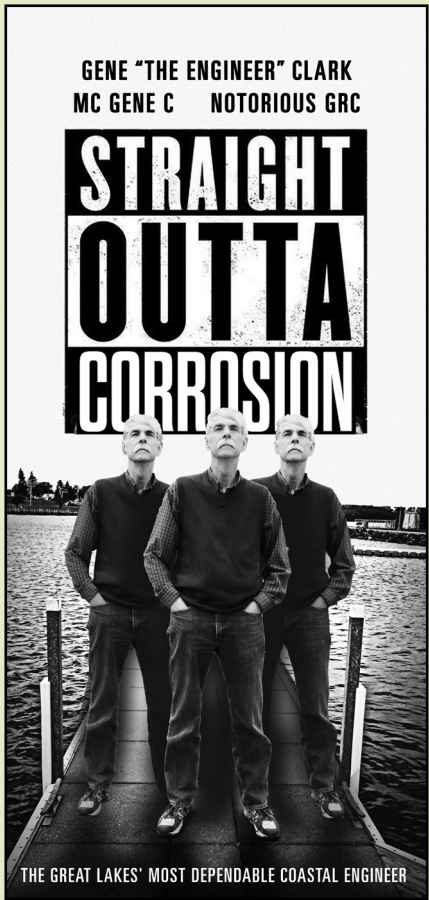
If you check out @UWiscSeaGrant on Twitter on nearly a daily basis, you’ll be front and center for discussions among @DrFishSG, @t_campy, @ks_kline, @WiscWaterLib, @dhartuw, @JimHurley8, @NoordCoast and @DeidreMKE. That’s the slice of staff members who are engaged in water quality, aquatic invasive species, resiliency and education activities. They provide insights into their areas of expertise and explore how their work intersects with each other’s, as well as with peers throughout Wisconsin, the Great Lakes region and nationally.

Over on Facebook, recent popular posts previewed photography in the 2014-16 Sea Grant Biennial report, go.wisc.edu/k16h33, and another imagined what a movie poster commemorating our coastal engineer (left) would look like go.wisc.edu/e88clm.

A post about an art and science talk the Wisconsin Water Library hosted elicited a response from one visitor who shared an additional story about the merging of these two disciplines. Another post linked to a news-

paper story about alewives in Lake Michigan. It prompted a fisherman to share his thoughts about the numbers of the small prey fish in the lake.

It’s easy to get pulled into those kind of trends on WRI and Sea Grant social media platforms, and informative once you do.



WATER RESOURCES RESEARCH COVER STORY

University of Wisconsin-Milwaukee researcher Sandra McLellan is heading one of five research proposals that received funding in a national annual competition by the U.S. Geological Survey (USGS). Her three-year proposal, “Detection of Sewage Contamination in Urban Areas of the Great Lakes,” has just begun and is using a combination of science and policy to improve water quality in urban areas. Steve Corsi, a research hydrologist with the USGS, is co-investigator on the project.

Attacking Urban Water Contamination Through
Science and Policy

“Although there are regulations against it, untreated sewage release is widespread and chronic in urban waters,” said McLellan. “Much of it can be attributed to failing sewer systems and illegal connections, which can often go undetected.”

McLellan’s lab has found that nearly 30 percent of local stormwater outfalls show evidence of such sewage contamination.

For the science part of the project, McLellan and Corsi are using the \$240,000 in federal funding for three things: to collect data on pollution loads in the waterways around Milwaukee and Wauwatosa, Wis., develop an optical sensor tool that can estimate sewage contamination in real time and look at associated pollutants, such as pharmaceuticals, that can harm aquatic life.

According to Corsi, the research team plans to analyze more than 200 different pharmaceutical compounds, more than a dozen viruses and different types of harmful bacteria in the water samples they collect. They are doing this using different methods and plan to compare them for consistency in order to help water resource managers choose the best one for their situation.

“Many people use only one of these methods to make a determination of pollution loading for their waterways,” Corsi said. “We want to know how different they are for instances when only one is available.”

The optical sensor is something that can be placed into a stream or sewer pipe. It emits a beam of light and a reading is taken that can be assessed in real time.

“We’ll be able to see how the pollution loading fluctuates on more of a five-minute basis rather than limiting ourselves to the frequency of water

sample collection,” Corsi said, which could be very helpful for water managers.

While the optical sensor does not detect the presence of sewage itself, it can detect compounds that indicate sewage is present through a change in light absorbance or fluorescence.

“We’ve shown in the past that sewage has a specific signature with optical properties of water that is different than the signature from environmental waters. We are doing this analysis to determine which optical signals may be worth pursuing to

Steve Corsi (top), research hydrologist with the USGS, and Sandra McLellan, UW-Milwaukee, are working to improve water quality in urban areas by detecting and evaluating the effects of sewage leaks.

add to the mix of indicators and make pollution assessments more accurate,” Corsi said.

On the policy end of the project, the research team will work with water resource managers in Milwaukee and Wauwatosa to adapt the optical tool and to develop policies that address wastewater infrastructure leaks.

“Urban wastewater infrastructure is aging throughout the country,” McLellan said. “The scope of the problem is startling, and requires billions per year to address. Unfortunately, only about 14 percent of that investment is made each year by Congress. The true economic costs of this deferred maintenance can only be determined by sound science to demonstrate the harm to water resources. We are working to understand this problem and find cost-effective solutions. We expect that this project will advance our understanding of sewage impacts on the Great Lakes, and it will allow us to infer the extent of the problem in other cities across the country.”

In his letter supporting the project, Kevin Shafer, executive director of the Milwaukee Metropolitan Sewerage District, said he anticipates the project will help his organization better track and remediate pollution sources.

“Rapid detection of sewage contamination will allow us to quickly respond to health risks and to formulate more effective management strategies to reduce water-quality impairments,” he said. —MEZ



Sara Stathas, Marie Zhuikov



Clean Water and Tribal Rights

The ongoing protest of the Standing Rock Sioux Tribe and their allies against the \$3.8 billion Dakota Access Pipeline reminds us of similar conflicts. These battles occur at the intersection of issues, including Native American land rights, water rights, extraction industry growth, fossil fuels usage, economic growth, tension between land tenure and land improvements, and spiritual beliefs.

The Wisconsin Water Library has many books in its collection to help think through these complex issues. Search for these titles and more at waterlibrary.aqua.wisc.edu.

ALL OUR RELATIONS: NATIVE STRUGGLES FOR LAND AND LIFE

By Winona LaDuke. Cambridge, Mass.: South End Press, 1999.

Native environmental activist LaDuke writes a thoughtful and in-depth account of native resistance to environmental and cultural degradation, including the challenges faced by the Seminoles, Anishinaabeg, Innu, Northern Cheyenne, Mohawks and others.

AMERICAN INDIAN ENVIRONMENTAL ETHICS: AN OJIBWA CASE STUDY

By J. Baird Callicott and Michael P. Nelson. Upper Saddle River, N.J.: Prentice Hall, 2004.

To illustrate the environmental ethic of the Ojibwa, this book focuses on the Ojibwa narrative, myths, legends, stories and rituals. This examination demonstrates the worldview of the group, their social inclusiveness and their ethical commitments.

DEFENDING MOTHER EARTH: NATIVE AMERICAN PERSPECTIVES ON ENVIRONMENTAL JUSTICE

Edited by Jace Weaver, Maryknoll, N.Y.: Orbis Books, 1996.

This series of essays brings together native voices to address environmental issues as they affect indigenous peoples throughout the Americas. The essays document a range of ecological problems, including the effects of mining, water pollution, nuclear power facilities and toxic waste dumps.

WATER CONSCIOUSNESS: HOW WE ALL HAVE TO CHANGE TO PROTECT OUR MOST CRITICAL RESOURCE

Edited by Tara Lohan. San Francisco: AlterNet Books, 2008.

Compelling contributions by Bill McKibben, Maude Barlow, Vandana Shiva, Wenonah Hauter, Sandra Postel, Tony Clarke and other top environmental writers explore all aspects of the water crisis and inspire readers to action. This book includes essays on privatization, bottled water, conservation and appropriate technology; lessons from indigenous cultures; and an argument for the need for new public policy on the right to water.

Anyone in Wisconsin can borrow these books. Just email askwater@aqua.wisc.edu.



Kathy Kline / Wisconsin Sea Grant

Sails Hoisted, Ship Tall

The S/V *Denis Sullivan* has been making summer educational pilgrimages on the Great Lakes for many years now, giving educators and graduate students in Great Lakes states like Wisconsin and Minnesota the opportunity for some hands-on experience in both the particulars of marine science and the proper technique for rigging a sail.

But it's not every year that the *Denis Sullivan's* voyage traverses two Great Lakes and culminates in a major event like the 2016 Tall Ships Festival in Duluth.

The 2016 voyage began Aug. 12 in Milwaukee. Over the course of the ship's six-day journey, the 31-member crew — a group that included 12 Wisconsin teachers, staffers from the Wisconsin and Minnesota Sea Grant programs, and Wisconsin Sea Grant Maritime Archaeology Fellow Tori Kiefer — experienced a passel of unforgettable activities, including lowering hydrolabs (for water-quality sampling) and plankton nets (for marine life sampling) into Lake Michigan and piloting a remotely operated vehicle in a swimming pool on the ship's deck.

"It was a tough week both physically and mentally for all of us, but one of those amazing life experiences that I think we'll all dwell on for some time," said Kathy Kline, Wisconsin Sea Grant's education outreach coordinator. "There were two functioning toilets, no showers and little sleep, but also gorgeous sunrises, serene nights in the middle of Lake Michigan and lots of laughs."

Kiefer, who spent several evenings on the ship presenting slides about shipwrecks to her crewmates, said she really enjoyed the daily ship-handling duties. As someone who studies the wrecks of ancient vessels, the opportunity to hoist the ship's 500-pound anchor and step out onto the ship's bowsprit — that's the timber that extends out from the front of the ship — to secure the head rigging were lifetime-level highlights.

For Kline, a highlight was viewing a photograph taken by the Duluth Visitor's Bureau of the *Denis Sullivan* as it first appeared on the horizon, approaching the city.

"There we were — 31 of us aboard that little speck sailing on Lake Superior. It really gave me a new perspective on our Great Lakes," she said. —ARC

Growing Power's Will Allen Joins Wisconsin Sea Grant's Advisory Council

A national profile's nothing new for Will Allen, 67, the former professional basketball player who's used his charisma, drive and business acumen to champion the cause of urban farming, becoming one of the most recognizable faces of the modern food revolution. Working from the urban center of Milwaukee, where Growing Power, the organization he founded in 1993, is housed, Allen has spent the last two-plus decades training thousands in the art of aquaponics and urban aquaculture. This year, he became a member of Wisconsin Sea Grant's Advisory Council, advising the organization on its strategic plan and future research directions.

His addition to the council was simply the formalization of a relationship that's been in place for many years. For more than a decade, Allen's been collaborating with Fred Binkowski, Sea Grant's aquaculture outreach specialist, to train more than a thousand people to become aquaponics farmers.

"We're incredibly fortunate to have an individual of Will's character and stature affiliated with our organization," said Jim Hurley, Sea Grant's director.

"I really wanted to spread the word," said Allen. "I just want to see the industry grow, to provide good food and good jobs for people. I thought joining the council would be a great opportunity for my voice to be heard, to be able to voice some of the concerns of the inner city on these issues. Aquaponics needs someone to speak up for it and I think I can be that voice."

Allen's keenly aware that the biggest obstacle to continued growth of the aquaponics industry is proper training. It's all too easy for an untrained fish farmer to make a mistake that results in the death of half the crop and an expensive, sometimes business-killing, financial loss.

"Growing a fish is much harder than growing a plant," he noted.

Currently, most of the top-flight aquaponics training takes place within the university setting — in Wisconsin, at the University of Wisconsin-Milwaukee's School of Freshwater Sciences and the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility. Allen and Growing Power have been working to change that since not every would-be entrepreneur has access to those resources.

"It's about getting more people involved," said Allen. "I can be the face. I can be one of the leaders, but this will ultimately be done by entrepreneurs. Nonprofits and the university have an important role to play, but entrepreneurs will be the ones who expand it."



Narayan Mahon

"I just want to see the industry grow, to provide good food and good jobs for people."

—WILL ALLEN

Infrastructure is the other big missing piece. While there's no shortage of abandoned warehouses in places like downtown Milwaukee that could be converted to aquaponics operations, the lack of a privately held hatchery to provide enough fish fingerlings to fuel a new wave of aquaponics startups presents an ongoing problem. Allen and Binkowski have already moved to address the shortfall — they've partnered with a group called The Farmory to create a hatchery in the Green Bay area. Allen's also working to open an urban hatchery near 10th and North avenues in Milwaukee. —ARC

It Ain't Easy Being Green (Infrastructure)

While continuing to grow in popularity, green infrastructure faces obstacles to implementation. But a Wisconsin Sea Grant researcher is aiming to create a tool that could change that.

On the surface, it seems both easy and obvious: If you're living in an area struggling with stormwater runoff issues, just add in some green infrastructure — a rain garden, bioswales, maybe some new permeable pavement — and voilà! runoff problems solved — or at least reduced.

The reality's not nearly that simple. In addition to the composition and soil conditions of every lot and neighborhood being vastly different, green infrastructure is also what's called a dispersed technology. In other words, it's all but impossible to get everyone in a neighborhood or on a block to adopt it uniformly.

"You're never going to have 100 percent of homeowners say, 'I want a rain garden,'" explained Steven Loheide, a University of Wisconsin-Madison associate professor of environmental engineering, whose primary research focus is green infrastructure. "But you might not need all of them — you might only need some people to have a rain garden. And where on that block matters quite a bit."

Supported by funding from Wisconsin Sea Grant, Loheide and graduate student Carolyn Voter are — through a combination of outreach, sampling and detailed watershed modeling — trying to remove some of the obstacles that prevent more widespread use of green infrastructure, and, more important, evaluating which green infrastructure strategies are most effective in which areas.

Their work builds on a previous University of Wisconsin Water Resources Institute (WRI) project that looked specifically at a handful of residential lots in Madison to determine the impact of small

green-infrastructure changes (redirecting downspouts, etc.) on the lots' water budget.

Those small-scale findings now inform a much more expansive project. Loheide and Voter are sampling and studying multiple neighborhoods in the Milwaukee Metropolitan Sewerage District (MMSD), everything from residential areas near 30th Street, where investment in green infrastructure is already underway, to areas near the airport and 16th Avenue near the Kinnickinnick River. Their work aligns with the MMSD's ambitious goal of using green infrastructure (and other techniques) to capture one inch of stormwater across the entire district by 2035. That equates to a whopping 7.1 billion gallons.

"What we're looking for is how big of an impact do any one of these interventions have, and what impact do they have together?" said Loheide. "Green infrastructure is extremely context dependent — for instance, what works in Florida won't necessarily work in Milwaukee, given that both locations experience different precipitation duration and intensity."

What Loheide and Voter are ultimately angling to create is an online tool, a dashboard with drop-down menus that will allow homeowners, engineers and other stakeholders to input a series of characteristics about the lot (and/or neighborhood) in question and get a sense of how extensive the impact of adding specific green infrastructure strategies might be.

"It's not going to be an answer that is specific to every city block, because each block has different soils and different amounts of impervious surfaces," explained Loheide. "What we're going to do is develop a tool that says, 'Are you in an area with sandy, loamy or clay soils? How does the best management practice differ for you?'"

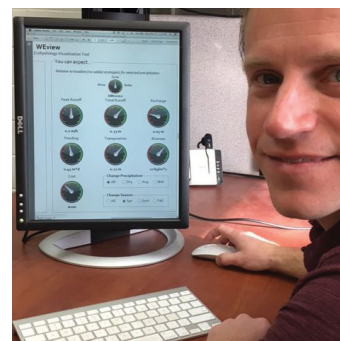
Voter, a former WRI fellow, is the one handling the project's heavy computational load. Using sets of high-performance and high-putthrough servers located at the Wisconsin Institutes for Discovery (WID) on the Madison campus — a resource that's actually free to use for all UW students — Voter inputs climate and rainfall data from the areas being studied into a watershed simulation model called ParFlow.

The model kicks out another massive set of data on the neighborhood's soil moisture conditions and how much runoff and transpiration occurred during that target period, allowing for the creation of maps that shows the changes over time. The WID servers can handle more than a hundred models simultaneously; given that each model can take up to three weeks to run, there's a massive efficiency savings.

"We're interested in those data as a cumulative total for the whole lot, in terms of trying to figure out if you reduce runoff, what changes in the water balance, and also spatially," said Voter. "For instance, when we disconnect downspouts, we can see these hotspots where deep drainage and recharge have increased right by those downspouts. We're interested in those lot total changes and how that might be playing out spatially within a lot."

The online tool could eventually be expanded to apply to a wide range of climates across the country. In Wisconsin, the regional differences aren't that vast; in other words, what works in Milwaukee will also likely work in Green Bay and Racine.

"People at the decision-making level already know that green infrastructure is good," said Loheide. "What we don't know is which practices are most effective and how they compare to traditional methods." —ARC



Aaron R. Conklin / Wisconsin Sea Grant

GREEN FAIL

As both real-world experience and Steve Loheide's research make clear, not every green infrastructure strategy is useful and effective in every setting. And if you install the wrong one in the wrong environment, you're likely to end up with a green infrastructure fail.

Take rain gardens, for instance. Creating a vegetation-laden depression in your lot that captures water from your roof and driveway, all the better to allow it to infiltrate into the ground after a storm, seems like an obvious win. But if, for instance, the soil on your lot is packed with infiltration-resistant clay or the groundwater is shallow, you're more likely to end up with an unexpected pond on your lot — or worse, a flooded basement or a ready-made mosquito breeding ground.

"That's probably not what the homeowner was hoping for," said Loheide. "If the rain garden is failing because the soil doesn't have the proper hydraulic qualities, you can amend the soils, increase the infiltration capacity and make a functioning system. If on the other hand, the water is not draining because the water table is shallow, it's not in your benefit to be infiltrating more water. It's not a good idea to put a rain garden in an area that already had basement flooding issues."

Looking at other green infrastructure strategies, like a rain barrel that keeps the water out of the ground altogether, might be a better green infrastructure option.

"A lot of these decisions about green infrastructure are context dependent," said Loheide. "Determining which are good values is often an individual thing."

Eventually, Loheide wants homeowners and other stakeholders to be able to use this online dashboard, now under development, to measure how much impact green infrastructure strategies are likely to have on their lots.

Kevin J. Mrazek



Eventually, Steve Loheide, center, wants homeowners and other stakeholders to be able to use an online dashboard to measure the impact of green infrastructure strategies.



TRACKING GHOST NETS, PART TWO

A NEW NOAA GRANT FUNDS MORE OUTREACH — THIS TIME, TO A DIFFERENT STAKEHOLDER GROUP

Steve Humblet was just trolling along in the Wisconsin waters of Lake Superior near Long Point when it happened.

“Both of my new electric downriggers and poles started swaying,” Humblet recalled. “I pretty quickly realized I didn’t have a big fish, but I didn’t know what the heck I had hit. I fought with it for half an hour.”

What he had hit was a ghost net — a gill net that had torn loose from its moorings and eventually drifted into the path of Humblet’s motor, fouling it badly. Gill nets are used by commercial and tribal fishermen for larger hauls.

“At first, I was mad at myself for running through a net,” said Humblet, who thought he had somehow missed some warning floats. “And then I took a closer look.”

What he saw was a line of floats on the surface extending out nearly 300 feet, with the rest of the net wrapped around his downrigger, with lots of bait and debris still stuck in it. He realized he hadn’t run into the net; the net had run into him.

Luckily, Humblet had heard about an educational video co-produced in 2015 by Wisconsin

Sea Grant, the Apostle Island Sportsfishermen’s Association (AISA) and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), instructing boaters on what to do if their vessel became entangled in a ghost net. He contacted the Coast Guard and a friend in the AISA. About an hour later, he had extricated his boat, losing only the cannonball and flasher from his downrigger in the process.

Humblet’s story is the textbook example of how the ghost net education and outreach campaign, fueled by a NOAA Marine Debris Outreach and Education Grant, is supposed to work. And it points up the need for continued outreach: Since the project began, it’s estimated that at least 5,000 feet of ghost net have been removed from the waters of Lake Superior alone.

Luckily, that education and outreach will continue. The current grant has been extended through April and will fund another educational workshop for boaters and anglers, outreach at the Upper Peninsula Sport Show, and the development of a second educational video, this one aimed at the groups that set the gill nets, detailing the proper methods to ensure the net doesn’t become unmoored during installation, and that it doesn’t break apart and drift away as it’s being removed from the water.

The bigger and better news is that the partnership has been awarded a 2017 NOAA Marine Debris Removal Grant to continue the campaign.

“It’s interesting — we’ve come full circle,” said Titus Seilheimer, Sea Grant’s fisheries outreach specialist and a lead on the project. “A lot of what we had prepared initially when we first began talking about doing this project is coming back in the scope of this second grant.”

Specifically, the new grant will fund the development of a net-marking kit anglers can carry to make identifying, marking and reporting ghost nets to the proper authorities easier and more accurate. As part of the grant, GLIFWC will also receive high-resolution sonar equipment and underwater optics that will help locate ghost nets once they’ve been reported. Funding will also be provided to the Wisconsin Department of Natural Resources to cover expenses related to ghost net removal.

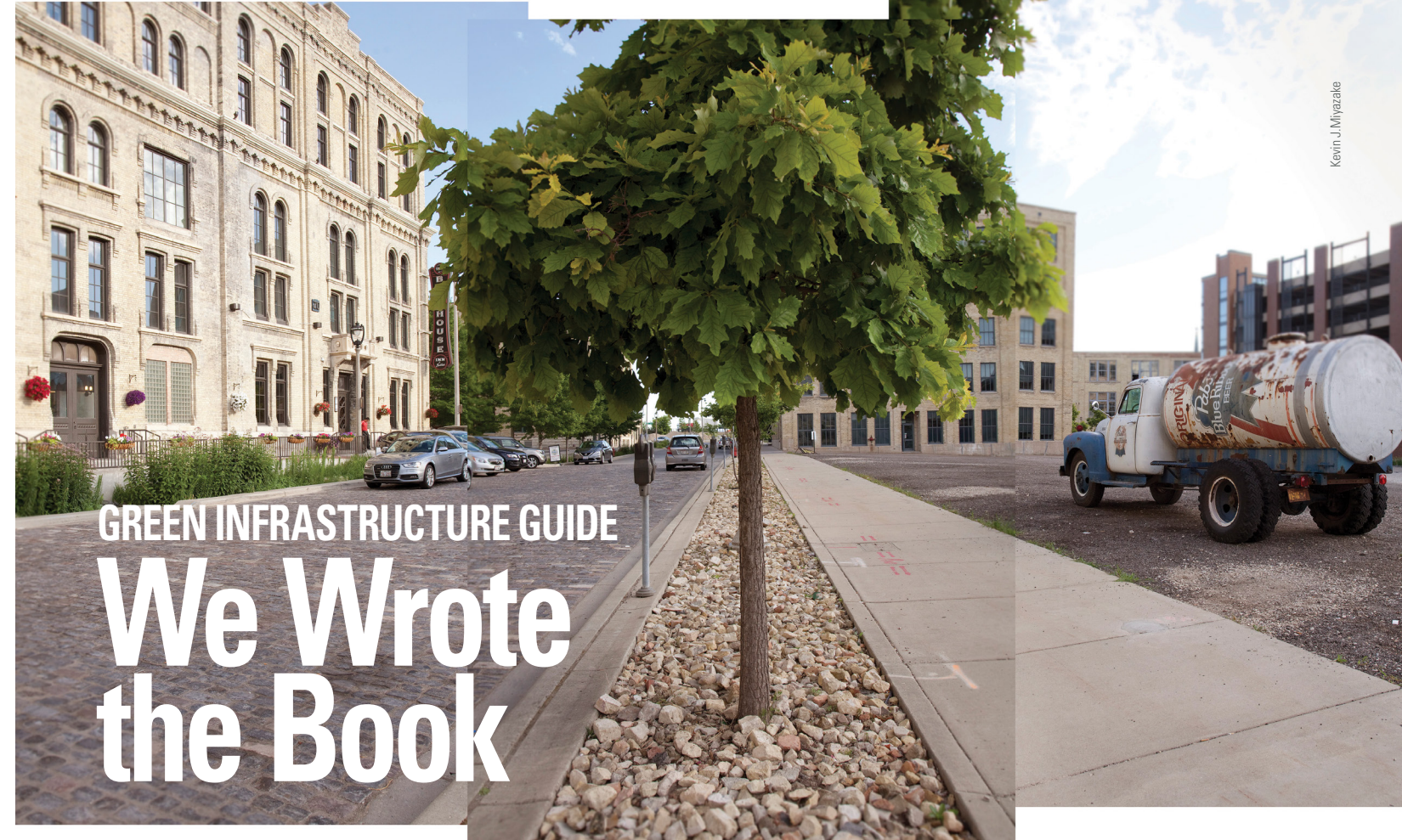
“That’s a vital piece of this,” said Seilheimer. “They can go right to the location and pull it out.”

To view the video “Avoid the Trap: What Anglers Should Know about Commercial Fishing Nets,” visit go.wisc.edu/49084s. —ARC



It took Steve Humblet more than an hour to untangle about 300 feet of ghost net from his fishing boat.

Steve Humblet



GREEN INFRASTRUCTURE GUIDE We Wrote the Book

Trying to plant a rain garden in a community space? Want to control stormwater runoff in a way that is both effective and beautiful? How about designing a green roof for a new construction or improving stormwater runoff in existing parking lots?

All too frequently, green infrastructure practices — methods to control stormwater using the natural capacities of soil and vegetation — are discouraged or even actively prohibited by outdated, poorly worded or ambiguous local codes and ordinances.

Since 2012, 1000 Friends of Wisconsin has worked with 28 municipalities in southeastern Wisconsin to audit, revise and prioritize codes and ordinances that deter and prohibit the more widespread use of green infrastructure. To help replicate this approach and facilitate the development of strategic code and ordinance revisions for green infrastructure in other communities, Wisconsin Sea Grant, with support from the NOAA Coastal Storms Program, developed the *Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances* workbook.

What makes this project unique in comparison to similar audits is the “no judgement” approach to working with municipalities. Barriers to green infrastructure can vary widely within the code language — specific rights, specific prohibitions, partial limits or practices mentioned with no guidelines for implementation. Therefore, solutions to code barriers need to be customized for the specific municipality and cannot be satisfactorily addressed by model ordinances.

Julia Noordyk, water quality and coastal communities outreach specialist for Wisconsin Sea Grant, was a co-editor on the project with Kate Morgan, former water policy director of 1000 Friends of Wisconsin.

Noordyk said, “We realized that cooperation among municipal zoning and planning departments, non-profit groups, planners, consultants and other local groups was key. Evaluating how green infrastructure fits within a municipality’s context — the regional culture, pattern of development and specific challenges regarding water quality or quantity — is crucial to successfully overcoming code barriers. The community scoping section of the project reflects that need.”

After the scoping worksheet, the audit provides a comprehensive series of questions to ask about local codes and ordinances. Using the provided grading matrix, users select a grade in response to each question, based on whether a code, policy or operation is enabled, conditional, discouraged or conflicted with regard to green infrastructure. The results, along with suggestions from the workbook, can be used to identify critical barriers and determine how best to resolve them.

Noordyk said, “This project builds capacity and brings technical assistance for this work at a time when local governments are facing restricted budgets and reductions in personnel.”

The guide also contains a wealth of examples, references and definitions. Available at seagrant.wisc.edu/greeninfrastructure —EAW

Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances, consists of three main steps — community scoping, auditing community codes and ordinances, and prioritizing recommendations to develop a strategy for adoption.

Kevin J. Miyazaki



Tyler Firkus at NADF, where he'll be doing his lamprey project.

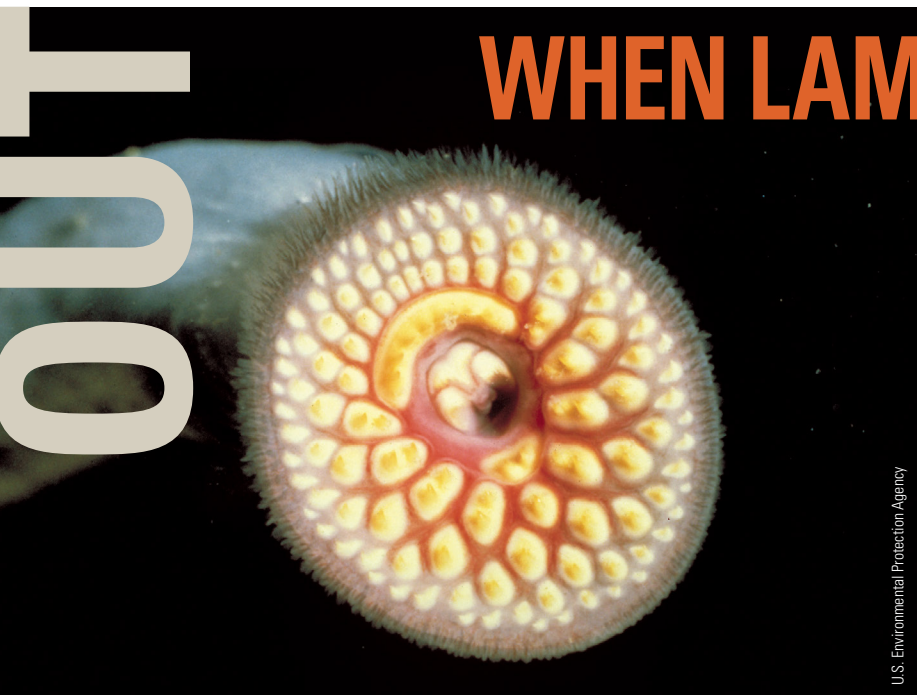
Marie Zhukov / Wisconsin Sea Grant

Despite close attention by fishery managers, the lake trout population in the Wisconsin waters of Lake Superior has been declining in the past decade or so. Recently, this led to emergency limits on the number of lake trout that can be harvested by anglers and commercial and tribal fishermen in Wisconsin waters of the lake.

In an effort to get a better handle on population stressors so that more accurate fishing quotas can be set, fishery managers are looking at a variety of

Tyler Firkus, a fish and wildlife Ph.D. candidate at Michigan State University (MSU), plans to change that. However, first he has a few obstacles to overcome for this unique project. For instance: how to catch lamprey that are in the relatively short feeding stage of their life cycle, how to keep the lamprey alive until they can be introduced to lake trout and how to expose the trout to lamprey parasitism just long enough so that it's not lethal. "It's a major project with a lot of moving parts,"

WHEN LAMPREY ATTACK!



U.S. Environmental Protection Agency

Firkus said. "There's different hurdles and different things that keep popping up because nobody's ever done this before."

Firkus is conducting his research at the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (UWSP NADF), a Wisconsin Sea Grant partner organization located in Red Cliff, Wis.

As for catching the lamprey, Firkus is getting help from commercial fishermen in the Bayfield area and from the Hammond Bay Biological Station in Michigan, which specializes in lamprey collection and research. So far, he has about 20 lamprey in the feeding stage, with hopes of capturing 30 to 40 total.

After the lamprey are removed from the lake trout, Firkus plans to study a number of physical parameters of the fish over the long term. These include growth, reproduction and immune response. He will divide his time between UWSP NADF and MSU depending on whether he needs to collect data, process data or teach.

"The data will be an important tool to refine current physiological and bioenergetics models to better predict how sublethal sea lamprey attacks can affect the lake trout population," said Greg Fischer, UWSP NADF operations manager. "The information will be vital for proper management strategies in all the Great Lakes."

Funding for the project is coming from the Great Lakes Fishery Commission. —MEZ

factors that might stress this important population. One of those things are attacks by sea lamprey — the eely vampire of the fisheries world.

Lake trout deaths by lamprey rank behind those from commercial fishing, natural causes and angling, but it's long been assumed that lamprey-attack survivors suffer from impaired growth and reproduction rates. Even though it is estimated that more than 50 percent of lake trout attacked by lamprey survive, effects on survivors have not been studied in the lab.

ATLANTIC SALMON ON THE HORIZON

Aquaculture in Wisconsin and North America

Greg Fischer, facility operations manager for the University of Stevens-Point Northern Aquaculture Demonstration Facility (UWSP NADF), has seen the future of aquaculture in Wisconsin and North America, and it contains platefuls of delicious Atlantic salmon.

Fischer and others at NADF are working with partners in Washington state, West Virginia and Wisconsin to get U.S.-grown and farmed salmon onto people's dinner tables. Most of the Atlantic salmon produced for food is imported from Chile, Norway, Scotland and Canada.

The Washington company NADF has been working with, Riverance, plans to develop a U.S. source for all-female Atlantic salmon eggs for the aquaculture industry. Currently, only a few sources for these eggs exist. (Female eggs are preferred because female fish grow faster.) For several years in their facility in Red Cliff, Wis., NADF staff have been rearing a special strain of salmon called Cascades for Riverance, working in partnership with the Freshwater Institute in West Virginia.

Emma Wiermaa, NADF and Wisconsin Sea Grant aquaculture outreach specialist, explained that the salmon were domesticated fish originally bred for net pen aquaculture in salt water. "We raised them in a freshwater recirculation system, and they are doing really well in fresh water. Their growth just exploded," she said.

At up to 40 pounds apiece, these spotted levathans are so huge they've broken the nets used to transfer them during spawning operations. The fish are four to five years old and are currently spawning for the second time.

"This is the last remaining population of the Cascade strain in the world that we are aware of, and we believe it's the future for food fish for Atlantic salmon," Wiermaa said. "We take really good care of these fish; we give them top quality feed and check their water quality frequently."

Fischer said that because of their work with Riverance, NADF has another partner in Wisconsin that is building up their business. The company is called Superior Fresh, and it is constructing an aquaponics facility near Eau Claire, Wis.

"They're establishing one of the first on-land, sustainable, Atlantic salmon and aquaponics facilities built in North America," Fischer said. "It's unlike any of the other ones we've seen so far."

"... they are doing really well in fresh water. Their growth just exploded."

EMMA WIERMAA

NADF and Wisconsin Sea Grant aquaculture outreach specialist

They will have very little water discharge. It will be a great showcase to demonstrate how other facilities could be built around the country and also here in Wisconsin."

"The investment that's been put forward to get these fish into Wisconsin is probably the largest we've seen for food fish aquaculture in over 10 years," Fischer said. "These projects really show the future and where aquaculture is headed. It's kind of neat to see it coming." —MEZ



Clockwise from left; UWSP NADF technician Jared Neibauer holds up a hefty Cascade strain Atlantic salmon. Air spawning Atlantic salmon with UWSP NADF staff and Riverance partner. The future for sustainable production of Atlantic salmon is land-based water recirculation systems.

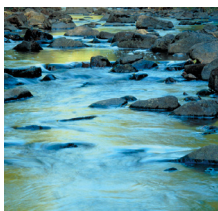
UWSP NADF



University of Wisconsin Aquatic Sciences Center
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Aquatic Sciences Chronicle

a joint newsletter from UW Sea Grant and UW Water Resources



CALENDAR OF EVENTS

APRIL 30 – MAY 3, 2017

Spring American Water Resources Association Conference
Snowbird, Utah
awra.org/meetings/Snowbird2017

APRIL 30 – MAY 5, 2017

Association of State Floodplain Managers Annual Conference
Kansas City, Kan.
asfpmconference.org/2017

MAY 15 – 19, 2017

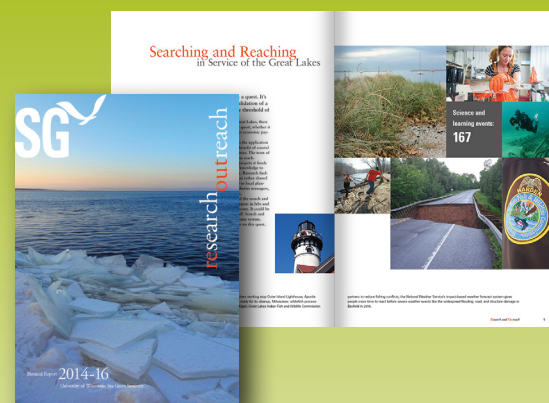
IAGLR, Conference on Great Lakes Research
Detroit
iaglr.org/iaglr2017

JUNE 7 – 8, 2017

Great Lakes Fisheries Commission Annual Meeting
Duluth, Minn.
glfc.org

JUNE 13 – 15, 2017

Universities Council on Water Resources
Fort Collins, Colo.
ucowr.org/conferences



SEARCHING AND REACHING

2014-16 SEA GRANT BIENNIAL REPORT

Sea Grant's vision is thriving coastal ecosystems and communities. The program's 2014-16 biennial report provides great detail on the searching and reaching in which it engages to achieve that vision. Download a copy of the report from **seagrant.wisc.edu/BiennialReport/2014-16**. Or visit **aqua.wisc.edu/publications** and request a hard copy be mailed to you.