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Aquatic Sciences Chronicle

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

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Forecasting Algal Blooms

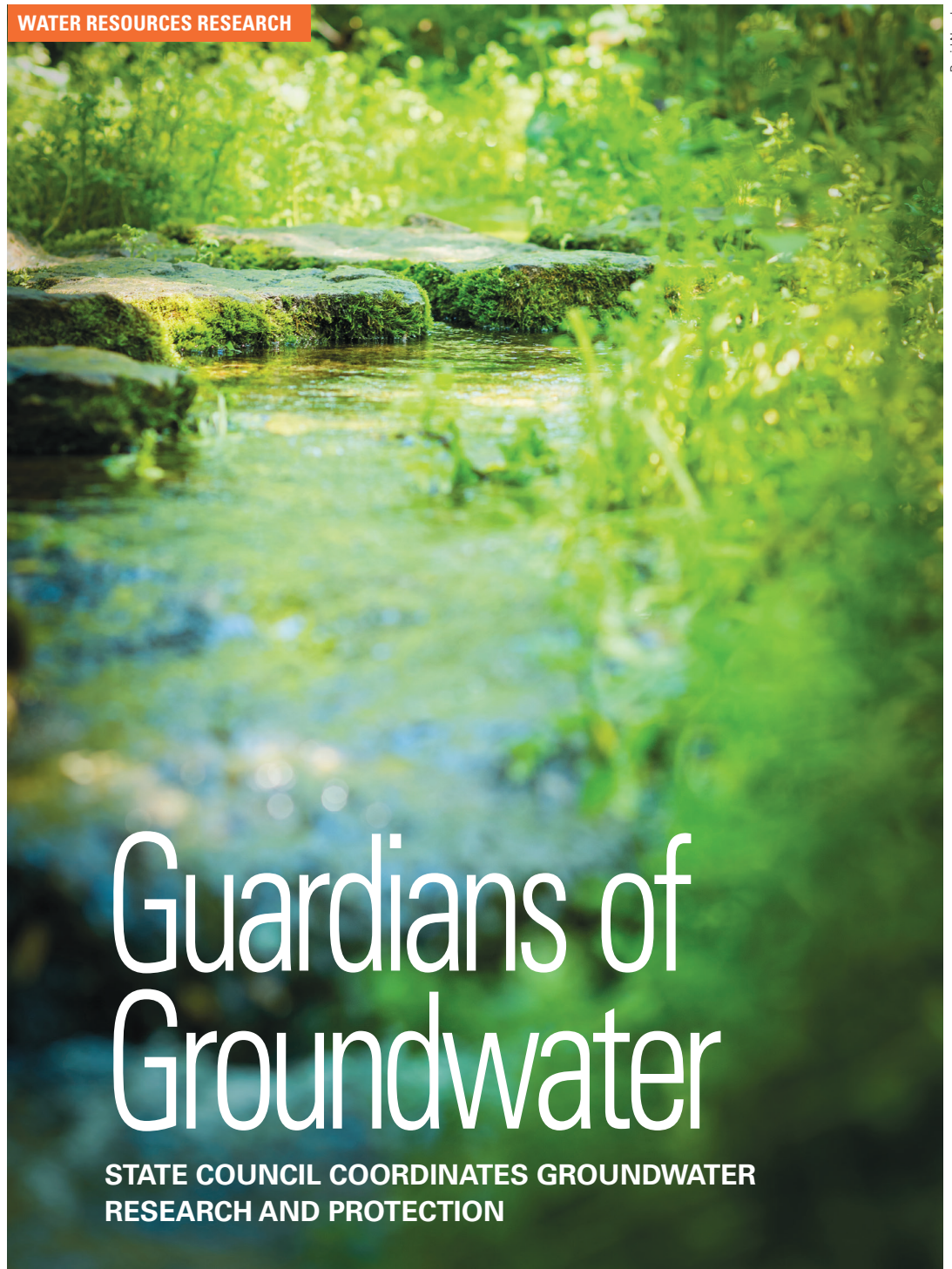


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RESEARCH AND PROTECTION

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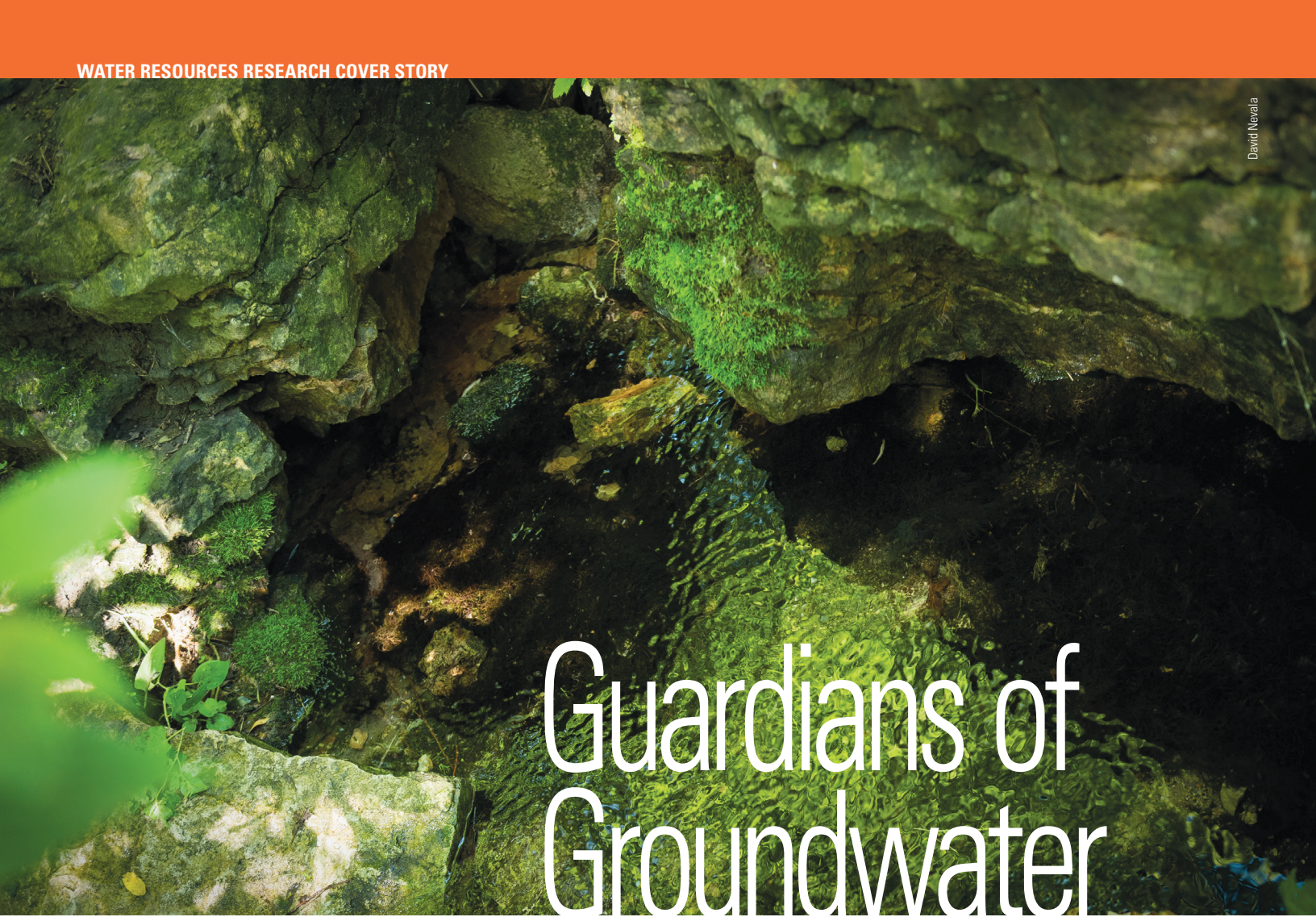


Removing Radium From Groundwater

go.wisc.edu/rgrqge



Radium is a naturally occurring, potentially cancer-causing element found in some of Wisconsin's groundwater. With funding from the Water Resources Institute, Madeleine Matthews (above) and Matt Ginder-Vogel along with Madeline Gotkowitz of the Wisconsin Geological and Natural History Survey are determining what rock layers the contaminant is associated with, in hopes that wells can be constructed to avoid it. Learn more in this video.



Guardians of Groundwater

STATE COUNCIL COORDINATES GROUNDWATER RESEARCH AND PROTECTION

Wisconsin is one of only three states in the U.S. that coordinates its groundwater research and monitoring through a special council. Since 1984, the Groundwater Coordinating Council (GCC) has fostered the exchange of information about groundwater programs among state agencies and promoted efficiencies to benefit this subterranean resource.

“It’s something that other states might want to think about,” said Jennifer Hauxwell, who helps coordinate research proposal reviews for the GCC and is assistant director for research and student engagement for the University of Wisconsin Water Resources Institute, which is part of the GCC.

“The council has been a great resource and venue for raising groundwater issues and trying to tackle them,” said Steve Elmore, director of the Drinking Water and Groundwater Program for the Wisconsin Department of Natural Resources (DNR). “When you have broad issues like nitrate and bacterial contamination of groundwater that affects a whole region, you need more than one agency or entity to deal with those sorts of issues.”

According to state statutes, the GCC serves “as a means of increasing the efficiency and facilitating the effective functioning of state agencies in activities related to groundwater management.” The GCC “advises and assists state agencies in the coordination of non-regulatory programs and the exchange of information related to groundwater, including, but not limited to, agency budgets for groundwater programs, groundwater monitoring, data management, public information and education, laboratory analysis and facilities, research activities and the appropriation and allocation of state funds for research.”

Piece of cake, right? To do all these things, the GCC meets quarterly, coordinates an annual competition for groundwater research and monitoring projects, and prepares an annual report to the Legislature.

The state provides funding for groundwater activities, which goes to the University of Wisconsin System to support research and monitoring and is coordinated by the Water Resources Institute. The institute receives additional federal funds through the U.S. Geological Survey to support the work. Projects for funding are selected only after rigorous

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SEEKING REAL-TIME, EARLY-WARNING DEVICE FOR

Harmful Algal Blooms

The green in this satellite image from 2011 shows an extremely large algal bloom in Lake Erie and Lake Huron's Saginaw Bay.

Matt Smith and Todd Miller have a real connection to the lagoon in Milwaukee's Veteran Park, but it's not because of fishing or boating.

The lagoon is a sampling spot for these two researchers based at the University of Wisconsin-Milwaukee. They are constructing and testing an autonomous device that measures toxins from blue-green algae blooms, otherwise known as harmful algal blooms (HABs).

HABs spring from cyanobacteria that are naturally present in Wisconsin waters but get active — and can be harmful to human and animal health — when conditions are right during warm months.

Conditions were right multiple times in 2017. In two high-profile instances uncovered by Smith and Miller's monitoring, major events were affected. In June, an international "extreme" water skiing competition sidelined athletes from 31 countries because the HABs produced a toxic compound known as

microcystin, which is the toxin the team's device will measure. The Milwaukee Dragon Boat Festival in August was moved to Lakeshore State Park because the lagoon's water quality was dangerous to human health.

Public health officials exercised caution in these instances because microcystin poses a danger to the liver, brain and reproductive organs of humans, particularly children. The blooms can also kill pets and wildlife, including fish living in the affected water. HABs are perhaps best known in the Great Lakes region as the reason behind the 2014 drinking water crisis in Toledo, Ohio, fueled by nutrient loading

microcystin. Then, the microcystin concentrations can be quantified.

This collaboration draws a workable detection and early-warning system ever closer. It would join a few commercial systems on the market. At this point, Smith termed those current offerings as expensive and high maintenance.

Miller and Smith are aiming for a different niche. "What we are trying to do is, number one, make a device that is open source and affordable," Miller said. "number two, we want some universality to it. What I mean by that is that it's not just a device that can detect this one toxin but that you could

"It is real nice when you do something that has immediate results, consequences and application to the taxpayer or the community."

—TODD MILLER, ASSOCIATE PROFESSOR OF PUBLIC HEALTH, UW-MILWAUKEE

into Lake Erie. For three days, nearly half a million people had unsafe water flowing from their taps.

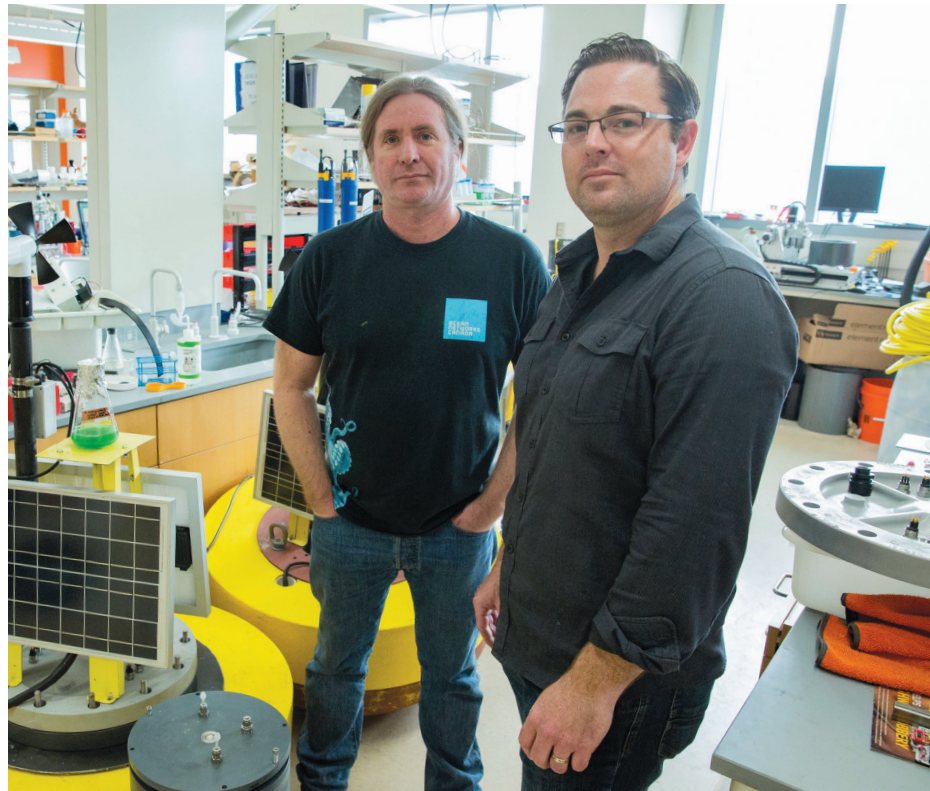
Current methods to keep Toledo residents — or water skiers, dragon boat captains or really anyone using the public water supply — safe, require technicians to collect water samples, return to a lab with the samples, do a chemical extraction from the sample and set about finding the toxins. Next comes toxin analysis through one of various methods, checking what kinds and how many of those kinds are present in the sample. The entire process is time consuming, labor intensive and costly.

Here's where Professor Smith of the School of Freshwater Sciences, and Miller, professor in the Zilber School of Public Health, come in. They are co-investigators on a Sea Grant-funded project, "An In Situ Molecular Detection System for Microcystin Monitoring."

"Our system pulls in a water sample. We filter it and get rid of the water because that's not really what we're interested in. Then, we extract the particular toxin that we are focusing on from the cells that we captured on the filter. By looking at the toxins contained inside the cells, we hope to create an early-warning system that can detect toxins before they are released into the water, thereby causing problems for drinking water," Smith said. "We determine if we need to purify that sample further or whether some of the detection strategies we're looking at can directly detect them."

The UW-Milwaukee team has formulated solid sampling and extraction protocols, so they've taken the next step in connecting with Chemistry Professor Maria DeRosa at Carleton University in Ottawa.

DeRosa has helped them overtop the detection-within-a-sample speed bump. She uses a method employing DNA aptamers. Aptamers can bind tightly and recognize other molecules, such as



easily adapt to a new chemical, whether that be a marine toxin or whether that be, for example, an oil chemical or a fuel chemical you want to monitor in the Gulf of Mexico."

Smith hopes for a prototype device by end of the year.

Miller reflected on the big picture: "It is real nice when you do something that has immediate results, consequences and application to the taxpayer or the community." — MH

Todd Miller (left) and Matt Smith of UW-Milwaukee are constructing and testing an autonomous device that measures toxins from harmful algal blooms.



Reading About ROVs (Remotely Operated Vehicles)

Middle school students in Wisconsin have been learning about maritime history and underwater exploration with a new education kit the ROVe Pack. (For more information or to request a pack, see go.wisc.edu/ROVe.) Even without an ROV, these books can help anyone dive deeper under the water.

IN THE DEEP DARK DEEP

By Ben Joel Price. New York: Random House, 2015.

Deep Sea Diver, Robot and Monkey board a submarine called the Guppy to delve into the darkest depths of the sea to discover what has taken the light from the sea. For children ages three to seven.

ROBOTS UNDERWATER

By Richard Spilsbury. New York: Gareth Stevens Publishing, 2016.

Underwater robots help accomplish many amazing feats, including mapping the ocean floor, exploring deep shipwrecks and opening up a world not seen by humankind. This book contains technical details and full-color photographs of a technology that has transformed human exploration underwater.

THE ROV MANUAL: A USER GUIDE FOR REMOTELY OPERATED VEHICLES

By Robert D. Christ and Robert Wernli Sr. Waltham, Mass.: Elsevier, 2014.

A complete user's guide for ROV technology for industrial, commercial, scientific and recreational uses.

UNDERWATER ROBOTICS: SCIENCE, DESIGN & FABRICATION

By Steven W. Moore, Harry Bohm and Vickie Jensen. Monterey, Calif.: Marine Advanced Technology Education (MATE) Center, 2010.

Up-to-date technical and scientific info about subsea vehicles, pragmatic "how-to" advice, step-by-step plans for a basic shallow-diving ROV and real-life stories. Hundreds of illustrations, diagrams and color photographs featuring hand-built craft as well as commercial ROVs, autonomous underwater vehicles and submersibles.

UNDERWATER ROBOTS

By Daniel R. Faust. New York: PowerKids Press, 2017.

Robots can be sent to the most extreme environments in the world. This book takes readers on a deep-sea dive to learn all about underwater robots. For children ages eight-12.

Please visit the Water Library at waterlibrary.aqua.wisc.edu for more information or to learn about more ROVs.

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

The Art and Science of Sturgeon

A Japanese professor's concern about the condition of the ocean's coral reefs translated into a unique melding of freshwater art and science once he found himself in the Great Lakes. Ryuta Nakajima, associate professor of art and design at the University of Minnesota Duluth (UMD), came to the north-land via Hawaii and Japan.

"It's hard not to notice the devastating state of coral reefs everywhere in the world," Nakajima said. "So I started a coral reef conservation organization in Okinawa two years ago."

The organization is called the Okinawa Seaside Laboratory (OSL), and it promotes coral conservation and a sustainable economy through art.

Nakajima moved to Duluth in 2005 for his academic position. After starting OSL during one of his annual forays back to Japan, he felt he should also do something here to promote aquatic conservation.

"We hear so much about the conditions of the oceans in terms of plastic pollution, acidification and so forth. We don't hear too much about what's going on with the freshwater





environment. So I thought, well, maybe I can do something about that,” he said.

Nakajima joined with colleague Darren Houser, assistant professor of art at UMD, who teaches courses on sustainability. The more Nakajima and Houser studied and talked to local groups such as Minnesota Sea Grant; the U.S. Fish and Wildlife Service in Ashland, Wis.; the Iron River National Fish Hatchery; and the Fond du Lac Tribe, the more he heard about lake sturgeon, an ancient and long-lived fish species that is currently the focus of many conservation efforts.

“Then the Great Lakes Aquarium launched a sturgeon touch tank,” Nakajima said. “I listened to the writing on the wall and chose sturgeon as my focus.”

Nakajima and Houser gathered sturgeon artwork from 43 artists around the country to create an exhibit called “Black Gold,” which debuted in Duluth last year. The goal was to create an exhibit that could be easily shown and transported to other areas of the Great Lakes. Collecting the art in digital format fit the bill. That way, any venue interested in housing the exhibit can print the 36-inch-by-36-inch works themselves.

“It’s way more flexible,” Nakajima said.

Another way to increase the project’s outreach was to print a black and white ‘zine from the digital images. Wisconsin Sea Grant’s educator and sturgeon history expert, Kathy Kline, was included in the effort when she wrote a column for the ‘zine.

Their efforts seem to be working. After its debut in Minnesota, a teaser collection of five art pieces was shown in Fond du Lac, Wis., as part of the annual Sturgeon Spectacular, and a full exhibit was held in Detroit at the Belle Isle Aquarium. In the spring the exhibit was on display at UW-Madison at the School of Education Gallery in a cooperative effort among the organizers, the Wisconsin Water Library and the University of Wisconsin-Madison Art Department.

“There’s a lot of interest in Madison in the intersection of art and science,” said Anne Moser,

Wisconsin Water Library librarian, who has helped find venues for the shows in Wisconsin. “The graduate students in the UW-Madison Art Department are interested in melding art and science and want to do more of these kinds of events, so they are helping, too.”

To increase interest even more, organizers convened panel talks by local sturgeon experts in conjunction with some of the shows. Wisconsin Sea Grant’s Kline and Aquaculture Outreach Specialist Fred Binkowski participated as panelists in the Fond du Lac show.

Related activities for children feature the traditional art form of Gyotaku, or “fish impressions,” which dates from the mid-1800s. Nakajima makes silicon molds from young sturgeon that the children can dip in ink. They then lay paper on top of the fish and rub it to create a fish print.

Fish prints were a way to keep ancient anglers honest, Nakajima explained. “Every fisherman brags about how big the fish was that they caught. Japanese fishermen are no different.”

Fishermen imprinted the fish on paper to prove that they caught it. In addition, they would record the date it was caught, location, the weather conditions and the weight of the fish.

“Then the fisherman and two other fishermen at the site needed to sign the paper for it be official,” Nakajima said. After photography evolved and the need for Gyotaku lessened, it evolved into more of an art form.

Moser said the fish printing activity is a great way to teach children about sturgeon that’s also a lot of fun.

The exhibit, now called “Living Memory: Portraits of the Lake Sturgeon,” will return in its entirety to the Sturgeon Spectacular in Fond du Lac in January 2019. It will feature more panel discussions and activities for families.

To schedule a show in your Wisconsin community, contact Moser at akmoser@aqua.wisc.edu. — MEZ

“Living Memory: Portraits of the Lake Sturgeon” features art and activities inspired by the ancient and long-lived fish.



Tap Talks at Central Waters Brewery Tap Into Thirst for Science Learning

This fall, Tim Campbell and Eric Olson are bringing serious scientific research to a seriously comfortable environment. Tap Talks is a series of nine monthly talks to be held at Central Waters Brewery to engage those who live in and around Amherst in Portage County with the science and scientists of the University of Wisconsin-Madison and Stevens Point campuses.

"In the communal space of the brewery, we'll be supporting two-way communication between scientists and the public in the spirit of the Wisconsin Idea, the foundation of Wisconsin's public university system," said Campbell, who is an outreach specialist with Sea Grant and also holds a part-time appointment with the University of Wisconsin-Extension Environmental Resources Center.

Olson brings his expertise as director of the University of Wisconsin-Extension Lakes.

Tap Talks is modeled after science cafes, an effective way to both convey scientific research findings and get feedback on future research directions. Scientists have been increasingly sharing their work through semi-formal presentations in small regional breweries in outstate Wisconsin; Minocqua and Ashland are two examples. The River Talks science series hosted by Sea Grant and several partners has for five years offered monthly talks in Superior and Duluth coffee shops and bars.

In 2017, Jon Steigerwaldt, owner of Steigerwaldt Forest Professionals and community partner with Campbell and Olson, contacted Central Waters Brewery to kick-start the speaker series. An Ira and Ineva Reilly Baldwin Wisconsin Idea Endowment grant will allow its expansion.

For more information, including dates and times for the talks, visit centralwaters.com. —MH

The comfort and familiarity of a brewery (above) combined with science talks — it's all about taking science off the research campuses and sharing widely.

Jim Paine (right), Mayor of Superior, Wis., prepares to tackle a zoning code "monster" with help from Sea Grant.

Sea Grant Helps City Clean Up Its Zoning Code "Monster"

The city of Superior, Wis., is surrounded by water. The St. Louis River bounds it to the west, the Nemadji River to the east, the Pokegama River to the south, and the harbor and Lake Superior to the north.

"Protecting that water as well as our overall natural environment should be one of our highest priorities," said Superior Mayor Jim Paine.

To that end, city staff and a contractor are beginning a process this summer, led by Wisconsin Sea Grant's Julia Noordyk, to review and update city codes and ordinances to reduce stormwater pollution.

The effort is thanks to a grant from the Wisconsin Department of Natural Resources and involves something called a green infrastructure code audit. Green infrastructure includes creating natural water-collecting features like rain gardens, permeable pavement and green roofs to help soak up snowmelt and rainwater.



Interest in a green infrastructure audit grew from a workshop Noordyk, water quality and coastal communities outreach specialist, put on last year in Duluth with staff from Minnesota Sea Grant.

The workshop spurred the idea of cooperation between Superior's Environmental Services Division of Public Works and Noordyk, which led to the successful grant proposal for the code audit. Activities will follow the process outlined in Wisconsin Sea Grant's "Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances Workbook," which involves community scoping, auditing codes and ordinances, and developing a strategy for adoption of the changes.

Noordyk expects to have her work cut out for her, playfully stating, "I've already heard that Superior's zoning code is a monster."

The mayor echoes this viewpoint. "I think everybody agrees that our zoning codes need revision. The most important thing, though, is that we have a vision for what kind of city we want as we're revising them." —MEZ

You can download "Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances Workbook" at seagrantwisc.edu/greeninfrastructure.

UWSP NADF: Advancing Aquaculture Education and Outreach

Emma Wiermaa, UWSP NADF

Sea Grant has supported the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (UWSP NADF) since 2014. The facility is a northern campus of UW-Stevens Point, located near Bayfield, Wis., that houses groundbreaking research projects, offers demonstrations of systems and practices and provides state-of-the-art training and educational opportunities.

To learn more about the facility, projects and opportunities visit aquaculture.uwsp.edu.

FISH DONATIONS

Thanks to technical assistance, resources and fish from the UWSP NADF, schools in Ashland, Washburn and Bayfield, Wis., have operating aquaculture or aquaponics systems in their classrooms. UWSP NADF has also recently donated extended fingerling feed-trained walleye to additional schools across Wisconsin, including Winneconne, Bay Port and Freedom High School. Because currently there are no commercial suppliers of feed-trained walleye in Wisconsin, these schools have a very unique opportunity to raise walleye in their systems. Aquaculture in the classroom not only promotes STEM education but also stimulates workforce development.

AQUACULTURE BOOT CAMP (ABC) IN WISCONSIN

In partnership with The Ohio State University, the UWSP NADF and UWSP Aquaponics Innovation Center are collaborating with Nelson & Pade Inc. and the Wisconsin Aquaculture Association to offer Wisconsin's first Aquaculture/Aquaponics Boot Camp. This is a free, yearlong training for beginning aquaculture farmers that covers a variety of topics to prepare participants for fish farming in the Midwest. UWSP NADF is organizing the sessions, topics and speakers, highlighting one aquaculture topic a month for a year at various locations.

WISCONSIN AQUACULTURE CONFERENCE

In collaboration with the Wisconsin Aquaculture Association, UWSP NADF organized the Wisconsin Aquaculture Conference last March. The conference

included Minnesota and Michigan in discussing industry updates and state priorities. It included such topics as industry updates, hatchery design, aquaponics, and fish health and biosecurity and featured an industry trade show, lunch and cooking demonstration. Speakers represented businesses and organizations such as Virginia Tech, the Wisconsin Department of Natural Resources, the University of Minnesota, Superior Fresh, Urban Organics, Plymouth Springs Fish Farm, Rushing Waters Fisheries and Clayton Veterinary Care.

POND CULTURE WORKSHOP

Nationally, the aquaculture industry continues to expand, but growth of the Great Lakes region's aquaculture industry has slowed. Many new and existing fish farmers cite a need for technical training and dissemination of current production knowledge. UWSP NADF is developing a series of three- to five-day teaching modules, for both online and in-person workshops, based on topics the Great Lakes aquaculture industry has identified as missing from current education offerings. One of the topics identified was pond culture.

Last summer, UWSP NADF offered pond culture training consisting of four online video PowerPoint modules and two hands-on workshops. The online modules were created by UWSP NADF and project partner the Lac du Flambeau Tribe and included pond construction and fertilization, water quality and fish management. — *Emma Wiermaa, UWSP NADF Aquaculture Outreach Specialist*

Freedom High School students travel to UWSP NADF for tour and donation of feed-trained, intensively reared extended fingerling walleye raised at the facility.

Fish veterinarian Robert Smith provides a fish health demonstration at the UWSP NADF Pond Culture Workshop.

Students of the Pond Culture Workshop pose for photo during a pond aeration demonstration provided by Kasco Marine at Lac du Flambeau Tribal Fish Hatchery.



Sea Grant Advisory Council Welcomes Two New Members

TODD AMBS

Todd Ambs, director of the Healing Our Waters (HOW)-Great Lakes Coalition, grew up on Michigan's lakes and rivers. He's spent the last 25 years focusing on water policy. It's safe to say that Ambs is attracted to water and to organizations that advocate for it.

This has put him in a great position to be a member of Wisconsin Sea Grant's advisory council, which now numbers 15 people.

The council is appointed by the University of Wisconsin-Madison chancellor and consists of leaders from academia, state and local government, industry and the public who bring a variety of viewpoints to the table and help ensure the relevance of Sea Grant research and programs to needs in the state.

In college at Eastern Michigan University, Ambs majored in political science and speech. Despite his early attachment to water, he thought he would do something in local government.

"But I got more and more engaged in environmental policy and water policy, working for nonprofits," Ambs said. "Then I worked for the Ohio Department of Natural Resources, and then in two different attorneys general's offices. I just sort of gravitated to water as a subject matter."

Ambs also served in Wisconsin's Department of Natural Resources (DNR), managing the Water Division for nearly a decade.

In his current position as director of HOW, Ambs coordinates efforts of about 150 non-governmental organizations to advocate at the federal level for programs and policies that benefit the Great Lakes. Ambs said that HOW, which has been in existence for about 15 years, has advocated for a variety of water issues, "Including things like continued funding for Sea Grant. But the bread and butter of the organization is advocating for and then advocating to retain funding for the Great Lakes Restoration Initiative."

Ambs has been active on the council since this past fall. "I was happy to be asked to serve," he said. "I've long felt that the connection between academia and the science community and the cutting edge of water-related issues that are happening around the county is really important. Certainly, in the Great Lakes, when you look at the significant water policy challenges that are out there, Sea Grant is right in the middle of helping to provide that guidance and expertise to the discussion – whether it's dealing with challenges in Green Bay or the harmful algal blooms in Lake Erie, or problems in general with excess nutrients."

As for water issues that are of current concern, Ambs sees HOW and Sea Grant as having impacts on drinking water contamination, aquatic invasive species and polluted runoff.

"As an overlay to those areas, the ongoing impacts of climate change just exacerbate everything," Ambs said. "From the synergistic impacts of having excess nutrients and new forms of aquatic invasive species, coupled with large, episodic precipitation

events, you have a kind of toxic recipe for the water resources in the state."

Wisconsin Sea Grant's Assistant Director for Research and Student Engagement, Jennifer Hauxwell, appreciates what Ambs brings to the advisory council. "We look forward to benefitting from Todd's knowledge and passion for the Great Lakes," she said. "Not only does he understand the 'big picture' associated with various Great Lakes challenges, he also often knows the details . . . the nuts and bolts of how a system or program works and how to improve upon the status quo. Also, Todd's Great Lakes professional network is vast, and we look forward to his insights on how we can build new collaborations with other Great Lakes groups or programs to better serve Wisconsin."

JUSTINE HASZ

When it comes to Wisconsin's fisheries, Justine Hasz gets around. The 18-year veteran of the DNR has worked in many of the state's fisheries hot spots. She began her permanent career with the DNR in 2000 as a fisheries biologist for Green Bay, then covered Marinette and Oconto counties before moving to Wisconsin Rapids to cover Adams, Juneau and Wood counties. In 2012, she was named fisheries team supervisor for 13 counties in the western part of the state.

Hasz was named fisheries bureau director in 2015. In that position, she leads more than 200 staff members who are responsible for fish propagation, management and angler services.

Her journey to Wisconsin also covered a lot of ground. Hasz, a native of Leicester, England, moved to Wisconsin in 1997 to UW-Stevens Point to earn a master's degree in freshwater fisheries management. But before that, she earned her master's in marine fisheries science from the University of Aberdeen, Scotland.

An avid angler and hunter, Hasz said her work around the state with both recreational and commercial anglers gives her insights into the connection between the environment and the economy. The DNR sells more than 1 million resident and 500,000 nonresident recreational fishing licenses annually, collecting over \$1.1 billion in fees. The DNR estimates that those anglers spend another \$2.1 billion in Wisconsin communities each year.

Last fall, Hasz was appointed to the Wisconsin Sea Grant Advisory Council.

"Justine's knowledge about Wisconsin fisheries management and the economic impacts of the state's fisheries will be an important asset on our advisory council, a group that helps Wisconsin Sea Grant set priorities and allocate funding toward those priorities," said Jennifer Hauxwell, Wisconsin Sea Grant's assistant director for research and student engagement. — MEZ



Groundwater Council

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“In Wisconsin, only the coastal communities draw their water from Great Lakes surface water sources... Pretty much everyone else relies on groundwater.”

— JENNIFER HAUXWELL, UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

review by experts from around the world as well as the GCC research and monitoring subcommittee, with advice from the UW System’s Groundwater Research Advisory Council. In addition, other state agencies like the DNR routinely allocate part of their funding toward groundwater projects.

Besides protecting water supplies from contamination, another reason why the GCC was formed in Wisconsin is the importance of groundwater to the people of the state.

“Many people don’t realize where their water comes from,” said Hauxwell. “In Wisconsin, only the coastal communities draw their water from Great Lakes surface water sources. Lake Winnebago is a surface water source as well. Pretty much everyone else relies on groundwater.”

Wisconsin leads the nation in the number of public water systems that rely on groundwater. More than 97 percent of agricultural irrigation water and more than one-third of the water used for commercial and industrial purposes comes from groundwater supplies. Many ecosystems in the state require clean, plentiful groundwater supplies as well.

“Other states have asked Wisconsin a number of times how the GCC works,” said James Hurley, Water Resources Institute director. Currently, only Ohio and Illinois have groundwater coordinating councils. Several national groundwater organizations offer resources for states that don’t have their own councils.

The GCC has identified several issues for future work, including sand mining, livestock industry expansion, effects of extreme weather and metallic mining (lead, zinc, iron and copper).

Elmore said other contaminants of concern are arsenic, strontium and perfluorinated compounds (historically used in firefighting foam, Teflon and Gortex clothing).

“What a wonderful idea to get all of the state organizations that manage or are affected by

groundwater in some way to talk, to gather quarterly,” Hauxwell said. “People are at the table together to receive updates from researchers, figure out where the priorities and challenges are for the state and how to most efficiently pool resources. I think it’s something that Wisconsin should be very proud of.” — MEZ

IMPACTS AND EMERGING ISSUES

Findings from the research projects have had significant impacts recently, including the following:

- A UV light water-purifying system resulting from a research project received a U.S. patent and attracted more than \$7 million in investment capital for a Wisconsin-based company.
- Scientists have refined methods to pinpoint sources of well water contamination. Their efforts reduced the number of contaminated private wells across the state.
- The U.S. Environmental Protection Agency used findings from research into sources of the contaminant mercury in the environment to formulate rules for how much mercury power plants can emit.
- The Nuclear Regulatory Commission and the Department of Energy are changing the design of covers and barrier systems for low-level radioactive waste disposal and uranium mine tailings sites across the country based on research findings.
- State regulators are considering whether to set limits for strontium, which researchers discovered is a natural element in wells in Brown, Calumet, Oconto and Outagamie counties. Strontium can cause rickets and damage tooth enamel in young people.



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Aquatic Sciences Chronicle

a joint newsletter from UW Sea Grant and UW Water Resources



CALENDAR OF EVENTS

AUG. 19 – 23, 2018

148th Annual Meeting of the American Fisheries Society

Atlantic City, N.J.

afsannualmeeting.fisheries.org

AUG. 26 – 30, 2018

National Conference on Ecosystem Restoration

New Orleans

conference.ifas.ufl.edu/ncer2018

SEPT. 19 – 23, 2018

Association of Nature Center Administrators

McAllen, Texas

natctr.org/meetings/annual-summit

OCT. 9 – 13

North American Association for Environmental Education

Spokane, Wash.

naaee.org/conference

Wisconsin Sea Grant 2018-20 Directory of Projects and People

All of Wisconsin Sea Grant's currently funded projects, researchers and staff in one publication.

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