

ASC

AQUATIC SCIENCES CHRONICLE

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RYAN LEPAK

His research reveals aquatic invasive species have upended the food web and forced fish to seek atypical food sources contaminated with mercury. PAGE 4

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FEATURED AUDIO + VIDEO

Storytelling Success

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It takes a particular kind of mind to review a story that exists in one format and then imagine it in another format, to give it a fresh resonance in an alternate manner.

The Sea Grant and Water Resources institutes are fortunate to have communicators with those kinds of creative minds. Two of them applied their ingenuity to four existing stories and went on to fashion them into compelling videos and podcasts, which recently yielded professional recognition through award competitions.

Marie Zhuikov (left), science communicator, is a talented writer. Each time she works on a story, she records her interviews to ensure accuracy. Not one to let such a mother lode of material lie, she then creates podcasts of some of those stories. Two of them were honored early in 2020.



"Connecting Teachers and Students to the Lake Superior Watershed" won a gold through the AVA Digital Awards. "It Takes a Family to Deal With Dangerous Currents" received an honorable mention nod. Both podcasts are part of a longer series by Zhuikov, Wisconsin Water News. Plug in for a listen, or a re-listen.

"The people I interview are what makes these stories so interesting," Zhuikov said. "Instead of the standard phone conversation, I was able to get out of my office and talk to these people in the field, which makes the stories livelier and more immediate."



Digital Storyteller Bonnie Willison (right) found the inspiration for her award-winning work in a best-selling Sea Grant book. "People of the Sturgeon: Wisconsin's Love Affair With an Ancient Fish" is filled with history, fish tales and photos.

Willison created video profiles of two people in the book who carve decoys for sportsmen who harvest lake sturgeon through spearing.

"Voice of the Coast: George Schmidt" won an editing award and a judge's choice award. One of only three judge's choice awards given as part of the Madison Media Professionals WAVE competition, Willison's video was termed "astounding."

Willison herself said, "It was an honor to receive recognition for this video. George was a pleasure to interview, and I'm glad I was able to share his charming and inspiring stories through the Voices of the Coast project."

Willison also won a merit award for "Great Lakes Fisheries and Family Businesses: Titus Seilheimer," highlighting the work and background of Sea Grant's fisheries specialist.

Watch these videos for the first time or re-watch them and reflect on the storytelling.



Tea and
sunlight

EXPLORING HOW NATURE BREAKS DOWN
POLLUTION IN THE ST. LOUIS RIVER

Water that forms the beginnings of the St. Louis River in northern Minnesota percolates through moldering plants in remote wetlands and bogs. All this peaty goodness turns the water brown, as if the mythical giant Paul Bunyan squeezed it through his tea bag.

Along its winding 190-mile journey from Seven Beaver Lake into Lake Superior, this dissolved organic matter in the water is diluted until, when the water reaches Lake Superior, the color clears and it more closely resembles the rain and groundwater sources that were its beginnings.

Researchers funded by Wisconsin Sea Grant have found that various amounts and types of dissolved organic matter (also known as organic carbon) combined with sunlight can break down different pollutants in the St. Louis River. The research team was headed by Christina Remucal, University of Wisconsin-Madison, and Kristine Wammer, University of St. Thomas.

They focused on four pollutants: the insect repellent DEET, the cholesterol-inhibitor

atorvastatin, the antidepressant venlafaxine, and the anti-epileptic medicine carbamazepine.

They chose to study the St. Louis River because of the variety of organic matter along its course. Remucal explained, "The headwaters are full of wetlands and all the organic carbon is really terrestrial — coming straight from plants. Then as you move into the estuary itself, there's more of an anthropogenic influence as well as wastewater effluent. Once you get out into Lake Superior, the quality of the organic matter is quite different."

Energy from sunlight can also break down the pollutants on its own in a process called direct photolysis, or it can interact with the dissolved organic matter to break down the pollutants in a process called indirect photolysis. For this study, the researchers focused on indirect photolysis.

Their findings are detailed in the Sept. 11, 2019, issue of "Environmental Science and Technology." go.wisc.edu/7i02wo

For more information, see the expanded version of this story on the Sea Grant website: go.wisc.edu/9th2wx — [MEZ](#)

Blatnik Bridge, which spans the St. Louis Bay near Lake Superior, is one of the sampling sites for this project.

Mercury reductions derailed by AIS

AQUATIC INVASIVE SPECIES SHORT-CIRCUIT BENEFITS FROM MERCURY REDUCTION IN THE GREAT LAKES

WATER RESOURCES RESEARCH COVER STORY

According to a new study published in November in the Proceedings of the National Academy of Sciences, 40 years of reduced mercury use, emissions and loading in the Great Lakes region have largely not produced equivalent declines in the amount of mercury accumulating in large game fish.

Researchers, including those from the University of Wisconsin-Madison, say this is due to aquatic invasive species in Lake Michigan — quagga and zebra mussels — that have upended the food web and forced fish to seek atypical food sources contaminated with mercury.

Mercury, or methylmercury as it exists in fish, is a neurotoxin that can cause damage to the nervous system if consumed by people or animals. The study has consequences for health officials and natural resource managers who need the best science possible to inform their decisions, said lead author Ryan Lepak, a postdoctoral researcher at the UW-Madison Aquatic Sciences Center (ASC).

“Our work highlights that mercury concentrations in fish cannot be predicted by emission inventories alone, and other factors such as food web alterations are needed to get the full picture,” said Lepak, who is stationed at the U.S. Environmental Protection Agency Great Lakes Toxicology and Ecology Division in Duluth, Minnesota. “All five of the Great Lakes have fish consumption advisories in effect because mercury poses a disproportionate risk to the health of children and pregnant women.”

Lepak and coauthor James Hurley, ASC director, were interested in what has driven elevated rates of mercury concentrations in bigger fish, such as lake trout, despite policies that have largely reduced mercury emissions into Great Lakes waterways.

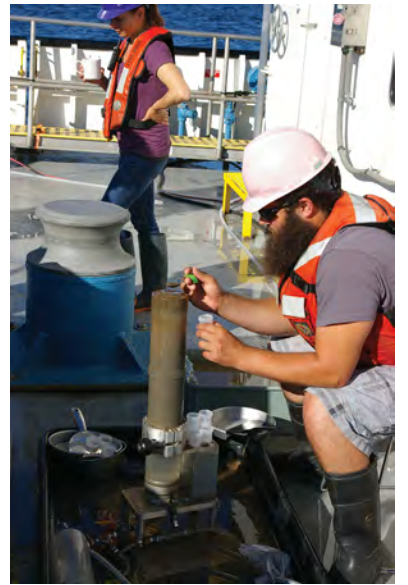
To understand the history of mercury in Great Lakes fish and determine sources of the contaminant, the research team performed a combination of mercury, nitrogen and carbon isotope analysis — which Lepak termed “fingerprinting” — on samples of lake trout archived from 1978 to 2012.

From the same period, Lepak also examined archived samples of sediment taken from the lakebed to compare trends of mercury sources to sediments and fish.

The study years encompassed the period after which hospitals and municipalities stopped burning waste — one example of practices that substantially reduced mercury uses and loading — sparing the Great Lakes from additional mercury contamination. Researchers expected the decline to reduce methylmercury accumulation in fish.

However, Hurley says that though the unique fingerprinting technique showed measurable changes to mercury concentrations in the archival fish and from lake sediment samples beginning in the 1980s, “There wasn’t an obvious decrease in concentrations of mercury in these fish

Mercury loading in the Great Lakes decreased after about 1990, yet concentrations of methylmercury in game fish did not show a comparable decline. Invasive Dreissenid mussels disrupted the food chain, forcing the fish to consume different, more contaminated, foods.



thereafter, even though the sediment record revealed reduced mercury loading.”

Hurley notes that this is despite the fact that, after about 1990, mercury emissions and uses were substantially reduced and resulted in reduced mercury loading in the Great Lakes.

The bigger the fish, the greater the accumulation of methylmercury in the filets of the fish. Image courtesy of Sarah Erickson, director of Learning and Engagement, Great Lakes Aquarium

The culprits behind this, the analysis shows, are invasive Dreissenid mussels, zebra and quagga, which exploded in number in Lake Michigan in the 1990s. Estimates indicate there are now trillions of mussels, which have led to significant shifts in lake trout feeding habits.

As Dreissenids have filtered and consumed free-floating phytoplankton and cleared Lake Michigan waters, fish have been forced to search for food in deeper waters in the lake’s offshore zone and at the bottom of the lake in nearshore waters. The food the fish find here not only provides less energy but also more mercury.

“People enjoy sport fishing for lake trout but the larger the fish, the more mercury that has accumulated in filets of the species,” Lepak explains. “Unfortunately, people have to consider contaminant levels when making a choice to serve fish for dinner.”

Study collaborators include the U.S. EPA Great Lakes National Program Office and the Office of Research and Development; U.S. Geological Survey Mercury Research Laboratory; the Minnesota Science Museum; St. Croix Watershed Research Station; and the Chinese Academy of Sciences, Institute of Geochemistry. It was funded by the Great Lakes Restoration Initiative; U.S. Geological Survey, National Institutes for Water Resources and the Toxics Substances Hydrology Programs; University of Wisconsin Water Resources Institute; and the Wisconsin Alumni Research Foundation through the University of Wisconsin Office of the Vice Chancellor for Research and Graduate Education. — MH



Plastic Footprints

Plastic has transformed life for humans in both positive and negative ways. It's a necessary material in health-care but is often used for non-essential purposes as well, from single-use water bottles to bags. Because it takes so long to break down in nature, plastic poses a threat to aquatic ecosystems. Read up in the books below on creative ways to reduce your plastic footprints.

LIFE WITHOUT PLASTIC

By Chantal Plamondon. Salem, Mass.: Page Street Publishing Co., 2017.

As new parents concerned with plastic chemical leaching in baby products, Jay Sinha and Chantal Plamondon set out to find alternative options for household goods. The book explores ways to analyze personal plastic use, find alternatives and create easy replacements in a step-by-step guide to reducing your personal plastic use.

PLASTIC FREE: HOW I KICKED THE PLASTIC HABIT AND HOW YOU CAN TOO

By Beth Terry. New York, N.Y.: Skyhorse Publishing, 2015.

The creator of the blog My Plastic-Free Life provides personal anecdotes, stats about the environmental and health problems related to plastic, and personal solutions with charts and tips on how to limit one's plastic footprint and get involved in community action.

ONE PLASTIC BAG: ISATOU CEESAY AND THE RECYCLING WOMEN OF GAMBIA

By Miranda Paul. Minneapolis, Minn.: Millbrook Press, 2015.

A children's book about the power of reusing plastic to create beauty, strengthen community and provide economic opportunity for women in Gambia.

WHAT MILLY DID: THE REMARKABLE PIONEER OF PLASTICS RECYCLING

By Elise Moser. Toronto, Calif.: Groundwood Books/House of Anansi Press, 2016.

The global recycling standard — those small numbered triangles on plastic containers — was established after Milly Zantow sought a solution to her town's landfill problems. A great book for children about recycling, plastics and creating change through activism and determination.

Please visit the Wisconsin Water Library online at waterlibrary.aqua.wisc.edu for more information about the library's resources on a wide range of aquatic topics.

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

UW-Madison and EPA to train next generation of scientists

The University of Wisconsin-Madison and its Aquatic Sciences Center are supercharging efforts to train the next generation of scientists who will protect human health and the environment. Funding from the U.S. Environmental Protection Agency (EPA) will allow UW-Madison to partner with the EPA facility in Duluth, Minnesota, on a three-year project. Duluth is home to EPA's Great Lakes Toxicology and Ecology Division (GLTED).

The training program, which runs through 2021, supports trainees at three levels — undergraduate students, graduate students and postdoctoral fellows. Up to eight trainees per year will be placed at GLTED.

UW-Madison students, according to their skills and interests, will be matched with EPA-GLTED researchers focusing on four EPA priorities — systems toxicology, watersheds and water resources, ecosystem services, and translational toxicology.

Said Jim Hurley, director of the Aquatic Sciences Center (ASC) and a professor of civil and environmental engineering, "The Duluth lab is recognized as one of the top laboratories in the world specializing in toxicological and ecosystem research. They also respond to current and emerging issues for environmental management. Fellows can be immersed in relevant, ascendant work in a world-class lab. It's a terrific opportunity for trainees. It also allows faculty at UW-Madison to directly collaborate with federal researchers. It's a win-win situation."

Ryan Lepak, who completed his Ph.D. in environmental chemistry and technology at UW-Madison in 2018, is the first postdoctoral fellow.

"This opportunity places me with top-notch Great Lakes scientists focused on fisheries, ecosystem health, toxicology and much more. Working together, we are furthering our understanding of contaminant cycling and bioavailability of contaminants to aquatic organisms. More specifically, our

work is centered on the sources of methylmercury to game fish from the mid-1970s until the present day," Lepak said. (For more information on Lepak's work, see the cover story in this issue.)

Hurley is providing general oversight of the program, and Jennifer Hauxwell, ASC associate director, is coordinating the undergraduate program.

Hurley and Hauxwell will serve on a project oversight committee that includes UW-Madison professors Emily Stanley (freshwater and marine sciences) and Christina Remucal (environmental chemistry and technology). Ten other UW-Madison faculty are affiliated with the project.

ASC, which houses Wisconsin Sea Grant and the Water Resources Institute, will manage the

"[Students will] learn more about how science really works. We hope it will inspire some of them to go on to graduate work in water-related fields."

"By working with both a faculty mentor in Madison and an EPA mentor in Duluth, undergraduate students will get a well-rounded experience that allows them to dig into a particular problem," Hauxwell said. "By spending their summers doing research full time in Duluth, they'll learn more about how science really works. We hope it will inspire some of them to go on to graduate work in water-related fields."

grant. ASC developed programming to help researchers and trainees boost the impact of their findings through effective communications and stakeholder engagement.

In the long term, the project with the EPA facility in Duluth will foster closer connections between the agency and UW-Madison, recognized as an international leader in water-related research and teaching. — JAS



Bob King / rking@duluthnews.com

EDUCATION

Meeting attendees from across the country got a true taste of a northern Wisconsin winter at the inaugural meeting for a Sea Grant-funded effort to support the sustainable development of the land-based Atlantic salmon industry in the U.S.

As the gathering kicked off in Washburn in December, the mercury read a nippy 6 degrees Fahrenheit, with sub-zero wind chills. Yet energy levels inside the Harbor View Event Center were high as approximately 50 attendees began laying the groundwork for a robust collaboration that was dubbed RAS-N, for “Recirculating Aquaculture Salmon Network.”

“Sea Grant effort will support growth of land-based salmon industry in U.S.”

The effort is being funded as part of a larger package of \$16 million in federal aquaculture grants announced in September 2019 by the National Sea Grant Office.

Participants at the meeting included Sea Grant staff from Maryland, Maine and Wisconsin, plus the National Sea Grant Office; National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Agriculture (USDA) and U.S. Fish and Wildlife Service staff; and representatives from private industry, including feed and salmon producers.

Maryland Sea Grant is leading the three-year project to identify and address challenges faced by the land-based Atlantic salmon industry. The Wisconsin and Maine Sea Grant programs are partners in the multistate consortium. The project builds upon earlier Sea Grant investment in this area, including research based in Wisconsin.

The December event spanned two full days of presentations and discussion. It also featured a tour of the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (NADF) in nearby Bayfield. Attendees observed various NADF research projects with Atlantic salmon and other fish species.

Emma Wiermaa, an aquaculture outreach specialist with Wisconsin Sea Grant and NADF, and Greg Fischer, assistant director and research program manager at NADF, played major roles in organizing this productive event.

Said Fischer, “I was very impressed by the commitment of the group, who showed up in the middle of a good old-fashioned Wisconsin snowstorm. Even with record-setting low temperatures, many expressed how glad they were that they came, some from as far as Europe.”



GROWING THE ECONOMY — AND THE WORKFORCE

As one of the conference speakers noted — Brian Peterson of the USDA’s National Cold Water Marine Aquaculture Center in Maine — seafood represents the United States’ largest trade deficit of any agricultural product. And, as David O’Brien, acting director of the NOAA Fisheries Office of Aquaculture, told the group, “Wild fisheries alone cannot meet the increasing demand for seafood.”

This sets the stage for sustainable U.S. aquaculture to help meet the world’s demand for seafood while growing a sector of the U.S. economy.

As Wiermaa observed, “Land-based, water reuse systems for growing Atlantic salmon allow the fish to be raised close to market, with limited impacts on the surrounding environment. The result is fresh, local filets for consumers.”

Wisconsin-based Superior Fresh is already having success in this arena as the country’s first land-based Atlantic salmon producer and world’s largest aquaponic farm. Said Chief Science Officer Steve Summerfelt, 99.9% of the facility’s water flow is recycled, and there is zero discharge to surface water. Superior Fresh currently employs more than 70 staff and is expanding.

Representatives from Riverence, Whole Oceans and American Salmon — other private entities currently in this space or preparing to launch facilities — also presented.

Several speakers addressed the educational and workforce development aspects of the industry.

Scarlett Tudor of the University of Maine’s Aquaculture Research Institute described her campus’ approach to fostering the future aquaculture workforce. By placing paid interns in companies, the university helps students build their resumes while conducting research for industry that may not otherwise be possible. The university is also

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A NADF Aquaculture Technician explains research being done at the facility during the workshop tour (top). Atlantic salmon fingerlings in a water reuse system (bottom).

RAS-N the Stakes for Aquaculture

Three-year, nationally funded salmon aquaculture project kicks off with northern Wisconsin meeting



Fellow to Shed Light on Central Sands Lakes

As Yogi Berra famously said, it's déjà vu all over again. Carolyn Voter, a familiar face around the Aquatic Sciences Center (ASC), is reprising her role as the Wisconsin Water Resources Science-Policy Fellow. The fellowship is jointly supported by the Water Resources Institute (part of the ASC) and the Wisconsin Department of Natural Resources (DNR).

It's a role Voter first filled in 2015-16, when the fellowship was being piloted and designed for a graduate student. Voter was working on her Ph.D. in urban hydrology at the time. Now, with her doctorate freshly in hand, Voter is embarking on a new fellowship, which has been reconfigured for post-doctoral or post-master's applicants.

"I'm doubly lucky to do this a second time," said Voter.

Voter began her current tenure in September and works in downtown Madison at the

DNR's Drinking and Groundwater Bureau and Water Use Section.

For the next year, her task will be to shed light on a topic of great interest to residents and stakeholders in the Central Sands region. Along with a team of about 40 others, Voter is working on the Central Sands Lake Study, which focuses on the interactions between groundwater and three lakes in the region, and the impact of high-capacity wells on those lakes.

In 2017, the Wisconsin Legislature tasked the DNR with conducting this study as part of the passage of Act 10. In particular, the DNR was charged with looking at three Waushara County lakes — Pleasant, Long and Plainfield — and determining whether groundwater withdrawals are having a significant impact on them, or could have a significant impact in the future.

The study must be completed by June 2021, when the DNR will present its final report to the Legislature. In that report, the DNR may recommend special measures to prevent or remedy a significant reduction in lake levels, per the charge from the Legislature.

The study team spans multiple DNR units, the Wisconsin Geological and Natural History Survey, the U.S. Geological Survey, and academic researchers from UW-Madison, UW-Stevens Point and other schools. While Plainfield Lake lies next to a lot of DNR land, Long and Pleasant Lakes have homes along their lakeshores. Naturally, homeowners are one stakeholder group with an interest in the study's findings, as are area farmers, such as those in the Wisconsin Potato and Vegetable Growers Association.

As the study progresses, the DNR will continue to reach out to interested parties through a variety of means, such as webinars that are expected to take place next spring or summer, and conference presentations to lake managers and academic researchers.

"The DNR is really conscious of the different perspectives that these different stakeholder groups have, and they are being very intentional in how they're reaching out to the public and providing updates about what we've found so far. Continued engagement with the community is a strong part of this study," commented Voter, "and something that will be helpful for me to have more experience with as well."

There will also be public hearings before the final report is delivered to the Legislature.

For more information, see the expanded version on the WRI website: wri.wisc.edu/news/voter-returns-as-wri-fellow.

—JAS

SEA GRANT RESEARCH

RAS-N the Stakes for Aquaculture

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interested in reaching noncredit students. Hands-on experience is key in the aquaculture world, and not everyone needs a degree for their particular career path, Tudor noted.

Wiermaa said that NADF hosts one or two student technicians at a time, and more than 90% of those techs find aquaculture positions after their stint in Bayfield is over. UW-Stevens Point is a leader in aquaculture education. It is the first accredited university in Wisconsin to offer an aquaculture minor (which is still uncommon in U.S. colleges) and the first in the country to offer full-semester aquaponics courses, a master class and professional certificate program.

Fish health, biosecurity, consumer perceptions and other topics were also addressed during the wide-ranging meeting. The aim of this gathering was to bring together a small, focused group of stakeholders to get the project off the ground.

Future steps in 2020 will be a RAS-N session at the Aquaculture America conference in Honolulu in February, and a fall gathering at the Institute of Marine and Environmental Technology in Baltimore is planned. Organizers expect to invite a larger group of stakeholders to the Maryland meeting as the collaboration continues to take shape. —JAS



Lisa Tossey / Maryland Sea Grant

New Keillor Fellow to study movement of firefighting chemicals in watershed

Sarah Balgooyen completed her Ph.D. at the University of Wisconsin-Madison last spring and has moved right into a hot topic in water pollution. Firefighting chemicals, also known as per- and polyfluoroalkyl substances or PFAS, are estimated to contaminate the drinking water of 16.5 million people in the United States alone. One of those sites is the Tyco Fire Products facility in Marinette, Wisconsin.



Fellow Sarah Balgooyen's research is sampling tributaries around Marinette, Wis., for PFAS to evaluate their movement into the Menominee River and possibly Green Bay.

Evidence of PFAS has been found in ditch water near the company.

"Mostly, people are concerned with private drinking water wells, but also there's the potential for the contamination to get into Green Bay and eventually out into Lake Michigan," Balgooyen said.

Balgooyen will use her two years of funding as a J. Philip Keillor Fellow to determine how much of the contamination is moving toward the bay and if it's going to be an issue for Lake Michigan.

Step one is to clear her lab instruments of PFAS.

"That's tricky because scientists have been finding that PFAS are dangerous at really low levels, so at these low concentrations, they're hard to measure," Balgooyen said. "With the instruments we use in the lab, there's often PFAS in our tubing and in the little components that are made of Teflon or other PFAS-containing materials."

Step two is to obtain water samples. Balgooyen said she and the rest of the research team plan to sample tributaries around Marinette that lead into the Menominee River or directly into Green Bay.

"We'll see where we can find PFAS. Then, based on the flow of those surface waters, we can gauge how much PFAS might be reaching Green Bay."

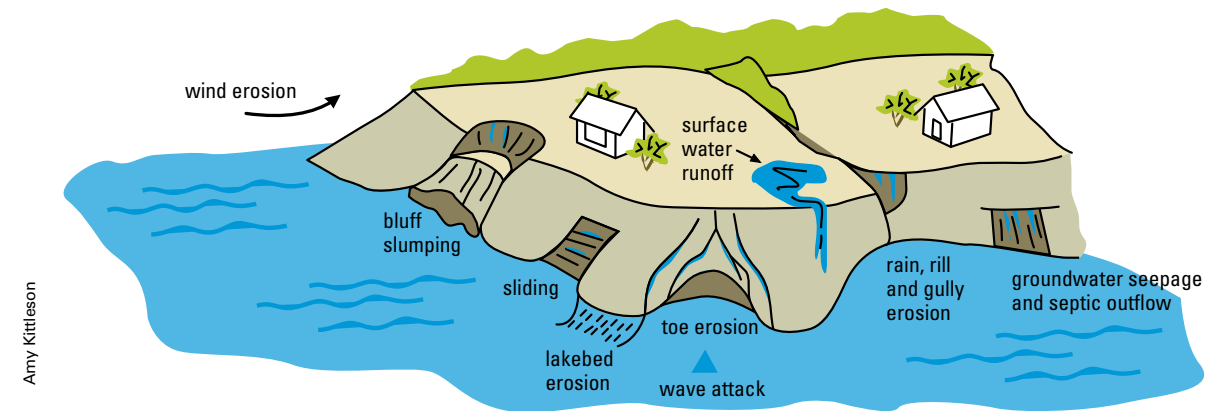
Step three, the final part of her experiment, will involve lab work to investigate whether the PFAS remain in the water or are being absorbed into river or bay sediments.

"This is a key factor in the way these chemicals move around the environment," Balgooyen said.

The project fits with Balgooyen's passion for water. "I grew up in Michigan, so I'm used to having a lot of clean, drinkable water around me, but not everyone has that. I think it's really important for us to monitor that and make sure we all have access to clean water so our citizens' health isn't being put at risk," she said. — MEZ



...It's really important for us to monitor that and make sure we all have access to clean water so our citizens' health isn't being put at risk.— SARAH BALGOOYEN



Amy Kittleson

Coastal Management Fellow ready to seek out his niche

While fellowships can be a great stepping-stone for those with laser-focused career goals, they are also a great way for recent graduates to explore options and get a clearer sense of how they want to contribute to a particular field.

Adam Arend, a 2019-20 J. Philip Keillor Fellow, falls into the latter camp. After high school, he considered entering the priesthood and began his academic journey in a seminary program in Minnesota. He shifted gears and completed his undergraduate education at Ave Maria University in Florida, where he majored in environmental science. His next stop was a master's degree in environmental policy and planning from the University of Michigan School for Environment and Sustainability.

Now, with his graduate degree in hand, Arend (pronounced like "errand") is eager to gain additional experience, work with his fellowship mentors and refine his career path. He is based at the Wisconsin Coastal Management Program (WCMP) offices, part of the Wisconsin Department of Administration.

Arend works closely with Wisconsin Sea Grant Coastal Engineer Adam Bechle and WCMP Federal Consistency and Coastal Hazards Coordinator Kate Angel, who also serves on Sea Grant's Committee on Outreach and Education.

"I'm excited for the opportunity to explore different aspects of coastal management and state government," said Arend. "That aspect of the fellowship was really attractive to me. I'm ready to get a better idea of what exactly my next steps might look like, or what I might be doing in 15 years."

One of his main tasks is to help update the Coastal Processes Manual. Said Bechle, "In updating the manual, Adam has picked up right where our last fellow, Yi Liu, left off. He has jumped into writing about measures to mitigate coastal hazards and the impacts of a changing climate on the Great Lakes."

Arend will build on experience from his master's project at the University of Michigan. He worked with an environmental law firm in Traverse City on the Blue Communities Project. As part of a team of students working with the firm, he brought a social science perspective to the group's work, which centered on getting municipal entities, environmental groups and private businesses to join forces on common steps they could take to protect local waters.

"Our goal, essentially, was to figure out how to connect people in Traverse City and support them in working together on a better water stewardship ethic," said Arend. While that process was not without hurdles, he noted, "Sometimes people are surprised how many common interests they have."

Arend is learning to learn more about how state government works and policy is crafted. He's taking on the challenges of the Keillor Fellowship and continue carving out his professional path. Concluded Arend, "I want to be in the freshwater world, and I've found my broader niche within the Great Lakes. Now I'm ready to define that further." — JAS



Fellow Adam Arend is based at the Wisconsin Coastal Management Offices, and his work will include updating the Coastal Processes Manual.

Bonnie Willison / Wisconsin Sea Grant



Plastics and Art — No Throwaway Messages Here

In the airy atrium of the Chazen Museum of Art in Madison for several weekends in late 2019, dozens of people participated in the museum's three outreach events coupled with their exhibition *Plastic Entanglements: Ecology, Aesthetics, Materials*.

For Sea Grant's Anne Moser, the events — known as Art Spins — were a chance to marry two of her favorite themes of art and science, including the science of plastics.

"Similar to the way the exhibition had been organized around the past, the present and the future of plastic as a material, so is the science of plastic pollution in our waters," she said.

Moser is the senior special librarian for the Wisconsin Water Library, and she leads Sea Grant's education efforts with colleague Ginny Carlton. The education offered at the Art Spins focused on topics such as "mosaic," which explored the chemistry of plastics. The pair collaborated with the Wisconsin Energy Institute on the University of Wisconsin-Madison

campus to create stations that explored plastic as a material in the past, present and a speculative future.

On prior weekends, Art Spin participants explored plastic in fashion by examining microfibers under microscopes and plastic as a waste in waters by playing a game centered on marine debris collection.

Moser and Carlton also felt it was important to prompt action to reduce plastic pollution. They demonstrated shopping alternatives to single-use plastics and offered blank canvas bags along with plenty of fabric markers so creativity could foster the practice of using reusable bags when shopping.

"People are hearing about plastics. They're worried about their plastic footprint," Moser said. "People want to understand what the issues are and what alternatives they can choose. The art exhibit and the outreach events gave people inspiration to make some differences in their lives." —MH

Survey Results Confirm AIS Messaging

Boating is a way of life for many Wisconsinites. The state boasts more than 2,000 lakes with public access, and 624,882 boats are registered here.

Of course, the best way to enjoy fun, fishing and friends is to do so in a way that minimizes the potential spread of aquatic invasive species (AIS), unwanted invaders that can take a toll on native species, water quality and more.

Said Tim Campbell, an AIS outreach specialist with Wisconsin Sea Grant and the University of Wisconsin-Madison Division of Extension, "Once invasive species are here, recreational boaters are the primary way they move around the landscape."

This is where well-designed boater education campaigns come in. They inform boaters about legal requirements and good habits to adopt to make sure that good times on the water do not end up harming local ecosystems. Methods include signage at boat landings, in-person efforts by boat inspectors and advertising campaigns.

Wisconsin's leading AIS prevention effort is the "Clean Boats, Clean Waters" initiative helmed by the Wisconsin Department of Natural Resources (DNR) and Extension, which includes a Great Lakes watercraft inspection program and an evaluation of outreach efforts.

According to a recent survey administered by the Natural Resources Institute Evaluation Service Unit within Extension, these education efforts are quite effective.

Said Evaluation Specialist Evelyn Hammond, 1,498 surveys were mailed in 2018 to a random sample of registered boat owners in Wisconsin, and 532 completed surveys were returned. A response rate of 36% is very good, Hammond said, especially for a detailed survey with 35 questions.

A formal report on the survey will be available on the Wisconsin Sea Grant website within the next few months. In the meantime, said Campbell and Hammond, the results are encouraging in terms of boaters' understanding of Wisconsin laws and their commitment to take preventive measures each time they take their boats out on Wisconsin waterbodies.

"The results confirm that what we're doing is on the right track for increasing boater compliance (with AIS-related laws)," said Campbell. "For the most part, people are 'usually' or 'always' taking action to prevent the spread of AIS; few people fall into the 'never' or 'rarely' category."

He stressed that the survey is not new, but rather the latest in a series of similar evaluation efforts — conducted via mail or phone — stretching back about a decade. Wisconsin AIS professionals now have about 10 years' worth of data that track boater behaviors, awareness of laws, and the like.

Said Hammond, "People know that aquatic invasive species are a threat and have negative effects. They are aware

of the impacts that AIS have on the lakes and on the environment in general."

The current survey instrument was designed by Bret Shaw, an associate professor of life sciences communication at UW-Madison who is also an environmental communication specialist with Extension, in coordination with DNR and Extension AIS partners.

While the picture in Wisconsin is overall a positive one — there has been no significant spread of AIS in Wisconsin

"The results confirm that what we're doing is on the right track for increasing boater compliance."



waters in the last several years — study administrators found that there is still some confusion surrounding the legality of a few specific practices, such as the handling of bait. This information lets AIS professionals know where they should fine-tune their communication efforts.

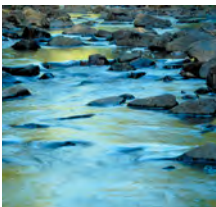
For questions about the boater survey, contact Tim Campbell at Tim.Campbell@wisc.edu. —JAS



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CALENDAR OF EVENTS

APRIL 8 AND MAY 13, 2020

River Talks

Superior, Wis.

go.wisc.edu/4uz720

MAY 27 AND 28, 2020

Great Lakes Fisheries Commission Annual Meeting

Niagara on the Lake, Ontario

glfc.org

JUNE 7 – 12, 2020

ASLO-SFS 2020

Madison, Wis.

aslo.org/madison-2020

JUNE 7 – 11, 2020

Association of State Floodplain Managers Annual National Conference

Fort Worth, Texas

asfpmconference.org

JUNE 8 – 12, 2020

IAGLR

Winnipeg, Manitoba

iaglr.org/iaglr2020



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