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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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Narayan Mahon

Aquatic Sciences Chronicle

University of Wisconsin Aquatic Sciences Center
1975 Willow Drive
Madison, WI 53706-1177
608-263-3259
Email: chronicle@aqua.wisc.edu
Web: seagrant.wisc.edu, wri.wisc.edu

The Aquatic Sciences Center is the administrative home of the University of Wisconsin Sea Grant Institute and the University of Wisconsin Water Resources Institute.

ASSISTANT DIRECTOR FOR COMMUNICATIONS

Moira Harrington

EDITOR

Elizabeth A. White

WRITERS

Moira Harrington, Jennifer A. Smith, Elizabeth A. White, Morgan Witte and Marie Zhuikov

ART DIRECTOR

Yael Gen

DESIGNER

Kristen Rost

CIRCULATION MANAGER

Linda Campbell

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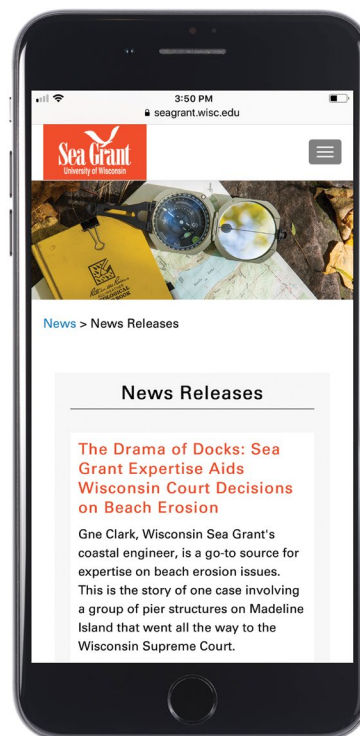
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FEATURED WEB



Wisconsin Sea Grant Makeover

seagrant.wisc.edu

In this issue, the website we're featuring is our own. Over the last several months, Wisconsin Sea Grant staff have worked diligently to give our online home a makeover. A streamlined look, simpler navigation and better functionality for mobile users are just a few of the improvements.

We designed these technical and aesthetic improvements with Wisconsin Sea Grant's mission in mind: research, education and outreach for the Great Lakes. An updated website allows us to tell our story more effectively — and better serve — citizens, resource managers, students, public officials and others. Our aim is to make it easier for you to find answers to your questions or connect with an expert.

We encourage you to explore the new site and give us your opinions. Are you finding what you need? Have you come across something that may not be working properly? Send us your thoughts by contacting Assistant Director for Communications Moira Harrington at moira@aqua.wisc.edu.

We hope you like what you see. — JAS

Freedom High School student Allison Breier collects egg ribbons from a female yellow perch. From left, Sea Grant's Fred Binkowski, Breier, Dylan Huse, Kevin Champeau and Ph.D. student Peter Shup.



Sara Stathas

Students Get Hands On With Yellow Perch

In a large lab filled with circular tanks, amid the sound of gently rushing water, nine students from Freedom High School gathered to learn about indoor aquaculture at the University of Wisconsin-Milwaukee School of Freshwater Sciences (SFS).

Their teacher, Kevin Champeau, brought them last October to visit Wisconsin Sea Grant Aquaculture Specialist Fred Binkowski, who is based at SFS. Champeau teaches several courses at the high school that focus exclusively on aquaculture.

Binkowski brings many years of experience to the table. He has worked in fisheries science and aquaculture for about four decades and, on that blustery fall day, was eager to engage with the class, quickly learning their names and enlisting them in a hands-on activity.

The students took part in an artificial spawning process with yellow perch. Binkowski and his colleagues induce perch to spawn out of cycle using a photothermal system (manipulating light and temperature). Binkowski received a patent in 2010 for this process, and the University of Wisconsin-Milwaukee Research Foundation manages the patented license technology.

In the wild, these fish spawn in the spring, but invasive species have taken a severe toll on the yellow perch population in Lake Michigan. Yellow perch aquaculture can be one way to revive this sought-after food fish.

After first asking the students who among them are avid anglers — a way to gauge which students will be confident handling wriggling fish — Binkowski coached them in collecting egg ribbons (also called “skeins”) from the female fish.

Two females were lifted carefully from the tank and then held over stainless steel bowls to release

their ribbons. “Let gravity do the work,” Binkowski advised the teens, as the pale, translucent yellow skeins dropped quickly into the waiting bowls.

After repeating a similar process with two male fish, the material was mixed together for fertilization. Students gently decanted excess water from the bowls of now-fertilized egg ribbons before a lab technician bagged the ribbons for transport back to Freedom High.

For most students, Champeau said, this was their first time experiencing a lab of this scale. “It made a very good impression on them,” he said. “It was very cool to get them on a university campus in a research lab where they can see things that are different from a production facility, and that are different from our facility at school, and they can see a different side of aquaculture.”

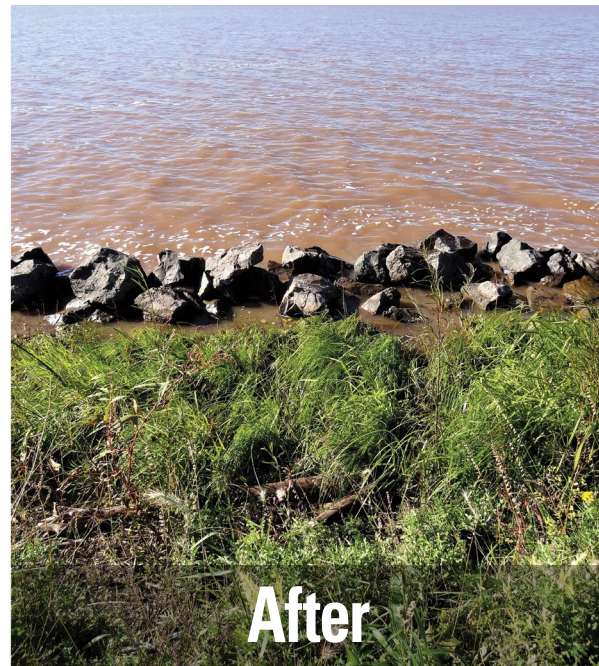
One enthusiastic sophomore said he hoped to study aquaponics in college and maintains an aquaponics system at home.

Learning continued well after the students returned home to Outagamie County. While the eggs did not make it to the hatching stage — at first they did well, but in about 10 days turned black — it gave the students a chance to discuss what they might have done wrong, and what they could try next time around.

“While it didn’t end up going where we wanted it to go, they found it important, and they are still coming to me with suggestions about what to do next time,” Champeau said, who has taught agriculture for more than 30 years. “Failure tends to breed success, and I think that’s not a bad message to bring to kids, especially at the high-school level, where we can learn from mistakes and do better next time.” — JAS

Living Shorelines for Northern Climes

An example of a living shoreline on Wisconsin Point in Superior, Wis. The photo on the left was taken in 2017 when it was installed. The photo on the right was after a growing season a year later in 2018.



Marie Zhulkov / Wisconsin Sea Grant

Coastal engineers are working more with nature to solve erosion problems and protect shorelines. This involves using things such as plants, sand or rock instead of “hard” materials like concrete and steel.

The practice is called “living shorelines” and was put forth by Sea Grant’s parent organization, the National Oceanic and Atmospheric Administration, in 2014 with the goal of improving fish habitats, remediating nutrient pollution and buffering sheltered shorelines and estuaries from waves and storms.

The problem is, the techniques employed don’t always work in areas of the country that have four seasons — the plants die back and ice can create problems. Wisconsin Sea Grant is cooperating with Canadian counterparts to develop guidelines and a network of engineers, known as a community of practice, who are interested in living shorelines for cold regions — and they would like more to join them.

Gene Clark, Wisconsin Sea Grant’s now-retired coastal engineer, said the idea for the Cold Regions Living Shorelines Community of Practice came after a daylong workshop about living shorelines sponsored by New York Sea Grant in 2014.

“We had this workshop and realized that certainly along the Great Lakes, we didn’t have any guidance. In fact, we had a hard time coming up with some good examples of living shorelines that worked,” Clark said.

At the workshop, Clark began talking with Pete Zuzek, incoming president of the Coastal Zone Canada Association, about practices employed in his country and how to continue the discussion about living shorelines for cold climates. They decided to hold a half-day session in 2016 at the Coastal Zone Canada Conference in Toronto.

“We had maybe 50 to 60 practicing engineers and coastal process specialists talking about it. We heard the same thing: There was a strong desire to learn more but we just didn’t have a lot of case studies to even talk about or share, much less practice the design guidance,” Clark said.

That led them to the idea of forming a community of practice to share information and develop more living shorelines techniques for northern regions. Zuzek invited Danker Kolijn (pictured on the front cover), an engineer from Halifax, Nova Scotia, to join them, and they decided the effort should be binational. They created a scope of work for the community of practice and a website, which they presented at the Coastal Zone Canada Conference held in St. Johns, Newfoundland, in July 2018.

Kolijn said the attendees were excited about the idea and wanted to be part of the group.

“There is a lot of really great work being done and there are a lot of people invested in this topic and doing work on it,” Kolijn said.

“The idea of a community of practice is to bring it together ... and have a place where consultants and people with municipalities can go to seek out this information, and also see the contacts that are available for them to learn more about it.”

Kolijn encourages people who want to join the effort to visit ccadaptation.ca/en/crlscop and register to get complete access to the information. The group plans to offer webinars and to develop a blog in the future. — MEZ

Monitoring Water From Space

Steve Greb Uses Sampling and Remote Sensing to Monitor Water Quality

One of the familiar faces around Goodnight Hall — the home of the Aquatic Sciences Center — since spring 2018 is Associate Fellow Steven R. Greb. Retired after 32 fruitful years with the Wisconsin Department of Natural Resources (DNR), Greb continues to protect Wisconsin's waters using innovative technology.

Greb began his tenure at the DNR's research bureau in 1986, fresh from graduate school at Utah State University. For the Menomonee Falls native and undergraduate alum of UW-Stevens Point, it marked a welcome return to his home state.

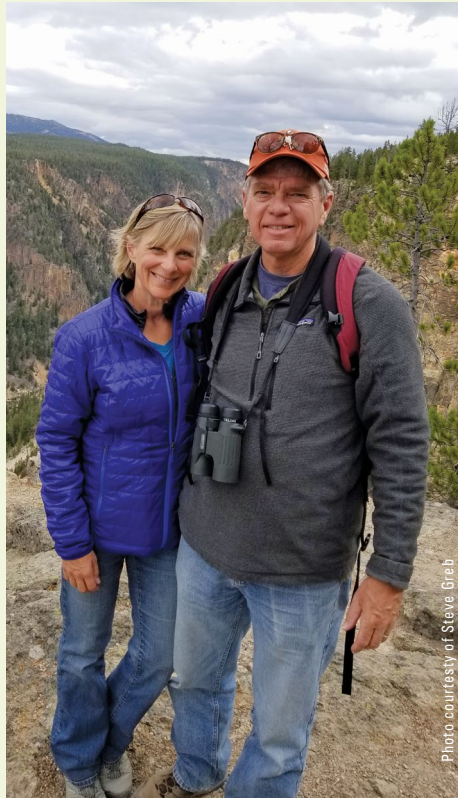
"We did a lot of really interesting work (at the DNR). When you have fun and are constantly learning, those are good jobs to have, and so I spent my career there," said Greb.

It was at the DNR that Greb met Jennifer Hauxwell, who was with the agency before taking on her role as an assistant director with the Aquatic Sciences Center (ASC). Hauxwell helped facilitate Greb's honorary role at the ASC.

One of Greb's major endeavors at the DNR was using satellite remote sensing to measure water quality from space, something that attracted considerable attention both nationally and internationally. These efforts required extensive collaboration since, as Greb noted, "The state of Wisconsin is not going to build a satellite." Greb worked with space agencies and other scientists around the country and globe. Those interactions led, in time, to his being invited to serve a three-year term on a body called the International Ocean-Colour Coordinating Group (IOCCG).

As the name implies, IOCCG focuses on oceans, while Greb's focus has been

on inland waters — so he proposed a working group of the IOCCG on using satellite and remote sensing for inland water quality.



Steve Greb and his wife, Julie, at Yellowstone National Park last fall.

Those efforts resulted in a 2018 publication of which Greb is quite proud: the report "Earth Observations in Support of Global Water Quality Monitoring" (IOCCG report No. 17, available online at go.wisc.edu/l74hfu).

Greb assembled top researchers from many countries. He began with a group of 15, and that group eventually expanded to 22.

Their report, which Greb co-edited, is constructed in three sections, each geared to a different audience: end users (such as water quality managers and lake property owners), the scientific community and space agencies. The final chapter contains recommendations for all three groups and also identifies issues such as gaps in the science and what space agencies should consider in the next generation of satellites.

While Greb said some skepticism of satellite remote sensing remains, the technology is getting better and better all the time. He stresses that the technique, combined with in situ water samples, reveals more about water quality than either approach could alone.

"For example, a sample taken at a single point may not truly represent water quality conditions of the whole waterbody, whereas a satellite image gives you a better sense of the spatial variability across the waterbody," said Greb.

Aside from his activities at the ASC, Greb maintains a one-third appointment on the UW-Madison campus through the Space Science and Engineering Center. He also continues to serve as the director of Aqua Watch, a community of practice around water quality within the Group on Earth Observations.

With all of these professional activities, Greb's "retirement" may seem like a misnomer. Yet he still finds time to enjoy hobbies and travel with his wife. As avid cyclists, the two have taken bike trips to France and Ireland. Greb also enjoys skiing, gardening and woodworking.

To get in touch with Steve Greb, contact him at srgreb@wisc.edu. —JAS

Dock Drama

SEA GRANT EXPERTISE AIDS WISCONSIN COURT DECISIONS ON BEACH EROSION

A few years ago, Gene Clark, Wisconsin Sea Grant's recently retired coastal engineer, got a call from the Wisconsin Department of Natural Resources (DNR) about a problem. Residents of Madeline Island in Lake Superior were complaining that a neighbor's pier seemed to be causing erosion to their beaches. The DNR wanted Clark to come to the island and take a look.

That the DNR would turn to Clark for objective advice is not uncommon. "If the DNR had an issue or a significant erosion control project that somebody wants to do, they often asked me either to look at the plans or to go out with them to the site," Clark said. "That's what this was."

The conditions were evident to Clark right away. "There was a definite buildup of sand on one side of the pier, and a significant deficit on the other side," Clark said. After doing some more research, he learned that the problem probably started even before the current owners bought the property. They inherited a dock and a concrete pad built for a commercial fishing operation. The structures interfered with the natural dispersal of sand along the beach.

The problem was intensified when the owners, Philip and Terri Myers, added onto the structure under a permit issued by the DNR in 2001, until they had a "significant private property dock with portions of the old one still in place," Clark said.

"Some of my conclusions were that the entirety of the group of structures were making a difference on the down-drift side. It was difficult to pull out how much of that was attributable to the portion that the current dock owner built because there's still remnants of the old structure," Clark said. "But clearly the combination of all of the changes were making a difference."

Another issue was that the current dock had an opening that was too small, and behind it about 20 feet were remnants of another dock that were blocking the flow of sand so that it quickly piled up. One neighboring property owner said he had lost about 80 percent of his beach. Another called Clark in tears because her former large beach was now nothing but a five-foot embankment.

A storm had damaged the pier and the owners wanted to make it larger and more solid. In cooperation with the DNR and Philip Myers, Clark worked on design ideas that would allow the dock to be sturdier, yet make it more permeable so that sand could travel naturally down the beach to the neighbors' properties. Myers did not agree to the eventual plans, so the DNR denied him a permit for reconstruction.

Myers took the case to the Wisconsin Court of Appeals District 3. Citing Clark's information in three instances, the court ruled against Myers, noting that his reconstruction plans would cause increased shoreline erosion for his neighbors.

Myers then took the case to the Wisconsin Supreme Court. After reviewing briefs filed by the DNR and Myers, on Jan. 18 the court ruled in favor of the Myerses, saying that the DNR did not have the authority to amend the Myerses' permit granted in 2001. This effectively reversed the court of appeals decision.

In their decision, the judges cited Clark's report, honing in on his expert view that it was "extremely difficult to estimate how much if any additional littoral material trapping is occurring due only to the [Myerses'] newer pier structures."



Gene Clark / Wisconsin Sea Grant

Podcasting Pro

seagrants.wisc.edu/audio/wisconsin-water-news/ or iTunes



Not one, not two, but all three podcasts submitted to the AVA Digital Awards scored wins for Aquatic Science Center's Science Communicator Marie Zhuikov.

Zhuikov's series is known as Wisconsin Water News, and she brings technical prowess and water learning to each episode about either a Sea Grant or WRI project. Take a listen again, or for the first time:

Platinum award winner

"College Course Uses Lake Superior Watershed"

Gold award winner

"Central Sands Nitrogen"

Honorable mention winner

"Milwaukee River Race Proceeds Swimmily"

The AVA digital awards recognize outstanding achievement by creative professionals involved in the concept, direction, design and production of media that include audio and video productions. The awards process is sponsored and judged by the International Association of Marketing and Communications Professionals, which includes several thousand marketing, communication, advertising, public relations and freelance professionals. Competition officials report that about 15 percent of entries win platinum awards, 20 percent gold and 10 percent honorable mention.

The Myers Family pier structures on Madeline Island before storm damage (left) and after (right).

The courts stated that the dock permit is akin to a building permit, which can no longer be modified after construction is complete after the time period specified in the permit. In this case, it was three years. The court said although, “The DNR possesses a limited right to modify a permit until the earlier of the expiration date of the permit or the date when pier placement was completed ... that right does not include the ability to require partial removal of a pier, and substantial modification to a permit, over 14 years after a pier was placed.”

In effect, the Myerses’ permit expired, so the DNR could not require modifications to their pier.

In a dissenting opinion, Judge Ann Walsh Bradley argued that piers are not like buildings because they are constructed in the more dynamic environment of water rather than the more static element of land. She thinks the pier-permitting statutes give the DNR the right to amend permits and set forth a continuing obligation to meet the permit requirements.

“The question raised in this case is what happens when a pier meets the criteria of [state statutes] when it is initially installed, but at some point conditions change and the pier no longer meets the statutory requirements,” Bradley wrote.



Gene Clark / Wisconsin Sea Grant

“The statute dictates that if the requirements are not met, then a permit shall not issue. This means that the non-compliant condition must be corrected.”

She said the court’s decision renders the DNR “toothless” to fix similar situations where a pier is not functioning properly, “even if it obstructs navigation, is a detriment to the public interest, or reduces flood flow capacity.”

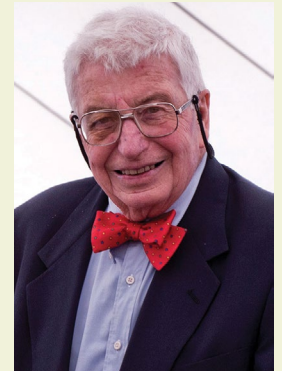
This fascinating case has gone as far as it can, for now. Whatever the decision, Clark said he was satisfied that the courts and the DNR used his expertise to make their arguments, in line with Wisconsin Sea Grant’s role as a purveyor of evidence-based information.

While the case was going through the courts, natural coastal processes continued in Lake Superior. Several more storms destroyed much of the pier. So although this case may have a long-lasting impact on the way the DNR manages permits, the structures that raised the issues are no longer functioning.

The lake, it seems, had the final say. — MEZ

Knauss Fellowship celebrates 40 years

Since 1982, the marine-science and marine-policy career hopes and dreams of 28 Wisconsin scholars were sparked and fanned into a blaze due to something known as the John A. Knauss Marine Policy Fellowship, which celebrates a 40-year anniversary this year. The nationally competitive 12-month Washington, D.C.-based fellowship matches graduate students with an interest in ocean, coastal and Great Lakes



JOHN A. KNAUSS

University of Rhode Island

resources and national policy with an executive office, a member of Congress or a congressional committee with jurisdiction over coastal matters.

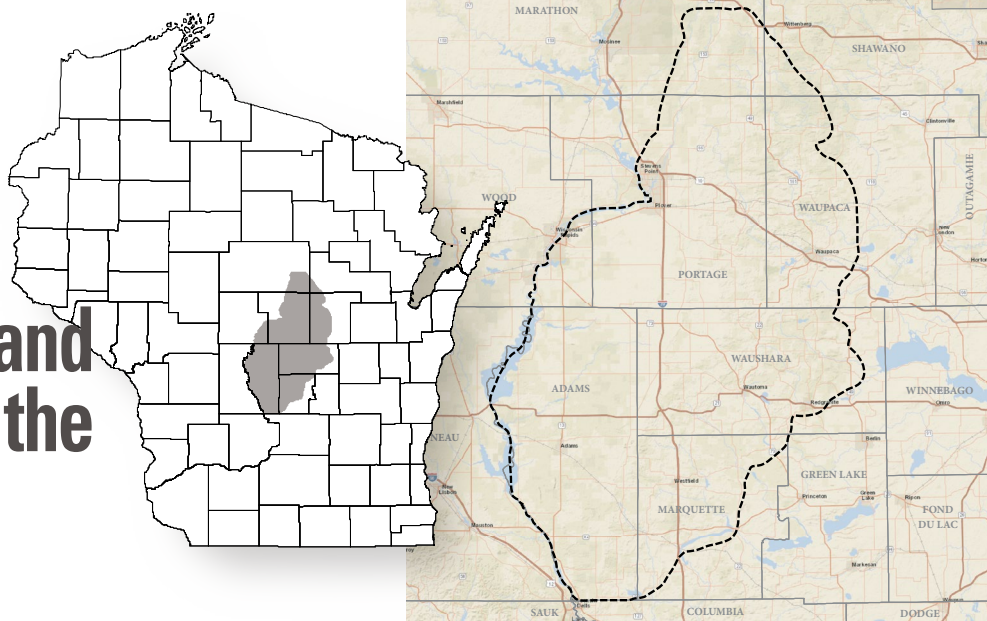
The 28 Wisconsin fellows have now gone on to careers in both the public and private sector. The first Knauss Fellow from Wisconsin, Bill Horns (1982), retired in 2014 from the Wisconsin Department of Natural Resources (DNR). A retirement resolution adopted by the Natural Resources Board to commemorate his contributions reads, in part, “Bill’s excellent service to the DNR on both the Wisconsin and national stages is recognized across the Great Lakes community. From serving on the DNR Invasive Species Team to the U.S. Fish and Wildlife Service Review Committee for the Great Lakes Fish and Wildlife Restoration Act, to the Council of Lake Committees, Bill has provided a consistent voice on fish management issues.”

Wisconsin’s two most-recent Knauss Fellows — from the 2017 cohort — Shelby (LaBuhn) Brunner and Danielle (Cloutier) Brunner remained in the Washington, D.C., area immediately following the conclusion of their experiences. The first Brunner, Shelby, is now a project specialist for the University Corporation for Atmospheric Research and coordinator for international ocean observing projects. The organization is in Silver Spring, Maryland. The second Brunner, Danielle, recently took on the role as Pacific fisheries policy director for the American Sportfishing Association.

Of course, there were many other people and experiences between the first and most-recent fellows. One is Joe Fillingham, a 2011 fellow. Placed in the National Oceanic and Atmospheric Administration Office of Cooperative Institutes, he termed his time as a Knauss Fellow as “transformative.”

continued on page 10 >

Efficient Water and Nitrogen Use in the Central Sands



Thanks to its sandy soil, the Central Sands region in Wisconsin is a great place to grow vegetables. However, this area north of Wisconsin Dells is also known for water quantity issues. Lakes and rivers are slowly disappearing for complex reasons, one being the high-capacity wells that provide water for irrigation.

Now the beleaguered area is also facing water quality issues from the longstanding use of fertilizer on its cropland.

Two Water Resources Institute researchers are working on a project that will help farmers in the Central Sands better manage their nitrogen fertilizer use and improve water quality and quantity in a changing climate.

Chris Kucharik, professor in the Department of Agronomy and the Nelson Institute Center for Sustainability at the University of Wisconsin-Madison, and Matthew Ruark, associate professor in the Department of Soil Science and extension state specialist also at UW-Madison, are conducting their work at several farms and at the Hancock Agricultural Research Station in the center of the Central Sands region.

One focus of their project is the amount of nitrogen contained in irrigation water even before any fertilizer is applied. Kucharik and Ruark plan to develop measures and computer models that can guide farmers in their water and nutrient management plans.

"The whole idea is to give growers and extension folks a more concrete number they can work with so that they can adjust the amount of fertilizer they're applying to accurately account for the amount of nitrogen that's coming through the water," Kucharik said. "Any little bit of nitrate that we can prevent from making its way down into the groundwater system is a win for the environment as well as farmers in terms of saving money."

The sand that makes the soil so good for growing potatoes, sweet corn, peas and snap beans also requires frequent irrigation and fertilization. Bacteria in the soil convert the ammonia and nitrogen from fertilizers into the harmful nitrates sometimes found in irrigation water and drinking water from wells.

"The farmers have really struggled with how to minimize the amount of nitrates that are leaving the soils and making their way into the groundwater system," Kucharik said. "We've known this for decades. Given the sandy soils — they're not really great for holding onto water. Things drain quickly through them."

Kucharik explained the long history of human health problems caused by people drinking water with an elevated concentration of nitrate. "It's not healthy for pregnant mothers, it's not good for young children. The condition of blue baby syndrome is often attributed to this problem," he said.

"It's going to be more challenging for growers to keep nitrogen in the cropping



Nitrate is Wisconsin's most widespread groundwater contaminant. The threshold for nitrates that the Environmental Protection Agency considers safe is 10 parts per million. A 2018 report by Wisconsin's Groundwater Coordinating Council found that about 10 percent of private wells sampled in the state exceed these standards. At least one homeowner's well in the Central Sands district tested at 45 parts per million — more than four times the safe limit.

Even rainwater is not immune from human influence where nitrates are concerned. A small quantity can be found in it, especially in urban areas where emissions from cars, electric utilities and industrial boilers are a source. Kucharik and his team are collecting rainwater samples in addition to weekly irrigation water samples to have a complete picture of nitrogen inputs to the land.

According to previous research by Kucharik and information from the Wisconsin Initiative on Climate Change Impacts, the Central Sands area has already experienced a trend toward warmer nights, along with a 15 percent increase in annual precipitation and a longer growing season by approximately two weeks. By mid-century, the annual mean temperatures are predicted to increase by 2.6 to 3.6 degrees Celsius, and the growing season is projected to lengthen by yet another two weeks.

"The bottom line is that it's going to become more challenging in the future for farmers to grow

crops because warmer temperatures mean an increased demand for water that will need to be applied at the same time as the weather becomes more variable, particularly how precipitation is delivered," Kucharik said. "It's going to be more challenging for growers to keep nitrogen in the cropping system and not have it leach out."

The researchers plan to develop a modeling tool as a way to explore various climate scenarios so that growers know what to expect. They want to develop management options that hit a "sweet spot" where water and nitrogen use efficiency are maximized in the Central Sands without significant reductions in yield.

Kucharik is excited about this project. "It's very much a tight coupling between doing field work on the landscape, working with the growers, and connecting that to modeling to help us understand how things will function differently in the future so we can help people get ahead of the curve and help farmers think about potential adaptations they might need to make. The last thing we want is for environmental problems to become so bad that the state has no choice but to start regulating nutrient and water management in ways that growers are not used to. That could mean great economic hardships in a variety of ways," he said.

— MEZ

system and not have it leach out."



UW-Madison

— CHRIS KUCHARIK

"It changed my perspective on the world of science and how science is done and how science is managed and how science is funded. It really opened my eyes to what options and potential a career in science can have," Fillingham said.

After the fellowship, Fillingham completed his Ph.D. at the University of Wisconsin-Milwaukee School of Freshwater Sciences. He's now the science lead at WellIntel, Inc., a Wisconsin startup company that offers groundwater monitoring equipment and data analysis tools.

The Knauss Fellowship was named for John A. Knauss in 1979 in honor of his leadership in developing the National Sea Grant College Program. Knauss was an oceanographer and former NOAA administrator. Well-versed in the ways of saltwater, Knauss was also a Great Lakes native son, hailing from Detroit and earning a master's degree at the University of Michigan.

For 25 years, he headed an oceanography program at the University of Rhode Island, where he was exposed to legions of talented students — 169 to be specific. Their successors in marine-science studies, and those from around the nation, now have the opportunity to apply for his namesake fellowship. That fellowship has also inspired a Wisconsin-ized version of fellowship opportunities.

Jennifer Hauxwell, Sea Grant's assistant director for research and student engagement, oversees a robust effort offering invaluable learning and job training for a new generation of leaders. She forges partnerships with state agencies to offer fellowships for postgraduates that provide on-the-job education and training opportunities. Students have been placed in the Wisconsin Office of Coastal Management, the Wisconsin Geological and Natural History Survey, and the Wisconsin Department of Natural Resources.

For more information about fellowship opportunities, see the Sea Grant website fellowships page: go.wisc.edu/nu57er. — MH

"It really opened my eyes to what options and potential a career in science can have."



Courtesy of Joe Fillingham

Take 5: Marine debris with Titus Seilheimer

Fisheries Specialist Titus Seilheimer has been the go-to on behalf of Wisconsin Sea Grant for activity surrounding the NOAA Great Lakes Land-Based Marine Debris Action Plan. "It's a big issue for me personally," said Seilheimer, "particularly the questions around what the impacts are to fish and invertebrates and other animals. That's an important piece of the puzzle."

One outcome of the work on marine debris is the Marine Debris Collective. go.wisc.edu/8qe02a

Plastics are one key segment of the marine debris problem. Read on for tips from Seilheimer about what you can do to make a dent in the crush showing up in waterways.

1. Single-use plastics are one obvious culprit. You may be shocked how long they last.

"Our day-to-day lives are surrounded by plastic meant to be used once. Plastics are designed to be durable and light. They stay in the environment for tens to hundreds of years," Seilheimer said.

According to data collected from the International Coastal Cleanup and the Alliance for the Great Lakes, which help coordinate trash pickups in coastal areas around the world, some of the most common items littering our shorelines are plastic beverage bottles and caps, plastic bags, straws and coffee stirrers, and takeout containers. A lone plastic bottle can take a whopping 450 years to decompose.

Cigarette butts are another major offender. They're the most common type of trash found in these cleanups, and they're not just paper. Most cigarette filters are made of cellulose acetate. Aside from being unsightly, those pesky butts take one to five years to decompose.



2. Plastic fibers from our clothes are a less visible source, yet still problematic.

Synthetic fibers (like polyester, nylon and acrylic) now constitute about 60 percent of the material that goes into clothing worldwide. Fabrics produced from these fibers have a lot of benefits — they can be lightweight, stretchy, breathable, warm and/or sturdy — and they're cheap to produce. All fabrics shed tiny fibers, especially when washed, and synthetic fabrics shed tiny plastic fibers. These fibers are now ubiquitous, showing up in water, fish and even human waste. A U.S. Geological Survey study found microplastics in every sample of water from the Great Lakes and 29 tributaries.

"Wastewater treatment plants are not designed to catch fibers, so some will pass through and others end up in the biosolids that are spread on farm fields," said Seilheimer.

Front-loading washing machines, cold water and liquid detergents cause less shedding. Several commercial products are available to trap the fibers in the washer, like the Cora Ball (cora-ball.com) or the Guppyfriend (available from Patagonia or REI). Filters are also available for septic systems: septic-safe.com/microfiber-filter or environmentalenhancements.com.

3. Microbeads in personal care products like face scrubs are a success story due to a change in the law — but there are exceptions to that law, so you still need to be a savvy shopper.

Said Seilheimer, "Microbeads are something people have heard about, and there's been quite a bit of progress made about those."

As of July 1, 2017, it became unlawful in the U.S. to manufacture rinse-off cosmetic products that contain plastic microbeads. A year later, it became unlawful to sell those products. While those are steps in the right direction for protecting our waters, there are numerous exceptions to this law. There are deodorants, lotions and makeup products that fall outside of the law, so it still pays to check labels when shopping.

One resource you can check is "Beat the Microbead" (beatthemicrobead.org), which lists personal-care product makers that do not use any microbeads in their product lines.

4. Once debris is out there, it moves around, creating a global problem.

Debris is dynamic. "We can see evidence of the movement of this litter on our beaches and in our waterways. Common items on Great Lakes beaches are similar to the top items in the International Coastal Cleanup," said Seilheimer.

5. There's hope, because you can make a difference with your actions.

While the problem is daunting, we all can play a role in reducing marine debris.

Seilheimer offered these tips: "Be aware of your single-use plastic use. Be aware of the fabrics that you are wearing. Buy natural fibers, use a filter, or wash synthetic fibers less often. Go to an organized beach cleanup or just pick up litter when you see it." — JAS

OUTREACH

ADVANCING AQUACULTURE



Sara Stathas



Narayan Mahon

Wisconsin Sea Grant awarded federal research funds to aid development of salmon aquaculture

A Wisconsin Sea Grant project, “Overcoming barriers to support the growth of land-based Atlantic salmon production in the Great Lakes region,” was selected to receive part of an \$11 million grants package from the National Sea Grant Program designed to further advance sustainable aquaculture in the U.S.

The budget for the two-year project, including both federal and non-federal matching dollars, is approximately \$773,000.

James Hurley, director of Wisconsin Sea Grant, will serve as the principal investigator for the grant, while Greg Fischer of the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (NADF) will serve as the project leader and research team organizer. Fischer is facility operations manager at NADF, located in Bayfield, Wis.

Other partners include the Conservation Fund Freshwater Institute, a prominent research entity based in West Virginia.

“This project will help to ensure the Atlantic salmon harvested have the very best flavor profile.”

Researchers will focus on two key issues that have hampered the continuing growth of salmon aquaculture in the United States — fish health and fish flavor.

Said Fischer, “Land-based salmon aquaculture is growing by leaps and bounds in North America. This research study is very exciting because it is really going to help the industry. We are working in close concert with private partners that are doing this type of aquaculture right now.”

Fischer’s comment touches upon the robust, public-private nature of this effort. Private industry partners are Superior Fresh, based in Hixton, Wis. (30 minutes southeast of Eau Claire), and Riverence/Evaqua Farms, sister companies based in Washington and Idaho, respectively.

An infusion of national dollars is funding research at Superior Fresh to best manage a common fish fungus as well as looking at achieving “flawless” flavor in farmed Atlantic salmon, an ideal menu complement to the leafy greens also grown at the facility.

Superior Fresh is the largest Atlantic salmon aquaponics facility in the world. Some of the research will be conducted there, and some at NADF. Superior Fresh will provide fish at various life stages, and Riverence/Evaqua will supply some of the salmon eggs.

The fish health issue the research team will address involves managing a common fungus (*saprolegnia*) that occurs in both farmed and wild fish.

“Various Atlantic salmon life stages are particularly vulnerable to infection, including early rearing — the fry stage — and during smoltification, when salmon physiologically prepare for the transition from freshwater to seawater,” said Good, director of aquatic veterinary research at the Freshwater Institute. “We aim to investigate novel approaches to prevent or reduce the impact of fungus at both of these life stages, in order to ... ensure the health and welfare of farmed fish.”

As for the flavor issue, some farm-raised salmon can have an “off” or musty flavor. For consumers to choose farmed fish, it must have a “flawless” flavor profile, say the researchers. Said Steven Summerfelt, chief science officer of Superior Fresh, “This project will help to ensure that Atlantic salmon harvested have the very best flavor profile: succulent, buttery-rich and mild.”

Farming fish closer to where food shoppers and restaurants buy it has several benefits, including greater freshness, a smaller carbon footprint (since the product does not have to travel via air) and job creation in these communities.

At Superior Fresh, leafy greens are grown along with salmon in an efficient, sustainable way. “We use a state-of-the-art recirculating aquaculture system technology in a ‘fish house’ and connected hydroponics ‘greenhouse’ to produce micro-greens, baby greens, head lettuce, steelhead and Atlantic salmon year-round while recycling 99.9% of the (water and nutrient) flow,” Summerfelt said.

Said Jason Mann, director of nutrition at Evaqua Farms, “We’re on a mission to help our peer fish farmers contribute to the future growth of aquaculture in the U.S. in order to provide more healthy seafood to our citizens from safe, domestic origins.”

Looking ahead, the work of the public-private research team will have impact well beyond Wisconsin.

“We expect to publish a myriad of papers out of this (research study),” concluded Fischer, “and it will help the industry as a whole.” — JAS



Natural, Native Landscaping

With spring right around the corner, many people are planning their seasonal landscaping projects. Landscaping with natural and native species can be a great way to make your outdoor spaces more resilient, sustainable and welcoming. The Wisconsin Water Library has some great resources on landscaping with native species in natural ways.

LANDSCAPING WITH NATIVE PLANTS OF WISCONSIN

By Lynn M. Steiner. St. Paul, Minn.: MBI Publishing Co., 2007.

Great for both beginners and experts, this book contains planting, maintenance and landscape suggestions for more than 600 native Wisconsin species.

THE LANDSCAPING REVOLUTION: GARDEN WITH MOTHER NATURE, NOT AGAINST HER

By Andy Wasowski. Lincolnwood, Ill.:

Contemporary Books, 2000.

Offering gradual landscaping changes, this book explains how to build an outdoor area that reduces the need for fertilizer and insecticides while still providing a gorgeous, usable space. It also includes an extensive list of native plant societies in each state.

THE NATURAL HABITAT GARDEN

By Kenneth Druse. Portland, Ore.: Timber Press, 2004.

Five hundred color photographs demonstrate the beauty of natural habitat gardens in each of the four main botanical habitats. Author Kenneth Druse explains how to create an aesthetically pleasing natural, native garden that will become a haven for birds and butterflies.

ROOTS, SHOOTS, BUCKETS & BOOTS: GARDENING TOGETHER WITH CHILDREN

By Sharon Lovejoy. New York: Workman Publishing, 1999.

While this book isn't exactly about landscaping, it's a great introduction to sustainable planting for kids. Great illustrations and creative ideas will inspire children to protect and nurture plants.

Please visit the Wisconsin Water Library online at waterlibrary.aqua.wisc.edu for more information about the library's resources on landscaping and gardening for adults and children.

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

A Sea Grant-designed exhibit at the Dane County Regional Airport showcases numerous Great Lakes resources and challenges, including artifacts from Wisconsin shipwrecks (lower left) and an instrument that can help predict bluff failures (lower right). Pictured is Neal Lord, UW-Madison Department of Geoscience, who helped design and build the device.

BRINGING GREAT LAKES LEARNING IN FOR A LANDING

Travelers unfamiliar with the Great Lakes arriving at airports throughout the region have been known to ask locals, "What was that ocean my plane just flew over?"

Capitalizing on such curiosity, an exhibit at the Dane County Regional Airport in Madison on display from now until mid-June offers a wealth of learning about the inland seas — targeted toward visitors and natives alike. On the airport terminal's ground floor near the ticket counters, Wisconsin Sea Grant's Graphic Designer Yael Gen has created an exhibit featuring dramatic photomurals and objects representing themes of sustainability, resilience, recreation, aquaculture, shipwrecks, aquatic invasive species and education.

The exhibit highlights research on the lakes to ensure their health for fishing, boating and beach-going, along with the economic benefits of each of those activities. It represents Wisconsin as a hub for a burgeoning aquaculture industry and a state with a commercial fishing fleet. Exhibit-goers can learn more about the power of the lakes, fueled by storms and capable of dangerous waves. It showcases teaching tools designed to boost water literacy, and features information about aquatic invasive species. Finally, it focuses on the more than 170 known shipwrecks that lie in state waters.

"Day to day, we tend to focus on these issues on a granular level. This exhibit is a chance to communicate not only the beauty of the Great Lakes but also the broad scope of the work Sea Grant does to protect this valuable resource," Gen said.

"In 2017, about 2 million people came through the airport. That means the venue provides a wonderful opportunity to educate a lot of people about our treasured Great Lakes," said Moira Harrington, Sea Grant's assistant director for communication, who worked on the display along with Gen.

Harrington also credited the instrumental role of Tandem Press, which manages the exhibit space on behalf of Dane County. The press is a self-supporting entity affiliated with the Department of Art in the School of Education, UW-Madison. It shares the university's mission by teaching, undertaking research into new and old printmaking techniques and by conducting outreach programs to help educate the public about art in general and printmaking in particular.

Others supporting the airport art space are County Executive Joe Parisi, Airport Manager Kimberly S. Jones and members of the county airport commission and art subcommittee. — MH



Courtesy Neal Lord / UW-Madison Department of Geoscience

OUTREACH

Give Us Your Thoughts

What is measured, improves. That's an adage often used in communications circles, and we're taking it to heart. We are conducting a survey — a measurement — of the Aquatic Sciences Chronicle. What do you like or dislike about this quarterly publication? What changes would you like to see and what would you like to retain in the event of a redesign? Now is your chance to give us your thoughts.

There's a link at go.wisc.edu/r94v6s to complete an online survey. Responses will be collected until 3 p.m. CST on Friday, April 19.

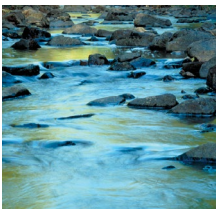




University of Wisconsin Aquatic Sciences Center
1975 Willow Drive
Madison, WI 53706-1177

Aquatic Sciences Chronicle

a joint newsletter from UW Sea Grant and UW Water Resources



CALENDAR OF EVENTS

MAY 19 – 23, 2019

Association of State Floodplain Managers Annual Conference

Cleveland

asfpmconference.org/2019

MAY 29 – 30, 2019

Great Lakes Fisheries Commission Annual Meeting

Detroit

glfc.org

JUNE 10 – 14, 2019

IAGLR, Conference on Great Lakes Research

Brockport, N.Y.

iaglr.org/iaglr2019

JUNE 16 – 19, 2019

American Water Resources Association Summer Meeting

Sparks, Nev.

awra.org



Tapestry of Collaboration

A new 2016-18 Sea Grant biennial report celebrates a tapestry woven throughout the Great Lakes Basin to serve community needs. Wisconsin Sea Grant's strands of research and threads of collaboration include fellow Sea Grant programs, local planners and resource managers. Rich photos and concise copy tell the story in these 32 pages. Get a copy at aqua.wisc.edu/publications.