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SEA GRANT RESEARCH

Breaking new ground to stop erosion

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The University of Wisconsin Sea Grant Institute is part of a national network of 34 university-based programs funded through the National Sea Grant College Program, National Oceanic & Atmospheric Administration, U.S. Department of Commerce, and through matching contributions from participating states and the private sector.

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Potential Solutions to Nitrate Problems

Stephanie DeVries

WATER RESOURCES RESEARCH



"Targeted land acquisitions — converting parcels to grassland or non-agricultural — use may offer the most permanent solution to reducing nitrate levels."

—STEPHANIE DEVRIES

Addressing water challenges faced by Wisconsin communities is a key goal of the Wisconsin Water Resources Institute (WRI) Science-Policy Postdoctoral Fellowship — and that is just what Stephanie DeVries accomplished during her recently ended tenure as the 2018-19 fellow.

DeVries lent her expertise to the city of Waupaca by studying increasing nitrate concentrations in two of its seven municipal wells.

At the May 21 meeting of the Waupaca Common Council, DeVries presented her findings. She had traveled to the central Wisconsin community frequently over the preceding year, doing fieldwork to inform the creation of a sophisticated, 3D groundwater flow model designed to explore several key questions related to increased nitrate contamination.

Wells #5 and #6 lie just south of the city proper in the town of Lind. Together, these two wells provide up to 60% of Waupaca's water supply. An increase in nitrate has been noted in recent years, particularly in well #5. While levels are still within federal limits, the upward trend has prompted concern. High nitrate levels in drinking water can have adverse impacts on human health because nitrate can impact the blood's ability to carry oxygen.

DeVries' computer models identified each well's capture zone and uncovered reasons why nitrate is higher in well #5 than well #6, even though they are only about a football field's length apart. This gave her the information she needed to consider land management strategies that could reduce nitrate in well discharge.

Her work was well received at the meeting of city leaders, prompting follow-up questions from the officials in attendance on how to best deal with

the nitrate situation. Options include, but are not limited to, taking one or both of the wells offline, and buying or renting nearby parcels of land when the opportunity arises, so those pieces of land could either stay idle or be used for purposes that would not add to nitrate concentrations in the water supply.

While the decision-making is up to city leaders, DeVries' work has provided scientific grounding to make an informed choice in the best interest of city residents.

Video of DeVries' presentation to the Waupaca Common Council may be viewed on the YouTube channel of the city's cable access station at go.wisc.edu/709422. (To watch, begin just after the one-hour mark at 1:01:42.)

During her fellowship, DeVries was based at the offices of the Wisconsin Geological and Natural History Survey (WGNHS) in Madison. The fellowship was jointly supported by WGNHS, the Wisconsin Department of Natural Resources and the WRI.

Now, DeVries is in the scenic foothills of the Appalachian Mountains. DeVries, who earned her Ph.D. at the City University of New York Graduate Center, began a faculty position this fall at the University of Tennessee-Chattanooga. She anticipates refining and building upon her Waupaca work once she is fully settled in Chattanooga. —JAS

Stephanie DeVries' evaluation of rising nitrate levels in two Waupaca wells offers city leaders options for resolving the problem.



Fish Tales

The exciting new Fish-o-pedia Packs available through the Wisconsin Water Library provide hands-on learning about Great Lakes fish. The fish tales for kids listed below are an excellent companion.

H IS FOR HOOK: A FISHING ALPHABET

By Judy Young. Chelsea, Mich.: Sleeping Bear Press, 2008.

From A to Z all that is fishing is explained in this illustrated picture book using poetry and prose. Topics include angler, catch and release, fly-fishing, tackle and more.

FISH FACTS

By Geoff Swinney. Gretna, La.: Pelican Publishing Company, 2011.

Did you know that sharks can "see" with electricity or that icefish have blood like antifreeze? This book provides a wealth of information on many forms of aquatic life.

THAT'S PAPA'S WAY

By Kate Banks. N.Y.: Farrar, Strauss and Giroux, 2009.

When a father and child go fishing together, each does certain things his own way, and both have a wonderful day.

A DIFFERENT POND

By Bao Phi. North Mankato, Minn.: Picture Window Books, 2017.

As a young boy, Bao Phi awoke early, hours before his father's long workday began, to fish on the shores of a small pond in Minneapolis. Unlike many other anglers, Bao and his father fished for food, not recreation. Between hope-filled casts, Bao's father told him about a different pond in their homeland of Vietnam.

UGLY FISH

By Kara LaReau. Orlando, Fla.: Harcourt, 2006.

At first Ugly Fish likes being alone in his tank so much that he eats any fish that tries to share it, but when he becomes lonely, he devises a better plan.

Please visit the Wisconsin Water Library online at waterlibrary.aqua.wisc.edu for more information about the library's resources on Great Lakes fish and fisheries.

Anyone in Wisconsin can borrow these books and Fish-o-pedia packs. Just email askwater@aqua.wisc.edu.



Fish-o-pedia



Joseph Tomelleri

What makes a steelhead trout different from a rainbow trout?*

For answers to this and other fishy questions, simply grab the Fish-o-pedia Pack. These new educational packs are filled with materials to help teach students and other groups about Great Lakes fish.

Each pack includes life-size vinyl cutouts of 12 native and non-native Great Lakes fish. The pack also contains cards filled with facts and figures about each species. Another resource included is the book, "The Life of the Great Lakes: A Guide to the Great Lakes Fishery," by Michigan Sea Grant.

Get a sneak peek by downloading the Fish-o-pedia Guide at go.wisc.edu/psvd26. The packs are available by request from your local Great Lakes Sea Grant program. In Wisconsin, the person to contact is Senior Special Librarian Anne Moser, akmoser@aqua.wisc.edu or (608) 262-3069.

The packs were created by Wisconsin Sea Grant with Center for Great Lakes Literacy funding from the Great Lakes Restoration Initiative.

*Answer: Although steelhead and rainbow trout are the same species, steelhead spend most of their time in one of the Great Lakes or the ocean as adults. Rainbows spend their time in rivers or streams. The fish illustrated above is a steelhead.

FEATURED VIDEO

Bonnie Willison / Wisconsin Sea Grant



Watch decoy carver George Schmidt at work in a recent video. One of his hand-carved decoys in the shape of a paddlefish (below).

New Series Gives a Voice to Coastal Stories

go.wisc.edu/97v9et

In songs, videos, novels or poems, nature often takes the role of the main character, a unifier of sorts around which activities and other characters revolve. That's the case with a new video series from Wisconsin Sea Grant, Voices of the Coast.

The Great Lakes waters, tributaries and coastlines are the magnets drawing in people with compelling stories to tell. From ship captains to sportsmen. From scientists to harbormasters. From folk artists to tribal elders. Through short videos, the series offers a way to showcase the people who shape the coast and whose lives are, in turn, shaped by the coast.

Sea Grant's Digital Storyteller Bonnie Willison said, "When Senior Special Librarian Anne Moser first told me about George Schmidt and his esteemed decoys, I immediately knew he was someone I wanted to talk to for the Voices of the Coast series. As someone who has been carving decoys for more than 50 years, George had so many stories to share. His video is a great way to kick off Voices of the Coast, which will provide a unifying picture of the Great Lakes and Great Lakes coasts. I am also excited to keep expanding the series with, for example, stories from a Green Bay conservationist and two Milwaukee women building social justice around water."

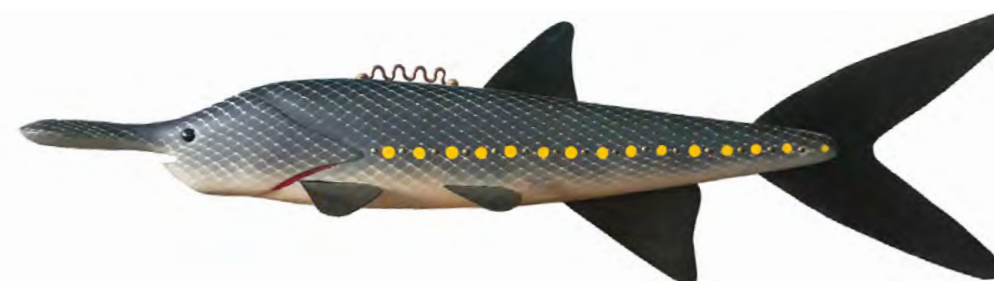
Uplifting is one way to describe the tone of "Voices of the Coast: George Schmidt," go.wisc.edu/97v9et. Schmidt's hand-carved wooden lake sturgeon decoys undoubtedly qualify as folk art, yet with a function.

Growing to more than six feet in length, lake sturgeon are the largest fish found in the Great Lakes. In many parts of the basin, they have disappeared due to overfishing, pollution and habitat loss. Thanks to tremendous conservation efforts, Wisconsin is one place they thrive. So much so that there is a legal harvest season in the state on tributary waterways in the winter.

Fishermen spearing these large fish have used Schmidt's wooden decoys for years, and his infectious conversation about his craft and the camaraderie of the sport are on full display in the five-minute video.

Schmidt's declaration: "It's kinda nice to leave a little something back to this Earth before you pass on. That's the way I look at it. We're either an asset or a deficit for having been born. I guess I'd rather be an asset," will have you nodding in agreement that he is indeed an asset, and a fitting person to share his voice of the coast.

Find all the videos at youtube.com/user/UWASC. — MH



WRI Welcomes Attention to Water

THREE NEW PROJECTS FUNDED IN 2019-20

Between the governor's declaration of a year of clean drinking water and the Wisconsin Assembly Speaker's Task Force on Water Quality, Wisconsin's public officials are devoting concerted attention to water issues in 2019. It's welcomed by the University of Wisconsin Water Resources Institute (WRI), which has worked to address

and the ways in which we interact with water and ecosystems is constantly changing. Continued research on Wisconsin's water resources is required to help inform decision-making that will lead us and future generations down sustainable paths that support our cities, our agricultural systems, our environment and our

data will be used to develop models of snow accumulation and diminishment, variably saturated ground flow and heat transport.

The remaining projects are: "Assessment of the Source and Mobility of Phosphorus in the Hydrologic System in Western Wisconsin." Investigators at the University of Wisconsin-Eau Claire will collaborate with a scientist with the U.S. Geological Survey to better understand the source of phosphorus entering lakes in western Wisconsin and how it is moving through water bodies. This will contribute to effective non-point source contaminant cleanup, lake management and land-use regulation. Water samples will be collected from private and municipal wells, and sediment and water will be tested from Mud Lake in Barron County.

"Microbially-Mediated Oxidation of Trace Element-Bearing Sulfide Minerals in Sandstones of Trempealeau County, WI." Three researchers based at UW-Madison will also draw on the contributions from a researcher at Beloit College to gauge any possible effects on drinking water quality due to both natural and frac sand mining. Microbial-laden groundwater flowing through mined areas could expose oxygen to minerals that then generate acidity and lead to the release of toxic trace elements. The team will approach this exploration by charting the rate of reaction to oxygen in both the presence and absence of natural groundwater microorganisms.



UW-Madison Professor Steve Loheide's team will be studying how the freeze-thaw cycle affects the rate at which groundwater is replenished by surface water.

present and emerging water quality, quantity and management challenges since 1964.

In 2019-20, WRI will fund three new projects and three continuing ones. The research is centered on groundwater, and projects have been selected from proposals submitted in response to a joint solicitation for Wisconsin Groundwater Research and Monitoring projects from the Groundwater Coordinating Council.

Civil and Environmental Engineering Professor Steve Loheide at the University of Wisconsin-Madison said, "Wisconsin is a water-rich state, but its climate, the way we use the land

economy — all of which are very much dependent upon water."

His project, titled "Impact of Changing Snow Cover and Frozen Ground Regimes on Groundwater Recharge," will help decision-makers understand the quantity and flow of groundwater in the future. Loheide's research team will determine the extent to which changes in the freeze-thaw cycle might affect the rate at which groundwater is replenished from surface water moving down from above. They will analyze existing conditions in groundwater and climate and soil temperature that encourage or inhibit this replenishment. That

University of Wisconsin-Madison Department of Civil and Environmental Engineering



ASC bids adieu as Terri Liebmann retires

This summer, staff at the Aquatic Sciences Center (ASC) said a bittersweet goodbye to Terri Liebmann, assistant director for administration. While we're glad she has more time for travel and personal projects, we miss her warm, easygoing personality and wealth of institutional and procedural knowledge.

Said Jen Hauxwell, ASC associate director for research and student engagement, "Since the day I started, Terri has been my go-to person for everything related to how the center operates, from how our state budget works to where in the heck in Goodnight Hall we might have stashed the paper plates for hosting meetings. She knows where everything is, how everything works and who everyone is! She also has a great sense of humor, which will be missed as much as her knowledge about ASC administration."

Liebmann acquired her wealth of knowledge over many years of state service: 37 total with the state of Wisconsin and the last 20 of those at ASC, where her activities covered both Wisconsin Sea Grant and the Water Resources Institute.

Liebmann had led budgeting and grant management, human resources and other administrative areas that kept ASC humming.

A native of Madison, Liebmann now lives about 30 miles southwest of town in Blue Mounds, where she and her husband, Tim, care for more than 200 acres of land. Some is their own, and some acreage they manage for her father-in-law.

She is devoting some of her newfound free time to projects on the property and is also looking forward to upcoming travel to Colorado and Seattle. She and Tim have longer-range plans to visit Spain in the next year or two.

While Liebmann is happy to start this next chapter, ASC has been a major part of her life. "ASC staff had been my family for 20 years," she said. "I truly will miss everybody and the work, because I obviously enjoyed what I did, or I wouldn't have been here for two decades."

High points for Liebmann had included being part of the Sea Grant Fiscal Officers Network and participating in several program reviews conducted by the National Sea Grant Office, including the March 2019 review.

Although program reviews are a lot of work, she said, "It was my favorite time because it pulled all of us staff together to make it happen, and it also pulls in many of our Pls." It was a chance to step back and appreciate the full portfolio of Sea Grant activities, from research and outreach to education and communications, said Liebmann.

On behalf of the entire Aquatic Sciences Center: best of luck, Terri, in all your future endeavors. — JAS

Retirement will give Terri Liebmann, former assistant director for administration, time to travel and pursue other projects.

Travel Wisconsin ranks Kenosha Dunes and its surrounding prairie No. 1 on a list of seven scenic natural wonders in Kenosha County. Unfortunately, these sand dunes located between Milwaukee and Chicago are eroding at an alarming rate due to high water levels in Lake Michigan.



The dunes protect an ecosystem that is home to more than 26 rare, threatened or endangered plants and more than 75 bird species. People enjoy hiking and biking in the area to view the lake and the natural features.

The landowners, which are the Wisconsin Department of Natural Resources (DNR) and We Energies, added large rocks to the shoreline about four decades ago to control erosion, but boulders are no match for the onslaught of rising water levels and large waves created by heavy storms since 2014.

No doubt, erosion has been occurring on the lakeshore since the dunes were formed more than 13,000 years ago when the lake receded. But at the rate it's occurring now, which is 25 feet per year, the water could reach the Chiwaukee Prairie Scientific Natural Area soon if nothing is done. The record-high lake levels add even more urgency to the issue.

Now, a team led by Wisconsin Sea Grant researcher Chin Wu is looking at new solutions to the old problem of erosion. The DNR asked Wu to assess the dune erosion in 2016.

"It turned out, from 2016 to 2018, the area eroded 80 feet," Wu said. "The eroded area just kept extending. The question became, do we want to repeat the rock revetment that was done 40 years ago, or do we want to start with a new design?"

Wu, a professor of professor of civil and environmental engineering at the University of Wisconsin-

stick out of the water around 10 feet when we get low water levels again," Bechle said.

If the project comes to fruition, it would be the first of its kind in the region.

"The submerged sill approach is a really innovative concept," said Bechle. "Having multiple layers at different elevations is something that we've not



Adam Bechle / Wisconsin Sea Grant

Breaking new ground to stop erosion

Current high Lake Michigan water levels and decades of storms have taken a toll on scenic dunes. Sea Grant's Coastal Engineer Adam Bechle is part of a team formulating solutions to arrest the erosion. One approach may be submerged sills to break wave action, along with establishment of a living shoreline.

Madison, said previous studies have shown that building a revetment could erode neighboring properties, so adding more rocks to the shore was out as a solution.

FISHING FOR NEW IDEAS

Instead, the team is looking at constructing multiple submerged sills offshore to break the wave energy, and combining that with establishing vegetation to create a living shoreline that limits erosion.

"The sills would be a series of parallel submerged rock structures that wouldn't necessarily block the waves, but would trip the waves as they come in," said Adam Bechle, Wisconsin Sea Grant's new coastal engineering outreach specialist (see page 12). "As the waves go over these submerged breakwaters, they reduce their energy.

"Now, we still have the issue of water levels. We're exploring the idea of having two or three layers of these submerged sills at different elevations so that they can function at the different water levels we might see, and be a little less visually apparent than a normal emergent breakwater — which might

been aware of elsewhere in the Great Lakes. It could be a good solution to marry with the living shoreline, and do a project that protects the ecosystem and also provides some fish habitat."

As if providing innovative erosion control weren't enough, the sills will be designed with fish in mind.

"The idea is that these structures would be a model for other places in the Great Lakes for shoreline protection, and why not add some features to make them more fish-friendly, or at least create some new habitat for fish?" said Titus Seilheimer, Wisconsin Sea Grant fisheries outreach specialist.

Seilheimer described the lake bed off Kenosha Dunes as fairly flat and open. Adding a reef-like structure could attract fish.

"Potentially, we might see sportfish — things like brown trout might come into these reefs because of the gobies and the alewife. Probably some sunfish species, rock bass, maybe smallmouth and largemouth bass and then yellow perch...might move into these habitats," Seilheimer said.

continued next page >>

Breaking new ground to stop erosion

<< continued from page 9

The team also hopes to create an online GIS database filled with the information gathered during the project so that others could do similar projects around the Great Lakes in the future.

IMPLEMENTING A NATURE-BASED SOLUTION

With funding from the Natural Resources Foundation of Wisconsin and the Fund for Lake Michigan, the project is in the design and analysis phase. The outcome will be construction-ready plans.

Of course, because of the continuing erosion, timing is crucial.

Bechle describes the process: “Our team is focused on getting a design done by the end of next year. Then the challenge is implementation. The team is actively working on finding funds for that. If that’s all ready by the time the design is ready to go, hopefully, things will move quickly.”

Bechle stresses they are looking for a long-term solution that won’t need reconstruction in 40 years. “We definitely want to make sure that we’re doing it right,” he said. “Having a good, nature-based solution for the scientific and natural area is the track that has been chosen so that it provides good protection and restoration for the Kenosha Dunes habitat.”

Team partners include the Wisconsin DNR, Wisconsin Sea Grant, the University of Wisconsin-Milwaukee School of Freshwater Sciences, the University of Wisconsin-Madison Civil and Environmental Engineering Coastal Sustainability Lab, the Wisconsin Coastal Management Program, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the Southeastern Wisconsin Regional Planning Commission, Red Barn Design and Engineering, Geo-Professional Consultants and The Nature Conservancy. —MEZ

Adam Bechle / Wisconsin Sea Grant

Take 5: Water Levels With Adam Bechle

Sea Grant’s Adam Bechle, ASC’s new coastal engineer, is a go-to resource for resiliency issues along Wisconsin’s Great Lakes coastlines. He tackles a timely topic with his five things to know about Great Lakes water levels. The volume of water in the Great Lakes basin is always fluctuating, and, for now, water levels are high.

Which lakes have broken water-level records?

In the spring, the U.S. Army Corps of Engineers forecasted that Lake Superior and Lake Erie might surpass their all-time record high levels during the summer months. Amazingly, Lake Ontario had risen 2 feet from April to May. Records fell for all three lakes. Lakes Michigan and Huron — measured as a single lake because they are connected at the Straits of Mackinac — did not exceed the record water levels of their last high point of 582 feet in 1986, but were high and did come within an inch of per-month records for June.

Why are lake levels rising?

Water supply is measured as the net basin supply, which consists of precipitation onto the lakes and runoff into the lakes minus evaporation. In general, when net basin supply is positive, more water enters the lake than leaves, yielding a rise

in lake levels. A five-year history of the measured net basin supply indicates a consistently positive net basin supply that has driven high lake levels. A wet spring certainly contributed. For example, precipitation in the Lake Michigan basin was above average by 30%. Likewise, nearly the entire Great Lakes watershed received above average precipitation during the 2018-19 winter.

How do high lake levels affect the coast?

High water levels allow erosive waves to reach higher elevations on the shore where they batter shoreline infrastructure and eat away at the base of bluffs and dunes. High water levels can also make coastal flooding in low-lying coastal areas more likely. In ports and harbors, high water can cause operational and safety issues if a large elevation difference exists between vessel and dockage.

Where are water levels headed?

A very slight decrease in water levels is expected throughout the fall and winter as precipitation and runoff into the lakes typically decrease and evaporation from the lakes increases. In an average year, water levels vary seasonally by about one foot from a peak in summer to a low in winter, though every year is different. Water levels would

be expected to begin a seasonal rise again next spring when runoff and precipitation increase. Six-month water level forecasts from the U.S. Army Corps of Engineers project Lake Michigan to remain above the long-term average levels in the near future. These six-month forecasts are compiled considering estimates for future precipitation and runoff into the lake, evaporation from the lake and outflows from the lake.

Where can I go for more information?

go.wisc.edu/c63mow from the University of Michigan provides background on what makes the lakes go up and down.

The U.S. Army Corps’ Great Lakes Information go.wisc.edu/b295k6 page has a tremendous amount of detail on water levels.

go.wisc.edu/qs99kb has links to many resources on dealing with issues related to water level fluctuations. It’s a page maintained by the project team working on a National Oceanic and Atmospheric Administration Coastal Resilience grant, which includes Sea Grant.

OUTREACH

Sea Grant announces new coastal engineer

Andrew Mangham



Meet Wisconsin Sea Grant coastal engineering specialist Adam Bechle at go.wisc.edu/a86813

With Great Lakes water levels at record highs, it's a challenging time to be a coastal engineer, much less to start a coastal engineering job. But Adam Bechle is hitting the ground running (or swimming) in his new position as Wisconsin Sea Grant's coastal engineering outreach specialist, in which he'll be dealing with erosion and flooding issues on the state's Great Lakes shores. He replaces Gene Clark, who retired this summer.

"Gene and I spoke recently and I teased that he picked a time to retire just when things were getting rough," Bechle said. "I'm excited to continue some of the projects he was working on and to add new ones into the mix."

Bechle, who began his new job on June 1, spent his academic career at the University of Wisconsin-Madison Department of Civil and Environmental Engineering, progressing from a bachelor's degree, to his master's and ultimately, a Ph.D. His specialties include digital imaging techniques for measuring coastal process and the occurrence and behavior of meteotsunamis (single wave fronts generated by squalls) on the Great Lakes.

He has worked for Sea Grant and the Wisconsin Coastal Management Program before, as the first J. Philip Keillor Science Policy Fellow in 2016, where he used his technical skills on water issues and received science-policy experiences from resource professionals who served as mentors.

In his new job, Bechle is mentoring the latest Keillor Fellow as well as working on a coastal resilience grant from the National Oceanic and Atmospheric Administration to help communities on Lake Michigan plan for coastal hazards. In addition, he's packaging a ports and harbor marina

asset matrix and dredging cost estimator tool that Clark began so that it can be shared.

"I'm also working with a team on a property owner's guide to protecting your bluff, which looks at different parts of a bluff and identifies issues and opportunities to increase bluff stability," Bechle said. "Also, many property owners and municipalities contact Sea Grant with issues related to coastal engineering. Although I don't have time to work in detail with everyone individually, I'm trying to point them in the right direction and give them resources to look at and things to consider. So far, that's been keeping me busy — there's been a pretty steady stream of people looking for assistance with flooding and erosion."

He is looking forward to picking up on his previous work with meteotsunamis and rip currents.

With Bechle's hire, the coastal engineering position moves from the Lake Superior Field Office in Superior to Madison. The Superior Office recently hired Natalie Chin as a climate and tourism outreach specialist (See our social media for more information about Chin, and expect an article in the next issue of the Chronicle.) Bechle anticipates she will plug into coastal concerns in Superior and pass that information on to him when needed.

Bechle feels like he's come full circle now. He first met Clark in 2007 when Clark spoke in one of his classes. "I didn't know what coastal engineering was or what Sea Grant was back then," Bechle said. "But I remember thinking that Gene really had an interesting job. He knew so much. I never thought I would have his job someday."

Bechle can be contacted at bechle@aqu.wisc.edu or (608) 263-5133.—MEZ



GREAT LAKES, GREAT FISH!

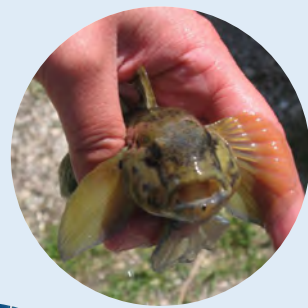
On June 5, more than 1,000 people attended the annual fish fry organized by the National Oceanic and Atmospheric Administration in Washington, D.C., an event that promotes public understanding of aquaculture and commercial fisheries. Ticket buyers sampled a wide variety of delicious fish and seafood, including some from Wisconsin.

Wisconsin Sea Grant Director Jim Hurley and Fisheries Specialist Titus Seilheimer, with help from Steve Summerfelt, chief science officer at Superior Fresh, donned "Eat Wisconsin Fish" aprons to serve hungry attendees. They dished up sustainably farmed Atlantic salmon from Superior Fresh in Hixton and wild-caught Lake Michigan whitefish from Susie Q Fish Co. in Two Rivers. It was a terrific chance to highlight Wisconsin producers who bring healthy food to America's dinner tables.

For more information about the event, visit go.wisc.edu/p89z6j. —JAS

Left to right: Brooke Carney, National Sea Grant Office; Amber Mae Peterson, owner of the Fishmonger's Wife; Titus Seilheimer, Wisconsin Sea Grant (top photo); Steve Summerfelt, Superior Fresh (left); and Jim Hurley, Wisconsin Sea Grant (bottom left photo).

Audrey Maran / National Sea Grant Office



Aquatic Invaders? There's a Plan for That

Some experts theorize the Great Lakes have been continuously subjected to widespread invasions by non-native species since the 1800s — zebra mussels, the spiny waterflea, the viral hemorrhagic septicemia virus, alewives, to name a few.

Clearly, the arrival of these invaders — invaders that can cause massive disruption, spoiling recreational activities, reducing property values, clogging water intake pipes and, overall, running up costs in an effort to control them — is not a new development. What has changed through the years are the ways in which they can be prevented from arriving in the first place, and if they do arrive, how to manage them.

That's where Wisconsin Sea Grant's AIS Specialist Tim Campbell (who also has a partial appointment with the University of Wisconsin-Extension) has stepped in. He spearheaded the first update to Wisconsin's aquatic invasive species (AIS) management plan in 16 years, finalizing it this past summer. go.wisc.edu/lru3g6

"Since the original version of the plan was approved, we have new species that we are concerned with, new pathways of invasion in Wisconsin and new tools to help us manage the undesirable impacts of AIS," Campbell said. "The new plan incorporates these approaches and concerns into our management plan so that we will be using the most effective methods possible to manage AIS."

The state of Wisconsin invests more than \$4 million annually in AIS prevention and management, with some critical funds coming from federal sources, the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency through the Great Lakes Restoration Initiative.

Invasives introduce uncertainty into lakes, rivers, streams and the Great Lakes, creating a cascade of effects. If society can prevent new invasions and existing management dollars are invested wisely, the economy is boosted and everyone's experience with Wisconsin's rich natural resources is improved. — **MH**

Teacher Development Program Adds Focus on Inclusivity

When teachers have access to professional development that inspires them, they find new ways to make science come alive for their students. Through networking with peers, field experiences and more, teachers gain insights and fresh techniques to bring home to their classrooms.

In northeastern Wisconsin, the Wisconsin Maritime Museum in Manitowoc continues to offer an innovative teacher professional development program supported by the National Oceanic and Atmospheric Administration's (NOAA) B-WET grant program, which stands for Bay Watershed Education and Training. B-WET encourages experiential learning for K-12 students, with the goal of increasing understanding and stewardship of local watersheds and ecosystems.

Wisconsin Sea Grant's Fisheries Specialist Titus Seilheimer first became involved with the program about three years ago. He provides content expertise and helps run field experiences for the teachers.

"Since I work in aquatic ecology, and I work with fish, my role has been to provide that ecological and scientific context to the overall program," said Seilheimer.

This has also helped Seilheimer build relationships with area teachers, who often invite him back to their classrooms. In April, he was involved in a beach cleanup along Lake Michigan in Two Rivers. The teacher in charge was a part of the B-WET program, and her sixth-graders had identified marine debris and beach litter as an issue they wanted to tackle.

A beach cleanup can be a great opportunity to teach watershed concepts, said Seilheimer, such as how stormwater outflow can transfer debris like cigarette butts from the streets to the beach.

This year, the museum's B-WET teacher program is continuing, adding a new focus on students with disabilities (physical, emotional or cognitive). In addition to experiences during which the teachers work mostly with each other and content experts, teachers and their students will go on inclusive field trips.

Twenty teachers from the 2016 B-WET grant will transition into the role of mentor teachers, working with newly recruited teachers. Given the focus on accessibility and inclusion in this year's program, the new teachers will either be in special education or teaching in classrooms that have a diverse array of student abilities.

Said Abigail Diaz, director of education and public programs at the museum and the B-WET principal investigator, the inclusion of students with disabilities fills a little-addressed gap in the world of environmental education.

"This is the first B-WET grant that focuses on accessibility, and I'm really glad that NOAA is prioritizing accessibility. Sometimes people with disabilities get overlooked in environmental issues because the environment seems like it's inaccessible to them. I'm thrilled we've been given this funding so we can help empower young people, because they have a voice — no matter their ability level — to be stewards of our environment," Diaz said.

Diaz hopes that this accessibility effort can be replicated in other places. "It's not difficult to create accessible and inclusive programs, but it can be daunting to start. I understand that. Yet I hope we can spread the good word — it just pays you back tenfold," said Diaz.

Diaz is looking forward to another productive year for the B-WET program, as well as joining forces with Seilheimer again.

"Other than being just the coolest guy, he knows everything," she laughed. "He's so great with both kids and adults, and his passion for Great Lakes ecology and fish is just infectious. This project wouldn't be possible without having somebody like Titus involved."

Other partners include Woodland Dunes Nature Center and Preserve, Michigan Sea Grant, the Lakeshore Natural Resource Partnership and the Museum of Science and Industry, Chicago. — **JAS**



Titus Seilheimer / Wisconsin Sea Grant

B-WET federal grants provide teachers with new ideas and resources, including getting students energized to clean up marine debris or offering opportunities for disabled students to be environmental stewards.

Listen to the People of the Sturgeon

Perhaps you've read the book. Now you can listen to the people who made the book, "People of the Sturgeon: Wisconsin's Love Affair with an Ancient Fish," possible. Throughout the process of writing this book about the culture surrounding sturgeon spearing on Lake Winnebago, the authors interviewed 69 community activists, sturgeon spearing enthusiasts, spear and decoy craftsmen and scientific researchers.

The importance of the cultural, social, economic and scientific knowledge captured in these interviews spurred the effort to preserve the audio files as a collection of oral histories. The recordings are available for free listening through the University of Wisconsin-Madison Libraries' Collections (digital.library.wisc.edu/1711.d1/WI.SturgeonPrj).

Short on time? You can listen to abbreviated sound clips from the book on Wisconsin Sea Grant's podcast page: seagrant.wisc.edu/audio/people-of-the-sturgeon.

The oral histories also contributed to two other "People of the Sturgeon" projects: an online story map and an art exhibit. The story map allows users to access a condensed version of the book text online, accompanied by images, oral history audio and interactive maps depicting sturgeon population data (bit.ly/20r7niV).

The inter 2019 art exhibit, a collaboration with the Thelma Sadoff Center for the Arts, tapped into the power of place-based education by bringing "People of the Sturgeon" to the heart of the sturgeon spearing community in Fond du Lac,

Wis. The exhibit included fine art prints, decoys, spears, worldwide memorabilia, audio from the oral histories and a record-sized taxidermied sturgeon. More than 8,000 visitors enjoyed the exhibit while it was open in the winter of 2019, and photos of the exhibit are available online for future enjoyment (bit.ly/2HUCemQ).

"People of the Sturgeon" was written by Wisconsin Sea Grant's Kathleen Kline and Fred Binkowski with help from Ronald Bruch. It was published in 2009 by the Wisconsin Historical Society Press and has captured a dozen state, regional and national prizes. The audio is courtesy of the Oshkosh Public Museum. — **MEZ**



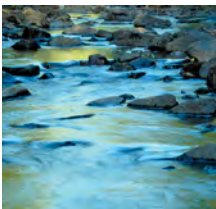
Loved "People of the Sturgeon"? Now you can listen to the full audio interviews or abbreviated sound clips. Also available is a story map and photos of the related art exhibit.

ASC

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Aquatic Sciences Chronicle

a joint newsletter from UW Sea Grant and Water Resources Institutes



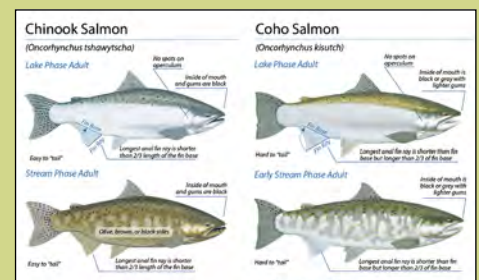
CALENDAR OF EVENTS

OCT. 16-19, 2019
North American Association for Environmental Education
Lexington, Ky.
naaee.org

NOV. 13-14, 2019
Great Lakes Panel on Aquatic Nuisance Species
Ann Arbor, Mich.
glc.org/work/glpan

NOV. 3-7, 2019
AWRA Annual Water Resources Conference
Salt Lake City, Utah
go.wisc.edu/dz35i9

NOV. 23-25, 2019
Wisconsin Association for Floodplain, Stormwater and Coastal Management Conference
Wausau, Wis.
wafscm.org/annual-conference



Hit pay dirt at the Publications site

No pickax is needed to hit the pay dirt of this goldmine, goldmine of water-related information that is. Visit publications at aqua.wisc.edu to find fact sheets, posters and booklets. Most of the material is free to download. One of the newer offerings is a guide to Great Lakes salmon and trout, created by a collaboration of the New York, Michigan, Wisconsin and Illinois-Indiana Sea Grant programs.