2020 issue 4



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### Aquatic Sciences Chronicle

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#### FEATURED WEBSITE



## Websites and Warm-Weather Pursuits

wisconsincleanmarina.org/ go.wisc.edu/sudq7t

Dreaming of warmer days? Although we're perhaps not quite into the teeth of winter — but certainly in the teeth of a pandemic that has been drawing many of us outdoors to mitigate the dangers of indoor exposure to the contagion — new webbased material from Sea Grant puts temperate conditions, and water-based and coastal pursuits, in mind.

First, there is a revamped website for the Wisconsin Clean Marina Program, <u>wisconsincleanmarina.org</u>. Second is a site with resources communities can employ to protect their coastal parks, beaches and marinas, along with all the other local infrastructure, from flooding.

Wisconsin boasts 19 certified clean marinas, businesses that are safer for both workers and customers, with the added and critical benefit of protecting the state's waters. Sea Grant provides training and technical assistance for this voluntary program that means marinas have met federal and state pollution safety laws and gone beyond by adopting practices that prevent fuel spills, mitigate stormwater pollution measures and safely dispose of chemicals and hazardous waste, and more.

The new website, with gorgeous water and boating photos, makes it easy to check out the steps to becoming a certified clean marina and how to make a pledge today. There are 18 marinas that have taken this pledge and additional ones are always welcome.

Coastal communities offer many shoreline recreational opportunities, yet those areas can be vulnerable to flooding. In collaboration with the Wisconsin Department of Health Services, Sea Grant created a <u>Flood Resilience Scorecard</u>. This analytical series of questions and considerations can guide communities in identifying what makes them at risk for flooding and what actions can be taken to increase flood resiliency.

A community could look at flooding through the lenses of environmental, institutional or social parameters, or simply focus on the elements most relevant to its needs. -MH



## **Love the Lakes?** A First-Ever Wisconsin Sea Grant

Great Lakes Champion Award Is in the Works

Motivated by the goal of raising awareness about the importance of the Great Lakes to Wisconsin's culture and economy, Wisconsin Sea Grant will confer the first-ever Great Lakes Champion Award in early 2021. A call for nominations is now open at <u>seagrant.wisc.edu/championaward</u>.

"I am an East Coast transplant, first arriving in Wisconsin more than 35 years ago," said Sea Grant Director Jim Hurley. "I could not be more enamored of the Great Lakes bordering my adopted state. They are the focus of my research on mercury cycling and the object of my appreciation for the beauty, recreation and resources they offer. I know there are potential winners of this award in Wisconsin, and in the wider Great Lakes Basin, who share my passion. We hope to see their names added for consideration for the Wisconsin Sea Grant Great Lakes Champion Award."

### Nominations are due by midnight, Friday, Jan. 16, 2021.

The award will be given every two years, and this first one will be presented during a virtual ceremony on Monday, Feb. 22, 2021.



SEA GRANT INSTITUTE (O WATER RESOURCES INSTITUTE

# **The Secretion Secret**

ne of the barriers to developing an aquaculture industry around yellow perch popular in Wisconsin for its starring role in fish fries — has to do with columnaris

disease, caused by *Flavobacterium columnare*, a naturally occurring bacterium affecting both wild and farmed freshwater fish.

Wisconsin Sea Grant-funded researchers have spent several years gaining a deeper understanding of *F. columnare* and working toward a vaccine that could prevent columnaris disease in farmed fish — and not just yellow perch, but other freshwater species as well.

In Sea Grant's 2020-22 research cycle, professors Mark McBride and Jhonatan Sepulveda Villet of the University of Wisconsin-Milwaukee and David Hunnicutt of St. Norbert College in De Pere, Wis., are joining forces to understand just how *F. columnare* wreaks its damage. "This is one of the top disease-causing organisms for freshwater aquaculture anywhere in the world," said McBride, a microbiologist in UW-Milwaukee's Department of Biological Sciences.

One of his discoveries — made in tandem with a group in Japan approaching the same problem from a different angle — is that many bacteria in the Flavobacterium family have a novel way of secreting proteins out of the cell. *F. columnare's* secretion system is, it seems, a key to combating the disease it causes.

In earlier work that McBride and Hunnicutt conducted together, they found out that *F. columnare's* secretion system secreted at least 40 different proteins from the cell, some of which were suspected to be involved in virulence, though it was not yet possible to determine which of those 40 proteins was the culprit.

Secretion system key to understanding the bacterium causing columnaris disease, a woe for freshwater fish





Left, at the University of Wisconsin-Milwaukee, graduate students Nicole Thunes and Rachel Conrad assist with the research.

The project has also provided learning opportunities for Prof. David Hunnicutt's undergraduates at St. Norbert College in De Pere, right.

On the cover, to make the "rainbow trace" image, researchers took many photographs of the *F. columnare* cells in motion over a 20-second period of time. They then colored each one based on the time it was taken (starting with red at 0 seconds and ending with blue at 20 seconds). The modified mutants (middle panels of A and B) didn't move at all, so all of the colors are overlaid exactly on top of each other, making white.

What they did find, however, was that knocking out the secretion system and creating a "mutant" without it made the bacterium unable to cause disease in fish.

Part of the current research focuses on which of the several dozen proteins secreted are the important ones in causing disease.

The secretion system also performs at least one other critical function: It helps *F. columnare* move, crawling over surfaces with a treadmill-like system. "These bacteria move kind of like a tank," said McBride, "with moving treads along the surface of the cell."

As he summarized, "The secretion machine has two jobs: it secretes proteins out through the cell surface, and it's also the motor that moves those treads along the cell surface. Both may be needed to cause disease in the fish."

Hunnicutt, the St. Norbert biology professor, brings expertise in fish and fish immunology and has known McBride for years, having completed a postdoctoral fellowship in McBride's lab. Experiments for the current Sea Grant project are taking place at both UW-Milwaukee and St. Norbert College.

Sepulveda Villet, an expert on yellow perch aquaculture at UW-Milwaukee's School of Freshwater Sciences, also plays a critical role in this work. In Milwaukee, McBride and Sepulveda Villet have the assistance of graduate and undergraduate students, and in De Pere, this work has proven to be a prime learning opportunity for Hunnicutt's many undergraduates.

Said Hunnicutt, "I have run three immunology lab courses using the vaccine trial as our central project, meaning some-

thing like 70 students have been exposed to the immunology and microbiology of aquaculture almost without knowing it."

Continued Hunnicutt, "A lot of my students are interested in [human] medicine and want to do infectious disease research, but they're undergraduates." Working with fish gives them a safe chance to get their feet wet because none of the diseasecausing systems they encounter in Hunnicutt's lab will cause illness in people.

Funding from the U.S. Department of Agriculture (USDA) is also playing a role in the research because the USDA – like Sea Grant – has an interest in research that aids the U.S. aquaculture industry. With that additional funding, similar experiments will be performed using rainbow trout.

USDA research scientist Brian Shepherd serves as the principal investigator for the rainbow trout work, with McBride as a cooperator, in the agency's terminology.

"The USDA and Sea Grant-funded projects are dovetailing," said McBride. "There's a synergism between them."

That synergy stands to benefit the aquaculture industry broadly, recognizing that there may be differences in how bacteria interact with one type of fish versus another, given the varying temperatures at which fish species grow and other factors.

McBride said, "We need to have our eye on not just one fish species. If we're going to make generalizations that are useful for freshwater aquaculture around the world, we need to have our eye on multiple fish to see where the generalities are in how this bacterium causes disease."—JAS

## wisconsinwaterlibrary

Diverse Literature Belongs in Our Library

Books have the power to inspire and enlighten. Diversity in books, especially in literature published for youth, is essential. All children must see themselves in the pages of the books they read, especially as we inspire and motivate the next generation of Great Lakes and water leaders. The Wisconsin Water Library continues to develop its collection to reflect the diverse members and experiences of a broad community of readers.

AGUA, AGÜITA By Jorge Argueta; illustrated by Felipe Ugalde; translated by Gabriela Baeza Ventura. Houston: Piñata Books, an imprint of Arte Público Press, 2017.

A COOL DRINK OF WATER By Barbara Kerley. Washington, D.C.: National Geographic Society, 2012.

FARMER WILL ALLEN AND THE GROWING TABLE By Jacqueline Briggs Martin; illustrated by Eric-Shabazz Larkin. Bellevue: Readers to Eaters, 2013.

ONE PLASTIC BAG: ISATOU CEESAY AND THE RECYCLING WOMEN OF THE GAMBIA By Miranda Paul; illustrated by Elizabeth Zunon. Minneapolis: Millbrook Press, 2015.

**OVER AND UNDER THE POND** By Kate Messner; illustrated by Christopher Silas Neal. San Francisco: Chronicle Books, 2017.

#### **SCIENCE IS EVERYWHERE: SCIENCE IS FOR**

**EVERYONE** By Jeanette Davis; illustrated by Philbert Washington. Atlanta: Mynd Matters Publishing, 2019.

**THE WATER WALKER** By Joanne Robertson. Toronto: Second Story Press, 2017.

WE ARE WATER PROTECTORS By Carole Lindstrom; illustrated by Michaela Goade. New York: Roaring Brook Press, 2020.

Please visit the Wisconsin Water Library's blog to see more titles on this topic. <u>go.wisc.edu/b4z1vy</u>

Anyone in Wisconsin can borrow these books. Just email <u>askwater@aqua.wisc.edu</u>.

## **Trash Trunk Filled With Learning Treasures**



If you're among the many who are looking for online learning materials for use at home, you might want to check out the Trash Trunk. This new learning kit focuses on trash found in our waterways, otherwise known as marine debris. Its free lessons are applicable for learners at levels kindergarten through adult in both formal and informal educational settings.

Wisconsin Sea Grant Education Outreach Specialist Ginny Carlton explained how the idea originated. "The topic for the trash trunks came from things we were seeing happening across the Great Lakes Basin. Marine debris is an emerging issue. There was consensus among the partners that this would be a worthwhile topic."

Sea Grant programs in Ohio and Michigan, and the National Oceanic and Atmospheric (NOAA) Marine Debris Program joined Wisconsin Sea Grant staff in



creating the trunks as part of their work for the Center for Great Lakes Literacy.

True to form, the team recycled lessons previously created by other educators, picking the best of the best materials about the impact of trash in both fresh and salt waters.

"We used materials from groups like NOAA, the Ocean Conservancy, the Alliance for the Great Lakes and other institutions," Carlton said.

The kit contains an <u>educator's guide</u> with 14 lessons, sturdy informational display cards and supporting materials needed to perform the activities. Those activities are organized into three sections, which address the origins of marine debris, its impacts and what can be done. Educators can select a single lesson or develop a unit using Trash Trunk content, supplemental materials and common classroom supplies.

Wisconsin Sea Grant's Senior Special Librarian and Education Coordinator Anne Moser has been doing marine debris activities with children for a while now. "They absolutely LOVE this topic!" she said. "It's very action-oriented. They can embrace the topic and make changes, especially with their waste and plastic consumption at home, which I think kids find inspiring."

Moser explained that due to COVID-19 quarantining requirements, the trunks are not available in Wisconsin right now but that the curriculum is available online. "If you have a student working at home, there are lessons they can use," Moser said.

For more information about the Trash Trunk and other educational materials, please visit this <u>resources page</u>.

Funding for the trunks came from the Great Lakes Restoration Initiative through the Center for Great Lakes Literacy. – MEZ University of Wisconsin-Madison Professor Eric Roden (right) and geoscience graduate student Lisa Haas discuss the thin, intermittent clay sequences of the Wonewoc Formation. yrite, the mineral commonly known as fools' gold for its luster and yellowish hue, can be found in the sandstone formations of Wisconsin, including in Trempealeau County.

Water Resources Institute-funded researchers are now examining what happens when that

pyrite meets oxygen and microbes deep below the surface, particularly at circumneutral pH, a situation that has not been well understood up to this point. This intermingling could affect groundwater quality.

The research team's two-year project ("Microbially Mediated Oxidation of Trace

## **Do Microbes + Water + M**

Element-Bearing Sulfide Minerals in Sandstones of Trempealeau County, Wisconsin") began in summer 2019.

The team consists of University of Wisconsin-Madison professors Eric Roden and Matt Ginder-Vogel, along with geoscience graduate student Lisa Haas and Beloit College professor zinc and lead — that have the potential to negatively affect groundwater quality.

The researchers believe this reaction is being sped up by the presence of microbes deep below the surface. "We've been working with the possibility that microbes, through their metabolism, can accelerate the reaction of oxygen with pyrite

## inerals = Contamination?

## RESEARCH ON PYRITE OXIDATION AND NATIVE MICROORGANISMS HAS IMPLICATIONS FOR GROUNDWATER QUALITY

Jay Zambito. Zambito was formerly with the <u>Wisconsin Geological and Natural History Survey</u> (WGNHS) and, while there, worked on an <u>earlier WRI-funded study</u> with hydrogeologist Mike Parsen (also at the survey) that <u>established some of the basis</u> for the current study in terms of the presence of pyrite in two geologic units.

The current study focuses on two rock formations that underlie much of the state — the Tunnel City Group and Wonewoc Formation named for the places in Wisconsin where they were first described. In Trempealeau County they are close to, or exposed at, the land surface and, depending on the amount of oxygen in the subsurface, have been observed to possess a notable amount of pyrite.

Roden described it: "In these sandstone formations, the pyrite is present in a state that you might call disseminated; it's basically spread throughout the aquifer sand," with the distributions varying in size and precise location.

What happens is that "when the pyrite in the sandstone is exposed to oxygen in groundwater, it reacts with the oxygen and that causes two things. One is that the mineral gets destroyed, if you will. It becomes oxidized," he said. That results in a lowering of the groundwater's pH. In turn, that increased acidity can lead to the release of toxic trace elements into the groundwater — things such as iron, arsenic, cadmium,

and this is what's crucial — at neutral pH," said Roden.

Ginder-Vogel summarized, "It's the microbes, water and minerals, and it's this really interesting interface that is super dynamic and constantly changing. It's really interesting from a broad groundwater perspective."

#### THE ROLE OF FRAC SAND MINING

The study bears a connection to industrial sand mining, also called frac sand mining, in this part of the state. When companies scrape off material they can't use, known as "overburden," they set it aside in order to get to the sand they seek underneath. They later use the excavated overburden and low-quality sand for reclamation. However, the geologic material that was isolated in the subsurface is now disturbed and exposed to atmospheric levels of oxygen and rain at land surface. If pyrite was present in the rock, it will oxidize.

The team will examine whether this excavation and piling of materials help lead to the release of trace elements as a result of pyrite oxidation, which could have implications for water quality, affecting homeowners in the area. In experiments, the researchers are working with collected samples of overburden and non-valuable geologic material and will be able to compare those with material collected from rock core of the geologic units of interest.

Continued on page 15 >>



#### **PEOPLEPROGRAMNEWS**

## Sharon Moen Wants You to Eat Wisconsin Fish MEET OUR NEW EAT WISCONSIN FISH OUTREACH SPECIALIST

Just as she regularly wrestles 50-pound boxes of clay into her studio to shape into vessels adorned with symbols of nature as part of her artistry-turned-business, Sharon Moen has some molding to do in her role as outreach specialist focused on the <u>Eat Wisconsin Fish</u> initiative.



Ciscoes or herring? Sharon Moen is on the case. Moen may be new to Wisconsin Sea Grant but is far from being new to serving stakeholder needs and immersing herself in Great Lakes issues after 21 years with Minnesota Sea Grant. Moen will be fashioning the parts of the existing initiative into new forms. She'll fire them into new tools to serve commercial fishermen, charter fishermen, processors and aquaculture operators, as well as educating consumers, retailers and those in the culinary world about the benefits of local, healthy and delicious Wisconsin fish.

This is all, of course, to be done against the backdrop of a once-in-lifetime pandemic that is affecting businesses of all types—particularly hitting hard those tied to the fish supply chain—and reaching into family homes where people are making food decisions in a disrupted world.

A Washington Post story from late spring noted that with restaurants closed, the nation's fisheries have reported sales slumps as high as 95 percent. Americans spend more than twice as much on seafood in restaurants than they do at home. Some species are considered more luxury choices and with the economic hit from COVID-19 perhaps grocery budgets aren't putting fish on the household menu.

Moen was Michigan Sea Grant's senior science communicator prior to her departure in April of this year.

"It's an honor to be a public servant again," said Moen. "The pandemic has revealed many things about the U.S., including how easily our food systems can be disrupted. I'm ready to channel creativity and moxie toward helping people value Wisconsin's commercial fisheries and fishproducing operations in ways that support jobs, the state's food independence, the environment and human health. I'm excited to be joining a great team of Sea Grant's staff and researchers on this important project."

Moen will tackle a needs assessment of various sectors to inform a strategic plan on how to best proceed to address challenges, through webinars, one-on-one communication, social media and the Eat Wisconsin Fish website. She'll rely on some previously funded Sea Grant research on fish farmers, as well as more on consumer perception of aquaculture.

"We are really excited about all the relevant experience that Sharon brings to Wisconsin Sea Grant. She has worked on past successful outreach and communications campaigns to promote farm-raised and wild-caught fish, including chef competitions and public tastings," Sea Grant Assistant Director for Extension David Hart said. "Sharon is a gifted writer and contributed to a strategic plan for aquaculture in Minnesota. She has extensive connections throughout the Sea Grant network and will be able to hit the ground running."

About that pottery, in her off hours, Moen will continue to create objects of utility and beauty, as well as embracing macro projects. She is currently making 140 specialty tiles for a kachelofen, a German masonry stove that will heat a vacation home on one of Wisconsin's many lakes. This proves, once more, Moen's skill at merging two careers and two passions from the clay of the Earth and the wonders of water. –MH





## **Carp Sampling Training**

*Training videos for fisheries managers cover techniques for sampling invasive carp species* 

#### go.wisc.edu/k1f0jq

A series of online videos for fisheries managers who need to sample for invasive carp species like bighead and silver carp is now available. This unique resource — a collection of 17 videos that can be watched on <u>YouTube</u> — grew out of a workshop that took place in spring 2019 at Lake Barkley State Resort Park in Kentucky.

The partners behind the workshop and video series are the Mississippi River Basin Panel on Aquatic Nuisance Species (MRBP), Wisconsin Sea Grant, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the Kentucky Department of Fish and Wildlife Resources.

The MRBP funded the event, and Wisconsin Sea Grant Video Producer Bonnie Willison filmed on location in Kentucky to create the training videos, working in cooperation with Sea Grant Aquatic Invasive Species Outreach Specialist Tim Campbell. Campbell also serves as the Wisconsin representative on the MRBP.

Said Campbell, "This workshop was a one-ofa-kind interagency effort to train people in the methods needed to sample for bighead and silver carp." Those methods can be different from standard ones familiar to most U.S. fisheries professionals. For example, different gear may be needed, and the video series covers different types of gear and how to use it, among other topics.

The effort as a whole is aimed at more effective management of these invasive species in the waters of the Mississippi River basin, a vast watershed covering about 40% of the continental U.S. The methods demonstrated at the workshop can be used for a combination of monitoring (to know where the fish are) and control (to remove the unwanted species).

Bighead and silver carp are problematic because they eat a lot, grow rapidly and become quite large, with silver carp exceeding 60 lbs. and bighead carp exceeding 100 lbs. If left unchecked, the fish can become abundant and make recreational uses of lakes and rivers difficult due to their sheer numbers. They also pose a significant threat to the Great Lakes, where they are not yet established.

"I'm so glad that workshop organizers had the forethought to capture this event so this knowledge could be preserved and shared with more people," Campbell said.

That forethought has paid off, with the videos being used throughout the U.S., and even Europe. Fisheries Biologist Jeff Koch of the Kansas Department of Wildlife, Parks and Tourism has expressed interest in using the videos with fisheries managers in his state, where there is a need for Asian carp removal on the Kansas River. And in Europe, Hungary is dealing with a burgeoning silver carp population in some rivers. Duane Chapman of the U.S. Geological Survey shared the videos with Hungarian colleagues, who found them highly useful as a training resource.

Questions may be directed to Campbell at 608-263-3259 or tim.campbell@wisc.edu.-JAS

## **Research, Partnerships and Equitable Access to Pools** A FIGHT TO KEEP MILWAUKEE POOL OPEN USES SEA GRANT DATA AND STRONG PARTNERSHIPS

In 2018, a group of children and their parents gathered in a hallway in the Milwaukee County Courthouse, holding signs and chanting. The signs said, "Closing our pool is mean" and "Don't drown us in bureaucracy!"

They were protesting the proposed closure of the Schulz Aquatic Center, a relatively new facility in their Lincoln Park neighborhood that had been targeted due to county budget shortages. Many of the protesters were Black, which reflected the makeup of their neighborhood on Milwaukee's north side.

Cheryl Bledsoe, an assistant principal at the time at Cross Trainers Academy and a board member of the Friends of Lincoln Park, announced to the <u>news video cameras</u> at the protest, "The pool should remain open so our current Black youths have the opportunity to receive swimming lessons at that pool...I don't think it's fair that since 1995, five public pools on the north side have been closed...Lincoln Park pool will not close under my watch."

The data behind Bledsoe's statement about the number of pool closures came from a mapping project undertaken by Deidre Peroff, Wisconsin Sea Grant's social science outreach specialist in Milwaukee. The interactive Google Earth map she developed with <u>Reflo</u>, a local nonprofit, provided pivotal information, which, when brought to light by the friends group, ultimately helped convince the Milwaukee County Board to keep the pool open and make their budget cuts elsewhere.

"Basically, we looked at where swimming pools are and where they have been historically, all the way back to the 1930s," Peroff said. "What the map indicated pretty clearly is they're mostly closing in the north side of the city, which is a predominantly Black community."

Peroff said she started the mapping project as part of her duties as co-chair of an education and recreation committee of Milwaukee Water Commons, a group that's working to make Milwaukee a model water city. "The two main goals of that initiative were that every child and adult in Milwaukee would have meaningful water experiences and to launch a comprehensive effort to change culture around swimming and improve access to swimming facilities," Peroff said.

The committee gathered various Milwaukee organizations together to discuss how to accomplish these goals and received an earful about past efforts that had failed due to socio-cultural, financial, historical, political and even transportation barriers.

Peroff said that myths about Black people and swimming, combined with a long history of segregation around swimming are hard to overcome.

Pool access for Black communities is a vital issue because, according to the USA Swimming Foundation (2017), 64% of Black children have no or low swimming ability. According to the Centers for Disease Control and Prevention, this may be why Black children, without regard to age or income, are up to 5.5 times more likely to drown than white children.

David Thomas, board secretary for the Friends of Lincoln Park, said the timing was fortunate for their information needs in fighting the pool closure. "When all this hit the fan and they announced the pool closing, Deidre had already started this research. It was a very fortunate chain of events that the research was already going on."

Bledsoe, who is Black, said she learned how to swim at a previous pool in Lincoln Park. She said the Schulz Aquatic Center closure issue was an opportunity for her students to learn how to peacefully advocate for their community. It showed them that public officials "aren't untouchable. You can talk to them, you can call them. Their information is available."

She said their successful protest was about more than just saving the pool. It helped build the

youths' confidence and self-esteem. "There were lives changed as a result of that, and people fighting for something very meaningful."

Bledsoe's own parents were so proud of their daughter's role in keeping the aquatic center open, they framed a copy of the "Milwaukee Journal Sentinel" newspaper story, displaying it in their living room.

Peroff credits the Friends group's strong community relationships for their success. They were able to call on people who were already invested in the park and cared about the aquatic center. "That was one reason they were able to move so quickly, and then also use the map and some other data to tell the story they needed."

A spin-off project, undertaken in 2019, had Peroff looking at the impact of swimming programs on underserved communities in Milwaukee. She hired EmilyTolliver, a professional master's student, to interview seven swimming organizations about how they address the issue of diversity and access to swimming resources in their programming.

She is still analyzing the data but said one thing is coming out clearly. "We found that the programs that were more successful in being diverse said the best thing was having African American or Black role models — teachers or lifeguards or staff — who are part of the swimming program." She said these programs worked extra hard to recruit people of color to be part of their organizations.

Peroff said addressing these difficult issues is satisfying, but they are complex. "It's not like one approach is going to fix any problem. We have to understand the barriers at a much deeper level." -MEZ







## **East River Watershed study to** address flooding and pollution

In March 2019, a massive snowmelt combined with heavy rain over frozen ground disrupted lives and flooded homes along the East River near and in Green Bay. A total of 50 homes were damaged and then condemned.

A new partnership that includes Wisconsin Sea Grant seeks to address conditions that caused the flooding and work with communities within the East River Watershed to increase their resiliency to such events. Other project partners include NEW Water (the brand of the Green Bay Metropolitan Sewerage District) and the Nature Conservancy. The communities include Brown, Calumet and Manitowoc counties, the cities of Green Bay and De Pere, the villages of Allouez and Bellevue, and the towns of Ledgeview, Rockland, Wrightstown and Holland.

Julia Noordyk, Wisconsin Sea Grant's water quality and coastal communities outreach specialist, explained that although this formalized partnership is new, the project partners often work individually with these communities.

"One thing that's unique is that we want to work within the watershed and not just within municipality boundaries or county borders," Noordyk said. "Working beyond their borders is very challenging for local governments. So the partnership between NEW Water, the Nature Conservancy and Sea Grant is really to help provide that coordinating capacity and bring together those communities that are being affected by flooding and water quality issues to help them learn how to move forward."

The year-and-a-half-long project, which was recently funded for \$50,000 by the Wisconsin Coastal Management Program and \$123,000 by the Fund for Lake Michigan consists of four parts. The first is an East River flood study. Noordyk explained that this will involve development of a hydrologic computer model to understand current and future flood risk for the watershed. Sea Grant's Coastal Engineer Adam Bechle will take the lead on that. He will work with Chin Wu, professor in the department of civil and environmental engineering at the

University of Wisconsin-Madison, to develop the hydrologic model.

Noordyk said the East River is a major tributary to the Fox River, which flows into the bay of Green Bay. Besides the flooding risk, the East River provides the highest load of sediment and unwanted nutrients to the bay, which contributes to poor water quality and clarity, and toxic bluegreen algae blooms.

"The upper parts of the watershed are dominated by agriculture. In the lower parts, it's more urban and developed suburban areas," Noordyk said. The clay soils and compacted land in the upper watershed contribute a lot of agricultural pollution and excess water runoff. Once this water reaches the paved surfaces in the urban areas that were developed over floodplains and have outdated and aging stormwater infrastructure, it can cause flooding issues. Warmer winters are compounding the problem, with more frequent and intense rainstorms resulting from a changing climate in the region.

The project's second part involves formation of an East River Watershed Resilience Community of Practice. This will be facilitated by an East River resiliency fellow who has been hired by the Nature Conservancy with Noordyk's guidance. Through regular meetings, the coordinator will help build knowledge and relationships among local officials and staff, practitioners, scientists, NGOs and outreach specialists in the watershed.

The third part is development of a communitybased watershed resilience framework. Noordyk and the resilience coordinator will work with the communities to draft the vision, goals and nearterm actions for building community capacity and flooding resilience.

David Hart, Wisconsin Sea Grant's assistant director for extension, will lead the final part of the project, which involves working with the UW-Madison Cartography Lab to create interactive maps to communicate the flood study's findings and recommendations to the communities and partners involved.-MEZ



## **Pyrite Oxidation Research**

#### Continued from page 9 >>

Haas, the graduate student, is running the lab experiments. A native of Mount Horeb, she completed her bachelor's degree in the geoscience department in 2016 and then spent a few years with the WGNHS before beginning graduate school. As an undergraduate, she served as a research assistant to Zambito and Parsen on the earlier, related study.

For the current project, she is wrapping up the first set of experiments capturing pyrite oxidation and subsequent metal release from subsurface rock samples of the Tunnel City Group and Wonewoc Formation in unfiltered groundwater samples with the native aquifer microorganisms — the microorganisms thought to be accelerating the pyrite oxidation reaction.

As Haas described the process, "What we did is collect groundwater with some of those native microorganisms, and I put them in a vial and monitored chemical compounds that are produced as a result of this mineral dissolving and found that, with the native microbial communities, pyrite will dissolve faster than abiotically. So microorganisms are...significant drivers to this reaction."

The next set of experiments will investigate pyrite oxidation inTunnel City Group overburden and unprocessed sand from the Wonewoc Formation as described previously.

#### **A KIND OF UNIVERSALITY**

While this experimental, analytical study is not designed to survey impacts to groundwater or surface water in Trempealeau County, it lays a foundation for possible future work.

"Our findings have a kind of universality," said Roden. "Microbes are everywhere. And whatever we find, I can guarantee that that would apply in other environments where the lithology and also the hydrology were similar... All the details of what happens where on the landscape are determined by geology, but the microbes and the chemistry are always there."

Ginder-Vogel echoed that thought: "These are reactions that are occurring everywhere. [Frac sand] mining may accelerate some of the reactions, and that's where fundamental types of science — and what Eric and I do — comes in. We can understand these reactions and start to think about what types of processes might push them one way or push them another way, and then bring in some smart hydrologists to help us model what actually happens."—JAS



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#### **Aquatic Sciences Chronicle**

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### **The Science of Giving**

For more than 50 years, the University of Wisconsin Water Resources Institute and the Sea Grant program have been supporting water science that applies to the waters of the Badger State. As you consider your year-end giving, we hope you will consider giving to science — water science.



#### **Check Online for Calendar Updates**

Due to the disruption caused by the spread of coronavirus and public health guidelines to maintain social distancing, large public meetings focused on water science have been postponed or outright cancelled.

Check the websites of organizations you are interested in for updates regarding scheduling. For the latest on Sea Grant and University of Wisconsin Water Resources Institute functions and other news, visit <u>seagrant.wisc.edu</u> or <u>wri.wisc.edu</u> or follow our social media channels.

**On the front cover:** The Type IX Secretion System Is Required for Virulence of the Fish Pathogen Flavobacterium psychrophilum. Paul Barbier, Tatiana Rochat, Haitham H. Mohammed, Gregory D. Wiens, Jean-François Bernardet, David Halpern, Eric Duchaud, Mark J. McBride. DOI: 10.1128/AEM.00799-20

