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LIMNOLOGY NEWS

News for Alumni and Friends of the Center for Limnology

Fall 2024

Science, Scuba and Summer Vibes at Trout Lake Station

Read more on pages 4-5



UW-Madison student Marin Danz looks through a viewing scope to survey aquatic vegetation. *Photo: Bryce Richter*



Photo: Jeff Miller



2024 has been an especially eventful year at the Center for Limnology (CFL). A key highlight was the [Trout Lake Station 100-year anniversary celebration](#) in early June. Nearly 150 Trout Lake Station friends and alumni 'came home' for the event – a full weekend of talks, receptions, and activities to celebrate the legacy of our beloved field station. It was a wonderful opportunity to reconnect with old friends, and to make new friends as well. For me, the event highlighted the profound impact that Trout Lake has had on the careers and lives of those who have worked and lived there. It was also an opportunity to look forward as Trout Lake Station charts a path for expanding its research capabilities and its engagement with local communities in Wisconsin's Northwoods.

Immediately following the Trout Lake event, Madison played host to the annual meeting of the Association for the Sciences of Limnology and Oceanography (ASLO). Associate professor [Grace Wilkinson](#) and I served as co-chairs of the meeting. We were delighted to be able to host roughly 800 aquatic scientists from 38 countries for a diverse and

exciting scientific program. And CFLers were exceedingly well represented in the program. In addition to all of the talks given and posters presented by current faculty and students, dozens of CFL alumni made it back to Madison for the meeting, and many were able to swing by the reception we hosted at the Hasler Lab. Two of the invited plenary speakers were CFL alumni (Stephanie Quinn-Davidson and Elena Bennett). The CFL was also well represented in the ASLO awards– associate professor Hilary Dugan won the [Yentsch-Schindler Award](#), while research professor Paul Hanson was recipient of the [Martin Award](#). Congrats to Hilary and Paul!

So many other things are going on – fortunately we have a whole newsletter to cover it! We are grateful for your support and engagement, and we look forward to hearing from you in the coming year and seeing what 2025 brings!

[Jake Vander Zanden](#)

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Limnology News

Three Years In, the Midwest Climate Adaptation Science Center is Already Informing Management Approaches to Climate Impacts

by Adam Hinterthuer



Water samples collected during an unprecedented bluegreen algae bloom in Lake Superior in 2018.
Photo: Brenda LaFrancois, National Park Service

In the fall of 2021, the U.S. Department of the Interior announced the creation of the ninth, and final, Climate Adaptation Science Center (CASC). The newly formed center, dubbed Midwest CASC, launched a collaboration among universities and other partners across eight Midwestern states.

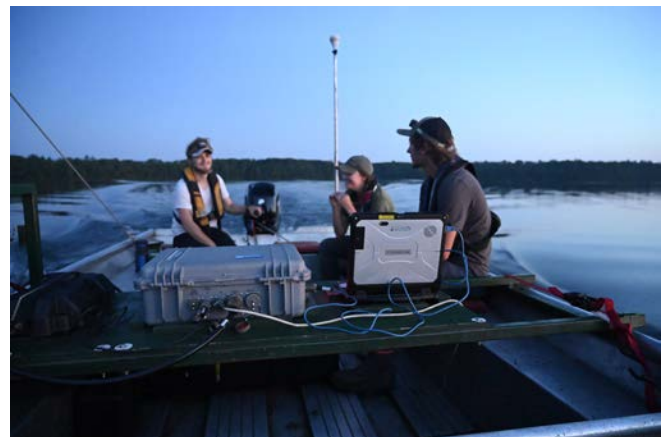
Secretary of the Interior, Deb Haaland, extolled the virtues of the new [Midwest Climate Adaptation Science Center](#), saying that it “better positions us to mitigate climate impacts while focusing needed attention to Tribal and state resources that are particularly vulnerable to climate change.”

The goal, says Center for Limnology (CFL) director [Jake Vander Zanden](#) was to foster “science aimed to inform this fundamental challenge we have, which is adapting to climate change. There is a need for research in that area and it needs to be translated rapidly into how we manage ecosystems.”

Now, three years into this partnership, Midwest CASC is [producing results](#). Member organizations have authored dozens of scientific publications on everything from conservation efforts for species like walleye, Monarch butterflies and Blanding’s turtles to climate impacts on lake surface temperatures, grassland management and forest nurseries. And, to fully fulfill their mission, Midwest CASC partners routinely conduct trainings on best management practices and participate in other events, like a recent knowledge exchange workshop with the Lac du Flambeau Band of Lake Superior Chippewa.

Former CFL graduate student [Joe Mrnak](#) is now a research scientist with the Wisconsin Department of Natural Resources (WDNR) where he still participates in Midwest CASC research. As a graduate student, Mrnak was involved in a project to try to help cisco, a native fish species, reestablish their “niche” in warming lake habitats. By focusing on variables that fisheries managers could control, like removing invasive rainbow smelt that were negatively impacting cisco, Mrnak and his team hoped to build cisco resilience to bigger climate impacts they couldn’t control.

Mrnak hopes to help shift fisheries management paradigms from a “single species” focus to one that considered species interactions, ecosystem changes and other variables to produce a more holistic form of resource management. In other words, as he said in [Trout Lake Station’s 2022 newsletter](#), the goal was to “find a better way to manage a fishery.”



Joe Mrnak drives his crew out for an evening collecting data on fish populations on Sparkling Lake.
Photo: Audrey Hoey Kummerow

Mrnak’s research is just one example of Midwest CASC helping to change the way we understand and manage our natural resources, says Midwest CASC communications director, [Jess Del Fiacco](#).

Del Fiacco highlights a number of CFL-connected projects, like CFL associate professor [Hilary Dugan](#)’s work on the appearance of more frequent bluegreen algae blooms in Lake Superior, and the “Bright Spots” project that is co-led by associate professor [Olaf Jensen](#), CFL research scientist [Zach Feiner](#), and graduate student [Quinn Smith](#), that strives to identify climate “refuges” for struggling walleye populations.



“We’re a relatively new center,” Del Fiacco says, “so in general, I’m excited to watch our network grow in the coming years and to see our research impact management practices.” Already, she says, examples of the work the CFL is doing as a Midwest CASC partner shows that the center is well on its way to fulfilling its mission to “deliver science to help fish, water, wildlife, land, and people adapt to a changing climate.”

Quinn Smith (left) and Jack Abel (right) scuba diving on Escanaba Lake.



Science, Scuba and Summer Vibes at Trout Lake Station

by Chris Barncard

This article was originally published by University Communications; it has been edited for length. Photos by Bryce Richter. Read the [full article](#).

For 100 years, freshwater scientists from around the world have used the University of Wisconsin–Madison’s [Trout Lake Station](#) (TLS) as a home base while toiling in, on and around the lakes of northern Wisconsin. But to the outside observer, the toughest part of summer field work at TLS just might be making it look like ... work.

“It is crazy that we get to work in this environment,” says [Quinn Smith](#), a UW–Madison graduate student studying walleye, one of the state’s most iconic sportfish. “We’re so lucky to have this place.”

Smith’s arms are stretched wide over the deepest part of undeveloped Escanaba Lake, where he and Jack Abel, a University of Minnesota undergrad, have just finished their weekly data collection of lake conditions like temperature and water clarity.

A curious, red-eyed loon has been quietly shadowing their boat. Purple spikes of blooming pickerelweed wave in the breeze. Clouds pass one by one across the sun, turning the lake’s

surface from blue to green and back. In such an idyllic setting, you could mistake this research for recreation.

“Well, in some cases, I do literally get paid to fish,” says Abel of his work.

Later, the pair don about 60 pounds of scuba gear each and try to look not entirely uncool as they heave over the side of Micropterus to perform what amounts to underwater window-washing. Stretched along the murky lake bottom are an array of sensors keeping constant tabs on the amount of dissolved oxygen available to Escanaba Lake’s various living things.

“There’s always algae growing on the surface of the sensors, and the algae absorbs CO₂ and releases oxygen. That could really mess with our data,” says Smith, holding a torpedo-shaped sensor in one hand and a tiny scrap of cloth in the other. “So, we’re down there every week with a little piece of towel or sponge, carefully wiping these sensors clean to make sure we’re getting good data.”

“This is what science looks like, sometimes,” he shrugs. “Except we can barely see anything down there.”



Carol Warden, researcher at Trout Lake Station, collects data on fish type, size and weight before releasing them back into Trout Lake.

As petite as the cleaning cloth and sensor window may be, the scientific research happening at TLS is no small thing.

For more than 40 years, Trout Lake and six other lakes within a short, trailered-boat drive of each other have served as the [North Temperate Lakes](#) (NTL) site of the National Science Foundation's [Long Term Ecological Research Network](#) (LTER).

Across the United States, LTER ties together decades of observations and research at 27 sites representing a broad range of ecosystems – from coral reefs to desert to the Arctic to urban neighborhoods and, of course, the lakes of Wisconsin's Northwoods. The nationwide network is a resource for an equally broad range of environmental science.

"Our data gets used by people all over the world," says UW-Madison research specialist [Paul Schramm](#), who has worked at TLS surveying fish populations and aquatic plants since 2012. "Not everyone can get here, but what's going on in these lakes can still be represented in their work."

Trout Lake has its own culture, stretching back to its founding in the 1920s by limnology pioneers like [E.A. Birge](#) and [Chancey Juday](#).

Many of the students that seasonally fill out the station's staff of about 40 (not to mention visiting scientists from many other universities) live on site in a gaggle of buildings originally built on the opposite side of the lake. They were hauled across winter ice on skis when the university acquired the property on the southern shore.

There are touches of summer camp. There's a raft to swim to, Smith's weekly homemade pizza night and a fire pit down by the dock that stays busy in the evenings.

And the station is growing. A building under construction will serve as a winter workshop with a makerspace and more room for staff to teach clinics on water quality sensors – events that help community organizations like lake associations understand the benefits of building and deploying their own, relatively inexpensive equipment for monitoring their neighborhood waters. Ideally, those sensors could also be tied into LTER's network, adding to its reach and pool of data.

Not that the buoys would replace any scientists, who just keep coming back each summer for another field season at Trout Lake.

"When I'm at the station, I'm either in the field, at work, making food or asleep," Smith says. "But it's hard to think of a better place to be."



UW-Madison undergrads Eliana Cook (left) and Marin Danz (right) collect water and vegetation data as part of a wild rice study at Allequash Lake near Trout Lake Station.



Jack Abel works with Quinn Smith to collect and test water samples at Escanaba Lake, near Trout Lake Station.

Peter and Paul Lakes, shown here, have been the site of whole-lake experiments for decades.
Photo: Danny Syzdlowski



Checking in on the Cascade Project After (Almost) 40 Years

by Adam Hinterthuer

In 1985, a [landmark paper](#) in the journal, *BioScience* helped broaden horizons in the field of aquatic ecology and led to a series of whole-lake experiments conducted by Center for Limnology (CFL) researchers on lakes within the University of Notre Dame's Environmental Research Center ([UNDERC](#)) along the borders of northern Wisconsin and Michigan's Upper Peninsula. Not only did the paper explore concepts like top-down impacts on aquatic food webs and the idea of managing lakes by manipulating fish populations, it also launched an ambitious research collaboration that continues to this day.

Named "Cascade" the project set out to use the unique opportunity afforded by UNDERC lakes to conduct a series of long-term, whole-lake experiments to answer questions about things like food web structure, the impacts of excess nutrients and how our lakes are changing over time. The goal was to produce actionable science - research that could lead to new knowledge and methods for resource managers tasked with conserving our invaluable freshwaters.

CFL director emeritus [Steve Carpenter](#), a founder of the project and lead author of the *BioScience* study, remembers the excitement behind the work they were doing. "Ecosystem experiments are a sure-fire path to novel and interesting results," he says and the ability to use lakes at UNDERC, especially the ecologically famous Peter and Paul Lakes, enabled the team of researchers to test all sorts of hypotheses. Carpenter likes to compare the ecological sciences to a "four-legged table" held up by whole-lake experiments, long-term data, cross-landscape comparisons and modeling. Cascade gave limnologists rare access to the whole-lake experiment part of that equation.

This summer, CFL graduate student [Danny Syzdlowski](#) continued the Cascade legacy by, well, dyeing a lake blue. Algae blooms are caused by a complex combination of factors, Syzdlowski explains, which is why he helped devise a whole-lake manipulation using a non-toxic dye called Aquashade. "Algae need light to grow, so we wanted to see if by blocking out that light we could change the resilience of the lake and make it harder for algae blooms to happen," he says.

Unfortunately, Syzdlowski and his summer undergraduate field technician encountered an unusually stormy summer this year and their dye additions kept getting flushed out by rains. The good news, though, is that, just like every summer since 1985, researchers will be back out at the Cascade lakes next field season and can "try again to get more definitive results," he says.



UW-Madison undergrad Zoe Stansbury gets ready to conduct an experiment and dye the lake blue. Photo: Danny Syzdlowski

The ability to keep long-term research projects going through different challenges is a key component of the Cascade project, says associate professor [Grace Wilkinson](#). Work like Syzdlowski's may someday provide critical insight into making informed decisions about how to best take care of our fresh waters. "The combination of accelerating climate change interacting with changes in land use, land cover, and [fishing] harvest by humans is leading to a higher chance of abrupt ecological change," Wilkinson says. And those changes can have "profound" consequences for both human and environmental well-being. "Our current experiment is an effort to move 'resilience' as a concept out of our textbooks and into the toolbox for policy and management," she says.



During her first field season as a PhD student in 2011, Grace Wilkinson (left) had her own experiences with whole-lake dye experiments for the Cascade project. Photo: Grace Wilkinson

Wilkinson is now the lead researcher on the Cascade project and says she's looking forward to leading it into the future. "I'm excited to carry on the legacy of whole-lake experiments in Peter and Paul Lakes," she says, adding that she hopes the project grows to involve new collaborations that will help researchers "tackle pressing questions about the response and management of lakes in an era of unprecedented global change."

CFL Hosts Association for the Sciences of Limnology and Oceanography

by Adam Hinterthuer

This June, more than 800 aquatic scientists from 38 different countries gathered at the Monona Terrace Convention Center for the annual conference of the Association for the Sciences of Limnology and Oceanography (ASLO).

CFL director [Jake Vander Zanden](#) and associate professor [Grace Wilkinson](#) served as co-chairs of the event and the CFL was well-represented throughout the week.

Two of the invited plenary speakers were CFL alumni. Dozens of faculty, postdocs and students gave talks and presented posters. CFL director emeritus [Steve Carpenter](#) was honored with a tribute session titled "From Phosphorus to Fish: Celebrating the Free-ranging Career of Steve Carpenter."



Jake and Grace welcome ASLO attendees to Madison in the opening session.



ASLO was a chance for current and former CFLers to reconnect – like these past and present members of the Dugan Lab.

And two CFL scientists received prestigious ASLO awards, with associate professor Hilary Dugan receiving the [Yentsch-Schindler Award](#) and research professor Paul Hanson the [Martin Award](#), for achievements in the field of freshwater research.

Even though the week was punctuated with stormy weather, the rain couldn't dampen spirits. Several dozen conference-goers trekked across the isthmus for a reception in the Hasler Lab boat slip and the dancefloor was full for Madison disco band V05, even though the weather moved the party indoors.

The Center for Limnology Gets Salty! by Gretchen Gerrish



UW students (left to right) Marissa Faulkner, Kymberly Coolidge, and Remi Cooper teaming up to snorkel survey fish abundance along established long-term transects.

While the CFL is best known for its freshwater focus, the salt, sun, and diverse coral habitats of Florida are now a welcome winter reprieve for instructors and students looking to explore the marine sciences.

Starting in 2022, associate professor [Olaf Jensen](#) and Trout Lake Station (TLS) director [Gretchen Gerrish](#) partnered with Integrative Biology assistant professor [Robert Johnson](#) to develop [Field Marine Biology](#), a two-week Integrative Biology course during the January winterim session. UW students in environmental fields of study join the team of instructors off the Florida Keys as they learn about research that spans the marine tree of life.

Jensen studies the world's fisheries, considering how cultural harvest and fishing practices drive dynamics at local to global scales. Johnson evaluates ecological interactions in seagrass meadows, emphasizing how sea turtle grazing and climate change affect these coastal habitats.

Gerrish explores evolutionary questions about [bioluminescent marine ostracods](#)

speciation and reproductive behaviors in a unique Caribbean group of [bioluminescent marine ostracods](#) who conduct firefly-like displays in shallow coral reef systems.

Week one of the course is a water-soaked launch into snorkeling. Students swim through all different types of marine habitats including seagrass meadows, mangrove islands, coral reefs, man made rock walls, and artificial reef structures. Students keep a daily field journal capturing lists and observations of all the creatures and behaviors observed. Artistic, eloquent, reflective, empirical; submitted field journals tell of personal learning journeys and demonstrate the value of experiential immersive hands-on course work.

Kymberly Coolidge, a recent UW graduate and CFL field technician who participated in 2024 reflects that "the course was a great way to dive deeper into marine biology and to get hands-on experience in aquatic field techniques. I met so many great people and was able to see the organisms we were learning about up close!"

In week two, students work in small groups to develop research questions, design methods, collect data, and report their findings. Things often don't go as planned and students are often surprised. But they learn that scientific success is stepping through the process with an open mind, rejecting and supporting hypotheses, and letting the organisms and environment teach you through those interactions and outcomes.

"The Florida field course was by far THE BEST learning experience of my life," writes 2022 participant, Jumana Tanner. "I not only got to see myself grow as a person, but also got to share the real excitement of field work with other peers and professors. From the luminous night creatures to the playful manatees, every second of it was an adventure waiting to happen."

This January, NSF Postdoctoral Fellow [Ray Allen](#), who is based at TLS, will join in the rotation of instructors bringing his expertise in sea urchins, developmental biology, and community-embedded research to a new crew of students. Combining team teaching with early and mid-career instructors is great for professional training and for the students, who receive hours of individualized interaction in this immersive setting. The Field Marine Biology course is one more way in which the CFL supports hands-on aquatic training that expands students' problem solving, creativity, exposure to environments and leads them toward potential career paths.



Students pose underwater showing off their snorkeling skills.

Field Samples: Graduate Students and Postdoc



Jess Briggs (PhD, Wilkinson)

Jess grew up in Erie, PA and completed her BS in Environmental Resource Management at Penn State Univ. Growing up on Lake Erie ignited her interest in aquatic science and she spent her undergraduate summers sampling local beaches for bacteria and harmful algal bloom toxins. Inspired by the challenges that come with green and scummy waters, Jess's PhD research focuses on biogeochemical cycling in nutrient-rich urban ponds. She is particularly interested in algal bloom and greenhouse gas dynamics and how ecosystem functions change over time. She is also defending her master's degree this fall!



Lonnie Parry (MS, Jensen)

Lonnie grew up on a Pacific Salmon Hatchery on a remote island in Prince William Sound, AK. Her childhood exploring local waters and waiting for salmon runs fueled her passion for the outdoors and fisheries science. After earning her bachelor's in biology, she worked for the Idaho Dept. of Fish and Game, focusing on anadromous fish passage. In January 2024, Lonnie began her Master's in the Jensen Lab, studying urban anglers in Milwaukee to compare shore and boat fishing behaviors and motivations. She is particularly interested in sustainable fisheries management and aquatic habitat restoration.



Sarah Ramirez (Postdoc, Vander Zanden & Zuckerberg)

Sarah is originally from Columbia, SC. She stayed in SC to earn her BS in Wildlife and Fisheries Biology from Clemson University, before moving to Auburn, AL to work on a MS in Wildlife Sciences, followed by a PhD in Biological Sciences. She greatly enjoyed her research on food hoarding behavior of eastern gray squirrels through both graduate degrees. After moving to WI in January this year, Sarah now has a postdoc position through the Midwest Climate Adaptation Science Center exploring how flexible traits may benefit fish and wildlife species as they respond to climate change.

Catching Up With Alumnus David Lodge

Where are you now and what are you up to? I'm thrilled to have the best job ever: director of the Cornell Atkinson Center for Sustainability, where I get to facilitate and fund the work of all sorts of creative, mission-driven Cornell faculty, postdocs and students on our priority topics of climate, energy, food, and [global] health. We continue to build an ever larger and more influential intellectual community focused on driving university-based knowledge to impact public opinion, corporate practices, innovative products, and government policies.

What led you to study at the CFL back in your grad school days? Any fond memories?

I was a postdoc at CFL from 1983-1985, which were the most formative years for me professionally. I'm forever grateful for the freedom, challenge, help, and encouragement I got at the CFL from Tom Frost, Jim Kitchell, John Magnuson, and a host of graduate students and other postdocs who were more professionally mature than I was. Summers at Trout Lake were filled with memory making experiences with terrific scientists who were also fun people, from birding with Bill Tonn and Cindy Paskowski to watching Tom Frost get intense—and occasionally mad—during the post-seminar volleyball game.

Are there any new research projects, life developments, hobbies, etc. we should now about? In the last two years, I've gotten great satisfaction from leading a group of non-federal scientists to inform our US federal colleagues as they produced the White House Office of Science Technology Policy's [National Aquatic Environmental DNA Strategy](#), which was published in June this year.

Read [full interview with David](#).



“Collaboration is vital.” An Interview with Zach Feiner

by Madelyn Anderson



Here at the Center for Limnology (CFL), we know that truly understanding the waters of the world takes collaborations across scientific disciplines, departments and agencies. Partnerships are crucial to aquatic research and that’s a big reason why we’re thrilled to have [Zach Feiner](#) onboard. Feiner is an aquatic scientist with both the CFL and Wisconsin Department of Natural Resources (WDNR) and serves as a research liaison between the two.

Zach worked as an undergraduate in the [Stanley Lab](#) at the CFL before pursuing graduate studies at North Carolina State and Purdue University. After completing his postdoc, he spent time working as a WDNR research scientist at WDNR before starting his dual role in 2020. Zach has become an expert at collaboration and is excited to share some of what he’s learned with us.

Q: Tell us about some of your aquatic science interests.

A: I am a fisheries ecologist by training. My current research follows two pathways: climate change and recreational fisheries management. On the climate change side of things, I spend a lot of time thinking about phenology, or how seasonality influences our lake ecosystems. This looks like work with walleye recruitment, aquatic plant habitat, and more. As far as recreational fishing management goes, the work focuses on how people and fish interact. That comes with a lot of creel surveys and policy work. Both of my research areas involve an applied aim of helping us make better decisions about our natural world.

Q: What does it mean to be a “research liaison”?

A: To me, it means thinking about how we can expand research capacity by creating better collaborations between the CFL and the WDNR. Whether that means literally working together or informing people about the work happening, it ensures we share resources.

Q: Describe some common themes you’ve seen in the CFL and WDNR’s work.

A: Every other year at the WDNR fisheries research, we do a research prioritization process that identifies what big questions we have to answer. Two years ago, we chose to focus on climate change. That’s also an important research area at the CFL, and it’s resulted in a lot of collaboration. I’ve talked to associate professor [Hilary Dugan](#) about ice phenology and associate professor [Olaf Jensen](#) about walleye bright spots, and so on. All these different pieces come together to help us think not just about how fisheries will change with the climate, but how we should respond to that.

Q: Are there any interconnected projects that currently excite you?

A: I have a large project focused on how aquatic plants influence fish communities. At the WDNR, we had all these questions about vegetative habitat. It turns out, there was a large body of fish and plant survey data from other scientists, but we hadn’t connected with them. So, once you start bringing people together you can expand your ideas, get funding, and really start to answer these questions.

Q: How do you think collaboration benefits science?

A: Collaboration is vital. It allows for more diverse viewpoints, and that combined knowledge provides a holistic view of how ecosystems work. That informed understanding allows you to better answer questions about how things might change or how they should be managed. Not only does it benefit you, but you might be surprised at what your research can also be applied to, from fishing regulations to lakeshore development to whatever else people are curious about.

Unthreading the Mussel Mystery: Part 1 by Madelyn Anderson

The following article is part of a series. Read [Part 2](#) and [Part 3](#) at CFL Blog.

"D" shaped shells, light and dark stripes, sticky byssal threads. These are all characteristics of zebra mussels, an invasive aquatic species. Only around an inch long, these little creatures can have big impacts. Wisconsin waters are proof. But how did they get here?

Once introduced, zebra mussels use byssal threads (protein packed ropes) to attach to hard surfaces. Logs, pipes, rocks, boats and more provide habitat for this species, which soon begins filtering water in search of food. Zebra mussels feast on plankton, which leaves less food floating in the water column for the rest of the food web. And they filter a lot of water – a single adult around 20 mm long can filter nearly 6 liters of water a day, which pulls nutrients down to the lake bottom where the Zebra mussels live and can clear the water of other organic matter that is important to the life of a lake. This filtering takes a toll, often resulting in a clear view to the bottom, or "benthic," level of the lake.

While improved water clarity may sound positive, this process (known as benthification) alters the typical flow of energy in a lake's food web. With deeper light penetration and more nutrients down in lake sediments, benthic algae and aquatic animal communities shift.

According to postdoctoral researcher [Tyler Butts](#), zebra mussels were first detected in Lake Mendota in 2015 and they reached peak densities in 2016, nearing 30,000 individuals per square meter. The discovery was made by students in an undergraduate limnology class here at the UW-Madison, and it spurred scientists at the CFL like [Mike Spear](#) and [Jake Vander Zanden](#) to take a closer look at how Lake Mendota would respond.

Almost a decade later, the species presence in Lake Mendota has declined dramatically, but there are still many questions. And, here at Hasler Lab, Butts is asking them.

"Through long-term data and small-scale experiments we are working to yield a deeper understanding of how invasive species affect nutrients, water quality, and the lower food web – including microbes," said Butts.



Tyler Butts checks out water samples taken from Lake Mendota. Photo: Madelyn Anderson

While these topics have been researched, mainly in the Great Lakes, studies on the connections between zebra mussels and cyanobacteria blooms mostly occurred in oligotrophic (low nutrient) or mesotrophic (moderate nutrient) waters. Lake Mendota is classified as eutrophic due to its high nutrient and biological productivity levels, making this research unique. According to research technician, Joe Noeske, things can behave "shockingly different" in high nutrient systems.

This project, spearheaded by Jake Vander Zanden and [Trina McMahon](#), will study these systems in multiple contexts.

"We're exploring two Lake Mendota invasions, the spiny water flea in 2009 and the zebra mussel in 2015, to see how they operate in concert with other drivers of global change like climate change introducing higher temperatures and more precipitation in lakes," Butts said.

The researchers aim to build a better understanding of ecosystem relationships and inform management as invasions become more common.



[Freshwater@UW SROP](#) summer undergrads Matyia Ross collects data as Megan Perkins takes notes during an excursion on Lake Mendota.

Photo: Madelyn Anderson

"Another novel piece of this research is that we're tying in the microbial food web," Butts said. "Thanks to Lake Mendota's twenty-plus year record of microbial community dynamics shepherded by the McMahon Lab, which we're expanding this summer with graduate student Jackie Lemaire".

"If you want to beat your enemy you have to know them first," said undergraduate technician Joey Munoz. "Realistically, zebra mussels are probably never going away. But we can learn how to cope with them, how to understand them."

THANK YOU FOR SUPPORTING THE CFL

The generosity of our supporters allows the Center for Limnology to continue to train the next generation of limnologists, generate new knowledge about inland waters, and share this knowledge with diverse audiences. Please consider making a gift to the Center for Limnology.

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Contact Jake Vander Zanden at

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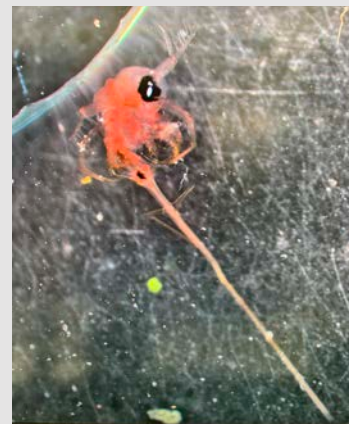
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Colorful Sights from 2024

A Little Pink Mystery

In 2009, undergraduates learning how to sample Lake Mendota for the limnology lecture course first discovered the invasive spiny water. Earlier this summer we got another surprise. Although they were a year late to the big Barbie party, spinies started turning pink! We think the pink color is due to infection from a parasitic bacteria, but it was a reminder that, even after 100+ years of study, our lakes can still surprise us!

Photo: Tyler Butts



The Northern Lights and the Great Aquatic Migration

CFL postdoc Tyler Butts and his summer field crew got a pleasant surprise while out on a midnight sampling trip in early October. While Tyler's team studied the diel vertical migration (DVM) of zooplankton, the night skies over Madison put on an epic aurora borealis show! Read about [Tiny Invertebrates and the Great Aquatic Migration](#) at the CFL Blog. *Photo: Joey Munoz*