College of Letters & Science
UNIVERSITY OF WISCONSIN–MADISON

LIMNOLOGY NEWS

News for Alumni and Friends of the Center for Limnology

Fall 2022

All-Hands-on-Deck for Limno Launch

Read more on page 6

In late May, Trout Lake Station hosted “Limno Launch”, an all-hands-on-deck training for the upcoming field season. *Photo: Amber Mrnak*

Photo: Jeff Miller

Greetings from the (interim!) director. While Jake Vander Zanden is enjoying a well-deserved sabbatical, I'm doing my best to hold down the fort. There's nothing like filling in for someone else to make you appreciate all that the other person does. I am really appreciative not only of all that Jake has done as a director, but also how he's done this job with such grace and good will.

This was an action-packed year, as we returned to full capacity for summer field seasons at both Trout Lake Station (TLS) and the Hasler Lab. It's safe to say that our organizational skills at managing lots of people doing lots of field work were a bit rusty, and our newest members of the Center for Limnology (CFL) community got a crash course in dealing with this slightly overwhelming experience. But I'm happy to report that we all got through it without a major catastrophe, thanks to veteran guidance and the new Trout Lake "Limno Launch" initiative described inside.

Along with the busy field season, we are also delighted to welcome three new and extremely talented lab managers to the Hasler Lab: Rachel Claussen, Helen Schlimm, and Georgia Dahlquist Selking. This trio has been speeding up the post-pandemic recovery in our lab spaces and helping with the launch of a variety of new research initiatives.

As with all years, additions were paired with departures. I especially want to recognize the passing of long-time supporter of the CFL, Wayland Noland, in early October. Wayland grew up in Madison and his childhood explorations of area lakes- including a summer spent mapping Lake Wingra for the Wisconsin DNR- stayed with him throughout his life. He received his B.S. in Chemistry here at UW-Madison and went on to a long and highly productive career as a professor in the Chemistry Department at the University of Minnesota. Wayland was an enthusiastic proponent of undergraduate research, mentoring hundreds of students in his lab.

At the CFL, we too have benefitted from this enthusiasm. Wayland's support for Limnology began with a gift to endow summer research fellowships for undergraduates and was then followed by a gift that created Wayland Noland Distinguished Chairs both in Integrative Biology and Limnology. As the current director, I am honored to be the holder of the Wayland Noland Distinguished Chair in Limnology, and I want to extend my enormous thanks to Dr. Noland and his family for their generosity and enduring support for our science. His friendship over the years has been invaluable to the CFL, and we are incredibly grateful for his support and the support from all our friends and alumni that allows us to keep limnology at Wisconsin moving forward.

Emily Stanley
Wayland Noland Distinguished Chair
Interim Director, Center for Limnology
University of Wisconsin-Madison

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"Drawing Water" Art & Science Mentorship Program Produces Beautiful Results by Amber Mrnak

This summer, Trout Lake Station hosted three undergraduate artists for the entire field season as part of a program exploring new ways to share our science with wider audiences. Each student spent time doing fieldwork with a scientist mentor and time in the studio (or outdoors *plein air* painting) with an artist mentor. Having student artists living and working on station and interacting with other "Trout Lakers" helped students and researchers see the science they interact with daily in new ways and also added a new, vibrant aspect to our community. Below is a sample of each student's work.

Cameo Boyle

"I want to show our connection with nature through my work. As humans we have the desire to be near nature such as plants and wildlife. We as humans depend on the natural world that supplies our daily needs."

A Turtle's Tale, 2022, Acrylic paints

Sampling, 2022, Oil on canvas

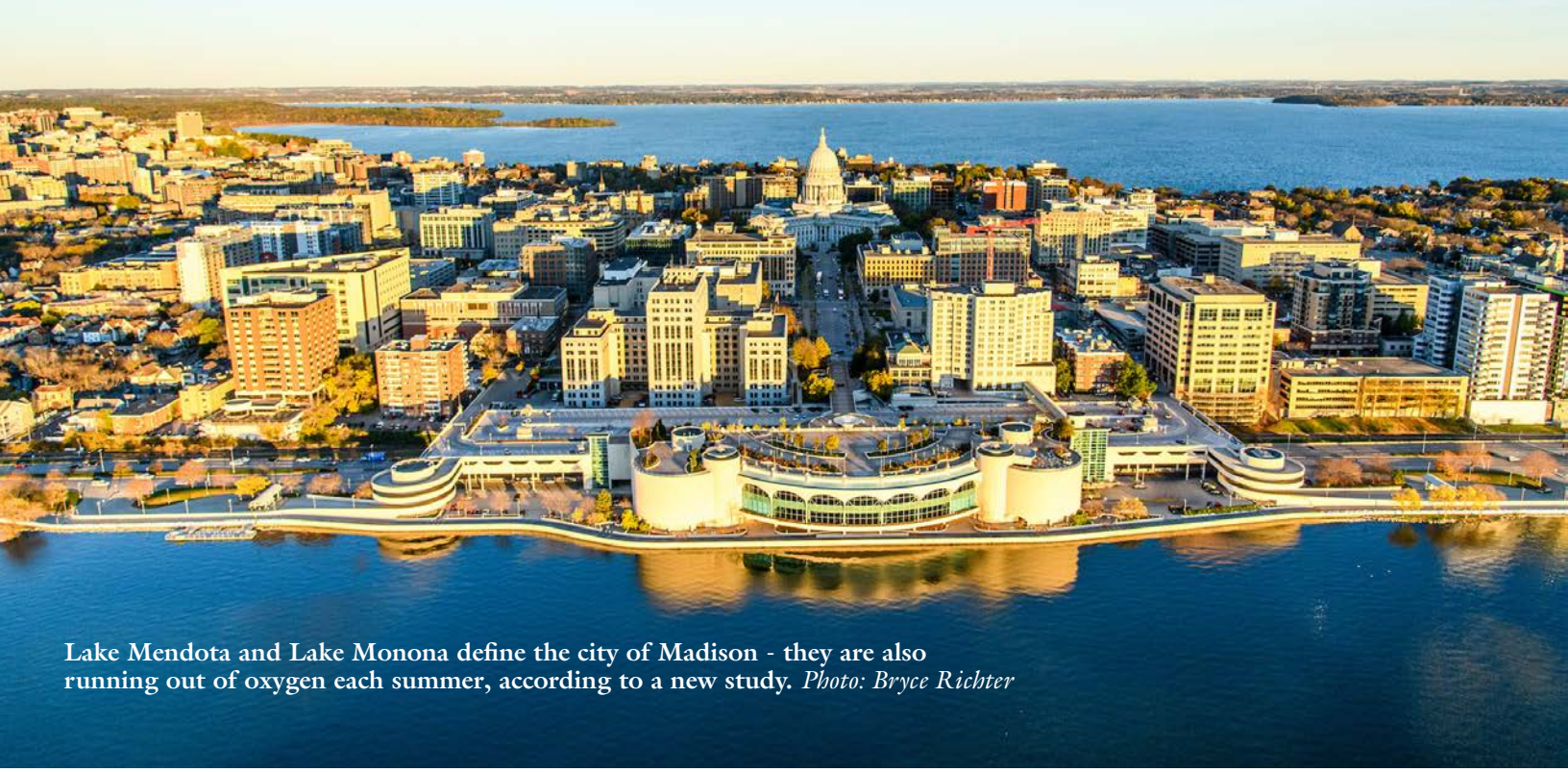
Libby Hetzel

"Nature has always sought ideals. Ideals that are never perfectly realized, but that exist nonetheless: only as intangible concepts… Concepts that humans understand collectively; concepts that are evident in every methodical step we take to study our surroundings."

Catherine Nelson

"My work is about connection: bringing people closer to each other and to the natural world around them. Influenced by both science and art, my work in each field is strengthened by skills I've learned in the other."

Susan and Erin on Aurora Lake, 2022, Watercolor



Lake Mendota and Lake Monona define the city of Madison - they are also running out of oxygen each summer, according to a new study. *Photo: Bryce Richter*

Study Finds Unpredictable Fate In Lakes "Up North," While Southern Waters Run Out of Air

by Adam Hinterthuer

Robert Ladwig working at his computer on a lake model. *Photo: Robert Ladwig*

Despite relatively similar climate conditions, there is a big difference in how lakes in northern and southern Wisconsin are responding to a warmer, wetter world.

Using data collected on eight Wisconsin lakes over the last forty years, a team of researchers, led by CFL postdoctoral researcher, Robert Ladwig, built a computer model to better understand how the "annual life cycle" in each lake was both changing over time as well as predict those conditions in the future.

Specifically, the study documented how lakes' oxygen supplies are depleted each year. While the northern lakes were usually "breathing" just fine later in the year, the "annual life cycle" of the southern lakes always ends with a "dead zone."

The pattern for the southern lakes was "the same every year," says Ladwig. Since routine monitoring began in 1995, a pattern emerged of the lakes running out of oxygen earlier in the year and experiencing longer lasting dead zones. Ladwig was lead author of the report, released in July 2022 in the journal Limnology and Oceanography.

What their study documented, says Ladwig, is an irony of "life killing life."

The culprit is an overabundance of nutrients, especially phosphorus, that wash into the lakes from the surrounding landscape. For the southern Wisconsin lakes, the land that drains into them is dominated by agriculture, which means that fertilizers used to grow corn and soybeans – as well as the manure produced by the state's iconic dairy cows – often end up in nearby waterways after big rain events or spring snowmelt. And all those nutrients result in a whole lot of growth in the lake.

Specifically, high levels of nutrients in a lake can trigger big blooms of organisms like algae and tiny plants called phytoplankton. While these organisms do add oxygen into the lake while they're alive, when they die, they drift to the

bottom of the lake and begin to decompose. Over the course of the year, the microscopic bacteria responsible for this decomposition use up a lot of oxygen in the deeper waters of a lake.

In the study's four southern lakes, Ladwig says, so much life is growing and dying that the water near the bottom literally runs out of oxygen, creating "anoxic" zones where no oxygen-breathing organism can survive.

What surprised the researchers, Ladwig says, is that this high-nutrient status seemed to be the only information needed to predict their annual oxygen levels.

"The southern lakes, even though they have different characteristics, they all have the same pattern of anoxia every year and there's no change to the pattern," he says. "The nutrients override things like individual lake characteristics and climate change in the region [when it comes to predicting their annual cycles]. In the end, [they] are more or less the same in their dissolved oxygen and metabolism patterns."

While the southern lakes are similar to each other, the northern Wisconsin lakes in the study behaved "more like individuals," Ladwig says. These lakes are surrounded mostly by wetlands and forests and have far lower amounts of nutrients entering their water column. Without that "overriding" presence of excessive nutrients, northern lakes were more prone to annual variability.

"Maybe in the north there's a slight increase in [summer] oxygen drawdown in some lakes," Ladwig says. "It might be a trend, but it's hard to see. Northern lakes in our study were less predictable on how climate conditions would impact them."

These findings have big implications for lake conservation and management in our changing world, Ladwig says.

"Managers have to know their lake before making landscape level predictions [and developing management strategies]," he says. For the lakes in northern Wisconsin, more research is needed to better understand what a warmer world means for each lake individually.

For the southern lakes, Ladwig says, the message is already pretty clear – until we fix the nutrient pollution problem, any other attempts to address lake health or climate change aren't going to do much to help them breathe any easier.

Under New Management

by Adam Hinterthuer

Hasler Lab is at full capacity these days and three of our new arrivals share the official title of "research specialist" but are better known around here as "lab managers" – the critically important people who keep our ship sailing smoothly.

We asked them what they're looking forward to at the CFL. Their answers are edited for length. Full interviews at https://tinyurl.com/mumpcpba.

RACHEL CLAUSSEN - Jensen lab

"I love fish and social science! This is a great opportunity to combine these two interests. I'm looking forward to helping with different projects around the lab. Something new for me will be working on Dr. Jensen's boat, the Roccus. I don't have much experience on boat maintenance, but I'm ready to learn!"

HELEN SCHLIMM - Wilkinson Lab

"I am looking forward to the continued growth of our community science program and I deeply enjoy working with our awesome volunteers (Pond Pals!) on interesting water bodies around Madison. I wear a lot of different hats in my position, which is fun and engaging. I take sediment cores from canoes, I purchase equipment, I plan outreach activities, I coordinate volunteer monitoring, I test water samples, and I run our lab Instagram - @limno.lab - check us out!"

GEORGIA SELKING - NTL LTER Chem Lab

"I [am] excited by the opportunity to use my experience … to support active research projects for faculty, staff, and students. I make several infographics a month, detailing best practices for different aspects of the [North Temperate Lakes Long Term Ecological Research (NTL LTER)] lab. I also design and write a monthly lab newsletter with tips to improve lab etiquette."

Limno Launch gave participants a chance to learn to use tools like these clover and minnow traps. *Photo: Amber Mrnak*

Limno Launch Breaks Barriers and Builds Connections for Summer Field Season

by Adam Hinterthuer

During Limno Launch, Susan Knight taught students (and some staff) how to identify common aquatic plants. *Photo: Amber Mrnak*

This summer, the CFL started our summer field research season off with a bang. On May 26th and 27th, dozens of undergraduates, graduate students, CFL staff and researchers descended on TLS for an all-hands-on-deck, two-day training event called "Limno Launch." The idea behind the event, says TLS director, Gretchen Gerrish, was two-fold.

First, Limno Launch was designed to break down barriers for anyone with little-to-no experience doing this kind of scientific field work. This has been a point of focus at the national level, Gerrish says, noting that there has been a lot of discussion within both the Organization of Biological Field Stations and the national Long-Term Ecological Research Network (LTER), about how to minimize barriers to fieldwork. "It can be really intimidating to just jump in on field work, especially when you're with more experienced people," she says. "Many [summer students] come from all over the nation, from places and backgrounds where they haven't had access to boating and trailering."

Understanding how those things work can be a big barrier to someone even applying for this kind of work in the first place. Limno Launch is intended to break that barrier or, as Gerrish says, "get everybody's feet wet at once."

Trout Lake staff set up stations to train participants on basically everything that comes up in a field season. It was an exercise in what Gerrish calls "multi-tiered mentoring." Driving UW Fleet trucks and boats, backing up trailers, power-washing boats and trailers to prevent the spread of invasive species, taking biological and chemical samples from a boat anchored at Trout Lake's deep hole and learning about aquatic plants and using microscopes to identify plankton - the list of activities was exhaustive.

"It's a universal component of field work that people come in with different levels of experience," Gerrish says. Limno Launch was a way of saying "you're here, we support you. And it allowed people to gain more

broad experience than they [would] on their individual projects."

One of those people was Bennett McAfee, a recent graduate of Lawrence University, who was on station last summer to help with a research project on zooplankton led by Lawrence professor, Bart De Stasio.

"I had more experience with many of the technical aspects of limnology going into Limno Launch than most [people], but the event helped me realize how narrow my experiences actually were," McAfee recalls. "One of the cool things about the station-based design of the event was that it allowed people to prioritize the stations that they wanted more experience in. Despite my sampling experience, I had never backed up a trailer and launched a boat prior to Limno Launch. Meanwhile, some of the people on station who had been fishing all their life could back up a trailer like no other but had never heard of a Schindler trap before."

The second goal of Limno Launch was to build a better sense of community among everyone doing research on our lakes this summer. Instead of learning on the job with a team of only two or three people assigned to a specific project, Limno Launch participants got to work with staff and students from both Hasler Lab and TLS. The group also shared a meal together and time was built into the schedule for everyone to get to know one another and socialize.

"The community building aspect was a hit, which was exciting," Gerrish says. "One of the main goals was to start the community building early so that [everyone] had a shared experience and had some connections and no one started the season in isolation."

McAfee agrees, saying that the event created "common ground" for participants and served as a good conversation starter. "[It] did a lot for the community on station. The fun part about fieldwork is that you always end up with stories to tell. In addition to helping everyone learn each other's names, Limno Launch gave everyone something to talk about afterwards."

For her part, Gerrish hopes that Limno Launch can be an example for other field stations interested in forming similar programs. And she's already fine tuning things for next year. "We may need a little more structure on the timing of things because learning to back a trailer takes a long time and spending three hours on a cold lake doing sampling might be a bit much!"

Visiting Scholar Ricardo Taniwaki

by Adam Hinterthuer

This year, from April to August, the CFL had the privilege of serving as the scientific home for Ricardo Taniwaki, a professor at Federal University of ABC in São Paulo, Brazil. Ricardo received a Fulbright Junior Faculty Member Award to study anywhere in the world and chose the shores of Lake Mendota "to work with Emily Stanley, because of her worldwide recognition [as an expert] on methane dynamics in streams, which is the topic of my current research."

Ricardo made the most of his time working with Emily and the students in her lab, even publishing a paper entitled "Methane concentrations and fluxes in agricultural and preserved tropical headwater streams" in the journal Science of the Total Environment. The paper is the first to evaluate methane concentrations and fluxes in the most important region for sugarcane production in the world, Ricardo says, and it "stands alone for this type of data in the entire southeast region of Brazil."

Ricardo thoroughly enjoyed spending time with the faculty, postdocs and students at the "most respected center for limnology in the world," he says, noting that the experience was a "huge" improvement for his career.

A stroll on a frozen lake was one of Ricardo's highlights.

But he didn't just stick to science. The biggest highlight, he reports, was experiencing a bit of "true" winter up at Trout Lake Station and walking on a frozen lake which, "would never happen in Brazil."

Ricardo also discovered that the first limnologist in Brazil was from the CFL, thanks to a conversation with the CFL's unofficial historian (and director emeritus), John Magnuson. Stillman Wright, who was Chancey Juday's first Ph.D student, is considered one of the founders of Brazilian limnology for his research there in the 1930s.

"After [learning] this, I felt that I was just in the best place that I could be to develop my career as a limnologist," Ricardo says.

A "Patchwork Quilt" Career: Remembering Lorna Petty Harrell (1947-2022)

by Adam Hinterthuer

Lorna Petty on a training cruise in Cape Hatteras, circa 1971.

In late April of this year – on Earth Day, to be exact – CFL alumna, Lorna Petty Harrell passed away. Lorna earned her master's degree in zoology in 1972 at what was then referred to as the Laboratory of Limnology. She was the first female graduate student in John Magnuson's lab and while in Madison, did her research on the impacts of the power plant outfall on bluegill populations in Lake Monona – a project that won her an award for the best student paper at the American Fisheries Society conference.

In a 1998 article she wrote in the CFL newsletter, Lorna called her career a "patchwork quilt" and spoke eloquently and honestly about her journey.

"In July, 1970, I entered the graduate program at the Laboratory of Limnology where I became the first woman grad student in many years. Because of my innocent intrusion into this male domain, I became an object of curiosity and, at times, considered myself a social pariah. In short, my first year at UW-Madison was hard and lonely.

At the same time, my adviser, John Magnuson, was as determined as I that I succeed, and he generated funds, ideas and perpetual challenges to assure that I did. … My second year in Madison was one of the best in my life. I felt accepted for who I was, and my research began to coalesce, thanks to a lot of field help and moral support from many."

Lorna went on to a long career in freshwater research and conservation, working in high-level positions for environmental consulting firms, soil and water conservation districts and universities in northern Kentucky and southern Ohio. It was a career she fought hard for, as being the only woman working in a field dominated by men and the expectations of a "woman's role" in it, threw many obstacles in her path.

"As I reflect on obstacles I've overcome and mistakes I've made in piecing it all together," she wrote, "I know the design isn't perfect but at least it's mine."

We are saddened by her passing and honored that the "Limnology Lab" here at UW-Madison was part of her journey. And we are thankful that she left behind a legacy and a story that shows us both how far we have come in the freshwater sciences and how far we still have to go.

Steve Carpenter Wins Blue Planet Prize by Adam Hinterthuer

When the results of the Asahi Glass Foundation's 31st Blue Planet Prize were announced this summer, the list of winners was short.

One was the King of Bhutan.

The other was CFL director emeritus, Steve Carpenter.

According to the Foundation, which administers the annual award, the Blue Planet Prize is given out each year to two individuals or organizations working to make the earth more sustainable.

Carpenter received the award in recognition of more than 40 years of research on lake ecosystems. This work, the Foundation wrote, provided the world with "a new perspective on social-ecological systems" and highlighted the global issue of human use of agricultural fertilizers and their pollution of our freshwater systems.

"I am challenged and humbled by the Blue Planet Prize," Carpenter says. "This mission is the greatest challenge of our time, and we all have much work ahead."

Steve Carpenter (right) and former CFL visiting scientist, Shin-Ichiro Matsuzaki (left), shake hands at the award ceremony.

We at the Center for Limnology couldn't be prouder of Steve (or less surprised). It is a well-deserved honor and one that will, hopefully, help us move toward a more sustainable future for our freshwater.

Field Samples: Graduate Students and Postdoc

Amanda Kerkhove (MS, Jensen)

Born and raised in the Twin Cities (MN), Amanda got her BA in Biology at the College of St. Benedict and St. John's Univ. Her work in the Northwoods of WI as an undergraduate student opened her eyes to the possibility of a career in fisheries. After her BA she worked as a fisheries technician for the Univ. of Illinois at the Sam Parr Biological Station. She started her master's degree in August 2021, and from there she embarked on an eight-month field season spanning the state of WI, with the goal of understanding how recreational anglers differ between urban and rural areas, as well as between winter and summer seasons. Amanda is particularly interested in the impacts of angling technologies, like sonar and underwater cameras, on recreational angler's experiences. In her spare time Amanda spends her time backpacking, reading, and preserving food.

Danny Szydlowski (Ph.D., Wilkinson)

Danny is from Buffalo Grove, Illinois, but spent many summers growing up on lakes in Vilas County. After finishing his undergraduate degree in environmental engineering at the Univ. of Notre Dame, where he worked at UNDERC and first learned about limnology, he decided to pursue his interest in lakes with a MS at the Univ. of Illinois at Urbana-Champaign. After finishing his MS he started a Ph.D. at the CFL, where he studies the effects of external disturbance (especially storms!) on lake structure and function. He still has a special interest in the north temperate lakes which first gave him a love for ecology, and is excited to get to do summer fieldwork at UNDERC and TLS. When he's not working up north, Danny enjoys hiking, reading, running, and making lake artwork.

Ray Allen (Postdoc, Gerrish)

Ray is from Lac du Flambeau, WI and is a citizen of the Lac du Flambeau Band of Lake Superior Chippewa Indians. He received his A.B. in Chemistry-Biology from Ripon College in 2015, and his Ph.D. in Biology with a minor in Science & Society from Duke Univ. in 2021. Ray moved back to northern Wisconsin in 2021 to start his postdoc at the CFL's Trout Lake Station. He is a developmental biologist by training and junior Indigenous Science & Technology Studies scholar. His research interests include the impacts of climate change on lakes and seasonality, including freshwater fish development, spawning, disease, and human relationships to water. Ray is also interested in science art and science policy, and is a current Lac du Flambeau Tribal Council member.

Catching Up With Alumnus Elena Bennett

Where are you now and what are you up to? I am a Professor at McGill University in Montreal, Quebec. I'm jointly appointed to the Department of Natural Resource Sciences and the Bieler School of Environment. I'm running a pan-Canadian network called "ResNet", which does stakeholder-driven science in working landscapes (agriculture, fisheries, timber, and energy production areas) with the goal of improving understanding [of] ecosystem services in human-occupied lands. I'm also a coordinating lead author on an intergovernmental report, working with Oonsie Biggs (another former CFL Ph.D. student).

What led you to study at the CFL? I came to Wisconsin thinking I might work on environmental history. In my first semester, I saw there was a new course being offered called "Lakes and Society." I thought I would go check it out. The first day's lecture was given by Steve Carpenter, and boy was I ever hooked!

Any fond memories you'd like to share? [I got to] my desk one morning after a really, really hard day the day before, to find that another student (Chris Harvey) had made me a little clay T.Rex holding a sign that said, "the next time you have a bad day, let Tyrannosaurus Rex chase it away!". I still have that T Rex on my desk just in case! It is interesting to realize how many of the things I learned at CFL –scientific learning as well as knowledge about how to be a good scientist and a good person – are central to who I am and what I do today.

Also, I'm still married to the guy I met in Wisconsin (Jeff Cardille, who was a postdoc with Steve and also with Monica Turner), and we have two kids, Talia (15) and Simon (13). They definitely keep me busy!

Elena's answers are edited for length. Full interview at https://tinyurl.com/4x482jey.

Photos from the Field

It was another beautiful year to work on our beautiful lakes. Here are some of our favorite pictures from 2022.

Clockwise from top right: Emily Stanley, visits David Buoy with the new UW-Madison chancellor. UW undergrad, Sean Bertalot with a chlorophyll sample. Postdoc, Rob Mooney, introduces a group of first-generation UW freshmen to aquatic inverts. Adrianna Gorsky and Linnea Rock go “American Gothic” on Trout Lake. Dat Ha, Danny Syzdlowski and Katie Bollini with some froggy friends.

Tiny Invertebrates and The Great Aquatic Migration

by Christina Weatherford

2022 Trout Lake summer scicomm intern

Painting by Christina of a nightly zooplankton migration and a winner of the UW-Madison's annual Cool Science Image Contest

When looking at the lakes in northern Wisconsin, you might be struck by how scenic they are, or daydream about how many trophy fish they contain. For the scientists at TLS, however, this love of lakes extends to an appreciation of things that are often overlooked. This summer, a crew of TLS scientists and students worked to unravel the intricacies of a nightly mass migration that features miniscule creatures with massive importance.

Their focus is on tiny, free-floating critters called zooplankton. During the day, zooplankton stay near the bottom of lakes to avoid being seen by hungry predators. But, at night, they rise to the surface to eat algae. While that might not sound impressive, keep in mind that these tiny animals are so small that just a 10 meter-long trip up in the water column is 50,000 times their body length. That's the equivalent of a five-foot-tall person going 50 miles to get dinner and, before daylight, going 50 miles back to where they started!

Zooplankton may be tiny, but they are crucial to the structure of lake ecosystems by grazing on algae and being the main source of food for most larval fish, many adult fish species, and other larger zooplankton predators. They also are surprisingly cool in their own tiny ways.

Bennett McAfee, who helped create modeling software for migration patterns as a student at Lawrence Univ., developed an appreciation for these little creatures during his summer on station. "The shear complexity of such simple-looking creatures is astounding. These little animals that you can only barely see with the naked eye and that most people don't ever think about are capable of some fascinating behaviors and really complex interactions with other species," says McAfee. "Zooplankton are a marvel of evolution and are incredibly important to the aquatic ecosystem, which makes them incredibly interesting."

Eleanor Meng, another student at Lawrence Univ, came to TLS this summer to assist with the project. Although the study will undoubtedly help further her career, it also built excitement about a different outcome.

"On a personal level, I'm interested in increasing public awareness of [zooplankton] and other invertebrates using visual references and images," Meng said. "They're cute creatures and I'd love to share this side of aquatics!"

So, the next time you're at a Wisconsin lake, take a second look at the water before you. While you might not be able to see them, now you know that, somewhere down below, thousands upon thousands of tiny, little zooplankton are awaiting nightfall so that they can begin the epic daily migration that plays such a critical role in the health of the lake.

See all previous Newsletters, Awards, Catching Up With Alumni, and Field Samples at

CFL Newsletter webpage

PLEASE JOIN US!!

Science on Tap-Minocqua

CFL Wednesday Seminar

Hasler Lab Open House
June 23, 2023

Trout Lake Station Open House
August 4, 2023

PLEASE JOIN US!!

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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 Endowment Fund.

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For their work on Wisconsin fisheries, CFL faculty member, Olaf Jensen and research scientist, Zach Feiner, hired summer students to take creel surveys. Here Limno Launch participants practice their angler interviewing skills on each other.