



College of Letters & Science
UNIVERSITY OF WISCONSIN-MADISON



Trout Lake Station News

News for Alumni and Friends of the Center for Limnology

Summer 2022



Undergrads Olivia Nyffeler and Kailee Berge sampling fish on McDermott Lake. *Photo: Cassie Gauthier*



Photo: Riley Steinbrenner, Undergraduate Outreach Intern, Summer 2017



For the first time in two years, and really, since I have taken the helm, Trout Lake Station (TLS) is planning to be back to capacity with new research and an influx of students in 2022. It is exciting to rev up long-rested motors, oil up the oar wells, and to host a conference room full of budding limnologists and limno-enthusiasts on each Wednesday evening for our weekly seminars.

Our past year has been one of transition and looking toward future capacity building. Amber Mrnak stepped into the station coordinator position last summer and with her hire, we were able to make the position full time, providing effort and support for our science outreach and communication. Her natural resources and teaching backgrounds have already proven invaluable in her planning of our winter [North Temperate Lakes Long Term Ecological Research \(NTL-LTER\) Schoolyard](#) event and in the educational bridges she is building (imagine managing ~120 middle schoolers winter sampling lakes through the ice!). We also have a new post-doctoral researcher at TLS, Ray Allen, who joined the community in October 2021.

Ray's background in developmental biology adds new directions for studies on how extreme spring conditions relate to the growth and reproduction of native fish populations. Ray also brings expertise in Science and Technology Studies and will be exploring how regional communities interact with and perceive our past and present work at TLS.

Capacity building and transitions will continue into 2022. We will be welcoming a new facility team member soon to fill the position left by John Vehrs' retirement after 29 years at UW. This position will be much needed since this fall and winter will see the beginning of construction on our new heated winter workshop that will replace the existing garage facility.

While lots of action continues in the background at TLS, we are most excited to see research and initiatives, like those highlighted throughout this newsletter, resume in full!

Bring on the native cisco stocking, lake phenology extremes, parasitized crayfish assessments, wild rice seed counts, walleye recovery, creel surveys, and artistry!

[Gretchen Gerrish](#), Director, Trout Lake Station
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Trout Lake Station News

Drawing Water: Art and Science Mentoring by Amber Mrnak

2022 brings big changes in the 'Artist-in-Residence' program at Trout Lake Station.



Cameo Boyle, Undergrad
Nicolet College

Trout Lake Station's long-running artist-in-residence program will be expanding this year in both its mission and the number of faces on station.

For the first time ever, [three college interns](#) will be joining the TLS community to work at the intersections of art and science. Also for the first time ever, each intern will be joined by both an [artist mentor](#) and a [scientist mentor](#) to improve their craft, engage in scientific discovery, and demonstrate the wonders of the natural world to a larger audience.

This change adds many new people to the TLS community and provides opportunities for everyone on station to interact with the artists and benefit from their perspectives on the research we do.



[Terrill Knaack](#), Artist Mentor

Discussions with both student and mentor candidates for this position have shown that there is a real need for mentorship to show aspiring artists what is possible when it comes to sharing scientific concepts through their art. Many students have discussed how pivotal this opportunity will be for their personal lives as well as their careers. As the first year begins, we are excited to see new connections form and new opportunities unfold as these two passions for art and science unite and new paths toward careers in art and science unfold.

This partnership also provides opportunities to strengthen collaboration between local agencies with similar missions. Science mentors will come from three local sites: the Wisconsin Department of Natural Resources, Lac du Flambeau Tribal Natural Resources, and UW-Madison Trout Lake Station. The student artists' limnology experience will grow as they actively participate in research in fisheries, wetlands, and aquatic plants at their respective sites.



[Libby Hetzel](#), Undergrad
Whitman College



[Catherine Nelson](#), Undergrad
St. Norbert College



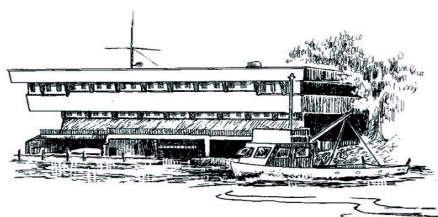
[Mindy Schnell](#), Artist Mentor

Not only are the student interns enthusiastic to get started, but their artist mentors are eager to help them shape their craft. While the artist mentors have been working professionals for many years, they are looking forward to the inspiration that will come from working with someone new and the joint experiences they will have in the field with the scientists.

The interns are looking forward to gaining experience in a community that holds high value in both art and science. Hopefully this opportunity inspires them to become mentors for other young artists. They are looking forward to showing local middle school students how art and science aren't mutually exclusive and that their lives and careers can feature both.

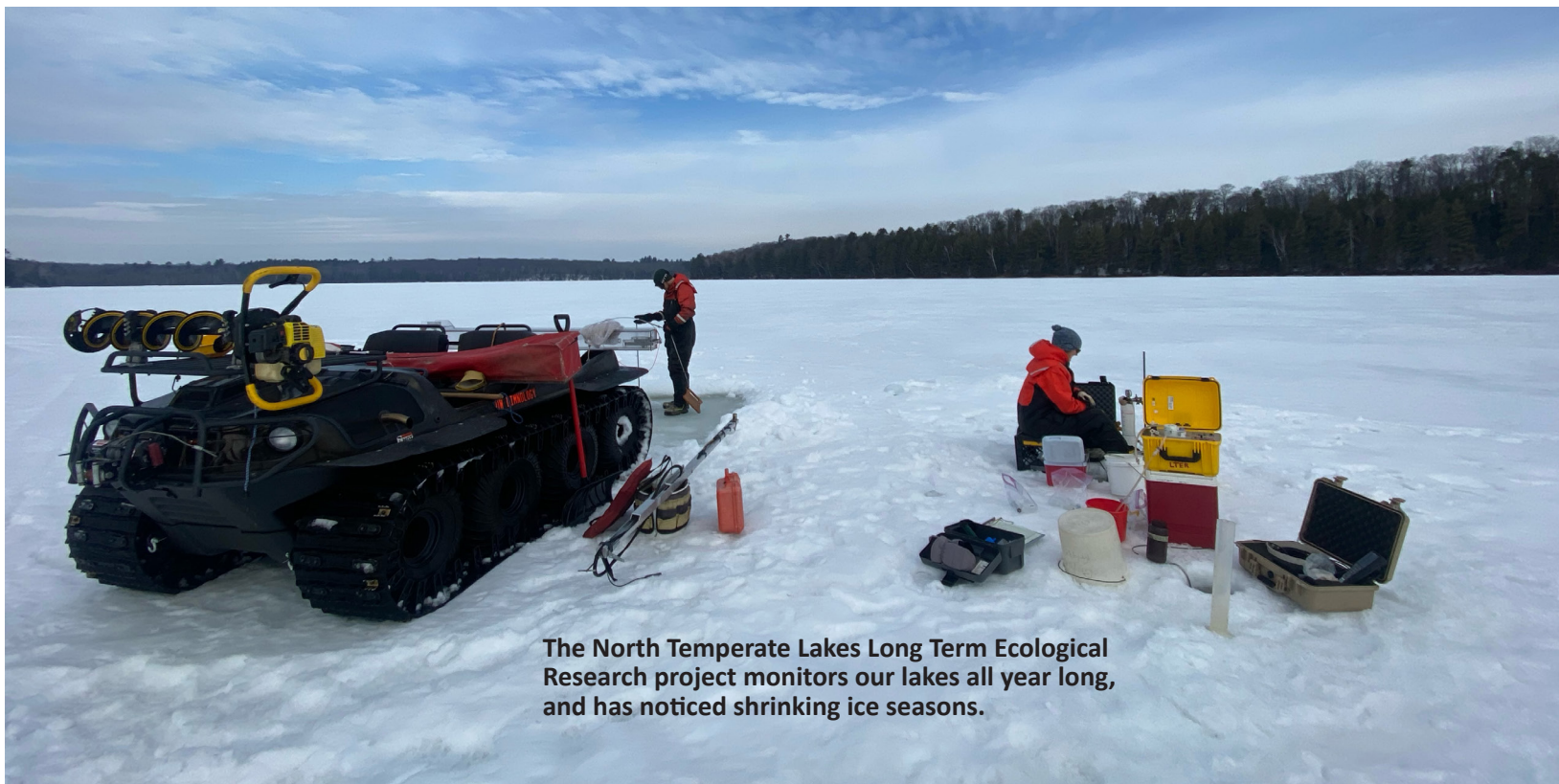


[Adam Swanson](#), Artist Mentor



We hope that you will follow along with us this summer as we plan events and galleries to showcase the art and the science that inspires it.

drawingwater.weebly.com



The North Temperate Lakes Long Term Ecological Research project monitors our lakes all year long, and has noticed shrinking ice seasons.

Timing is Everything, Especially to The Team of Researchers Studying our Changing Northwoods Lakes

by Adam Hinterthuer

[Ray Allen](#), a new postdoctoral researcher at TLS, spent his winter converting a cinder block room not much larger than a storage closet into a fish hatchery. He arranged aquariums onto shelves, ordered equipment like “egg tumblers” online and worried about the timing of the annual thawing of the Northwoods’ ice-covered lakes.

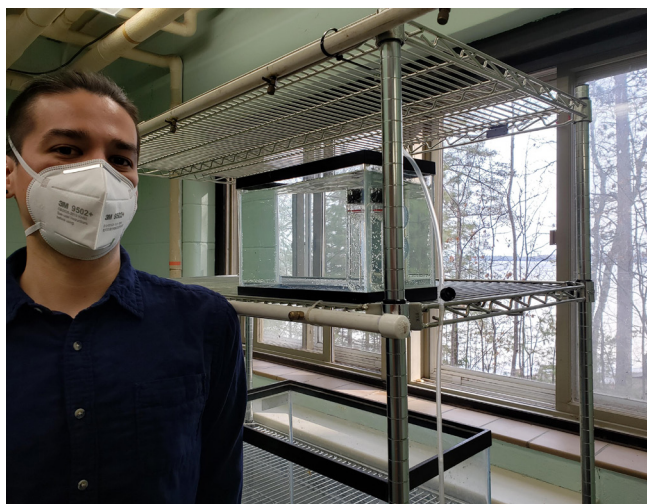
“All winter and spring I’ve been asking ‘When’s it going to happen and am I going to be prepared?’” Allen says, “Because around this time last year the lakes had already opened up.”

Allen’s concern about timing is more than appropriate, considering that he is part of a large team of researchers studying how the timing of annual events like “ice off” affects the organisms that call our rapidly changing lakes home.

Humans have long kept tabs on seasonal changes in nature - taking note of the timing of everything from flowering plants, to migrating birds, to spawning fish. These observations have helped indigenous peoples hunt, fish and gather foods and medicines for thousands of years and were a hallmark of famed Wisconsin naturalist Aldo Leopold’s writings on conservation.

The practice of making these kinds of observations is called phenology and, this spring and summer, a team of University of Wisconsin-Madison and Wisconsin Department of Natural Resources (WDNR) researchers is launching a project focused on the phenology of northern Wisconsin lakes.

The origins of the project, says TLS director, Gretchen Gerrish, stem from the fact that the timing of important seasonal events is changing. The [North Temperate Lakes Long Term Ecological Research](#) project, which is based out of TLS, has monitored seven Vilas County lakes since the early 1980s. And that monitoring has tracked not only shorter winter ice seasons on the lakes, but increasingly extreme variability in the dates when lakes freeze and thaw.



Trout Lake Station postdoc Ray Allen spent his winter building a “fish hatchery” in the station basement. Photo: Amber Mrnak

"This really started when we were thinking about long-term data and the ice record showing this increased variability where we've had five times the variability in the last ten years than we've seen in the last hundred," Gerrish explains. For example, in 2013, Trout Lake thawed in late May, a full 50 days later than the 2012 ice-off event.

Zach Feiner, a scientist at the University of Wisconsin-Madison's Center for Limnology, calls this "phenological whiplash."

"One year, like last year, you'll have a really early ice off and spring and then this year is a really late year," he explains, "So you have back-to-back extremes in opposite directions, so what does that mean for the lake and everything in it?"

Feiner says ice off is like a "light switch" that triggers a lot of activity in our lakes, from the spawning of fish like walleye and muskellunge, to large blooms of the tiny plant life called phytoplankton that form the base of a lake's food web. When that switch is flipped at increasingly variable times, it can have all sorts of impacts - like larval fish missing the plankton blooms that normally sustain them, or plankton adapted for early spring conditions suddenly forced into action in late May.

Through a combination of being out on the lakes monitoring conditions, conducting experiments in the lab and running ecosystem models through computers, Feiner says, the team can start to piece together how all of these changes are impacting organisms at both an ecological and evolutionary level.

Of course, like all science, getting to those answers will only happen piece by piece, which brings us back to Ray Allen and TLS's new "fish hatchery."

Allen's role in the project is to focus "on spring spawning fish, like walleye and musky and doing some experiments to see how water temperature may be affecting their survival and development in these changing conditions," he says.

Luckily for Allen, this year saw a late "ice off" of our lakes, which meant that he was ready to go and as lakes thawed this spring, he was out with colleagues collecting fish embryos, which he brought back to raise in his experimental aquariums.

Those aquariums all hold water that Allen keeps at different temperatures to mimic the variability we are seeing in our Northwoods lakes. He'll be monitoring how different temperatures impact things like egg viability, larval fish survival and even how extreme temperatures can impact whether a fish develops into a male or female.

What Allen finds might be only one piece of a much larger puzzle of how our changing climate is changing our lakes and, in turn, the organisms living in them. But it's okay, he says, if that takes some time. "This is very much a short-term component of a larger issue, but it will lead to better knowledge of the long-term."

Gillum Award for Outstanding Graduate Achievement by Gretchen Gerrish



Sandy Gillum

In 2021, Sandy Gillum generously worked with Trout Lake Station to implement the annual Gillum Award for Outstanding Graduate Achievement. Sandy knew that graduate students are at the heart of the TLS community, serving as undergraduate student mentors, driving cutting edge research and creative endeavors, and working to chart their future path in the freshwater sciences. With her award, Sandy hoped to help

boost the careers of these young scientists and recognize achievements in both research and publication in scientific journals.

Sandy first became entranced with the clear waters and aquatic species, forests, and geology in the Northwoods area in the 1950s when she visited as a child. Her connection to the area persisted until she and her husband, Don, decided to 'retire' to Vilas County in 1988. Her 'retirement' stint was brief (all of 4 days!) and she quickly joined the WDNR Science Services program where she actively worked on shoreland restoration, avian monitoring, and a variety of projects, some directly connected with TLS.

[Holly Embke](#) received the first ever Gillum award in 2021 for her station involvement and research paper entitled, 'Production dynamics reveal hidden overharvest of inland recreational fisheries'.

This paper generated a lot of discussion among researchers, anglers, and management agencies alike, challenging some of our fundamental [practices in walleye fishery management](#). In addition to producing top notch research, Holly has been a central member of the TLS summer communities



Holly Embke

for five years, mentoring teams of undergraduate fellows, developing community outreach, and facilitating regional partnerships with the WDNR and UW Stevens Point. Holly plans to complete her graduate work this spring at UW Madison but will remain connected to northern Wisconsin lakes in her new role as a Research Fish Biologist with the United States Geological Survey Midwest Climate Adaptation Science Center.

Who will the next Gillum Award go to???

We look forward to recognizing another graduate student in 2022 and nourishing a developing career path and helping the next generation of freshwater scientists conduct relevant and innovative research to steward lakes into the future.

Overnight Delivery: Thousands of Fish Hand-Delivered to Lakes in Attempt to Restore a Native Species

by Adam Hinterthuer



Joe Mrnak (right) moves cisco caught in White Sand Lake from a holding tank. The cisco will be transferred to the truck behind Mrnak and taken to Sparkling Lake. Photo: Amber Mrnak

Last fall, under the cover of darkness, a small group of people decked out in chest waders and headlamps slowly backed a truck down a boat ramp just off of Highway 51 in the middle of the night. Working quickly, they began to unload their cargo into the dark water of Sparkling Lake. When the sun rose the next morning, the lake was home to nearly a thousand new cisco, a native species of fish that had disappeared from Sparkling Lake sometime back in the 1980's.

This nocturnal crew wasn't some fishy version of Johnny Appleseed. They were a team of researchers from TLS and the WDNR. And their goal was two-fold – to try to restore a native species of fish and to fight back an invasive species at the same time.

What they hope to do is find “a better way to manage a fishery,” says [Joe Mrnak](#) a graduate student at TLS. “Historically and even currently, management has taken a single species approach where [for example] walleye are

declining, and we're just going to stock more walleye in a lake,” says Mrnak.

Mrnak and his colleagues are taking a dual approach to restoring cisco populations. They remove invasive rainbow smelt in the spring and stock cisco in the fall. Since smelt inhabit the same waters and compete with cisco for food, their removal may ‘open’ the niche required for cisco to successfully move back in.

Over the last several decades, Mrnak explains, cisco populations in lakes across Wisconsin have struggled. Scientists believe that this problem is caused by warming water temperatures. Cisco are what's known as a “cold water” species of fish and don't do well in warm water conditions.

In addition to facing warming water temperatures, native cold-water loving cisco struggle to compete with the non-native species called rainbow smelt which have colonized select lakes in the Northern Wisconsin region. Originally brought to Lake Michigan by anglers wanting to recreate the Atlantic Coast smelt runs of their youth, rainbow smelt quickly spread throughout the region. This is a problem, Mrnak says, because smelt can tolerate a wide range of temperature conditions and, most problematically, “smelt are also extremely omnivorous. If it can fit in their mouth and it's in front of their face, they'll eat it.”

Rainbow smelt have, essentially, taken ciscoes' place in the food web. The problem, Mrnak says, is that cisco “evolved with the other fish in the system to sort of play nice with each other,” while smelt did not. The end result is an ecosystem that is out of balance.

Cisco eat the tiny, free-floating animals called zooplankton that form the base of the lake's food web and, in turn, are eaten by bigger fish. Smelt are just as likely to be a predator as they are prey and chow down on everything from zooplankton to the younger members of many species of fish.

Mrnak hopes that, by removing smelt as they are reintroducing cisco, they will be able to “reset” the lake's food web and give cisco a fighting chance to take back their niche.

Mrnak and his team are also doing the same thing in nearby Crystal Lake, where rainbow smelt have caused a crash in yellow perch populations. The goal in both lakes is to have stable cisco populations that fill a more natural, and far less disruptive, role in the food web.

“The thought is that cisco will gain a significant foothold ... and smelt will exist at low enough levels that their impacts will be minimized,” Mrnak says. “We're not hoping to remove smelt completely from these systems, we're trying to control them.”



Researchers measure a cisco before moving it into a tank to be transported to Sparkling Lake. Photo: Amber Mrnak

Life on Station

Life on station involves everything from research, to outreach, to relaxation. Enjoy these pictures from last summer (2021). More photos at photos.limnology.wisc.edu/TroutLakeStation.



Clockwise from upper left:

(1) Graduate student David Ortiz records data using the Fast Limnological Automated Measurements ([FLAMe](#)) platform developed at the Center for Limnology to understand how conditions on lakes change over time and space.

(2) At the end of a long day of field work, students living on station head to our pier to catch the sunset.

(3) More than 200 visitors came out to our first in-person [Open House](#) in two years. **Join us this year on Friday, July 29th from 1-5pm to get a first hand look at our research and free Babcock ice cream!** And, join us at Hasler Lab Open House in Madison on Friday, June 24 from 2-6pm.

Memories of Carl Bowser and His Contributions to Limnology by John Magnuson

In early 2021, Carl J. Bowser passed away at home in Arizona after a long bout with cancer. I miss him, as do all who knew him.

Carl, a geologist, geochemist, and hydrologist, was one of six faculty members who wrote our first proposal to the National Science Foundation in 1980 that resulted in the [North Temperate Lakes](#) Long-Term Ecological Research (NTL-LTER) program, which has now been studying Wisconsin lakes for nearly 40 years. Judy, Carl's wife, writes that the LTER project was indeed one of the involvements "for which he was most proud."

Together, he and I selected the first set of primary study lakes, and ran the NTL program together with a lot of help from our colleagues. Carl continued to be a key contributor through the early 2000's and provided intellectual leadership and skill in orchestrating our research efforts. Carl was also a long-time participant in the "[Sapelo](#)" class, which was a rite of passage for many young limnology students.

Over the years, we became friends, canoed the lower Wisconsin River, and spent hours driving back and forth to Trout Lake Station. I always enjoyed his company and his stories about the geological landscape between Madison and Trout Lake.

Carl's mark remains on the NTL-LTER program and on those of us who knew him. We very much appreciate his contributions.



Trout Lake Station - limnology.wisc.edu/trout-lake-station-welcome/

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WANT TO SUPPORT TROUT LAKE STATION?

We are excited to announce the creation of the new "Trout Lake Station Fund." Donations to the fund will go directly to TLS to help improve our facilities and support our mission of freshwater research, undergraduate training, and public outreach.

Individual donors make a BIG difference by funding summer internships, innovative Northwoods research projects and more.

Please consider making a gift to
Trout Lake Station.

CFL and TLS support webpage:
<https://limnology.wisc.edu/support/>

or contact

Gretchen Gerrish at
ggerrish@wisc.edu (608-890-4763)

or

Jake Vander Zanden at
mjvanderzand@wisc.edu (608-262-3014)

--Hello, Goodbye

Since last summer, Trout Lake Station said goodbye to a long-serving employee and made a couple of new additions. Here's the latest on our comings and goings.



Amber Mrnak joined the Station staff in 2021 as our station coordinator AND first-ever outreach coordinator. She looks forward to sharing our science with local residents, schoolkids, and tourists alike!



Next time you drive along the southern shoreline of Trout Lake, be on the lookout for our brand-new sign - carved by our very own TLS facilities technician Michael Coakley!



After 29 years as a facilities manager John Vehrs retired so that he could have more time to explore the Northwoods – and only be responsible for maintenance of his own equipment for a change!