



College of Letters & Science  
UNIVERSITY OF WISCONSIN-MADISON



# LIMNOLOGY NEWS

News for Alumni and Friends of the Center for Limnology

Fall 2017

## Putting Algae on the Front Page

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Photo by Jeff Miller

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Photo by Jeff Miller

## From the Director



More than any year in recent history, 2017 has been a year of transitions for the [Center for Limnology](#) (CFL). Professor and former Director [Steve Carpenter](#) retired ([page 3](#)) at the end of summer, and is now a self-proclaimed 'free-range scientist.' We are excited that Steve will stick around in his retirement and continue to do free-range science.

Steve isn't the only CFL figure who headed to greener pastures this year. [Trout Lake Station](#) (TLS) Director Tim Kratz ([page 5](#)) moved to Duluth with his wife, Cathy, and retired after more than 36 years at UW-Madison and 17 years leading our iconic [Northwoods research station](#) on Trout Lake. TLS also lost its research technician extraordinaire, Tim Meinke ([page 10](#)), who retired after 34 years with the [North Temperate Lakes Long Term Ecological Research](#) (NTL LTER) program.

But, fear not. Our ranks are being replenished. The CFL is delighted to welcome [Hilary Dugan](#) ([page 3](#)) as the newest faculty member of the CFL family. Hilary brings exciting new expertise to the CFL, having previously worked on a wide range of topics in arctic, antarctic, and

temperate lakes. Moreover, we are currently in the midst of an international search for a new director at TLS.

As suggested by the fact that I'm writing this column, I've stepped in as the new director of the CFL. A bit about myself: I grew up in Wisconsin's Fox River Valley, attended Neenah High School, did my undergraduate and graduate degrees at McGill University and, in 2001, was fortunate enough to get a faculty job back in my home state of Wisconsin. Madison has been a fantastic place to live and work during the last 16 years. And, needless to say, I feel both fortunate and deeply humbled to join the ranks of past CFL directors ([Steve Carpenter](#), [Jim Kitchell](#), [John Magnuson](#), and [Art Hasler](#)).

All this change brings many challenges, but it also provides an opportunity for growth and re-invention. We are charting a course to be stronger than ever - building on our strength of conducting top-notch research in Wisconsin and around the world, while also expanding in new directions and deepening our commitment to the [The Wisconsin Idea](#) and serving the people of the state and beyond.

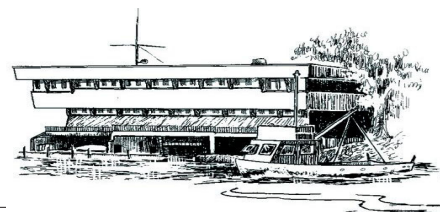
As the new director, I look forward to staying in touch and getting to know friends of the CFL. Please don't hesitate to drop me a note, and enjoy this issue of the CFL's Limnology News.



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Hasler Laboratory of Limnology  
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Madison, WI 53706

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3110 Trout Lake Station Dr.  
Boulder Junction, WI 54512



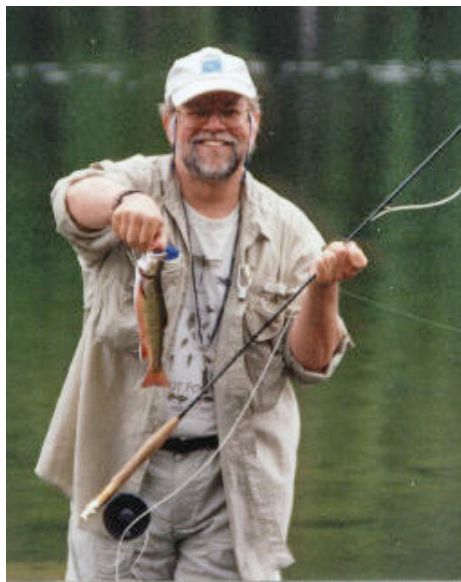
Limnology News

# Steve Carpenter Retires from CFL

by Adam Hinterthuer

[Steve Carpenter](#), director of the CFL and Stephen Alfred Forbes professor of Integrative Biology (Zoology), retired after 28 years at the University of Wisconsin-Madison.

Widely recognized as one of the world's most influential researchers in the fields of limnology and ecosystem science, Carpenter leaves a legacy that will endure not just here at the CFL, but throughout the ecological sciences and in lakes, rivers and streams across Wisconsin and the globe.



"If you went to any freshwater research institute in the world," says Jake Vander Zanden, new director of the CFL, "and asked the researchers there who the leading scientist was in their field, they would all say 'Steve Carpenter.' Steve helped change not only the way we study freshwater systems, but also how we manage them and work to conserve them."

Carpenter spent his career combining theoretical modeling, long-term studies, and whole-ecosystem experiments to inform our understanding and management of freshwater resources. His work showed that phosphorus from agricultural activity is the leading contributor to poor water quality in lakes. He helped build scientists' ability to

forecast potentially harmful algal blooms and pioneered work on how disturbances in ecosystems can cascade up or down the food web, leading to dramatic change.

Monica Turner, Eugene P. Odum professor of ecology at UW-Madison, says Carpenter's skill as a scientist was matched by a willingness and ability to collaborate. With his "active support, praise and commitment to his colleagues," she says, he helped establish the UW-Madison as a leader in the ecological sciences and "helped all boats to rise, not just his own."

Michael L. Pace, a professor in the Department of Environmental Sciences at the University of Virginia, agrees. "It is hard to think of another scientist who makes those working with him so much better," he says.

Pace calls Carpenter a "brilliant and creative" scientist and compares him to legendary musician Ray Charles who could sing a song perfectly on the first take and became known in the business as "One-Take Ray."

"Steve is the 'One-Take Ray' of scientific paper writing," says Pace. "He somehow visualizes a paper and knows before hitting the keyboard how he wants to play the song. I've never seen anyone who was better or more efficient."

Among many other awards and accomplishments, Carpenter is the former President of the Ecological Society of America, co-founder of the scientific journal *Ecosystems*, a member of the National Academy of Sciences and recipient of the 2011 Stockholm Water Prize, widely regarded as the "Nobel Prize" of freshwater sciences.

While he is stepping away from the administrative and teaching duties of his previous titles, Carpenter will still continue to conduct research as an emeritus professor or, as he calls it, "free-range scientist." When he isn't cooped up in his office writing papers on big ecological themes, he'll more than likely be fighting invasive species and restoring native prairie plants on his land in Wisconsin's driftless area west of Madison.



# Hilary Dugan Joins CFL Faculty



*We are thrilled to announce that the Department of Integrative Biology has hired [Hilary Dugan](#) to be an assistant professor and a faculty member at the CFL. Here are a few things to know about the newest addition to Hasler Lab:*

**Hometown:** Woodstock, Ontario, Canada

**Educational background:** BSc, Queen's University, 2008; MSc, Queen's University, 2010; Ph.D., University of Illinois at Chicago, 2014

**How did you get into your field of research?** I was always fascinated by earth sciences, and how ecosystems worked. During my undergrad, I worked as a research assistant in the Canadian Arctic and fell in love with fieldwork and studying global change. At some point, my interests narrowed to water and, eventually, lakes. Having grown up around lakes, this was probably a natural progression, but it took me awhile to get there.

**What attracted you to UW-Madison?** As a limnologist, there's no better place in the world to study lakes.

**Favorite place on campus?** The [Memorial Union](#) is top in my books. If you can't be out on Lake Mendota, spending time on its shore is the next best thing.

**What are you most enjoying so far about working here?** UW-Madison felt like home the minute I started working here. Across campus, people are welcoming and collaborative. Campus is a giant hive of activity and it is easy to get lost in all of the opportunities.



## A Tale of Two Lakes

by [Samantha Oliver](#)

[From CFL Blog post, January 18, 2017](#)

Ten Mile Lake in winter  
Photo: Sam Oliver

Today, I woke up at my favorite place on earth – Ten Mile Lake, in Hackensack, Minnesota. On the coldest day of the winter thus far, the frozen lake is so bright, so sparkly, it is hard to look at. And when you are from a place where 30 below is often the actual temperature (NOT the wind chill), you rely less on the calendar to define the seasons and more on observations of specific events tied to the climate.

Summer, to me, never began on the day with the most sunlight, but rather on the day the dock was installed (and ended, of course, when the dock was removed). Winter and spring were always announced by the day the lake froze and thawed.

Then I moved to relatively tropical Madison, where winter is shorter, but the lakes still provide a checkpoint in our urban phenology. But now my observations are set up as a study of contrasts: my asparagus came up two weeks sooner than my mom's or subtract 10 degrees from Madison's temperature to guess Hackensack's temperature. On

December 15th this year, I texted my mom: "Is Ten Mile frozen?" "Almost," she responded.

We have this conversation every year, but this year felt different. Lake Mendota seemed close to freezing. I couldn't remember a time when the two lakes froze within a week of each other. Mendota always seemed to be frozen a month less than Ten Mile. But lakes are losing ice cover and [colder places are warming faster](#). Maybe, I thought, the two lakes' ice seasons are converging because of climate changes. Was my hometown becoming more like my new town?

I was hesitant to believe my own conclusions because human perception of climate change is complicated. Our beliefs are influenced by our experiences – if you can remember ice fishing in November as a kid, but not as an adult, you might feel certain that climate change is affecting ice duration. But, if you already believe climate change is not real, you might instead remember the polar vortex of 2014, and conclude that

the climate fluctuates and warming isn't happening.

But these perceptions of change cannot protect us from the observable fact that we are living in a [warmer](#) and [more extreme](#) climate. And that fact has consequences. For example, the data tell us that Lake Mendota has lost a month of ice cover in the last 150 years.

I wanted to move beyond my experience and perception – what do the data say?

Ten Mile Lake doesn't have a long record, but it does have [dedicated citizen scientists](#) who have tracked ice on and ice off dates since 1988. I made plots to compare the ice on and ice off on Ten Mile and Mendota to see if my own perception matched reality.

The data both validated and disproved some of the conclusions I made from my personal experiences. Or, to put it in less scientific phrasing, the answer to my question was both “yes and no.”

The plots showed that the two lakes can and have frozen on the same date. But, it's rare, and this year Mendota didn't succumb to the cold snap in mid-December, freezing instead on January 1st, 15 days after Ten Mile and consistent with the record average of 16 days. The data show that the freeze date for both lakes appears to be getting later, so they aren't converging as I suspected.

Where the lakes might be getting more similar is ice off date. While my memory of the two lakes being “two weeks” apart held up for ice on, it turns out that ice off differences are much larger (29 days apart on average), and I was shocked to learn the difference in total ice duration between the lakes can be as high as two months!

In my childhood, the lakes frequently thawed more than 40 days apart, but that hasn't been documented in the past 15 years. So, even as a limnologist, my perceptions didn't exactly match the reality of the data. This shouldn't be too surprising, I guess, as [Lake Mendota has already taught us](#) that 30 years of data may not be enough to reveal the slow, variable, but very real changes taking place around us.

## TLS Director Tim Kratz Retires

by Susan Knight



In June 2017, Tim Kratz retired after more than 36 years at the Center for Limnology's Trout Lake Station (TLS). Tim graduated with a BS in Botany from UW-Madison in 1975, migrated over to Minnesota for his MS and migrated back to complete his Ph.D. at UW-Madison in 1981. Tim started his career at TLS as the site manager for the North Temperate Lakes franchise of the National Science Foundation's (NSF) then brand-new Long Term Ecological Research network. Tim was a lead on the project for most of his career and became director at TLS in 2000.

Tim's research interests included bogs, long-term changes in lake ecology, lake metabolism, and interactions between land, groundwater and surface water. Tim contributed to the greater scientific community as a journal editor, and reviewer for countless proposals and articles. He helped develop the Global Lake Ecological Observatory Network (GLEON), which took him to nearly every continent where he helped launch scientific buoys into lakes across the globe. One especially memorable trip to Taiwan involved the untimely arrival of a typhoon and Tim and his team stranded on top of a mountain.

*Tim was as dedicated to science as he was sharing that work with the broader public.*

Tim was as dedicated to science as he was sharing that work with the broader public. He hosted lake associations and school groups at TLS, enthusiastically organized the TLS annual open houses and, while at a brewery in Ashland, WI in 2013, stumbled on an advertisement for a science café – which led to the idea to start Science on Tap-Minocqua. To everyone's surprise, about 200 science-starved enthusiasts showed up for the first program at the Minocqua Brewing Company to hear Tim and colleague Tom Steele talk about lakes and land in the Northwoods. Now, five years later, Science on Tap-Minocqua continues to thrive.

In his later years as director, Tim took time away from TLS to serve two stints at NSF Headquarters in Washington D.C. – first as a program officer in the Division of Environmental Biology and later as program officer in MacroSystems Biology.

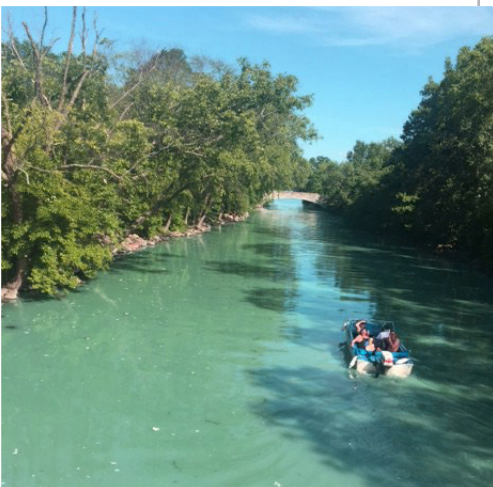
Tim's quiet but effective leadership at TLS, GLEON, and NSF assures his scientific legacy. And, coming full circle, after retirement Tim once again migrated to Minnesota. He and his wife now live in Duluth, where Tim is learning how to ride his bike in much steeper terrain than the Northwoods.



A blue green bloom off Hasler Lab pier.  
*Photo: Emily Stanley*

## Madison in Bloom: CFL Helps Get Algae on the Front Page

by Adam Hinterthuer



*Photo by Katie Rice*

June 16th was a hot, sunny Friday in Madison and [Steve Carpenter](#) couldn't believe the view from second-floor perch in the Hasler Laboratory for Limnology. West to the UW-Madison Rowing team's boathouse and east all the way to James Madison Park, the calm waters of Lake Mendota looked just like teal-blue paint.

The massive bloom of toxic blue-green algae was "the worst one I've seen in a long time," says Carpenter, recently retired director of the CFL. In fact, the bloom was the largest to mar Mendota's shoreline since the summers of 1993 and 1994.

Like this summer, those summers were marked by "classic" conditions for an algae bloom. Madison was beset by higher-than-average rainfall and that rain was coming in intense storm events. In a landscape dominated by agriculture, these gullywashers carry manure waste from dairy farms and synthetic fertilizers used to help crops. And the nutrients (especially phosphorus) contained in these pollutants run into our

lakes, where it is really good at growing algae.

Algae also like it warm and, when it got hot in June, Carpenter says, "we had this incredible spin up of cyanobacteria (blue-green algae) in the surface water and then the wind stopped, and these kinds of algae are buoyant and they just floated to the top in this awful scum."

The bloom was hard to miss. Besides the highly unusual hue and unsettling stench, it was blown by the wind toward Lake Mendota's outlet into the Yahara River, where toxic, oxygen-starved water resulted in a large fish kill. Despite this, there was extremely little coverage in local Madison news outlets.

A few articles noted the "stinky" water. One local TV outlet posted an online news story about people, "unfazed" by the bloom, going swimming. And that was it.

Here at the CFL we were surprised that a story with potentially dire consequences for both our local lakes and public health wasn't bigger news. So we decided to at least share

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**We were surprised that a story with potentially dire consequences for both our local and public health wasn't bigger news.**



Fish kill along the Yahara River. Photo: Jake Vander Zanden

the story to our readers and followers on our blog and social media feeds. The unexpected results showed that we are reaching far beyond the halls of academia with our outreach and communication efforts.

To begin with, local news media took notice. Within a day of our [algae-induced blog post](#), the Wisconsin State Journal featured [a long front-page piece](#) on the causes and consequences of algae blooms. WKOW, the local ABC affiliate that had run the story of swimmers brushing off the bloom, broadcast a closer look at algae in their “[Digging Deeper](#)” series.

But most rewarding was the fact that we were able to reach big audiences on our own.

In two days, 7,500 people read our initial blog post on the algae bloom. A lively discussion began in the comments section as people thanked us for informing them about what they'd witnessed over the weekend, vowed to warn friends and family against swimming or paddling in the potentially toxic waters and brainstormed ways to tackle the

problem. Our Facebook post landed in more than 20,000 news feeds. Our Twitter feed “blew up” as they say these days.

Considering that our mission at the CFL is to “exemplify [The Wisconsin Idea](#) by providing new knowledge and information on aquatic ecosystems,” we were thrilled with the engagement and dialogue we were able to create.

It underscored the importance of science communication in a new landscape where shrinking newsrooms and reduced coverage of natural resource issues often leaves news outlets unprepared to cover emerging environment and public health stories.

We were happy to, however modestly, step in and try to address that gap.

Hopefully it won't take another harmful algal bloom to bring Wisconsin's iconic lakes back into the limelight but, if it does, we'll be sure to let people know.

Go to [CFL blog](#) to read full post.

### Going viral: the big reach of digital media

1 CFL blog post on algae bloom

36 Comments on blog

73 Retweets on Twitter

7,500+ Blog post views

20,336 People reached on Facebook



facebook

# It's a Jungle Down There: Zebra Mussels Transform Depths of Lake Mendota

by Mike Spear

In September 2015, a single zebra mussel about the size of a fingernail signaled the arrival of one of the world's most notorious invasive species in one of the world's most studied lakes.

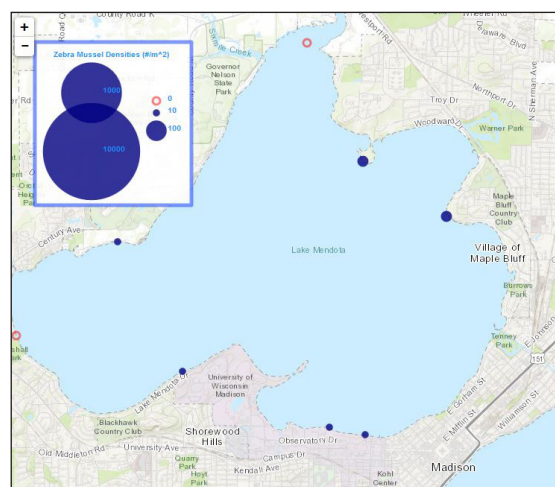
In June 2016, I led a team of SCUBA diving researchers at the CFL on surveys of the lake's nearshore habitat. We found maybe four or five mussels at each dive site, needing little more than our fingers and a tiny plastic baggie to take samples. Just a year later, the mussels now count upwards of 30,000 below the dock of the Hasler Laboratory and now we use paint scrapers and underwater vacuums to chisel our countless specimens off rocks, logs and piers and get them back to the lab.

To help the public track the invasion, the CFL put together [an online tool](#) that provides interactive maps and figures for freshwater enthusiasts anywhere to see the transformation happening beneath the waves.

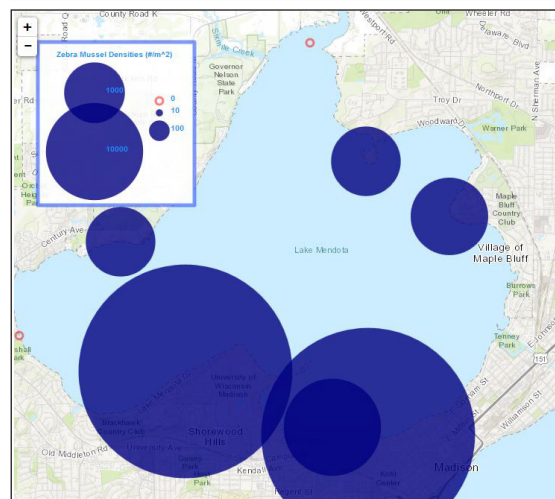
The bottom of the lake looks very different since the outbreak of zebra mussels. Most hard surfaces, including shells of native mussels, are now encrusted in the critters. Their sharp shells create a hazard for bare feet but a new world of nooks and crannies for all sorts of algae and invertebrates to inhabit.

Here at the CFL, we're intensely studying the growth of the lake's newest invasive population and keeping our finger on the pulse of the rest of Mendota to detect any changes they trigger. Though it's difficult to pin impacts on zebra mussels this early, their continued growth should bring more nutrients to the lake bottom, upsetting the balance between the open water and nearshore habitats. In fact, thick, stringy mats of algae already coated Mendota's rocks this summer as they found nice, hard shells to grow on and a buffet of nutrients at the bottom of the lake.

Between vine-like weeds, algal underbrush, and a stampede of hungry zebra mussels, it's truly a jungle down there!



Zebra Mussel Density June 2016



Zebra Mussel Density June 2017

This exponential growth can't go on forever, but zebra mussel populations in the Great Lakes reached the hundreds of thousands per square meter before they leveled off. Such densities are sure to have impacts on Lake Mendota. Their growth here is limited to the nearshore, as their need for rock and wood make most of Mendota's mucky bottom an inhospitable desert of silt.

Monitoring indicates zebra mussels spread to Lake Monona last year, and WDNR scientists detected zebra mussels in Lake Waubesa this summer, as well, so it appears the invasion is headed downstream.

Zebra mussels are likely a permanent resident of the Yahara chain of lakes going forward. However, it's important to limit exposure of Wisconsin's other lakes, the vast majority of which are still zebra mussel-free. Following [DNR guidelines](#) to clean and dry boating and angling equipment could prevent these changes in more waters across the state.

## Field Samples: Postdoc and Graduate Students



**Vince Butitta (Ph.D., Stanley) @VButitta**

Vince grew up in Delavan, Wisconsin, and headed to Lawrence University for college where he was mentored by CFL alumnus, Bart DeStasio. While at Lawrence, Vince heard a talk about restoration efforts on his hometown water body, Delavan Lake, and it kindled his interest in aquatic ecology. He embarked on a project mapping spatial patterns of water quality in Lake Winnebago that, he says, “foreshadowed my master’s research at the CFL.”

After graduating, Vince taught high school science and math before heading to Madison. At the CFL, he completed a master’s degree with Emily Stanley, studying early warning indicators of abrupt transitions in ecosystems. He’s now “switched gears” for a Ph.D. on the ecology of North America’s native freshwater mussels, our continent’s most endangered animals.



**Allison Moody (Postdoc, McIntyre) @atmurre**

From Dartmouth, Nova Scotia, Allison planned to stay in Canada and work for the government until, one harsh winter during the middle of her Master’s program, she saw a listing for a job in California. After that detour, it was back to grad school for a Ph.D. on the landscape ecology of bird conservation.

At the CFL, Allison is part of Pete McIntyre’s lab developing the online tool, [FishWerks](#). She’s currently working on a paper and series of maps that show where state agencies or non-profits can get the biggest “bang for their buck” when it comes to freshwater conservation and dealing with dams and road crossings in Great Lakes tributaries.

Despite her time in California, Maine and Madison, Allison hopes to someday head home toward her original goal of working for the Canadian government.



**Mike Spear (Ph.D., Vander Zanden) @spearmike**

Originally from Mokena, Illinois, Mike arrived at the CFL in 2015 to pursue a Ph.D. with Jake Vander Zanden to study eDNA (fragments of DNA animals leave behind in an environment) and how to use it to identify what’s living in an ecosystem.

Unfortunately, his arrival coincided with the discovery of zebra mussels in Lake Mendota. So Mike threw on his SCUBA gear and dove headfirst (okay, feet-first!) into invasion ecology, studying how zebra mussels are colonizing and impacting Madison’s lakes.

He hasn’t lost his eDNA interest and occasionally ventures to Patrick Krysan’s lab at the Genome Center of Wisconsin, but most days find Mike armed with SCUBA gear and a paint scraper, heading out to get clusters of the invaders off nearshore rocks.

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## Catching Up With Alumnus Chris Harvey (Ph.D. 2001, Kitchell)

### Where are you now and what are you up to?

Since 2001, I’ve worked at the NOAA Northwest Fisheries Science Center in Seattle, where I’m a marine ecosystem ecologist. I lead a small team studying marine communities in Puget Sound and along the West Coast. I’m also one of the science leads of the California Current Integrated Ecosystem Assessment project, a NOAA-led effort to provide quantitative, integrative science support for ecosystem-based management.

### What led you to study at the CFL?

I am an Ohio native but ricocheted all over the country as I was growing up and when I was in school. The basic order (using state postal codes) was OH-CA-AZ-NC-WA-MA-WI-WA, with extended forays to OR, MD, AK and Sweden. So, I’m from Ohcaazncwamawiwaormdaksweden. A mentor encouraged me to apply to the CFL when I was looking at Ph.D. programs; I told her I was interested in aquatic food web studies and where I was thinking of applying, and she said, “Why the heck aren’t you applying to Wisconsin!?” It turned out to be some of the best and most important guidance of my life.

### Is there anything you learned at the CFL that’s been helpful in your current pursuits?

I would be hard-pressed to name something from CFL that HASN’T helped me. Core principles of ecology, the value of cross-disciplinary collaborative research, the essential and rejuvenating importance of side projects, appreciating interactions between natural and social systems...the list could go on and on.

## Tim Meinke Retires - Q and A

*This year we also said goodbye to jack-of-all-trades, Tim Meinke, at TLS. We checked in with Tim in the early days of his retirement.*

**After 34 years with the CFL, what do you do now?**

I've little fear of being bored between making music, messing with gadgets and continuing the adventure travel I've had with my brothers. But, at the risk of sounding mundane, lately I've been filling a hole that developed in my working life - rolling over and smiling after disarming my morning alarm.

**Is there an accomplishment you're particularly proud of?**

I always enjoyed solving puzzles that came with integrating diverse sensors on buoys, and the issue usually came down to available power. In my last years and with all the improvements in solar technology, Noah Lottig, Dave Harring and I assembled the MegaBuoy, also affectionately known as Buoy McBuoyFace. It is a great powerhouse and built to outlast all buoys before it; I'd be proud to see it outlive me.

**In your own words, what was your job at TLS?**

In many ways, my job reminded me of a very old cereal commercial. When something new came around, they said, "Let Meinke try it, he likes everything." They were right and I became the first in-house web guy, the buoy guy, the isotope guy and caretaker of most of the analytical instruments. Only later did they discover their predicament - I was actually useful!



## The Power of a Picture

by Riley Steinbrenner



Sydney DeMets (left) and Camryn Kluetmeier (right) Photo by Riley Steinbrenner

*This summer, the CFL was lucky enough to have Riley Steinbrenner, a talented photographer and communicator, as Trout Lake Station's summer science communication intern. The following is an excerpt from her final blog post about her experience in the Northwoods.*

Goodbyes are hard, especially when it comes to saying them to people you've lived with and developed friendships with over the summer. (Seriously, where did the time go?!) And so, I'd like to start off my final post as Trout Lake Station's science communication intern by thanking all the wonderful staff and student researchers who made my time at Trout Lake so enjoyable. It's hard to believe I got to call this my job.

Through my summer spent trying to tell the wider world what it is we do here, I learned that understanding the language of science is not much different than understanding Chinese, German, French or English. It requires translation through metaphor, visuals and humanization.

Sixty-five percent of us are visual learners. I don't remember anyone in my third grade class who objected to our science teacher popping a Bill Nye the Science Guy video into the VCR and pleaded with her to read "Chapter Eight: Plate Tectonics" instead. Why? Because visuals—whether moving or still—transport us to the content of that image and increase our engagement with and enjoyment of it.

In today's routine of news perusing (often on a 5.5-inch smartphone screen) a person takes no more than seven seconds to decide if they want to click on that headline about conducting long-term ecological research (LTER) on Trout Lake. Unless someone is already interested in the LTER network, what would make them want to click on something that is not immediately relatable?



(Front to back) Martin Perales, Alyssa “Liddy” Ginther and Matt Chotlos use Fyke net to sample for fish species on a Northwoods lake

But, when that headline gets paired with a picture of an undergraduate student reaching over to one side of a wind-tossed boat with a graduated cylinder in her hand and the kind of look on her face that anyone who’s had a stressful week at work is all-too familiar with, [that article](#) becomes more appealing. It’s something we can all relate to—that feeling of dreading the situation but having to push through and get the job done. And since most of us are empathetic humans, you more often than not click on that headline.

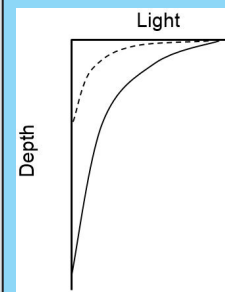
The power of photos doesn’t stop there. While they work wonders reeling readers in, they also have a special power to augment key points in the written text because seeing is experiencing. For example, if a reader misses the written explanation of what [gastric lavage](#) is, a picture can help them understand that it means making a fish puke in a petri dish! Or, when I’m writing about going into the field with a team of researchers, a picture can bring the reader with me. For example, the realities of night fieldwork become clearer – the complete and utter darkness of a moonless night in northern Wisconsin, the headlamp needed to measure fish and take notes, the long sleeves and mosquito netting needed to preserve your sanity.

Overall, writing and photographing these posts have made me realize that photos truly help place the readers into the text, transporting them to the scene of the action, which increases their attention as well as their engagement and, ultimately, their comprehension. That “as if you were there feeling” a photo can capture can have the same (if not stronger) impact as writing. There is no writer’s voice to alter the viewer’s experience, making the experience more relevant and meaningful to the viewer. It’s an aspect of science communication that is crucially important - making things matter.

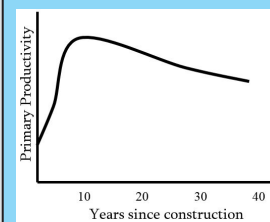
You can find more of Riley’s words and pictures on our [blog](#).

See all ‘Awards’ and ‘Catching Up With Alumni’ at our [CFL Newsletter webpage](#)

### LIMNOLOGY 315 ANSWERS (Graphs and questions on back page)



**Top Graph:** Coffee is rich in dissolved organic matter that is capable of absorbing light; much like dissolved organic carbon from peat surrounding dystrophic lakes such as Crystal and Trout Bogs. Thus, light penetration would decrease substantially (dashed line).



**Bottom Graph:** The period in which primary production reaches a relatively high rate during the first years of a reservoir’s life is referred to as “trophic upsurge” and is supported by the release of nutrients from decomposing terrestrial plants, soils, and other materials after they become inundated.

## THANK YOU FOR SUPPORTING THE CFL

The generosity of our donors allows the Center for Limnology to help our students, faculty and staff reach their full potential. Please consider making a gift to the Center for Limnology Endowment Fund.

### CFL Support webpage:

<https://limnology.wisc.edu/support/>

or

Contact Troy Oleck, UW Foundation at 608-284-1673 or [troy.oleck@supportuw.org](mailto:troy.oleck@supportuw.org)

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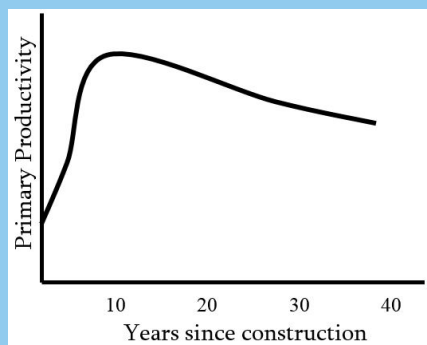
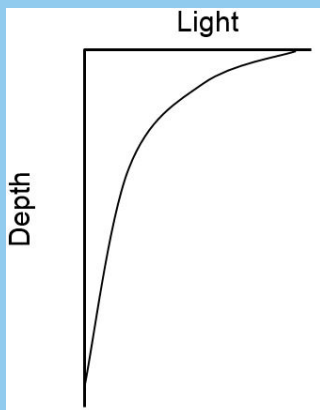


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Representing three eras of leadership at the  
University of Wisconsin-Madison CFL  
(left to right) John Magnuson,  
Steve Carpenter and Jim Kitchell  
*Photo by Shanna Wolf Photography*



## Could You Pass Limnology 315?

**Top graph:** A Starbucks's tanker truck recently fell off of a road in Washington's Cascade Range - after the driver had one too many double-shot mocha latte - and thousands of gallons of French roast coffee spilled into a small glacial lake. The graph shows the incident light profile BEFORE the spill. Add a line indicating your expectation for the light profile after the spill.

**Bottom graph:** The graph shows the change in primary production of Big Gulch Reservoir since the completion of its dam. Explain why production increased dramatically during the first 10 years of the reservoir's existence.

See [page 11](#) for answers.