College of Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

LIMNOLOGY NEWS

News for Alumni and Friends of the Center for Limnology

Fall 2018

The Year of the Flood

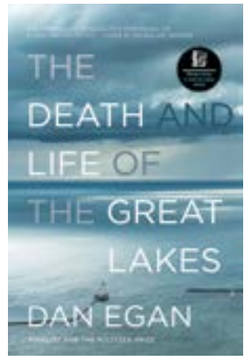
Read more on page 6

Photo: Jeff Miller

Photo: Jeff Miller

Greetings! I'm excited to share that our inland lakes spent a lot of time in the spotlight on the UW-Madison campus this year. As you may know, each year the UW-Madison Chancellor selects a single book as the focus of a campus-wide shared reading experience called 'Go Big Read.' Thousands of UW-Madison students read the book, and it's used in scores of courses and discussion groups across campus and throughout the state. This year's Go Big Read selection was *The Death and Life of the Great Lakes* by Milwaukee Journal Sentinel reporter Dan Egan. The book tells the remarkable story of the ecological changes in the Great Lakes wrought by the introduction of invasive species and other various forms of environmental mismanagement. With all this attention on the ecology of our lakes, we've been taking advantage of the opportunity to increase awareness and promote conversations about our lakes and water resources. It may be a while before another limnology-themed book ends up on the 'Go Big Read' list!

I hope you enjoy the latest *Limnology News*. It has been an eventful year and we cover a broad swath of topics in this installment. In addition to 'Go Big Read' we recap the unprecedented floods in Madison, how they swamped the Center for Limnology (CFL) basement, and how they relate to climate change. We discuss CFL leadership in the open data movement, introduce the new Trout Lake Station Director, explore road salt in our lakes and head out on a hunt for fish DNA. Each of these vignettes highlights the synergy among teaching, research, and outreach that we constantly strive for at the CFL.



I'll close with a warm 'thank you' to the many generous alumni, friends, and donors who have financially supported the CFL during the past year. Your support allows us to sustain our impact, and to train the next generation of leaders in limnology and the aquatic sciences. We couldn't have done it without you. Please don't hesitate to drop me a note and an update.

Jake Vander Zanden
Wayland Noland Distinguished Chair and Director
Center for Limnology, University of Wisconsin-Madison

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3110 Trout Lake Station Dr.
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Limnology on People's Minds All Year Long Thanks to 'Go Big Read'

by Adam Hinterthuer

Dan Egan answers questions from a crowd of more than 200 people for the CFL-sponsored "Science on Tap-Madison" event. *Photo: Adam Hinterthuer*

This Spring, when it was announced that Chancellor Rebecca Blank had selected Dan Egan's book "The Death and Life of the Great Lakes" as the UW-Madison's Go Big Read book, we knew that it was an excellent opportunity to keep limnology in the public discourse all year long.

Trout Lake Station (TLS) staff hosted a book discussion for more than 40 northern Wisconsin residents at TLS. Our director Jake Vander Zanden (who Egan quotes in the book) joined Egan for a public discussion at a Madison bookstore and moderated Q & A after Egan's official UW-Madison lecture. Our blog published posts on the Great Lakes and invasive species throughout the year.

It was great to see a sustained interest in freshwater sciences, but nothing was more rewarding than watching 200 people cram into Working Draft Beer Company for our Science on Tap-Madison event in October.

Egan had just finished up his week of speaking engagements at the UW-Madison, including a public talk at UW Memorial Union's Shannon Hall to more than 1,000 people the night before. When the CFL teamed up with University Communications to add a final, more casual event to Egan's agenda, we didn't know what to expect.

What we got was an engaged and inquisitive standing-room-only crowd joining in a conversation with Egan to talk about how human activity, both intentional and accidental, has shaped the entire Great Lakes ecosystem.

Perhaps the most poignant moment came when someone asked Egan how we, as individuals, could protect the Great Lakes. He responded by saying that, before we can start the hard work of protecting a place, we have to love it first. And for us to love a place, we have to know it. And the most powerful way to build that sense of place is to spend time in it when you're young. Essentially, Egan said, find some kids and get them to a Great Lake.

We couldn't agree more, and we're thrilled we were able to help Egan have that conversation.

Emily Stanley's Big Year

by Adam Hinterthuer

While everyone here at the Center for Limnology had a good year, it's safe to say that 2018 treated Emily Stanley particularly well.

Emily & Griffin *Photo: Selfie*

For starters, she was named a 2018 fellow by the Ecological Society of America (ESA). In an announcement about the award, the ESA wrote that Emily was recognized for "the quality and importance of her contributions to ecology, for her ability to identify and lead new ecological frontiers, and for making connections across boundaries that continue to push our field forward."

If that weren't enough, the Association for the Sciences of Limnology and Oceanography (ASLO) also weighed in, presenting Emily with the 2018 G. Evelyn Hutchinson Award. The G. Evelyn Hutchinson award honors a limnologist or oceanographer who has made considerable contributions to knowledge, and whose future work promises a continued legacy of scientific excellence.

Emily's award was for her contributions to the understanding of the roles hydrology and the biogeochemistry of nitrogen and carbon play in lake and stream ecology and for "consistently pushing scientists to look beyond traditional physical and disciplinary boundaries of freshwater research." She was presented with the award at the ASLO Summer Meeting in Victoria, British Columbia.

While all of these accolades merely confirmed what we already knew about Emily, it sure was nice to see some of the freshwater sciences' most esteemed professional organizations agree with our assessment. Congrats, Emily!

Environmental Data Initiative Wants to Make Storing and Sharing Data Second Nature

by Adam Hinterthuer

Photo above: Data scientists and computer programmers from across the country met to discuss building better software at an EDI "Hackathon." *Photo: Colin Smith*

Over the course of their career, a productive ecological scientist will publish dozens of scientific papers and pile up mountains of data to get those results. And all too often, says CFL senior scientist, Corinna Gries, all of that data is stuck on that single scientist's computer – doomed to disappear when they retire. Everyday, countless datasets that could help us learn more about the world around us are simply lost.

To try to fix that problem, Gries is looking to the stars. Or, rather, to the people who study the stars.

"What we are focusing on is really the culture change of convincing people to publish their data and share their data, because in ecology we are still so far behind. There's still a lot of data that people just aren't willing to share," says Gries. The hope, she says, is to be more like astronomers. "They are sort of the glowing goal of where everybody would like to be. They have data standards and they share. Nobody is even asked if they want to share [data] or not, it just is how it works."

The importance of sharing and archiving data is two-fold. First, rather than using only their own limited datasets from a few study sites, scientists can ask and answer questions about the natural world on much longer timescales and at regional or even global scales. Second, as new technologies or new issues emerge, we will have historical data archived that can help answer questions we're not even thinking about yet.

And that's where the Environmental Data Initiative (EDI) comes in. Founded in 2016, the EDI is a collaboration between University of Wisconsin-Madison and University of New Mexico Long Term Ecological Research (LTER) projects. Funded by the National Science Foundation (NSF), the LTER program is made up of more than two dozen research sites conducting long-term monitoring and research on different ecosystems across North America. Since the 1980s, the NSF has mandated that LTER sites manage and archive their data – resulting in a huge cache of information over the decades.

Researchers at the Wisconsin and New Mexico sites created EDI as a way to take data sharing and archiving mainstream in the ecological sciences. While it was initially a way to bring diverse LTER datasets together, Gries, who is a principal investigator (PI) for the project, says that they now work with researchers whether they are funded by the NSF or not.

"It is very, very important to support the ecological researcher in learning how to publish their data and help that process along," she says. "So we have professional data scientists to support [them]."

Colin Smith is one of these scientists. Part of the EDI's data curation team, Smith helps scientists submit their datasets to the EDI archives, writes data management software and leads trainings and workshop events. Smith says he's seeing a lot of enthusiasm for the EDI.

"People are quickly becoming open to this idea," he says. "It's a new generation of scientists coming up that are used to doing synthesis science with other people's data. They are also growing up in a culture where data is a valued research product and they're going to get credit for it."

People are also seeing the EDI as a way of having not only their published papers, but also their collected datasets outlive their careers, he says.

The EDI, Smith says, turns ecological datasets into a "living body of knowledge" that can be accessed and reexamined by future generations of scientists as they continue the important work of helping us "discover how the world works and how to adapt and live within it."

Gretchen Gerrish: Meet the New Trout Lake Station Director by Adam Hinterthuer

Gretchen and her family - husband, Ben, and sons, Luke (11) and Alex (8), are all looking forward to their new adventure in the Northwoods

Last year we shared the sad news (for us, at least) that Tim Kratz was retiring as director of Trout Lake Station (TLS). This year, we get to share the happy news that we have hired his successor. We're thrilled to welcome Gretchen Gerrish to the Center for Limnology (CFL). (She'll start summer of 2019.) We asked her a few questions about her current work and what she hopes to do in the Northwoods.

Who are you, where are you and what are you currently studying? I am a teacher, mentor, researcher, friend, sister, wife, and mother. I am currently filling those roles while working as an Associate Professor at UW-La Crosse. I study evolutionary ecology in aquatic invertebrates and am currently studying zooplankton community changes occurring in the Mississippi River in response to invasion by Asian Carp. I also am researching a group of marine bioluminescent ostracods found in coral reef habitats in the Caribbean.

What made you apply to head up a research station way up near Boulder Junction? I applied because I want to put my efforts toward conducting research, mentoring students and facilitating science at a place where field studies are a central part of generating new discoveries. I am passionate about promoting nature-guided research and learning. The relatively pristine systems surrounding TLS along with the long-term data available on the region make it extremely valuable in pairing past and present understanding.

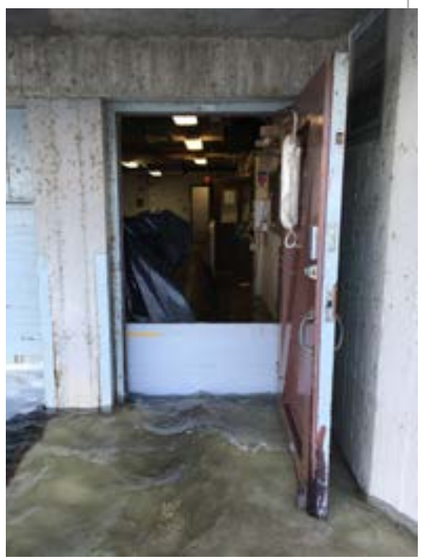
You spent a couple summers at TLS as an undergrad. Do any memories of the experience stand out? I was an undergrad at Lawrence University and was co-mentored by Bart DeStasio from Lawrence University and [former TLS director] Tom Frost. My first summer job was to [be involved with] chlorophyll and phytoplankton counts and other analyses from the Long Term Ecological Research (LTER) lakes. While not the most exciting job, my summer was filled by volunteering to help on LTER base crew, electroshocking, helping remove coarse woody debris from streams, etc. Helping graduate students and PIs on various projects filled my field skill toolkit and revealed the creative and problem-solving nature of science.

Is there anything you're excited about for the new job? Research questions you're already thinking about pursuing? I have a number of ideas but am excited to talk with folks more and cultivate collaborations. I plan to collect data (zooplankton microfossils, pollen, diatoms, chemistry, etc.) from sediment cores of the LTER lakes to see if we can match the long-term recorded data with dynamics inferred from the sediment record. Eventually, these data could be used to extend our understanding of these ecosystems back-in-time. I am excited to join the community of scientists at the station and CFL. Good people, common mission!

The high water overflowed the Hasler Lab boat slip making our inflatable dyke and water pumps essential for much of the fall.
Photo: Adam Hinterthuer

The Year of the Flood

by Adam Hinterthuer



Heavy rains and already high water levels had Lake Mendota knocking on the back door of Hasler Lab this summer. *Photo: Adam Hinterthuer*

This summer, an unwelcome houseguest moved into Hasler Lab. As the Yahara watershed received staggering amounts of rainfall, already elevated waters levels rose even more and Lake Mendota started knocking on our back door. Eventually, it let itself in. Even as summer turned to fall, we still had an inflatable dyke, water pumps and industrial-strength dehumidifiers deployed down in the boat slip.

Of course, the fact that Dave Harring, the Center for Limnology (CFL) facilities manager, had to wear waders to work for a couple of months is a mere inconvenience compared to the destruction Wisconsin's 2018 floods have had in terms of homes damaged, roads and bridges washed out and, in a few tragic cases, lives lost. But our soggy basement does serve as a reminder that weather like this is becoming more common and a sign that the impacts of climate change are here, now.

Immediately after the August rainstorm in Dane County, we noticed that this message isn't exactly getting out to a wide audience. While every media outlet covered the floods and many interviews involved people who had "never seen anything like this," the words "climate change" rarely came up - a strange omission, given that we are already seeing an increase in the frequency and intensity of storms like these and computer models predict even more extreme rain events for Wisconsin's future.

This isn't just a Wisconsin issue. A recent report found that, across all platforms, news coverage of extreme events is falling short on reporting on climate change. For example, out of 127 segments aired about 2018's global heat wave, only one mentioned global warming. And NBC and ABC never even brought it up during our most recent record-breaking hurricane season.

Part of the problem is that it is scientifically impossible to pin a singular weather event on climate change. When a reporter comes calling, most scientists are reluctant to assign blame.

Photo right: Lake Monona experienced record-high water levels, making boat launches inaccessible and forcing the DNR to declare the entire lake a "Slow, No Wake" zone from August through October.
Photo: Adam Hinterthuer

But there are things we can say when reporting on the weather.

Humans have been documenting weather events for hundreds of years and researchers have noticed alarming trends in that data. In the U.S., extreme tornado outbreaks are increasing. Hurricanes are getting more intense. And extreme precipitation events are much more common than they used to be - especially in the Midwest and Northeast U.S.

Climate change is not just some future problem looming on the horizon. It's here now. And we're dealing with its impacts. We've seen this in our own work - from shrinking lake ice to declining walleye populations to increasing harmful algae blooms. All are impacts associated with a warmer world.

Here at the CFL, we are trying to do our small part in helping inform the public about what climate change may mean for the future of our freshwater systems. Just as our coverage of massive blue green algae blooms last year reached thousands of Wisconsin residents, our blog and social media posts and media outreach about the floods this summer helped readers understand how the event led to historic flooding, how our own land-use decisions made the problem worse and what these kinds of changes may mean for the biology, chemistry and ecology of our lakes, rivers, streams and wetlands.

Here in Madison, the event revived a debate on how we manage water levels in our lakes. Should Lake Mendota's target levels be lowered so that it can hold back a higher volume of future flood waters? If so, what does that mean for the people and businesses who rely on the current levels to get their boats in the water, fish off their piers and otherwise get around on our city's largest lake? And what should we do with downstream dams, like the one in Stoughton, that acts as the last "plug" in the Yahara Lakes' drainage basin?

As these public conversations and policy debates get tossed about, we will continue to supply the best possible science we can to help inform the discussion, adjust to a new normal, plan for future weather events, and learn to better live with our lakes.

Cover Photo: Standing on a concrete pier more than six inches under water, graduate student Daniel Haryanto and undergraduate Ella Norris look out to the horizon as the rising water of Lake Mendota floods the boat slip underneath the Arthur D. Hasler Laboratory of Limnology on August 24, 2018.
Photo: Jeff Miller

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Hold the Salt: CFL Researcher Works to Preserve Our Freshwaters

by Adam Hinterthuer

Since the 1940s, road salt has been used to keep winter roads navigable by melting away snow and ice. Today, some 23 million metric tons of sodium chloride-based rock salt is applied to North American roads each year. Much of it washes into nearby water bodies, where it begins to add up, says Center for Limnology assistant professor Hilary Dugan.

In fact, 44% of North America's lakes are getting saltier, which is bad news for the plants and animals that call them home. While some species may be better able to tolerate salty waters than others, "our native species are adapted to freshwater," Dugan says. "Salt will stress them out and any kind of stress is taking away from their ability to survive and reproduce."

Dugan spent much of her early career exploring naturally salty lakes in Antarctica but, starting with a study published in the Proceedings of the National Academies of Sciences in 2017, she's broadened that focus to include waters closer to home.

Dugan studies super salty lakes in Antarctica as well as increasing salinity in lakes closer to home. Photo: Hilary Dugan

Dugan is currently at work on a "risk map" of all the lakes in Wisconsin that will predict the chloride concentration for a lake based on attributes like its proximity to paved surfaces or the amount of development around it. Such a map would be useful from a management point of view, Dugan says.

For example, she is in regular contact with the Wisconsin Department of Transportation (WDOT).

"I'm able to provide maps and data showing that this is a problem in every county in Wisconsin," Dugan says, which helps "show them what's being impacted and then they can go to their stakeholders and say, 'Look we really need to change what we're doing.' It saves us money in the long run. Salt is cheap, but it's not free! So if they reduce use, they reduce their budget. It can be a win-win as long as we maintain that level of safety."

Dugan points to WDOT studies on brine as one positive development. Brine, or a salt and water mixture that is sprayed on roads, sticks to the surface better than the rock salt that often simply bounces from the back of the snowplow and into a roadside ditch. The WDOT is also being more judicious in salt applications in spring she says, preferring to let those late March and early April snow showers simply melt away, rather than head out and dump tons of salt on our roads.

Lake Monona, where rising salinity is due to nearby road salt application.

But, she warns, "there's been very little effort [to address this] in the private sector." Road salt is especially problematic during snow removal on large parking lots, which are often managed by private snow-removal companies that have no incentive not to use as much salt as possible.

"There's this perceived liability and they cake parking lots full of salt," Dugan says, estimating that private snow removal companies may be responsible for as much as half our total road salt use. "There's still a long way to go to cut that back," she says but early responses to her research showing the extent of the problem are encouraging.

The public sector, especially state departments of transportation in the Midwest and Northeastern U.S., are "leading the pack" in addressing the increasing salinity of our freshwaters, she says, especially in Wisconsin where "they're pretty serious about cutting back salt use in the state."

The use of de-icer instead of solids can reduce the amount of salt needed.

Field Samples: Postdoc and Graduate Students

Sarah Collins (Postdoc, Stanley)
@eco_scollins

Sarah grew up in Bellingham, WA and received her undergraduate degree at Lewis & Clark College. Summer internships at Flathead Lake in Montana and Lake Tanganyika in East Africa inspired her to pursue a Ph.D. in aquatic ecology at Cornell University to study food webs in temperate and tropical streams.

At the CFL, as part of the Emily Stanley lab, she helped to build a database that includes water quality data for thousands of lakes at a continental scale. This work has allowed Sarah, Emily and a large group of collaborators to examine how stressors like land use change and climate change affect water quality in all United States lakes.

In August, Sarah took a position as an assistant professor in the Dept. of Zoology and Physiology at the University of Wyoming, where she plans to continue doing experiments and synthesizing data to understand how freshwater ecosystems work.

Rob Mooney (Ph.D., Stanley)
@MooneyRob

Rob is originally from Sauk Prairie, WI. He completed his B.S. and M.S. at UW-La Crosse. While living in the Driftless Area, he spent most of his time on streams - either fishing or conducting research. His experiences there magnified his appreciation for freshwater ecosystems.

When given the opportunity to pursue a Ph.D. at the CFL, he couldn't say no. Rob is studying seasonal and spatial nutrient dynamics in Lake Michigan's tributaries. Lake Michigan is the largest lake entirely within the United States, and Rob has travelled around its coastline numerous times to collect and analyze water from hundreds of streams and rivers that enter the Lake's coastal region.

"Seasonal shifts in Midwestern streams are a main interest of mine, " Rob says, "and this opportunity has allowed me to explore that."

Kousei (Martin) Perales (Ph.D., Vander Zanden)

Martin grew up in southern California and attended Bakersfield Community College before heading to the UC-Davis to earn his bachelor's degree in Wildlife, Fish and Conservation Biology. After graduating, Martin worked in the Peter Moyle fish ecology lab at UC-Davis where he monitored fish communities and mapped aquatic habitat in a tidal freshwater estuary.

Martin has had the privilege of working on issues related to the conservation of native fishes around the world, from Puerto Rico to Thailand to Alaska, and now in northern Wisconsin.

Martin says, "Studying fish has always been synonymous with adventure!" At the CFL, Martin is pursuing a Ph.D. with Jake Vander Zanden and is currently working to understand the consequences of increasing lakeshore development for shoreline habitat and fish communities.

Catching Up With Alumnus Lucas Joppa (Research Asst, Vander Zanden)

Where are you now and what are you up to?
I'm currently serving as the Chief Environmental Officer at Microsoft in Redmond, WA. After finishing my undergraduate degree at UW-Madison in Wildlife Ecology, doing a stint in the Peace Corps in Malawi and getting my Ph.D. in Ecology at Duke, I moved to Microsoft Research to lead research programs at the intersection of environmental and computer science. I now oversee environmental sustainability for Microsoft's global operations, as well as run Artificial Intelligence (AI) for Earth, a cross-company program dedicated to deploying Microsoft's 35 years of investments in AI research and technology to change the way society monitors, models and ultimately manages Earth's natural resources.

What led you to study at the Center for Limnology (CFL)?
Ichthyology! I loved that Jim Kitchell and CFL still taught the time-honored traditions of the standard "ologies" and that started my time at CFL. I was exceptionally fortunate to spend much more time in the Center as a research associate with Jake Vander Zanden, who taught me so much about what it takes to be a scientist who practices both theory and application. And I grew up in Price County, WI not far from Trout Lake Station, so even before I knew anything about the CFL. Maybe it was the subliminal messages from my childhood?

Is there anything you learned at the CFL that's been helpful in your current pursuits?
So much. I learned what science is, and how to practice it. I learned what computer science is, and how it relates to the natural sciences. And I saw how technology can accelerate scientific inquiry. Is it any wonder I chose the career path I did after my time at CFL?

The CFL Bids Farewell to Pete McIntyre

This year, the Center for Limnology (CFL) bid farewell to Pete McIntyre as he moved back to the place where he received his Ph.D. to become an associate professor in the Department of Ecology and Evolutionary Biology at Cornell University. We wish Pete and his family the best in their new location but can't deny that he leaves a fish-shaped hole here at Hasler Lab.

Pete was hired at the CFL in 2010 and launched an ambitious set of research projects that mixed field studies with large-scale spatial analyses across the globe. Pete's lab conducted studies on migratory fishes in the Great Lakes, native gobies in Hawaiian streams, local fish conservation efforts in Thailand, and the dynamics between nutrients and productivity in Africa's Lake Tanganyika.

When he wasn't globe-trotting, Pete was also a dedicated science communicator for the CFL.

Pete headed up the CFL's outreach efforts in our partnership with Chicago's Shedd Aquarium and their annual "World Fish Migration Day" event. He also worked with citizen scientists monitoring spring fish migrations in Lake Michigan near Chicago and was a yearly fixture at the CFL's Hasler Lab Open House, where he could be found down in the boat slip wrangling rock bass and common carp for our curious, younger visitors.

We know Pete will be an invaluable addition at Cornell and look forward to seeing what other far-flung adventures he gets up to!

Forensic Fishing: Using eDNA to Track Fish Populations

by Sydney Widell

Mike Spear heads onto Bearskin Lake looking for environmental DNA - or eDNA - the genetic material fish shed as they move around the lake. *Photo: Sydney Widell*

UW-Madison undergrad Sydney Widell spent her summer at Trout Lake Station as the summer science communication intern as she followed researchers around and sent back a ton of entertaining and informative dispatches from the field - like this one from August 20th.

At the start of every fishing season, the Wisconsin Department of Natural Resources (WDNR) embarks on the arduous task of setting catch limits on the state's popular game fish like walleye.

In order to estimate how many fish anglers may remove from a lake while still keeping the population healthy, the WDNR first needs to estimate how many fish are in the lake to begin with and how those populations are changing. Not an easy task, considering that there can be thousands upon thousands of fish in a single 100-acre lake.

And more than 1,000 of the state's 15,074 lakes fit that bill.

Enter CFL graduate student Mike Spear, who may be on the brink of developing a radical new way to estimate fish populations by decoding their DNA.

Mike is based in Madison, but I got the chance to catch up with him in the field on Bearskin Lake when he came up north to sample last week.

As fish swim through a lake, Mike explained, they constantly shed genetic material in the form of skin, eggs and waste. The amount of environmental DNA — or eDNA — in the water might give researchers like Mike clues about the size of the fish populations it came from.

"These fish are literally broadcasting their presence in DNA," Mike said. "What we want to do is see if we can use environmental DNA to get population estimate information in a much quicker, less disruptive and less costly way."

Once Mike's field technician Dane McKittrick collects a sample, he seals it, disinfects the bottle and quickly moves it to a cooler. *Photo: Sydney Widell*

Right now, Mike is specifically looking at walleye — a species that the WDNR is mandated by law to make population estimates of annually. The WDNR collects data on 15 different lakes each year, and Mike is surveying its 2018 sample sites. That way, he'll be able to compare his findings to theirs.

In the spring, researchers capture and tag walleye on a lake using nets. Later on, they return to the lake, and using a method called electrofishing to stun fish, quickly net them and check for tags before safely releasing them back to the lake.

Based on sex ratios, the size of the lake and the number of tagged walleye they caught a second time, they can extrapolate the size of the entire population.

But, for the WDNR, surveying the 15 lakes takes weeks and requires a lot of personnel.

If Mike can establish a relationship between the amount of walleye eDNA in a lake and the population estimates made by the WDNR, he could potentially model entire populations based entirely on eDNA.

"The idea behind that is we have all these walleye swimming around in a lake, and it takes a lot of time and effort to pull those walleye out of the lake and count them," Mike said. "But we can, just by taking a water sample, find and count the number of walleye DNA molecules that are floating around in the water."

Mike will spend the fall looking for segments of genetic code unique to walleye, or a "walleye signature," in the samples he's taking now.

Last year's sampling yielded results that looked a lot like the WDNR's, he said.

"The relationship was strong enough that we're doing it again this year to see if it holds up year to year," Mike said. "It could be a tool going forward [fisheries managers] might want to adopt."

You can find more of Sydney's words and pictures on our blog.

See all 'Awards' and 'Catching Up With Alumni' at our CFL Newsletter webpage

ASLO Association for the Sciences of Limnology and Oceanography

Society for Freshwater Science

SAVE THE DATE!

The Association for the Sciences of Limnology and Oceanography and the Society for Freshwater Science are teaming up to host joint aquatic science meetings here in Madison, June 7-12, 2020. This will be a great opportunity to learn the latest in aquatic and marine sciences and catch up with friends and collegues. We look forward to evenings on the Memorial Union terrace and watching the sun set over one of limnology's landmark lakes.

SEE YOU IN 2020!

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CFL Photo Caption Contest!

What in the world is TLS Interim Director Susan Knight doing?

Sure, there's a right answer, but we're looking for your funniest captions to explain the scene to the left.

Submit answers to the CFL Photo Caption Webpage or email to limnology@mailplus.wisc.edu by December 31st and CFL judges will choose their top 3 submissions to showcase on our CFL blog in 2019!