



University of
Montana's
Flathead Lake

Bio Station






Rising Above in an Unprecedented Year

OUR MISSION

The Flathead Lake Biological Station (FLBS) serves the Flathead region, the state of Montana, the nation, and world by advancing a cutting-edge research, education, and outreach platform for limnology, ecology, and environmental science in the Flathead Watershed.

We fulfill our mission in three ways:

-  advanced **research**,
-  sustained **monitoring**,
-  and **education** at all levels.

THIS ISSUE

Research Discoveries

Aquatic Invasive Species

Flathead Lake

Engaging Students

Art and Science at FLBS

Join Us Online



We write this message as winter of 2020 arrives and our community continues to struggle with the ongoing COVID-19 pandemic. This issue of our annual communication will certainly be different than those from recent years, which told stories of increasing student enrollment, expanding research portfolios, and broadening of our community outreach and interactions. This year, our wishes for our FLBS community are that you remain safe, take all due precautions, and work to persist in the face of the unusual challenges brought by the pandemic. We are very excited that science has brought us several successful vaccines and that life will begin to become more normal in the coming year. In the meantime, we will all continue to follow the best medical advice to protect our community.

So, how did FLBS meet the challenge during 2020? You will find various reports in the following pages. Our **Flathead Lake Monitoring Program** and regular surveillance for aquatic invasive species did not skip a beat. The lake remains clean and blue, and no new invaders were detected. During 2020, thanks to generous philanthropic investment, we were able to start a new, regional program called "Monitoring Montana Waters" (MMW), led by Rachel Malison, who will work with citizen scientists and watershed groups to establish basic water quality monitoring of streams, rivers, and lakes in Montana.

Even as COVID restrictions led us to implement limitations on occupancy of our research laboratories and vehicles (one person per row!), our scientists, graduate students, and postdocs showed real determination and continued to advance their **research projects**. Nanette Nelson and Bob Hall initiated a new project studying the content and fate of mercury in the fishes and food web of Flathead Lake, while Erin Sexton advanced important work on transboundary pollution. Unfortunately, we had to cancel our summer session courses for the first time

since World War II. However, we did offer in-person but socially distanced **internships** this summer, hosting ten outstanding students on-station during the summer as well as one via online mentoring.

While most on-station visits by school groups were canceled, our **FLARE K-12 education program** innovated to create online lessons related to invasive species for use by teachers (and parents!), and was able to safely host the "Flathead Watershed Through The Seasons" teacher workshop. Most of our **community outreach** went virtual, with our popular Science On Tap events online and a Zoom livecast of the annual Research Cruise. We also were able to host not one, not two, but three artists-in-residence (AIR) via the Open AIR program, and our summer AIR hosted weekly plein air workshops at the Bio Station for numerous artists from around western Montana.

Little of what we did in 2020 could have been accomplished without the generosity and support of our community. Indeed, FLBS was part of the University of Montana's ambitious and successful Campaign Montana fundraising effort. We are proud to say that FLBS easily surpassed its fundraising goals. We are so very grateful.

We hope that you enjoy reading how the resilient, enterprising, and compassionate members of the FLBS team came together to advance our mission during this difficult year. With your support, we continue to work hard, support each other, care for our community, and protect our beloved lake and its watershed.

A century ago, FLBS persisted through the 1918 – 1920 Spanish Flu pandemic and we will do so again. Please stay safe out there so we can see you in the "after times".



Jim Elser
Director



Tom Bansak
Associate Director



Impactful research continued in spite of the challenges of 2020. Many important studies were published in prestigious scientific journals, including two in the *Proceedings of the National Academy of Sciences*.

In the first of these studies, FLBS Director **Jim Elser** (pictured above) and a team of international researchers discovered a link between the dramatic improvement in wastewater treatment and potentially harmful changes in nutrient ratios that could threaten biodiversity and ecosystems of freshwater lakes.

In another study led by FLBS Associate Research Professor **Clint Muhlfeld**, researchers identified a specialized cold-water invertebrate community living in the highest elevation streams fed by not only melting glaciers, but also snowfields and groundwater springs. These stoneflies species protected by the Endangered Species Act have persisted despite glacier loss, even in areas deglaciated since the Little Ice Age over 170 years ago.

For more information on these and other studies, visit the FLBS news blog at flbs.umt.edu.



Research that Matters

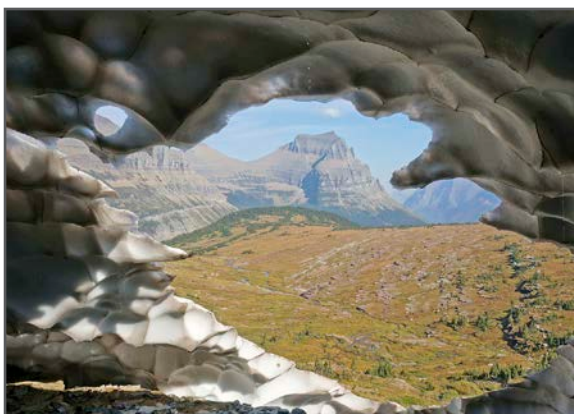
The Science of Safeguarding our Waters

For two decades, FLBS Senior Researcher **Erin Sexton** (pictured above) has been studying mining impacts on transboundary watersheds that cross the international border between the United States and Canada. She was among the first to document mining pollution crossing from British Columbia into Montana via Lake Koocanusa, and has continued to help uncover definitive evidence of water contamination in the United States that is occurring as a direct result of Canadian mining practices. Sexton has also been working with partners to address high levels of selenium, which can trigger deformities and cause an increased mortality in fish and wildlife.

With high levels of selenium entering Lake Koocanusa traced to coal mining in B.C.'s Elk Valley, the Montana Department of Environmental Quality's (DEQ) Board of Environmental Review (BER) initiated rulemaking in September to establish new, site-specific selenium standards for the Kootenai River and Lake Koocanusa. Then in December, the Montana DEQ BER approved these more stringent criteria aimed at protecting Montana's waters and ecosystems from Canadian mining contaminants.

Sexton participated in the multi-year effort to establish the selenium criteria, working closely with tribal, federal, and state partners to collaboratively identify an updated standard based on the best available science. Celebrated by outfitters and sportsmen groups as a protective measure for the world-class fishing that has become synonymous with Montana, this decision serves as an important step in the mitigation of widespread environmental damage in our freshwater ecosystems.

Though the Montana DEQ cannot enforce standards in British Columbia, the decision to approve will empower the United States federal government to work with Canadian counterparts to ensure the water crossing over into Montana meets the newly approved criteria.



A view of Going-to-the-Sun Mountain through melting snow and ice at the origin of Reynolds Creek near Logan Pass in Glacier National Park, Montana, where FLBS and USGS researcher Clint Muhlfeld says there is an urgent need to assess the widespread impacts of climate-induced glacier loss in high-elevation mountain ecosystems. (Photo Credit: Joe Giersch, USGS)



Expanding the Hunt

AIS Monitoring in the Flathead and Beyond

This year, in partnership with the Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife & Parks, FLBS Aquatic Invasive Species (AIS) Specialist **Phil Matson** and his team of researchers collected over 770 samples from Flathead Lake. A generous grant from Montana Department of Natural Resources and Conservation funded the sampling of Flathead Lake, as well as two rounds of sampling on Tiber Reservoir. On Tiber, FLBS researchers also used an underwater rover to video varying locations where the invasive mussels might be hiding.

The importance of this expansive sampling can't be overstated. The Flathead Watershed is the headwaters of the Columbia River, at this point the only major river system in the continental US without an invasive mussel presence. Meanwhile, Tiber Reservoir, in the headwaters of the Missouri River, was listed as "positive" for invasive mussels in 2016. Since then, Tiber has gone four years without another positive sample, and is now only one year away from being declared clear of invasive mussels. Additionally, with the pandemic triggering an explosion in out-of-state visitors this past summer, more mussel-infested boats were stopped at Montana's boat inspection stations before July 2020 than in all of 2019.

This sampling team included an incredible group of volunteers, including Big Sky Watershed Corps members Abigail Schmeichel, Sarah

Klaus, and Emily McGuirt; FLBS intern Kelly Hendrix; CSKT National Resources Wetlands Conservation Coordinator Tabitha Espinoza; and ten students and faculty from Flathead Valley Community College and the University of Montana. These volunteers were trained in AIS sampling protocols and played a vital role in this summer's early detection monitoring.

All Flathead Lake and Tiber samples were shipped to the state lab in Helena for microscopy analysis and to UM's Montana Conservation Genomics Laboratory for DNA analysis. Tiber samples were also sent to a Bureau of Reclamation DNA lab. As of the publication of this column, none of the samples collected this summer from anywhere in Montana have been positive for invasive mussel larvae, nor for invasive mussel DNA. These days the future seems more uncertain than ever, but for now we can all sleep a little more soundly knowing there are people standing watch to keep our waters free of invasive species.

FLBS continues to prevent the spread of AIS with local, state, and regional partners, such as the Flathead Basin Commission, the Upper Columbia Conservation Commission, and the Western Regional Panel on Aquatic Nuisance Species. By providing scientific expertise, we help develop recommendations for policy, protocols, and best management practices.



Mark Your Calendars

Follow us on Facebook for updates on all FLBS news and events.

Science on Tap Flathead:

At the start of each month, we partner with the Flathead Lakers to host an informal science presentation at the Flathead Lake Brewing Co. Join us for topics that range from osprey to oil trains to grizzly bears!

Data and Donuts (June–July):

During the first four Mondays of our summer program, scientists from FLBS, Montana, and around the world give one-hour lectures on exciting research. This is a great opportunity to learn while enjoying a tasty pastry or two!

Research Cruise (July):

Hop aboard the *Far West* for a cruise that features great food, beverages, live music, and an ample dose of innovative science. You'll learn directly from our scientific staff and interns as we discuss how to protect Flathead Lake.

Open House (August):

We invite you to come to our beautiful facilities to engage in hands-on science activities; meet our faculty, staff, and students; and get an update on the State of the Lake and Bio Station. Come early and get a boat ride on the *Jessie B*!





Securing Flathead Lake's Shorelines

For nearly a century, since the regulation of lake levels began, significant shoreline erosion has been documented around Flathead Lake, including at the Bio Station and Flathead Lake State Park - Yellow Bay. The Bio Station's nearly 7,000 feet of shoreline has suffered significant erosion. Between 1991 and 2006, FLBS lost over 2.9 acres of property, mostly gravel beaches and back shore habitat, due to wave action.

Back in March, FLBS launched a new and exciting project to address erosion of Bio Station property. Created by former FLBS research faculty **Mark Lorang**, the Erosion Control Beach Project utilized a 'design-with-nature' approach to construct a gravel beach that protects the shoreline while providing environmental and recreational benefits. The beach works by dissipating the energy of a wave before it reaches the shore, thus preventing erosion and loss of land and habitat.

Use of gravel erosion control beaches, instead of hard structures like sea walls and rip rap, is an effective way to protect property and important habitats. With plans to add more gravel erosion control beaches on FLBS property in the near future, safeguarding Flathead Lake's shorelines from erosion is one of the many ways the Bio Station is working to protect Flathead Lake for future generations. For more information about FLBS erosion control beaches, visit our news blog at flbs.umt.edu.



Finding a Way Resilient Interns Making a Difference

While forced to cancel many of our normal programs and events due to the pandemic, we were able to host a truly special group of talented interns (ten on-site and one remotely), who played a crucial role in advancing all areas of our mission.

Whether telecommuting or working on campus, our 2020 interns made a significant impact during their time with us. They worked diligently through unprecedented challenges to further important research projects and outreach efforts. They also helped us launch our first virtual Bio Station Research Cruise, assisted in critical aquatic invasive species sampling, and conducted important work advancing our environmental monitoring systems, especially in SensorSpace.

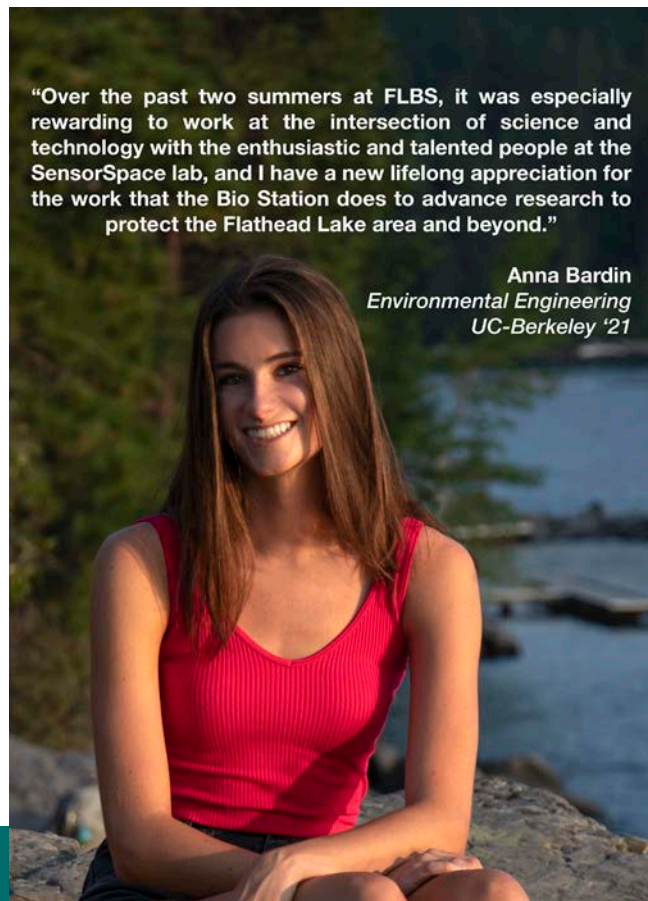
Many of our summer internship opportunities are funded through philanthropic support. We're also fortunate to host interns funded by research grants from the

National Science Foundation and NASA, and during the school year to host interns from Flathead Valley Community College and the Big Sky Watershed Corps. All of our 2020 interns were outstanding individuals with amazingly bright futures, and we can't wait to see all the exciting achievements they are bound to make.

For more information about our internship program, visit the FLBS website at flbs.umt.edu.

"Over the past two summers at FLBS, it was especially rewarding to work at the intersection of science and technology with the enthusiastic and talented people at the SensorSpace lab, and I have a new lifelong appreciation for the work that the Bio Station does to advance research to protect the Flathead Lake area and beyond."

Anna Bardin
Environmental Engineering
UC-Berkeley '21





Data and Discovery

FMP Enters Global Discussion

In spite of 2020's many challenges, our Flathead Lake Monitoring Program (FMP) has maintained a vigilant watch over Flathead Lake and its watershed. As a result, we are excited to announce that Flathead Lake remains clean and blue! This outstanding news is made all the more exciting thanks to the increasingly significant roles that our monitoring partners, citizen scientists, and funding from the Flathead Lake Protection Association's "Keep It Blue" license plates continue to play in the support and growth of FMP.

This collaborative commitment to our mission of vigilant research and monitoring continues to result in vast scientific discovery, and has created one of the best long-term ecological and water quality records in the world. Recently, in a study published in *Nature's Scientific Reports*, FLBS Lake Ecologist **Shawn Devlin** put our renowned data set to work. Joining a global team of researchers, Devlin helped compile the most comprehensive data set to date of long-term summertime vertical temperature profiles in more than 100 lakes all over the world.

The researchers determined that climate change is causing a disparity in surface and deep-water lake temperatures which could have a significant impact on freshwater ecosystems.

While more research is needed to determine the future of our lake ecosystems, this study serves as an important first step toward a better scientific understanding, and wouldn't have been possible without the decades of extensive monitoring and modeling efforts of the Flathead Lake Monitoring Program and those who support our work.

Additionally in 2020, we were fortunate to take part in the growing citizen science movement in the Flathead Watershed. Whether partnering with Flathead Lakers Citizen Scientists to conduct an important periphyton (algae) study or search for invasive mussels during the Flathead Lake Mussel Walk, we are truly inspired by the investments made by our partners and local communities to sustain our incredible watershed for generations to come. We were also able to financially and scientifically support the continuation of the Swim Guide Project, which monitors for pollution and the safety of public swimming areas around Flathead Lake.

We are proud to be able to collaborate and take part in these citizen science projects and grateful for any opportunity to work alongside our amazing partners. We look forward to another outstanding year keeping watch over our incredible freshwater ecosystems on a local and global scale.

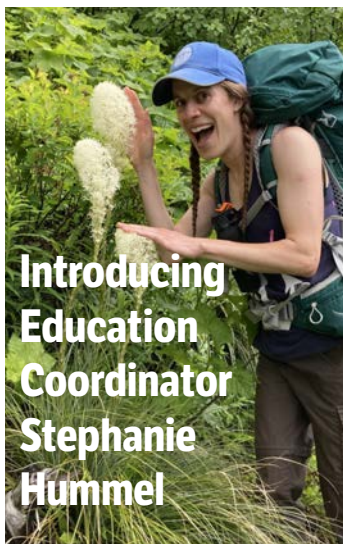


Connecting Research With Community

FLBS Environmental Economist **Nanette Nelson** (pictured above) and her FLBS colleagues, **Bob Hall** and **Erin Sexton**, are joining forces with the Confederated Salish and Kootenai Tribes Natural Resources Department and Salish Kootenai College with the aim of better understanding methylmercury concentrations in Flathead Lake fishes and how those concentrations might be manifested in local food pantries.

The research project is being funded by the Environmental Protection Agency and is one of the initial grants to come out of the Columbia River Basin Restoration Funding Assistance Program. This program was established by Congress as an amendment to the Clean Water Act to address water quality issues by reducing pollution, including toxins that can accumulate over time in water, sediment, and fish tissues. Thus far, the EPA distributed over \$2 million in grants to 14 organizations, universities, and government agencies in Washington, Oregon, Idaho, and Montana related to this program.

The results of the project will be shared with the Tribes who will ultimately determine the best use of the newly acquired data, including the possibility of developing or updating consumption guidelines for fish species, depending on research results. For more information, visit flbs.umt.edu.



**Introducing
Education
Coordinator
Stephanie
Hummel**

The new year brought a new face to the FLARE K-12 Program with the arrival of our new Education Coordinator **Stephanie Hummel**.

Born and raised in Ohio, Stephanie (pictured above) earned her Bachelor of Arts degree in Environmental Geology at Case Western Reserve University and her Masters of Environment and Natural Resources degree at The Ohio State University. She has conducted research on sediment resuspension and its impacts on phosphorus flux in the ecosystem of Lake Erie and previously worked as an Interpretive Park Ranger at Glacier National Park. While at Glacier she worked extensively with local students, leading field trips and coordinating the park's distance learning program, which impacted thousands of students across North America.

In her free time, Stephanie enjoys running, hiking, and cross country skiing. She is already hard at work planning another fun and engaging year for FLARE K-12 and is eager to start researching and learning alongside all of our amazing partners, students, and teachers throughout western Montana.



Learning to Adapt

Staying Connected Through FLARE K-12

It wasn't a typical year for the Flathead Lake Aquatic Research Education (FLARE) K-12 program, but thanks to the creative work by our education team we were able to accomplish more than you might imagine. We started the year by welcoming our Big Sky Watershed Corps member, **Abby Schmeichel**, who was with us until November. **Holly Church** left for a full-time teaching position in June, and we welcomed a new Education Coordinator, **Stephanie Hummel**, to join Education Liaison **Monica Elser** and our team in November.

In the first few months of the year, the education team was able to visit classrooms and share our newly created "Be Aquatic Invasive Species Aware" teaching material. We participated in Family Science Night at the Dayton School, and our educators taught middle school girls about stream ecology at a science camp at the Glacier Institute's Big Creek Outdoor Education Center. We participated as judges in the 2020 Flathead Lake Science Fair, where we handed out four "Day at the Station" Awards, and shared information about aquatic invasive species and FLBS research with 25 plein air artists who came to paint at the Bio Station. Finally in fall 2020, four small groups of Columbia Falls, Flathead, and Ronan high school students participated in lake ecology field trips at FLBS, where they collected and examined water samples from Yellow Bay.

FLARE also hosted nine teachers as a part of the "Flathead Watershed Through The Seasons"

Teacher Professional Development program at the end of September. These teachers took part in field research on Flathead Lake, participated in a variety of activities and presentations, and enjoyed the incredible setting of our facilities. This was one session in a four-part series created by local outdoor educators in the Flathead region, and was made possible by grants from the Greater Polson Community Foundation and the Glacier National Park Foundation, philanthropic support from the FLBS community, plus additional in-kind contributions from numerous local agencies and organizations, including the US Forest Service, Glacier National Park, and Lone Pine State Park.

Reaching out to students and teachers during this time has allowed us to think outside the box. We've created videos for virtual field trips, adapted lessons for online instruction, taught classes via ZOOM, and even created an FLBS activity handout that was included in 800 science kits shared with kids in the region by the University of Montana's science education group, spectrUM. Like everyone, we're looking forward to the days when all of our programs can return to normal operations. In the meantime, we'll continue to mask up, practice social distancing, and do all we can to broaden scientific awareness while adhering to protocols that keep our Bio Station community as safe and healthy as possible!



Creative Collaboration

An Artistic Impact at FLBS

Despite the pandemic, our creative resilience remained strong in 2020. Adhering to stringent safety measures, we were fortunate to continue our partnership with Open AIR MT to host a new group of artists-in-residence at FLBS. Funded primarily through private support, the Open AIR MT Artist-in-Residency program connects artists with Western Montana through collaboration, creative place-making, artist-community integration, and education.

Our first artist-in-residence in 2020 was **Sandra Marker**, a visual artist based in Kalispell who creates artworks in watercolor, acrylic and oils, and photographs. Marker's work has been displayed in numerous shows around Montana, and she has received awards from the Montana Watercolor

Society and Headwaters Montana for her work. Marker also organized and hosted the first plein air painting workshops at FLBS since our founding in 1899.

In the fall, we hosted visual artists **Lisa Flowers Ross** and **Alice Hargrave**. Flowers Ross is from Boise, Idaho and creates colorful artworks using hand-dyed fabric. Her artwork has been exhibited nationally and internationally, in addition to being included in private, public, and corporate art collections. Hargrave, a photography-based artist from Chicago, Illinois, incorporates sound and video within layered installations of her photographic imagery. She recently collaborated with the Cornell Lab of Ornithology to create portraits of threatened birds using sound waves of their calls.

We continue to benefit from the ever-expanding perspectives these artists-in-residence provide. Our partnership with Open AIR MT has enriched all of us at FLBS, and we look forward to furthering our collaboration for many years to come!



Meet the 2020 Open AIR MT Artists



Sandra Marker
*Visual Artist
Summer 2020*

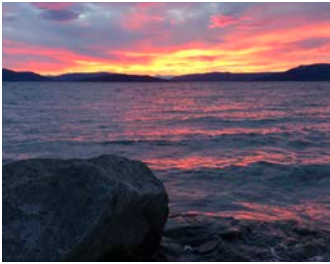


Lisa Flowers Ross
*Visual Artist
Fall 2020*



Alice Q. Hargrave
*Visual Artist
Fall 2020*





Join our growing Bio Station Community and help support Flathead Lake!

Charitable IRA Rollovers

A Tax-Wise Way to Support the Flathead Lake Biological Station and Flathead Lake

For those 70 ½ or older, up to \$100,000 can be transferred directly from a traditional individual retirement account each year to support critical research, monitoring and conservation of Flathead Lake. Charitable IRA rollovers avoid federal income tax and count toward satisfying your required minimum distribution (RMD) for the year of the gift.

To learn more about how you can support the Flathead Lake and the Bio Station with a charitable IRA rollover, please contact:

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