regulations, help them chart routes and offer life jackets for loan. One key issue on the river, Gill said, is human waste. On the North and Middle forks of the Flathead, boaters must have an approved portable toilet system to transport waste for safe dumping instead of dumping it on the banks or otherwise leaving in the area. Given the high level of traffic on the river, Gill said that the accumulation of waste is a significant threat and could degrade the otherwise pristine waters. River ambassadors help inform rafters about this regulation and give them resources like so-called "wag bags" to contain waste. Gill said that FRA's water monitoring can help river ambassadors discuss this issue and guide river users towards responsible behavior. Explaining that the group monitors water quality in the river and the importance of this water quality can nudge people towards responsible behavior, Gill said.

Terry Richardson, one of FRA's longest serving river ambassadors said that river users, whether tourists or locals, are respectful of the river and want to obey the rules and preserve the river. "People are very open" to learning more about the river and receiving guidance on how to follow rules and prevent damage, he said. The wild and scenic river designation is one of the less understood aspects of the river, said Richardson, but most people are willing to learn more about what it means and what actions are needed to protect it. The river ambassadors also have a significant role in keeping people safe on the river, Richardson said, distributing equipment like life jackets and providing advice.

FRA water monitoring volunteer and North Valley Search and Rescue member Andy Marvin said that, although traffic on the river has increased in recent years, the river conditions have remained largely pristine. Trash on the North Fork of the Flathead has increased somewhat in the last couple years, Marvin said, but the amount remains much lower than many other heavily trafficked rivers. Finding a few cigarette butts or pieces of plastic is a large haul of the trash on the Flathead, Marvin said. The "biggest outrage" on the river recently was when a bus accidentally rolled into the river for a few hours at a takeout, said Marvin and Richardson. Conditions on the more remote South Fork of the Flathead are more difficult, Gill, Richardson and Marvin agreed, with larger problems with trash and dumping of derelict trailers and vehicles. However, even there, the area is generally pristine and users are responsive to education, Richardson said.

Marvin said that the water monitoring project helps affirm that the work FRA and other organizations do to keep the Flathead pristine is working. It gives empirical evidence to support that the river is as healthy as it appears he said, as well as helping understand any changes increasing use or other factors cause in the future. "Our problem is how many people love this place and our solution is how many people love this place," said Gill, summarizing the future of the river and FRA's efforts.


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Community and volunteer engagement are at the center of Monitoring Montana Waters' efforts. Although the expert assistance MMW provides and the laboratory testing it supports are done by paid staff, community volunteers make up the core of all monitoring efforts. Almost all monitoring programs MMW supports involve volunteers that are deeply connected within their communities. The program is built around people identifying water quality concerns, then using MMW as a resource to learn what kind of water monitoring might be needed to assess these issues and get the funding and tools needed to do the monitoring. These community members organize to take regular samples, gathering enough people, managing schedules and handling the logistics of sampling. Once data is collected, community groups guide how and where that data will be disseminated with assistance from MMW. This ensures that decisions about how to use the data collected by MMW remain in the hands of the people who understand their water quality concerns and needs the most.

> "When you don't have data and there's no policy to protect your land and your water, you're pretty much defenseless when outside interests want to come in and want your water."
>
> Mike McDearmon, Central Montana Resource Council

The Ross Fork Creek is "amazing" Deb Biehl says. Starting in the Big Snowy Mountains south of Lewistown, Montana, the river runs through Fergus and Judith Basin providing irrigation, stock water and recreational opportunities to those who live alongside it. "It is just a beautiful waterbody," Biehl said.

After teaching in the Hobson public schools, Biehl retired with her husband to their ranch near Buffalo, which has been in the family for over 80 years. Now, Biehl is a core member of the group monitoring conditions in the Ross Fork in partnership with Monitoring Montana Waters. This community-driven effort is working to gather information about water quality in the Ross Fork, which is designated as impaired by the Montana Department of Environmental Quality (DEQ), and to help inform the public and nearby landowners about the potential drivers of poor water quality.

The project began with a community meeting titled "Hot chili, cold beer and clean water," said Laurie Lohrer, a leading volunteer on the water monitoring effort and board member on the Central Montana Resource Council (CMRC), which oversees the monitoring project. Lohrer said that the resource council, founded in 2013, had extensive experience in holding community workshops and events when it decided to hold an event focusing on water quality featuring experts including MMW Program Leader Rachel Malison and Montana State University Assistant Professor Adam Sigler. Biehl, who was also involved in organizing the meeting, recalled that it was held on a cold day in January and that, before the meeting, the organizers were unsure who would attend. However, the event ended as a great success, Biehl said, with about 70 highly engaged attendees hearing the expert presentations and discussing water quality. Lohrer said that a sign-up sheet passed around at this meeting furnished the initial volunteer base for the water monitoring effort. At the recommendation of Malison, Lohrer said that the group built off the momentum the meeting generated and applied to join MMW that year.

Mike McDearmon is a software designer was one of the writers on the application and helps process data for the monitoring group. He said that his interest in water began with growing up near Phoenix, Arizona and learning about the infrastructure that brings water to the Phoenix metro, as well as the water scarcity facing many rural Arizona communities. "When you don't have data and there's no policy to protect your land and your water, you're pretty much defenseless when outside interests want to come in and want your water," McDearmon said. He and his wife recently moved to Montana and she now serves as chair of the

CMRC while McDearmon helps the monitoring group. "Now is the time to collect this information," he said.

As the monitoring group formed, Biehl worked with ranchers and landowners along the Ross Fork to get permission for the group to cross their land to take samples from the stream. She said that the group faced initial challenges, especially since this outreach began around the same time that many landowners received water rights adjudication notices from the state government, raising concerns that the monitoring effort was somehow connected. However, Biehl said that the group's deep community connections and focus on building a "relationship of trust" with landowners on the stream let them overcome these concerns and secure stream access. Lohrer said they also emphasized that the group is focused strictly on fact finding and assessing the conditions in the stream, not "pointing any fingers at anybody."

In 2024, the group did monthly monitoring of four sites between July and September, while in the 2025 the group monitored five sites between May and September. Biehl said that the group has built a "pretty well-oiled system," for each month's monitoring trip. Lohrer sends emails to get the volunteer group organized while another volunteer, Linda Roche, packs coolers with water and snacks for the monitoring trip. The main monitoring trip happens on a Saturday, Biehl said, with the group taking samples to assess nutrients and oxygen levels in the water. Each trip takes between five and six hours, including breaks and snacks, and involves four to six volunteers traveling in two vehicles, Biehl said. Others wade into the water to take samples while she notes down their results. She said that she enjoys going on the trips and interacting with the volunteers in the group. "It's nice to meet new people."

The Thursday before, someone in the group typically accompanies a staff member from the Montana Department of Natural Resource Conservation (DNRC) office in Lewistown to take readings of water flow at each of the sampling sites. Biehl said that this partnership, where the DNRC supplies the flow testing equipment and a staff member to operate it, has enhanced the value of their water testing data.

After the first year of water monitoring, Lohrer said that the CMRC group presented its data to community members and landowners along the Ross Fork at a February 2025 event called Hot Chili, Sweet Rolls and Ross Fork Creek. The event attracted about 40 attendees and had lots of "really great questions" during a question-and-answer session following the presentation, said Biehl. She said that the group was careful to not offer any conclusions about what their data might mean, since one year of data isn't enough to draw clear conclusions

according to MMW Program Leader Malison.

However, once the second year of data is collected and processed, Lohrer said that the group will need consider where to go next. Biehl said that she hopes the program can do more to "educate people along the creek about what they can do to make their water clean and plentiful" in the future. McDearmon agreed, saying that he hopes that the monitoring can include more opportunities to "stop and chat" with the public, which is currently difficult given the remoteness of the group's sites. McDearmon said that he hopes the data the group is collecting can help the area prepare for change. The project is one of the "little things we can do to protect our interests in a place," he said.

Lohrer said that she wants to keep building an understanding of the Ross Fork's condition and to stay focused on the personal and community connections that are key to the program's success. "We just know that clean water, once it's gone, you can't get it back," she said.

Much of the data collected with support from Monitoring Montana Waters is ultimately used by volunteers for advocacy, both large and small. The (scientifically defensible and rigorously documented) data collected is used by groups to advocate for actions to improve water quality at venues from local forums to the offices of state policymakers and agencies. Having rigorous data can make water quality problems easier to understand and provide evidence that action is needed. It can also help determine what the sources of a water quality problem might be and offers a starting point for how to address identified problems. Together, the data collection that MMW helps facilitate provides a strong resource for groups working to inform their community about water quality challenges and present local policymakers with the information needed to make informed decisions to support clean waters.

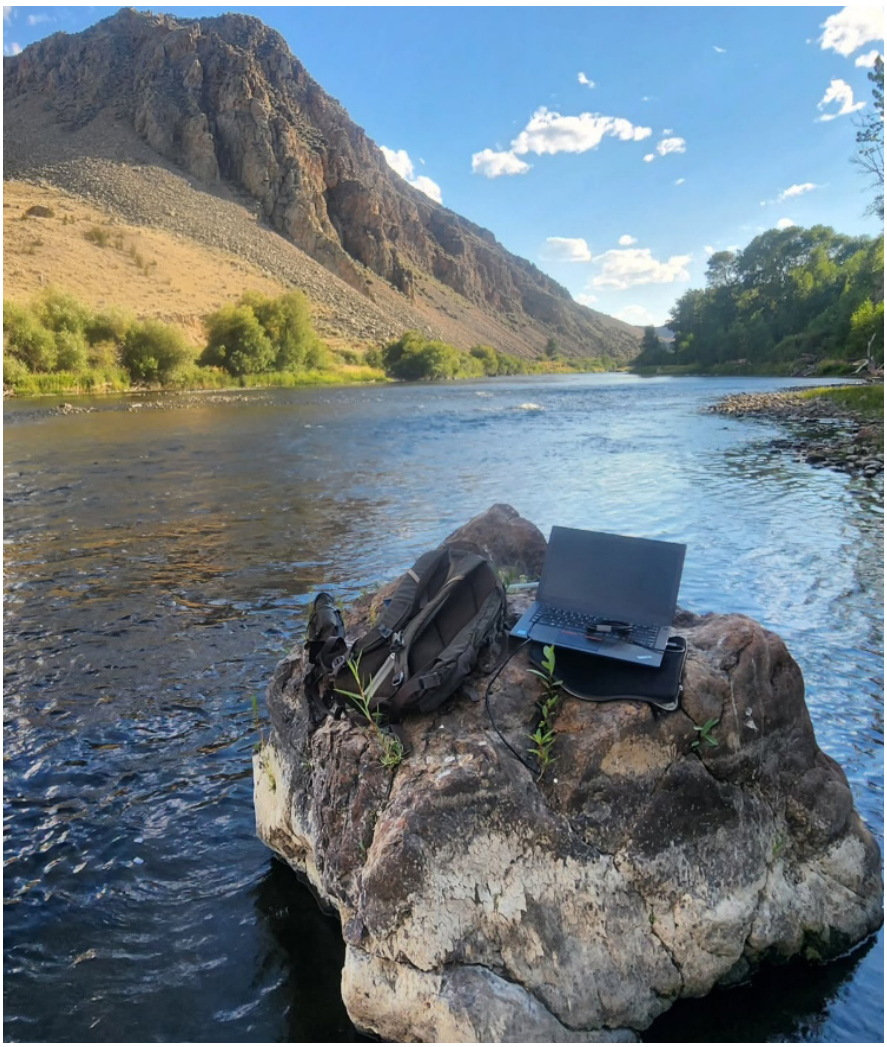
> "Water quality is fundamental to everything else."
>
> Brian Wheeler, Save Wild Trout

On the Big Hole River in southwest Montana, Monitoring Montana Waters is helping support efforts to protect water quality and trout in this (blue ribbon) stream. The river faces a variety of threats, said Brian Wheeler, program director for Save Wild Trout, an organization that advocates for trout conservation in the Big Hole River and elsewhere in southwest Montana. These threats include high water temperatures, low river flows and high concentrations of nutrients like nitrogen and phosphorus, he said. These pressures have likely contributed to the grisly kills of brown trout occurring on the river, Wheeler said, as the cumulative pressures of the stresses upon them harm the fish and leave them open for necrosis and fungal infections. River guiding and the trout fishery are pillars of the local economy, said Wheeler, along with farming which draws irrigation water from the river. "The ecology is suffering and it doesn't take long for the economy connected to the ecology to suffer," he said. "A whole lot of jobs and families depend on the health of these resources."

Wheeler served as the executive director of the Big Hole River Foundation (BHRF) until recently, when BHRF merged with Save Wild Trout. Overarching efforts continue to advocate for expanded trout conservation measures with state and federal agencies, and Wheeler said that water monitoring has become a central aspect of the group's work. "Water quality is fundamental to everything else," he said.

The organization's water monitoring efforts started in 2019, with the BHRF beginning a water monitoring project in the Big Hole approved by the Montana Department of Environmental Quality (DEQ). In developing this project, Wheeler explained that the group got into contact with Rachel Malison, Program Leader of the MMW program, through a BHRF board member. In 2020 Malison helped the group expand its monitoring program Wheeler said, opening a lengthy partnership between water monitoring in the Big Hole and Malison's water monitoring efforts. When the monitoring program started, Wheeler said that the organization expected the Big Hole's waters to be "relatively pristine."

However, monitoring quickly found that levels of nutrients in the Big Hole regularly exceeded the (DEQ) standards for healthy levels of nutrients like nitrogen and phosphorus. This finding led to a shift in the monitoring effort, Wheeler said, which refocused on documenting the high nutrient levels to support further research and advocacy. When MMW launched in 2020, it was a "perfect fit" for BHRF's water monitoring efforts, said Wheeler, providing technical support and funding to help the



program take accurate, scientifically defensible samples. The Big Hole project has been part of MMW since its inception and currently involves monthly sampling of 10 sites on the Big Hole River and tributaries. These test levels of nitrogen and phosphorus, water temperature, the amount of dissolved oxygen and other characteristics in the river. The MMW program provides scientific guidance on planning water monitoring, as well as funding for laboratory analysis of many of the samples that the BHRF collects. Wheeler said that participating in the program, as well as the Volunteer Monitoring Lab Analysis Support Program run by DEQ, gives the group a significant discount on analysis of the remaining water samples at the lab. "They're been generous and really helped us out," he said about MMW. The sampling helps the group keep track of changing river conditions and furthers their advocacy for the river, Wheeler said, enabling them to take actions like filing detailed petitions for more rigorous river health standards or providing supplementary water quality data for ongoing studies of brown trout die offs.

In 2025, Wheeler said the BHRF took its next step towards expanding its water quality data collection efforts by merging with Saving Wild Trout. Saving Wild Trout is a trout conservation group focused on the Jefferson Basin, which contains the Big Hole, Ruby, Beaver-

head and Jefferson rivers. Merging with the larger group will allow the water monitoring efforts to expand from the Big Hole to all four rivers in the Jefferson Basin, Wheeler said, broadening the reach and impact of the water quality monitoring work. This merger will expand the monitoring to 25 sites across the four rivers, in addition to an ongoing project monitoring changes in numbers and types of river invertebrates.

The issues on the Big Hole can be "kind of overwhelming," Wheeler said, driven or exacerbated by global forces like rising temperatures or changing weather patterns. However, he said that monitoring and improving water quality is something where individuals can make a difference, whether in helping with citizen science projects like Save Wild Trout's river monitoring or curtailing their own fertilizer and pesticide use to improve water quality. "Individual actions do add up," Wheeler said, and taking simple actions to prevent damaging the river can reduce pressure on the creatures in it and keep it healthy in the future. "It's easy to be overwhelmed by problems," said Wheeler. However, he applies his energy locally to issues like water quality because "that's the only place that I as an individual am able to have an impact."

Wheeler hopes that individual actions and continued advocacy will lessen the strain on the Big Hole River and the creatures that live in it. He said that he wants to see the river thrive, not just to stave off disaster. "I'd like to see this renowned and ecologically unique and sensitive watershed protected and enhanced as a headwater source of one of the nation's great rivers," Wheeler said.

The groups involved in MMW are primarily clustered in western and central Montana. Although MMW-supported monitoring efforts include many of Montana's iconic waterways, expanding the program's reach is a key goal for the future. Water monitoring is critical to understanding and maintaining healthy river environments and many Montana waterways, particularly in eastern Montana, are less well studied. These rivers have great value to local communities and environments and they face significant threats.

Another objective is to support other research and monitoring efforts at FLBS to expand the range of water parameters that are monitored and analyzed for in Montana. MMW-affiliated groups primarily monitor for many nutrients, sediment, metals and other physical water characteristics. MMW has been working closely with the Montana Pesticide Stewardship Partnership Program, also based at the Flathead Lake Biological Station, to help expand pesticide monitoring in western Montana. However, there are still many types of contaminants that are not assessed by the program and are not part of state-wide monitoring programs, including forever chemicals like PFAS and pharmaceuticals. These substances may also pose threats to both environmental and human health but are currently not sufficiently monitored in Montana waterways. Our aim is for MMW to help support future work to expand monitoring of such contaminants and help understand their impacts on our waters.

All this monitoring work is not possible without philanthropic support. If you are interested in supporting MMW and protecting Montana's waters for the future, contact Rachel Malison at rachel.malison@flbs.umt.edu or by phone at (406) 872-4518. Your support makes this program a reality.

For five years, Monitoring Montana Waters has helped communities understand and monitor the water in their rivers and streams. MMW support has helped track the threat of selenium in the Kootenai River, build baseline water data in Rock Creek, keep the Flathead River wild and scenic, understand water conditions in the Ross Fork and advocate for trout in the Big Hole. MMW Program Leader Rachel Malison said that she hopes, with ongoing philanthropic support and engagement from Montana communities, the program can grow into the future and keep doing its essential work of keeping Montana waters clean. "All of life needs water," she said. "For all uses, for all users, all of life needs water."

FIVE YEARS OF MONITORING MONTANA WATERS