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CONSERVING AND SHARING FRESHWATER IN THE WEST

By

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Bachelor of Arts in Environmental Studies and Outdoor Education, Prescott College, Prescott,
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Professional Paper

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Conserving and Sharing Freshwater in the West

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There are infinite stories to be told about water in the West. As an essential and finite resource, countries, states, tribal nations and neighbors must figure out how to manage this shared resource, whether for ecosystem sustainability, agricultural, household, or recreational use.

The Flathead Lake Biological Station in Polson, MT is one of the oldest active biological research stations in the United States. One of its former faculty, Dr. Mark Lorang, has been working on Flathead Lake's erosion problem for over 30 years. As a result of seasonal lake level fluctuations controlled by the dam, erosion over the years has resulted in significant shoreline and habitat loss, even prompting a class-action lawsuit. Lorang has been working on a possible solution; installing gravel beaches in a "design with nature" method.

Erin Sexton, a senior scientist at the Flathead Lake Biological Station has spent most of her career working on protecting The Crown of the Continent Ecosystem from mining pollution that starts in British Columbia's rivers and makes its way through the waters of multiple tribal nations and states. An ecologically distinct area, it has been divided up between countries, management agencies and owners making problem solving and management across a fragmented landscape challenging. Sexton has taken on the roles of researcher and field scientist, collaborator, advisor and science communicator, all with the hope that science will be used to inform policy.

The Wild and Scenic Rivers Act is an iconic piece of legislation that created a nationwide system that seeks to protect the country's rivers. The Act is over five decades old, and those working to protect its rivers see much room for improvement.

This includes people like Elizabeth Townley who works for the Forest Service creating and updating river management plans, and Darla DeRuiter, an environmental studies professor at Feather River College in California, who calls the Middle Fork, the river in her backyard her home.

I chose to report on these stories for my Master's Portfolio to raise awareness and make some of these complex topics more approachable. Because there are many stories about and so much nuance to water related management, it can be easy to stop paying attention. But to tell stories about water truly defines what means to live in the West.

Fighting Shoreline Erosion at FLBS



UM Bio Station Fights Shoreline Erosion with New Gravel Beach

By Kelsea Harris-Capitano, University of Montana Environmental Journalism Graduate Student and 2020 FLBS Ted Smith Environmental Storytelling Intern

Physical lake ecologist Dr. Mark Lorang stood on the shorefront of the Flathead Lake Biological Station (FLBS) enthusiastically taking pictures of the beach. “I wish I could have been down here filming it when it was happening,” he said.

Lorang was referring to a brief, intense storm that had rolled through the previous night. Its waves had rearranged the Bio Station’s newly completed erosion control beach, and Lorang wanted to see how it had fared. Lorang meticulously designed this beach to protect a portion of

the Bio Station's shoreline, and its completion meant part of a decades-long plan had finally come to fruition.

The beach was constructed in March, 2020 when things at FLBS were quiet. For the people working at the Bio Station during beach construction, the sound of heavy machinery and delivery of truckload after truckload of gravel was a change of pace.

Abigail Schmeichel who started working as a K-12 educator at the Bio Station in January said it was an interesting process to watch. Over the course of almost two weeks truckloads of cobble and gravel were continuously transported from Polson and Woods Bay.

“Every day from 8-5pm you could hear the trucks going, beeping, backing up and turning around. It definitely spiced up the week,” Schmeichel said.

Schmeichel had a front row view of the beach construction from her FLBS apartment and went to check out the process frequently. She said the addition of the beach is nice from a user standpoint. The slope of the bank into the water is less steep and the gravel is easier to walk on.

But the beach wasn't installed for aesthetics and recreational use, although they are a happy byproduct. It has a very functional purpose. It's called a “dynamic equilibrium beach,” a beach designed to prevent shoreline erosion and help restore habitat.

Lorang, who is former FLBS faculty, has studied Flathead Lake for over 30 years. His research led him to design soft structure beaches made of varying particle sizes (i.e., gravel and cobble) that can absorb and dissipate incoming wave energy, thus preventing damaging erosion.

The Bio Station beach is made up of varying sizes of rocks that were placed strategically at low water. First a mix of larger cobbles and gravel was placed lower down on the exposed shoreline. That was followed by a smaller cobble mix above the previous layer. And finally, on top of all that a large amount of pea-sized gravel was deposited extending up towards the trees. When the lake's water levels were brought up in June, only the easy to walk on smaller gravel was left exposed.

When waves break on the gravel it is pushed around as it absorbs the energy. A big storm at a high water level will create a berm or beach crest that is built up by the largest waves tossing larger rocks on top of the smaller gravels. The waves dynamically reshape the gravels into a beach that can break the waves and dissipate the erosive energy. It will take subsequent larger storms to rearrange the beach again.



These images show the progression from the original shoreline (top image, with original waterline shaded in blue), through snowy construction in the spring (middle image), to the newly restored gravel beach shoreline (bottom image).

Ultimately, Lorang has installed a soft structure that mimics what natural beaches do.

Flathead Lake water levels are controlled by the Seli's Ksanka Qlispe' Dam, formerly known as Kerr Dam, near Polson. Lake levels fluctuate as much as 10 feet throughout the year. In the summer the water is purposefully kept at a high level or "full pool" for recreational purposes.

In a recent report, Dr. Jack Stanford, former FLBS Director described how in natural conditions the shores of lakes are protected because they experience wave impact at varying water levels that occur during seasonal fluctuations. Stanford continued that erosion at the top of a lake's shoreline would naturally only occur during the largest floods, and for just a brief period of time.

Artificially keeping the lake at a high level longer accelerates the erosion process during large wind and subsequent wave events.

The Bio Station has lost 1.6 acres of shoreline property since the regulation of Flathead Lake's water level began in 1938. Diane Whited, FLBS researcher and GIS and remote sensing savant has helped document the Bio Station's shoreline loss.

Whited, who has worked at FLBS for about 20 years, used to measure shoreline erosion with surveying equipment and erosion pins but now uses drones to take images of the lake shoreline instead.

Whited said that remote sensing is a fast way to collect larger-scale amounts of visual data. She said imagery is useful in that it can quickly and easily communicate what numbers and equations can't.

"We've lost 20 meters of land over X amount of years.' Well, you can say that. But if you can visually show that, it's much more powerful," she said.

The drones also capture imagery of Lorang's beach projects. Imagery before and after construction, following big storms or 5-10 years down the line helps determine and document the effectiveness of the design-with-nature approach.

Lorang has designed and helped install about 2.5 miles of dynamic equilibrium beaches on Flathead Lake's shoreline since 1989.

Traditional and most commonly used methods for preventing erosion are hard structures such as seawalls, large barriers usually made of concrete, and riprap, a field of large boulders or objects. Historically large car bodies have been used along river banks called "Detroit riprap."

These methods have some drawbacks. The energy of a wave is what causes erosion. That energy doesn't dissipate when it hits a hard structure like a concrete wall Lorang said, but is reflected back into the lake where it interacts with other incoming waves.

This interaction causes scour to the lake bed in front of the seawall and to the adjacent shoreline. That process increases the severity of erosion to the neighboring property. This usually leads to the construction of more seawall and riprap resulting in a domino effect of building seawalls and losing natural beaches.



The drone image, taken in April 2020, shows the restored gravel shoreline during springtime lake levels. The new gravel swim beach at the Flathead Lake Biological Station offers a scenic setting for summer recreation while naturally protecting the shoreline from erosion.

Seawalls in particular cause more scour to lake bed resulting in unnatural and harsh environments that plant life can't grow in. This negatively impacts the aquatic food web as well as the connected terrestrial habitat.

From an aesthetic and recreational standpoint, seawalls and large boulder fields are not as appealing to beach goers and make the shoreline less accessible.

“No one wants to spread their towel on riprap,” Lorang said.

But a challenge for those looking to have an erosion control beach is the expertise needed to design and build them. Installing one of Lorang’s beaches is a much more intricate process than simply dumping a pile of gravel.

Lorang has years of knowledge and experience. He carefully calculates in all the variables. Every shoreline is different and Lorang looks at the characteristics of each individual section of shoreline and the waves affecting it. It isn’t a one size fits all method.

Lorang said beaches moving and being reshaped is a part of the process. It’s normal to see these beaches change after storms. That’s the point of a dynamic structure, it can adapt and change to the variable wave and storm conditions, while dissipating the wave energy that causes shoreline erosion.

These beaches have been slow to grow in popularity and Lorang thinks that people have this perception that a changing or “dynamic” beach means something bad.

But essentially, Lorang is simply providing the right volumes and distributions of gravel material so that the waves can do the work of mimicking what natural beaches do. And natural beaches change over time. Lorang said this method of designing with nature just doesn’t have enough credibility, yet.

“The first thing people do when they buy property out here is stake out their boundaries. Usually that means cutting down trees and building a seawall,” Lorang said.

In total, about 460 feet of FLBS shoreline was transformed with close to 1020 cubic yards of cobble and gravel. In weight that’s about 1,020 Toyota Corollas, or 510 medium sized hippos.

The beach was built with money the Bio Station was awarded in a recent class-action lawsuit for shoreline damages caused by dam-regulated lake levels according to Tom Bansak, FLBS Associate Director.

Bansak said the Bio Station wants their beach to serve as a model of how Lorang’s beach design works over time.

The Bio Station and Lorang have future plans to protect more of its shoreline with this kind of erosion control, Bansak said. This includes the adjacent Yellow Bay Unit of Flathead Lake State Park which sits on FLBS property. Flathead Lake State Park – Yellow Bay is open to the public and sees a lot of summer users on its shrinking shoreline. The Bio Station wants to enhance the visitor experience by helping to restore and protect it.

“From a recreational standpoint, you can't use half the State Park, right? Because you have to fight through the brush to get to the water.” Bansak said.

Flathead Lake State Park manager Amy Grout has been in talks with the Bio Station about an erosion control beach. Yellow Bay is one of six units around the lake that make up Flathead Lake State Park. Grout said the idea of Yellow Bay having one of Lorang's beaches is exciting.

Grout said that the park's usable space is shrinking. She has been park manager for five years and within the last year she has noticed notable erosion at Yellow Bay.

“A beach would allow for more usable area of the shoreline for the public,” she said.

The challenge for Yellow Bay is finding the funding. While Grout is on board with putting in a beach, the money just isn't there. The parks have many facilities that need repairs and upgrades and those take priority she said. Finding funding will be a challenge, but the Bio Station and partners are looking to philanthropy to help foot the bill.

Lorang standing on the new Bio Station beach commented on how the beach has already changed shape, hypothesizing why a curve was created here or debris was deposited there. He wants Whited to fly a drone over to take aerial photos of the beach to document the changes made before and after the storm.

“I've been doing this for 40 years and I still get excited about beaches,” Lorang said.

Science beyond boundaries: Decades of devotion to the Crown of the Continent

By: Kelsea Harris-Capuano | Missoula, Montana

During graduate school, Erin Sexton ran around a ranch in southwest Alberta, Canada, with her fellow classmates pretending to be ranchers and wranglers. But their fun was cut short at the sight of a cow starting to froth at the mouth. Snorting and heaving, it laid down and died in the pasture.

Sexton was on a six-week Crown of the Continent tour looking at environmental challenges of the region up close. Known as one of the most diverse intact ecosystems on the continent, the Crown of the Continent region encompasses more than 10 million acres that include part of the Rocky Mountains where Alberta, British Columbia and Montana meet.

The ranch sat next to a gas plant under the shadow of the Canadian Rocky Mountains. Gas plants clean raw natural gas to make it usable. One of the byproducts of the process is sulfur dioxide, an airborne toxin. Even short-term exposure can affect respiratory system function. The ranch was one of the last in the area that hadn't been sold off to the Shell Corporation for development. And the cows were paying the price.

It's been more than 20 years since Sexton saw that cow die. "That experience really struck me," said Sexton.

That ranch experience and Crown of the Continent tour deeply connected Sexton with the landscape and sparked her interest in environmental issues that cross human-made boundaries. Sexton, now a senior research scientist at the Flathead Lake Biological Station (FLBS) in northwestern Montana, is still a champion for complex transboundary issues. And she's dedicated most of her professional career to using science to help inform policy and decision-making and protect the environment.

Path to science

Sexton has an easy but confident presence — it's a self-assuredness that suggests she's used to talking about science and explaining her work. She usually sports a pair of dangly silver earrings that peek out from long dark hair that has streaks of gray.

Growing up in Salt Lake City, Sexton skied, hiked and backpacked all over Utah. Then she went to college at the University of California, Santa Cruz, longing for an ocean experience. Loving natural history courses and time in the field, environmental studies and biology seemed like a natural fit for her undergraduate studies.

After graduating in 1999 with a B.S. in biology and a B.A. in environmental studies, Sexton started working field jobs, like studying bird mortality rates on some of the early wind farms and surveying the endangered spotted owl in the Southwest.

She laughed while recounting one of her jobs tracking the endemic and endangered Hawaiian honey creeper on the big island of Hawaii. It involved spending her days running around a volcano trying to find the small finch-like birds.

Those early jobs strengthened Sexton's desire to use science for applicable problem solving and decision-making. But she quickly realized that the path from science to decision-making isn't straightforward.

The spotted owl, a fairly well-known symbol of controversy during the 1990s, was a great example of this. The data Sexton and fellow scientists found was clear. The habitat of an endangered species was being destroyed by the timber industry. Enter forest management, industry interests and politics, and things got complicated quick.

"In reality there are several more steps between scientific evidence and management outcomes," said Sexton. "Having that good data doesn't guarantee a management decision."

Researching the North Fork Flathead

Quality science is important. In graduate school, Sexton became interested in studying the East Kootenay coal fields that underly both the North Fork Flathead River Basin and the nearby Elk Valley. She realized there was little to no scientific data about the region.

Known as the Flathead River in Canada, the area is referred to it as the North Fork Flathead in the U.S. That's because the Flathead has three named headwater tributaries; two lie within the U.S. and start within wilderness areas, while the North Fork lies partly in Canada.

The nearby Elk Valley has a decades-long history of coal mining development, and Sexton wanted to know what would happen to the North Fork Flathead if it, too, was developed for mining.

The North Fork Flathead is undeveloped and considered to be a pristine river ecosystem with high water quality and ecological diversity and remains that way today. When the North Fork Flathead River crosses into the U.S., it forms the northwestern boundary of Glacier National Park.

Shortly after Sexton graduated from the University of Montana with her masters in 2002, Canadian mining company Teck Resources proposed coal bed gas development in the East Kootenay coal fields. The proposal included putting a coal mine in the Flathead where Sexton conducted her graduate research. After she finished her degree, she kept working in the area as a transboundary science coordinator, hired by the National Parks Conservation Association.

"I threw all of my time into figuring out what mining in the Flathead would mean," said Sexton. The Flathead and Elk Rivers sit within Ktunaxa Nation territory, a Canadian First Tribe. Downstream from the Flathead are the Confederated Salish and Kootenai Tribes (CSKT), and the Kootenai of Idaho and Glacier National Park. Sexton collaborated with many interested

parties including representatives from Glacier National Park, the U.S. Forest Service, Montana Fish, Wildlife & Parks, the U.S. Fish and Wildlife Service, the CSKT and the Ktunaxa Nation.

The headwaters of the Elk and North Fork Flathead Rivers that start in British Columbia are both part of the Columbia River system. Underneath those headwaters are high quality metallurgical coal (or coking coal) deposits. Steelworkers need metallurgical coal with its high carbon content to create coke, ideal for steelmaking. More than 70 percent of the world's steel is produced using coal.

Canada's mining sector has long been interested in the mining potential of the North Fork Flathead. Teck owns five open pit coal mines in the nearby Elk Valley, and four are still active. The valley is North America's largest coal-producing region. Close to 40 percent of the world's steelmaking coal currently comes from the East Kootenay coal fields.

Open pit coal mining became popular in the 1970s. The process involves blasting off the top of a mountain or surface area to expose the coal underneath. Tons of waste rock is excavated and usually dumped in nearby valleys, leaching contaminants into local water sources.

In their proposal, Teck representatives argued that they could mine the North Fork Flathead Basin without any significant impact on the fishery, wildlife and downstream ecosystems.

But concern grew over the potential impact a mining development in an untouched basin would have on the Crown of the Continent ecosystem and surrounding areas. Sexton said she was baffled by Teck's statement. How could Teck representatives demonstrate that their mine would have no impact without data on the region?

"If you don't know what your baseline condition is, how can you possibly claim that you'll have no impact on the environment?" Sexton said.

Building a team

Sexton worked for the National Parks Conservation Association for three years before joining FLBS as a research scientist so she could do more field work. Sexton said that joining FLBS was an easy move, and it felt like perfect fit for the work she wanted to do.

Backed by Montana legislators and federal congressional delegates, Sexton raised \$3 million over three years to fund data collection in the North Fork Flathead Basin and Elk Valley.

With this funding, Sexton hired interns at FLBS and worked with volunteers to collect water samples every summer from 2005-2011.

"I have a photo of a friend putting monitoring probes in the stream, with Coal Mountain mine right behind him in the background," said Sexton, a smile in her voice. "All of this work has always been an effort of so many."

Along with collecting water samples from the North Fork Flathead, Sexton and her team worked as close to the mines in the Elk Valley as they could — collecting water samples from all the major tributaries immediately downstream from the mine’s runoff.

Her team also took water samples from the headwaters of the Elk River, part of the Canadian Rockies on the continental divide, an area punctuated by mountain peaks and vast landscapes with high mountain lakes.

“It was really amazing work to do, drive across the international boundary, deep into British Columbia, and collect all this water quality data that I knew didn't exist,” said Sexton.

Sexton and her team gathered data on water quality, fisheries and macroinvertebrates, (animals lacking backbones), all indicators of ecosystem health.

Heavily impacted from years of development, the Elk River showed increased levels of selenium, nitrates, sulfates and cadmium — all byproducts of mining.

In contrast, her team discovered that the North Fork Flathead Basin showed almost no inputs from unnatural or manmade sources. It was a healthy and unimpacted system.

Science guides policy

Sexton’s years of research made her an expert on the North Fork Flathead and transboundary mining issues in the region. During that time, she became a scientific advisor to the state of Montana and worked closely with the Montana Department of Environmental Quality (DEQ), Department of Natural Resources and Conservation and natural resource advisors in the governor’s office.

She not only had the role of a field scientist, but also wore the hat of advisor and science communicator.

“There are such politically contentious issues at every turn,” said Sexton. “Every scientific question had a political consequence. Whenever these political discussions were taking place, everybody needed to have the science right in front of them.”

Collaborative scientific work along with significant political pressure led to the state of Montana, British Columbia, CSKT and the Ktunaxa Nation to sign a memorandum of understanding (MOU) in 2010. The MOU prohibited the mining of oil, gas and coal in the British Columbia Flathead and the North Fork Flathead River Basin in Montana.

Following the MOU, British Columbia’s legislature passed the Flathead Watershed Conservation Act in 2011. Similarly, the U.S. passed the North Fork Watershed Protection Act in 2013 to protect the watershed from energy development.

The closeness of two well-loved national parks, Glacier and Waterton Lakes, helped push the protective legislation on both sides of the border.

Through her journey, Sexton learned a lot about the U.S. and Canada's political landscapes. She said the experience gave her a crash course in environmental and international law, which she felt was necessary to understand the best way to make her science applicable.

Similar to her experience early in her career with spotted owls, Sexton found herself up against significant barriers between scientific evidence and protective management decisions.

“If you want to have impact with your science, you have to understand the decision-making landscape that you're in,” said Sexton.

Having a hand in passing protective legislation for the North Fork Flathead Basin on both sides of the border felt like a real victory.

But Sexton's fight wasn't over. She turned her attention to the nearby Elk Valley, where mining pollution was making its way across the border and impacting downstream communities and ecosystems.

Ongoing battles

About six years ago, British Columbia granted Teck a permit to expand several of its mines in the Elk Valley.

As Sexton now focused her efforts on protecting the Kootenai watershed, she wondered what kind of protection could be accomplished. With a strong established mining industry in the region, this was a completely different beast.

The Elk River is a main tributary of the Kootenai. The Kootenai River flows through three tribal nation territories and two U.S. states before heading back into British Columbia and ending up in the Columbia River.

Of the contaminants Sexton found in the Elk River, she said the increased levels of selenium were most concerning. Selenium is an essential element most people get through diet. It's found in some nuts, a variety of seafood including a lot of salt and freshwater fish, and some grains.

But the window between a healthy and unhealthy level of selenium is very small. Higher levels of selenium cause reproductive failure and deformities in wildlife.

Joe Skorupa, an environmental contaminants specialist for the U.S. Fish and Wildlife Service for more than 35 years, has witnessed firsthand what toxic levels of selenium can do to wildlife. In fish, he's seen stunted growth, deformities of the spine and missing gill plates (a bony flap that protects the gills and aids in breathing). And in birds, eggs that failed to hatch, malformed wings and in extreme cases, brains that developed outside of the skull.

Skorupa's expertise is in selenium pollution, and he's defended his science in court nearly two dozen times over the years. He stresses the importance of a solid scientific process to address pollution problems. He's followed the Elk Valley pollution problem and admires Sexton's work.

"Erin Sexton is one of the good guys in this whole process," Skorupa said. "She's a scientist working in the public's interest."

And Sexton is been one of the longest standing professionals in the selenium pollution conversation. That part of the process has been both fascinating and hard for Sexton. She's built relationships and watched people come and go. Montana has had three government administrations since she started working on protecting Crown of the Continent watersheds.

Frustration and Patience

Sexton became more familiar with international and environmental law over the years and she said it was a shock to learn about the mine permitting process in British Columbia and the differences in environmental assessment and protection on the two sides of the border.

The environmental assessment processes for mining permits in British Columbia didn't look at impacts to an entire ecosystem. Sexton said that for each permit, Teck would limit the scope of its assessment by drawing a circle or square geographically that ignored the potential impacts downstream or across the international boundary.

"I've always had this fundamental issue with that, it's inherently opposed to how we know rivers work," Sexton said.

Sexton has actively participated in Teck's many environmental assessment processes, which are part of acquiring mining permits. The processes have left her frustrated by the lack of objectivity as well as the exclusion of impacted parties in the decision-making.

During a two-year environmental assessment from 2012-2014 for one of Teck's mine expansion proposals, Sexton traveled around Canada attending meetings in British Columbia, Vancouver and Alberta.

One meeting in particular stood out to her. Teck was front and center, while some parties, including the Confederated Salish and Kootenai Tribes, were given "observer" status. Observers were even moved farther away, placed at a table behind the committee.

"The tribes, the first people on the landscape, were relegated to observer status. And then you have industry upfront leading the process," Sexton said.

Sexton was deeply offended by that particular meeting and its colonial feel. But despite the negative experience, Sexton said she would rather keep showing up to the table to fight for the Crown of the Continent than not participate at all.

“It's in our backyard, our watershed and it is a shared landscape,” she said. “I'm deeply concerned.”

In 2012, U.S. officials listed Lake Koocanusa, a manmade reservoir located about 60 miles downstream of the Elk Valley mines, as threatened under Environmental Protection Agency (EPA) standards. The lake straddles the border of Montana and British Columbia. Scientists from both sides have been working collaboratively to address the selenium pollution from the coal mines.

But the Teck mines in the Elk Valley have had minimal environmental oversight. Selenium levels, along with other contaminants, have increased over the years.

Lars Sander-Green, who works for Wildsight, an environmental non-profit based in southeast British Columbia, said that this is largely because British Columbia's government has been hesitant to set regulations that protect the environment. Regulations that do exist aren't enforceable or enforced at all. Sander-Green said that in the case of Teck mines in the Elk Valley, the lack of regulation has to do with coal's contribution to the economy and Teck's political power. In 2013, outside of its revenue from coal extraction, the Elk Valley coal operations spent more than \$1 billion on goods and services in British Columbia.

“There's a lack of political will from the [British Columbian] government to deal with this problem,” said Sander-Green.

Sander-Green said that another problem with the current regulation process is that Teck provides their own science. The law doesn't require the science to be independently verified. Teck officials can set their own limits based on how much pollution their company researchers say is safe, then they're allowed to monitor their own compliance.

Currently selenium levels are monitored under the Elk Valley Water Quality Plan, which was approved by the British Columbian government in 2014. Under this plan, Teck can continue mining as long as the company is working towards a long-term plan to stabilize selenium levels by 2023 and reduce levels after 2030.

Failure so far to make significant headway in stabilizing or reducing selenium in the valley's waterways hasn't stopped British Columbia from granting the company operating permits.

Montana steps in

Downstream at Lake Koocanusa, Montana officials are collaborating with their Canadian counterparts to protect the shared lake. Montana DEQ's Board of Environmental Review had a special meeting near the end of September 2020 to discuss implementing criteria for selenium levels in the reservoir before the year's end.

Montana is considering setting a lower standard than the EPA regulation in favor of a site-specific one. The current national EPA standard for lakes or reservoirs is 1.5 micrograms per

liter. The DEQ has recommended 0.8 micrograms per liter, a level that scientists think will best protect Lake Koocanusa's ecosystem.

Setting and monitoring selenium levels is complicated. Selenium accumulates in animals as it moves through the food chain. How this happens can differ site-to-site depending on wildlife type, diet and water characteristics. The proposed standard was developed based on the unique characteristics of Lake Koocanusa.

Montana's Water Policy Interim Committee (WPIC) also met and discussed the proposed rule-making process and standards.

The recent meetings included long and robust public comment and discussion. The many conservation proponents, including Sexton, argued for the need to protect the shared watershed and spoke to the integrity of the scientific process. Others said there needs to be accountability outside of British Columbia.

Several attendees opposed stricter regulations, though. Vicky Marquis, a lawyer representing Teck, argued that the science wasn't sound. Others like Montana Sen. Mike Cuffe said the process was rushed, and the science didn't show an immediate threat. Still others didn't see the point of a regulation that couldn't be enforced upstream across the border.

After a virtual public hearing in November, the DEQ's Board of Environmental Review will vote on the proposed rule by the end of the year. When the Montana state legislature reconvenes in 2021, lawmakers can allow the rule to stand or vote it down.

In Sexton's opinion, if the legislature rejects the proposed rule, it would unravel years of work.

Selenium levels in Lake Koocanusa exceed the proposed standard. Approving them would put Canada in violation of the International Boundary Waters Treaty of 1909 and Montana in violation of the U.S. Clean Water Act.

Sexton said enacting the new standard would create a precedent for legal action. She, sees this as an exciting step forward.

Watching the cow die on that Canadian ranch all those years ago, Sexton had wondered what evidence could link the dying cow to the gas plant. What kind of science could hold those responsible accountable and protect the environment?

Those are questions she's still asking and answering with her work with more than two decades devoted to protecting the Crown of the Continent under her belt.

Sexton loves field work, but her science has had incredible impact through her willingness to take on other roles that take her away from the field. She has missed it and still has the itch to get back out into the landscapes she loves. She would especially love to venture back into the Canadian Rockies for more data collection someday.

And she still gets out for adventures, sharing the Crown of the Continent with her two boys. Now that they're 12 and 10, the idea of getting back out into the field for work seems more accessible.

"When I first started out, I spent so much time in the field in these beautiful landscapes," Sexton said. "It's why I do science."

**After 53 years, Wild and Scenic River system is worth celebrating,
but could use some attention**

By: Kelsea Harris-Capuano



The Green River in Utah, designated Wild and Scenic in 2019 winds its way through one of the largest roadless areas in the lower 48 states. Photo by Kelsea Harris-Capuano.

Elizabeth Townley is a busy woman. As the only wilderness wild and scenic rivers planning specialist for the U.S. Forest Service, squeezing in time to talk is challenging.

“I was a whitewater raft and fly-fishing guide during college, and I just love rivers,” said Townley as she pushed her glasses up her nose and tucked hair that had fallen loose from her ponytail behind her ears.

Her love of rivers led her to become a river ranger for the Bureau of Land Management working on the Middle Fork and Main Stem sections of the Salmon River in Idaho for 10 years before becoming the planning specialist for the Forest Service and relocating to the San Juan islands located in Washington state.

A few years ago, journalists with publications including USA Today, NatGeo and High Country News covered the 50th anniversary of the Wild and Scenic Rivers Act. The National Park Service public relations team launched a social media campaign with the hashtag “#FindYourWay, which has over 215,000 posts, dedicated to “exploring America’s national scenic, recreational, and historic trails and wild and scenic rivers — and all rivers and trails in your neighborhood and beyond.” Organizations celebrated with in-person events across the U.S. But Townley thinks that as far as managing and protecting Wild and Scenic rivers, people aren’t paying enough attention.

For the USFS, Townley helps local management agencies create or update Comprehensive River Management Plans. These plans give essential guidance for agencies managing rivers and are a requirement for rivers designated Wild and Scenic.

Passed by legislators in 1968, the Wild and Scenic Rivers Act is an iconic piece of legislation. The act solidified the first national system put in place to protect some of the country’s most majestic, pristine and unique free-flowing rivers. Its intent is to protect rivers from development and dams, sustain their pristine water and preserve rivers that, in Congress’ words, “possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values.”

Under the act, a state governor with the secretary of the interior’s approval or most commonly, Congress, can designate rivers under three classifications: wild, scenic or recreational. These classifications determine what type of development can be near the river sections.

Sections designated “Wild” are inaccessible except by foot. Both the water and surrounding area must receive very little human impact.

“Recreational” river areas are readily accessible by road or railroad and may have some development on their shorelines. Developers may have even had a dam or structure that altered river flow in the past in some “Recreational” areas.

“Scenic” river areas fall in between wild and recreational. Their shorelines are largely undeveloped but accessible by roads in places.



Wild and Scenic River classifications

The task of managing and protecting wild and scenic rivers falls to four primary federal agencies: the National Park Service, U.S. Fish & Wildlife Service, the BLM and the USFS. Today, 208 rivers in 39 states and Puerto Rico have Wild and Scenic status, according to a mapping project conducted in collaboration with the four federal agencies. This amounts to the protection of close to 13,000 river miles — less than one half of one percent of the nation’s rivers.

Rivers are a small part of what managing agencies are responsible for, which ranges from wildfire suppression to tourism management. Other pressing tasks can easily take precedence.

“There are very few people whose job it is to focus solely on Wild and Scenic,” Townley said.

Townley is currently working with local managing agencies on drafting and updating 39 different plans. She estimated that last year, about three quarters of the wild and scenic rivers that the Forest Service manages either didn’t have a plan, or had plans that were long out of date and not reflecting or addressing current conditions. For example, the Rogue River in Oregon is on her list, one of the first rivers designated Wild and Scenic that still managed with the original plan written in 1972.

Conditions change over time include increase in pollution, changes in fishery health, climate change impacts such as increases in wildfires or water temperature or massive increases in river use which impacts local ecosystems.

Townley said members of Congress won't continue designating new rivers for protection if plans aren't written or are irrelevant.

This national network of protected rivers has a lot of moving parts. On a local level, people in Plumas County, California are seeing the effects of Wild and Scenic Rivers being a lower priority by management agencies.

A California Community Works to Protect its Wild and Scenic River

Darla DeRuiter, environmental studies program director at Feather River College in Quincy, Calif., has lived in Quincy for 17 years. She is also a boater and hiker who loves the Middle Fork area and wants it to be better protected.

The nearby Middle Fork of the Feather River is one of eight rivers written into the original Wild and Scenic Rivers Act. The river's headwaters lie in the alpine basin of the Sierra Valley; many of its tributaries flow into the steep canyon via waterfall. The area is known for its challenging whitewater, wild trout fisheries and scenery that includes Bald Dome, a granite face much like the one Yosemite is famous for.

"It's a huge wild watershed. It's just stunning, a really special place just a few miles from where we live," DeRuiter said.

DeRuiter said that colleagues and friends that have lived in the area a long time have noticed a decline in the health of its fisheries.

Managers of the local Trout Unlimited chapter released a [report](#) in 2018 saying that warming water temperatures have and will continue to impact fish species populations like the rainbow trout, steelhead and, chinook salmon which favor colder water temperatures. Lower flows due to drought and agricultural are also factors that impact water temperature and fisheries health.


In the report, managers also discussed wildfire as being one of the primary influences on watershed condition. Wildfires have been more frequent and severe in recent years, including the North Complex Fire that in August of 2020 burned close to 320,000 acres in the nearby Plumas National Forest. Wildfires increase debris and sediment creating runoff and erosion that destroys habitat and impacts water quality.

Through an environmental policy class at Feather River College, DeRuiter is working with her students to draft an updated river management plan — a plan they hope to give USFS managers that manage the Middle Fork Feather.

Normally such a task – developing a Comprehensive River Management Plan – would be done by the managing agency, but DeRuiter is hoping that the process can be collaborative and this will push the USFS to update its plan. DeRuiter also said the project is a good way to engage her students and the local community. Part of the planning process includes a public comment period, and DeRuiter added that the more public involvement, the better.

These plans are typically prepared within a few years after a river or section is designated Wild and Scenic, and management agencies address how those rivers will be protected.

To be designated for wild and scenic status, rivers must, along with being free-flowing, have at least one significant attribute or outstandingly remarkable value that makes it uniquely special.



Fish and Wildlife
Rare, unique or important terrestrial or aquatic species. Can include the presence of a species of special concern, e.g. listed threatened or endangered.

Historic
The river or corridor has site(s) or features associated with significant event or important person at least 50 years old.

Recreational
Recreation opportunities such as boating, fishing, hiking or wildlife viewing that attract visitors.

Scenic
Elements of landform, resulting in exemplary visual feature or attraction.

Cultural
River segment contains important evidence of occupation or use by unique cultural groups, usually pre-historic.

Geologic
Area contains examples of rare or unique geologic processes, e.g. channel braiding, geothermic springs.

Other
Similar values include hydrological, water quality, paleontological, ecological or botanical.

Managers have never updated the original plan for the Middle Fork of the Feather River, making it nearly 50 years old. The river was originally listed for having remarkable scenery, wild fisheries and recreational opportunities.

In a river’s management plan, agency staff must address how the enumerated values of that river will be managed and protected.

DeRuiter said that the Middle Fork Feather hasn’t gotten the attention it needs. Flowing from the Sierra Nevada Mountains into the Sacramento River Basin, it drains through an area with a long history of timber extraction which has more of the Forest Service’s focus rather than protecting the river corridor. DeRuiter thinks there are a number of reasons the river plan needs to be updated such as supporting the increase in recreational use over the years, but also to address climate change-related issues like warming temperatures and managing for wildfires — important topics that weren’t on the radar of managers 50 years ago.

“I believe in planning. Funding, enforcement and agency presence often accompanies that planning. Right now, it feels like a free-for-all,” DeRuiter said.

The Middle Fork Feather is one of a number of rivers with a decades-old plan. During a 2018 symposium about river plans hosted by all four federal agencies, hosts delivered a PowerPoint

presentation depicting ranges of age for all river plans. The data showed that about 43% of all river plans were at least 20 years old or more.

Challenges in Oregon

The Rogue River in Oregon is another river operating with a plan that has never been updated. According to BLM River Ranger Katie Gregory, one of the biggest complaints recreational users on the Rogue River have is the scarcity of campsites relative to the river's growing popularity.

Gregory said that knowing and meeting the needs of river users is an important part of protecting the river by helping to reduce and manage human impact. U.S. Fish and Wildlife Service estimates that the Rogue sees half a million visitors a year.

The Rogue River, like the Middle Fork of the Feather River, is one of the original eight rivers designated Wild and Scenic. The others are spread across the country in Missouri, Idaho, New Mexico, Wisconsin and Minnesota.

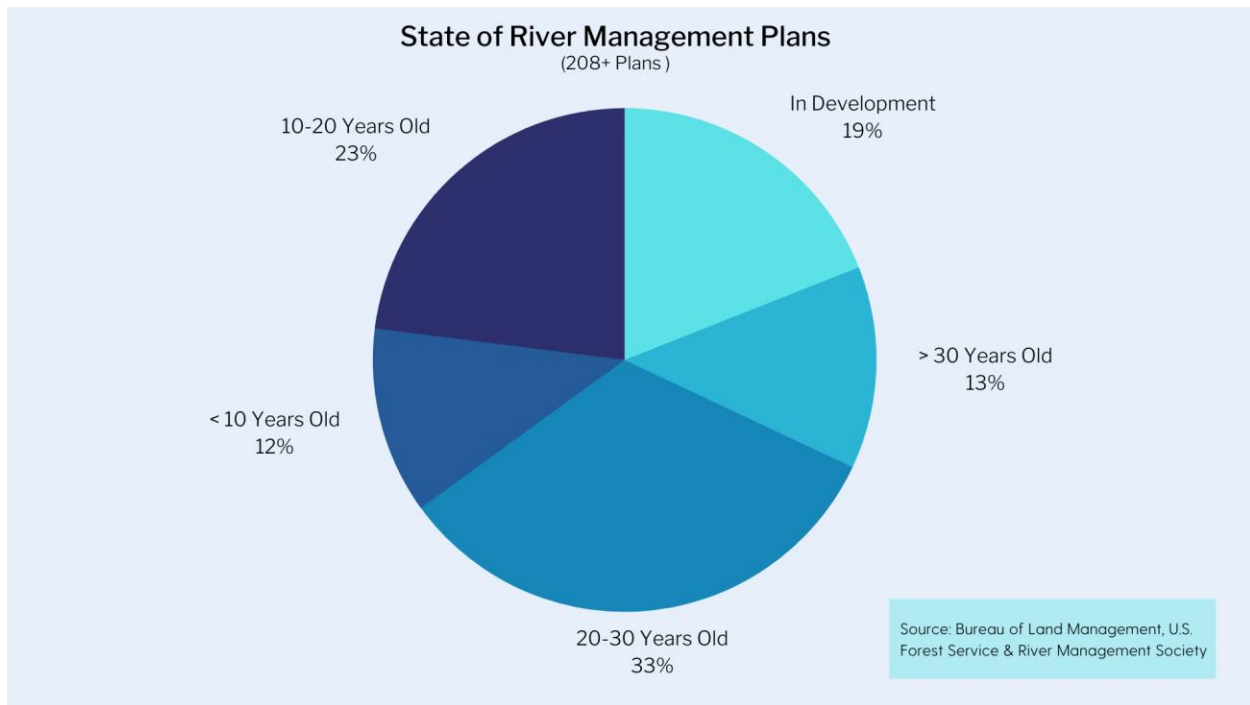
The Rogue is characterized by its steep mountainous terrain, as the headwaters of the Rogue flow from the Cascade mountains 215 miles to the Pacific Ocean, and the area is known for its cold, clear water, diverse wildlife, fishing opportunities and remote feel.

One of the reasons Gregory became a river ranger is because like Townley, she too loves rivers. As an avid boater who kayaks and rafts on her days off, she wants the rivers she enjoys to be protected.

“We need the Wild and Scenic Act, but without proper direction to implement it, it's not going to protect our rivers,” she said.

Kevin Colburn, national stewardship director at American Whitewater, a nonprofit river conservation organization, said that in general, management agencies have dropped the ball in regards to management plans.

“It's crazy to think that a 50-year-old plan can describe how to protect a river in today's world. Management will become less relevant to people and make less sense over time,” Colburn said.



According to Colburn, one reason the plans are important is because they’re so specific to each river. That the rivers are designated based on certain specific values, the plans are essentially capturing what makes each river stand out and what should be done to enhance and protect those qualities.

One big change for the Wild and Scenic Act was technology and public access to more information. Management plans and information on wild and scenic rivers can be found on this [website](#), co-managed by the NPS, Service, USFS and the BLM.

According to Colburn, American Whitewater was the first organization to digitize and put management plans online, making them accessible in one location.

Colburn said that staff at American Whitewater formally started putting together a more comprehensive list online around 2004.

The [River Management Society](#), a nonprofit focused on studying and protecting North America’s rivers, helped them encourage the federal agencies to add the plans to a central website.

Colburn said that before that project they were being used very little. “It was a great thing, because before that the plans were sitting in a filing cabinet somewhere, and a lot of them didn’t exist in an electronic format,” Colburn said.

Colburn said that making them more accessible is also a great way for the public to find information and learn about wild and scenic rivers whether it’s a local river near their hometown, or information on a destination vacation for boaters, fishers or hikers.

According to Edward Sherman, the Zone Recreation Manager for the Mark Twain National Forest in Missouri, another positive change over the years has been collaboration among management agencies.

Urging from conservation organizations led to the creation of the Interagency Wild and Scenic Rivers Coordinating Council. The interagency council includes representatives from all four federal agencies and was developed in the 90s to help communicate and administer the mandates of the Wild and Scenic Act to “protect and enhance.”

Sherman has been working for the USFS for 17 years and spent the last 7 years working in the Mark Twain National Forest area, where he developed a new appreciation for wild and scenic rivers.

Sherman, who is working to update another 50-year-old plan, this one for the Eleven Point River, another of the original eight, said managers know a lot more today about river plans and working together across agency.

“It has taken a really long time to really wrap our brains around what a river plan should look like and we know a lot more than we did 40 and 50 years ago,” he said.

A number of amendments have been made to the Wild and Scenic Rivers Act over the years, including a 1986 provision that more clearly defined river management plans and what they should entail.

Some of those components include: descriptions of existing conditions, like fisheries health, water quality and amount of development like roads and structures; specific information about the river’s designated remarkable values; goals to protect those conditions and values; a monitoring strategy to help track the river’s conditions, visitor numbers, water flow; and recognition of regulatory authorities and their responsibilities.

While the structure for a river plan has become more streamlined over the years, due to the unique nature of each river, management plans vary widely in length and content. If management issues are more complex, it typically takes more time and require more resources to write up a thorough plan.

Updating the Flathead River plan in Montana

Forest Service staff like Colter Pence are working on the river plan for the Flathead River in Montana. Designated in 1976, the section of river includes 219 miles with sections of wild, scenic and recreational classifications. This means some areas have fewer users with trail access while others have roads, buildings, facilities and will have a lot more users than others. This also means areas will be impacted differently and require a variety of management strategies which have to be detailed in the plan.

Pence, the wilderness and wild and scenic river trails manager, has been working on updating the plan for the Flathead for the last four years. She said many river plans written before the 1986

amendment did not address the newer requirements including the Flathead. She estimated that they're probably a year or so away from finishing.

Back in her office, Townley said that while a river plan for the Flathead may take five years to finish, a plan for the Franklin River in Oregon, which includes just a 4.5 mile stretch of river designated wild, took one year to complete.

Townley is working on a side project to help streamline the planning process even more by creating a template. She wants to make the process less arduous. She said that given the difference between rivers there's no one size fits all, but there are ways to make the process easier and more approachable. That may help in putting rivers higher on the list of priorities for managing agencies.

“It's a difficult feeling like we're not moving the needle on protecting a resource that I'm super passionate about and love. I know that we can do better,” she said.