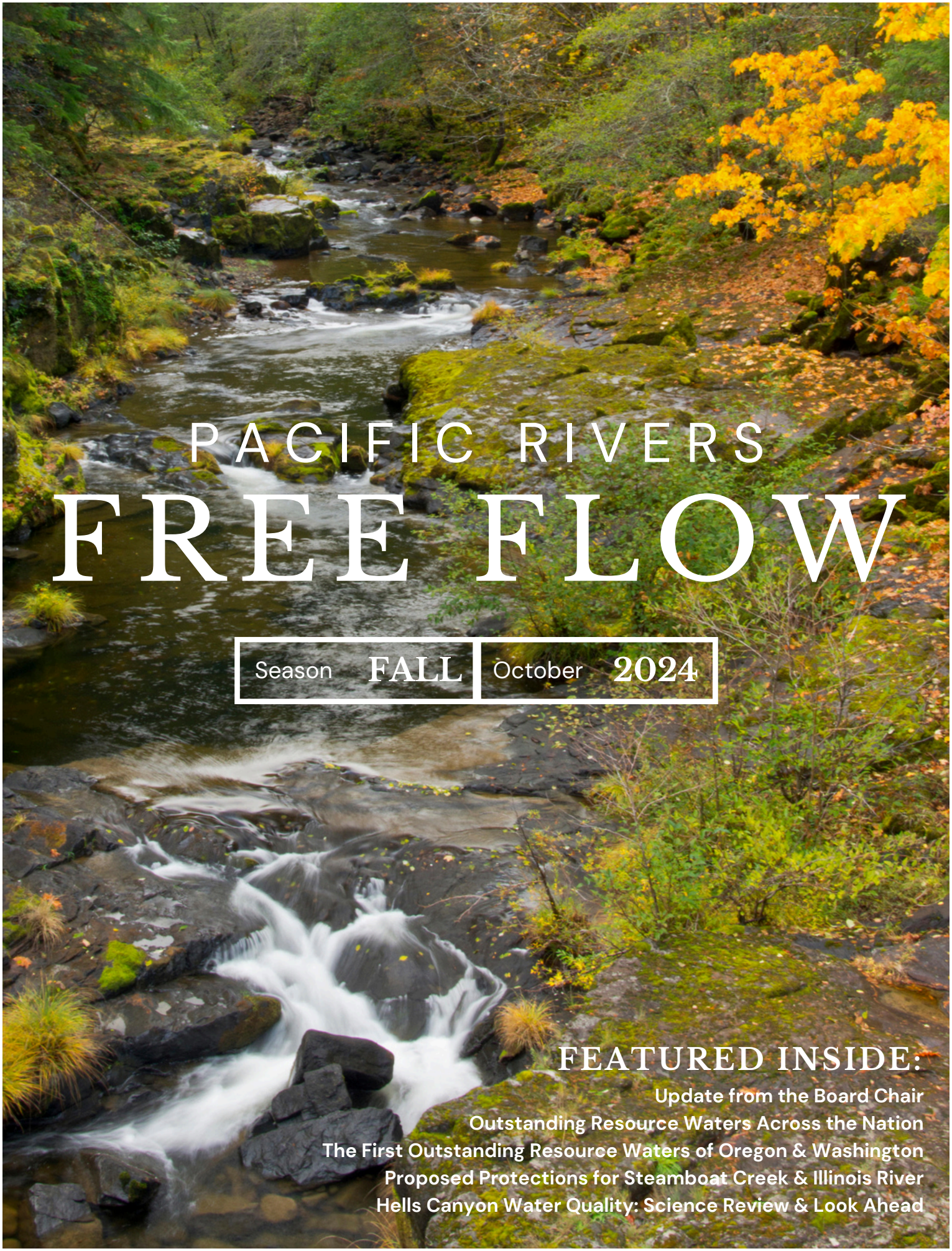


PACIFIC RIVERS

FREE FLOW

Season FALL | October 2024

FEATURED INSIDE:

Update from the Board Chair
Outstanding Resource Waters Across the Nation
The First Outstanding Resource Waters of Oregon & Washington
Proposed Protections for Steamboat Creek & Illinois River
Hells Canyon Water Quality: Science Review & Look Ahead

BOARD CHAIR UPDATE


Mike Morrison - Board Chair

Greetings, Supporters of Healthy Watersheds, and welcome to Pacific Rivers' Fall 2024 issue of *Free Flow*,

We are pleased to bring you another in our series, again an effort to both give you an idea of what we at Pacific Rivers are doing and to offer information about and insights into what we believe are current, important issues facing the conservation community.

In this issue we feature a series of articles about the need and potential to expand state Outstanding Resource Water (ORW) programs in the Northwest. ORW designations provide important state water quality protections for our highest quality waters and waters of exceptional ecological significance. While Northwest states have long been national leaders in some aspects of river conservation and environmental protection, none have yet done nearly as much with ORW programs as half or more of the other states in the nation. Last year, Washington designated its first three ORWs; this year, Pacific Rivers and our ORW coalition partners have nominated Steamboat Creek in the North Umpqua Basin and the Illinois River in the Rogue Basin as Oregon's fourth and fifth ORWs. We will work through the upcoming Oregon Triennial Review of Water Quality Standards to make the case for the current nominations and for others in the near future.

Also in this issue we provide an overview of recent groundbreaking research regarding the serious mercury pollution problems in the Snake River in and downstream of three Hells Canyon reservoirs. We have been following the research closely and preparing to participate in the development of a plan to make Snake River fish safe to eat again.

Through our membership in the North Umpqua Coalition, we continue to press for enforcement actions against the Winchester Dam owners, for both the serious safety issues with the structure itself and for the disastrous loss of Pacific lamprey resulting from major failures to meet permit requirements during last year's "repairs" to the dam. Also through the Coalition, we are following the legal actions against the ODFW Commission for its responsible and bold decision to terminate the summer steelhead hatchery program on the North Umpqua River. The Commission's action was challenged by Douglas County (and others) in Marion County Court, where it was alleged that the action by the Commission failed to meet administrative requirements; the trial court determined that the issue was to be determined by the Oregon Court of Appeals, which heard the matter and ruled in favor of the Commission; the plaintiffs then petitioned the Oregon Supreme Court for intervention, which has recently been denied — the Appeals Court's decision stands and the matter will return for possible further proceedings in Marion County. Importantly, the Coalition is asking the Commission to now, given the new developments, seek termination of the Restraining Order that is keeping the termination decision from going into effect.


Winchester Dam on the North Umpqua River. Photo by Kirk Blaine.

We continue to work towards a management plan for the Frank and Jeanne Moore Steelhead Sanctuary. Liz Gilliam and Dr. Charley Dewberry are gathering, from far and wide, all of the available historical data so they can determine what studies or additional data are needed in order to recommend to the Umpqua National Forest Service how the Sanctuary should be managed, given what we know. This is, frankly, a long term process but so was the struggle to get the Moore Sanctuary designated in the first place. We hope that we will have more to report in the Spring.





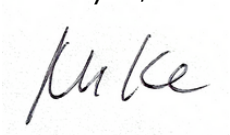
Photos by Nick Basaraba.

The threat of a proposed dam on the Chehalis River remains. We are continuing to monitor the situation. Recently, key staff and board members met with the Tribal Historic Preservation Officer of the Confederated Tribes of the Chehalis Reservation and were given a briefing by the Tribe about their concerns and why they oppose dam construction, including that the proposed site is on land that is culturally very significant to the Tribe. Construction of the dam would also lead to the loss of one of the last undeveloped floodplains in Southwest Washington. The story of the proposed dam and efforts to stop it are featured in Pacific Rivers' film, *Chehalis: A Watershed Moment*.

We are pleased with our program progress, but well aware of the enormity of the challenges facing our watersheds. Currently, we focus most of our work on the rivers of Oregon and Washington, including those such as the Snake and the Smith that we share with neighboring states. We hope, by way of *Free Flow*, to inform and educate you as we learn ourselves. Our view toward conservation remains our whole-watershed approach, that each part of a watershed is affected by and affects the rest of the drainage. We seek to heal the streams that need it most, protect those that are in the best shape and, within our capacity, remember that every river is worth attention.

We hope you find time to read and learn from this issue. Thanks for making it possible. We understand any progress we have or will make on behalf of watersheds is due to your generous support.

Thank you,



Mike Morrison

Steamboat Creek of the North Umpqua watershed. Photo by Joshua Duplechian.

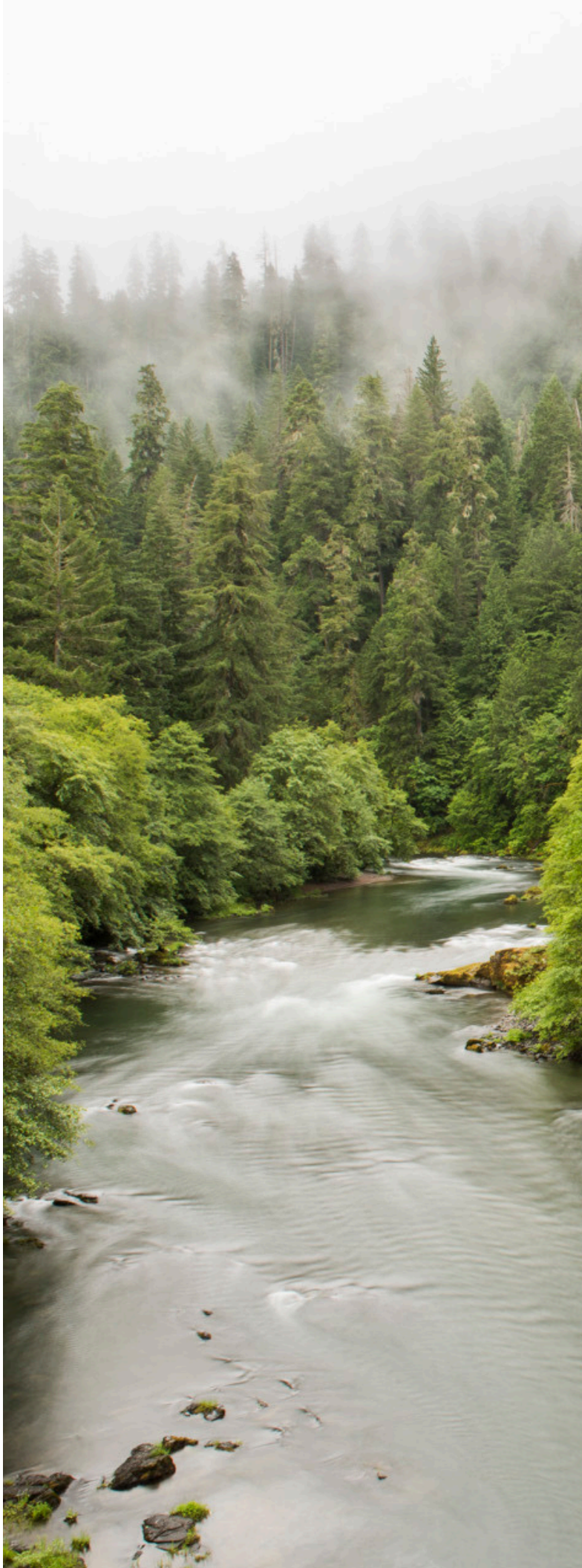
OUTSTANDING RESOURCE WATERS

Strong, overdue protection for our most cherished rivers, lakes, streams and wetlands in the Northwest

It's been said that an ounce of prevention is worth a pound of cure. Nowhere is that more apt than in protection of our healthiest and most ecologically important rivers.

The goal of the Clean Water Act is to restore and maintain the *chemical, physical, and biological integrity* of the Nation's waters. The Act's backbone is the three-tiered antidegradation policy, which requires all states to:

1. set minimum standards to protect all existing uses (such as fishing, swimming, and aquatic life) of all waters,
2. provide additional protection to prevent or at least limit water quality "backsliding" where waters exceed minimum standards, and
3. *establish rules for strict protection of the water quality and aquatic ecosystems of outstanding resource waters, including those of exceptional ecological significance whose water quality may not be particularly high.*





Napeequa River near Lake Wenatchee. Photo by Thane Tuason.

Many states around the country have protected rivers, lakes, streams, and wetlands as Outstanding Resource Waters (ORWs). They are as far flung and different as Maine, New Mexico, Wisconsin, Kentucky, Colorado, Louisiana, Utah, North Carolina, and Kansas. At least 12 Tribes with Clean Water Act authority have also designated ORWs.

Alas, until fairly recently, no states in the Northwest had protected any ORWs. The state of Oregon designated its first ORW - the North Fork Smith River - in 2017 and has designated only two other bodies of water since then. Washington just approved its first ORW designations at the end of 2023 with the designation of portions of the Napeequa River and its tributaries, the upper watershed of the Green River, and the upper watershed of the Cascade River.

It is high time for us to secure the highest degree of protection for other outstanding waters of our region.

Our highest quality waters that have never been degraded should have it. Because an ounce of prevention is worth a pound of cure, it just makes practical and economic sense to protect them.

Many of our waters that are now high quality because we have worked hard to restore them should also have it. After all, the goal of the Clean Water Act is to restore *and maintain* the Nation's waters – not to restore them so we can degrade them again.

Many of our most ecologically significant waters, including those that provide critical habitat for threatened and endangered species, should have it. They are much too important to our environment, cultures, public health and economies to allow their degradation.

Many high quality drinking water sources should have it. They are irreplaceable and must be strictly protected.

Many designated Wild, Scenic and Recreational rivers should have it, too. While new dams on river segments in

the national system are prohibited, and some lands along them are managed by federal agencies, these rivers typically enjoy no clear state *water quality* protection from activities in their watersheds.

Outstanding Resource Water classifications provide rivers, streams, lakes and wetlands meaningful watershed-scale protection by state and Tribal water quality management agencies. They prohibit new activities that would degrade water quality or other values central to a water's ORW designation. They can also encourage and support state and local development of highly protective watershed plans and lead to dedication of additional federal and state resources for watershed protection and restoration.

National Wild and Scenic designations require an Act of Congress. Rules for ORW designations vary by state. Typically, they are made by state and Tribal agencies to which the US EPA has delegated authority for setting water quality standards. Citizens may petition their state or Tribal officials for ORW protection of their most cherished rivers, lakes and streams.

This year, Pacific Rivers and our coalition partners formally proposed designation of Steamboat Creek, the critically important tributary of the North Umpqua River, as Oregon's next ORW. Soon after, three of our southwest Oregon partner groups submitted another strong petition for the Illinois River, the largest tributary of the lower Rogue. Other proposals for Northwest rivers are now being considered.

What regions have more outstanding waters than the Pacific Northwest? We admit our bias and proudly answer "*None*!". In this issue of *Free Flow* we celebrate our region's waters now protected as ORWs, highlight current proposals for future ORWs, and show how you can get involved in the work to protect others around the Northwest in the next few years.



The upper reach of the Green River flows from the foothills of Mount St. Helens. Its ORW designation bolsters efforts to defend the watershed against mining threats. Photo credit: Cascade Forest Conservancy.

Our thanks go to our coalition partners who helped in the creation of these articles: American Rivers, Trout Unlimited, Pew Charitable Trusts, Friends of the Kalmiopsis, Klamath-Siskiyou Wildlands Center, and Kalmiopsis Audubon Society.

OUTSTANDING RESOURCE WATERS
AROUND THE NATION

The federal antidegradation policy is the backbone of the Clean Water Act. States and Tribes with federally approved water quality programs are required to adopt an antidegradation policy that is consistent with the federal policy, at a minimum.

Tier III of the federal policy provides for protection and maintenance of Outstanding Resource Waters. Nomenclature and details of state and tribal ORW programs around the country vary and evolve. Some states outside the Northwest began to develop Outstanding Resource Water programs in earnest decades ago. Many other states and tribes have joined them since.

At least 27 states, one territory, and 12 tribes have ORW programs and designations of some kind today:

- Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Mexico, North Carolina, Oklahoma, Oregon, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, and Wisconsin;
- Puerto Rico; and
- The Bad River Band of the Lake Superior Chippewa Tribe, Confederated Salish and Kootenai Tribes of the Flathead Reservation, Grand Portage Tribe of Minnesota Chippewa, Hoopa Valley Tribe, Hopi Tribe; Hualapai Tribe, Lac du Flambeau Band of Lake Superior Chippewa, Pueblo of Laguna, Pueblo of Taos, Sokaogon Chippewa Community (formerly Mole Lake Band), Ute Mountain Ute Tribe, and White Mountain Apache Tribe.

Examples and Lessons From Six States Outside Our Region



Twin Crater Lake in the Rawah Wilderness Area, Colorado. Photo by Clark Harris.

Colorado

As of 2023, Colorado already had 88 waters totaling 7,600 miles with ORW protection, with many more under consideration. Clear criteria for designation, specific rules for protection, proactive stakeholder involvement, and transparent public processes are said to have been valuable in the development of Colorado's program.

Lessons:

- Patience pays off, especially early in the development of an ORW program.
- As an ORW program becomes established – and it becomes clear what it will (and will not) do – public support, demand and initiatives for more designations can grow.

Florida



Sunset at Ten Thousand Islands National Wildlife Refuge within the Everglades National Park. Photo by Jim Liestman.

Florida was one of the first states to develop an Outstanding Resource Waters program, with designations underway by the 1980s. Today, Florida protects many waters in national and state parks, wildlife refuges, and recreation areas – and at least 41 additional "Outstanding Florida Waters (OFWs)" of "exceptional recreational or ecological significance".
Lessons:

- Over time states can and should provide Tier III protection to many waters.
- This protection should include but not be limited to waters in state and national parks. Many other waters need and deserve it.

Alabama



Little River Canyon National Preserve atop Lookout Mountain in northeast Alabama. Photo by Brent Moore.

In the early 1990s citizen groups formally petitioned the state to 1) develop an antidegradation policy at least as clear and strong as the federal policy, 2) develop an Outstanding National Resource Water Classification and supporting criteria, and 3) designate the state's longest free-flowing river, the Cahaba, as the state's first ONRW. This initiative led within a few years to Outstanding Alabama Water classification for the Cahaba, and to ONRW classification for three other waters: Little River, Sipsey River, and Weeks Bay.
Lessons:

- The Clean Water Act does not implement itself. Implementing state agencies need consistent support and occasional prodding to fulfill its promise.
- Broad public support for protection of outstanding waters is necessary but not sufficient. Advocates should organize and make specific, formal Outstanding Resource Water proposals through official state procedures.
- Classifications to prevent further degradation of outstanding waters with existing pollution problems can be devised.

Wisconsin



The mouth of the Bois Brule river, where it flows into Lake Superior. Photo by Aaron Carlson.

Like Oregon, Wisconsin was an early leader in development of state-level water quality programs that became models for the federal Clean Water Act. Wisconsin's water quality agencies and strong statewide and local conservation groups were also leaders in development of new programs that implemented and built on the CWA, including its antidegradation provisions. Today, 97 of Wisconsin's lakes and 7.6% of its total stream miles are classified as Outstanding Resource Waters, and 11% of its stream miles are classified as Exceptional Resource Waters. (Wisconsin's ORWs are waters that had no direct pollution discharges before designation. ERWs are those that did.)

Lessons:

- Wisconsin, with much less public land and far fewer "pristine" waters than those of most western states, has nevertheless seen fit and found ways to prevent degradation of nearly 20% of its total stream miles already.
- Here again, a state has developed practical management strategies to prevent further degradation of streams with existing pollution discharges.



Mammoth Cave: Underground reflections on Echo River. Photo by Don Sniegowski.

Kentucky

The Kentucky Waterways Alliance began long-term work in the late 1990s to improve the state's antidegradation program. Today the program is defined and the state has designated eight rivers, 2,000 acres of wetlands, and the underground waters of Mammoth Cave National Park as Outstanding National Resource Waters. Hundreds of more waters across the state are also much better protected than before as Kentucky Exceptional Waters, which have explicit protections meeting or exceeding Tier II requirements to prevent or at least limit new pollution loads.

Lessons:

- The long-term involvement, support and initiatives of statewide and regional conservation groups is important to develop a Tier III program and keep it on track.
- State ORW protections can extend to wetlands, estuaries and even underground waters.
- The work to secure Tier III protections for the most outstanding waters can also lead to stronger Tier II and II+ protections for thousands more waters across a state.



The Pecos River's headwaters in New Mexico run through red soil and minerals which add a unique hue to its flow. Photo by Luvduck Photography.

New Mexico

On July 12, 2022, the state of New Mexico designated 304 miles of the northern Rio Grande, upper Upper Pecos Watershed, and other major regional rivers as Outstanding National Resource Waters. The designation prevents new government permits for activities that would pollute the water. It also demonstrates respect for existing and traditional water uses like agricultural irrigation, including centuries-old acequia practices in New Mexico, a tradition of agriculture using diverse crops, animal types and land use techniques in the watershed based on seasons. The new classification will sustain wildlife and protect outdoor sports like fishing, hunting, and rafting that contribute to the state's tourism economy. It was made possible by an exceptionally large and diverse coalition that included Tribal leaders and governments, local governments, state leaders, businesses, farmers, acequia members, water conservation groups, and outdoor recreationists.

Lessons:

- ORW designations can protect cultures, values, and traditional water uses.
- ORW initiatives can generate much public enthusiasm and support.
- The larger and broader the coalition, the better.

THE NORTHWEST'S FIRST

OUTSTANDING RESOURCE WATER DESIGNATIONS

2017-2023



Kayakers on the North Fork Smith River. Photo by Zachary Collier.

Oregon's First ORWs

North Fork Smith River, 2017

The North Fork Smith River is a jewel of the Northwest. It rises in the Kalmiopsis Wilderness of southwest Oregon and flows south through a rugged canyon for 28 miles before joining the main stem of the Smith in California, which then flows through the Redwood National and State Parks and the Jedediah Smith Redwood State Park on its path to the Pacific Ocean. Renowned for its water clarity and brilliant blue hue, the North Fork of the Smith provides habitat for endangered coho salmon, several rare plant species, and myriad other fish and wildlife.

In 2017, the Oregon Environmental Quality Commission voted unanimously to designate the North Fork of the Smith River and its tributaries in southern Oregon as the first Outstanding Resource Waters in the Pacific Northwest. Water rights expert Gordon Lyford formally petitioned the state in 2016 for the ORW designation. Then, over the following year, a broad coalition of local, state, and national conservation and sporting groups and local businesses engaged and lent their support, with many citizens writing letters, signing petitions, and attending public meetings to speak on behalf of the proposal. The campaign built upon years of research, data gathering, and local community organizing and advocacy on behalf of the North Fork Smith. The subsequent decision of the Oregon EQC in July 2017 was a very important conservation milestone for our entire region.

Congress designated the North Fork Smith as a National Wild and Scenic River in 1988. ORW designation now adds a much-needed layer of protection by prohibiting activities that could degrade its water quality.



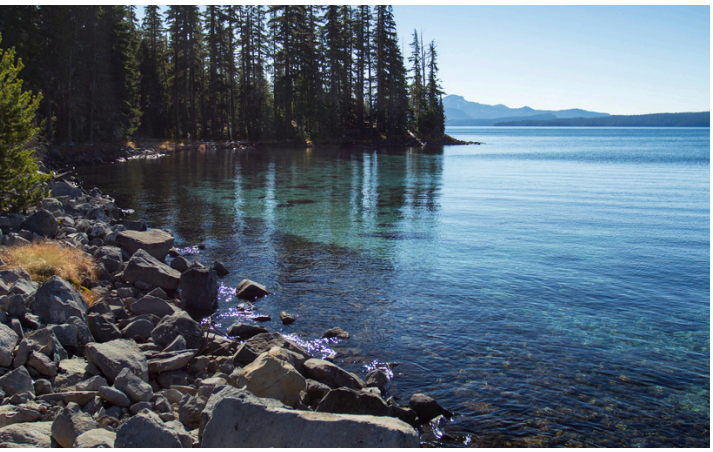
Crater Lake - Discovery Point. Crater Lake is the deepest lake in the United States. Photo by Charles Dawley.

Crater Lake and Waldo Lake, 2021

Crater Lake and Waldo Lake are Oregon waters renowned worldwide for their exceptionally high water quality. Both have average visibility to depths of more than 100 feet.

Lying in the heart of Oregon's only National Park, at over 6,100 feet above sea level, Crater Lake is by far the nation's deepest at 1,943 feet. It was formed by a massive explosion and subsequent collapse of 12,000-foot Mt. Mazama just 7,700 years ago – a point recent

enough in geologic time to be witnessed by the region's First Peoples, who remember the event in legends that live on today. Over the next several hundred years the mountain's caldera filled gradually with rain and snow. Despite its high elevation, the lake seldom freezes over because of the residual heat of its immense volume. Oregon's mighty Rogue River rises from springs on the caldera's flanks.



Islet Bay, Waldo Lake. Photo by Bonnie Moreland.

About 70 miles north of Crater Lake as the crow flies, just west of Willamette Pass at over 5,400 feet above sea level, lies Waldo Lake. With a surface area of over 10 miles and a maximum depth of 420 feet, it is known far and wide for its great beauty and exceptional water clarity. It is a very popular destination for camping, hiking, and boating by paddle and oar. (Gas motors are prohibited.) Boaters marvel at its water clarity, which averages 125 feet and can reach as much as 160 feet. Its outflow is the source of the North Fork of the Middle Fork of the Willamette River, one of Oregon's cleanest and most beautiful streams.

Early in 2021, in response to a citizen petition submitted by the Northwest Environmental Defense Center, and with a detailed recommendation by the Oregon Department of Environmental Quality, the Oregon Environmental Quality Commission voted to make Crater and Waldo Lakes Oregon's second and third Outstanding Resource Waters.

Future ORWs in Oregon and Beyond

In the Clean Water Act's antidegradation framework, "high quality" does not mean "pristine". "High quality" waters are defined as those that meet the CWA's minimum "fishable/swimmable" goal. Waters that don't meet the fishable/swimmable goal should be in a cleanup plan to bring them up to minimum standards.



Illinois River. Photo by Zach Collier, Northwest Rafting Co.

Among the many waters that exceed the minimum CWA goal, "outstanding resource waters" are to be "maintained and protected". No new activities that would result in long-term degradation are to be allowed. "Outstanding" waters that should be protected include "*water bodies that are important, unique, or sensitive ecologically, but whose water quality, as measured by the traditional parameters such as dissolved oxygen or pH, may not be particularly high.*"

The North Fork Smith River, Crater Lake, and Waldo Lake are highly qualified, arguably "pristine" candidates that were logical starting points for Oregon's ORW program. Going forward, we should ensure that Northwest states provide ORW protections to many other qualified waters.

Oregon defines its Outstanding Resource Waters as "*high quality waters that constitute an outstanding state resource due to their extraordinary water quality or ecological values, or where special protection is needed to maintain critical habitat areas.*" (Emphasis added.) This clear definition and first three designated waters provide a solid foundation for Oregon's ORW program. It is time to build on it.

Designation of Steamboat Creek and the Illinois River this year would be a solid next step. Details about current proposals for those waters follow this article.

Washington's First ORWs

Cascade, Napeequa and Green Rivers, 2023

In 2019, members of the Protect Washington Waters Coalition identified Outstanding Resource Water designation as an important conservation tool that had yet to be utilized in the state. In 2020, a strong coalition developed to pursue designation of Washington state's first ORWs. This coalition included Washington Wild, Trout Unlimited, American Rivers, the Pew Charitable Trusts, American Whitewater, Wild Salmon Center, and Cascade Forest Conservancy. Coalition members spent more than a year reviewing 22 potential candidate waters across the state. Special care was taken to ensure transparency and local stakeholder input. Feedback from Tribes, hunting and fishing groups, key local elected officials, and recreation leaders addressed concerns and values associated with each potential nomination. Based on this feedback, the coalition ultimately settled on three waters for nomination as Washington's first ORWs.

In June 2021, the Coalition formally submitted ORW nominations for the *Cascade, Napeequa and Green Rivers*. In August, the Washington Department of Ecology confirmed all three rivers' eligibility and initiated a robust public process toward designation. The process included two informational webinars in November.

In 2022 and early 2023, the coalition built broad, diverse grassroots support from more than 240 elected officials, Tribes, hunting and fishing outfitters, outdoor recreation groups, local businesses, Brewshed® partners, conservation organizations, and faith leaders. On July 18, 2023, the Department of Ecology opened a 70-day public comment period, including Tribal consultation. In the coming months the Coalition encouraged and supported strong participation in the public comment process through local town hall meetings and written comments.

On December 18, 2023, Washington's Department of Ecology officially announced its decision to designate all three rivers—the Cascade, Green, and Napeequa—as Washington's first-ever Outstanding Resource Waters.



The Cascade River provides great habitat for salmon, steelhead, and trout. Photo by Chris Chappel.

The Cascade River

ORW designation of 149 miles of streams and tributaries in the watershed of the Cascade River in Skagit County now provides meaningful water quality protection above and well beyond the Cascade's prior Wild and Scenic designation. A U.S. Geological Survey monitoring station tracks flow and temperature on the Cascade River. The river is cold and clear, averaging roughly 42 degrees with low turbidity. A significant number of old logging roads and culverts have already been repaired, thus improving water quality and fish passage. The Cascade River provides excellent habitat for spring and summer Chinook, sockeye, chum (spawning), pink (spawning) and coho (rearing) salmon; as well as for coastal cutthroat, rainbow, and bull trout. With such varied salmon and steelhead runs, the Cascade River is significant to upholding the treaty rights and lifeways for the Upper Skagit, Swinomish, and Samish Tribes. Flowing through North Cascades National Park,

Mt. Baker-Snoqualmie National Forest, and Glacier Peak Wilderness, the Cascade offers opportunities for peaceful camping, exciting paddling, beautiful hiking, and great fishing.



The Green River in the Mount St. Helens foothills. Photo courtesy of Cascade Forest Conservancy.

The Green River

The Green River's water quality is among the highest in the Toutle River subbasin, with very little developed or agricultural land, and no logging activity since the 1990s. With Summer and Winter Steelhead (spawning), Coho (spawning), Cutthroat, and Fall Chinook (spawning) all present, the Green is part of the North Fork Toutle Steelhead recovery plan and listed as a Wild Steelhead Gene Bank. Flowing through Mount St Helens National Volcanic Monument, this area is of significant scientific and ecological value for the study of landscape recovery after a volcanic eruption with portions of the adjacent land also serving as riparian reserves for spotted owls. A unique and popular recreation destination, the area draws 500,000 hikers, mountain bikers, equestrians, and paddlers annually. As ancestral lands of the Confederated Bands and Tribes of the Yakama Nation and the Cowlitz Indian Tribe, the Green River Watershed is of significant cultural importance. 44 miles of its streams and tributaries in Lewis and Skamania Counties now enjoy the state's highest level of water quality protection as Outstanding Resource Waters.



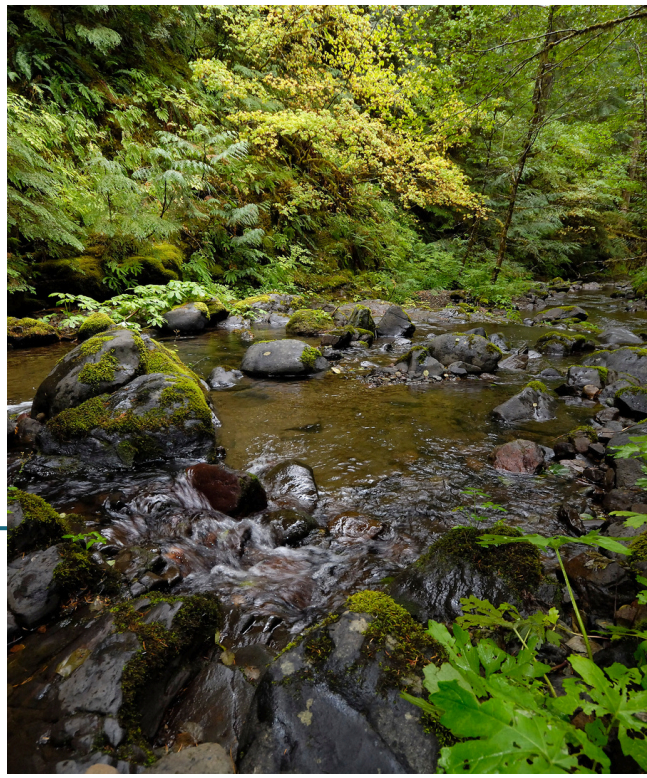
The Napeequa river is a White River Sockeye spawning habitat stronghold and an important source of "glacial flour". Photo by Thomas O'Keefe.

The Napeequa River

35 miles of streams and tributaries in the Napeequa River Watershed in Chelan County are now protected as Outstanding Resource Waters. The Napeequa was an excellent candidate for early ORW designation as it flows almost entirely through the remote Glacier Peak Wilderness, which offers rare near-solitude and remarkable recreation opportunities for climbers, hikers, and paddlers alike. Boasting pristine water quality, the Napeequa will play a critical role in maintaining cool water temperatures downstream in the White River and Lake Wenatchee. Downstream reaches of the Napeequa support one of the strongest runs of sockeye in Washington, and provide critical habitat for endangered spring Chinook and threatened bull trout. The Napeequa is also a unique source of glacial flour, a fine sediment transported downstream from glaciers, giving rivers and lakes their stunning turquoise blue color. Containing a wide range of minerals and a spectrum of trace elements, glacial flour may help to neutralize acidity, promote microbial activity, improve soil structure slowing soil depletion, and even be an important form of carbon sequestration.

Our thanks go to all Washington ORW coalition members for their outstanding work and results, and in particular to our friends at Washington Wild for their help with this article.

OREGON ORW PROPOSAL FOR STEAMBOAT CREEK



Steamboat Creek of the North Umpqua watershed. Photo by Mark Conlin.

Steamboat Creek, its watershed, and its fish

Steamboat Creek's importance as a tributary to our beloved North Umpqua River cannot be overstated. The geology, topography and precipitation of its watershed create frequent extreme high-flow events. These events carve deep pools with cold bottom water and distribute coarse gravel in the area's numerous riffles and glides. Steamboat's headwaters are fed by glacial deposits that store rain and snow and provide cold water throughout the year.

Thanks to these characteristics, the Steamboat Watershed has more than 50 miles of anadromous fish streams, 40 miles of streams with resident fish species, and a diverse array of aquatic life. It is particularly important as habitat for salmonids, providing outstanding spawning and rearing habitat and crucial cold water refugia. Steamboat's wild salmonids include spring Chinook, coastal coho, sea-run cutthroat trout, and winter and summer steelhead.

Steamboat Creek is particularly important for summer steelhead. Because they remain in freshwater streams for longer periods, including through warmer summer months when stream temperatures now frequently exceed their natural requirements, summer steelhead are uniquely dependent on habitats that provide cold water refuges. Like other anadromous fish, they also require connected habitats, adequate flows, clean gravel, and a complex environment for spawning and rearing months.

There are only two populations of Oregon coastal summer steelhead – those of the Siletz and North Umpqua Rivers. The wild steelhead of the North Umpqua are almost entirely dependent on Steamboat Creek for spawning, rearing, and survival.



Summer run steelhead in the Big Bend Pool. Photo by David Lambroughton.

Pacific Rivers' work and advocacy for the North Umpqua River and Steamboat Creek over the years

Pacific Rivers has a long and proud history of conservation science, advocacy, action, and results in the North Umpqua River Basin. It includes

- Designation of the North Umpqua as a National Wild and Scenic River in 1988;
- Major contributions to the development in the 1990s of the Aquatic Conservation Strategy of the Northwest Forest Plan to increase protection of the rivers and tributary streams of the North Umpqua (as well as many other rivers on federal forest lands in the region);
- A decade of consistent monitoring of salmonid populations in two key North Umpqua tributaries, Steamboat and Canton Creeks; and
- Current work to catalog and synthesize all data from all studies and reports on the Steamboat Creek Watershed over the past fifty-plus years.



Little Falls on Steamboat Creek in Autumn. Photo by Michel Hersen.

But conservation is a commitment, not an endpoint. It requires eternal vigilance. Today, we work in partnership with allied organizations in the North Umpqua Coalition, and with federal, state and local agencies and elected officials to protect and build on the results of our past work. Together we aim to identify present and emerging problems and threats to the North Umpqua and its ecosystem, and to work for effective and durable ways to address them.

In 2019 – in response to years of research and advocacy by Pacific Rivers and our allies – Congress designated the Frank and Jeanne Moore Wild Steelhead Sanctuary in the watershed of Steamboat Creek. That legislation recognized the Sanctuary's values and stated broad goals for their protection. But five years later, there is still no clear inter-agency plan for the whole watershed to ensure that those goals are met.

Last year, we once again:

- coordinated snorkel surveys of juvenile salmonids (with participation of students from the local Phoenix High School) in Steamboat and Canton Creeks;
- summarized a decade's worth of data and findings from those surveys;
- initiated a project to secure a protective watershed management plan for Steamboat Creek;
- investigated the possibility of securing water quality protection of Steamboat Creek through Outstanding Resource Waters classification by ODEQ;
- continued our effort to end the summer steelhead hatchery program that imperils the North Umpqua's wild steelhead; and
- worked with conservation allies to hold the owners of Winchester Dam accountable for disastrous consequences of their "repairs" of the dam in the summer.

This year, we are working to secure Outstanding Resource Waters protection for Steamboat Creek.

Outstanding Resource Water protection

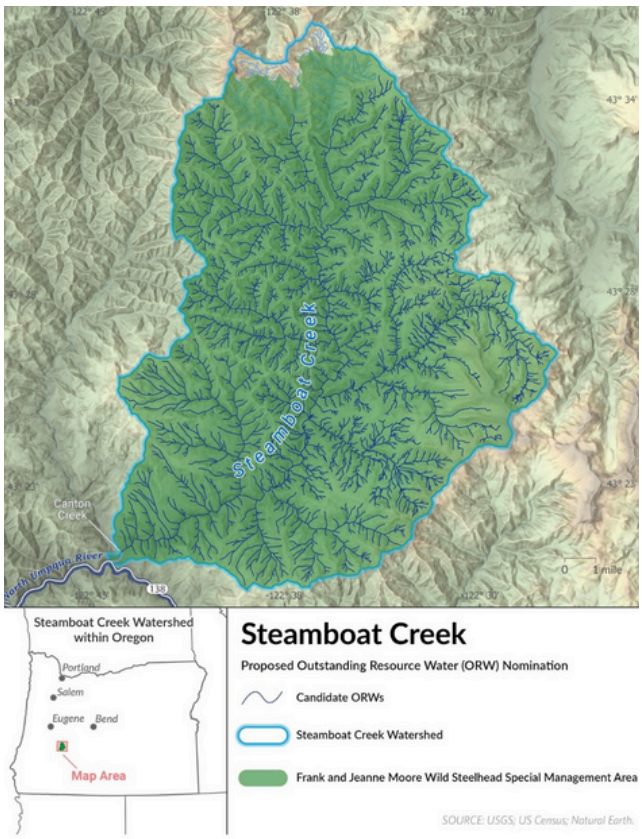
Oregon's Outstanding Resource Waters (ORWs) are "high quality waters that constitute an outstanding state resource due to their extraordinary water quality or ecological values, or where special protection is needed to maintain critical habitat areas."

ORWs fit in the highest tier of Clean Water Act (CWA) protections. The CWA requires states to set minimum standards for water quality; to make plans to bring all degraded waters at least up to minimum standards; and to prevent or strictly limit degradation of all waters that meet or exceed minimum standards.

A higher bar is set for state-designated Outstanding Resource Waters. They are to be "maintained and protected". No long-term degradation is to be allowed, period. Activities to protect, improve and restore them can and should be prioritized.

That's just what Steamboat Creek needs. Between the 1950s and 1980s – prior to forestry rules that Pacific Rivers helped secure in the 1990s – timber practices regularly removed much or all shading from streams and degraded stream channels, raising water temperatures and destroying aquatic and riparian habitat. Since then, some progress has been made to restore Steamboat Creek. It needs to be accelerated today, especially in light of climate change. Having the right goal – to restore, maintain and protect water quality and other designated values – is key. An ORW designation can provide that.

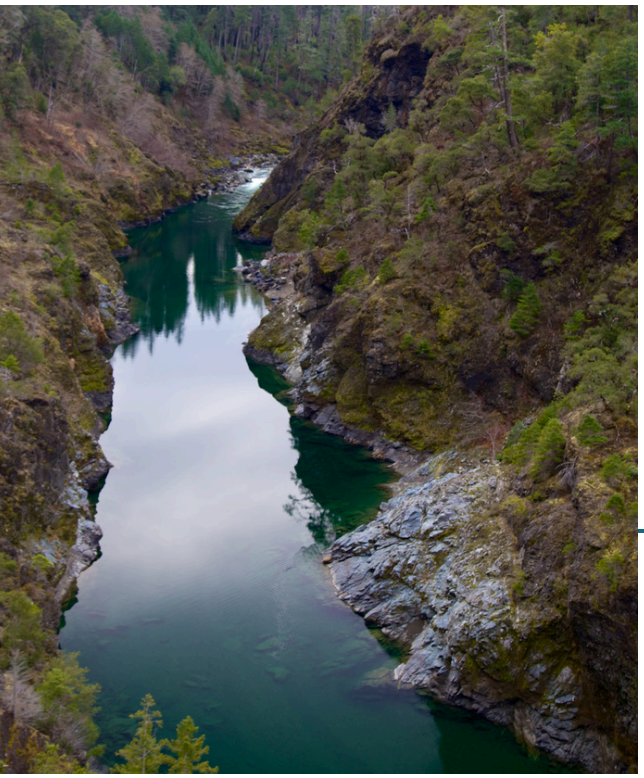
Pacific Rivers is an active member of a coalition to secure ORW classification for Steamboat Creek. Our partners include American Rivers, Trout Unlimited, and the Pew Charitable Trusts. The coalition's formal proposal, finalized in May, is to designate Steamboat Creek as an ORW above its confluence with Canton Creek as well as named and unnamed tributaries located within the 99,653-acre Frank and Jeanne Moore Wild Steelhead Special Management Area (with the exceptions of Annie Creek, Knott Creek and Hobart Creek, and Horse Heaven Creek above its confluence with Windy Creek). This would provide much-needed water quality protection to build on prior designations that recognized but did not adequately protect Steamboat Creek's ecological, resource, cultural and economic values.



What's next

Our coalition's proposal has already earned letters of support from the Cow Creek Tribe of the Umpqua Band of Indians, the Tribal Council of the Confederated Tribes of Grand Ronde, and the Oregon Department of Fish and Wildlife. Our petition provides a good model for other ORW petitions in Oregon and other states.

We expect our proposal to be considered in Oregon's Triennial Review of Water Quality Standards later this year. Please stay tuned for updates and action alerts.



Illinois River reflections.
Photo by Zach Collier, Northwest Rafting Co.

OREGON ORW PROPOSAL FOR ILLINOIS RIVER

Oregon's Illinois River is a major tributary of the lower Rogue River. Its watershed comprises about 1/5th the area of the entire Rogue River Basin and contributes about 1/4th of the Rogue's total flow.

The Illinois' clean, reliable flows provide thermal refuge for many anadromous fish that migrate up the Rogue in summer and fall. As the climate continues to warm, its value to the Rogue's fish and wildlife is becoming greater than ever.

However, the Illinois is far more than just a key tributary of the Rogue. ***It's an outstanding river – one of the nation's finest – in its own right.***

Outstanding resource values of the Illinois River

Few rivers its size in the nation rival the Illinois in terms of water quality. Its wilderness headwaters and spring-fed wetlands and tributaries downstream provide the river with an exceptional blue-green color and typical clarity of 15 feet or more. No one who sees it ever forgets it.



Silver Creek of the Illinois river.
Photo by Zach Collier, Northwest Rafting Co.

With its rugged canyons, consistent cold flows, and steep tributaries, the Wild and Scenic reach of the Illinois is an unparalleled bastion for wild winter steelhead in Oregon. It also provides habitat for Chinook salmon, cutthroat trout, Pacific lamprey, and sturgeon, as well as critical habitat for federally threatened Southern Oregon-Northern California coho.

Because the Illinois is one of just a few rivers on the West Coast where there is no hatchery supplementation program, it is an important refuge for the conservation of wild fish. In particular, Silver Creek and Indigo Creeks are the most productive steelhead tributaries in the lower Illinois River and represent a very significant genetic core for wild steelhead populations of both the Illinois and Rogue River basins. Other tributaries also host valuable habitat for steelhead and other native fish. The Illinois River's fish values are highly dependent

on its deep pools and clear, cold, consistent flows.

The lower river's corridor hosts diverse plant communities, including rare and endemic plants adapted to the region's unique geology. There are Jeffrey Pine savannas with native bunch grasses and notable assemblages of Western Azalea. Several of the river's unusual plants are associated with or wholly dependent on its perennial springs and distinctive serpentine wetlands; they include the uniquely charismatic California Pitcher Plant (*Darlingtonia Californica*), a showy carnivorous plant, and the California Lady Slipper (*Cypripedium californicum*), with striking white orchid "pouch" blossoms.



California Lady Slipper. Photo by Bill Bouton.

The Wild and Scenic Illinois offers a bounty of exceptional recreational experiences. Countless people enjoy rafting, kayaking, swimming, camping, fishing, and hiking in and along many portions of the river. Thousands seek relief in its Scenic section's cool, clear waters on hot summer days. Its Wild section is reputed to possess the most remote and inaccessible whitewater in the lower 48 states, with long stretches in the canyon inaccessible even by trail. It features 150 challenging rapids in 29 miles, including eleven class IV and one class V drop at the formidable "Green Wall." For a true wilderness float trip, very few rivers anywhere in the nation come close to Oregon's Illinois. It is not, however, for the inexperienced, faint of heart, or ill prepared: *it should only be run by highly skilled and equipped boaters*. If you aren't one, get an excellent guide!



California Pitcher Plant. Photo by Noah Elhardt.

Need for meaningful water quality protection

The 1968 National Wild and Scenic River Act designated the lower Rogue as one of eight original rivers comprising the National Wild and Scenic River System. It also named the Illinois as one of 28 additional "study rivers".

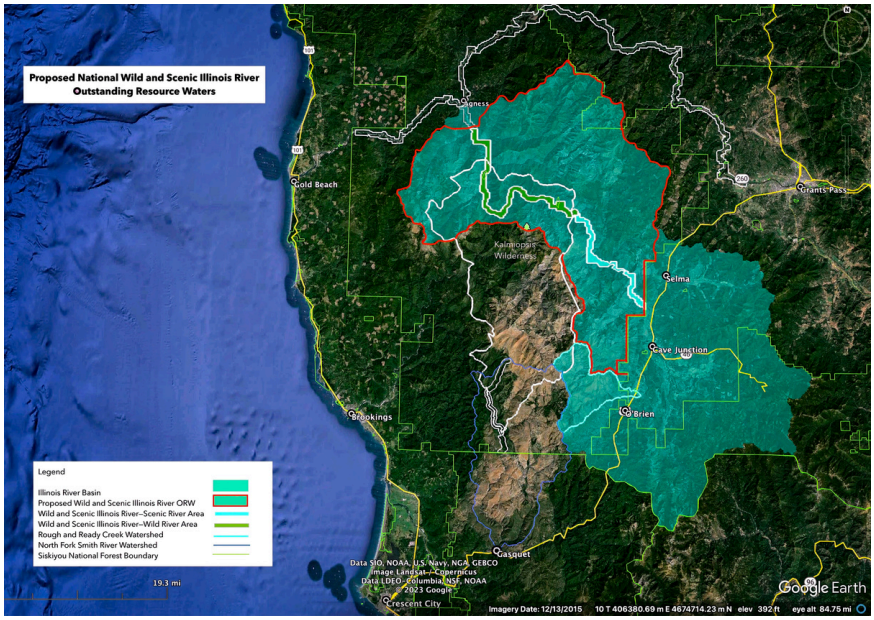
The 1977 USFS Illinois River Study Report identified not one but five "outstandingly remarkable" characteristics of the river worthy of its designation: its "scenic, recreational, botanical, fish, and water quality values". All five are dependent on or associated with the river's water quality. The



The importance of the Illinois River and its lower tributaries to the National Wild and Scenic Rogue River cannot be overstated. At the rivers' confluence in Agness, the contrast in water quality after three inches of rain fell on both rivers' lower watersheds is startling—with the waters of the Illinois on the lower right relatively clear compared to the muddy waters of the Rogue. Photo by Barbara Ullian.



River runners scouting the Green Wall.
Photo by Zach Collier, Northwest Rafting Co.



Map of proposed Illinois River ORW designation.
Courtesy of Friends of the Kalmiopsis.

report stated that "The scenic and recreational values are closely associated with the river canyon, while the botanical, fish, and water quality values occur, and are reliant on, the entire river system." In other words, we must take a whole-watershed approach to protect the Wild and Scenic Illinois.

50.4 miles of the lower Illinois River were designated Wild and Scenic by Congress in 1984. New dams on it are thus prohibited, but ***the Wild and Scenic Rivers Act does not provide clear authority for agencies to protect water quality.***

The Clean Water Act does. Through it, EPA delegates authority for setting and maintaining water quality standards to state and tribal agencies. In Oregon, the Department of Environmental Quality is responsible for establishing state water quality standards, which must include means for designating and protecting Outstanding Resource Waters.

Proposed Illinois River designation

In May of this year, three Southern Oregon organizations -- Friends of the Kalmiopsis, Klamath-Siskiyou Wildlands Center, and Kalmiopsis Audubon Society -- formally petitioned the Oregon Department of Environmental Quality for ORW designation of the lower Illinois River. Pacific Rivers soon went on record in strong support of their compelling petition.

Specifically, the petition calls for ORW designation of 46.6 miles of the Illinois River, from the upstream boundary of the Rogue-Siskiyou National Forest downstream to Nancy Creek, as well as the watersheds of its tributaries including Josephine Creek, Briggs Creek, Silver Creek, Indigo Creek, Collier Creek, and Lawson Creek. Numerous smaller tributaries and associated wetlands are also included.

ODEQ has accepted the nomination of the Illinois for consideration in its upcoming Triennial Review of Water Quality Standards.

Please stay tuned for alerts about how you can help!

HELLS CANYON WATER QUALITY UPDATE

Science Review and Look Ahead



The Brownlee reservoir with a sheen of toxic algae bloom. Photo by Cecelia Alexander.

Fish and other aquatic life in the Snake River in and downstream of three Hells Canyon reservoirs are contaminated with mercury. Levels in many fish exceed state standards for safe human consumption. Fish-eating mammals and birds are also being contaminated. Levels of mercury in some fish are so high that they have been described as "swimming Superfund sites."

This bad news is *not* new news. For more than fifty years, officials have known that we have a mercury problem in this portion of the Snake River. The questions have been why, how much, and what to do about it.

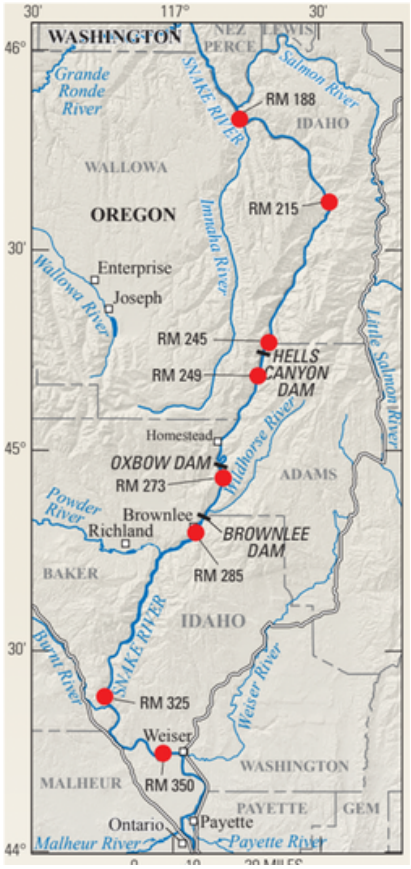
Today's good news is that plenty is now known to take action to solve the problem. In fact, so much is known now that *inaction* would be inexcusable.

In this article, we review results of a series of recent scientific studies that have shed much light on Snake River mercury issues.

Spoiler alert: *This is not your typical pollution story*. It's not about a single polluter or pollution source. It's about a complex interplay among water quality conditions, physical forces, biological processes and structures constructed by humans that together have created a serious problem that's greater than the sum of its parts. It's about a problem that must be solved, but that can't be solved overnight.

<u>But it *can* be solved.</u> Science has now provided ample perspective and data to do so. The Clean Water Act provides the framework to do so. We now know how to get started, measure progress, and proceed until the problem is solved.

One of Pacific Rivers' six strategic goals is *Snake River fish safe for all to eat*. Since it will take considerable time to reach it, we are adopting interim goals along the way. For the next two years, they are:



The Hells Canyon Complex consists of the Hells Canyon, Oxbow, and Brownlee dams and reservoirs. Map from USGS.

1. A much better public understanding of the nature, sources, current levels, and fate of mercury and other pollutants in and downstream of three Hells Canyon dams and their reservoirs.

2. An official pollution reduction target and action plan adopted in 2025 to make good progress beginning immediately in order to make Snake River fish safe for all to eat by 2045.

As a first step to increasing public awareness of this issue, we provided an article in last year's Fall *Free Flow* that addressed ten topics:



The diet of a river otter consists mainly of aquatic organisms, including plenty of fish. Photo by Jon Nelson.

1. Mercury pollution sources
2. Transformation of mercury into methylmercury
3. Health effects of methylmercury
4. The Snake River and its water quality upstream of Hells Canyon
5. Hells Canyon and its three Snake River reservoirs
6. Methylmercury production in Hells Canyon reservoirs
7. Rights, interests and concerns of the Nez Perce Tribe
8. Clean Water Act action
9. Agreement
10. Next steps

Like all our newsletter articles, *Mercury Contamination of Snake River Fish* is available on our website under "Our Work." We recommend it as an introduction to this subject.

Science Review

Over the past decade, scientists with the U.S. Geological Survey (USGS) and a number of partner agencies, universities and firms have conducted extensive research into Hells Canyon mercury pollution issues. Seven published papers listed at the end of this article have documented much of their work. Some were published within the last twelve months. In this article, we summarize these papers and our main conclusions by five major questions they helped answer:

1. *How much of a problem is there?*
2. *How does reservoir stratification influence fish mercury concentrations?*
3. *How does methylmercury form, then move into and up the food chain?*
4. *How do these processes unfold in the Hells Canyon Complex?*
5. *Where are the pollutants in this system coming from?*

We conclude with a look at the needed official actions and what Pacific Rivers will do to help bring them about in the next year.

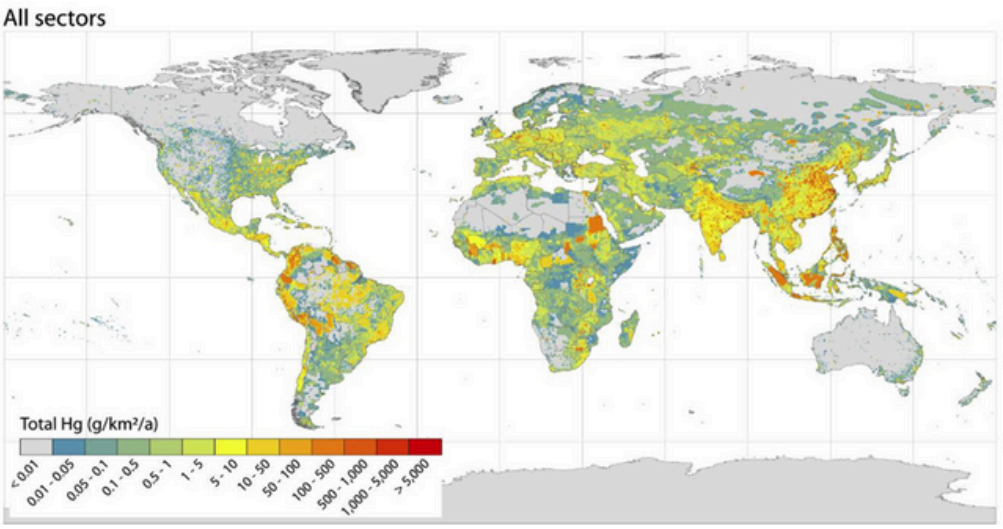
1. How much of a problem is there?

Mercury sources, distribution, forms and health effects

A 2016 publication "Mercury in Western North America" documented widespread mercury in the region. Some watersheds have much more than others, due to their widely varying geologic, mining and industrial histories. But all have at least some mercury today, thanks in large part to depositions to land and water of mercury emitted to the atmosphere by coal-burning power plants and other industrial facilities around the world.

Elemental mercury, commonly known as quicksilver, is pure mercury in its metallic form. Highly toxic, it is a liquid at room temperature that readily vaporizes into an odorless gas.

Inorganic mercury is created when mercury bonds with other elements, creating compounds such as mercury chloride or mercury sulfide. Some such forms can move easily through river systems in suspended sediments and then settle in lakes or reservoirs.



Geospatially distributed (total) mercury emissions to air from anthropogenic sources in 2015 (g/km2/a) from all sectors. Figure from US EPA.

Methylmercury forms in some waterbodies, especially certain types of lakes and reservoirs. It is mercury's most dangerous form. Reasons include:

1. Toxicity: It is a powerful neurotoxin and endocrine disruptor with known neurological, cardiovascular, and reproductive health effects.
2. Persistence: It does not break down easily in the environment or the human body.
3. Bioavailability: It is easily absorbed into the human body through ingestion, inhalation, and skin contact.
4. Bioaccumulation: It accumulates rapidly in organisms and ecosystems.
5. Exposure: Fish from contaminated waterbodies – especially long-lived predatory fish – can accumulate extremely high levels of methylmercury.

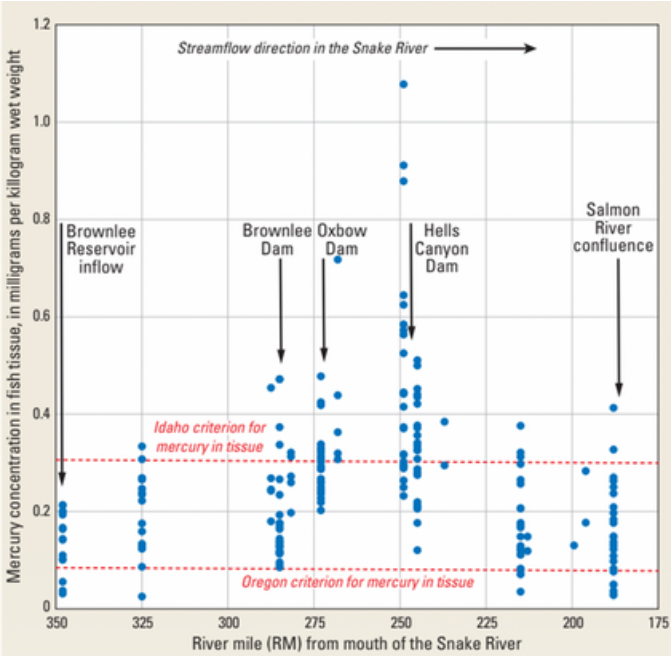
Children, infants and especially the unborn are particularly vulnerable to methylmercury. Because their brains and nervous systems are still developing, their exposure to small amounts can have very serious long-term effects on vision, cognition, memory, attention, fine motor skills, and language.

In adults, moderate levels can lead to irritability, tremors, and problems with vision, hearing and memory. High levels can lead to dementia, cerebral palsy, deafness, blindness, sensory and motor impairment, and even death.

Mercury in fish in and below the Hells Canyon Complex

The Hells Canyon Complex (HCC) consists of three dams that were licensed by the United States in the 1950s.

The three dams of the HCC – Brownlee, Oxbow, and Hells Canyon – were constructed between 1958 and 1967. In the Hells Canyon Complex, mercury in various forms from multiple sources is transformed into methylmercury at very high rates.



Mercury fish tissue content in and downstream of the Hells Canyon Complex in 2013. Figure from USGS.

A 2016 USGS report summarized what was known at that time. It included a graphic illustrating results from fish tissue sampling in 2013. Smallmouth bass from Brownlee, Oxbow and Hells Canyon Reservoirs, as well as from the Snake River downstream, were sampled. Almost all significantly exceeded Oregon's state standard for safe fish consumption. Concentrations were highest – as much as 25 times the standard – just above Hells Canyon Dam. They remained very high – as much as 10 times the standard – at the downstream end of the study area at the Snake/Salmon River confluence, nearly 60 miles below Hells Canyon dam.

Smallmouth bass are usually chosen as the species for tissue sampling in the Snake because they are abundant, non-native fish that grow quickly and are caught and eaten by many people. However, we know that larger, longer-lived species such as catfish and sturgeon can accumulate even more mercury than bass. Some exceed Oregon's standard well more than one hundred fold.

Our conclusions: The mercury problem in and below the HCC is acute. It is a real and present danger to fish, wildlife and people. It must be brought under control. This is an ecosystem issue, a human health issue, and a justice issue.

2. How does reservoir stratification influence fish mercury concentrations?

Stratification is the development of distinct layers of different water temperatures in lakes and reservoirs during warm weather. Some stratify much more often and distinctly than others. Highly stratified waters have a warm layer with high levels of dissolved oxygen on top, a cold layer with much less dissolved oxygen on bottom, and a relatively thin layer in the middle where temperatures drop quickly. This middle layer – the "thermocline" – is well known to divers and anglers. It concentrates much of a waterbody's aquatic life in summer, because temperatures above are too high for many species, and oxygen levels below are too low for almost all.



A layer of fish within the thermocline. Photo from Carpology.

It has long been known that fish in some lakes and reservoirs that stratify have unusually high levels of methylmercury. Recent studies have explored

where and how much.

One published just last December looked at a 536-mile section of the Snake River with more than a dozen reservoirs. (See map. The study area was between the red line above American Falls and the one well downstream of Hells Canyon Dam and the Salmon River confluence). It examined fish mercury concentrations in

- three types of habitat – reservoirs, tailraces (defined as river segments extending 25 km below dam outflows or the start of the next reservoir), and free-flowing river (defined as segments between the end of a tailrace and the beginning of the next reservoirs);
- three types of reservoirs – those that do not stratify much or at all, those that stratify distinctly each year, and those that stratify inconsistently; and
- three sizes of smallmouth bass – 1-year old, first reproductive, and harvestable.

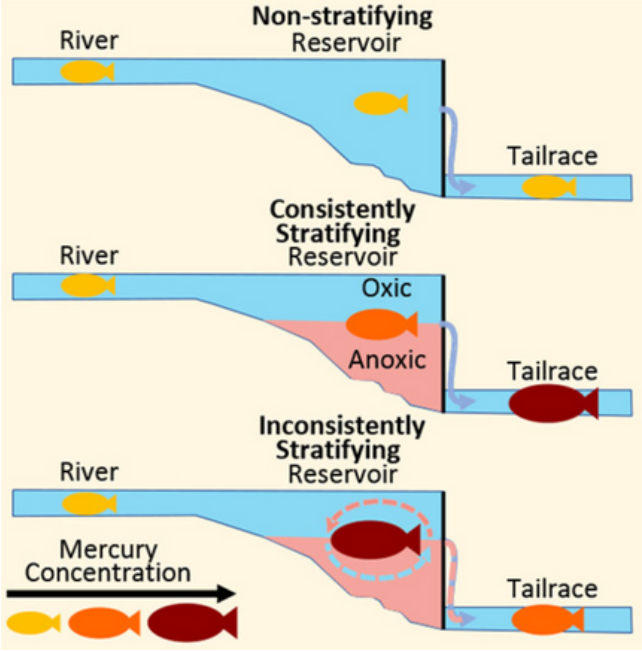


Figure above and map below from "Reservoir Stratification Modulates the Influence of Impoundments in Fish Mercury Concentrations along an Arid Land River System"

The findings were eye-opening:

- In reservoirs, the highest concentrations were in those that stratified inconsistently.
- In tailraces, the highest concentrations were in those below reservoirs that stratified consistently.
- On average, concentrations in reservoirs and tailraces were 76% higher than in free-flowing segments.

Our conclusions: It's now very clear that dams on the Snake River make mercury problems worse in and below their reservoirs, especially if those reservoirs stratify. This needs to be taken into account when dams and reservoirs on the Snake and elsewhere are proposed, developed, managed, relicensed, or considered for removal.



Major mainstream dams on the Snake River.

3. How does methylmercury form, then move into and up the food chain?

The primary way mercury becomes mobilized and then concentrated to dangerous levels in organisms is *methylation* – transformation into methylmercury – in aquatic ecosystems. This occurs in still or slow-moving water with high levels of nutrients and organic material that cause algae blooms. It also occurs in the low-oxygen zones of waterbodies that stratify in summer.

It has long been widely thought that methylation in waterbodies occurs mainly near the bottom, at the "sediment-water interface." Recent studies have shown that it actually occurs throughout the water column in cold, low-oxygen zones in the HCC and elsewhere.



A duck cuts through dense algae bloom on the surface of the water. Photo by Alexei Vinogradov.



Osprey with fish dinner. Photo by Mike Baird.

It has also been thought that methylation is driven entirely by a small number of extremophile bacteria. Recent studies have shown that to be false as well; a wider range of bacteria than previously thought can generate methylmercury from various types of inorganic mercury in low-oxygen conditions.

In aquatic food webs, methylmercury can bioaccumulate in piscivorous (fish-eating) fish to concentrations more than one million times greater than that of the waters in which they swim. This is one reason that more than 80% of the fish-consumption advisories posted in the United States and Canada are partly or entirely attributed to mercury.

Methylmercury is not *only* a threat to humans who eat fish. It is also a threat to wildlife that feed on fish, as well as to birds that feed on emergent insects with aquatic larval stages. Recent studies have shown high mercury levels in songbirds, shorebirds and bats that feed around waterbodies with methylmercury problems. Levels are very likely high in other fish-eating wildlife such as eagles, osprey and otters.

Our conclusions:

- ***Methylation allows mercury to swim and fly, spreading it through terrestrial as well as aquatic food webs.***
- ***Methylation is more complex and dynamic in lakes and reservoirs than previously thought.***
- ***Even a little mercury entering a reservoir can cause a big food web problem through methylation and bioaccumulation.***
- ***Complete elimination of mercury in reservoirs is impossible. Management strategies must therefore focus on reducing incoming mercury to the extent possible and on minimizing the extreme low-oxygen conditions in which most methylation occurs.***

4. How do these processes unfold in the Hells Canyon Complex?

The pollution loads of the Snake River would be serious even if the Hells Canyon Complex did not exist. The HCC dams and reservoirs greatly magnify the Snake's mercury problems.

Hypoxic (very low-oxygen) conditions are created each spring as the Snake's abundant loads of sediments, nutrients and organic material settle to the bottom of the upstream portion of Brownlee Reservoir, resulting in Brownlee's infamous algae blooms. As spring progresses, a pocket of water with virtually *no* oxygen – an *anoxic* zone – develops.

In the blazing sun and intense heat of Hells Canyon, its three reservoirs stratify distinctly, with a growing layer of warm water floating on the cold, low-oxygen, higher-density layer below. As the graphic here illustrates, the anoxic zone at the head of Brownlee grows to an immense volume in the deepest water of the reservoir all the way to Brownlee dam. Devoid of oxygen for months each year, this zone provides ideal *conditions, space and time* for bacteria to convert inorganic mercury into methylmercury.

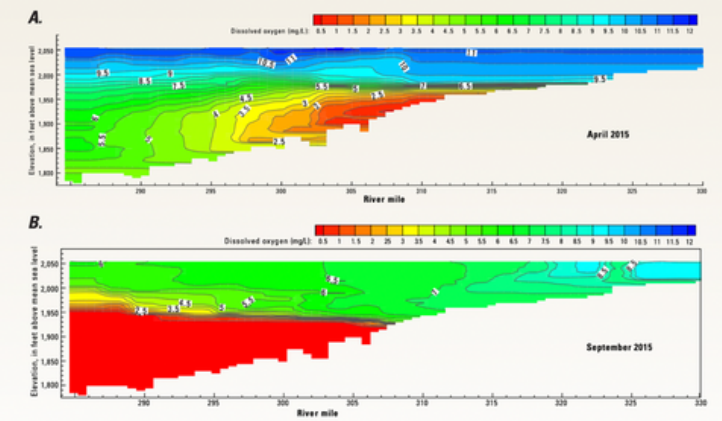


Figure from USGS illustrating oxygen levels in Brownlee reservoir.

Because almost all aquatic life is concentrated in the oxygenated layers above during summer, there is little uptake of methylmercury from the anoxic zone into the food web then. But when stratification breaks down in the fall, rapid mixing of the layers occurs, and prodigious amounts of methylmercury are released throughout the reservoir and into the food web.



Cliff Swallow in Southeastern Oregon. Photo by Vickie J. Anderson.

Much is first taken up by tiny invertebrates in Brownlee. A great deal also makes its way via suspended particles and microorganisms through Brownlee Dam to Oxbow Reservoir, then Hells Canyon Reservoir, and finally to the Snake River below. As it moves through the system each fall, it bioaccumulates to much higher concentrations in larger organisms such as crayfish and fish. Some of the highest concentrations in fish are found in Hells Canyon Reservoir and the Snake River below. Some long-lived fish-eating fish, including sturgeon, eventually become the aforementioned "swimming Superfund sites."

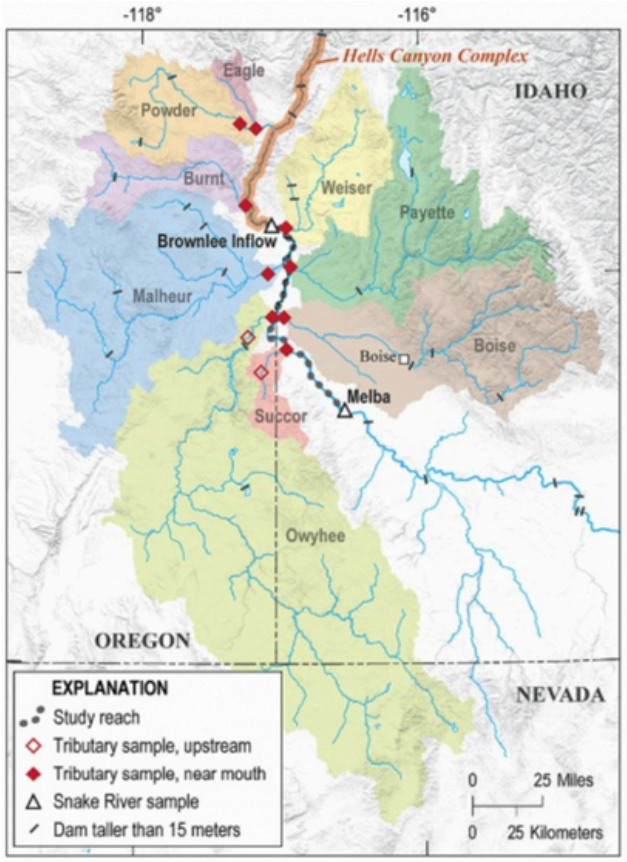


White Sturgeon can live to over 100 years of age and have been around for 175 million years. Photo by ODFW.

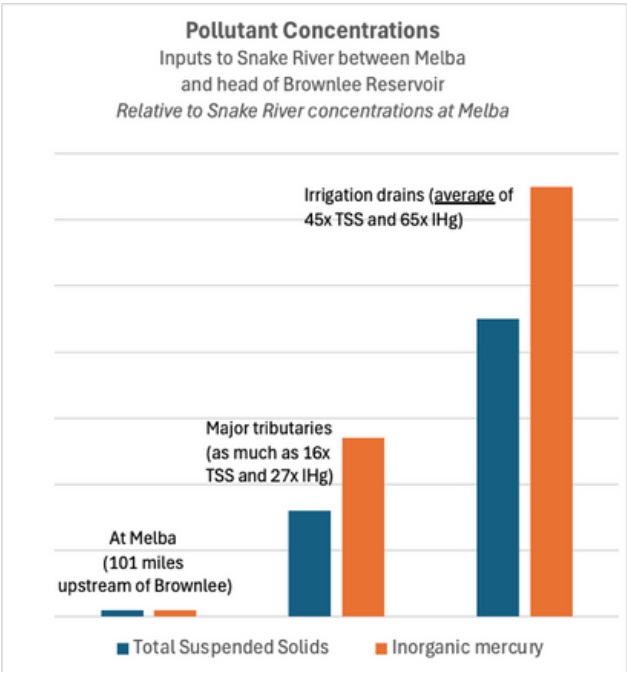
The larger the anoxic zone and the longer it lasts, the more methylation there is. The reverse is also true. One current estimate is that reducing the average volume and duration of Brownlee Reservoir's annual anoxic zone by ⅓ would reduce methylation by ⅔ or more. Whatever the exact figures prove to be, limiting anoxia will surely be key to solving the Snake's mercury problems.

Our conclusions: To solve the mercury problem in and downstream of the HCC, we must reduce incoming mercury from the Snake River and its tributaries to the extent possible. But we must

also reduce the other incoming pollutants that cause or contribute to the formation, size and duration of Brownlee Reservoir's annual anoxic zone. Other measures may well be needed, but these two are clearly essential.



HCC pollution sources study area. Map from USGS.



5. Where are the pollutants in this system coming from?

Results from an in-depth study published in late 2023 shed much new light on this question. Detailed water quality and flow data for the Snake River were first compiled for two points:

1. The Snake's entrance to Brownlee Reservoir, and
2. 101 miles upstream at Melba, Idaho.

Comparisons of the two datasets provided a crucial insight. *Between those two points, the flow of the Snake increased by 70% – but inorganic mercury loads increased 500%.*

This begged the question: What could account for the highly disproportionate pollution impacts of the tributaries in this relatively short segment of the Snake River (which, after all, is hardly pristine even at Melba)?

The major tributaries to the Snake in this reach are the Owyhee, Boise, Malheur, Payette and Weiser Rivers. Relative to the Snake River at Melba, most had significantly higher concentrations of total suspended solids and inorganic mercury (up to 16- 27-fold, respectively). This accounted for much but not nearly all of the additional mercury and suspended solids at Brownlee. What could account for the rest?

Twenty-two irrigation drains were then sampled during the irrigation season. Concentrations in irrigation drains, relative to the Snake River at Melba, averaged 45 times as much Total Suspended Solids and 65 times as much inorganic mercury.

Our conclusions:

- **It is essential to reduce the loads of nutrients, organic matter and mercury in tributaries and irrigation return drains that enter the Snake in the 100 miles upstream of Brownlee Reservoir.**
- **Focusing on this right away is the best way to get a good start soon toward solving the Snake River's mercury problems.**

What is to be done?

Efforts to clean up the Snake River must quickly expand and accelerate. Benefits will include hastening the day when Snake River fish are safe for all to eat. But they will not be limited to that.

Many of the things we need to do to control mercury pollution in the Snake will also make its tributaries better habitat for fish and wildlife, safer for swimming and boating, better for fishing, and more beneficial to watershed communities' economies and quality of life. Crucially, they will also begin to mitigate some of the many injustices visited on the Nez Perce Tribe since its treaty with the United States in 1855.

The Clean Water Act requires state water quality agencies to adopt a Total Maximum Daily Load (TMDL) of pollutants for waterbodies where state water quality standards cannot be met through typical regulatory control of one or a few direct pollution sources – in other words, in situations like the one today in the Snake River in and below Hells Canyon. The TMDL sets an upper limit for the pollutants in question – a sort of "pollution budget" – that then drives decisions about management actions necessary for water quality standards to be met and maintained.



The Nimiipuu, also known as the Nez Perce people of the Columbia Plateau, harvest fish along the Snake River. Photo by Shane Anderson.

In 2019, the Nez Perce Tribe, Pacific Rivers and Idaho Rivers United objected to a draft state water quality certification required for the renewal of the federal operating license of the HCC. Our objection was that it did not provide the required assurance that state water quality standards for mercury and temperature would be met. In 2021 – after going to court over the issue – our three parties signed a Settlement Agreement with the state of Oregon that included the following specific goal regarding the mercury problems in and downstream of the three reservoirs:

"...Treaty-reserved aquatic resources continue to inhabit the Snake River within and downstream of the [Hells Canyon] Complex and are safe to support Treaty-reserved rights to harvest and consume fish within and below the Complex no later than the year 2045 and at levels at least as protective as Oregon's human-health criteria reflecting a per-capita fish consumption rate of 175 grams per day at a risk level of 10-6."

That is a precise way to state our strategic goal: *Snake River fish safe for all to eat.* To be clear: by "all" we mean all people – especially those, beginning with the Nez Perce, whose health, cultures and/or livelihoods depend on a diet that includes Snake River fish. We also mean all wildlife of the Snake River and its environs.

With the needed scientific work now wrapping up, the Oregon Department of Environmental Quality must now prepare to issue a methylmercury TMDL for the Snake River in and downstream of Hells Canyon. It must be

accompanied by a sound water quality management plan to make steady progress that begins in earnest right away.

Pacific Rivers will monitor this process closely and participate actively in the upcoming public comment period. We will insist on:

1. adherence to Oregon's fish tissue standard for methylmercury;
2. commitment to its achievement no later than 2045; and
3. a water quality management plan designed to make consistent progress toward the goal.

These items are required and non-negotiable.

We will also advocate for:

1. a robust monitoring program to confirm that adequate progress is being made;
2. a firm commitment to adaptive management – using monitoring data to drive decisions about whether and when to take additional, expanded or accelerated actions to stay on track; and
3. annual progress reports to the public.

These items are good practices that will guide progress and provide accountability.

Making Snake River fish safe for all to eat will take considerable time. That's all the more reason to get started now. Please stay tuned for updates and action alerts from Pacific Rivers as important decisions are made in the next few months.

KEY PAPERS SUMMARIZING STUDIES CONDUCTED IN THE LAST DECADE ON SNAKE RIVER MERCURY ISSUES

Mercury Cycling in the Hells Canyon Complex of the Snake River, Idaho and Oregon (USGS, 2016) https://www.usgs.gov/centers/idaho-water-science-center/science/mercury-cycling-hells-canyon-complex#publications

Mercury in western North America: A synthesis of environmental contamination, fluxes, bioaccumulation, and risk to fish and wildlife (USGS, Science of the Total Environment, October 2016) https://www.sciencedirect.com/science/article/abs/pii/S0048969716310245

Seasonal dynamics and interannual variability in mercury concentrations and loads through a three-reservoir complex (Environmental Science and Technology, July 15, 2020) https://pubs.acs.org/doi/10.1021/acs.est.9b07103

In-Reservoir Physical Processes Modulate Aqueous and Biological Methylmercury Export from a Seasonally Anoxic Reservoir (Environmental Science and Technology, 2022) https://www.usgs.gov/publications/reservoir-physical-processes-modulate-aqueous-and-biological-methylmercury-export-a

Metabolically diverse microorganisms mediate methylmercury formation under nitrate-reducing conditions in a dynamic hydroelectric reservoir (www.nature.com/isme, July 2023) https://www.nature.com/articles/s41396-023-01482-1

Reservoir Stratification Modulates the Influence of Impoundments in Fish Mercury Concentrations along an Arid Land River System (Environmental Science and Technology, 12/15/2023) https://pubs.acs.org/doi/10.1021/acs.est.3c04646

Mercury sources and budget for the Snake River above a hydroelectric reservoir complex (Science of the Total Environment, 1/10/24) https://www.usgs.gov/publications/mercury-sources-and-budget-snake-river-above-a-hydroelectric-reservoir-complex

STAFF HIGHLIGHT: LIZ GILLIAM



We are delighted to announce that Liz Gilliam has joined our Pacific Rivers Conservation Program team!

Liz is a fluvial geomorphologist practicing in the field of river science in the Pacific Northwest working on protection and restoration projects throughout the watershed.

Her early and formative years were spent as a river guide and field ecologist - experiences that crystallized her commitment to protection and restoration of healthy rivers and wild places. That commitment led her to return for her Master of Science Degree in the geosciences- a field that requires a holistic understanding of physical processes and the connected ecological feedbacks.

Liz has since surveyed the dynamics of water, rocks, wood, fish, amphibians and vegetation in California and the Pacific Northwest, as well as the Rocky Mountains and Neotropics. She has worked in beaver meadows, reconnected floodplains, wetlands and estuaries and restoring intertidal zones. She tells us that she finds dam removal the most exciting and rewarding.

To share her learned experience, Liz provided national and international training on stream restoration and river science through the Restoration Professional Certificate Program for over 10 years.

Liz says she joined the Pacific Rivers Board five years ago because “As an applied scientist, I wholly appreciate the work Pacific Rivers does to bridge the gap between Science and Policy.” This year she stepped off the Board to assume her new role working directly with our conservation program team.



In that role, she is now focusing much of her time on Pacific Rivers’ work in the North Umpqua River Basin. In addition to serving as Project Manager for the North Umpqua Snorkel Surveys, she is working closely with Dr. Charley Dewberry to gather, analyze and summarize all available historical and current data from Steamboat and Canton Creeks, in support of our work to secure meaningful protection of the 99,653-acre Frank and Jeanne Moore Wild Steelhead Sanctuary. She also now serves as principal science and technical advisor to our board and staff on our other conservation programs and projects. Last but not least, she serves as lead author for our series of river restoration articles in our journal Free Flow.

We look forward to working with Liz and sharing our mutual passions for rivers and wild places.

Welcome, Liz!



Steamboat Creek, Oregon. Photo by Mark Conlin.

THANK YOU FOR YOUR SUPPORT!

We want to thank our many supporters for giving us the information, inspiration, motivation, and yes, funding, to tackle the most important river and watershed issues of our day. We could not do it without you.

OUR MISSION

The mission of Pacific Rivers is to protect and restore the watershed ecosystems of the West to ensure river health, biodiversity and clean water for present and future generations.

OUR VISION

A future where healthy communities have access to clean, cool drinking water free from chemicals, and people can play in rivers and streams. A future where watersheds that store carbon are resilient to warming temperatures and other effects of climate change and are home to abundant populations of fish and aquatic wildlife.

PACIFIC RIVERS

PACIFICRIVERS.ORG
1001 SE Water Avenue, Suite 450
Portland, OR 97214
info@pacificrivers.org