THE OSPREY

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Rewilding the White Salmon River

State of wild fish since dam removal

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Fire, Forests and Fish

by Jim Yuskavitch

Sometimes it seemed as if the entire West Coast was on fire this summer. As of late September, about 4 million acres had burned in California, more than a million in Oregon and 626,000 in Washington. As of this writing, California wildfires have destroyed more than 8,000 structures and killed at least 26 people. In Oregon, those numbers are 3,000 and 10, respectively. Washington State has fared a little better with just under 400 buildings destroyed and one reported death.

Driven by a combination of excess fuel in the forests, high winds, and most importantly, increasingly drier environmental conditions resulting from climate change, these fires erupted into conflagrations that in many cases were unstoppable by humans. Here in Oregon, major fires raced down Cascade Mountains canyons including the North Santiam, McKenzie and North Umpqua — all important salmon, steelhead and trout watersheds.

When the smoke clears — literally and figuratively —thorough damage assessments will need to be made to fish and wildlife habitat along with human structures and property.

While wildfire's destructive properties are emphasized in news reports, surprisingly these fires can be a mixed bag for fish, with both negative and positives impacts. The traditional view has been that wildfires destroy fish habitat and kill fish, yet wildfires are a natural-occurring phenomenon and fish have been persisting in spite of fires for millenia.

Wildfires certainly do damage habitat, including destroying riparian trees that provide shade and denuding slopes resulting in landslides and siltation of streambeds.

But those landslides will also dump rocks, logs, stumps and other natural debris into streams to begin the proces habitat rebirth. Warmer water temperatures in the aftermath of fires can cause trout, salmon and steelhead to grow faster and mature earlier, although population densities may be lower.

Wildfires may both hurt and help fish populations. Photo by Jim Yuskavitch

Interestingly, recent research comparing riparian areas that experienced high severity fires over more moderate fires have found that the former sites show an increase in the emergence of adult aquatic insects, suggesting there may be a kind of "fire pulse" that boosts insect productivity.

A critical aspect for fish to survive wildfire is the need to have options when fires erupt, such as the availability of coldwater refugia and other high quality habitat.

Researchers are only beginning to study and understand the relationship between fish and fire. But as fires increase in numbers and severity, as they are expected to do, especially in salmon and steelhead country, wild fish managers and conservationists are going to need a full understanding of these dynamics if fish are able to continue to survive this natural processes that humans are making much worse.

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T*he Osprey* has been bringing the latest science, policy, opinion and news stories to its readers supporting wild Pacific salmon and steelhead conservation and management for 31 years. But we are much more than a publication that you subscribe to because of your own interest in wild fish conservation. The funds we receive from our subscribers allows us send *The Osprey* to wild fish conservation decision-makers and influencers including scientists, fisheries managers, politicians and wild fish advocates.

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Jim Yuskavitch
Editor, The Osprey

Kamchatka Steelhead Anti-Poaching Project and Wildfire Destruction in Steelhead Country

By Pete Soverel

In the midst of the Covid panic, it's often difficult to find good news. At the top of my list is an angler-financed anti-poaching program in Kamchatka in the Russian Far East. As many readers are well aware, The Conservation Angler and Moscow State University have directed a long-term study — now going on 26 years — of steelhead populations in several western Kamchatka Rivers.

A MISS, THEN A HIT

This program, The Kamchatka Steelhead Project (KSP), is sanctioned under the US-Russia Agreement on the Environment and has contributed to new levels of understanding of *O. mykiss* — life history strategies, evolutionary legacy, recovery dynamics, relationships between resident and anadromous population segments. Our KSP field presence also eliminated large-scale illegal harvest, which helps facilitate recovery of native salmonid populations. With these protections in place for the past 25-plus years, wild steelhead populations in the study rivers have exploded from lows of 1,500-2,000 spawners per river to 8,000-30,000 annually.

These dramatic conservation gains were suddenly at risk when COVID travel restrictions forced KSP partners to cancel the planned 2020 field season. Twice in the past, the KSP was unable to secure the necessary permits to conduct the annual field work. In both cases, commercial level poachers descended on the study rivers, syphoning off 12 to15 tons of steelhead from each of the study rivers. To prevent a repeat of these earlier setbacks on currently larger steelhead populations, KSP co-directors — The Conservation Angler and Moscow State University with support from partners outfitter Kamchatka Trophy Hunts and principal booking agent and guides The Fly Shop — developed an emergency anti-poaching/scientific data collection program to (1) protect our conservation gains and (2) continuing our important scientific monitoring and evaluation. Senior Scientist Kirill Kuzishchin organized a skilled field team: two Moscow State University (MGU) scientists; four armed fisheries inspectors including two senior, Moscow-based inspectors with arrest authority and; a dedicated ATV with a three-man crew to patrol these rivers from mid-September to late October ice up. The anti-poaching program budget was $36,000.

With donations from previous Kamchatka Steelhead Project supporters, the fully-funded steelhead anti-poaching team departed for the Utkholok River on September 20.

The Conservation Angler and The Fly Shop reached out to prior KSP sponsors seeking fiscal support for the emergency program. The response was immediate and overwhelming. Fully funded, the anti-poaching team departed Esso, Kamchatka on September 20, 2020 for the three day cross country ATV trip to the Utkholok River camp. The Conservation Angler will post periodic field reports which may be viewed on its blog: theconservationangler.wordpress.com.

The local jungle music from the poachers: "How long are you guys going to be guarding the river?" Response: "Till ice up," resulting in sad faces on the poachers.

MISSES

I'll pass on posting my usual litany of management missteps to be resumed in the future in favor of pausing to consider the catastrophe that has befallen our friends and steelhead pioneers crushed by the Archie Creek fire, which ravaged the North Fork Umpqua River valley. Our hearts go out to our many friends and supporters there. Miraculously, the historic Steamboat Inn survived mostly intact. Less fortunate were Umpqua legends Frank and Jeanne Moore, and Pat and Keith Lee, who lost their homes to the blaze. Everyone in steelheadom loved and admired these families whether known in person or by reputation.

The same Archie Creek fire largely leveled the Rock Creek Hatchery, near Glide, killing most fish there. Hope-

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Umpqua steelhead conservation legends Frank and Jeanne Moore, along with Pat and Keith Lee, lost their homes to this summer's wildfires. Photo by Jim Yuskavitch

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fully, the Oregon Department of Fish and Wildlife will take time to carefully assess whether or not rebuilding and resumption of this hatchery operation is a wise option.

In Memoriam
Art Tautz, Ph.D.

Art Tautz, Ph.D.; retired BC fisheries (Ministry of Forests, Lands, Natural Resources and Rural Development colloquially known as BC Fisheries). Art died after a long battle with brain cancer on September 13. Steelhead lost a champion who sought to conserve BC's steelhead fisheries by protecting the fish while moderating angling related mortalities.

I first met Art as a newly installed Director of the Steelhead Society of BC over 30 years ago as BC was crafting new regulations to limit angling pressure on BC's premier steelhead waters — constraining guide licenses, establishing daily recreational licenses and restricting non-resident angling pressure. These regulations were strongly supported by the guide community and resident anglers. They were less warmly received by many local businesses and opposed, even resented, by non-resident anglers. More importantly, the complex of resulting regulations have significantly contributed to protecting BC steelhead resources from over-exploitation by anglers while providing a fair system of allocating angling opportunity.

Art's example was key to the evolution of my own thinking and approach to steelhead management and was a guide star to how The Conservation Angler approaches fish management: the fish come first. Anglers are, of course, part of steelhead management, but the fish, not people, come first. Lots of fish managers never seem to get this key point. People management is a key element of steelhead conservation.

We need a leader of his stature, commitment and insight to guide the Province, Federal Government, commercial fishers and First Nations out of the current wilderness where fish do not come first. Absent near-term change in this failed paradigm, we can stop worrying about wild fish in the future — there may not be any.

Letters to the Editor

Manage Salmonids Utilizing Basic Principles

Dear Editor:

Professional management of salmonid resources is relatively simple. We had enough information to correctly manage these resources when I started my career as a fisheries biologist in the 1950s in Alaska and we certainly do today. Every life history stage of every species has both positive and negative forces. Large Chinook are more effective spawners but have a longer period for natural mortality. Steelhead spawn in the spring to avoid winter flood events but miss the first part of the juvenile growing season.

Whenever you stop or modify the natural selection process there will be a negative impact on fish populations. The most obvious is when you take fish into a hatchery or for controlled juvenile rearing. Less obvious was when bird control yielded more juvenile Atlantic salmon in streams but this was cancelled out by lower survival.

There is always competition and predation within and between species. Any increase in hatchery production will always have a negative impact on wild fish.

Forget about having to study or prove things that have been basic principles for many decades. Manage fisheries to provide adequate spawning escapements and move hatchery production out of systems with significant wild fish populations.

For details, please visit www.fishmanagementadvocates.org

Sam Wright
Olympia, WA

Time to Watch (or Re-Watch) "Our Two Hands"

Dear Editor:

I just finished re-watching the movie, "Our Two Hands", a story about salmon, steelhead and those who love them. Most of *The Osprey* staff and readers are devoted to salmon and steelhead recovery, and we understand that means advocacy, personal involvement, and "doing something." This movie covers completely how we got where we are, where we need to go, and who needs to do it.

As an active swing-fishing steelheader, I found the movie both compelling about our sport, as well as providing direction on what is needed to ensure we have fish available for future generations.

The movie focuses on many of the leaders of our sport — Dec Hogan, Jim Lichatowich, Bill Bakke, Trey Combs, and many others — and their insights into what action is needed to make sure we have salmon and steelhead 100 years from now. This is not a simple act or policy change. It involves a substantial change in thinking and cultural shifts, and the time to act is now.

After my 20 years of advocacy for these fish, I have come to realize that many of us who care are not sure what to do. This film will answer that question.

We need all of us to be involved — doing something! One thing we know for sure is that human activity has not been as supportive of the natural world as it should be. We can start with shifting our thinking to realize that the natural world around us is what we must have to survive. It supports both us and the fish we love. Fact is,- it supports all life. Degrading the natural world has to stop. Of course, there is more, but that shift of thinking comes first.

Watch the film and join with your fishing brothers to make the world a better place — for ourselves, our families and generations to come. "Our Two Hands" is "must see" for all who love salmon and steelhead and the world they live in.

Mark Rockwell
Santa Barbara, CA

Editor's Note: Mark Rockwell authored "Klamath River Dams: Where are we Today?" for the May 2020 issue of The Osprey.

Rewilding the White Salmon River

The view from nine years after the removal of Condit Dam

By Jeanette Burkhardt

Nine years ago, the process of re-wilding a river kicked off with a blast: Condit Dam on the White Salmon River was breached, reopening a watershed to anadromous fish after nearly a century of blockage, restoring constrained physical processes, and initiating the recovery of riverine habitat. The largest dam removal attempted in the U.S. up to that point: how is it unfolding?

The Backdrop

The White Salmon River, in south-central Washington, flows southward 45 miles (72 km) from Mt. Adams to the Columbia River, 179 miles (288 km) from the Pacific Ocean, a watershed spanning 12,000 feet (3657m) of elevation carved through basalt, straddling the climatic divide between the temperate coast and arid interior. The canyon-bound river is punctuated by several significant cascades, some barriers to fish, on its way to the Columbia. The White Salmon drains a diverse landscape of forests, meadows, agricultural lands and small communities. Abundant seeps and springs release captured rainfall, glacial and snow melt into the river, ensuring sufficient base flows, cold water and dissolved oxygen concentrations favorable for salmonids year-round, and gaining the river recognition as a coldwater refuge (US EPA 2019).

A hydroelectric dam was built at river mile (RM) 2.2 (river kilometer [rkm] 5.3) in 1912-1913, blocking passage for native migratory salmonids that called it home: the river's namesake "Tule" fall Chinook, spring Chinook, chum and coho salmon; steelhead, coastal cutthroat and bull trout; and Pacific lamprey. Without fish passage, the dam also blocked the livelihood of Native American communities along its banks. When dam relicensing started in 1999, in the context of the Endangered Species Act (ESA) listing of most of the river's anadromous fish populations, lack of passage was a primary consideration. After over a decade of planning, permitting, and wrangling, the current owner, PacifiCorp Energy, opted to decommission the dam. By summer 2012, less than a year after breach and a century after its completion, the dam had been dismantled, the majority of sediments accumulated in the former reservoir flushed downstream, and the stabilization and revegetation of the reservoir sediments initiated. The river's re-wilding had begun.

The White Salmon River continues to be a dynamic environment, where natural processes delivering large wood and sediments to the lower river have been restored.

Physical Restoration

The White Salmon River continues to be a dynamic environment following the removal of Condit Dam, where natural river processes delivering large wood and sediments to the lower river have been restored. After the breach, the river in the reservoir reach found its old channel, while an estimated 1.8 million m^3 (2.4 million yd^3) of silt, sand and gravel, impounded in the reservoir, recreated missing gravel bars in the lower river and a delta at the Columbia River confluence. The basin experienced a drought in summer 2015, followed by flooding in December of that year, and sustained high flows in the spring and early summer of 2017, all of which, in addition to out-of-basin conditions, can affect various life stages of different fish species and influence population variability independent of spawning levels (USGS, written comm.).

The upland landscape is also evolving. PacifiCorp re-worked and re-seeded sediments, and replanted the former reservoir with thousands of trees. Native vegetation is recruiting onto formerly submerged sediments. Grant-funded restoration work continues apace, such as barrier removals on tributary streams (Indian Creek, Mill Cr., Buck Cr.), upland habitat work (mainstem and tributaries) and a restoration project at the mouth of the river at the historic Native American Underwood village, where reservoir sediments had inundated a Columbia River tribal treaty fishing-access site and created homogenous, shallow, stranding-prone habitat for juvenile salmonids. Yakama Nation (YN) has been actively restoring the site since 2018, re-activating the navigation channel and recreating deltaic island habitat by re-working the sediments, and restoring native vegetation to improve fish and wildlife habitat.

The YN, City of White Salmon and other organizations are investigating the feasibility of moving the city's municipal water source to the mainstem White Salmon River from Buck Creek to protect aquatic resources in this important, flow-limited tributary. PacifiCorp and the YN have signed a Right of First Offer agreement for PacifiCorp lands between the former dam site and the confluence, opening the possibility of tribal ownership of traditional lands of high conservation value along the river.

Meanwhile, local stakeholder groups are working to steward river resources, ensuring that the river community protects the instream and riparian ecology and upholds conservation values. However, models of future climate scenarios suggest a changing hydrograph, while increasing residential development — including riparian vegetation

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removal, groundwater development and other impacts—is stressing the ecology of the system. The recreational carrying capacity of this increasingly popular whitewater river is unknown. Health of uplands is being challenged by legacy impacts, conversion, fragmentation, changes to precipitation and related stressors. Land managers and restoration practitioners are investigating ways to increase resilience of upland habitats to buffer impacts to the river, such as restoring hydrologic processes to headwater systems to retain water and deliver flow when precipitation is scant. Will all these efforts be enough to sustain an historic restoration experiment represented by Condit Dam removal?

Monitoring Fish Recolonization of the White Salmon River 2012-2019

A multi-agency working group met for several years before the breach to consider options for restoring the river's native salmonids. The working group recommended allowing the basin's salmonids to recolonize naturally, and to assess efficacy after 5 years. Rainbow Trout PIT-tagged upstream of Condit prior to dam removal had been detected downstream in the Columbia, indicating that those fish isolated above the dam were still expressing an anadromous life-history. The Yakama Nation and Washington Dept. of Fish and Wildlife (WDFW) share co-management authorities over the White Salmon fishery. The YN has opted for a 15-year window to assess recolonization to inform future tribal fishery management considerations. Despite concurrence of ESA recovery plans and assessments that monitoring was crucial to the evaluation of the dam removal's success, fisheries agencies have had inadequate funding to fully evaluate the recolonization of the White Salmon River.

Monitoring recolonization has been focused on determining adult abundance, spatial distribution, diversity, and productivity of returning fish runs. It has primarily consisted of spawning surveys for Chinook salmon (by WDFW), steelhead (by YN), and juvenile salmonid monitoring by tributary electrofishing and operation of a rotary screw trap in the lower river by U.S. Geological Survey (USGS). Data collected thus far show that fish are recolonizing available habitats, both those newly accessible due to barrier removal and those where the restoration of natural processes improved formerly degraded habitat, such as areas below the former dam site that were deprived of gravels necessary for spawning and juvenile rearing.

Adult Spring and Fall Chinook Spawner Surveys (WDFW)

WDFW has monitored native adult Tule Fall Chinook salmon abundance in the White Salmon basin since 1965, and (non-native) Bright Fall Chinook salmon abundance since 1989, more recently documenting recolonization post-dam removal by Chinook salmon. Spawning ground surveys took place weekly during 2013-2019 from BZ Falls (RM 12.34/km 19.86) to the mouth for spring Chinook salmon, and from Husum Falls (RM 7.8/km 12.55) to the mouth for fall Chinook salmon during their respective spawning periods (Figures 1-3).

Spawning occurred mainly below the former dam site, with over half of spring Chinook, and all but a very small percentage of Tules and Brights (in some years) spawning below the dam. However, spawning opportunities even in previously accessible areas below the dam has increased due to the influx of gravel post-dam-removal. The proportion of hatchery-origin spawners has varied by year, but was highest for spring Chinook salmon (considered "functionally extirpated" in the basin), constituted the majority of Brights, and was lowest for Tules. Temporal distribution for Brights spawning (late October - early December) overlaps somewhat with that of Tules (generally mid-September - late October). Spatial distribution also overlaps, with unknown impacts from redd superimposition and genetic introgression. These interactions merit more study. Chinook salmon returns to the White Salmon generally track trends in the remainder of the Columbia Basin.

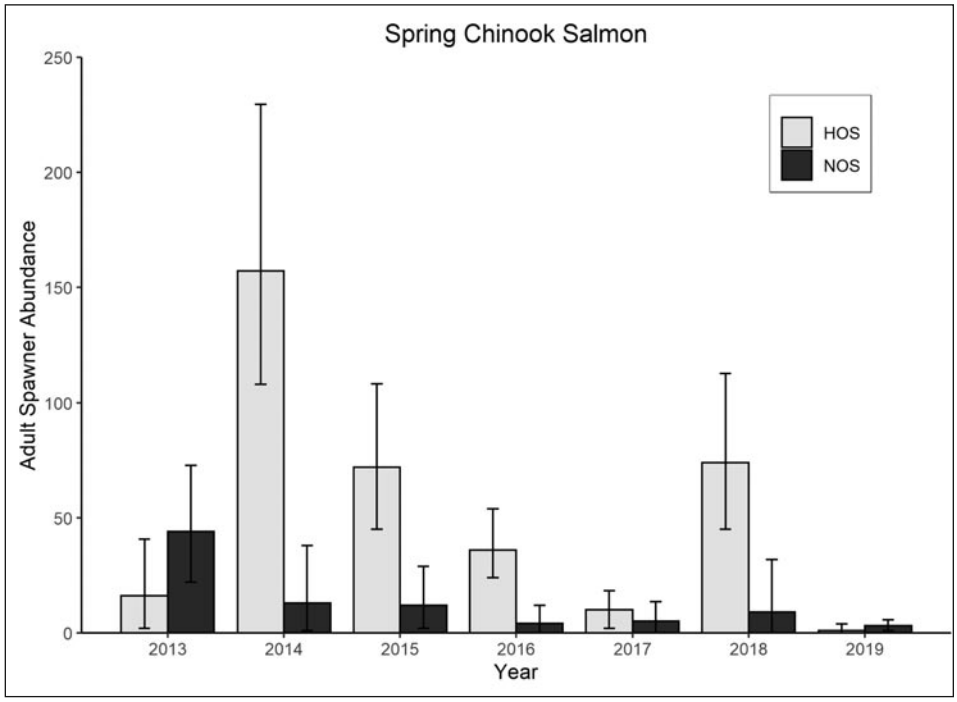

Figure 1. Spring Chinook salmon spawning abundance by origin (HOS=hatchery-origin spawner, NOS=natural-origin spawner) in the White Salmon River, 2013-2019 (WDFW).

Steelhead and Coho Spawning Surveys (YN)

The YN Fisheries program conducted steelhead spawning surveys to document recolonization in anadromous-accessible tributaries downstream of barriers (lowermost sections of Rattlesnake, Indian, Buck, Mill and Spring creeks, Figure 4) using wading surveys and redd counts (2012-2019). Steelhead spawning survey limitations arise from steelhead's prolonged spawning period during generally high flows and turbidity, the propensity to repeat-spawn, and the confined, high-gradient nature of the White Salmon River mainstem.

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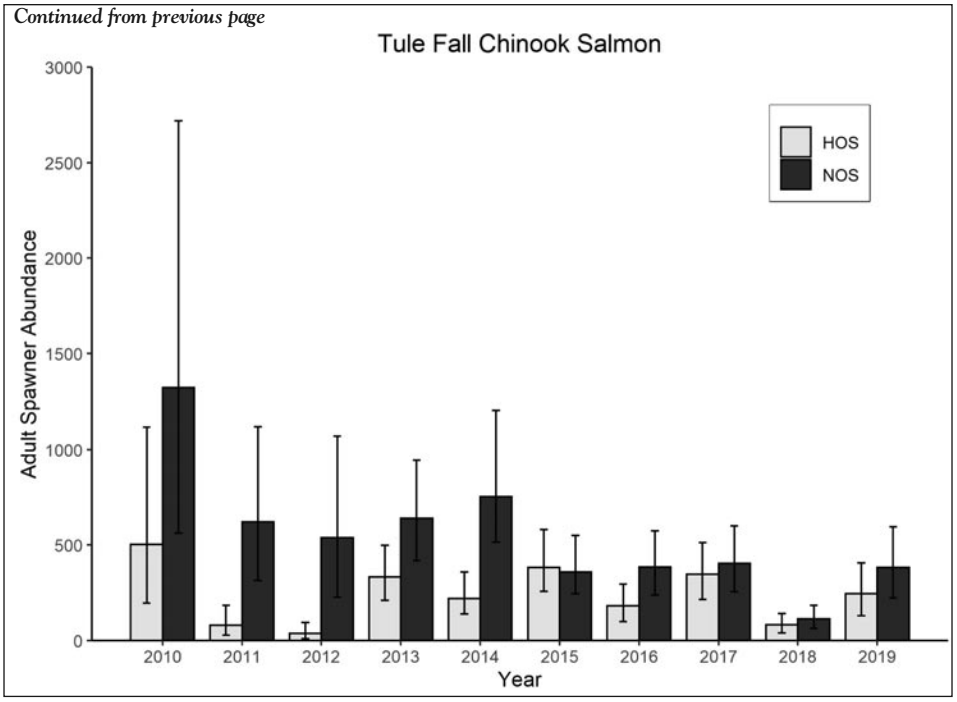

Figure 2. Tule Fall Chinook salmon spawning abundance by origin (HOS=hatchery-origin spawner, NOS=natural-origin spawner) in the White Salmon River, 2010-2019 (WDFW).

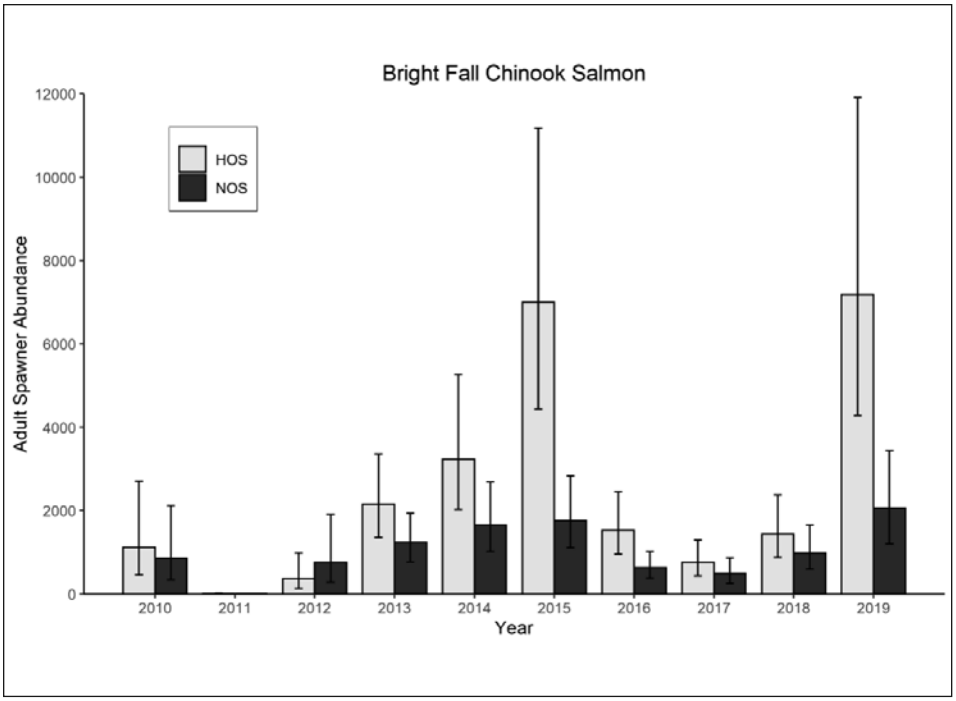

Figure 3. Bright Fall Chinook salmon spawning abundance by origin (HOS=hatchery-origin spawner, NOS=natural-origin spawner) in the White Salmon River, 2010-2019 (WDFW).

The first years of these surveys provided the first known documentation of steelhead spawners returning to White Salmon River tributaries; adult steelhead were observed in the mainstem beginning in summer 2012. Survey results indicate that steelhead are recolonizing most accessible streams in the subbasin. They also suggest a moderately low level of recolonization in these streams (fewer than 12 identified redds per tributary per season) to date. There were increasing numbers of redds in the first few years after dam removal, followed by a general downward trend in more recent years, similar to that in nearby rivers and Columbia Basin-wide. Results from these surveys likely represent a minimum spawner abundance level.

Possible origins of these steelhead include strays from other rivers or hatcheries, large migratory rainbow trout from the White Salmon River, or returning steelhead from previously-resident rainbow trout populations in these tributary streams. Minimal analysis of genetic material from *O. mykiss* (steelhead) from the USGS smolt trap and analyzed by the Columbia River Inter-tribal Fish Commission (CRITFC) genetics lab suggests a mix of source populations, including a native White Salmon population and those of other nearby rivers (Hood, Klickitat, Deschutes) (YN, pers. comm.). Preliminary genetic analysis also confirms both summer and winter runs of steelhead, as in the nearby Hood River (OR) and Klickitat River (WA). Genetic analysis could help assess if and how White Salmon steelhead are related to other local populations, to inform ESA recovery of these fish.

Coho spawner surveys have been more limited, and no data have been published to date. Indications are that coho are present in unknown, but apparently low to moderate numbers in all the major anadromous-accessible tributaries (YN, pers. comm.). Status of Chum salmon populations is unknown, but presumed to be low to non-existent.

Juvenile Salmonid Monitoring (USGS)

Several studies occurred in the basin both upstream and downstream of the former dam site prior to dam decommissioning that allow comparison to post-dam conditions, including rainbow trout/steelhead population and habitat assessments in Rattlesnake Creek (2001-2005, USGS) and Buck Creek (2009-2010, USGS and YN). USGS operated a rotary screw trap at RM 1/ rkm 1.4 to assess juvenile species composition and abundance downstream of Condit Dam (2006-2009). Limited monitoring of salmon and steelhead spawning has occurred since the breach of Condit Dam in 2011. Because of the difficulties of generating adult estimates for coho salmon and steelhead in the White Salmon, researchers agreed that juvenile monitoring could play a role in assessing efficacy of natural recolonization.

From 2016-2019, USGS operated a rotary screw trap at RM 1.4/rkm 2.3 (1.8 mi/3 km downstream of the former dam site) during spring to assess salmonid

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smolt and juvenile migrant production upstream of the trap. In concert with the screw trap, USGS conducted backpack electrofishing in summer to assess juvenile salmonid distribution in tributaries and abundance in a reach of each Rattlesnake Creek and Buck Creek, both of which were sampled prior to dam removal (Figure 5). Fish are tagged with Passive Integrated Transponder (PIT) tags for mark-recapture estimates; future recaptures or detections of these marked fish, as juvenile or adults, will contribute data about the life-history diversity of naturally produced salmonids in the White Salmon basin (USGS, pers. comm.) Genetic material was collected to investigate stock origin of fish captured during electrofishing or in the rotary screw trap.

Juvenile monitoring efforts to date confirm: production of natural-origin steelhead and coho smolts from upstream of the Condit Dam site, including Buck, Rattlesnake, and Mill Creeks; production of natural-origin Chinook salmon fry upstream of the screw trap; coho salmon smolt estimates have increased from 2016 – 2019; adult returns to Bonneville Dam of PIT-tagged White Salmon-origin steelhead and coho salmon from the screw trap and tributaries; juvenile salmonid abundance at a sample site in Buck Creek has exceeded that found at the same site during pre-dam removal sampling each year; juvenile salmonid abundance at a sample site in Rattlesnake Creek has exceeded that found at the same site during pre-dam removal sampling in some of the post-removal years. All of the juvenile coho salmon or steelhead caught in the screw trap appear to be of natural origin (based on adipose fin presence). One steelhead kelt was captured in 2016 that lacked an adipose fin. Fish PIT-tagged as part of this study have been detected at downstream locations such as Bonneville Dam, estuary trawl PIT arrays and estuary island bird colonies.

Continued monitoring to build a longer, more robust data set would help fisheries agencies better understand trends in abundance, distribution, genetic diversity and life history patterns of salmon and steelhead recolonizing the White Salmon River, and to assess the effectiveness of natural recolonization to inform management decisions, while also contributing to a growing body of science focused on effects of dam removal. Juvenile monitoring has been funded by grants from the Washington State Salmon Recovery Funding Board and Clark-Skamania Flyfishers, both administered through Mid-Columbia Fisheries Enhancement Group, and by Pacific Coastal Salmon Recovery Fund, administered through YN, which has also funded steelhead spawning surveys.

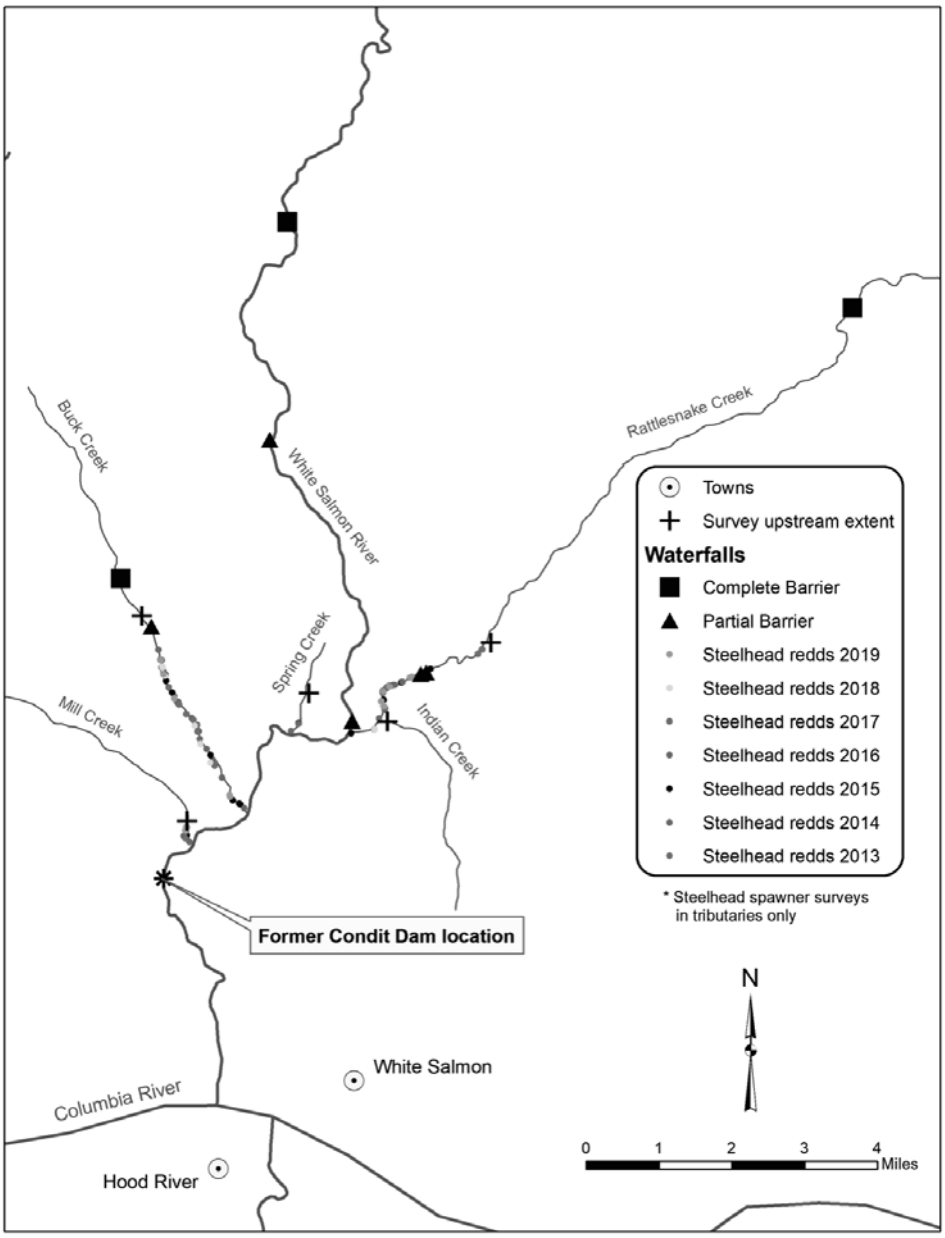

Figure 4. Observed steelhead redd distribution in White Salmon River tributaries 2013-2019. All redds observed (possible, probable, and definite) are shown (YN).

Bull Trout

A fishery biologist angled a bull trout upstream of the former dam site in the first few years after dam removal. Two bull trout have been captured at the screw trap, one in June 2018 and one in June 2019; both exhibited smolt characteristics. Both bull trout were PIT-tagged and the fish caught in 2018 was detected at Bonneville Dam a couple days after capture in the White Salmon (Figure 6; USGS, pers. comm.), confirming use of the White Salmon by this species, and the first confirmed in the basin since 1988 (surveys in intervening years had detected no bull trout). No systematic sampling or surveying for bull trout is currently occurring. The White Salmon basin also has a population of Coastal cutthroat trout, which may also exhibit an anadromous life history, though they are not being surveyed currently.

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Pacific Lamprey

Anadromous Pacific lamprey make significant ecological contributions to river systems in the Pacific Northwest, and have cultural significance for many Native American tribes. Pacific lamprey response to dam removals is largely unknown. The US Fish and Wildlife Service (USFWS, 2007-2015) and YN (2012-2019) have studied the recolonization of the White Salmon River by Pacific lamprey since Condit Dam was removed. The USFWS estimated abundance of larval Pacific lamprey using backpack or deep-water electrofishing. Before the dam removal, USFWS had found Pacific lamprey in areas downstream, but not upstream, of the dam. After dam removal, Pacific lamprey larvae were collected from four reaches of the mainstem White Salmon River upstream of the former dam site. No Pacific lamprey were detected at the mouth of the White Salmon prior to dam removal, but were detected afterward in improved habitat where sediments mobilized by the breach had deposited. This indicates that Pacific lamprey had quickly recolonized the White Salmon River after Condit Dam removal.

Yakama Nation Pacific Lamprey Project and CRITFC sampling confirmed that the most upstream known distribution of Pacific lamprey is currently rkm 9.4, 3.5 km upstream of the former dam site. Lamprey species may benefit from the redistribution of reservoir sediments, and the return of more normative river processes in the White Salmon River downstream of the former dam site.

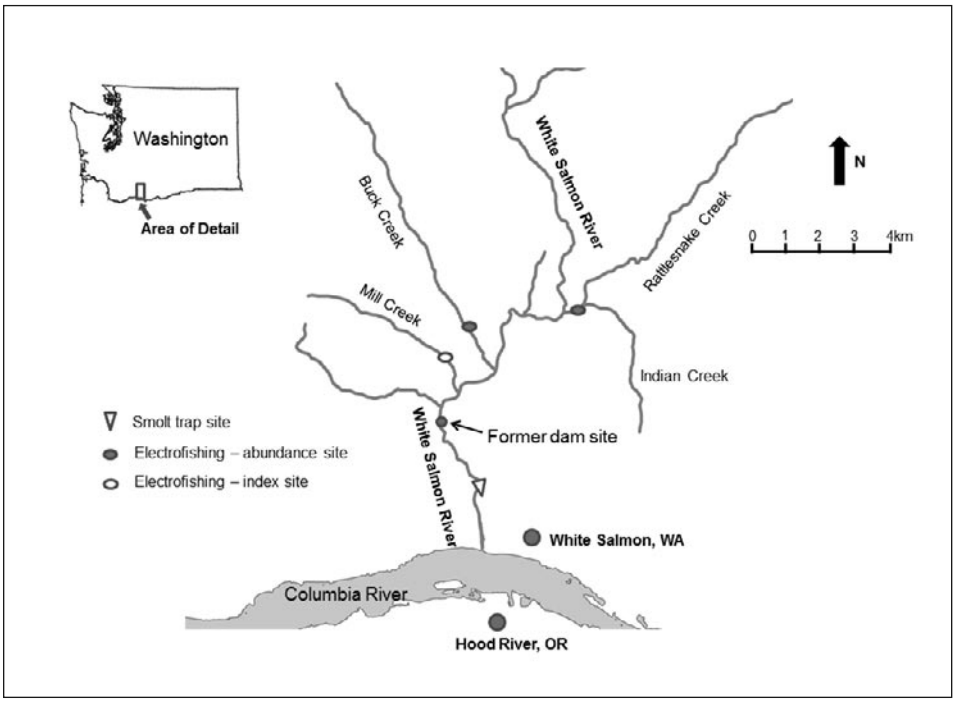

Figure 5. Schematic of the White Salmon River watershed accessible to anadromous salmonids showing locations of rotary screw trapping and electrofishing surveys 2017-2019 and the former location of Condit Dam, which was breached in 2011 (USGS).

Conclusion

Since Condit Dam removal, the White Salmon River has continued to evolve and change, recovering from a century of human impediment. In-channel river processes came roaring back, and the system has gotten a hard re-set. Upland habitats and processes affected by prolonged inundation and lack of soil-building are slower to recover, but are re-vegetating. Migratory fish populations are taking advantage of a newly free-flowing river, returning to spawn, occupying habitats that have been inhospitable or off-limits for a century, rearing and sending progeny out of the basin. And the human community has been bearing witness to the evolution. Fisheries agencies have been monitoring the recolonization of the river by anadromous fish with sparse funding, collecting valuable information to inform management. Research and monitoring are raising questions as they attempt to answer others.

The human community has witnessed the unleashing of a tamed river, and now, its re-wilding. Questions and challenges persist, including: can we stay out of the river's way and let it heal?

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Hear No Evil

Canada's broken Department of Fisheries and Oceans

By Jesse Zeman and Harvey Andrusak

The news that Interior Fraser steelhead (IFS) are spawning at near-historic low numbers is alarming. The iconic and world-renowned Thompson River steelhead that numbered in the low thousands a few decades ago now number less than 300. The Chilcotin River steelhead numbers in 2020 are less than 50. How has this happened?

The Thompson and Chilcotin steelhead fishery was historically catch-and-kill, later catch-and-release, and today, there is no fishing at all. The trouble is that these fish co-migrate with pink and chum salmon, and in the worst years, steelhead experts estimate that half of these fish were caught in gillnets as by-catch, and up to half of those died. These populations were considered in severe decline by the late 1990s and were trending downward but still producing 2,000 to 3,000 returning spawners.

By 2017, the alarm bells were going off when the numbers declined below 500 spawners, and a true crisis was in the making. Despite this, Fisheries and Oceans Canada (DFO) still permitted net fisheries on the lower Fraser. The B.C. Wildlife Federation (BCWF) and other environmental non-governmental organizations pushed for an emergency assessment under the independent Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which was undertaken. In 2018, COSEWIC announced that these two populations were at imminent risk of extinction. The main threats include poor ocean conditions and by-catch of adults by net fisheries targeting Pacific salmon.

Such low spawner numbers during the last few years triggered the Species at Risk Act process. As part of this process, a science advice document was put together by three scientists: one from the province of British Columbia, one independent, and one from DFO. It went through the Canadian Science Advisory Secretariat's peer review process, and later freedom of information feedback indicates that 42 experts and managers vetted it. This document has never been released to the public.

After a recovery potential assessment (RPA) was completed, correspondence was obtained from the province, going to DFO, which stated the DFO summary was no longer scientifically defensible. The BCWF found, through freedom of information requests, that the peer-reviewed science document findings had been edited in a science advisory report ostensibly to downplay the effects of nets on steelhead

There is little argument that DFO and the province are responsible for the decline of interior Fraser steelhead populations.

In 2019, the federal and provincial governments created a recovery plan. B.C. recommended that protecting 95 percent of these fish would require a period of 84 days without nets on the Fraser. DFO committed only to a 27-day moving window. In September 2019, DFO killed its first two steelhead in its test fishery. On September 16, the Province of B.C. closed its statistically insignificant trout fishery on the Fraser, likely as a quid pro quo with DFO, only to find the next day that DFO had opened an economic opportunity fishery for pinks using beach seines and allowing chum salmon to be retained. It should be noted that at that tim, DFO had calculated a one percent probability of meeting its escapement target of 800,000 chum in the Fraser, yet it still allowed chum retention. This was not a conservation measure, and no account was made of any steelhead caught.

DFO again used its model, which was found to be invalid, to justify opening this fishery. The BCWF had to file an Access to Information and Privacy (ATIP) request to find out what had gone on behind the scenes inside DFO for the entire two-year process. It took two and a half months to get our ATIP back from the federal government, and it will take two years to find out what went on behind closed doors.

In 2020, the plan is the same: The steelhead experts say you need 77 days without nets, and DFO's plan is to take the nets off for only 27 days. That means we are pushing these fish into extinction.

At this point, the science advisory report is the only document available. The peer-reviewed science is still not out, and we still don't have our ATIP. That is the DFO that informed people in B.C. know. There are dozens of structural and cultural issues within DFO that have resulted in a failed ministry and agency.

Steelhead are not the only victims. Interior Fraser coho were put on life support in the 1990s, and a number of our Chinook and sockeye salmon runs are headed for the same place now. In late summer 2020, a permitted Chinook fishery on the river yielded more sockeye than Chinook, and the sockeye were retained despite the predicted worse sockeye run in history. DFO's response has been to fiddle around with fisheries regulations while knowingly managing weak stocks towards zero. The DFO strategy to sustain the commercial fishery has failed our fish and the people who care about them.

There is only one measure that can be implemented immediately to ensure that greater numbers of adult steelhead reach the spawning grounds on the Chilcotin and Thompson rivers next year (2021). Governments should an-

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nounce a moratorium on the 2020 chum salmon gillnet fishery that incidentally catch and kill these steelhead as they migrate upstream during October and-November.

There is little argument that DFO and the province are responsible for the decline in interior Fraser steelhead populations. Ineffective measures have been in place for over a decade in an attempt to mitigate for the chum salmon gillnet by-catch of Interior Fraser steelhead. Mitigative measures touted by DFO for the last decade or so, such as rolling closures, soak times etc. have been abject failures as evidenced by the continuing downward numbers of steelhead.

The time has come for the responsible parties to get serious about steelhead conservation, which is the mandate of both levels of government. Conservation groups have sent numerous letters and have had meetings with governments over the last number of years to express concerns. These concerns have been ignored, and most often, there has not even been a reply to such communications! An expert, independent from the government, is required to review the chum salmon fishery's efficacy.

The BC Wildlife Federation and other fish conservation organizations have observed for decades that commercial harvest interests have driven salmon management in B.C. Only in more recent years have the constitutional rights of Indigenous people been brought into the allocation equation.

There are four main reasons for the continual decline of most salmon and steelhead stocks: Ocean survival; pinniped predatio;, climate change and; harvest. Yes, freshwater habitat deterioration is an issue in some instances. Still, there are many examples throughout British Columbia where pristine habitat lies vacant because no fish are left to use it. Of the four main factors we can only control harvest, yet collectively, we have failed to manage intelligently to ensure various stocks' conservation. Why? There is no other way of saying it: greed and fear of change. Politicians of all stripes have been complicit in ignoring individual weak stocks' demise by permitting harvest to trump conservation.

DFO has relegated conservation to a secondary concern, so it is little wonder that First Nations, the angling public and, increasingly, the general public have become alarmed at our salmon and steelhead stocks' status. One only has to look at DFO's mandate to realize that conservation is not the primary interest—commercial harvest is. The Fraser and Skeena systems cry out for better management in the future.

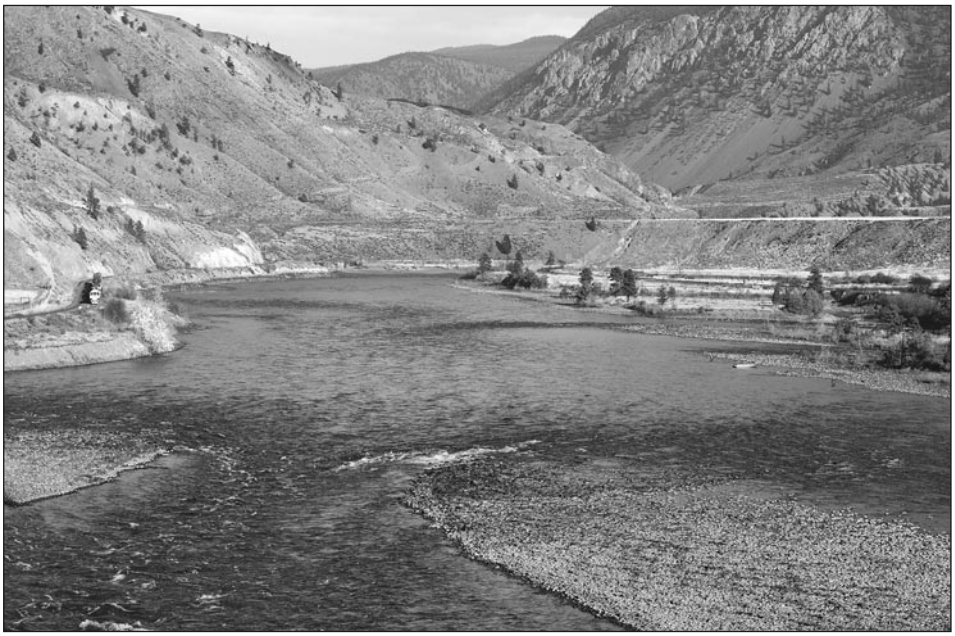
Salmon managers need to immediately pull back from their antiquated goal of trying to manage stocks to maximum sustained yield. We must significantly reduce harvest now so that our salmon runs can demonstrate their recovery potential and restore abundance to levels that meet conservation and First Nation food, social and ceremonial requirements and provide harvest opportunities. It clearly entails immediate pain for all in order to achieve longer-term gains. Is there any political will to take this on? So far, the answer is no.

To achieve the desired outcome, we need to change how and where we catch salmon. Non-selective net fisheries need to be eliminated, not just "tweaked". Terminal fisheries need to be emphasized, and First Nations-led selective fishing methods need to take on a far more significant role. To date, senior DFO staff with single authority have ignored their scientists and the public by marginalizing conservation concerns to satisfy commercial interests. This systemic failure has been evident for nearly a century. DFO has squandered yesteryears' abundance of wild salmon and increasingly pointed to climate change and ocean survival as the culprits—this is called deflection.

Despite the monumental investments in planning processes and addiction to hatchery "solutions," we find ourselves with an ever-growing list of salmon stocks that are in serious peril of becoming extinct. Hatcheries and the indiscriminately mixed-stock fisheries they have created are the crowning examples of failed management.

The B.C. Wildlife Federation's call for a moratorium on the chum salmon gillnet fishery is one not taken lightly! The BCWF has offered positive solutions to avoid Interior Fraser Steelhead (IFS) extinction while allowing the continuation of chum salmon harvest. The net fishery needs to be moved from the main stem river and replaced with chum salmon harvest in the lower Fraser tributary streams where most chum salmon spawn. Moving the nets would be a win-win solution that has not been dismissed, yet both government levels have so far ignored this proposed solution.

Selective fishing methods on the main river have also been proposed to reduce IFS by-catch. These have also been rebuffed and turned down by both government levels seemingly intent on the status quo, outdated fishing methods. Despite pleas from the Steelhead Society of B.C., the B.C. Federation of Fly Fishers, the Outdoor Recreation Council, the BCWF and other conservation groups, DFO has continued to permit



The Thompson River is one of a number of tributary streams in the Interior Fraser River watershed whose wild steelhead numbers are plummeting. Photo by cogdogblog. Creative Commons Attribution 2.0 Generic License. Converted to black and white.

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the chum salmon fishery knowing that the few remaining iconic steelhead are killed in the gillnets each year. It is time for governments and the involved commercial fishers to step up to the plate and show the much-needed leadership in IFS conservation and do the right thing for the fish.

Here are some things that can be done to stop the downward spiral of B.C.'s wild fish species.

1. Support science-based decision making.

2. Move to selective fishing methods. Not only are steelhead a victim of nets on the Fraser; so are salmon, and we predict over the next year we'll find that sturgeon are being driven into a decline that is largely attributed to nets. Nets need to go.

3. On poaching, there are pictures of endangered Chinook and steelhead and at-risk coho in illegal nets that surface almost daily. They are reported to DFO, and no one even calls us back. Charges are rarely pursued. Fisheries officers have become experts in cutting gillnets out of the Fraser instead of protecting salmon from poachers.

4. Fisheries monitoring must be improved for all sectors. There is no illegal harvest accounted for in-run reconstruction models, and we are aware that fisheries-related induced mortality of Fraser Chinook is not even included in the river. That means there are thousands of fish, if not tens of thousands, that are killed in the Fraser every single year, which, according to DFO, never even existed.

We can deal with fish farms, we can deal with pinniped predation, we can deal with fish passage, and internationally we can deal with ocean ranching to reduce the number of hatchery pink and chum fish that are being dumped into the Pacific on an annual basis. These are all things that can be done.

Now, on the broader picture around natural resource management, whether it's water, air or fish, you need three things. You need funding, science and social support.

First, funding has to be dedicated, facilitating leveraging, line of sight for ratepayers, and planning on annual, five-year and 10-year basis.

Science's role is to set objectives for fish and habitat populations to identify threats and barriers, and establish the allowable catch. That is not management's function; that is a science function.

Wild Interior Fraser River steelhead, along with other salmon species, are caught and killed as bycatch during the commercial chum (pictured) and pink salmon net fisheries. Photo by K. King/USFWS. Attribution-Non Commercial 2.0 Generic License. Converted to black and white.

Finally, there's social support. The agency needs to be accountable and transparent and make decisions based on evidence, and those who care about the resource have to see themselves as part of the process. That is what DFO should look like, and currently couldn't be any further from.

DFO is culturally and structurally broken. It is a fishing management agency that is not accountable to the public. Getting data from them is almost impossible. We are constantly referred to Access to Information and Privacy because people are worried they will lose their job if they share data with the public that was paid for by the public. Scientists, habitat staff and enforcement staff are rarely listened to. The prescription of the day is fishing, fishing, fishing.

The public needs to understand the dire situation the iconic steelhead and salmon species are in. There needs to be the political will to make the necessary changes to the fishery. The public is encouraged to write or call their Members of Parliament and Members of Legislative Assembly and express their disbelief that steelhead conservation is not a concern or priority for the federal and provincial governments.

There are some quick-fix solutions to the situation we find ourselves in, but it means lowered expectations, and declining revenues and opportunities across all sectors. Is there a politician out there prepared to champion conservation over all else? The current situation speaks volumes of failure. Change needs to take place immediately. Many well-informed people with strong fisheries backgrounds both within and outside the B.C. Wildlife Federation echo these sentiments. Far greater involvement by First Nations and the public in the decision-making process is required. If we want a future for our salmon, conservation must trump all other interests.

To sign the B.C. Wildlife Federation petition please visit https://bcwf.bc.ca/initiatives/bcwf-calls-for-a-moratorium-on-lower-fraser-chum-gillnet-fishery/

Jesse Zeman is British Columbia Wildlife Federation Director of Fish and Wildlife Restoration, and Harvey Andrusak MSc, is BCWF past President and Chair, Inland Interior Fisheries Committe. For more information on the British Columbia Wildlife Federation's work check out their website at bcwf.bc.ca.

As Glaciers Melt, Impacts on Salmon Complex

A new study takes stock of whether salmonids might benefit—and how humans can help

By Ramona DeNies

Across the North Pacific, glaciers are melting. Eighty percent of today's glacier cover will be lost by 2100, according to current scientific consensus. Now, a new study, "Glacier Retreat and Pacific Salmon" from 14 leading Pacific salmon experts suggest that loss will have significant impacts on the region's salmon ecosystems —some 85 percent of which have at least some glacier coverage.

What exactly does glacier retreat mean for wild salmon? As with all climate change tales, it's complicated. Adding to climate effects from warming ocean water and extreme temperatures, disappearing glaciers will leave some North Pacific salmon systems more vulnerable to heat and drought. But retreating ice will also likely create thousands of miles of potential new salmon habitat.

The revelation of a possible silver lining to climate change made waves following the study's debut, this past March, on the cover of Bioscience. According to co-author Dr. Jonathan Moore, Professor of Aquatic Ecology and Conservation at British Columbia's Simon Fraser University, the study serves as a reminder that now, more than ever, policies aimed at ensuring the long-term success of Pacific salmon must be forward-thinking.

"Glaciers are a real in-your-face example of climate change, so that really captivates people," says Dr. Moore. "Oftentimes when we think about climate change, it's about how everything is going to hell. But climate change poses potential short-term benefits in some situations, and it's good to point that out, too.

Across their range, Pacific salmon runs are in decline, and some salmon managers and conservationists are recognizing the need to adjust approaches. Study lead author Kara Pitman, an SFU doctoral candidate, said the research team's findings can help inform those adjustments. She highlighted one insight in particular: that if salmon are to weather climate change, we should expand today's map of salmon strongholds to include those that might emerge in the future.

While some salmon systems will be challenged by glacier loss, evolving downstream conditions will not necessarily hurt all populations.

"Managers will have to make careful choices," says Pitman. "We recommend they consider the future state of salmon, how habitat might change, by integrating longer-term predictive modeling for glacier retreat and keeping pace with how salmon populations are changing."

According to the study, glacier retreat will likely manifest a wide range of impacts on salmon productivity. In addition to increased risk of heat and drought in some watersheds, downstream effects could include changes in sediment transport, hydrology, and biogeochemical fluxes. While some salmon systems will be challenged by glacier loss, evolving downstream conditions will not necessarily disadvantage all salmon populations: warmer temperatures, for example, could in some circumstances benefit juvenile salmon growth. Conversely, while examples already exist of successful salmon colonization of new habitat in areas of glacier retreat—in Glacier Bay, Alaska, for example—not all new areas made accessible by glacier retreat will prove hospitable to salmonids.

"This is a sober assessment of predicted changes to the salmon landscape," says Dr. Matt Sloat, a study

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Retreating glaciers will have a wide range of impacts on downstream salmon habitat. While some populations will suffer others may see benefits. Photo Courtesy National Park Service.

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co-author and Science Director at the Wild Salmon Center. "Change is inevitable. But it is also the case that salmon can continue to thrive, especially if we give them room to move into new habitat."

Over time, Pitman and her colleagues say that salmon can and will find their way to many of the new streams, rivers, and lakes created through glacial melt and retreat. Their optimism stems in large part from the fact that wild salmon are proven survivors. In the study, the authors point to salmon's long history—dating back to the Miocene, also characterized by warmer temperatures and higher sea levels—of evolution and adaptation. Wild salmon are hardy, endowed with genetic diversity that expresses itself in a range of behaviors, including the fraction of salmon that "stray"—seek out new spawning rivers instead of returning to where they were born.

Human-caused climate change is happening rapidly, with melting glaciers among the most wide ranging responses. Photo Courtesy National Park Service

"Salmon have been dealing with an evolving landscape for a long time," says Dr. Sloat. "They've outlasted ice ages and floods and scores of natural disasters. But human-caused climate change is happening fast. We need to make sure that any productive new habitat isn't lost through short-sighted development."

As an example of how human development could preempt any gains for salmon, the study points to mines recently approved in heavily glaciated regions of British Columbia. Ice retreat could open new river valleys for salmon—or new sites for resource extraction and development. For salmon managers looking to substantively participate in those conversations, the study's fusion of two fields of research—large scale watershed change and salmon ecology—offers a way for decision makers to better understand and communicate how deglaciated areas might affect a fishery, or even create the conditions for new ones. According to Dr Moore, the study can help inform efforts to protect areas of glacier retreat that hold promise as future salmon spawning or rearing habitat.

"These are places that might be the future salmon hotspots, so investing in them now might make the most sense," says Dr. Moore. "It's not an either/or between fisheries and development, but there can be trade-offs. Some mining practices are very environmentally harmful, and there are things that can be done to make things safer and more responsible. There are a lot of ways to decrease environmental harm."

Precisely where and when glacier retreat might create future salmon habitat is the subject of a forthcoming paper from the team, he says. In the meantime, the 2020 study offers some direction. Some more northerly salmon systems may benefit from a slight uptick in stream temperatures as meltwater wanes and new habitats appear, says lead author Pitman. But toward Pacific salmon's southern range, the study's authors predict that over the next 80 years, the coastal rivers of the Olympic Peninsula will lose much of the beneficial summertime refrigeration and flow regulation afforded by meltwater.

"The communities we work with are really interested in these findings, because they're watching their glaciers shrink," says Dr. Moore. "People who live close to the land not only see the glaciers change, they see the rivers change. Up and down the coast, people want to know what will happen."

Predicting what will happen is a complicated calculation. For salmon, the benefits and challenges of glacier retreat are mediated not just by geographic location, but also by factors including lakes, watershed size, and river valley form. The evolving impacts vary further by the phase of retreat for each glacier: from short river systems beheaded by glaciers to complete glacier loss. To better assess these impacts, the study breaks glacier retreat and its associated watershed changes into four phases: ice-dominated watersheds, rivers and lakes fed by ice, high-elevation glaciers with downstream effects, and watersheds without permanent ice (see sidebar).

Despite the complexity of these mediating factors, the study's authors assert that tools exist to help scientists and fishery managers pivot toward the future, and adapt policies and practices to maximize positive outcomes. These tools include predictive modeling, establishing more responsive escapement and fishing targets, and prioritizing process-based river restoration (e.g., floodplain reconnection, repairing incised channels) over engineering and infrastructure approaches.

According to Pitman, Dr. Sloat, and Dr. Moore, the research team is now working with climate change and glacier retreat models to identify those future salmon hotspots. The results of this work will be the foundation of a second study that will map phased glacial melt—and potential high-quality new salmon habitat—across a number of currently glacierized watershed.

With that knowledge in hand, says Dr. Moore, it will fall on salmon managers

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and policy makers to consider how to quickly evolve escapement goals and sustainable fishing levels as salmon populations respond to changing conditions. If rapid glacier retreat is lowering salmon productivity, managers may need to increase escapement and reduce harvests; by the same coin, if salmon are colonizing new habitat, allowing higher escapement might expedite the establishment of that population in the system, for future sustainable harvest.

"We're suggesting a longer-term management strategy," says Dr. Moore. "The world is changing so fast. Investing in the future is an important point."

Perhaps the wisest investment that salmon managers can make right now, he says, is in proactive habitat conservation and process-based river conservation and restoration. The study's authors caution against engineering and infrastructure strategies to mitigate for lost glaciers: for example, current proposals to build reservoirs in the fast-deglaciating European Alps.

"We're proposing letting rivers do their thing," says Dr. Moore. "Climate change and glacier retreat is posing a threat, but if we take restoration activity to allow rivers to move back and forth across valleys, that can to some extent take the place of glaciers.

How we help salmon thrive in a time of rapid climate change, he says, will depend in part on our success in preserving and restoring rivers across the North Pacific. It will take agreement across many jurisdictions; collectively, we must commit to being better neighbors; to clean up where we can and then step back, giving salmon space to find their own way.

"These actions will likely not only come from the top down, from governments, but from local communities managing their resources," says Dr. Moore. "It will be the watershed councils and Indigenous groups with roles in salmon stewardship and habitat: people who know what salmon need."

Ramona DeNies is Senior Writer for The Wild Salmon Center. Learn more about the organization's work at www.wildsalmoncenter.org.

Glaciers and Salmon in Four Acts

Phase One

In phase one, high glacier coverage means that salmon populations are relatively low. At this stage, the new rivers formed by glacial melt theoretically do represent new habitat for salmon to colonize. Yet their conditions are often inhospitable, characterized by unstable channels and river banks, high sediment loads, frigid temperatures, and a vegetation-free landscape. Lake moraines often breach and drain, adding a transitory quality to emerging habitats. Nevertheless, salmon's wide-ranging life-history traits mean that some species can still persist in these frigid, heavily glacierized streams; the study gives the example of Alaska's Stonefly Creek, colonized by pink salmon following early deglaciation.

Phase Two

In phase two, valley floors open up, shaped by natural processes that produce canyons, lakes, and gravel-bedded floodplains. Ice grinding against rock produces fine silt and glacier flour; those sediment loads, combined with peak-water flow in warm weather, can create volatile, braided river channels—risky habitat for spawning salmon. The high turbidity of these young rivers also limits food resources for rearing salmon, meaning that calmer, warmer, groundwater-fed side channels provide critical habitat during this phase of glacial retreat. Case in point: the significantly glacierized Taku River of Alaska and British Columbia, where juvenile Chinook, sockeye, and coho were found to be largely absent from the mainstem during summer. The presence of a mosaic of habitat is critical for salmon in this phase: from side channels to tributaries and lakes.

Phase Three

In phase three, glaciers have retreated to steep terrain—too steep for salmon to reach. At this phase, all the system's available river habitat is ice-free, yet glacial melt continues to shape downstream river conditions. Riparian forests are now mature enough to both stabilize stream banks and influence habitats, as wood accumulates in streams, slowing water flows and trapping gravel. Food resources diversify. Dissolved carbon accumulates downstream. Meltwater levels are lower, and downstream temperatures are higher. At this phase, summertime glacial runoff plays an important role in regulating seasonal water temperatures. Other research has shown that every 10 percent increase in glacier coverage cools summer water temperatures by about 1°C. The inverse—warmer stream temperatures as glacier coverage reduces—has mixed effects on salmon. Higher temperatures can speed up embryo development, linked with smaller size among adults. But they can also speed up juvenile growth rates in freshwater, which might improve survival rates in the ocean. At this phase, a diverse and complex mosaic of habitats supports a wide range of species and salmon life histories.

Phase Four

In phase four, glacier loss is complete, likely resulting in fundamental changes to a watershed's hydrology and temperatures. Downstream habitat is no longer insulated from high temperatures by an influx of glacier meltwater. In summer, lower water levels may impede the ability of home-migrating salmon to reach spawning grounds, and higher temperatures could lead to more hypoxic events. An example of this is found in Alaska's glacier-free Bristol Bay, where record summer heat in 2019 resulted in significant fish die-offs through suffocation. In winter, meanwhile, precipitation shifts from snow to rainfall could exacerbate flooding risks for juvenile salmon. And because the very presence of glaciers themselves can influence microclimates, their absence may over time contribute to changes in local rainfall and temperatures.

Reflections on Fishing Coldwater Refugia

And why more need to be protected

By Bill McMillan

Note: This personal essay from Bill McMillan was sent to Bill Bakke in response to Bakke's note to a small group of activists that "no angling sanctuary" regulations to protect migrating wild steelhead in the Columbia River had been established by Oregon's Fish and Wildlife Department — after 20 years of persistent advocacy — first initiated by Bakke in 1998, and finally secured via permanent rules by The Conservation Angler in 2020. The essay perfectly captures one angler's keen observations and conscious choice to spend more time caring for wild fish than fishing for them. For that, all should be grateful.

David Moskowitz, Executive Director, The Conservation Angler

I first fished the mouth of the Little White Salmon while trolling for steelhead with a U-20 Flatfish with my father in early September of 1958. It was already well known as a place where upriver bound steelhead congregated. I did not fully understand the reasons for this until almost 30 years later. I was fishing at the mouth of the Wind River in 1985 and saw several pods of 10-30 steelhead laying near the surface in the calm backwater where the Wind River current slowly gave way to Bonneville Pool. 1985-1987 were those years of hope when Columbia returns seemed to be en route to a beginning of recovery for steelhead, with the largest returns since the 1960s. It had been a particularly warm July for that era. News was that the mouth of the Big White Salmon and Little White Salmon were fishing well as steelhead sought out colder tributaries. I knew that the Wind provided a cold flow into the Columbia, and thought they might hold there as well. I was not about to be part of the crowds trying to cast among the densely packed boats at the other rivers.

Indeed, I was completely alone that late-afternoon in August after fishing earlier in the day in the Wind River canyon. The current at the Wind's mouth remained sufficient for the greased line method, but not fast enough for fishing a waked surface fly. That day still stands out, fishing a greased line with a low-water Lady Caroline — the long gradually building weight of a steelhead moving away with the fly and then "Fish on!" They were not large fish, all A-run specimens of 4-6 pounds, those landed all wild but for one hatchery. They were not Wind River fish at all, plainly differing in morphological and phenotypic characteristics. Between releases, I would sit for a moment and marvel at the last light leaving the water from hill on the west side of the river. I came to understand that these pods of steelhead, in the shadows of evening light, were gathered there to weather out the hot summer days and nights…and no one else knew about them but me (or at least so it seemed)… and it was up to me to keep them hidden.

Fishing can lead to a life that progresses from fishing for carp to increasingly letting go of fishing to better understand what fish need for their survival.

Several days later I returned to the mouth after doing a snorkel survey of the upper Wind with several Clark-Skamania Flyfishers. I didn't breathe a word about my intentions to anyone. The return to the river mouth was a virtual repeat of the earlier experience — this time using a low-water Silver Doctor. I returned no more. It was enough for memory and remains so.

Some years later, while working at a fly shop in downtown Portland, a California angler I had met several years before came in. He told me he and a contingency of his fellow flyfishers had decamped from fishing for Chinook at the mouth of California's Eel and Salmon rivers with their prams, to the mouth of the Little White Salmon (Drano Lake) where they were catching dozens of steelhead each day. "You ought to try what we found," he said. "No one else seems to know about how good the fly fishing is with all those fish moving in there. Everyone else is trolling with gear. We use flies of sizes 14-16 and sinking lines. Great sport." I just smiled and said I'd heard about that fishing. Nothing more.

By the late-1990s, an increasingly large group of fly anglers had converged on Drano Lake in their own lineup of prams. By that time I had gladly moved north, away from the discouragement of watching the hopes of the mid-1980s collapse into the reality of ESA listings resulting from the collapse of the Columbia salmon and steelhead during the 1990s. My memory of the fishing off the mouth of Wind River remained pure. I saw it as it could be at its best. I decided to leave it be, a bright pure memory, as something that would all too soon be discovered by many — exploited and corrupted — to the detriment of the fish, as well as to the fishing — miles and miles distant in eastern Washington and Oregon and deep into Idaho.

In mid-September of 2015 my son and I were invited to participate in one of the full-basin Wind River snorkel surveys that was to occur during a 2-day weekend. I had not seen Wind River for over 20 years. I could no longer snorkel survey, my 70-something body too brittle for such surveys. But I did look forward to seeing the full length of Wind River once more. I hiked for the first time into the Trapper Creek Wilderness Area, and also hiked into the McClellan Meadows headwaters of Wind River. I had not seen it since about 1968. I also drove down the winding grade to the mouth of Wind River where I first fished with my father in the fall of 1956. Just above the Bonneville back-

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waters, I caught my first adult steelhead on a fly in July 1961. And of course, I waded across the river to see once again the backwater entry where in 1986 I had found the greased line fishing Shangri-La.

Back at the White Salmon Washington Department of Fish and Wildlife office, where all snorkelers met the first morning to learn the survey logistics, I was invited to provide a historical background for the Wind River snorkel surveys which I had initiated in August of 1983 with two other willing volunteers – Randy Stetzer and Kerry Burkheimer (yes, that Burkheimer of CF Burkheimer rods). During those surveys, we had counted only 4 steelhead in 4 miles of river surveyed. WDFW personnel became part of our volunteer snorkel surveys in 1985, and in 1987 WDFW took over and expanded it into full-river surveys. I continued to be part of those surveys until moving away in 1996. The Wind River snorkel surveys remain the basic method by which it is now managed entirely for wild steelhead escapement and angling strictly regulated — only allowed for a month or so if sufficient escapement has been met in autumn as all rivers should be managed.

Fishing can lead to a life that ever progresses — from that of fishing for carp with rod propped in a forked stick in a Columbia River slough clogged with paper mill log rafts, to that of fishing for steelhead with surface flies, to that of increasingly letting go of fishing to better learn and understand what the fish I had come to pursue actually needed for their survival.

Bill Bakke (founder of Oregon Trout, Native Fish Society and now Science and Conservation Advisor with The Conservation Angler) showed me a way out of years of depression after I realized that I could not be a part of the University of Washington Fisheries School, a program that excluded conservation and was entirely focused on hatchery production. Bakke showed that fisheries science can continue to occur at the independent, voluntary, hobby level with complete purity of one's own findings. It was and remains my vision of what science should be — something pure outside the deadly clutch of bureaucracy and moneyed professionalism.

Tributary streams provide critical coldwater refugia along the Columbia River. Pictured here is the Underwood navigation and restoration site at the mouth of the While Salmon River. See article beginning on page 6 for more information. Photo Courtesy Yakama Nation Fisheries

Steelhead and salmon thrive in areas of coldwater refugia, and so do the angling opportinities. Photo by Bill McMillan

In 2020, the state of Oregon adopted measures to prohibit angling in cold water refugia in the Columbia River, thus giving passing steelhead and salmon a cool, safe resting area as they make their way east. As of this writing, the state of Washington has failed to do similarly, leaving my Wind River memories bitter-sweet. There had been some intuitive wisdom at the time to leave steelhead protected at the colder outflows of river and creek mouths in their vulnerability to wait out conditions for continued upriver migrations. Climate change at the time was still little considered except by a few lead scientists in that field. By the 1990s it became increasingly evident. Today there is no excuse for fishery mangers to deny its impacts on salmon and steelhead trying to adapt to an altered Columbia River — leaving it to the angling community to voluntarily restrict themselves to protect the fish of their interests or to otherwise deny doing so. The latter has never worked and is the very reason for the creation of fish and wildlife managing agencies.

Washington has yet to accept its management responsibility to protect salmon and steelhead increasingly confined for long periods in the Columbia's cold water refugia. Oregon has shown the way with a beginning that Bill Bakke well understood and advocated long ago.

Bill McMillan is a fisheries biologist, long-time wild fish advocate and Archivist for The Conservation Angler. To learn more about The Conservation Angler, visit their website at www.theconservationangler.com.

Don't Let Politics Drive Salmon and Steelhead into Extinction

By Rick Williams and Don Chapman

Salmon recovery efforts on the Columbia and Snake rivers over the last several decades have tried unsuccessfully to balance fish recovery with hydrosystem operation, energy production, and barge transportation among other services. These federal efforts represent a kind of 'salmon triage.' Medically, triage is the sorting and allocation of treatments to patients according to a system of priorities designed to maximize the number of survivors.

Issued by the U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power, the latest federal guidance for these efforts — the 2020 version of salmon triage — was released in March 2020 as a draft Environmental Impact Statement (EIS) for Columbia River system operations. Once again, the EIS selects a "Preferred Alternative" that clearly, although implicitly, abandons Idaho's iconic ESA-listed wild spring Chinook and steelhead as a lost cause. They are the patient chosen not to survive!

The federal agency alternative protects barge traffic, a sightseeing cruise company and slack-water recreation, but ignores the consensus of fishery scientists who overwhelmingly embrace another alternative that includes breaching of the four dams on the lower Snake River. The "Preferred Alternative" merely extends river management measures that have not worked to restore wild fish over the last 25 years. These failures have been well documented.

Wild Snake River salmon and steelhead listed under the provisions of the Endangered Species Act represent less than 2% of predevelopment numbers. Each species contains over two dozen unique sets of genes that resulted from thousands of years of adaptation. Are they worth saving? The federal agencies do not think so, saying "it would be too expensive."

The federal agencies will do anything to protect the four lower Snake River dams and have slanted the "Preferred Alternative" to do so. They have already sunk 17 billion dollars into failed fish mitigation. They are willing to watch wild salmon and steelhead runs drop into the dark night of extinction. We do not believe Idahoans or Americans in general, agree with this approach.

Restoration of wild fish requires smolt-to-adult returns (SARs) assessed at Lower Granite Dam of 2 to 4 percent (mean of 4%). That range has been attained only three times in the last two decades. Pristine spawning habitat in the Middle and South Fork Salmon rivers remains nearly unoccupied by adults. Twenty years of research has provided estimates of Middle Fork Salmon River spawner capacity of 48,000 fish. In 2019, only 322 Chinook returned to the Middle Fork of the Salmon River. Passage of wild spring/summer Chinook salmon destined for all tributaries upstream from Lower Granite Dam in 2019 totaled 4,723 fish. The trajectory of returns of wild spring Chinook and steelhead is towards extinction, not recovery.

The federal agencies will do anything to protect the four lower Snake River dams and have slanted the "Preferred Alternatve" to do so.

The federal agency "Preferred Alternative" is simply a politically driven triage decision for extinction of wild salmon and steelhead in Idaho.

Rick Williams is a research associate in the Department of Biology at the College of Idaho, and a scientific adviser to The Osprey. He has worked on Columbia River salmon recovery for 30 years. Don Chapman is a seminal scientist on Columbia River and Snake River salmon and steelhead issues and has worked on their interactions with the hydrosystem for more than 40 years.

Removing the four lower Snake River dams is considered key by scientists and conservationists to successfully recover Snake River salmon and steelhead. Photo by David G. Rigg, US Army Corps of Engineers

Oregon Legislators Pass Major Forestry Reform Law

Forestry practices on non-federal timberlands in Oregon will see significant improvement as the result of the passage of Senate Bill 1602, the Forest Aerial Spray Bill, on June 26, 2020, by the Oregon State Legislature. The bill sets the stage for forestry reforms along with a directive that the state establish a mediation process to create comprehensive protections for salmon streams on private and state timberlands. The bill is a result of months of negotiations between 13 conservation organizations and 13 timber companies.

The new law provides for larger buffers around homes, schools, small streams and drinking water intakes during aerial spraying operations. It allows people in areas scheduled for aerial spraying to be notified in advance, and sets up larger buffers for many salmon streams in the Rogue-Siskiyou region.

The new law's key components include:

• Requiring 50-foot buffer zones on all tributary and headwater streams where aerial spraying is prohibited.

• Expands no-spray buffer zones to 75 feet on fish-bearing streams and streams that provide drinking water.

• Spraying is prohibited for 300 feet around drinking water intakes.

• Expands no-spray zones around homes and schools from 60 feet to 300 feet.

• Requires 24-hour advance notice to people living in areas scheduled to be sprayed.

• Improves the accuracy of timber spraying notifications and allows other state agencies to access files for research purposes.

The recently-passed Forest Aerial Spray Bill will better protect Oregon salmon and steelhead streams. Photo by Jim Yuskavitch

• Requires the development of a Habitat Conservation Plan for protecting native fish and wildlife on non-federal timber lands.

Two Dams Removed in Washington State

Over the course of this summer, two dams in Washington State were removed, opening up 53 miles of habitat to salmon and steelhead.

With work beginning on June 13, 2020, the Middle Fork Nooksack Dam, on the Middle Fork Nooksack River, has been demolished, opening 16 miles of previously inaccessible upstream fish habitat.

Removal of the Middle Fork Nooksack Dam has opened 16 miles of previously inaccessible habitat to salmon and steelhead. Photo by April McEwen/American Rivers

Located in northwestern Washington and into British Columbia, the Nooksack River watershed consists of the North Fork, Middle Fork and South Fork. It encompasses more than 830 square miles and has over 1,000 miles of streams.

The dam was constructed in 1961 to provide drinking water for the city of Bellingham. However, it did not have a fish ladder, and blocked upstream passage for its native populations of bull trout, spring Chinook salmon and steelhead, all now listed as Threatened under the Federal Endangered Species Act. Removing the Middle Fork Nooksack Dam was also a high priority for NOAA Fisheries to help boost spring Chinook populations to benefit declining numbers of Southern Resident orcas. It is estimated that with the dam gone, Chinook salmon populations in the Nooksack River system should eventually increase by 30 percent.

In addition to removing the dam, the intake for providing drinking water is being relocated to negate the need for a dam, channel restoration is planned and diversions will be screened to keep fish from straying.

This was a cooperative project of the City of Bellingham, American Rivers, Nooksack Tribe, Lummi Nation and the Washington Department of Fish and Wildlife.

Also this summer, the Pilchuck Dam, on the Pilchuck River, a tributary of the Snohomish River, was removed, which

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opens 37 miles of upstream river habitat to salmon and steelhead.

Located near Granite Falls, the Pilchuck Dam was built in 1912 and was owned by the City of Snohomish. The dam's original purpose was to supply drinking water to the city. Eventually the City of Snohomish switched to the Sultan River for its drinking water, which is both a more reliable and less expensive source. In addition, the Pilchuk Dam was beginning to require frequent, expensive maintenance without providing any benefit to the city.

The new habitat now available on the upper river consists of much higher quality fish habitat than the reach below the dam. In addition, removing the Pilchuck Dam was a priority for the Southern Resident Orca Task Force to help increase runs of spring Chinook salmon.

Chehalis Dam Plan Put on Hold

Washington Governor Jay Inslee has paused work on an Environmental Impact Statement until January 2021 for a proposed dam on the Chehalis River asking instead that alternative solutions for flood control be investigated.

The Chehalis River Basin Flood Control Zone District has proposed construction of a 250-foot tall dam and temporary reservoir on the upper Chehalis River, near Pe Ell, Washington. The purpose of the development is to reduce flooding damage, which is sometimes severe enough to close Interstate 5, by storing floodwater in the reservoir, then slowly releasing it downstream. While the proposal would include fish passage facilities, the project has been opposed by conservationists, wild fish advocates and Native American tribes due to potential damage to wild salmon and steelhead populations, especially wild spring Chinook, and water quality.

Artist rendition of the proposed 250-foot-tall flood control dam on the Chehalis River in Washington. Illustration Courtesy Washington Department of Ecology

Governor Inslee is requesting a process and timeline for developing and evaluating an alternative to reducing flood damage in the basin without constructing a dam; continue to evaluate concerns about the flood reduction project's potential negative impacts and develop strategies to avoid, minimize or mitigate for these impacts and; make a recommendation by the end of September 2020 for the Governor and Washington State Legislature to consider in early 2021.

Fish Cannon Operational at Big Bar Slide

Fisheries managers from Fisheries and Oceans Canada (DFO) have been at work addressing the Big Bar landslide on a remote stretch of the Fraser River in British Columbia. The slide was discovered in June 2019, which dumped some 75,000 cubic meters of boulders and other debris into the river and formed a five-meter waterfall that created a significant obstacle to upstream migrating salmon. The slide is located about 375 kilometers from the river's mouth. Unfortunately, some salmon spawning runs had been ongoing for at least a month before the slide was discovered, causing a some mortality. DFO staff moved tens of thousands of fish around the blockage by truck and helicopter after the slide was discovered.

Passage portal construction at the Big Bar landslide site, Fraser River. Photo Courtesy Peter Kiewit Sons, ULC/Province of British Columbia. Attribution Non-Comercial 2.0 Generic License Converted to black and white

This summer, DFO constructed a fish ladder at the slide in conjunction with a pneumatic pump system consisting of six 160-meter tubes. The fish are attracted to the tubes, which are suspended along the canyon, by the fish ladder. Upon entering the tubes, the fish are "shot" through the tubes into the river above the slide. The contraption, manufactured by a Seattle company, has been dubbed "the fish cannon."

In addition, the Canadian government is contracting to have the slide cleared at a cost of more than $52 million.

Pebble Mine Surprise Development

This summer, the Environmental Protection Agency announced the results of its environmental review process for the proposed Pebble Mine at Alaska's Bristol Bay by Northern Dynasty that the mine would have no serious environmental impacts. Then, in early September, in a move that came as a great surprise to conservationists and wild fish advocates, the EPA notified Northern Dynasty that it now must

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first determine how to mitigate for "all direct and indirect" impacts to Bristol Bay watershed rivers.

The 20-square-mile mining complex proposed for development on land owned by the State of Alaska would extract copper, gold and molybdenum. The open pit mine would be over a mile long and up to 1,700 feet deep. The containment pond would be 10 square miles in size and hold up to 10 billion tons of mining waste. The commercial salmon fishery in Bristol Bay is valued at $1.5 billion and provides 14,000 jobs, along with supporting a major recreational fishery of about 30,000 fishing trips annually.

The Obama Administration vetoed the project in 2014 by invoking the federal government's authority under the Clean Water Act. In 2018, the Trump Administration reversed that decision and put the mine on a fast-track environmental review. Now, unexpectedly, another monkey wrench has been thrown into Northern Dynasty's plans.

However, mining interests have not given up and are expected to continue to push for the project's development.

ODFW Petitioned to End Beaver Trapping on Federal Lands in Oregon

Eight conservation groups have filed a petition asking the Oregon Fish and Wildlife Commission to permanently close commercial and recreational beaver trapping and hunting on the state's federally managed public lands and the waters that flow through them. Beavers are a furbearing species and can currently be legally trapped in Oregon.

The Oregon Fish and Wildlife Commission discussed this request in June as part of its review of the state's furbearer regulations. But it was rejected then as being outside the scope of that rulemaking notice. The current petition initiates a new rulemaking process for the Commission's consideration.

Beavers are an important keystone species that improve riparian habitat. Photo by Kent Miller, National Park Service

The groups note that federal and state agencies, watershed councils, utility companies, conservation groups, and private landowners spend countless hours and millions of dollars every year to restore Oregon's waterways, mimicking the natural behavior of beavers and say that ODFW's beaver trapping regulations are outdated and directly undermine the extensive, ongoing restoration of water resources and efforts to recover imperiled salmon populations.

Beavers are a keystone species and offer widely recognized ecological, economic, and social benefits, the petition notes. Beaver-created and maintained habitat improves water quality, decreases the impacts of floods, and restores natural water flows. This benefits humans and a wide variety of fish and wildlife, including highly endangered coho salmon.

The conservation groups argue that trapping has significant negative effects on beaver populations and their corresponding social, economic and ecological benefits. The petition's requested changes wouldn't affect beaver trapping elsewhere but would protect beaver populations on federally managed public lands in Oregon.

THE OSPREY

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