

University of Montana

## ScholarWorks at University of Montana

---

Graduate Student Theses, Dissertations, &  
Professional Papers

Graduate School

---

2013

### Salmon & Steelhead Hatcheries: Conservation or Condemnation?

Samuel Hunter Lungren  
*The University of Montana*

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

Let us know how access to this document benefits you.

---

#### Recommended Citation

Lungren, Samuel Hunter, "Salmon & Steelhead Hatcheries: Conservation or Condemnation?" (2013).  
*Graduate Student Theses, Dissertations, & Professional Papers*. 858.  
<https://scholarworks.umt.edu/etd/858>

This Professional Paper is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact [scholarworks@mso.umt.edu](mailto:scholarworks@mso.umt.edu).

SALMON & STEELHEAD HATCHERIES: CONSERVATION OR  
CONDEMNATION?

By

SAMUEL HUNTER LUNGREN

Bachelor of Arts, Gonzaga University, Spokane, Washington, 2011

Professional Paper

presented in partial fulfillment of the requirements  
for the degree of

Master of Arts in Environmental Science and Natural Resource Journalism

The University of Montana  
Missoula, MT

May 2013

Approved by:

Sandy Ross, Dean of The Graduate School  
Graduate School

Nadia White, Chair  
Journalism

Jeremy Lurgio  
Journalism

Lisa Eby  
Biological Sciences

## Salmon & Steelhead Hatcheries: Conservation or Condemnation?

Chairperson: Nadia White

Wild salmon and steelhead are as fundamental to the Pacific Northwest as evergreen trees and rain. For thousands of years ecosystems and economies have relied on the bountiful marine nutrients annually running inland from the Pacific Ocean in the form of large, silver fish. Even today, the chance to tangle with one of these wild gems is one of the greatest gifts the Northwest has to offer. Early settlers of the West Coast witnessed seemingly infinite salmon abundance. But as time passed and humans increasingly exploited both salmon and their ecosystems, they found out just how finite salmon really were. Instead of a cure for the problem, early managers chose a band-aid: salmon hatcheries. It now appears that band-aid may have worsened the affliction. There are now nearly 250 salmon hatchery facilities on the West Coast producing hundreds of millions of juvenile fish every year. A debate over the efficiency and wisdom of this practice has been simmering for nearly a century. A growing body of scientific research indicates that hatcheries may have detrimental effects on the remaining wild salmon and steelhead. Only recently have management agencies begun to concede. Big changes are now afoot. The future of salmon hatcheries is as uncertain, as the future of the salmon themselves.

This piece explores the West Coast's complicated social and political relationship with salmon hatcheries through the theme of fathers and sons fishing together. The stories I tell illustrate the arguments for continuing hatchery supplementation, the arguments for improving it and the arguments for stopping it.

**O**n a frigid January morning, my father and I drove out to the Northwestern-most thumb of the contiguous United States to fish for steelhead in the glacial Hoh River. The Olympic Mountains stood proud and white against the Pacific as we passed through Forks, Wash.. Dozens of black and tan Roosevelt elk lay crouched together in a hayfield. There are more favorable seasons to visit the Olympic Peninsula, but steelhead prefer the dead of winter for their spawning run out of the North Pacific and into the temperate rainforest.

A snap decision led Dad and me down a logging road that ended bluntly at the edge of the swift, jade-hued river. We started fishing, working our way downstream through a churning rock garden to a slower stretch of water draped by overhanging cedars. A crust of ice fringed the shoreline where the sun had not yet reached.

Dedicated anglers like us brave all but the most horrific weather for steelhead – the pursuit of which is the only fish with its own verb: steelheading. Beside the catchiness of the name, I imagine their incredibly transient, rugged, powerful and challenging nature has set steelhead apart from all others, even from the general category of “fishing.” It is not uncommon to go days on end without a bite. But when it comes, the world can change.

I struck into a feisty little steelhead that was sitting behind a submerged boulder. After a brief, spirited fight, we got a hold of the fish in the shallows and my dad and I knelt to inspect our catch. At a stunted 24 inches and four pounds, the male sat in the low end of the steelhead spectrum for both size and beauty. A crooked dorsal fin and healed scar where the adipose fin had been clipped off distinguished its fish hatchery origin. My dad joked that hatchery fish show the downside of arranged marriages then delivered the coup de grâce with a rock.

I placed my fish in the truck bed on our way back upstream. Refrigeration isn't crucial when the air temperature is flirting with freezing. Further up the river, we found a long, deep stretch of river a friend had shown us the year before. Since then, a wide logjam had appeared on the inside bend, taking up most of the bank. These coastal, flood-prone rivers can change drastically from year to year.

Almost immediately upon reaching the top of the pool, I set the hook on a much more significant fish. A tail roughly the size and shape of a broom fan churned the surface. Line ripped off my reel as a large steelhead headed as far away from me as he could get.

I yelled to my dad downstream and tried to put on the brakes but the fish couldn't be stopped. I tried not to get my hopes up. Still fighting, I climbed back over the logjam and down to the end of the run. After a tenuous 20 minutes, Dad grabbed the fish just behind its thick, intact adipose fin. Gleaming like chainmail and 36 inches long, we figured he probably weighed 18 pounds. It certainly was the biggest steelhead of my life. A couple pictures later, I let go and my trophy flashed, fins erect, back into the emerald depths.

**T**he difference between a hatchery-born and a wild steelhead has never been so strikingly apparent as that day on the Hoh. Research studies have shown that fish raised

in hatcheries are often smaller and less fit than their native counterparts and those findings seemed validated by the two utterly dissimilar fish. Both grew up in the same river, but one came back a dumpy runt and the other a shining specimen. The difference illustrates the turbulent scientific and social history of the West Coast's ubiquitous system of salmon hatcheries.

It's no secret that salmon have steadily been disappearing from the Pacific Northwest. A century and a half of overfishing, logging, mining, grazing, irrigating, polluting and dam building has left the once innumerable salmon stocks a shadow of their former abundance. Residents of the West Coast noticed declining runs as far back as the late 19<sup>th</sup> century. But even with the glaring example of the nearly extinct Atlantic salmon on the East Coast, managers were hesitant to regulate the booming new economy fueled by salmon. And in the still-Wild West they had little power to do so.

New techniques for fish breeding were being developed right around the time people started to notice the salmon disappearing. Records of artificial fish propagation date back thousands of years in China and various experiments were conducted through the ages in Europe, but the practice as we know it today was invented in the 1840s by two uneducated French fishermen, Joseph Remy and M. Gehin. Americans used those techniques with trout and Atlantic salmon production in New England with moderate success over the next few decades. In 1872, the newly created U.S. Commission on Fish and Fisheries built its first West Coast hatchery, a small facility on California's McCloud River which demonstrated that Pacific salmon could be artificially propagated. Three years later, Spencer Baird, the newly appointed head of the commission, took this modest, experimental success as a bellwether for the future of Pacific salmon management.

Baird wrote to the Oregon legislature, advising lawmakers against the passage of "protective, laws, which cannot be enforced except at very great expense and with much ill feeling." Instead, he advised that, "Measures be taken, either by the joint efforts of the States and Territories interested or by the United States, for the immediate establishment of a hatching establishment on the Columbia River, and the initiation during the present year of the method of artificial hatching of these fish."

So, hatcheries became the panacea not only for reduced salmon abundance, but also for habitat destruction and loss, both through mitigation and conservation of imperiled genetic material. A century later, fisheries policy has started to drift away from hatcheries.

Since the 19<sup>th</sup> century scientists have been skeptical of the efficiency, logic and effects of artificial supplementation. Management agencies are starting to catch up. With wild populations of steelhead and all salmon species except pinks currently listed as threatened or endangered in at least one region in Washington State, it is obvious that hatcheries didn't solve the problem. Some people even believe that these facilities are actually responsible for further eroding many wild salmon stocks. State agencies now concede this may be true in some cases.

Last year, for the first time in Washington history, the state closed a popular hatchery for the express purpose of protecting wild fish. Washington Department of Fish & Wildlife shut down the Snider Creek Hatchery and designated the Sol Duc River as its first "Wild

Steelhead Management Zone.” Even more recently, Oregon suspended the take of wild steelhead to use for hatchery broodstock in five major rivers. These two acts mark a watershed shift in the trajectory of salmon management.

Washington State has also recently undertaken the enormous process of updating and improving its hatcheries based on scientific recommendations and has ceased planting hatchery fish in several small streams. The newly-undammed Elwha River has become a battleground for this debate, as big decisions are made over the proper manner of restoring salmon to more than 70 miles of pristine habitat that had been walled behind a dam for 100 years. Those decisions will play heavily in the new era of dam removal, perhaps with rivers like the Sandy, Rogue, White Salmon and potentially the Klamath, Trinity and Snake.

“It occurred to me that there is a fundamental paradox that lies at the heart of recreational fishing today,” author and biologist Anders Halverson said. “Specifically, like a lot of anglers, I view fishing as a way to escape civilization and reconnect with the natural world. And yet so many of the fish that we catch today are very much a product of our industrial society.”

This debate now centers on whether governments should keep trying to save salmon and steelhead with hatcheries. The science says one thing, the economics another, and the public covers a spectrum of opinions on artificial propagation, from catch-and-release fly fishermen obsessed with wild fish, to conventional gear meat fishermen who would see hatchery plants doubled. Many people, especially fishing guides and commercial fishermen, simply wonder whether there would be enough salmon left to catch if the hatcheries went away. The future of salmon hatcheries is as uncertain as the future of the salmon themselves.

**O**n a misty March evening, Matt Heil and his son Brian walked the thin strip of land between two wide concrete ponds snaking off into the distance. Both wore camouflaged baseball caps, one bearing a Seattle Seahawks logo and the other reading Hunter’s Specialties.

Matt works for the Washington Department of Fish & Wildlife managing a steelhead hatchery on the upper Skykomish River, about an hour east of Seattle. He lives on-site with his wife Tanya and their 13-year-old son Brian.

Washington State contains 146 hatcheries, more than any other state in the west. In all, about 240 facilities in Washington, Oregon, California, Idaho, Alaska and British Columbia propagate steelhead and all five species of Pacific salmon.

At the Reiter Ponds Steelhead Hatchery where Matt works, mesh is draped like a circus tent above the ponds. The surface of the water continued to dapple, though it had briefly stopped raining. Brian took a scoop of feed out of a drum and flung it across the pond. The water boiled everywhere the food pellets hit, as hundreds of juvenile steelhead, none more than two inches long, frenzied for the food.

“We’ll release these guys in May,” Matt said. “It’s about a year and a half from the time they’re spawned. Then they’ll spend two years out in saltwater, sometimes three, the big ones stay out three years.”

Steelhead and salmon are anadromous, meaning they are born in freshwater, migrate to the ocean, grow big in the bountiful North Pacific, then return to freshwater to spawn – usually to the same stretch of river in which they were born. Steelhead are not a true salmon, but are similar enough in size, shape and life history to be lumped in the same group. They are actually rainbow trout that have evolved an anadromous lifecycle. A primary difference is salmon die after spawning, completing the cycle and providing crucial nutrients for their progeny and the ecosystem. Steelhead do not necessarily die, and often go back out to the ocean for another tour.

Every December and January, then June and July, adult hatchery steelhead run back to Reiter in droves. And so do their devotees. When the fish are in, it is not uncommon to see 100 anglers lining the banks of the Skykomish near the hatchery. It is still challenging fishing, but in the right conditions it is quite possible to catch and kill a limit of two hatchery fish. This is highly appealing to some anglers. Steelheading is objectively difficult, nearly impossible in many people’s eyes. A huge hatchery run of steelhead returning to a predictable location simplifies the process enormously. These facilities give anglers a fighting chance at landing a prized steelhead they can bring home for dinner. Native steelhead are more difficult to find, more difficult to land and are illegal to kill in most places. It is easy to see why many fishermen like hatcheries.

Brian, a skinny kid with messy blond hair, plays wide receiver for his seventh grade football team but his true love is fishing. Just like dad.

“I really like living next to rivers without having to have a car or ride a bus to go to a river to go fishing. I think I started fishing for steelhead around age five, or four,” Brian said, looking to his father.

“He’s been fishing ever since he was four months old,” Matt said. “I used to backpack him. He’s been places that most people have never seen. He caught his first steelhead when he was six, which beats me by a long shot.”

A boy’s first steelhead is a rite of passage for Pacific Northwest outdoorsmen on par with losing one’s virginity. Brian was lucky enough to spend much of his childhood living on Washington’s Olympic Peninsula, one of the last remaining strongholds of large, wild steelhead and salmon.

“He’s spoiled. He lived almost his whole life on the river,” Matt said. “Him being brought up on the West End, he was really spoiled with some really good fishing.”

Still, Brian fishes plenty. Lately, Matt said, fishing and football have actually been a problem. He told Brian he can’t go on trips to the Olympic Peninsula until he gets his grades back up.

Grades may become more important down the line for Brian. After high school, he hopes to get into the fisheries school at the University of Alaska Southeast.

“If I do good in school, I’ll go on hopefully to be like my dad and run a hatchery like this,” Brian said. “I find it really cool to see the fish that you raised being caught by other people and feeding them.”

After feeding the fish, Matt and Brian go into a shed up by the house. The inside of the incubation building is like a miniature water park with pipes running every which way around the room and water spraying out into buckets. Matt lifts the foam cover off one of the buckets, dips his hand in then lifts it out, his palm full of pea-sized, peach-orange steelhead eggs. Tiny eyes peer through the translucent casings.

In mid-January, seven men in various green WDFW jackets and hats joined Matt at Reiter Ponds to create this next generation of Skykomish summer-run hatchery steelhead, in assembly line fashion.

“Male!” *Whack. Flop.* “Female!” *Whack. Flop.* “Female!”

Three hatchery employees stood thigh-deep in water and thrashing steelhead, brilliant green and red fish that had been maturing in the holding pond for several months. Having corralled them in one corner, two of the men scooped several at a time then would pull one out of the net, rub gently along its belly to check for developed eggs and call out the sex of the fish to Heil standing above. Then they held the fish against a railing for the third man to whack it over the head with a lead pipe. Another hatchery technician held out another net for the dead, bug-eyed fish and hoisted them out of the holding pond and on to a table.

Up above, the dead steelhead were sorted by sex. Another worker grabbed one female at a time, inserted a hooked knife at the anus and sliced upward toward the gills, spilling out bright orange eggs, known as roe, into a small bucket held by a Fish and Wildlife Health Specialist.

Most of the men were in their 20s and 30s. They bantered back and forth about wives, newborn children, hunting and fishing through the whacking, slicing, squeezing and fish flying through the air. So practiced is their routine that they regularly managed to poke fun at the new kid.

With all the fish out of the pond, the three men climbed back out and set about helping Heil with the male steelhead. One man holding a small plastic cup, the other squeezed the fish’s belly and slid down toward the anus, squirting the white sperm, called milt, into the cup.

On the tailgate of a pick-up, the fish and wildlife health specialist took kidney and spleen samples from a portion of the fish. The rest of the men cleaned up the area and tossed all the steelhead into a tub in the back of the truck labeled “Food Bank.”

“Now we get to see the sex part of all this sex and violence,” Bruce Ault, one of the WDFW employees, said with a grin.

Up by the incubation building, the men set about conceiving steelhead. What has been done for millions of years by female and male sweeping gravel out of a streambed then depositing roe and milt is now accomplished in white plastic buckets.

“This is state-funded, so you have to be resourceful to make things work,” Will Irwin said. “But it makes you take pride in what you do.”



Irwin and another technician dumped milt into each bucket of roe and swirled them in a circular motion, fertilizing the eggs. Then they combined a few buckets into one larger one, added more milt cups and swirled again, making sure every egg was fertilized.

“We try to be equal opportunity spawners,” Heil joked.

With Heil as foreman, the entire breeding process lasted just over two hours.

From that point, they left the fertilized eggs to develop under running water in a variety of apparatuses in the incubation building. In March, Matt will drive them down to the nearby Wallace River Hatchery where the young steelhead will hatch soon after. Once their yolks have been absorbed, they will go out into the ponds, first at Wallace then back up at Reiter in September. Matt and Brian will then feed the smolts until the next May, then release them into the Skykomish.

By WDFW’s own estimate, more than 75 percent of the salmon caught in Puget Sound and 90 percent of the salmon caught in the Columbia River originate from hatcheries, as do 88 percent of all steelhead. According to a published budget, WDFW spends \$30.8 million annually on fish production – a fifth of the department’s expenditures – to make a total of 163 million salmon, steelhead, trout, bass, perch and walleye. They clip adipose fins off 95 million coho, chinook and steelhead. The department spends \$21.9 million every year on native fish recovery, for such projects as culvert construction and stream restoration.

Matt annually plants about 190,000 summer-run and 145,000 winter-run steelhead smolts. Fish survival is nearly always a strength-in-numbers game and steelhead are no exception. Of those hundreds of thousands of juveniles, Heil will be lucky to have 3,000 summer-runs and 1,200 winter-runs return to Reiter as adults – less than one percent of the individuals released. But that is enough sometimes.

“I went down midmorning on opening morning last year and some of the old timers were saying it was the best fishing at Reiter in 20 years,” Heil said. “There was fish laying on the bank everywhere you looked and I guess there was limits that had already walked out before I got down there.”

That means a great deal to both of the Heil men.

“There is definitely a sense of pride when the fish come back and I know I had a part in it,” Matt said. “My goal is to always put out the best fish that I can and do everything I can and know how to make it the best return and the highest quality fish. And I enjoy interacting with the other fishermen, that’s a big part of the job too. I get to be around the steelhead club, which is a group all to their own.”

Matt, and the other hatcheries employees helping him with the spawning, believe that hatcheries are imperative to the survival of salmon and steelhead in Washington.

“If there were no hatchery steelhead, then there’s no steelhead fisheries,” Matt said. “There might be some opportunity, say on the coastal rivers, for a little while, until that would eventually go away too. The hatchery fish are vital.”

Matt admits that the system isn’t perfect. He knows the hatchery fish probably do interact with what’s left of the native steelhead in the Skykomish system. In the future, he hopes

to integrate some native genetics into his broodstock – a practice recently halted by the State of Oregon.

“We are working toward finding a balance between (hatcheries and) bringing back the wild fish that are getting away from us,” he said. “But at the same time we are trying to keep it where fathers and sons can go out and fish and be able to take something home.”

**B**earded biologist and wild fish advocate Bill McMillan lives in Concrete, Wash. on the banks of the Skagit River, two watersheds and fifty miles north of the Skykomish. His son John is also a salmon biologist and, while he has not lived at home in a long time, the two still fly fish together every chance they get.

“When we would go to the Deschutes River I would cut him a little willow stick and put a piece of leader on the end with a fly with the hook cut off, starting when he was about two,” Bill said. “He would still be in diapers actually and he would be out wading around on the sand bar in front of where we used to camp. He’d be occupied out there all day long casting this little switch, anticipating doing the same thing I was doing.”

Just like Matt Heil with Brian, Bill used to backpack John, as well as his daughter Melody, when he was fishing, even in the nasty Western Washington winters.

“I immediately started taking my kids out in snowstorms where they would have to endure cold early on (to) learn that sort of toughness that’s needed to really enjoy the outdoors,” Bill said.

Over a 40-year career and a lifetime of exceptionally avid salmon and steelhead fishing (he used to fish over 300 days per year,) Bill has an almost unmatched familiarity with and knowledge of salmon and steelhead. In the early ‘80s he popularized the technique of snorkeling down rivers as a method for taking fish surveys. Even as a pre-teen, John was right there with him. Now both men have logged several hundred river miles snorkeling, often in below freezing temperatures, observing and counting salmon and steelhead. Bill calls it “extreme biology.”

The McMillans recently co-authored a coffee table-style book entitled “May the Rivers Never Sleep” in tribute to famed fish advocate and writer Roderick Haig-Brown’s novel, “A River Never Sleeps.” Both works play on the theme of rivers as calendars for life in the Pacific Northwest. The McMillan’s book is packed with eye-catching photography of fish and rivers, both from above and below the water’s surface.

“I just love to study the fish, I like to be in the water,” John said. “Tell you the truth, angling has become a little less important over the last 10 years and snorkeling is starting to take a little more of a precedence. Eventually, you catch a lot of fish and it becomes not as exciting to catch fish anymore. It’s more fun to be underwater and see them and get a photo.”

Their exhaustive study has given them vital insight into the relationship between hatchery fish and their wild kin. For decades, Bill has been one of the most outspoken critics of salmon and steelhead hatcheries. John agrees with his father on many points, but he said

hatcheries seem to have a more significant effect on steelhead, chinook and Atlantic salmon than the other four species of Pacific salmon.

“We first started hatcheries 135 years ago on the Pacific Coast down in the Sacramento River system,” Bill said. “If they had worked, we should see at some point where numbers of fish are not declining.”

He said that the initial promise of hatcheries was that they would provide salmon runs so bountifully, managers would not need to worry about declines in natural production. Bill said this was an empty promise.

“At this point in time, people keep saying, ‘Well, it’s loss of habitat. We have to have hatcheries,’” he said. “Well, one of the main reasons we continue to have lost habitat is we keep believing in the myth that we can provide developers with the option for mitigating for lost habitat through a hatchery. So hatcheries are actually the primary reason we continue to lose habitat.”

Not only have hatcheries ultimately failed to increase salmon abundance, but Bill believes hatchery programs have actually become a direct detriment to wild fish recovery. Well practiced in his arguments, he gave several reasons why hatchery salmon and steelhead are detrimental to their native counterparts.

The primary issue Bill and many others in the anti-hatchery camp cite is spawning interactions between hatchery and native fish. As illustrated by the two male steelhead in the Hoh, the differences between the two types of fish are often striking. Bill said the cumulative effect of artificial spawning, even after only one generation, invariably leads to smaller, weaker, inbred hatchery salmon. Many people refer to hatchery steelhead as “cookie cutters” because they often look so much alike.

John explained this well, referring to a research study by scientists at Oregon State University entitled “Fitness of hatchery-reared salmonids in the wild.” John said this study, and several others, suggests that a hatchery environment selects for specific traits such as fast metabolism and aggression. However, those same traits are much less suited to life in the wild.

“It’s kind of like domestication,” John said. “We’re selecting for animals that do really well with a bunch of food and very low predation.”

Though some of those hatchery fish do survive, if they return and spawn naturally as many do, the hatchery-adapted traits will not suit their offspring born in the wild. This compounds in every generation of hatchery breeding.

“I think in places where you still have a lot of wild fish, the problem is the hatchery fish come in and interbreed with the wild fish and will pass on those maladaptive genetics,” John said. “And the proportion of hatchery genes in that fish that becomes wild appear to be enough to make it not survive well. And those fish end up competing with the wild fish for food.”

Hatchery fish survive to spawn more than one might expect, and Bill said they sometimes take a shortcut. Shockingly large percentages of salmon and especially steelhead, when released as juveniles from a hatchery, will not travel to sea as they are supposed to.

Rather, Bill said, they remain in the river, growing larger, sometimes eating wild smolts and often developing a “precocious male,” “residualized” or “sneaker” life history.

“As soon as they are released, they are ready to spawn. And these small fish are extremely effective at fertilizing females,” Bill said. “Residualism rates can range from as high as 45 percent and as low as one percent. So if you are talking about a million fish and 45 percent then you have a real problem.”

By Bill’s reckoning, sneaker hatchery males in the Skagit annually outnumber the adult male native steelhead returning to the river.

“Their physiological clock essentially tells them to start maturing because food is really plentiful and they are growing really fast and there is no need to go to saltwater if everything is this good in freshwater,” John said. “I think the smallest rainbow I’ve seen mature is probably 3 ½ inches and I’ve seen them spawning with 12 pound steelhead.”

“It’s a problem with virtually all (salmon) species,” Bill said.

Most hatcheries release several hundred thousand smolt every year, often all at the same time. You’d better believe plenty of piscivores are paying attention.

“So if you’re putting out, for instance, in the Skagit, 500,000 hatchery steelhead smolts, all in a two- to three-week window, pretty soon predators realize, ‘Whoa, it’s going,’” Bill said. “It’s a predator’s haven. Here’s a critter that has no clue about how to get away from you and you just open up your mouth and go through them. And wild fish are going to be mixed with them and they are going to be taken equally. I suspect in a lot of ways this may singularly be the biggest problem that explains much of the trend on the Skagit that shows that continuous decline over time.”

Caspian terns and cormorants, northern pikeminnow and dolly varden have all learned to exploit hatchery smolt releases. Many species have developed migration patterns to coincide with these outmigrations. And that is not the only time wild fish get killed right along with hatchery fish.

The main reason there are hatcheries in the first place is to provide more fish for people to catch, ostensibly taking the pressure off the beleaguered wild stocks. Bill said this has not been the case.

“We have to kill more because if we don’t kill the hatchery ones they are going to spawn with the wild ones,” Bill said. “The problem is, when you elevate the harvest level to take out the hatchery fish, the wild fish are mixed with them.”

Most commercial salmon fishing, at least in Washington, has traditionally been done with gillnets or purse seines. Gillnets are made of clear monofilament with mesh approximately the size of a salmon’s head. The fish swim into the net and snare their gills in the mesh, effectively killing them. Any salmon that becomes tangled will die. Purse seining involves two boats encircling a long, deep net around a school of traveling salmon then cinching the bottom of the net, like a coin purse. The fish don’t typically die until being brought aboard and dumped into the hold.

Gillnetting, and purse seining to a lesser degree, are considered non-selective fisheries – meaning the target species are not the only fish that get caught. Commercial fishermen at Washington river mouths are mostly targeting either hatchery or healthy wild runs.

Unfortunately, salmon don't take turns running, so endangered wild fish get swept up in the process.

Bill said that rules have been implemented to minimize the impacts of sportfishing on wild fish, such as targeting only hatchery fish and catch-and-release. He said such measures are impossible with non-selective gillnets.

"In fact, oftentimes wild fish average a somewhat larger size and are more inclined to be caught in gillnets than hatchery fish," Bill said.

As the detrimental effects of hatchery-wild spawning interactions have come to light over the years, managers have responded by trying to segregate many hatchery and wild fish runs. They have selected for and created hatchery fish that all come back around the same time, generally before the wild contingent, focusing commercial fishing attention on those times of year. The problem, Bill said, is that native fish used to come back at those times. A lot of them, actually.

"We've almost completely lost that early life history component," Bill said. "There's still a few and it's still possible that we can recover those populations if we can protect them and get rid of hatchery plants now."

And that is exactly the big question in the back of most angler's minds when thinking about the future of hatcheries: If hatchery planting were to end, would there be any fish to catch?

To this hypothetical, Bill responded with a hard "Yes." John agreed cautiously.

Bill said that discontinuing hatchery plants in a river system has been seen to increase native fish abundance. He points to his pet project, Southwest Washington's Wind River.

After years of declining wild steelhead stocks and political haggling, in 1998 WDFW decided to discontinue planting smolts in the Wind. Wild steelhead numbers have increased every year since. A study published in Transactions of the American Fisheries Society by Kathryn Kostow showed the same trend on Oregon's Clackamas River.

"We found that large releases of hatchery smolts contributed to the decrease in wild adult productivity," Kostow wrote. "The number of smolts and adults in the wild winter steelhead population declined until critically low levels were reached in the 1990s. Hatchery fish were removed from the system in 2000, and early results indicate that the declining trends have reversed."

It has always taken a long time for public opinion and policy to catch up with science. But the McMillans are hopeful that someday everyone else will recognize the enormous economic and ecological costs the men see hatcheries having on native fish. Bill said that every hatchery steelhead landed in Washington costs the taxpayers around \$100, and upward of \$60,000 at some facilities.

"I don't know how long it will be until we see the light on hatcheries, but I think in the next decade there's going to be a lot more (research) to come up," John said. "I really think people are going to see how much money it costs to produce hatchery fish and how little return we get back. Education could sure use money."

“Wild fish have been reduced by about two-thirds due to hatchery interactions. If we had a similar reduction over time of putting effluent into a system we would call it toxic,” Bill said.

**A**n anyone retreating to the north from the wilds of the Hoh River must cross its damaged neighbor, the Elwha River. Robert Elofson, a member of Lower Elwha Klallam Native American Tribe, grew up at the mouth of the Elwha. He fished the depleted stream with his son Jason and joined the successful fight to remove the strangle-hold of two hydroelectric dams. Now, he is overseeing one of the largest river restoration efforts ever attempted. Hatchery supplementation features prominently in his toolbox.

Frontier entrepreneur Thomas Aldwell acquired the title to the Elwha Gorge in 1894 and began construction of the Elwha Dam in 1910 to supply electricity to the pulp and lumber mills of nearby Port Angeles. The dam was completed in 1914. Unfortunately, Aldwell provided no means for the bountiful salmon runs that used to migrate 70 miles inland on the Elwha to pass the 105-foot-tall structure. That dam lay only five river miles from the Straits of Juan de Fuca and the Pacific Ocean. A complete barrier across the river was highly illegal, even 100 years ago.

In 1890, Washington’s very first legislature enacted a law requiring fish ladders or other such measures on dams “wherever food fish are wont to ascend.” In one of the state’s most pitiful cases of government acquiescence to industry, Governor Ernest Lister convinced the legislature to change the law after the dam was completed, allowing a deal in which Aldwell would construct a hatchery in lieu of ladders.

The hatchery was built in 1915 and abandoned just seven years later in 1922. The remaining salmon and steelhead in the Elwha – and the dozens of other rivers affected by Lister’s policy reversal – were left to fend for themselves. Another dam was built in 1925 at Elwha river mile 13.6. No salmon could get that far anymore anyway, so the 210-foot-tall Glines Canyon Dam involved neither fish ladder nor hatchery.

Fish populations in the Elwha were annihilated. The bountiful sockeye salmon immediately were extirpated after their spawning grounds in Lake Sutherland were no longer accessible. An endemic strain of Elwha chinook salmon called tyee, once known to grow as large as 100 pounds, were all but eliminated. Two other hatcheries were built over the decades, but neither could replace the natural spawning habitat now sealed off upriver.

The Lower Elwha clan of the Klallam Tribe has resided at the mouth of the Elwha River since time immemorial. A fishing people, they were hamstrung by the dams in the first place. Yet, they kept fishing, and kept fighting for the dams to come down.

Elofson is the river restoration director for the Lower Elwha Klallam Tribe. He received a bachelor’s degree in physics from Western Washington University and another in biology from University of Washington. Following college, in 1979, he started commercial fishing for salmon, steelhead, halibut, shrimp and Dungeness crab, after the 1974 Boldt Decision reaffirmed native fishing rights in the State of Washington. In 1997, his tribe

won shellfish rights and he got into SCUBA diving for sea cucumbers, sea urchins and the giant clams called geoducks.

From the fancy new Klallam Tribal Center, past the boarded up fireworks stands and an old gillnetting boat covered in blackberry vines, the mountains of Canada's Vancouver Island were visible across the Straits of Juan de Fuca. A hat reading "We Want Our Dammed Salmon Back" sat on Elofson's office desk as he talked about his people being steamrolled 100 years ago.

"Basically, you're talking about a time when poor people had very little say in things and minority poor people less than anybody. We were an uneducated poor minority so we had little or no say," Elofson said. "I don't think he (Aldwell) even told us. I think some of the Klallams might have even participated in clearing the land in the Aldwell (Reservoir) area, not knowing what the plan was."

"There's never been a time that we thought the dams being there would do anything but damage to the fish runs in the Elwha."

When the tribe received federal recognition in 1981, they began petitioning Congress for removal of the dams. Near the same time, a Federal Energy Regulatory Commission inspection found that, under certain river conditions, the dams could be prone to collapse. Finally, there was a reason to take them down.

The Elwha River Ecosystem and Fisheries Restoration Act was passed by Congress and signed into law by President George H.W. Bush in 1992. It directed the owners of the dams to tender title and authorized the Secretary of the Interior to pay a specified sum then commence with restoring the river. A framed copy of the act hangs on the wall in Elofson's office.

Deconstruction crews broke ground in September of 2011 and both dams are expected to be completely gone by 2014.

Robert's son Jason Hunter dropped out of the reservation school in 10th grade to fish with his dad. They still regularly work together almost 20 years later, though Jason made Robert quit SCUBA diving after a minor heart attack a few years ago.

"I spent too much time fishing when my kids were kids," Robert said. "I was too focused on making sure I made every opening and doing well in the fishery. He (Jason) is concentrating much more on spending more time with his kids."

Jason now has three young children of his own. He said his 7-year-old son Tyler has already expressed interest in becoming a commercial fisherman.

"They're a little young to take out fishing but I've taken them on the boat to drive around a couple times. Yeah, they like being out on the water," Jason said. "Fishing's great, but I'll have them do school first. But if that falls through there's always fishing."

Fishing, and the sharing of the catch, is an essential part of the tribe's cultural heritage, Jason said.

"My dad, and a lot of the other divers and fishermen, donate fish and crab and whatever into the tribal feasts we have," Jason said. "I do it sometimes but not quite as much as the elder guys. They feed everyone salmon and have a feast of all different foods."

The Klallams recently held an especially happy feast in celebration of the removal of the Elwha dams.

“We’ve got a lot of tribal members that need to fish the river. They lived off it for years,” Jason said. “Half our tribe started out on the river. My dad started out on the river. It’s why he bought his first boat. It’s just been going downhill and downhill every year ever since they’ve had the dam. I’m hoping for a good return.”

Robert and Jason both mentioned an old photograph of a Klallam holding an unimaginably large salmon – one of the famed tyee chinook.

“They say there were 100 pounders out of the river but I couldn’t picture it,” Jason said. “But I saw that picture of a tribal elder holding a salmon over his shoulder with the tail still dragging on the ground and was like, ‘Oh, it’s possible.’ That guy he was probably like 5 feet 2, so you’re talking about a 6-foot salmon.”

“The kings (chinook salmon), I’ve seen ‘em up to 60 pounds still,” Robert said. “The heaviest they weighed before the river was dammed was 99 pounds. With the river open again I think that you would get up there at least in the 70 to 80 pound range.”

However, getting such exceptional salmon to return once again is not as simple as just pulling out the dams. Everyone involved wants to see the salmon runs restored to the Elwha, but there is a great deal of disagreement as to how to accomplish that goal. The federal government built the tribe a \$16 million hatchery on their reservation at the mouth of the river, hoping to jump-start wild salmon recovery by planting hatchery fish.

Robert said hatchery supplementation is imperative for salmon recovery because of the high silt levels in the river. As the dam removal allows 100 years of sediment to wash away, it may kill many of the naturally returning fish.

“First of all, its necessary because of the turbidity levels. We have to have them to protect the fish, unless you are going to start from having the stocks 100 percent wiped out and just have strays come in and restore it,” Robert said. “So in the Elwha, at least for that length of time, you have to have hatchery fish.”

Also, nothing exists in a vacuum. Robert’s charge is to restore the entire river ecosystem. He directs a nationally acclaimed river restoration team that is planting native flora in the areas formerly submerged in reservoirs. In such coastal ecosystems, dead salmon play as large a role as live ones.

“You are talking about a river that has been closed down for 100 years,” Robert said. “To restore the ecosystem you are going to have to provide the food and nutrients upstream. The sooner you provide the food and nutrients for the ecosystem to start, the sooner it’s going to recover. So if those are hatchery fish going up in those years, I think they would be a help restoring that whole ecosystem that’s required for the salmon.”

That conclusion has been highly contested.

“It’s a delicate situation when you are brought into federal court and accused breaking federal law as I and the hatchery manager and our natural resources director were,” Robert said bitterly about charges that the plan to use hatchery fish in the Elwah violated the Endangered Species Act. “It was dismissed, but still it took a lot of time and effort on our attorney’s part.”



Bill McMillan helped found the Wild Fish Conservancy in 1989 and Kurt Beardslee now heads the group in Duval, Wash. They believe the preponderance of the scientific literature says that hatcheries have and continue to cause significant problems for wild fish. That's why their organization filed an injunction against the Lower Elwha Klallam Tribe to prevent them from planting out-of-basin hatchery steelhead in the Elwha.

"I think our treaties are only implemented if we are going in a direction that is going to keep our resources around in perpetuity," Beardslee said. "Hence our litigation on the Elwha. We really believe that doing something that could destroy (wild fish) or significantly reduce the likelihood of recovery of the Elwha would be in violation of the treaty obligations for the public as well as the tribes."

Only a few months after the lower dam on the Elwha was out of the way, John McMillan discovered a 35-inch wild steelhead in the Little River, a tributary that joins the Elwha upstream from the former dam site. The fish traveled there to recolonize the stream on its own volition.

The Wild Fish Conservancy, as well as co-signers The Conservation Angler, Federation of Fly Fishers, and the Wild Steelhead Coalition would rather the Elwha recover naturally, with wild Elwha-strain steelhead repopulating their historic spawning grounds without hatchery fish getting in the way. Groups like this often drive policy change.

In the first year of recovery, the tribe agreed not to plant Chamber's Creek stock hatchery steelhead that they had been putting in the river for years. They tried to plant the fish again the next year and the conservationist groups sued them again. A settlement was finally reached in which the Klallams would only stock smolt produced from wild Elwha broodstock steelhead. Beardslee said he plans to appeal, but it was better than nothing. The hatchery will continue to produce pink, chum and coho salmon.

"The steelhead are going to be the ones that return naturally to the river and are spawning now, but we have a broodstock where we're producing about 170,000 a year for release," Robert said. "It's not only native but we have a complete genetic analysis so we aren't breeding closely related ones."

Further seeking to mollify hatchery opponents, the Klallams said they will slowly phase out the steelhead hatchery program.

"Hopefully that will only go through two or three cycles before the amount in the river is enough and the sediment load is low enough that we don't have to keep up the broodstock," Robert said. "Three cycles would be nine years so I'm hoping by then we have enough natural returning ones that we can start phasing them out."

Regardless, everyone enthusiastically awaits an end to the \$350 million federal restoration project and a free-flowing Elwha full of wild salmon.

"I had one person ask about the costs to the tribe to get this done, the impact and restoring the river and I just said, 'I don't want to have to tell my kids we had the chance to do this and didn't do it,'" Robert said. "And she didn't say another word and I never had anyone speak about it since."

**P**eople have been arguing about salmon and steelhead hatcheries for nearly the entire history of the practice on the West Coast of North America. Livingston Stone, the man who built the United State's first West Coast hatchery in 1872, came to believe that the ideal way to maintain salmon runs would be to establish a system of "salmon parks" for protected spawning. The idea of salmon preserves was bandied around for decades but rarely, if ever, implemented.

In the early years of Pacific salmon hatching, success was measured by number of smolts released rather than number of adults returning. Managers did not start marking hatchery fish until much later, so they had no idea whether or not a salmon was of hatchery or wild origin. Jim Lichatowich, author of the seminal "Salmon Without Rivers," points to the fact that back then, the U.S. Fish Commission spent a huge portion of its budget on hatcheries.

"While blind optimism led them to premature and false conclusions about the success of their program, political expediency – the need to protect 85 percent of the commission's budget – made that success absolutely necessary," Lichatowich wrote. "Once the hatchery program became a political tool, it gained immunity from close scrutiny and scientific evaluation."

Scientists have expressed concerns about the efficacy of hatcheries for nearly the entire span of the practice's existence, but it was not until the 1920s that any sort of scientific inquiry was made. Contemporary fisheries expert Paul Needham made the relevant analogy: "How long would a bank last that invested \$500,000 without the slightest knowledge of what return it might expect annually from its investment? Just this sort of thing has been going on for years with regard to fish propagation."

Lichatowich described two studies completed in the 1920s. The analyses, one Canadian and one American, were the first tests in 50 years of supplementation of the basic premise that artificial propagation was more efficient than natural reproduction. Neither found any proof that hatcheries held any advantage. British Columbia closed all their hatcheries shortly after and Washington kept building more.

These findings and subsequent governmental disregard set the tone for the future of the hatchery debate. Yet as threats to salmon mounted in the form of hydroelectric and agricultural development, managers leaned harder and harder on the hatchery crutch.

Bill McMillan distinctly remembers the preeminence of fish culture when he entered the University of Washington in 1965.

"My junior year I hit the brick wall at the fisheries school realizing all they were teaching essentially was around the Lake Union hatchery ponds. They were the whole world to them," Bill said. "There were absolutely no field courses an undergraduate could even take."

That complete dedication to hatcheries drove Bill straight out of the fold and into wild fish activism, but it was long accepted as the norm in fish biology.

"Until very recently, there's been very little, essentially no studies on hatchery-wild interactions because the managers basically didn't care," said Nick Gayeski, a Wild Fish Conservancy biologist. "It's very rare that you get the truly independent scientific

reviews and there have been two of those, in our opinion, that have been done on this whole issue.”

The first review was done on the Columbia River by the Independent Science Advisory Board in 2003.

“Their review was ‘Don’t do any more supplementation until you undertake the kind of design to get the kind of answers that we need to get about supplementation,” Gayeski said. “That, of course, has pretty much been ignored.”

The second, called the Recovery Science Review Panel, was actually commissioned through the National Academy of Sciences by NOAA fisheries. Gayeski said the panel recommended comparing hatchery-supplemented basins with comparable non-supplemented basins nearby in order to have a true experimental control treatment.

“Again, because their recommendation was, ‘You don’t do anything, essentially,’ fisheries managers said, ‘We’re not listening to you guys, thank you very much,’” Gayeski said.

The most recent multi-million dollar review of hatcheries was called the Hatchery Scientific Review Group and has been heavily touted by the Washington Department of Fish & Game. However, rather than assess the efficacy and effects of the hatchery program as a whole, the HSRG study reviewed individual hatcheries and made recommendations as to how they could minimize or eliminate their effects on wild fish.

“‘If you want to drive 100 miles-per-hour, this is how you can do it the safest when you cross this crosswalk,’” Beardslee said is the analogy the HSRG makes. “It’s very different than, ‘Should these hatcheries be here at all? Are they part of the problem or the solution?’”

John McMillan said the very fact that Washington has a scientific review group and they are trying to set guidelines is a great example of policy moving forward.

Fish and game employees would likely agree. Brian Missildine and Mark Kimbel work in the Hatchery Division in WDFW headquarters, at the state capitol in Olympia. A mounted native steelhead on a coffee table by the receptionist’s desk greets visitors entering the office. Kimbel is the hatchery evaluation manager and Missildine is the hatchery evaluation and assessment team supervisor.

The federal government allows the state to continue hatchery operations under the Endangered Species Act as long as the state follows 1,000-plus HSRG recommendations aimed at reducing the genetic impact of hatcheries on native fish. The genetic management plan suggests measures such as improving intakes, removing weirs, integrating wild genetics, and segregating hatchery stocks.

“Now with the (Endangered Species Act) coming on we’ve had to make some adjustments to make sure our hatchery facilities are not impacting those stocks to the point where they’re creating a jeopardy in ESA terms,” Kimbel said.

Kimbel and Missildine said that the directives from the scientific review group are trying to walk a fine line between providing hatchery fish for sport and commercial harvest, while protecting wild fish at the same time.

“Society has already said they want hatcheries, they want fish. The problem that we have in Washington is we have too many people,” Kimbel said. “So until that stops or something else changes, you’ve got to have hatcheries if you want fish. We’re trying to use these hatcheries to provide fish for people to fish on but also to maintain the genetics for when we can get the habitat fixed.”

“Some of our biggest critics are just saying we aren’t moving fast enough. And we would agree as well but we’ve got to have the resources. Wild fish aren’t free,” Kimbel said. “We’re making progress, but not as fast as Kurt Beardslee would like, I’m sure.”

**T**he hatchery run in the Skykomish was mostly over, though a couple anglers were still landing fish. Among the dozen men plying the waters was Justin Frei, a sawyer from nearby Monroe who grew up fishing with his dad in North Idaho.

Between casts and pulls on a joint, Frei talked about his complications with the law. He was shot twice with a taser after arguing with an Idaho game warden a few years earlier.

“Since that case went through, after work if it’s light out I fish. I work Monday through Friday and on the weekends I fish every day,” he said. “The river is my salvation.”

He said he prefers wild steelhead, but will take what he can get.

“There used to be huge wilds in here, but now you’re going to be lucky if you catch one wild during the regular season,” Frei said. “So as far as this river goes, I think that they should set it up as a hatchery program for life.”

Frei said he would like some rivers to be reserved for hatchery fish and others only for natives, a sentiment echoed by many of my sources.

“This hatchery, if they ever shut it down, I’d move. It’s perfect – next to the city and I can catch steelhead,” Frei said. “I eat ‘em, but I wish they were all wilds and I could let ‘em go. But I don’t like to let hatchery fish go because they’re clipped and I don’t want ‘em to go there,” he said, waving his rod tip upriver.

“I just want to catch ‘em. I want ‘em all to be wild, but it’s not realistic so I’m good with it.”

It seems that fishermen all want the same thing – for fathers, sons, mothers and daughters to be able to get out and catch salmon and steelhead together. Unfortunately, the best method for preserving that opportunity is as elusive as the fish themselves. Yet it is somehow comforting to know that residents of the Pacific Northwest care enough to yell at each other over it. The totemic salmon are present enough to be worth fighting about.

Just before nightfall that evening, I hooked and landed a healthy, six-pound hatchery steelhead about two miles below Reiter. A heavy mist was falling. Two bald eagles whistled in staccato to each other and there was no sign of humanity in any direction. I held the fish in the Skykomish for a long time before killing it, looking at its shiny pink cheeks and the freckled spots that covered the scar where an adipose fin used to be.