The Salmons' History Lesson:
How Historical Events and Policy Drivers Affect PNW Salmon*

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Abstract:

The overall public policy goal of restoring runs of wild Pacific salmon in California, Oregon, Washington, Idaho, and southern British Columbia appears to enjoy widespread public support. Billions of dollars were spent in a failed attempt to reverse the long-term, general decline of wild salmon. Anyone, even those slightly familiar with the decline of wild salmon runs, knows the direct and immediate causes of the decline. These proximal causes are "old news" to folks even marginally familiar with the wild salmon story. Rather, this article focuses on decisions about competing policy priorities that resulted in those proximal causes. There are no heroes or villains in this story, but rather a series of difficult and unappealing choices that society made over many decades. No one was ever out to eliminate wild salmon runs intentionally. This story is not analogous to the decline of wolves, grizzlies, and cougars. Many people wanted them gone, and the sooner, the better! So the wild salmon decline is all about competing policy priorities. Wild salmon runs are one of many competing priorities in the political world. Policy making is all about picking "winners" and "losers," and this example is no different.

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The Salmons' History Lesson

How historical events and policy drivers affect PNW salmon

By Robert T. Lackey

Anyone who is aware of the precipitous decline of wild salmon and steelhead runs in California, Oregon, Washington, Idaho, and southern British Columbia is also aware of the primary factors driving those declines. These so-called proximal causes, usually expressed as the Four "Hs' — Habitat, Hatcheries, Hydro and Harvest — is "old news" to folks familiar with the wild salmon story.

Behind those proximal causes of wild salmon and steelhead declines have been a series of decisions over many competing policy priorities. There are no heroes or villains in this story, but rather a series of difficult and unappealing choices that society has made over many decades.

No one was ever out to intentionally eliminate wild salmon runs. So it is not analogous to the declines of wolves, grizzlies, and cougars that many people wanted gone — and the sooner the better. So the wild salmon decline is all about competing policy priorities. In the political world, wild salmon runs are one of those many competing priorities. After all, policy making is all about picking "winners" and "losers" and this case study is no different. It is, perhaps, a perspective that is a bit different than what you typically hear.

While this paper focuses on wild salmon and steelhead, defining "wild" is not as simple as it might at first appear. Of course, salmon do not return to the stream of origin with 100% fidelity. The frequency of straying is often pretty significant, and a very handy survival trait. Further complicating the definition of "wild" is that most salmon runs these days are predominantly hatchery-origin fish — sometimes close to 100%. When such hatchery-origin salmon return how do you count the offspring from those that spawn in the wild? Their parents were from a hatchery so it might be a stretch to call the offspring "really" wild.

Another wrinkle is that salmon from hatcheries were stocked in rivers and streams for decades without regard to genetic considerations. Hatchery salmon in the late 1800s — and well into the 1900s — were planted pretty much everywhere. In short, the genetics of so-called wild salmon have been changed by such stocking in ways that no one really understands.

In addition to defining what a wild salmon is, "collapse" is another word that needs a more precise definition. What is exactly meant by invoking the word "collapse" to describe the decline of wild salmon runs or is this just hyperbole? For example, these days we all hear many policy issues routinely labeled as being "crises." Thus, such a label no longer has a broadly accepted meaning. And even worse, it suffers from a bad case of over-use. Does a similar charge apply to the word "collapse?"

Policy choices are made by society in response to a whole suite of real world challenges. These choices are called "policy drivers."

Let me offer my rationale for using the term "collapse" to describe to the long-term decline of wild salmon runs. We have a very rough estimate of the number of salmon in the region. In the early 1800s that number was approximately 50 million — it was not billions but it was not just a few million, either. I have arbitrarily set this level at 100%.

As you move through the years starting in 1800 there is a lot of variation in year-to-year runs. Even if we had very reliable data over this 200-plus year period there would be a lot of variability. Furthermore, the overall downward trend oscillates between so called "good" ocean conditions and "bad" ocean conditions. These oscillations, the Pacific Decadal Oscillation and El Nino – La Nina, and their impacts, typically last roughly 10 to 30 years.

There is great variability in these estimated run sizes. However, the long-term trend is clearly downward. And now runs are typically from 0% to 3% of the 1800 level. Salmon no longer occur in approximately 40% of the original locations. Furthermore — most runs are primarily hatchery-origin salmon — not wild salmon. So, "collapsed", the way I am using the word means wild runs somewhere between extirpated and 3%, which is almost all of the wild runs in these states and province. So saying that wild salmon and steelhead populations are collapsing is no exaggeration.

Overall Trends in Wild Salmon Abundance

Short-term trends are often misleading. For example, if you only had 20 years of run data showing a downwards trend, a naive salmon manager might sink into despair. Or, conversely, two-decades of run data describing an upwards trend may lead the same salmon manager to break into multiple choruses of "Happy Days are Here Again!" Beware of the allure of over interpreting short-term trends in salmon numbers. A few decades of data is often misleading when assessing the long-term status of salmon runs.

So what caused the runs to trend ominously downward since no one was out to deliberately eradicate salmon? What happened? The answer is found in the policy choices that society made when faced with a whole suite of real-world challenges. Political scientist typically label these choices "policy drivers." Conversely, those of us who are scientists, managers, or policy advocates tend to focus on the so-called "proximal" influences. Proximal influences

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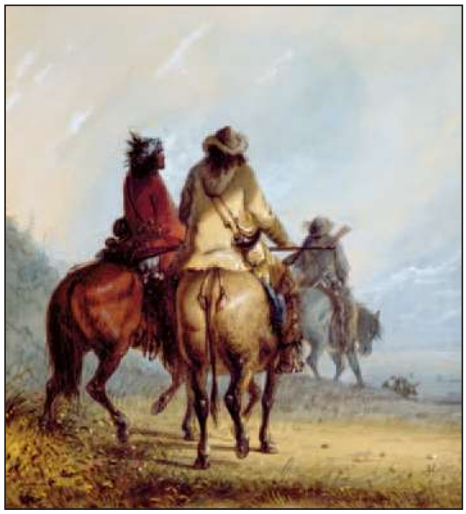
are the mechanisms that directly affect salmon runs. Most of us scientists tend to stay clear of policy drivers — and for good reason.

For example, supplemental hatchery stocking of salmon rarely, if ever, strengthens wild salmon runs. Scientists have worked this out pretty clearly. But such stocking continues. More science will not likely change anyone's mind. Why? It has to do with policy drivers.

There are 10 primary policy drivers — the reasons — that caused the downward trajectory for wild salmon and steelhead abundance in California, Oregon, Washington, Idaho, and southern British Columbia. It goes back almost 200 years ago, soon after Lewis and Clark completed their epic journey.

Beaver Trapping

The first reason for the decline of wild salmon took place in the early 1800s and was largely the result of a fashion and business competition. The fashion was the beaver hat. And a main source of beaver pelts was western North America, particularly what is now Oregon, Washington, British Columbia, and Idaho.



Trappers Starting for the Beaver Hunt, Alfred Jacob Miller. Commissioned by Willaim T. Walters, 1858-1860. Image Courtesy Walters Art Museum

Politically, competition for the territory itself was intense between Great Britain and the United States. The Hudson's Bay Company, in order to keep American trappers from moving northward into what is now British Columbia, implemented a policy of aggressively trapping all beaver inhabiting the Columbia Basin and the surrounding area. The result was the so-called fur desert, an area devoid of beaver, and thus in theory, American trappers would shun these areas. And the plan worked as intended. There were no beavers left to trap, so why even go there?

Another consequence, however, was that beaver dams soon essentially disappeared from the region. With this ecological change, the rearing habitat for young salmon was diminished. How much did this change affect salmon numbers can't be known. But it was certainly not a positive influence. Hence, this is the first reason why wild salmon numbers declined.

Gold Mining

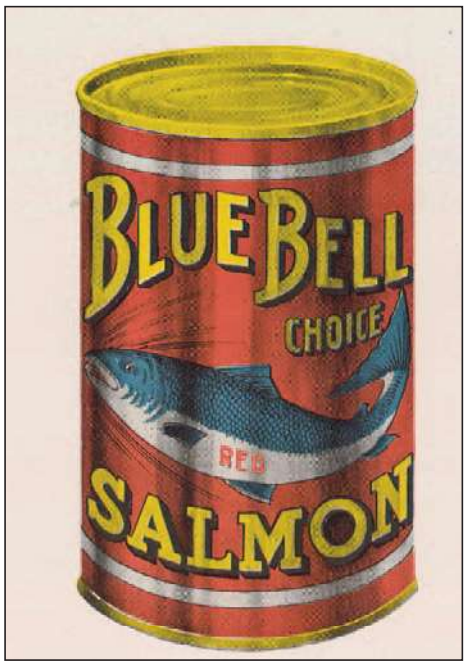
Much better known, and the second reason for the decline of wild salmon and steelhead in California, Oregon, Washington, Idaho, and southern British Columbia, was gold mining. Starting in California, then moving to Idaho, on to Oregon, followed by Washington and eventually British Columbia, gold mining — along with silver and copper mining — greatly affected salmon runs.

And these areas rarely came back to anything close to their prior condition. The tailings and other legacies from these mines are still prominent today in California's Central Valley rivers 170 years later. It was not a great surprise. As early as the 1850s, newspapers in California and elsewhere did report that salmon runs were being decimated by gold mining. But that was a trade-off people were willing to make and there was not a whole lot of opposition.

Food Preservation Technology

The third cause of the decline of wild runs was technology, and food technology in particular. A major constraint on the number of salmon that can be caught and sold is preserving the product.

Prior to the great human depopulation in the 1500s, 1600s, and 1700s due to diseases, the indigenous populations in California, Oregon, Washington, Idaho, and British Columbia caught a lot of salmon. But preservation was a constraint. Fish drying worked to an extent, but there were practical limitations. However, with the introduction of canning technology in 1864 commercial fishing and cannery operations could really take off. And they did!

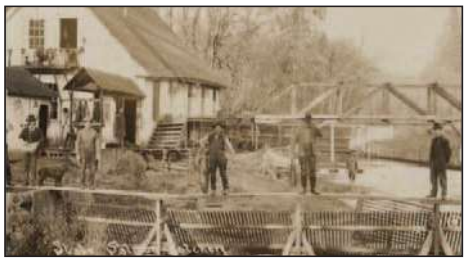


American Can Company, 1918. Image Courtesy Freshwater and Marine Image Bank, University of Washington

Better yet, solid pack salmon could be shipped anywhere with the advent of railroads and it could be stored without refrigeration for years. As usual, starting in California, heavy fishing and the associated cannery operations moved northward to the Columbia River, then to the Fraser River and then on to the great salmon runs of Alaska. Canneries could now process and sell more fish than could be caught. Thus, for fishermen, the challenge was now to catch enough salmon to keep the canneries running at full capacity.

Aquaculture

Salmon are relatively easy to raise in captivity. They are easy to spawn and adaptable to artificial environments. Thus, it should not be surprising that



Soos Creek salmon hatchery near Auburn, Washington. Circa 1910

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supplemental stocking from hatcheries was implemented early. In 1877 to be exact.

By the latter part of the 1800s, salmon runs in the Columbia River had dropped precipitously. In fact, the head of the precursor to the National Marine Fisheries Service publicly acknowledged in the 1890s that Columbia River salmon runs were headed for extinction unless an aggressive hatchery program was implemented.

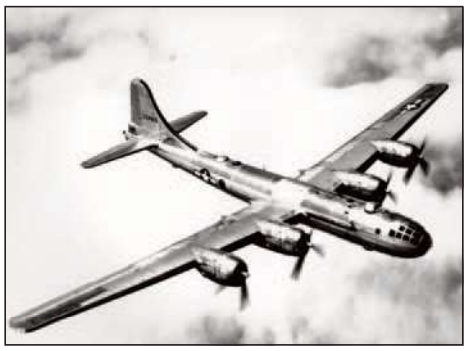
The first main-stem dam on the Columbia was not completed until 1933. Thus prior to this first dam, salmon runs were already reduced by roughly 80-90%. So if the public policy goal is to restore wild salmon runs, stocking from hatcheries clearly did not achieve this. Conversely, if the public policy goal was to sustain hatchery-supported runs at a level to support some fishing, then hatcheries achieved this. Like all tools in fisheries management, hatcheries are not inherently good or bad. It all depends on what one is hoping to achieve.

Stock Market Crash of 1929

The year 1929 turned out to be really bad one for salmon. The economy collapsed and a political response emerged that would have large and long-term effects on wild runs. Some economists, such as John Maynard Keynes, pushed the idea that government ought to aggressively stimulate the economy by funding massive public works projects. The idea was to put the unemployed to work and thus, the theory goes, jumpstart the recovery. In addition, the public pitch was that these projects would help improve long- term economic development. Irrigation projects were a favorite — and the largest of these was the Grand Coulee Dam.

Documents from the time make it very clear that scientists and policy makers understood the consequences for salmon — at least for wild salmon. There was some debate about how successful hatcheries would be in maintaining fishable runs but the consequences for wild salmon were obvious to all.

There were many public works projects all over the West and a good number had adverse effects on wild salmon runs. Was this a good public policy decision? As usual "it depends."



Boeing B-29 Superfortress. Photo Courtesy United States Air Force

World War II

The future of wild salmon in the late 1930s and onward were driven, in part, by events far away. In 1937, Japan invaded China and the Pacific War started, although the United States did not enter until 4 years later. In 1939, Germany invaded Poland and the European War started although the United States did not enter until 2 years after the invasion.

Senior officials in the U.S. Government, at least in private, assumed that the U.S. would be drawn in to these wars sooner or later. They also knew that aluminum would be a strategic material, and to process ore into aluminum requires massive quantities of electricity.

As a result, the U.S. Army Corps of Engineers was directed to identify options to retrofit dams for more electricity production. Hence, Grand Coulee, among many others, acquired some serious generation capacity. As a result, the Pacific Northwest became the main aluminum supplier to the massive Allied war machine. In fact, it is estimated that the electricity from Grand Coulee alone produced a third of the aluminum used for all Allied airplanes built during World War II.

How much concern was there for the future of wild salmon? It was not likely ever part of the discussion.

The Invention of Air Conditioning

Willis Carrier was an engineer who is credited with inventing the first commercially viable air conditioner more than a century ago. It took years for the technology to develop to the point where home air conditioners were a popular appliance. By 1960, however, home air conditioners were cheap, reliable, and they did the job. Nowadays, air conditioning is pretty much an expectation in most locations. Most of us just take it for granted.

However, the result of all this is the greatly increased demand for electricity in summer — the least desirable time for hydropower from a wild salmon perspective. Furthermore, the integration of hydropower to the West-wide electric grid means that there is a high demand for electricity pretty much year around. And there are now massive transmission lines to make this all happen.

What were, and are, the effects on wild salmon of this increased summer demand for electricity? Speculation of course, but from a wild salmon perspective, it sure doesn't help.

Flooding

There was a really large flood during the winter of 1861 - 62 that inundated most of the California Central Valley for months, creating an inland sea 300 miles long and 20 miles wide. It caused the State of California eventually declared bankruptcy. The same flood had a similarly devastating effect on the Pacific Northwest. Many of the original towns along the Willamette River were wiped out. Across from Corvallis, Oregon, for example, the town of Orleans was washed away completely and never rebuilt.

Another major flood struck in 1948. But this time it affected many more people and had a much bigger footprint. The effects were widespread and

Vanport flood along the Columbia River, May 30, 1948. Photo Courtesy National Weather Service, Portland, Oregon.

serous. For example, the city of Vanport, located along the Columbia River and the second largest city in Oregon at the time, was totally wiped out. People demanded that "something be done." And something was.

Starting shortly after the '48 flood, an

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aggressive four-decade dam building program was initiated in the Columbia Basin and elsewhere to avoid any repeat of the 1861 or 1948 floods.

The effects of dam construction on wild salmon runs was well understood. Everyone knows it is not good. But for hatchery-reared salmon the impacts were less clear-cut. For wild salmon, the resulting consequences were predicted by all. And the result pretty much followed expectations. Whether the choice to build these flood control dams or not was the right one is essentially a choice driven by human values and competing policy priorities.

Human Population Growth

In 1843, the first significant wagon train arrived in the Pacific Northwest. While many more followed, even in 1850 there were fewer than a hundred thousand people in the three states and one province. For perspective, the indigenous population in 1550 — 300 years earlier — was much larger, but most of those people died from Old World diseases.

By 1900 the regional population had shot up to 1 million. By 1950 it had reached 4 million. By 2000, it was hovering around 14 or 15 million. So what about the rest of this century? If you assume the annual growth rates since the end of World War II then the population would be over 100 million. A realistic expectation for the human population in 2100 would quadruple from the current 15 million to 60 million. Plug in your best guess, but it will be a big number under all realistic scenarios.

Imagine the demands of 60 million people for houses, roads, schools, electricity, food, ski resorts, airports, irrigation water, golf courses and much, more. It's a dose of realism for the future. But without such hard assessment we run the risk of slipping into delusional reality.

Seattle, Washington. Photo by Rattlhed, English Wikipedia

Climate Change Over Time

The final reason why wild salmon and steelhead runs declined is climate. On the century time scale climate does change. This is not to say that the recent changes in climate today are not in part due to human activities. But when assessing the abundance of salmon, no one should expect climate to be static.

Photo by Jim Yuskavitch

For example, in the California Central Valley starting around the year 800, the average temperatures were relatively warm for 400 or 500 hundred years — a period commonly called the Medieval Warm Period. This was not a great period for salmon in California and likely the Pacific Northwest. Runs would be low. This was the time of the megadroughts — droughts that lasted 100 years.

Around 1300 or so, average temperatures began to decline — a period labeled the Little Ice Age. This period lasted until approximately 1850. This was great for salmon in California and the Pacific Northwest. All things being equal, runs would have been large during this period. So when Lewis and Clark arrived in the very early 1800s ecological conditions for salmon were optimal.

Around the mid- to late- 1800s temperatures rose — the so-called Modern Warm Period. Some of this warming is likely due to human activities. Regardless, all things being equal, the climate is not currently optimal and it not great time for salmon. The climatic regime was similar to the Medieval Warm Period, which was another poor time for salmon in the Pacific Northwest, but one without much of a human footprint.

So the message is: regardless of human actions, over the century time scale, climate does affect the distribution and abundance of salmon runs. And temperatures will continue to increase and salmon will move northward. Look for big salmon runs in the Arctic Ocean later in this century.

The Future

None of these reasons for the decline of wild salmon should be much of a surprise.

First, the long-term policy drivers that determine the number of wild salmon in California, Oregon, Washington, Idaho, and British Columbia are broadly known. Some folks may not like the policy drivers, but what is influencing wild salmon numbers per the long-term is pretty clear.

Second, to change any of these policy drivers would require major adjustments from the residents of the region. Engineering and other tweaks will not do it. Frustratingly, more money will only make a difference around the edges. Changes that would increase wild runs long-term would have to be major behavioral adjustments by people.

Third, there are many species of non-native, introduced fish, such as American shad, walleye, crappie, smallmouth bass, largemouth bass, bluegill, striped bass, and pike that are perfectly adapted to the current and future aquatic environment in this region. And these species are thriving. This was to be expected.

Nevertheless, for those who are involved in wild salmon and steelhead conservation, avoid the pull of pessimism, but also dodge the allure of delusional optimism. Rather, acknowledge honest and accurate, though perhaps unwelcome, scientific and policy reality.

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