Salmon Decline in Western North America:
Historical Context

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Citation: Lackey, Robert T. 2009. Salmon in Western North America: Historical Context. In: *Encyclopedia of Earth*. Eds. Cutler J. Cleveland (Washington, DC, Environmental Information Coalition, National Council for Science and the Environment).
http://www.eoearth.org/article/Salmon_in_western_North_America:_assessing_the_future

Introduction

Wild salmon in California, Oregon, Washington, Idaho, and southern British Columbia have been on a 160 year downward trend and are now at very low levels. Efforts to reverse the decline have been extensive and expensive, but have not met with much success.

Salmon in the lower 48 states are well on their way to attaining a status enjoyed by some of their notable brethren — wolves, condors, grizzles, bison — wild animals that are unlikely to disappear entirely, but struggle to hang on as remnants of once flourishing species in small portions of their original range. A few entrepreneurs may be marketing the superior taste of buffalo burgers, but *wild* bison today are found only in Yellowstone and a few other refuges.

This prediction will not surprise anyone familiar with the state of wild salmon runs. Consider the following facts: in California, Oregon, Idaho, Washington, and southern British Columbia, many runs are reduced to less than 10% of their historical numbers; some have disappeared. Many salmon runs are dominated by hatchery-bred fish. Even for the Columbia River, once the mightiest salmon-producing river south of Canada, over 80% of the total run is now comprised of hatchery-bred fish.

Every few years, there is a media celebration of "record" salmon runs, but these temporary blips are due mainly to favorable ocean conditions coupled with a recalibration of what constitutes a "record" run. If doubling a run from 2% to 4% of the historical level qualifies as a record run, then we are often there, however modest the increase may be. More sobering, the majority of such runs are usually hatchery-bred fish. Nowadays *wild* salmon comprise less than a quarter of many West Coast salmon runs.

People in California, Oregon, Washington, Idaho, and British Columbia remain concerned about the decline of the once immense salmon runs. Billions of dollars already have been spent in a so-far failed attempt to reverse the long-term decline, which is largely due to altered or inaccessible freshwater and estuarine habitat. The option of using hatcheries to maintain runs is another story, but given the limited quantity and quality of spawning and rearing habitat now available to salmon, the region will not support self reproducing runs of *wild* salmon even remotely like those of the 1840s.

The pattern of salmon decline is not unique to western North America. Of the Earth's four regions where salmon runs occurred historically (Asian Far East, Atlantic Europe, eastern North America, and western North America), it appears probable that salmon runs in California, Oregon, Washington, Idaho, and southern British Columbia,

without a dramatic change in current and long-term trends, will emulate the other three: extirpated or much reduced runs. Since 1850, an array of factors has caused the decline and a plethora of specific impediments has prevented their recovery. Throughout the region, many wild salmon stocks (a group of interbreeding individuals that is roughly equivalent to a "population") have declined and some have disappeared.

The status of salmon along the west coast of North America is not uniform. Some wild salmon and habitat restoration possibilities are better than others. There are still *relatively* healthy runs of wild salmon (and habitat) in some locations such as the coastal watersheds of Northern California, Oregon, Washington, and some areas of southern British Columbia. Runs in northern British Columbia, Yukon, and Alaska are in much better condition.

1. Past Policy Choices

Our choices, both individually and collectively, are the most important determinant of the future of wild salmon. Salmon are only one of many, usually conflicting, priorities that society professes to rank high. Societal priorities are difficult to measure and subject to change. Forecasting changes in societal values several decades in the future is problematic.

Consider how the California electrical blackouts in the early 2000s affected opinions regarding the relative importance of saving Columbia River water to help salmon migrate *vs.* using the same water to generate electricity to service demands from California. Using Columbia River water to generate electricity for California and elsewhere ranked ahead of saving the same water to help young salmon migrate to sea.

Where does salmon restoration rank among the myriad of competing societal priorities? No scientific study provides a precise answer, but society's collective behavior, not opinion surveys, offer us the best indication. A brief recap of the past two centuries will help put salmon recovery in an historical context.

1820 — With the arrival of trappers in the region in the early 19th century, a systematic, intense harvest of beavers began. Large numbers of beaver can considerably alter the aquatic environment, in most cases improving salmon rearing habitat. As beaver populations declined, many salmon runs were adversely affected. As competition intensified between the United States and Great Britain for control of the Pacific Northwest, the British Hudson's Bay Company adopted a policy of leaving no beaver in the watersheds they trapped, because without beavers, the American fur trappers (and settlers) would be less likely to come to the Pacific Northwest. The overall effect on West

Coast salmon of nearly extirpating beaver is unknown, but it was likely great.

1848 — The most visible milestone in the two-century decline of wild salmon occurred with the discovery of gold in California. By 1849, the decline started in earnest and was widely reported in the newspapers of the day. By the 1850s, excessive harvest and the impacts of mining activities had decimated salmon in streams in and surrounding the California Central Valley. In response, there were regulations restricting some fishing and mining practices. Later, there were calls for the creation of salmon hatcheries to provide supplemental stocking to overcome the devastating effects of mining operations.

1870 — In the Central Valley of California, after a 30 year decline in salmon runs, supplemental stocking from hatcheries was widely viewed as the solution to declining salmon runs. By 1900, stocking from hatcheries had largely won out over preserving or restoring natural habitat as the preferred recovery strategy. Today, hatchery bashing is common in salmon policy debates, and hatcheries often are characterized as the nemesis of restoring wild salmon runs.

1905 — The mantra "reclaim the Klamath Basin" (along the Oregon/California border) reflected the values and priorities of the day. Creating productive farmland by irrigation was the public policy goal. In the competition between societal priorities, irrigated agriculture won out over salmon. Over the next several decades, millions of dollars were spent to develop an elaborate system of dams and canals in the Klamath Basin (and elsewhere). Now, at least for the Klamath Basin, based on regional and national polling data, society ranks salmon above agriculture for use of scarce water.

1933 — The mantra "put people to work" dominated the political landscape as people debated how to counter the effects of the Great Depression. Massive public works projects, such the high dams of the Columbia Basin and elsewhere, were built even though the anticipated and ruinous effect on wild salmon was understood. A single dam, the Grand Coulee, completely and permanently blocked a quarter of the Columbia Basin to migratory salmon, a thousand miles of the mainstem river lost to salmon in a single action. We knew precisely what would happen to those runs of wild salmon. The Depression and public works projects won out over salmon.

1942 — The posters adorning many public buildings proclaimed "America — the Arsenal of Democracy." Warplanes were needed in great quantities and in the shortest possible time. Thus, electrical generation in the Pacific Northwest was greatly increased to supply the voracious appetites of aluminum smelters. The hydro-power was there; the war-time demand for aluminum was acute; the public support was near universal. Turbines, operating at maximum capacity seven days per week, 24 hours per day, for four

years, chewed up salmon at devastating rates. It was a war for survival and bombers won out over salmon.

1948 — Widespread floods caused disastrous effects across the region, and politicians heeded the public's call for protection. Many flood control dams were built in Washington, Oregon, Idaho, and British Columbia. Society collectively demanded that human life and property be protected from uncontrolled river discharges. Flood control won out over wild salmon. Perhaps society's priorities have changed because now when a major Pacific Northwest flood occurs, such as the 1996 Oregon flood, it brings few appeals for constructing additional dams.

1960 – The technology for cheap, effective home and commercial air conditioning developed rapidly after World War II. By 1960, the indirect effect on salmon of widespread adoption of air conditioning was clear: (1) greatly increased demand for electricity; and (2) increased overall regional population growth because previously undesirable areas became, with the advent of air conditioning, more desirable places to live. Much of the West Coast is hot during summer months, thus air conditioners found a receptive market. Many people today cannot imagine living without the comfortable temperatures provided by home and office air conditioners. Directly relevant to salmon runs, electricity demand is now high for *both* winter and summer, necessitating more generating capacity and transmission lines.

1991 — The first salmon "distinct population segment" was listed under terms of the Endangered Species Act. With this action, the policy debate shifted away from restoring salmon runs in order to support fishing, to protecting salmon runs from extinction, two very different policy objectives. A century ago no one cared much whether a salmon started life in a hatchery or in a stream. Now, hatchery-produced salmon are not the restoration solution, they are part of the restoration problem, at least according to many.

2001 — Just a decade later, a severe drought, combined with ongoing California blackouts, provoked the U.S. Bonneville Power Administration to declare a power emergency, abandon previously agreed upon interagency salmon flow release targets, and generate electricity using water reserved to help salmon migrate. In one of the most striking recent barometers of competing societal priorities, electricity won out over salmon, and with scant public opposition.

Not one of these public policy decisions made over the past 200 years was inherently good or bad. Each simply reflected the priorities or legal interpretations of the time, coupled with a strong dose of optimism that we could have our cake and eat it too.

As the history reveals, however, it is unrealistic to consider salmon recovery as anything but one element, often a minor element, in a constellation of competing societal policy preferences. It appears that most people are willing to sacrifice wild salmon to achieve a suite of other priorities.

2. Trajectories

If society wishes to do anything meaningful about moving wild salmon off their current long-term downward trend, then something must be done about the unrelenting growth in the number of humans in the Pacific Northwest and California. The simple fact is that the anticipated human population level at the end of this century is a serious barrier, a show stopper, to achieving any kind of significant long-term wild salmon recovery.

Currently, Washington, Oregon, Idaho, and British Columbia are home to 15 million humans. Assuming a range of likely human reproductive rates, within country relocation to the Pacific Northwest, and continuing immigration, in 2100 this region's human population will be somewhere between 50 and 100 million: a quadrupling by the end of this century — less than 100 years from now. Similarly, extrapolating population growth rates for California, by 2100 this single State will be home to over 160 million people.

By 2100, from California to British Columbia, there could easily be 200 to 250 million people. With so many more people inhabiting the West Coast, consider the demand for houses, schools, stadiums, expressways, planes, trains, automobiles, coffee shops, fast food restaurants, malls, air conditioning, drinking water, pipelines, computers, home entertainment systems, ski resorts, golf courses, sewer treatment plants, and hotels. Society's options for sustaining wild salmon in significant numbers would be just about non-existent. Good water quality would be achievable, as would maintaining prosperous populations of fish species better adapted to altered aquatic environments (*e.g.*, walleye, smallmouth bass, and American shad), but the possibilities for *wild* salmon would be severely constrained.

There is not an exact one-to-one relationship that a given human population increase results in a predictable decrease in salmon run size, but the unmistakable relationships are there: (1) as the human population of the Asian Far East expanded, so salmon runs declined; (2) as the human population of Europe expanded, so salmon runs declined; and (3) as the human population of eastern North America expanded, so salmon runs declined.

The west coast human population trajectory will have to be changed dramatically for wild salmon to have any chance to recover. *Could* society reverse the trajectory? Yes, it is possible. It is happening in some European countries and Japan, but there is little indication that it will happen any time soon along the west coast. World-wide birth rates are generally declining, but they are still above replacement levels in western North America. The influx of people moving into the region shows no sign of abating.

There are many public policy choices that *could* alter the human population trajectory, but none appear likely to be widely embraced in the near future. These days, population policy issues are rarely presented without resorting to policy advocacy, but the current and expected population level is at the core of any credible analysis of potential recovery strategies, or at least those strategies that are offered as serious attempts to actually recover wild salmon.

3. The Future of Salmon

The challenge to restore salmon runs to some previous level is a policy conundrum. The conundrum that is characterized by: **(1)** claims by a majority to support the restoration of wild salmon runs; **(2)** competing societal priorities; **(3)** the region's rapidly growing human population and its pressure on all natural resources (including salmon and their required habitats); **(4)** society's expectation that experts should be able to solve the salmon problem by using a technology; **(5)** use of selected experts and "scientific facts" by political proponents to bolster their policy positions; **(6)** lack of a trusted source of scientific information because many scientists wind up as supporters of a particular political faction; and **(7)** the confusion caused by presenting value-based policy preferences as scientific fact.

The have been many efforts to develop policy prescriptions that would actually recovery wild salmon. Recently, the Salmon 2100 Project was initiated in 2002 as a response to the apparent dichotomy between public and private understanding of the likely future of wild salmon in the region. The overarching goal of the Project was to assess the potential policy options needed to protect and restore wild salmon runs from southern British Columbia southward to California.

4. Acknowledgements

This article and its precursors benefited greatly from candid reviews provided by numerous colleagues. Particularly important were the suggestions provided by Joan Hurley.

5. Summary

Of the Earth's four regions where salmon runs occurred historically (Asian Far East, Atlantic Europe, eastern North America, and western North America), it appears probable that salmon runs in California, Oregon, Washington, Idaho, and southern British Columbia, without a dramatic change in current and long-term trends, will emulate the other three: extirpated or much reduced runs. Since 1850, an array of factors has caused the decline and a plethora of specific impediments has prevented their recovery. Throughout the region, all runs of wild salmon have declined and some have disappeared. Substantial efforts have been made to restore some runs of wild salmon, but few have shown much success. Society's failure to restore wild salmon is a policy conundrum characterized by: (1) claims by a strong majority to be supportive of restoring wild salmon runs; (2) competing societal priorities which are at least partially mutually exclusive; (3) the region's rapidly growing human population and its pressure on all natural resources (including salmon and their habitats); (4) entrenched policy stances in the salmon restoration debate, usually supported by established bureaucracies; (5) society's expectation that experts should be able to solve the salmon problem by using a technological scheme and without massive cultural or economic sacrifices (e.g., life style changes); (6) use of experts and scientific "facts" by political proponents to bolster their policy positions; (7) inability of salmon scientists to avoid being placed in particular policy or political camps; and (8) confusion in discussing policy options caused by couching policy preferences in scientific terms or imperatives rather than value-based criteria. Even with definitive scientific knowledge, which will never be complete or certain, restoring most wild salmon runs in the region to historical levels will be arduous and will entail substantial economic costs and social disruption required. Ultimate success cannot be assured. Given the appreciable costs and social dislocation, coupled with the dubious probability of success, candid public dialog is warranted to decide whether restoration of wild salmon is an appropriate, much less feasible, public policy objective. Provided with a genuine assessment of the necessary economic costs and social implications required for restoration, it is questionable whether a majority of the public would opt for the pervasive measures that appear necessary for restoring many runs of wild salmon. There will continue to be appreciable annual variation in the size of salmon runs, accompanied by the decadal trends in run size caused by periodic changes in climatic and oceanic conditions, but given a continuation of the current trajectory, many, perhaps most, stocks of wild salmon in California, Oregon, Washington, Idaho, and southern British Columbia, likely will remain at their current low levels or continue to decline in spite of heroic, expensive, and socially turbulent attempts at restoration.

6. Further Reading

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Author Profile

Dr. Robert T. Lackey, senior fisheries biologist at the U.S. Environmental Protection Agency's research laboratory in Corvallis, Oregon, is also courtesy professor of fisheries science and adjunct professor of political science at Oregon State University. Since his first fisheries job more than four decades ago mucking out raceways in a trout hatchery, he has dealt with a range of natural resource issues from positions in government and academia. His professional work has involved many areas of natural resource management and he has written 100 scientific and technical journal articles. His current professional focus is providing policy-relevant science to help inform ongoing salmon policy discussions. Dr. Lackey also has long been active in natural resources education, having taught at five North American universities. He continues to teach a graduate course in ecological policy at Oregon State University and was a 1999-2000 Fulbright Scholar at the University of Northern British Columbia. A Canadian by birth, Dr. Lackey holds a Doctor of Philosophy degree in Fisheries and Wildlife Science from Colorado State University, where he was selected as the 2001 Honored Alumnus from the College of Natural Resources. He is a Certified Fisheries Scientist and a Fellow in the American Institute of Fishery Research Biologists.

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