The Future of Pacific Salmon: Ecosystem Health and Public Choice

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THE FUTURE OF PACIFIC SALMON: ECOSYSTEM HEALTH AND PUBLIC CHOICE

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Many salmon "stocks" (a term used in fisheries management that is roughly equivalent to "population") have declined and a significant, but unknown, number have been extirpated. Over 200 stocks are classified as "at risk".[3] There is uncertainty over the historical number of stocks (perhaps a thousand or two), the status of individual stocks, and the causes of the decline, but the general conclusion is clear: there *is* a widespread salmon decline in the Pacific Northwest. California, Oregon, Washington, and Idaho represent the southern range of the species' geographic distribution and the North American location where the declines are most acute. In contrast, Alaska's salmon populations are thriving and supporting record catches. Further, the aquaculture industry can spawn and raise salmon, produce a quality product, and sell it at a moderate price. Ironically, in spite of the decline of salmon stocks in the Pacific Northwest, salmon have never been more abundant in the retail market because of supplies from aquaculture and Alaska.

The well-documented decline of the Pacific salmon has an interesting twist: no species of salmon is in danger of extinction, but many individual stocks are declining and some have become extinct. What action -- if any -- is warranted remains one of the most contentious political issues in the region. Some advocate that all salmon stocks in danger of extinction should be listed immediately as threatened or endangered, which will invoke the full force of the Endangered Species Act. An opposite view is that less disruptive approaches and decisions should be employed before the Endangered Species Act is used. Besides, the Act itself is a simplistic approach for addressing complex, ecologically-constrained public policy questions.

Economically, the consequences of listing any significant number of salmon stocks as either endangered or threatened would be massive and dwarf the impacts of listing the northern spotted owl. The geographic area would include the entire Pacific Northwest.[2] Even though these dislocations would be great, some advocates assert that such actions are long overdue and are the only way left to save the remaining salmon stocks. After all, salmon have historically served as a cultural and natural icon for the region, as well as supporting a billion dollar industry, and ought to be preserved at any cost to society.

From a political perspective, the salmon debate has split Pacific Northwest Congressional delegations and parties, resulting in a highly polarized, partisan debate. There is agreement that restoration of salmon stocks, if undertaken in a serious way, will be expensive and socially, as well as economically disruptive. Some contend, and correctly so, that the hour is late and something drastic needs to be done now or many additional stocks will become extinct. But one opposing view holds that this position just reflects another example of environmental elitism. After all, there is little chance that any salmon species will be driven

to extinction in the foreseeable future, and hatcheries can produce salmon reliably and comparatively cheaply. The vast majority of people do not see any difference between salmon spawned in streams and those bred in hatcheries.

It is common to debate the salmon problem by focusing on public lands, especially Federally-controlled forest and range lands. What happens on forest and range lands is important, but it is the easiest part of the salmon problem to address. The more difficult -- and critical -- part of the debate deals with policies and decisions impacting agriculture, industry, electricity generation (including hydro, fossil fuel, and nuclear), national defense, urban development, transportation (including road, rail, air, and water), private property rights, community rights, the relative rights and role of local, state, and federal governments and Indian tribes, and policies on human reproduction, emigration, and immigration. Overriding all of the policy aspects of the salmon problem is the fact that over the past 100 to 150 centuries, the Pacific Northwest has changed from an uninhabited region to one supporting 13 million people, the majority of whom live in urban areas.

Viewed in broader terms, the salmon problem is a clash of fundamentally different values and priorities. One position argues that man has a moral obligation to preserve species. The reason we are in this policy conundrum with salmon is that we failed to make the right choices when they were easier to make. In short, man needs to adjust to and be part of the environment. Another view is that salmon are just one element of what man values. The future of salmon needs to be evaluated against what the alternative benefits are or might be. Balancing competing alternatives is the practical, realistic approach, not dogmatically locking into a restrictive, narrow policy position such as saving individual species at nearly any cost.

The rivers of the Pacific Northwest have been crucial to economic development. Rivers, especially the Columbia and its tributaries, were viewed as tremendous untapped resources that could be harnessed to support a strong, productive society. Electricity generation, agriculture, mining, flood control, water and land transportation, and urban development were all dependent on modifying these rivers. As one example of the importance of rivers in the Pacific Northwest, two-thirds of the electricity used in the region comes from dams in the Columbia River basin. However, one of the costs of this development was that salmon populations suffered mightily. The dams may block or delay adults on their spawning run. Young salmon migrating to the ocean may become disoriented by long reaches of slow-moving water, suffer mortality going through or over each dam, and be subject to voracious predators below some dams. However, the dams are only one factor. The Columbia River historically supported runs of 10 - 16 million salmon, but even *before* completion of the first mainstem dam in 1938, runs were reduced to 1.6 million, a drop of 84 - 90%.

The salmon's life history also causes serious problems for the survival of *individual* stocks.[5] There are seven species of Pacific salmon and several species of sea run (anadromous) trout. Five of the seven species of salmon -- chinook, coho, chum, sockeye, and pink -- are found on both sides of the Pacific. Two, the masu and amago salmon, are only found

on the Asian side. Of the sea run trout, steelhead is the most common and shares many of the salmon's life history characteristics. Salmon die after spawning, while trout may not. Salmon spawn in freshwater (rivers, streams, or lakes), spend various lengths of time in freshwater, migrate to the ocean, and spend from one to several years at sea. Depending on the species, salmon from the Pacific Northwest will move along the coast of North America or make a major migration past the Aleutian Islands. Salmon return to their stream of origin to spawn. Ocean conditions (especially El Nino events) have a major influence on the size of a particular "year class," and can result in dramatic influences, both positive and negative.

Salmon have always been important to people inhabiting the Pacific Northwest. The early aboriginal immigrants developed societies dependent on the annual return of salmon. For the past 3,000 - 5,000 years, there was a rough longterm equilibrium between salmon and human populations. The number of salmon that could be harvested was limited by lack of efficient fishing gear, limitations on the ability to preserve, store, and distribute the catch on a large scale, and most important, a human population of a hundred thousand or so. These conditions changed markedly in the nineteenth century. The early to mid part of the century saw a major drop in human population due to exotic diseases. Starting in the mid to late 1800s the population grew rapidly with major immigration from eastern North America. The human population growth coincided with the advent of more powerful harvest gear and the ability to preserve and distribute the catch in cans. The effect on salmon stocks was massive and rapid. Within six or seven decades many stocks were reduced below levels required to support fishing. Some were likely eliminated.

There were many other causes for the salmon decline beyond heavy fishing. Most of the Pacific Northwest is arid and water is a valuable resource for irrigation. Water diversions decimated many stocks. Timber resources are common, of very high commercial quality, and extremely valuable, and the harvest of these resources had adverse effects on salmon spawning and rearing. Floods historically have been common and devastating. Flood control has been a societal priority for many years. Dams create fish passage problems, both for returning spawners and migrating young fish, and has long been a challenge to fisheries managers. Competition for salmon harvest is also severe. Recreational, commercial, and Indian fishermen demand a share of a dwindling catch.

Some efforts to help improve salmon stocks may have actually accelerated declines. For example, Pacific salmon can be easily spawned and raised under artificial conditions in hatcheries. Starting in the late 1800s, when hatcheries first were used to help enhance salmon stocks, attitudes have evolved from near universal support to widespread skepticism. Many individuals are now openly hostile to the use of hatcheries; some contend that the 90 hatcheries releasing salmon into the Columbia River system actually worsen the condition of naturally spawning salmon. Hatcheries may introduce diseases, compete with naturally spawned fish, and decrease genetic diversity in the stock. Others regard this anti-hatchery view as another example of environmental elitism; why should society pay for the costs of maintaining wild salmon so a few, affluent individuals can fish for trophies.

Other actions have complicated the salmon situation. One especially troublesome problem is the introduction of non-native species. Non-native species, such as walleye, shad, brown trout, brook trout, smallmouth bass, and carp, have been widely distributed. As salmon stocks decline, other species move in to occupy different elements of their ecological niche. Once these exotic species are established, it is extremely difficult for salmon to reestablish viable stocks against such formidable competition and predation.

From a policy perspective, what, then, is the solution to the Pacific salmon *problem*? The answer to this seemingly simple question is crucial. On the simplest level, salmon stocks are declining and perhaps the elusive "public" might want to do something about this. As a public policy issue, the question is more correctly addressed as a *choice* among competing alternatives. But, couldn't the "problem" be equally formulated in terms of protecting agriculture? Or of maintaining the availability of inexpensive electricity? Even if we decide that the problem ought to be defined in "fish" terms, are we primarily interested in preserving all stocks, or just the most important stocks? From an evolutionary perspective, is it even possible to identify the most "important" individual stocks? Or, are we interested in maintaining relatively high stock levels so that they are *fishable*? Such questions are not unusual in public choice. A similar set of questions exists for policies on abortion, welfare, and disease management. Because these kinds of questions are so fundamental, yet so difficult to answer, it is often left to the province of "crats" (bureau*crats* and techno*crats*) to implicitly answer them. When crats can't satisfactorily answer these questions, the courts will.

Nothing is free in policy analysis and the salmon issue is no exception. For every benefit, there is a cost. Costs, of course, are only partially measured in cash. Other, often more important costs, might be loss of personal freedom, civil rights, fishing rights, or property rights. Many of the options revolve around decisions about the relative importance of an individual's benefits and rights compared to societal benefits. Depending on one's values and political perspective, the good guys and the bad guys are very different people and institutions.

The political constraints for resolving the salmon issue have evolved over time. Classical natural resource management is divided into a set of decision variables (elements a manager might control such as harvest rates, habitat improvement, and supplemental stocking) and constraints (for example, species being driven to extinction without due legal process) (Lackey, 1979). What is treated as a *constraint* and what is treated as a *decision variable* can and does change over time.

Health is one of those amoeba-like words that changes to fit the surrounding conditions. It is also a word increasingly used to describe ecological resources or ecosystems, but in ways very different from that of an individual animal. At least in a general sense, there is societal consensus of whether an individual person, dog, or cow is healthy. However, when the concept is applied to ecological systems, there is an explicit assumption that there is some ecological condition or state that is *desired or preferred*. Using the human health analog, we prefer healthy individuals to sick individuals. The condition of salmon stocks is often described against the norm of a healthy stock. Further, the health of salmon stocks is often

offered as a valid surrogate for the health of ecosystems. Appealing as health might be, there are serious problems in transferring the concept of human health to ecological resources and ecosystems. The word "health" carries so much meaning in everyday life that it is difficult to use it as a descriptor of how close an ecosystem matches a desired state.

The role of science and scientists in defining ecosystem or ecological health is contentious. To categorize something as "healthy" requires an implicit determination of what the desired or preferred state is. For example, to say that a patch of land is ecologically healthy implies something good, something desired, something preferred to alternative states. However, that same patch of land might be a pristine forest, a highly productive dairy pasture, a fertile field of corn, or a bustling university campus. Which ecosystem is healthiest? In a similar light, why should we define the problem in the Northwest as a salmon problem? Does that mean that we have tacitly placed salmon ahead of the alternative policy elements? Why not define it as a problem of enhancing inexpensive urban housing, maintaining the availability of cheap food, or minimizing flood risk?

Using the health concept in ecosystem management may not help resolve the public choice; in fact, it might cloud the fundamental choices society must make. Health has moved into the political lexicon, along with words such as *fairness, empowerment, reform, justice*, etc., as a term with politically loaded meaning. After all, who is against any of these? It is only when these terms are defined specifically that the true policy differences are clear.

The salmon situation illustrates a class of ecological policy choices that will become increasingly common and has been described as *socially violent*. There are a number of general characteristics: (1) *Complex* -- There is an almost unlimited set of alternatives and tradeoffs to present to decision officials or the public; (2) *Polarizing* -- They tend to be extremely divisive because they represent a clash between competing values;[6] (3) *Winners and losers* -- Some individuals and groups will enjoy positive effects, others will not, and this tradeoff is well known to the general public; (4) *Delayed effects* -- There is no immediate "fix" and the benefits, if any, of painful decisions are not obvious for many years; (5) *Decision problems* -- These are not the kind of problems that a democracy smoothly addresses because it is very easy for advocates to appeal to strongly held values; (6) *The role of science is unclear* -- Scientific information is important but usually not pivotal in the choice of an alternative when the choice is primarily driven by value judgements.

It is easy to sink into the mire and conclude that it is impossible to make a choice -- gridlock. The fact is, choices are being made. They may not be the best choices, *best* being defined as the desires of the majority and the choice being without unexpected consequences, but choices are being made. Democracy may not be efficient but history and recent world events shows the alternatives to be worse.

Informed public choice is crucial. It is not easy for the public, or anyone, to deal with the technical complexity of challenges like salmon and similar, complex environmental policy problems. One critical role of scientists and other technical people is to provide the scientific information in ways that help create an informed citizenry, but without the

advocacy of any particular political or policy choice. This is not a comfortable role for many scientists who hold strong personal views on policy choices.

Finally, those of us who are technocrats, scientists, biological resource managers, and scientific advisors should remain humble in our dealings with the public and elected officials and overcome the tendency to advocate political choices driven by strong personal interest in the resources we work with. However, it is equally important not to permit tough policy choices to masquerade in the cloak of a scientific imperative -- this is a prostitution of science and scientists that provides a convenient cover for avoiding difficult social choices. The complete implications of each alternative public choice should be fully and clearly explained, including the short and long term dimensions. Great care must be exercised to not abuse our positions as advisors and councilors.

LITERATURE CITED

1. Lackey, R. T. 1979. Options and limitations in fisheries management. Environmental Management. 3(2): 109 - 112.
2. Lichatowich, J., L. Mobrand, L. Lestelle, and T. Vogel. 1995. An approach to the diagnosis and treatment of depleted Pacific salmon populations in Pacific Northwest watersheds. *Fisheries*. 20(1): 10 - 18.
3. Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. *Fisheries*. (16): 4 - 21.
4. Nehlsen, W., J. A. Lichatowich, and J. E. Williams. 1992. Pacific salmon and the search for sustainability. *Renewable Resources Journal*. Summer: 20 - 26.
5. Regier, H. A. 1995. The old traditions that led to abuses of salmon and their ecosystems. IN: *Pacific salmon and their ecosystems: status and future options*, Deanna J. Stouder, Peter A. Bisson, Robert J. Naiman (editors), Chapman and Hall Publishers. [In Press]
6. Smith, C. L., and B. S. Steel. 1995. Values in the valuing of salmon. IN: *Pacific salmon and their ecosystems: status and future options*, Deanna J. Stouder, Peter A. Bisson, Robert J. Naiman (editors), Chapman and Hall Publishers. [In Press].