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## **Adverse Effects of Damming on Columbia River Salmon**

### I. Adverse Condition: Salmon Extinction

Over the last century, the Columbia River Basin, which once provided habitat for the largest salmon runs in the world, has been violently reshaped to satisfy society's ever increasing appetite for development. In our efforts to harness the river's power, we have disrupted riverine and riparian ecosystems, rendering the river unable to support the salmon populations that have spawned in the river and its tributaries since time immemorial. According to the Biological Perspective in the Columbia River Inter-Tribal Fish Commission's *Spirit of the Salmon*, "salmon once occupied nearly 13,000 miles of Columbia River Basin streams and rivers," and "the Columbia River Basin, both above and below Bonneville Dam, once produced between 10 and 16 million salmon annually." In comparison to historic runs, salmon runs today have declined by 90%. While there were historically 7.4-12.5 million salmon above Bonneville Dam, in 1995, there were an estimated 600,000 (*Spirit of the Salmon*, Biological Perspective).

In less than one hundred years, the Northwest's salmon population has dwindled to an abysmal, almost negligible, population. Most pink, chum, and wild coho stock in the Columbia Basin are extinct. Sixty-nine stocks have been identified as extinct, and 75 others are on the brink of extinction. In 2001, twelve salmon species that spawn in the Columbia were listed as endangered under the Endangered Species Act (*Return to the River* 8). Thanks to the network of dams that have turned the Columbia and the Lower

Snake River into a series of impoundments, Lewiston, Idaho is the farthest inland seaport in the continental U.S., but at what cost? In 1987, Snake River coho were declared extinct. In the early 1990's, Idaho's remaining salmon were listed by the ESA, and in the mid-1990's, wild spring and summer Chinook runs were the lowest in history (Columbia/Snake River drawdown 128).

In spite of unpromising Columbia River salmon statistics, can we harbor hope for the future of salmon in the Pacific Northwest? There is cause for hope, but saving the salmon and restoring ecological integrity to the Columbia and Lower Snake necessitates envisioning the river in a new way and rejecting the current approach to salmon restoration. In *Return to the River*, the Independent Scientific Group states, "Management of the Columbia River and its salmonid populations has been based on the belief that natural ecological processes comprising a healthy salmonid ecosystem can . . . be replace, circumvented, simplified, and controlled by humans, while production is maintained, or even enhanced" (447). However, new technologies have thus far proven incapable of substituting the natural processes that they were designed to replace. A holistic perception of salmon that recognizes the necessity of healthy habitat is needed to end salmon species' rapid migration towards extinction.

The Columbia Inter-Tribal Fish Commission, comprising members of the Nez Perce, Umatilla, Warm Springs, and Yakima Indian Tribes, espouses such a holistic approach that contrasts prevailing points of view. Their perspective can be used to guide us as we explore restoration possibilities. Under the 1855 United States treaty with the four tribes, the tribes ceded most of their land rights but reserved exclusive fishing rights on their reservations and the right to fish at "usual and accustomed" places (*Spirit of the Salmon*

table 2.1). Since the treaty was signed, the tribes have witnessed the rapid decline of native salmon stock and an end to subsistence, commercial, and spiritual salmon harvest.

In an effort to enforce recognition of their rights and reconstitute their way of life, members of the Inter-tribal Commission support an approach to salmon restoration that is premised on the inherent value, “spirit,” of salmon as well as their ecologic and economic worth. The Tribes base their management approach on respect for the dignity of nature, of all of Creation. They advocate restructuring human activity to allow for the peaceful coexistence of healthy salmon runs and people. Until the arrival of non-Indians, Indians had successfully managed the Columbia River’s resources for thousands of years. In the midst of arguments from the industry and agriculture sectors in favor of the status quo, the Commission’s philosophy and vision should be heeded.

## II. History Behind Decimation of Salmon Population

The current attitude endemic throughout many sectors of society that is largely responsible for the extinction of salmon stock and the threat of extinction to many others can be seen in testimony given during the Oversight Hearing on Columbia/Snake River Drawdown by Mr. Elridge, General Manager of the Umatilla Electric Cooperative:

Isn’t it time that we acknowledge that we are not going to remove or breach dams - - that we are not going to do deep drawdowns and that we are not going to drain Montana and Idaho for salmon? Isn’t it time to accept that we have a system in place that is not going to be dismantled? We have, through the development of the Columbia and Snake Rivers, given up annually abundant, naturally occurring salmon runs for the foreseeable future. A Columbia/Snake River system is the reality we have. We can and should improve our system for humanity as well as the other elements and creatures in our ecosystem. The existing system can be improved. (*Columbia/Snake River Drawdown* 123)

Mr. Elridge’s testimony reveals the attitude supporting maintenance of the status quo that has caused and will perpetuate salmon decimation. To save salmon, we must break free of this narrow mindset to realize that salmon restoration is valuable, in ecological and

human terms, *and* it is financially feasible if we calculate the minimal economic benefits of the current system and the true costs, without externalization and subsidization.

Using short-term economic benefits to justify industrialization of the river is not, however, a new phenomenon. Exploitation of the Columbia without concern for salmon and the ecosystems upon which they depend predates dam construction. In 1872, Congress passed the Mining Laws Act, which opened up public lands to mining without consideration for environmental impact. Salmon habitat devastated by mining operations has yet to recover (*Spirit of the Salmon* table 2.1). Large-scale use of the Columbia for irrigation dates back to 1910, when water from the Columbia was diverted to irrigate over two million acres of land (table 2.1). To the present day, an enormous amount of water continues to be diverted for irrigation. Water withdrawals destroy anadromous fish habitat. In addition to eliminating habitat, poorly designed irrigation structures greatly increase salmon mortality by trapping them in pumps and turbines.

Massive destruction of salmon habitat and disruption of salmon's migratory life cycles began in earnest during the era of dam construction, from the 1930s through the 1970s. Rock Island Dam was the first dam on the mainstem Columbia, completed in 1933. The Grand Coulee dam, perhaps the most devastating because it blocks access to 1,100 miles of spawning ground, was finished in 1941. When The Dalles Dam was completed in 1957, Celio Falls became the last major fishing area in the Basin to be inundated by dam waters. The completion of Hells Canyon Dam in 1967, combined with six other dams on the Upper Snake, blocked 600 miles of salmon habitat. In 1975, the ACE finished the fourth (and last) Lower Snake dam (*Spirit of the Salmon* table 2.1).

Today, there are thirteen dams on the Columbia and mainstem Snake that are passable by salmon (*Return to the River* 187). In total, construction of the Columbia River and lower Snake River dams has reduced historical salmon habitat by greater than 50%, making the Columbia River basin “probably the most dammed river system in the world” (*Spirit of the Salmon* Technical Recommendations). All but 50 miles of free flowing water in the U.S. have been replaced by impoundments behind dams. Only 100 miles of the Snake flow freely.

The habitat that remains after hydro development has been significantly degraded by poor land-use practices such as grazing, road-building, tree harvesting, and culvert construction. All of these activities increase erosion and collectively cause major declines in water quality. In combination with dams, poor land-use practices adversely affect salmon throughout all phases of their life cycle, beginning with poor egg survival. Invasive development along tributaries that are habitat for spawning salmon have led to grave drops in juvenile salmon survival: Mining, logging, irrigation, road-building, urbanization, and grazing cause increases in water temperature, increased sedimentation due to decreased bank stability, and less diversity in stream beds (*Spirit of the Salmon* Technical Recommendations).

Juvenile salmon migrating downstream are threatened directly and indirectly by dams, irrigation, and navigation. Estimates of mortality in juvenile salmon due to hydropower development range from 35 to 96 percent (*Spirit* Technical Recommendations). Hydropower, flood control, navigation, and irrigation have reduced spring and summer flows, thereby slowing juvenile salmon’s migration to the sea. Their increased travel time increases their mortality for numerous reasons (*Spirit*, Technical

Recommendations). Delays in downstream migration make them more vulnerable to predators and disrupt their bodies' transition processes that prepare them to enter the ocean. In addition to prolonged travel time, passing through turbines leads to direct and indirect mortality. An estimated 10–30% of salmon die directly when trying to pass through turbines during downstream migration (*Spirit Technical Recommendations*).

Once the juveniles reach the estuary at the mouth of the Columbia, they are threatened by changes in the ecology of the Columbia River Estuary as a result of dam-construction. Reductions in peak river flows have caused changes in sedimentation patterns and sediment composition. Reduced sedimentation is conducive to phytoplankton growth in the estuary. These ecosystem changes are detrimental to all anadromous fish, whose transitional period spent in the estuary is critical to their survival (*Spirit Technical Recommendations*).

Adult salmon returning upstream to spawn are obviously impeded by the physical barriers created by dams. Fish ladders are used to aid upstream migrants, but the efficacy of these technologies is questionable. In addition to the structural barriers imposed by dams, dams create impoundments that cause water temperatures to rise. Rising river temperatures also increase salmon mortality (*Spirit of the Salmon Tech.*

*Recommendations*). The salmon that manage to migrate back to their spawning ground are not guaranteed good spawning habitat. Habitat degradation due to land-use practices has made spawning grounds less than ideal and greatly increased egg mortality.

### III. Institutions Responsible for Salmon Restoration

According to the Inter-tribal Commission's *Spirit of the Salmon*, the Columbia River Fish Management Plan, Pacific Salmon Treaty, the Fish and Wildlife Program adopted under the Northwest Power Planning Act, the Federal Energy Regulatory Commission, and the Endangered Species Act create the framework for Northwest governing agencies to effectuate salmon restoration (*Spirit of the Salmon* Legal Context). The Columbia River Inter-Tribal Fish Commission (CRITFC) was created in 1977 to coordinate salmon restoration policies between the four treaty tribes. CRITFC does not wield power of enforcement, however. Procedures for salmon restoration, which have not been followed adequately, are outlined in *U.S. v. Oregon* and the Pacific Northwest Electric Power Planning and Conservation Act. The Intertribal Commission's recommendations are based on these documents, with some modifications.

In 1980, Congress passed the Northwest Power Act, which represented Congress's first real recognition of the impact of hydroelectric development on anadromous fish. The legislation focuses on how to conserve power and minimize the effects of power production on NW salmon. This legislation led to the creation of the NW Power Planning Council, funded by the BPA. The Council is designed to "protect, mitigate, and enhance" fish and wildlife that are affected by hydropower development (*Return to the River* 3).

In 1982, the Council established the first Fish and Wildlife Program to address habitat protection and species' recovery (4). However, the Council does not have regulatory power. The U.S. Bureau of Reclamation, the Federal Energy Regulatory

Commission, and the U.S. Army Corps of Engineers are supposed to implement the Council's mandates to the "fullest extent practicable," which clearly leaves significant room for interpretation (*Return to the River* 10). In 1992, the Council created the Independent Scientific Group to review the Program's efficacy and provide Council members with scientific advice. The ISG has since drafted multiple versions of *Return to the River*, which assesses the current approach to salmon restoration and suggests a new conceptual framework.

The National Marine Fisheries Service (NMFS) is responsible for managing and protecting listed anadromous fish species while the U.S. Fish and Wildlife Service is responsible for protecting listed resident fish (*Return to the River* 8). However, Judge Marsh reveals the inefficacy of the NMFS's salmon restoration approach in his review of the 1993 NMFS Biological Opinion on Columbia River mainstem operations, as cited in the introduction of the Independent Science Advisory Board's 2000 *Return to the River* report:

. . . the process is seriously, significantly, flawed because it is too heavily geared towards a status quo that has allowed all forms of river activity to proceed in a deficit situation-- that is, relatively small steps, minor improvements and adjustments-- when the situation literally cries out for a major overhaul.

The Columbia River Inter-Tribal Fish Commission similarly judged the National Marine Fisheries Service's 1995 Recovery Plan for Snake River Salmon to be inadequate. In response, the Commission drew up the *Spirit of the Salmon*. The document sets forth a series of institutional and technical recommendations to ensure salmon restoration and revitalize tribal fishing on the Columbia. The Tribal Commission calls for the adoption of a single plan for anadromous fish restoration involving

cooperation between federal and state agencies and the tribes. Their plan is designed to achieve a specific objective: restoring salmon stocks above Bonneville to 4 million annually in 25 years. The tribal plan situates the causes and implications of salmon's imminent disappearance within the relevant cultural, biological, institutional and legal perspectives. Unfortunately, their plan is merely a recommendation to members of state and federal government.

#### IV. Recommendations for Effective Salmon Restoration

Due to faulty accounting that has led to externalization of the true costs of maintaining the system and people's inexplicable attachment to the Northwest's dams, dam breaching is met by fierce opposition on a number of fronts. Subsidies including power rate discounts for the aluminum industry and irrigators distort the economic and environmental costs of river industrialization by forcing taxpayers to shoulder the burden (*Columbia/Snake River Drawdown* 130). These subsidies and others prevent people from accurately evaluating dams' economic benefits.

As a result, current restoration efforts have focused on making technical modifications to dams, including screens over pumps, surface bypass systems, and fish ladders. Praising the potential of fish barging is also a popular solution in spite of the fact that it has been proven incapable of replacing fishes' natural migration. Contrary to what hydropower and agricultural special interest groups advocate, fish barging for downstream migrating salmon is simply not a viable or scientifically sound conservation approach. As the representative from Idaho Steelhead and Salmon Unlimited states in his testimony before the Oversight Hearing on Drawdown Proposals, "Idaho's anadromous

fish return as adults in far greater numbers when as smolts they are able to ride a good spring freshet downstream to the ocean” (*Columbia/Snake River Drawdown* 134).

In addition to structural modifications, many people advocate changes in hydropower management. Such changes include augmenting flow to recreate natural periods of heavy flow that aid upstream migrating salmon. Hourly or daily fluctuations in flow due to power demands can be reduced. Turbines can be operated at maximum efficiency, which reduces salmon mortality, and controlled spill can be used to help downstream migrating salmon over the dams. While these efforts can aid wild salmon dam passage, they are ultimately insufficient for restoring salmon stock populations to pre-dam levels.

Permanent natural river level drawdown on at least all four Snake River dams is another possible, yet highly contested, solution. Although permanent river drawdown would lead to river flow closer to that prior to damming, the dam structures would still be left in place. Thus some impoundment behind the dams would necessarily remain. Since permanent drawdown would essentially disable the dams anyways, why not remove the structures entirely?

For too long, restoration efforts have focused on using technology to place a band-aid on rapidly disappearing salmon runs. Technology cannot be used to replace vital ecological processes. Salmon restoration must necessarily include ecological functions that are indispensable to wildlife survival, and as long as the rivers remain series of impoundments behind dams, natural ecological functions cannot be revived. To truly restore wild salmon stock to pre-dam levels and avoid extinction of many runs, it will be necessary to breach the four Army Corps of Engineer Dams on the Lower Snake: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. However, in a hearing on

hydropower river management, Antone Minthorn of the Umatilla Confederated Tribes states,

Breaching alone is not enough. But all other measures combined, without breaching, will not be enough. Partial removal of the four dams is an essential component of any effort to effectively protect and restore Snake River fish . . . It is necessary to rebuild and restore the runs and their habitat leading to sustainable, harvestable salmon populations consistent with tribal Treaty Rights and the federal government's Trust Responsibility to the tribes. (*Hydropower River Management* 187)

If breaching is necessary but insufficient in and of itself, what else is needed to restore salmon? After dam removal, restoring and protecting salmon habitat is perhaps the single most important factor in protecting salmon run populations. Habitat restoration involves establishing ecological standards that are enforced by the power of law. Such standards would include water temperature (not to exceed 60 degrees F according to the Inter-tribal Fish Commission), controls on levels of sedimentation, healthy riparian zone reserves, and healthy tributaries. Ultimately, habitat conditions must ensure that fish mortality returns to pre-dam levels, or as close as possible. This means that during downstream migration, approximately 71 percent of salmon would survive (*Spirit of the Salmon*).

Why protect salmon? From a biological standpoint, migrating salmon carry important nutrients upstream, and they serve as general indicators of an ecosystem's equilibrium. From an economic perspective, revitalizing the commercial, Tribal, and sport salmon fishing industries would be lucrative. From the different Tribes' points of view, salmon are a vital component of cultural and spiritual belief systems. But anthropogenic benefits aside, wild salmon and naturally flowing rivers are inherently valuable elements of the ecosystem. Prior to river development and dam construction

during the last century, salmon had thrived for thousands of years. What right have we to deprive them of their well-being? While the Treaty Tribes comprising the Columbia River Inter-Tribal Commission have an agenda, that is to restore tribal fishing, their wise philosophy regarding environmental stewardship is one that all of us collectively would do well to heed. The dedicatory note to *Spirit of the Salmon*, written by Eugene Greene, Sr., Chairman of the Columbia River Inter-Tribal Fish Commission, eloquently summarizes their philosophy:

This work is dedicated to all life on this earth, before our time and long after we are gone. We did not inherit this earth or its natural resources from our ancestors, we are only borrowing them from our children's children; therefore, we are duty bound and obligated to protect them and use them wisely until such time that they get here, and then they will have the same obligations. (*Spirit of the Salmon* dedication)

May the Northwest's wild salmon not be reduced to a relic of the past.

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