

**THE GEOGRAPHY OF HOPE: A REGIONAL STEWARDSHIP
STRATEGY FOR PACIFIC SALMON**

**A White Paper
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PART 1

INTRODUCTION: BRINGING BACK THE SALMON

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“The salmon is a symbol of the majesty of the Pacific Basin ... and it’s an indicator species of the health of the whole system that we must restore in order to survive, and in order to live the kind of lives that we set out to try to live..”

(David Simpson, Mattole Watershed Council; from the film, “Last Chance for the Pacific Salmon”, 1995.)

1. Introduction and Series Overview

The Salmon People

Many Native American tribes tell stories of the Salmon People. The Salmon People lived some of the year in the ocean, in human form, but each year would put on fish form and return to the inland streams. The tribes relied on the salmon for sustenance, but were warned to always treat the salmon with respect, in case they became offended and not come back. In several legends, tribal members disobeyed the injunction to return the salmon bones to the river once they had finished feasting, and the salmon did not come again, bringing hunger and despair to the tribe. This legend teaches us two important lessons: the health of human communities is linked to the natural bounty of the region, and salmon will only return to the rivers of the Northwest if we nourish those rivers.

Today, salmon^b runs are failing throughout the region, and with their decline many human communities - tribes and fishermen - are suffering. The impacts of salmon decline are felt beyond these resource-dependent communities, and indeed beyond the Pacific Northwest^c. In this series of papers we translate the lessons of the Salmon People legend into a new salmon restoration strategy, one that links salmon survival and community sustainability, and that relies on nourishing the salmon ecosystem to bring back the fish.

Salmon as an icon of the Pacific Northwest

Salmon are a cultural icon of the Pacific Northwest. The sight of a salmon, flashing silver as it struggles upstream, suggests the physical beauty of the land, which gave it birth. In their heroic journeys, salmon call to mind the determination and resiliency of the early pioneers. In their perilous status, they have become a surrogate for the health of the landscape, for its ability to sustain not only salmon but also human communities. The connections between salmon and people run deep, beginning over 10,000 years ago with early Native American cultures, continuing through the early explorers wonder at the “piscatorial spectacle” of rivers “crouded (*sic*) with salmon”¹ to the fishing-dependent communities of today. Whether for food, cultural identity, religious rites or employment, the people of the Pacific Northwest depend on salmon.

The decline of an icon

In recognition of their iconic status, journalist Timothy Egan defined the Pacific Northwest as “any place salmon can get to².” By this definition, the region is shrinking. According to the National Academy of Sciences, Pacific salmon have disappeared from about 40% of their historical breeding ranges in Washington, Oregon, Idaho and California over the last century³, and they are threatened or endangered over much of their remaining range. Figure 1 shows the location of watersheds in which salmon extinctions have occurred.

^b “Salmon” as used in this series of papers refers to the five species of Pacific salmon (chinook, coho, sockeye, chum and pink) as well as the two species of sea-run trout with similar life-histories (steelhead and cut-throat).

^c For the purposes of these papers, the “Pacific Northwest” comprises coastal California (excluding the San Francisco Bay-Delta area), Idaho, Oregon and Washington.

Figure 1. Watersheds that have experienced salmon extinctions

Consequences of

The ‘salmon crisis’ a biological concern, but for those who suffer the

and for those who must pay to restore fish runs. The social, political and consequences of failing fish populations extend beyond the Pacific Treaties between the U.S. government and Native Americans, and the U.S. and Canada, mean that the ‘salmon crisis’ is of regional, national international significance.

Within the region, remedying the ‘salmon crisis’ will require substantial changes in every sector of the economy. As many commentators have noted, the ‘salmon crisis’ will have much more impact on the region than the 1980s controversies over spotted owls. Unlike spotted owls, whose range was restricted to a relatively small fraction of the Northwestern landscape, salmon range from the interior deserts to the rainforest coast, from the skyscrapers of Seattle to the forested ridges of the Cascades, from the wheat fields of the Palouse to the paper mills of the Willamette Valley. In consequence, the impact of efforts to restore salmon will be spread over a much larger area and will affect more segments of the economy.

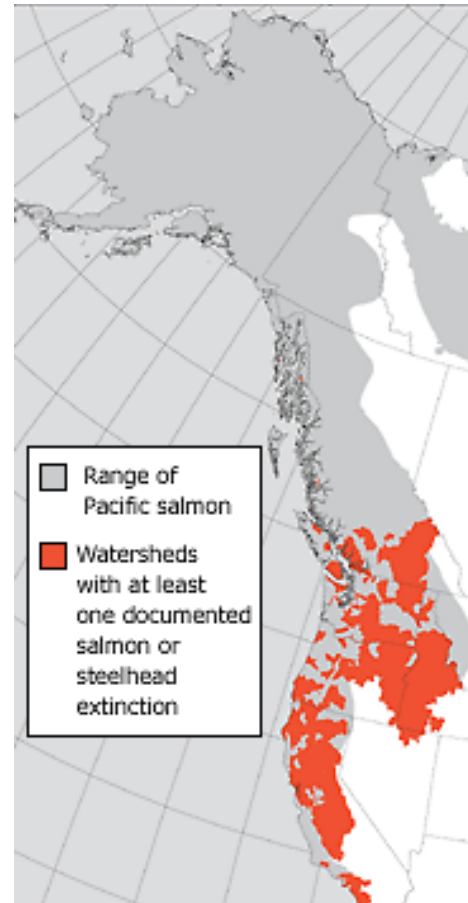
Choices: different visions of restoration

One of many difficulties is that there are several competing visions for salmon restoration. Perhaps the most ambitious calls for rebuilding all runs to pre-settlement levels; given the extensive habitat alteration which the region has undergone since 1850 (documented in Part 2) this goal appears unrealistic. A more plausible, but still challenging, goal would maintain stocks at levels where the risk of extinction was minimal. This goal would satisfy the Endangered Species Act’s legal obligation to “recover” listed species. It is not clear whether it is ecologically feasible to restore all runs⁴, and some scientists have proposed prioritizing stocks in order to focus efforts on those populations with the greatest likelihood of recovery⁵. A third vision seeks fish numbers high enough to support commercial, sport and tribal harvests. This goal emphasizes population size over the genetic diversity and geographic distribution criteria that are part of Endangered Species Act (ESA) recovery targets. It would be the easiest vision to achieve, as it would allow the loss of certain runs and the use of extensive hatchery releases to build population size.

In this series of papers, the general term “restoration” is used to refer to a vision that extends the second alternative. In this vision, all existing runs are brought back from the risk of extinction, and certain runs are rebuilt to a greater size where they can sustain commercial, sport and tribal harvest. The emphasis is on wild fish, though supplementation may be used where extinction would otherwise be unavoidable. The more specific term “recovery” will be used in Parts 2 – 5 to refer to ESA obligations to achieve sustainable populations of listed fish.

A new approach to restoring salmon

To date, many of the efforts to restore salmon have relied on technological fixes such as artificial production of salmon in hatcheries. The failure of technological remedies can be seen in the Columbia Basin, where despite some \$3 billion of investment since 1981, and annual spending which now approaches the billion-dollar level⁶, fish populations face



increasing risks of extinction. The goal of this series of papers is to propose a new and more cost-effective approach to salmon recovery based on protecting and restoring habitat.

A habitat-based approach is an investment in the future of both salmon and people, whose fates are linked: without healthy watersheds human needs for food, water and shelter will go unmet as streams are polluted or run dry, soil is exhausted and forests decline. Wallace Stegner called for the American West to “create a society to match its scenery”⁷. The salmon crisis, by encouraging the region’s citizens to rework their connections to the land and water, may provide the opportunity to build that society. A new stewardship ethic that engages the region in addressing the problems of salmon, water pollution and sprawl while encouraging sustainable rural development can serve as the foundation for healthy ecosystems, sustainable economies and vital communities.

Institutional changes

What is needed to make this new approach work? Most salmon recovery plans implicitly assume that increased scientific knowledge will point the way to improved decision-making. Certainly more and better science is needed – as will be discussed in Part 2 of this series - but science alone is not enough. Unless institutional obstacles to implementation are addressed, the best science and most detailed plans will not achieve recovery. Rarely are these institutional obstacles identified^d. For example, the Federal Caucus’ strategy for the Columbia River basin notes the importance of restoring tributary flows and improving fish passage, and assigns responsibility for this work to the Bureau of Reclamation, but fails to point out that the Bureau lacks authority to conduct such instream work except at its own projects. Management institutions must be able to effectively use scientific information to inform plan development and implementation. The Independent Scientific Advisory Board points out that proposed recovery strategies “provide little guidance on how institutions can function more effectively to promote ...recovery”⁸. This series of papers

Bioregional governance

This aligns management institutions with physical boundaries – watersheds and river basins - and allows management strategies to reflect local conditions. Implicit in this concept is ecosystem-based management that integrates management of land, water and other natural resources.

Cooperative management

This acknowledges the importance of involving a wide array of stakeholders in developing and implementing management plans. It also addresses the problems of fragmented authority, allowing Federal, State, tribal and local governments, along with the private sector, to coordinate existing efforts and share responsibility through partnerships.

Adaptive management

‘Learning-by-doing’ reflects our incomplete knowledge of how natural systems work and of how effectively we can manage them. It recognizes the need for additional policy-relevant science, as well as the importance of adjusting policies in response to new scientific information. Adaptive management is an essential part of a strategic, goal-oriented approach to salmon restoration.

^d An exception is “A Survey of Columbia River Basin Water Law Institutions and Policies”, by M. Schlosser, S. Yates, J. Nueman and A. Duncan.

attempts to meet that need, focusing on ways to align and adapt existing institutions in an integrated regional framework. In its analysis of the effectiveness of existing institutions, the National Academy of Sciences⁹ recommended three principles to be used in redesigning salmon management: bioregional governance; cooperative management; and adaptive management. These principles are explored in more detail later in this paper.

The resource challenge

The success of a salmon restoration strategy will ultimately rest on our willingness to invest in both the science that supports it and the people who we ask to implement it. We need to invest in scientific research to improve our understanding of salmon and their ecosystem, and we need to develop tools that link our scientific understanding to management decisions. We need to build partnerships – among different levels of government and between the public and private sectors – to develop salmon restoration plans. And we need to provide incentives to encourage the region’s citizens to adopt “salmon-friendly” practices and undertake restoration activities. Adequate funding, and staff support from government agencies, will be needed to make a salmon strategy work. Resource needs and opportunities are described further in Parts 5 and 6 of this series.

From the ground up: building a regional stewardship strategy

This series of papers explores how the principles of bioregional governance, cooperative management and adaptive management can be translated into a regional stewardship strategy to rebuild healthy salmon populations and watersheds. The strategy is built, literally, from the ground up, beginning with local activities in watersheds. This first paper lays the foundation for the strategy and the series by describing the need for a new approach. Subsequent papers will examine:

- the concept of stewardship and the ecological, economic and social benefits of a habitat-based strategy (Part 2)
- the role of watershed initiatives as a framework for integrating resource management and building partnerships (Part 3);
- using watershed initiatives and existing programs as building blocks for restoration programs at the ‘salmonshed’ (population) level (Part 4);
- a multi-State Pacific Salmon Stewardship initiative to coordinate programs and resources at the regional level, together with a detailed discussion of resource needs and opportunities for meeting them (Part 5); and
- an action agenda detailing steps that Federal, State, tribal and local governments, together with the private sector (including academia and non-governmental organizations) can take to develop and implement the strategy (Part 6).



Several themes recur through Parts 2 – 6:

- the important role of the States in sponsoring and coordinating restoration programs at the watershed,

- ‘salmonshed’ and regional level;
- the importance of partnerships (both intergovernmental and public-private) to build constituencies in support of salmon restoration;
- the need for incentives (financial, regulatory, social and political) to motivate governments, communities, businesses and individuals to participate in partnerships and undertake stewardship activities;
- the importance of accountability, including:
 - institutional commitments to implementing plans and meeting environmental goals; together with
 - the development of tools to measure progress towards meeting those goals; and
- the need for more and better science to identify problems, evaluate options and measure success.

2. The importance of salmon

Ecological importance

The annual migration of adult salmon to their spawning grounds represents a massive influx of nutrients that are a vital part of the ecological budget¹⁰. Decaying salmon carcasses provide food for bears, eagles and other carnivores, and they release nutrients into the streams, supporting an aquatic food web upon which the next generation of salmon depends. As salmon runs decline, nutrient flows drop, with unknown but potentially large implications for salmon and other species.

Cultural importance

Salmon are integral to the culture of the Northwest. The status of salmon as a regional symbol can be seen in any number of T-shirts, earrings, food baskets and other artifacts marketed to the tourist trade. The image of a salmon has represented ‘home’ to generations of Northwest residents, as evidenced by their representation in regional art and song. To those communities whose lifestyles are intimately entwined with the salmon – Native Americans and fishermen – salmon provide social context and a sense of heritage. Native Americans in particular value the salmon both for providing sustenance and for its central place in their spiritual lives. This is embodied in the First Salmon Ceremony in which the first returning fish is greeted with elaborate ceremony. The many salmon festivals throughout the region are testimony to the link between the presence of salmon and the sense of community well-being.

Economic importance

Ecological and social values are hard to quantify, and therefore easy to dismiss. What cannot be ignored is the very real contribution that salmon make to the regional economy. The value of commercially-caught salmon has declined as failing runs have triggered harvest restrictions. Income from commercial fishing has plummeted from \$41 million in 1976 to \$25 million in 1986 to \$4 million in 1998¹¹. In turn, the collapse of commercial salmon fisheries has triggered a decline in fishing-related income for businesses (e.g. marine suppliers) and service industries in coastal communities. The Pacific Coast Federation of Fishermen’s Associations estimates that salmon declines have cost the region over \$500 million dollars per year, and led to the loss of 72,000 jobs in the past 20 years¹². The return of fish populations to harvestable levels would also allow the rebirth of the sports fishing industry; in Idaho alone this could generate \$72 million per year and provide more than 2,100 jobs¹³.

Support for salmon restoration

Surveys show a high level of support for restoring salmon. The decline of salmon is the greatest environmental concern in the region¹⁴. An Oregonian poll reported that 85% of citizens wanted to preserve salmon runs on the Columbia and Snake Rivers¹⁵. Asked why preserving salmon was important, 35% replied that salmon were a part of

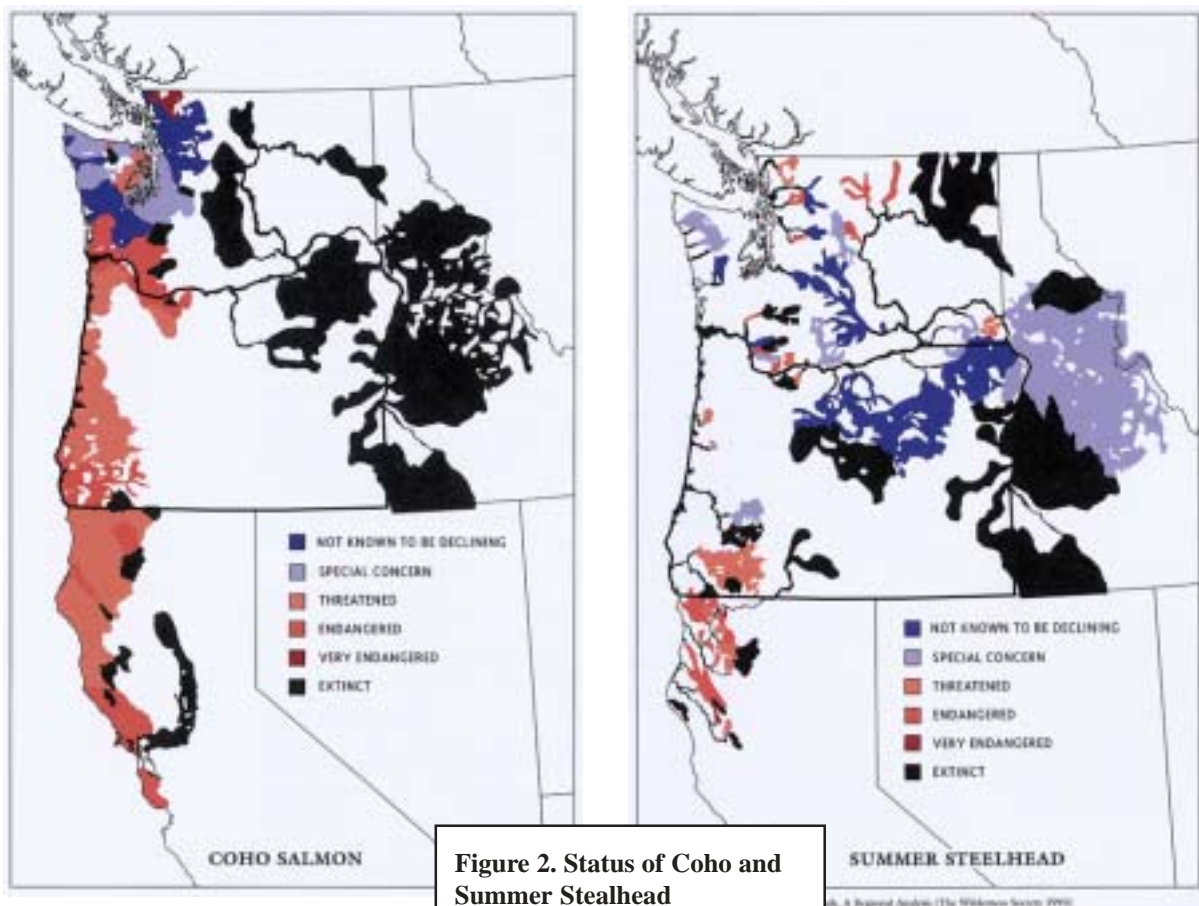
the Northwest's heritage, 36% viewed the salmon as proxies for environmental health and 15% focused on salmon's commodity value. Studies have estimated willingness-to-pay for salmon restoration, with results ranging from \$120 - \$325 per year per household¹⁶. In addition, 47% of respondents in Oregon coastal communities indicated a willingness to volunteer one half-day per month for salmon restoration work¹⁷.

3. The 'salmon crisis'

Natural and human influences on salmon populations

The most common image of a salmon is of an adult returning to spawn in its natal stream, but this image belies the complexity of a lifecycle in which the salmon migrates from river to sea and back again over a time span of 2 to 5 years. Although salmon spend the majority of their lives in the ocean, the influence of ocean ecology on salmon populations has only recently begun to be understood. The Pacific Decadal Oscillation, a climate shift that affects the productivity of marine ecosystems, has been shown to dramatically affect salmon survival. These natural variations greatly complicate any attempt to relate human activities to salmon survival on a decadal time-scale.

These natural decadal variations are superposed on a long-term decline in salmon numbers that began in the 1800s with the arrival of Euro-American settlers¹⁸. By 1880 the use of fish wheels on the Columbia had already caused fish stocks to collapse and the first hatcheries were being built in an effort to rebuild salmon runs. The long decline of fish populations from the 1850s to the present day can be attributed largely to human activities: habitat loss, over-harvesting, interactions with hatchery stock and – in many river basins – the impacts of hydropower.

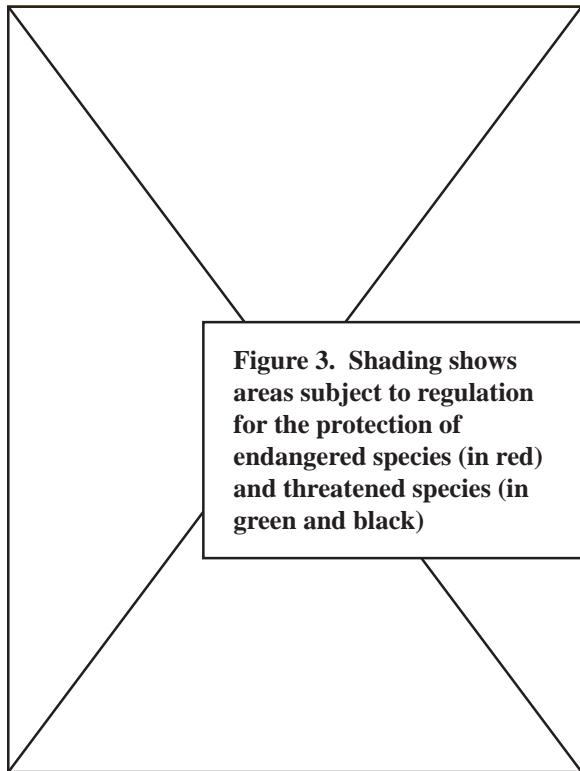


The status of salmon populations

As Figure 2 shows, salmon losses are widespread in the region. The American Fisheries Society identified over 100 salmon populations that have gone extinct, and some 214 populations at risk of extinction¹⁹. The Wilderness Society estimates that, unless current land use practices change, 9 out of 10 salmon species will go extinct²⁰. Watersheds that are home to threatened or endangered salmon occupy 50% of Oregon and 71% of Washington²¹. Across California, Idaho, Oregon and Washington current run sizes are approximately 5% of historic levels²². In the Columbia Basin it is estimated that when Euro-American settlers first arrived in the basin some 10 – 16 million adult salmon would return each fall to their spawning grounds²³; in the past decade annual returns average fewer than 1 million^e.

Endangered Species Act listings

The 1986 extinction of Snake River coho and the precipitous declines in numbers of other ESUs^f prompted a series of ESA listings beginning in 1991. As of 2001, 23 populations are listed as threatened or endangered in the area covered



by this paper, and another 4 are candidates for listing (see Table 1). Listing under the ESA potentially exposes a wide range of activities to Federal regulation and citizen lawsuits; it also adds a further layer of scrutiny for projects which receive Federal funding or which require Federal permits. The threat of regulation and judicial intervention has been an impetus for regional efforts to address the salmon crisis. Figure 3 shows the extent of the area subject to ESA jurisdiction.

The effects of the ESA listings extend beyond the region. Salmon in the ocean form a ‘mixed stock’ fishery; a fisherman cannot tell whether the fish he or she has caught is from a listed population. As a result, harvest levels are set to the tolerance of listed populations, which has the effect of lowering harvest levels from California to Alaska. Through the Pacific Salmon Treaty, declines in salmon stocks which spawn in the U.S. affect Canadian fisheries. Likewise, habitat management in Canada affects commercial fish landings in the U.S. Recently the U.S. government has come under pressure to persuade the Canadian government to reform timber management practices on salmon-producing streams.

Thus, the ‘salmon crisis’ can profoundly influence U.S. – Canada relations.

Trust and treaty responsibilities

The Federal government’s responsibility for the ‘salmon crisis’ is not limited to its ESA responsibilities. The tribal trust doctrine asserts that the government must recognize the impact of its activities on the tribes, and affirms a duty

^e In 2001, an estimated 3 million fish returned to the Columbia River, the largest return since 1938. Of these, an estimated 80% were of hatchery origin.

^f ESU: Evolutionarily Significant Unit. The smallest genetically distinct population segment; used to identify populations for ESA purposes.

Table 1.
Endangered Species Act Status of Pacific Salmon

Pink Salmon

Listed: None

Coho Salmon

Listed: Central California ESU (threatened)
Southern Oregon/Northern California ESU (threatened)
Oregon Coast ESU (threatened)

Candidate: Puget Sound ESU
Lower Columbia River/Southwest Washington ESU

Chinook Salmon

Listed: Snake River Fall-run ESU (threatened)
Snake River Spring/Summer-run ESU (threatened)
Puget Sound ESU (threatened)
Lower Columbia River ESU (threatened)
Upper Willamette River ESU (threatened)
Upper Columbia River Spring-run ESU (threatened)
California Coastal ESU (threatened)

Chum Salmon

Listed: Hood Canal summer-run ESU (threatened)
Columbia River ESU (threatened)

Sockeye Salmon

Listed: Snake River ESU (endangered)
Ozette Lake ESU (threatened)

Steelhead

Listed: Southern California ESU (endangered)
South-Central California Coast ESU (threatened)
Central California Coast ESU (threatened)
Upper Columbia River ESU (endangered)
Snake River Basin ESU (threatened)
Lower Columbia River ESU (threatened)
Upper Willamette ESU (threatened)
Middle Columbia River ESU (threatened)
Northern California ESU (threatened)

Candidate: Oregon Coast ESU

Coastal Cut-throat

Listed: Southwestern Washington/Columbia River ESU (threatened)

Candidate: Oregon Coast ESU

to safeguard natural resources, which are important to the tribes. In the Pacific Northwest, this trust responsibility is supplemented by the terms of treaties signed in 1855 that guaranteed tribal members the right to fish at their “usual and accustomed places”. Subsequent court decisions have affirmed and expanded these treaty rights. Current and future litigation will test whether reserved treaty rights oblige the States and Federal government to provide habitat adequate to support fish populations at harvestable level.

The scope of the salmon crisis

As can be seen from the above, the decline of salmon poses problems for an array of stakeholders: resource users whose activities may be altered or curtailed to limit impacts to salmon; commercial and sports fishermen whose harvest levels are at historic lows; Native Americans whose culture, religion and economy are tied to salmon runs; State and local governments who must attempt to balance competing demands on salmon and their habitat; the Federal government in exercising its responsibility under national law, international and tribal treaties and tribal trust; and, ultimately, the U.S. taxpayers who will be held accountable under those treaties if salmon populations are not restored.

4. Responses to the Salmon Crisis

Overview

Just as the roots of the salmon crisis extend back to the 1800s, efforts to reverse declining salmon runs date back to the building of Columbia River hatcheries in the 1880s²⁴. The passage of the Northwest Power Act in 1980 marked a turning point for salmon restoration²⁵. The Act mandated that, in the Columbia River Basin, protection and restoration of salmon runs be given equal weight with power production. Equally important, the Act provided a mechanism to pay for these efforts, requiring power customers to fund, through Bonneville Power Administration (BPA), a program “to protect, mitigate and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries.” In addition, the Act created the Northwest Power Planning Council (NWPPC), essentially an interstate compact between the States of Idaho, Montana, Oregon and Washington. The formation of the NWPPC represented an attempt to find a regional solution to the salmon crisis. Since 1980, a myriad of proposed solutions have been offered, not only by the NWPPC but also by the Federal government, States, tribes, local governments, environmental groups, fishing groups and a broad array of other stakeholders. These proposals are described in Appendix 1 and briefly summarized below.

Federal responses

The Federal government assumed an increasingly important role with the listing of several fish populations under the Endangered Species Act. Under the ESA, the Federal government is responsible both for preventing further salmon

²⁵ For an excellent history of resource development, salmon declines, recovery efforts and governance institutions in the Columbia Basin, see “A River in Common: The Columbia River, the Salmon Ecosystem and Water Policy”, a report by the Western Water Policy Review Commission.

declines by regulating activities which harm salmon^h and also responsible for rebuilding salmon populations through the recovery processⁱ. The first step in recovery planning is setting population goals; this has not yet been any done for any listed species, which has proved a significant obstacle to non-Federal entities wishing to develop their own recovery strategies.

The Federal government participates in setting harvest goals through the Pacific Salmon Treaty, Pacific Fisheries Management Council and other processes. The Federal government is also a landowner; much Federal land in the region is managed under the terms of the Northwest Forest Plan and Interior Columbia Basin Ecosystem Management Plan. The Federal government's most ambitious salmon effort to date is the "Coordinated Federal Strategy for the Recovery of Columbia and Snake River Salmon", a multi-agency endeavor to manage hydropower, harvest, hatcheries and habitat.

Additionally, the Federal government is a significant source of funding. In FY 2001, Federal agencies (excluding BPA) spent a total of \$280 million on salmon restoration²⁵. New programs are being created to meet salmon needs, such as the partnerships authorized through the Fisheries Restoration and Irrigation Mitigation Act, which will provide \$25 million per year for fish screens. The FY '01 Commerce-Justice-State Appropriations bill contained support for watershed-based restoration initiatives through the Pacific Coastal Salmon Recovery Fund; the Pacific Salmon Recovery Act (legislation pending) would provide \$200 million per year to the States and tribes for salmon restoration.

Regional responses

The NWPPC oversees the Federal hydropower facilities that affect rearing and migration conditions in the Columbia River mainstem and estuary. Salmon restoration efforts in the Columbia Basin have been underwritten by BPA, which has spent \$3.48 billion on recovery efforts since 1978. Most of this funding went to improve fish passage through the hydropower system, but \$811 million went to the regional Fish and Wildlife Program (funded by BPA, but managed by the Council in consultation with the States and tribes). Reflecting the continuing tension between the Federal government and the States over who has management responsibility for salmon, the Governors of Idaho, Montana, Oregon and Washington released a plan to restore Columbia River salmon²⁶ that was designed to provide a regional alternative to the Federal Caucus' strategy.

State responses

The States play a very important role. Many of the legal authorities for land and water management that influence the condition of salmon habitat reside at the State level (see Appendix 2). Oregon and Washington also have responsibilities as co-managers of fish harvest through the U.S. v. Oregon process. In addition, Federal funding to support salmon restoration (such as the Pacific Salmon Recovery Fund) is allocated through the States.

The States have taken the lead in salmon restoration. Both Oregon and Washington have restructured agency work plans to address salmon-related issues, and both have sponsored and funded watershed initiatives to engage local citizens in natural resource management and salmon recovery. Through the "Oregon Plan for Salmon and Watersheds" and Washington's "Statewide Strategy to Recover Salmon", both states have created management frameworks to address the salmon crisis at the state and local level. States can also provide significant resources: in the 1999 – 2001 biennium, Washington alone spent \$168 million on salmon recovery²⁷.

^h ESA prohibits the "take" (harm) of listed species, unless authorized under a '4(d) limit' for threatened species, a Habitat Conservation Plan (for threatened or endangered species) or as part of a section 7 consultation on Federally-funded or -permitted projects.

ⁱ The "take" prohibition seeks to prevent further salmon declines; "recovery" seeks to rebuild salmon populations to sustainable levels.

State-sponsored restoration programs in California and Idaho lag behind those in Oregon and Washington. California does not have a State-wide salmon plan, though the Resources Agency in collaboration with the Department of Fish and Game is developing the “California Coastal Salmon Recovery Program”^j. In addition, the California Biodiversity Council provides support, including GIS systems and other technical support, for local biodiversity efforts. Idaho last year created an Office of Species Conservation with the long-term goal of developing a State-based restoration plan.

Tribal responses

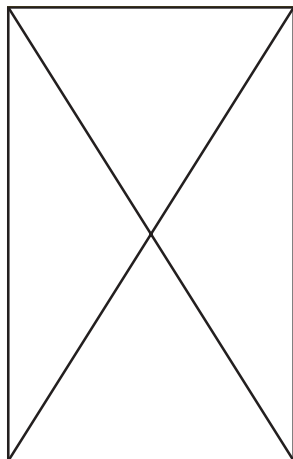
The tribes have been frustrated by limited opportunities to participate in regional decision-making. The tribes’ commitments to restore salmon populations are tied less to the legal requirements of the ESA and more to their own spiritual, cultural and economic imperatives. Salmon recovery, from the tribal perspective, means fish populations that can support tribal harvest. The Lower Columbia River Inter-Tribal Fish Commission has proposed a salmon strategy, Wy-Kan-Ush-Mi-Wa-Kish-Wit, or “Spirit of the Salmon”, based on ‘gravel-to-gravel’ management of the entire salmon lifecycle and with considerable emphasis on supplementation and watershed restoration.

Local government responses

As additional salmon populations have been listed under the ESA, local governments have stepped forward to propose salmon management plans designed to meet Federal standards but retain local authorities. The listing of chinook in Puget Sound prompted the three counties encompassing the Seattle metropolitan area to develop the TriCounty ESA Response. Portland Metro, the regional government for the Portland area, is coordinating local salmon restoration efforts for that area. Local governments have also taken the lead in sponsoring watershed councils. For example, one of the earliest watershed councils, the Grande Ronde Model Watershed Program in northeastern Oregon, grew out of an effort by Union County to develop a Habitat Conservation Plan for the area.

Other responses

Watershed councils have sprung up throughout the region to encourage citizen involvement in salmon recovery. For the Sake of the Salmon, a nonprofit organization, which supports watershed initiatives, estimates that there are currently 310 watershed groups in California, Oregon and Washington. Although States or local governments sponsored some watershed councils, others, such as the Mattole Restoration Council in California, were started as non-governmental organizations. The growing role of the private sector in salmon recovery can be seen in the creation of the Shared Strategy for Puget Sound, which was sponsored by a coalition of business leaders. Environmental groups (Pacific Rivers Council), fishing groups (Pacific Coast Federation of Fishermen’s Associations), business groups (Oregon Business Council) and river users (Columbia River Alliance) amongst others have proposed restoration strategies.



Analysis

This review of salmon restoration efforts has identified several problems which must be resolved.

^j California also supports salmon recovery through CALFED, but this effort is outside the cope of the region covered in these papers.

Governance

Tensions exist over authority, responsibility and representation²⁸. A key issue is the balance of power between the Federal government and the region; the Four Governors' Plan is the latest in a series of efforts to transfer more power to the region. The NWPPC exemplifies the region's frustration: although charged with managing a regional resource, it has no authority over Federal agencies. The region itself is no monolith: debates over reservoir management and Columbia mainstem flows have not been resolved because States are reluctant to give up authority to the NWPPC. The only institution to include representatives from each of the three sovereign powers (Federal government, States and tribes) – the Columbia Basin Forum - lacks a mandate and authority and has had little impact on salmon management. Agency representation is erratic; land and water management agencies, along with transportation and economic development agencies whose decisions can affect the infrastructure of the salmon landscape, are often not part of the decision-making process. Stakeholder representation is even more erratic.

Fragmentation

A fragmented approach in which myriad salmon plans are implemented independent of one another is both ineffective (failing to meet the needs of salmon) and inefficient (wasting resources on duplicative or unnecessary programs). Rather than identifying and meeting the needs of salmon, most salmon plans are designed within the context of existing agency missions and programs

Individual projects are reviewed for their compatibility with a portfolio of regulations. These regulations emphasize 'one-size-fits-all' prescriptions that may over-protect salmon in some areas, by requiring actions that provide little biological benefit, while under-protecting salmon in other areas. Projects may comply with all requirements yet their cumulative effects may still degrade habitat.

As an example of the multiplicity of efforts, consider the Columbia Basin where, in addition to the Federal, regional, State, tribal and local responses discussed above there also exist: proposals for alternative governing institutions (the Columbia Basin Forum); restoration programs which include salmon issues but are broader in scope (the Lower Columbia River Estuary Program); a myriad of Habitat Conservation Plans and TMDLs^k which will affect some aspect of salmon habitat; plans developed during the FERC-overseen relicensing of hydropower operations; several harvest and hatchery management programs; as well as numerous watershed groups, Regional Fisheries Enhancement Groups and other citizen-led efforts. The situation is similar in other river basins. This profusion of programs results in a large quantity of permit requirements that creates an enormous drain on the resources and good will of agencies, communities, businesses and citizens. This regulatory burden both alienates those whose support is needed for salmon recovery, and diverts resources needed for salmon recovery efforts.

Funding

Individually and collectively, one of the greatest problems for salmon recovery efforts is lack of funding. A full discussion of available funding, spending patterns, and future needs will be presented in Part 5 of this series. Until recently, the primary funding source for salmon restoration in the region has been hydropower revenues from BPA. As deregulation, power shortages and competing demands for Columbia River water threaten BPA's financial stability, and as fish populations outside the Columbia Basin are listed, additional sources of funding for salmon restoration must be found. An over-riding difficulty is that the need for large expenditures to halt salmon declines and restore runs

^k TMDL. Total Maximum Daily Load. Streams listed as water quality impaired under section 303(d) of the Clean Water Act are subject to TMDL requirements, in which the State must develop a pollution budget to account for and reduce pollutant inputs from the surrounding watershed.

is being realized at a time when Federal and State budgets are declining. Given the national and international importance of salmon restoration populations, how can it be funded? Parts 5 and 6 of this series explore options for supporting salmon efforts from public and private sources.

An additional difficulty is that most funding for salmon projects is delivered through an array of programs, most of which are not targeted to salmon recovery. For example, watershed restoration projects may be funded through a patchwork quilt of grants related to road maintenance, forest management and soil conservation. As a result, salmon recovery projects are developed for their ability to match funding criteria rather than salmon needs. This is neither effective nor efficient. Options to improve funding delivery will be explored in Parts 5 and 6.

5. The need for a new approach

“Thinking like a salmon”

In “Thinking Like a Mountain”²⁹, Aldo Leopold describes the interconnections between range vegetation, deer and wolves, and notes how too narrow a definition of the problem (“not enough deer”) dictates a solution (“kill more wolves”) that creates another problem (overgrazed range and deer starvation). If we are to restore salmon, we must move beyond a narrow definition of the problem (“not enough salmon”) to a broader view (unhealthy ecosystems). We must, in other words, start “thinking like a salmon”. From the salmon’s perspective, the multiplicity of salmon programs, regulations and agencies described above and in Appendices 1 and 2 have two over-arching failings: each treats only a fragment of the salmon landscape; and most emphasize ‘managing-the-project’ rather than ‘solving-the-problem’.

A fragmented landscape

An over-arching problem is that there is no mandate for ecosystem-based management. The Endangered Species Act focuses on species, not the ecosystems that support them. The Northwest Power Act focuses on hydropower operations in the Columbia River mainstem, ignoring other actions and other parts of the watershed. The Clean Water Act addresses water quality, but not water resources. Even though resident and anadromous fish share the same waters, responsibility for recovery planning is divided between different agencies¹ and the resulting recovery plans are often incompatible. The species-by-species, project-by-project approach fails to address the realities of place: multiple projects occur side-by-side with multiple species, and the cumulative effects of projects and the interactions of species must be considered.

Accountability for environmental outcomes

¹ Fish and Wildlife Service and National Marine Fisheries Service respectively.



Clearly, considerable effort has been invested in developing plans and programs for salmon restoration. The real challenge, however, is not plan development but plan implementation. As was noted in a report to the NWPPC:³⁰

“The greatest failing in regional governance...has been the failure to implement plans. It was generally agreed that actions must be taken if salmon recovery is to be effective...Those charged with carrying out plans should be accountable for doing so promptly and effectively.”

Even when plans are implemented, success is defined in terms of management actions, rather than environmental outcomes. If we are “thinking like a salmon”, we realize that plans prepared, permits processed and grants awarded are not enough.

From problems to solutions

In order to restore salmon, the landscape which is fragmented by ownership and management authority must be viewed as one piece - a ‘salmonshed’ - and a management plan for that ‘salmonshed’ must be focused on outcomes – the status of salmon. Institutions must be held accountable for implementing the plan, and for its success as measured in environmental terms. The National Academy’s management recommendations³¹ – for bioregional governance, cooperative management and a strategic approach that includes adaptive management – provide a framework for an approach that meets these needs.

Connecting the fragmented landscape through bioregional governance

In contrast to the current fragmented approach, a bioregional approach emphasizes environmental outcomes rather than individual agency programs, and focuses on cumulative effects rather than individual projects. A bioregional approach assigns responsibility for developing and implementing salmon programs to local and regional partnerships. Programs are coordinated within a nested hierarchy of geographic management units, ranging in scale from watersheds to ‘salmonsheds’ to the region, as described in Parts 3, 4 and 5 of this series. At each scale, the emphasis is on integrated management of resources and maintenance of ecosystem processes. The proposed bioregional approach combines local watershed efforts (discussed in Part 3) to meet biological goals (including ESA recovery goals) at the ‘salmonshed’ scale (as discussed in Part 4). These watershed and ‘salmonshed’ efforts are in turn supported by a region-wide structure that facilitates and coordinates watershed and ‘salmonshed’ efforts while ensuring that the necessary funding and other resources are made available (discussed in Part 5). A regional management institution can balance watershed and regional interests and needs, and prioritize watershed efforts for maximum biological benefit and cost-effectiveness. Such an institution can also provide an effective vehicle to argue for expanded Federal funding. The Chesapeake Bay Program, CALFED and the Upper Colorado River Fish Recovery Program are examples of ecosystem restoration efforts that have benefited from developing regional management structures to coordinate activities and obtain resources.

Connecting the fragmented landscape through cooperative management

Cooperative management recognizes that just as the parts of the natural system are interconnected, so should the parts of the management system be interconnected. In the proposed approach, these interconnections are built using Federal-State-tribal partnerships at the regional level, and public-private partnerships at the ‘salmonshed’ and watershed level. A cooperatively-managed bioregional approach represents a considerable redirection from the current, Federally dominated, ESA-driven approach to salmon management. It recognizes that salmon restoration is a shared responsibility of all sovereign entities – indeed all citizens – throughout the region. Cooperative management requires agreement on shared goals and principles and a commitment to meeting those goals. It solves fragmentation by coordinating existing

programs and reconciling existing restoration plans.

Changing management emphasis and creating accountability through a strategic, adaptive approach

A strategic approach

A bioregional approach provides the opportunity to shift from the current management regime – ‘manage the project’ – to a more biologically-effective and resource-efficient strategic approach that seeks to ‘manage the problem’. A strategic approach starts with a goal – restoring salmon populations – and identifies the suite of actions needed to achieve it. The emphasis is on meeting a goal, not simply following a regulatory framework. A formal commitment to meeting environmental goals is accompanied by the flexibility to select alternative ways of meeting those goals. A strategic approach recognizes that the causes of salmon decline, and the options for salmon restoration, are locally variable and so accommodates watershed- and site-specific conditions.

A strategic approach requires that we:

- identify fish population goals for a particular area
- identify the obstacles to achieving those goals;
- prioritize those obstacles;
- identify possible options to address the priority obstacles;
- select the most appropriate options and prioritize those;
- implement priority options; and
- evaluate success in meeting goals and adjust actions as necessary.

The last of these steps is perhaps the most important. Measuring success provides accountability for dollars spent and actions taken. Adjusting management actions in response to new data provides an adaptive management component that increases the likelihood of success.

Creating accountability

A focus on environmental outcomes requires a commitment to implementation, so avoiding the trap of ‘planning-to-plan’. It motivates institutions to translate a general strategy into detailed work plans, and to develop processes that convert those work plans into actions. A strategic approach will require a change in agency roles. Agencies will spend much more time collecting, evaluating and communicating environmental data, and much less time assessing procedural compliance.

Adaptive management

Adaptive management recognizes how much we do not know about salmon, their environment, and the effects of our management actions on both of these. Collecting data on the results of our actions helps us make mid-course corrections to better achieve environmental goals. In contrast to previous salmon restoration efforts, which emphasized implementation of static master plans, the proposed strategy emphasizes dynamic planning which evolves over time as more data becomes available. Adaptive management will require a set of environmental indicators to measure success, a monitoring scheme to track those indicators, and - most important and most difficult – a process to connect those indicators to management actions. Meeting these challenges will require considerable investments in science (discussed further Part 2) and, even more importantly, institutional mechanisms that respond to the data we collect. For example, we will need to identify environmental thresholds which, when exceeded, will trigger a change in management actions.

6. Framework for a new approach

Conceptual foundation



Many of the existing salmon restoration efforts have been criticized for lack of an explicit conceptual foundation that explains their assumptions about the workings of natural, social and economic systems. Conceptual foundations create an organizing framework that defines the range of possible options. The framework also provides a blueprint against which projects can be compared for their consistency both with stated goals and with each other.

Ecosystem management

This series of papers rests on the assumption that salmon restoration efforts will be most successful if based on restoration of the ecosystems on which the salmon depend. This means protecting and restoring natural ecological processes that exchange energy, water, nutrients and organic material between riverine, riparian and upland habitats. This in turn means taking a landscape-based approach to restoration, an approach that preserves and rebuilds connections between upstream and downstream reaches of rivers, between channels and floodplains, and between surface water and groundwater. An ecosystem approach means managing across the entire salmon life cycle, including improving survival rates in tributaries, mainstem rivers, estuaries and near-shore habitat. It also means that efforts to improve productivity should rely on restoring natural functions, using undisturbed watersheds as references.

Civic environmentalism

A second assumption is that salmon management will be most effective when it integrates ecological goals with social and economic interests. As evidenced by salmon declines, the traditional, top-down, command-and-control approach to resource management, which emphasized ecological goals, has not been successful in persuading social and economic interests to invest in attaining these goals. Alternative bottom-up approaches, which rely on voluntary activities and emphasize the role of the market have successfully taken account of social and economic interests, but are often too fragmented and opportunistic to achieve ecological goals. This series of papers proposes a third way, encapsulated in the Enlibra principle: “National Standards, Neighborhood Solutions”³². This approach sets volunteerism and the use of market tools in the context of a comprehensive, performance-oriented strategy designed to meet national environmental goals. The approach capitalizes on the attachment which individuals and communities feel towards “this place called home” to stimulate ‘civic environmentalism’³³. In civic environmentalism, communities, businesses and individuals

gain a greater role in decision-making in exchange for accepting responsibility for the stewardship of a place. Formal commitments to meeting environmental goals are accompanied by increased flexibility in the pathways to meeting those goals. Parts 3 and 4 describe civic environmentalism and stewardship commitments in more detail.

Guiding principles

The conceptual foundation described above gives rise to a set of guiding principles, which are woven together in the proposed strategy. Table 3 lists the guiding principles.

Table 3
Guiding Principles for a Stewardship Strategy

- Set management goals that meet the long-term needs of human and natural communities.
- Manage for ecoregions rather than single species.
- Invest in science to support decision-making from planning to implementation.
- Establish a mandate.
- Develop a governance structure that encourages the cooperation of agencies and coordination of programs and regulations, at all scales from the watershed to the region.
- Create an effective dispute resolution process.
- Ensure representation of Federal, State, tribal and local governments as appropriate to the geographic management area.
- Empower local communities.
- Encourage public participation.
- Create partnerships.
- Provide incentives.
- Require consistency.
- Ensure accountability for implementation and results.
- Adapt strategies in light of new information.
- Balance long-term and short-term actions.
- Ensure that funding is available, adequate, aligned with responsibility and tied to results.

Set management goals that meet the long-term needs of natural and human communities

Protecting healthy watersheds and restoring damaged watersheds are management goals that can serve the needs of people and fish over many generations.

Manage for ecoregions rather than single species

It is not possible to save species without saving habitats; managing to protect and restore ecosystem processes is not only the best way to restore endangered species, but also reduces the risk to other species.

Invest in science to support decision-making from planning to implementation

Science is the foundation of a strategic approach. It is needed at all stages from goal-setting and problem identification to option evaluation and measuring success. Independent scientific review can help resolve partisan disputes.

Establish a mandate

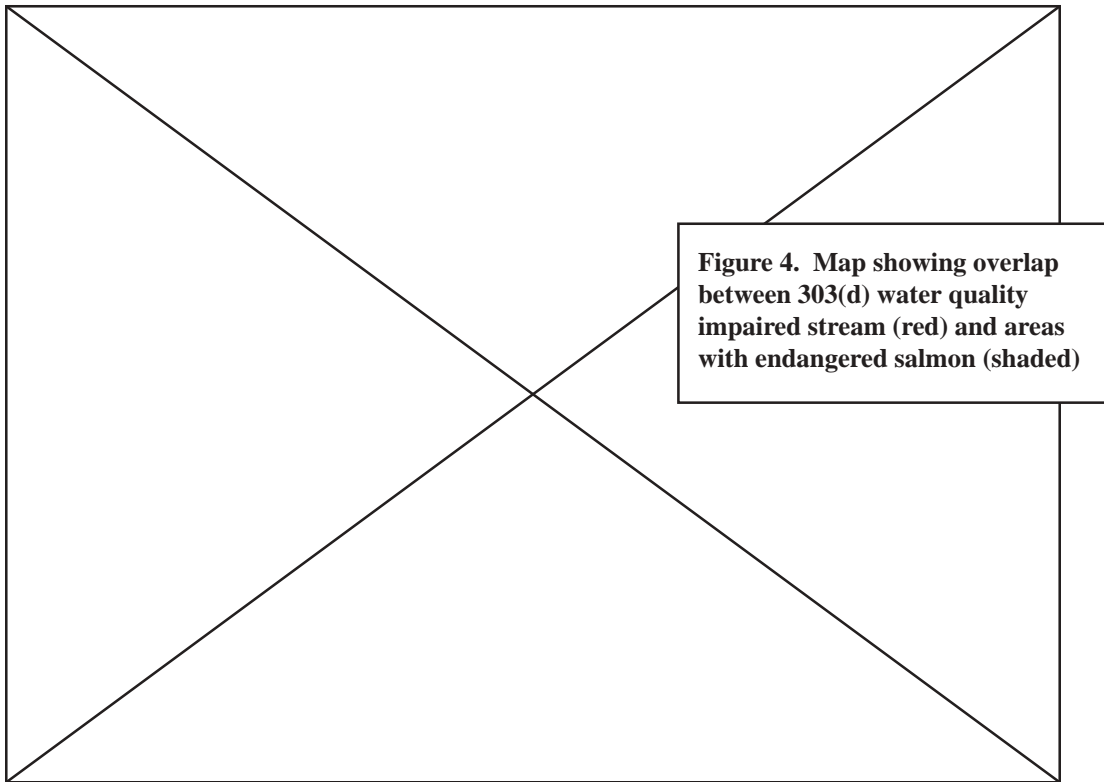
Without a mandate, ecosystem restoration efforts can easily become someone else's problem. Making salmon restoration efforts part of each participating agency's job description will help focus agency efforts.

Develop a governance structure that encourages the cooperation of agencies and coordination of programs and regulations, at all scales from the watershed to the region

Institutional fragmentation is one of the greatest obstacles to salmon restoration; coordination can allow agencies to share resources and overcome gaps in authority. Incentives are needed to encourage agencies to form partnerships. The need to coordinate regulations follows from the concept of ecosystem management; just as land, surface water and groundwater resources are inter-connected, so the regulations that manage their use should be integrated. Not only does this make sense scientifically, but also it can reduce the regulatory burden and thereby increase support for salmon recovery efforts.

Clean Water Act/Endangered Species Act Integration

Figure 4 shows the geographic overlap between streams listed under Clean Water Act section 303(d) as water quality impaired, and the range of endangered salmon. Landowners in areas of overlap face two sets of regulatory requirements which both have the same goal: restoring water quality to a level where it can support salmon. These requirements could be streamlined by identifying a common set of chemical and physical criteria which would satisfy Clean Water Act and ESA requirements. A landowner could then submit a management plan designed to attain these chemical and physical conditions and be assured of compliance with both sets of requirements. Regulatory streamlining and assurances will be discussed further in Part 4.



Create an effective dispute resolution process

Agencies enter partnerships with different and often conflicting missions; sometimes an agency’s mission may conflict with ecosystem restoration objectives. In such cases, a formal dispute resolution process can help avoid gridlock.

Ensure representation of Federal, State, tribal and local governments as appropriate to the geographic management area

The management of natural resources is fragmented among Federal, State, tribal and local governments; excluding any of these from the decision-making process risks developing a salmon strategy that cannot be implemented. At the regional level, Federal, state and tribal governments must be represented in the governance structure; at the watershed level, local governments assume increased importance but it is important to recognize the continued role of Federal, State and tribal governments both as resource managers and, in some areas, as landowners.

Empower local communities

If salmon restoration is to succeed, private entities must be involved as full partners. Communities are more likely to implement salmon restoration plans that they have helped to design. Community involvement ensures that community values and needs are respected and that local knowledge is utilized. Locally developed watershed plans are likely to be more effective than top-down plans designed by the Federal government or even the region.

Encourage public participation

At the watershed level it may be possible for the public to be directly involved in salmon restoration, but this option becomes less practical at the ‘salmonshed’ and regional level. Stakeholders can still be involved, either through formal advisory committees or through open meetings and opportunities for comment.

Create partnerships

Salmon restoration is a complex task, which cannot be accomplished by any one entity. Different agencies, different levels of government, and the private sector each can play a role according to their expertise and authority. Partnerships integrate fragmented authority, leverage resources, and create community support for salmon restoration. Partnerships can also overcome the problems of intermingled land ownerships, allowing the creation of new management units tied to the landscape (watershed) or resource ('salmonshed').

Provide incentives

Incentives are needed to encourage institutional change and to encourage private entities to undertake salmon restoration actions. Institutional incentives, such as greater control over work plans and budgets together with reduced reporting requirements, can allow agencies to change management emphasis from process to outcomes. Social, financial and regulatory incentives are needed to encourage landowners and businesses to go beyond compliance with the 'no-take' provisions of ESA and undertake voluntary actions that lead to restoration.

Require consistency

Salmon plans must be consistent with objectives. Watershed-level plans must be consistent with other watersheds and with an overall regional strategy. Equally important, actions must be consistent with plans. When a watershed, 'salmonshed' or regional plan has been agreed to, all partners must be required to act consistent with the plan.

Ensure accountability for implementation and results

Planning is not enough; partners must formally commit to implementing agreed-upon plans, and must be able to demonstrate progress towards meeting environmental goals. Implementation responsibilities must be spelled out for each partner. Targets and timelines can help focus efforts, and rewards can be tied to performance.

Adapt strategies in light of new information

We do not know enough about salmon, their ecosystems, or their response to our actions, to design the perfect plan. Instead we must learn-by-doing, using the scientific method to test ideas and gather new information. Our management institutions must be flexible enough to respond to this new information.

Balance short-term and long-term actions

In view of our limited knowledge of salmon and their ecosystems, it makes sense to start slowly, committing to longer-term, more complex and more expensive actions when we have gained more information. However, we must also recognize that the extinction clock is ticking, and that immediate action is needed to halt further declines. Certain actions can provide near-term benefits with a high probability of success, and should be undertaken now.

Ensure that funding is available, adequate, aligned with responsibility and tied to results.

Ecosystem restoration is a long-term process, requiring a long-term funding commitment. Federal and State appropriations have an important role to play, but must be supplemented by other funding sources. Funding must be directed to priority problems, and go to those who are in the best position to take necessary actions.

7. Costs and benefits



Salmon restoration will require changes in lifestyle throughout the region, and these changes will impose costs across many sectors of the economy. Detailed cost estimates, and ways of paying for salmon restoration, will be discussed in Parts 5 and 6. Fear of high costs has led some to claim that the region cannot afford to bring back salmon³⁴. This series of papers approaches salmon restoration from the opposite viewpoint: the region cannot afford not to bring back salmon. Over time, restoring salmon will be less costly than allowing their extinction.

The costs of extinction

How can there be costs associated with extinction? First, the precarious condition of salmon runs expose the region to lawsuits and potential claims for damages. Second, salmon are the early warning systems for the state of the environment and ultimately the economy. A region that cannot support salmon cannot provide clean water, open space and many of the 'ecosystem services' that have attracted much of the population to the area. Surveys of recent immigrants show that 44% moved to the region primarily for the quality of

life; retaining these highly skilled, high-income workers is critical to the regional economy³⁵. In a 1993 survey by the Oregon Business Council, respondents were asked which was more important to the regional economy: maintaining a quality environment or relaxing environmental regulations. In this survey, 75% of respondents rated it more important to maintain a quality environment. If we lose the salmon, we also risk losing the workforce on which the economy depends.

The costs of restoration

The good news is that the costs of salmon restoration may not be as high as some fear. Many of the needed changes can be made at relatively low cost, and many will provide economic benefits. The region has been undergoing a transition from primarily resource-extractive to non-extractive service and information industries, which will help, shield a high proportion of the economic base from salmon-related impacts. By analogy, ECONorthwest noted that while timber industry jobs declined in the years following the spotted owl crisis, overall regional employment rose by 27% despite a national recession³⁶.

The impact of salmon restoration on the overall regional economy will not be large, though it may be concentrated in some geographic areas and some sectors of the economy. Many of the most-impacted areas and sectors – especially agriculture - are already suffering from external economic forces. Based on this, the challenge is not how to afford salmon restoration, but how to best provide assistance to those economic sectors which are already suffering from regional, national and international economic trends and which will be most impacted by the costs of salmon restoration.

Economic benefits of restoration

The proposed approach, through its linkage of fish restoration to the development of a sustainable regional economy, provides several economic benefits.

Direct economic value of salmon

Salmon themselves are valuable. Estimates place the value of a single fish between \$70 (commercial fishery) and \$200 or more (sports fishery)³⁷. The Columbia River Inter-tribal Fish Commission has estimated that restoring fish to harvestable levels would generate \$98 million per year in income for tribal communities³⁸. The Pacific Coast Federation of Fishermen's Associations estimates that fish restoration would infuse the economy with \$500 million per year in fishery-related income³⁹.

Avoided costs

Repairing and maintaining the ecosystems on which salmon depend will avoid costs otherwise incurred to provide 'ecosystem services' such as clean water and flood control. Residents of Salem save \$15 - \$30 per year because the watershed is able to supply water that is clean enough to drink without expensive technological treatment⁴⁰. 'Salmon-friendly' urban design clusters development and reduces impervious surfaces, thereby reducing infrastructure needs for roads and sewer systems and reducing stormwater bills.

Marketing benefits

'Salmon-friendly' development can increase land value: land in Salem next to a greenbelt is worth \$1,200 per acre more than land 1,000 feet away⁴¹. Consumers will often pay higher prices for products that meet certain environmental standards. The Pacific Rivers Council's "Salmon-Safe" program provides marketing benefits to farm products produced under sustainable conditions.

Increased productivity

Re-thinking business practices to minimize waste benefits the environment and the economy. A study by the Center for Watershed and Community Health documented 137 businesses in the Pacific Northwest that have saved a total of \$142 million by investing in practices that are both 'salmon-friendly' and business-smart⁴².

8. Conclusion

Salmon are in crisis, and the effects of this crisis are, and will be, felt in communities across and beyond the Pacific Northwest. How can we respond to the crisis in a way that restores fish, sustains the economy and supports communities? Despite substantial investments, salmon continue to decline. As a result, 60% of the public says that restoration spending has been ineffective⁴³. Analysts estimate that we need to double or triple our spending to resolve the salmon crisis: some have suggested that \$12 billion will be needed over the next 10 years⁴⁴. How can we be sure that this investment will succeed in restoring salmon? Existing regulations have not halted the salmon's decline. Do we need additional regulations, or is there a more effective way to influence behavior?

Clearly, changes are needed. Previous restoration efforts have emphasized technological approaches – structural fixes to dams on the Columbia and Snake Rivers, and massive investments in hatcheries. The legend of the “salmon people” shows us that there is another way, based on a stewardship ethic. Stewardship teaches us how to live in a place so that the watersheds which we share with the salmon will continue to support people and fish. Regulations cannot create this ethic, but incentives can encourage the region's citizens to accept stewardship responsibility. A stewardship strategy looks for ways to align the industrial^m and naturalⁿ economies by identifying practices that use resources more efficiently and with less environmental impact. Such a strategy will focus primarily on land and water resources, i.e. habitat. A habitat-based strategy is likely to be less expensive, more effective, but more challenging than previous technologically focused efforts. It will require an investment in science to guide management choices, and an investment in incentives that encourage the adoption of “salmon-friendly” practices. Perhaps most importantly, it will require the formation of place-based partnerships in watersheds and ‘salmonsheds’. These partnerships will need to involve all levels of government and all interested stakeholders. Through those partnerships and our commitment to the places we love, the region can bring back the salmon and create “a society to match its scenery”.

¹ Wilkinson, C., “Crossing the Next Meridian”

² Egan, T., “The Good Rain: Across Time and Terrain in the Pacific Northwest”

³ National Academy of Sciences, “Upstream: Salmon and Society in the Pacific Northwest”

⁴ Lackey, W., “Restoring Salmon to the Pacific Northwest: Chasing an Illusion?” in “What We Don't Know About Pacific Northwest Fish Runs”, ed. P. Koss and M. Katz

⁵ Allendorf, F. et. Al., “Prioritizing Pacific salmon stocks for conservation”, *Conservation Biology*, vol. 11.

⁶ Barnett, J., “The high costs of fish recovery”, *The Oregonian*, June 28, 1999.

⁷ Stegner, W., “The Sound of Mountain Water”

⁸ ISAB “A Review of Salmon Recovery Strategies for the Columbia River Basin”.

⁹ National Academy of Sciences, “Upstream: Salmon and Society in the Pacific Northwest”

¹⁰ Washington Department of Fish and Wildlife, “Pacific Salmon and Wildlife: Ecological Contexts, Relationships and Implications for Management”.

¹¹ Oregon Coastal Zone Management Association report

¹² Institute for Fisheries Resources, “The Economic Burden of Salmon Declines”.

^m The “industrial” economy is the traditional economic base: manufacturing, agriculture, forestry, fishing etc.

ⁿ The “natural” economy is the flow of energy and matter in ecosystems

- ¹³ Idaho Fish and Wildlife Foundation, “The Economic Impact of Steelhead Fishing”.
- ¹⁴ “Salmon Tops Environmental Worries”, The Oregonian, 7 Dec. 1997.
- ¹⁵ “Salmon Tops Environmental Worries”, The Oregonian, 7 Dec. 1997
- ¹⁶ ECONorthwest, “Salmon and the Economy: A handbook for Understanding the Issues in Oregon and Washington”
- ¹⁷ “How the Coast Public Views Salmon Restoration”, Restoration (Oregon Sea Grant newsletter), Spring 1997.
- ¹⁸ Lichatowich, J., “Salmon Without Rivers”.
- ¹⁹ American Fisheries Society, “Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho and Washington”
- ²⁰ The Wilderness Society, “Pacific salmon on Federal lands”.
- ²¹ ECONorthwest, “Salmon and the Economy: A handbook for Understanding the Issues in Oregon and Washington”
- ²² T. Gresh, J. Lichatowich and P. Schoonmaker, Fisheries, volume 25.
- ²³ NWPPC estimate
- ²⁴ Cone, J., “A Common Fate: Endangered Salmon and the People of the Pacific Northwest”.
- ²⁵ “Kitzhaber lobbies for \$500 million increase for salmon”, Columbia Basin Bulletin
- ²⁶ The Four Governor’s Plan
- ²⁷ Data from Washington Governor’s Salmon Recovery Office
- ²⁸ Duncan, a., Neuman, J., Swift, B. “Overhaul or Maintenance: a Review of Existing and Proposed Governance Institutions in the Columbia River Basin and Estuary”.
- ²⁹ Leopold, A., “A Sand County Almanac”
- ³⁰ Getches, D. “Report to the Northwest Power Planning Council for the Workshop on Fish and Wildlife Governance”
- ³¹ National Academy of Sciences, “Upstream: Science and Society in the Pacific Northwest”
- ³² Enlibra was developed by the Western Governors’ Association. For a good discussion, see “Unleashing Enlibra” by R. Halvig and K. Deike, Environmental Forum, Vol. 17.
- ³³ Progressive Policy Institute, “Civic Environmentalism in Action: A Field Guide to Regional and Local Initiatives”
- ³⁴ Michael, J., “The Future of Washington Salmon: Extinction is Not an Option but may be the Preferred Alternative”, Northwest Science, vol. 73.
- ³⁵ ECONorthwest: “Salmon and the Economy: A handbook for Understanding the Issues in Oregon and Washington.
- ³⁶ ECONorthwest, “The Sky Did Not Fall”
- ³⁷ ECONorthwest: “Salmon and the Economy: A handbook for Understanding the Issues in Oregon and Washington
- ³⁸ Columbia River Intertribal Fish Commission, “Wy-Kan-Ush-Mi-Wa-Kish-Wit” (salmon restoration plan)
- ³⁹ Pacific Coast Federation of Fishermen’s Associations, Testimony
- ⁴⁰ ECONorthwest: “Salmon and the Economy: A Handbook for Understanding the Issues in Oregon and Washington
- ⁴¹ ECONorthwest: “Salmon and the Economy: A Handbook for Understanding the Issues in Oregon and Washington
- ⁴² Center for Watershed and Community Health, “Saving Salmon, Saving Money: Innovative Business Leadership in the Pacific Northwest”.
- ⁴³ “Salmon Tops Environmental Worries”, The Oregonian, 7 Dec. 1997.
- ⁴⁴ Columbia River Inter-Tribal Fish Commission data.