Connecting Cultural and Biological Diversity in Restoring Northwest Salmon

By Courtland L. Smith

ABSTRACT

Salmon problems in the Pacific Northwest have an important cultural as well as biological dimension. Economic growth is a dominating cultural goal. Social and political units do not match well with ecosystems. Authority is fragmented, and local, state, and federal agencies have conflicting mandates. To achieve biological diversity, a suggestion is to use adaptive management, taking major subbasins as bioregions. Using cooperative management a planning unit in each subbasin would determine the qualities of a long-term experiment that best assures biological and cultural diversity. An organization overseeing the whole region would coordinate activities among subbasins.

The situation of endangered salmon (*Oncorhynchus sp.*) is as much a cultural problem as a biological one. The dominant cultural preference in the Pacific Northwest has been for population and economic growth. According to the Northwest Power Planning Council (NPPC) (1992:5), "Our prosperity has had a price: dramatically reduced salmon runs."

Two related planning studies completed in the early 1970s predicted the impacts of growth on the environment and fisheries. The Pacific Northwest River Basins Commission's (PNWRBC) (1973:15) comprehensive study of water and land use noted, "It is foreseen that even with well-planned programs . . ., the future quality and success of hunting and fishing may not be as high as it is today." The PNWRBC's Urban and Rural Lands Committee (1973:7) warned, ". . . if effective countermeasures are not taken, increases in population and industrialization may eventually result in drastic degradation of the quality of the outdoor environment."

With the predicted degradation of environmental quality has come concerns for biological diversity. Perhaps Stephen Jay Gould (1992:11) points out the value of diversity best when he says it "is our ballast, our anchor, our only safe mooring in the flood of time. We either preserve this nurturing variety, or ultimately, we may intone a requiem for all humanity. . . ." From this perspective, diversity may be as important for human actions as it is for salmon populations. Preserving diversity is a process of preserving options, avoiding large-scale irreversible change, learning from trial and error, and applying safety factors (Bella and Overton 1972).

To achieve biodiversity, is having cultural diversity also desirable and necessary? In dealing with fish, forest, wildlife, urbanization, and growth issues of the Pacific Northwest, preserved diversity could be used to try different approaches in various parts of the region. With uncertainty for the future, incomplete knowledge about how ecosystems work, changing environmental conditions, and changing cultural preferences, the region should be careful not to bet all its salmon eggs on a single approach. Multiple approaches would do more to preserve diversity for adaption to future conditions.

To improve the salmon situation, a suggestion is to consider adaptive management, taking a bioregional approach that preserves diversity. Create cooperative management institutions that bring together affected people, government agencies, and knowledgeable scientists.

Adaptive Management

The NPPC practices adaptive management as it searches for ways to improve conditions for salmonids (Mahar 1990; Halbert 1991). Adaptive management is suggested for a number of related ecological problems. For example,

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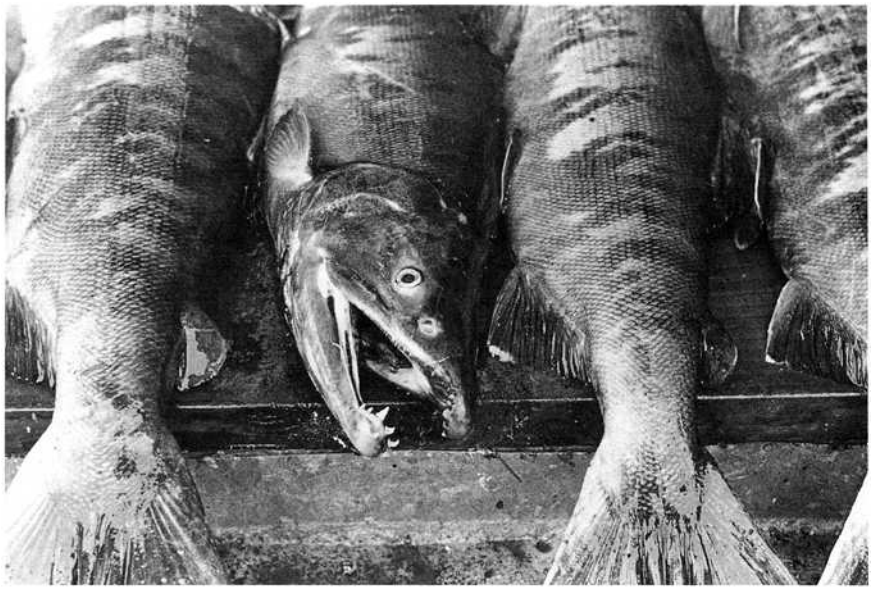
the Forest Ecosystem Management Assessment Team (FEMAT 1993), looking at westside forests, and the Eastside Forest Ecosystem Health Assessment (EFEHA) (Everett 1993) both prescribe adaptive management to find solutions to difficult resource management problems.

Adaptive management is an approach designed for situations where information will never be adequate, answers come only from experience, knowledge gets lost, analyses cannot be simplified, nothing is certain, and much of what people think they know is wrong (Walters 1986). According to the EFEHA, ecosystem management "must be an experimental and adaptive process because of the uncertainties that exist concerning societal values and expectations, the processes that shape such values, and the capacities and responses of ecosystems" (Everett 1993:1).

The NPPC began several adaptive management experiments to find the "best" solutions for doubling salmon runs. Three problems confront these adaptive management experiments. First, not enough time is allowed to select which solutions work. Most adaptive management experiments must continue for generations of salmon to assess adequately the relative success. Second, should the search be for one or a few basinwide treatments or for a diversity of approaches? Third, social objectives change as the adaptive management experiments are conducted. When the doubling goal was first adopted, artificial propagation was viewed as one of the primary methods; subsequently, issues of wild salmon gained emphasis.



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Chum salmon await to be spawned at the Netarts Bay Fisheries Research Station.

Bioregions

Regionalizing the adaptive management experiments would allow each bioregion to pursue different long-range goals and deal with the bioregion's unique problems. What regions would work for ecosystem management? The Pacific Northwest can be divided a number of ways. One is according to bioregions defined by physiographic integrity. Relief, soils, and vegetation differentiate physiographic regions. An alternative would be large river valleys that may present distinct physiographic regions and combine many human and ecosystem elements (Vink and Davidson 1983). Williams and Rinne (1992) suggest the watershed as the basic bioregional unit.

For the U.S. Pacific Northwest, the watershed is proposed by many as the landscape-level planning unit. Johnson et al. (1991) proposed to Congress the "Watershed Option" for late successional ecosystems. Moyle and Ellison (1991) provide a conservation-oriented classification system for managing aquatic diversity that focuses on watersheds. The Oregon Chapter of the American Fisheries Society has an aquatic biodiversity and critical areas mapping project that takes a watershed focus. The Washington Department of Natural Resources has initiated a watershed analysis program designed to assess the cumulative impacts of forest land use on fish habitats (Green et al. 1993; Washington Forest Practices Board 1993). The environmental group Ecotrust is using a watershed strategy for sustainable development in Willapa Bay, Washington (Colby 1991). The Northwest Power Planning Council (1987) divided the Columbia basin into 31 subbasins for planning its salmon restoration program, and the Pacific Rivers Council (1993) proposes a watershed approach for the Pacific Northwest. Both FEMAT and EFEHA also contain a watershed framework.

Salmon inhabit rivers emptying into the Pacific Ocean from above the Arctic Circle to the central California coast. The Fraser and Columbia rivers drain from the crest of the Rocky Mountains on the east, west to the Pacific Ocean. The salmon bioregion covers much of Alaska, Washington, Oregon, Idaho, and California, as well as parts of Montana, Wyoming, Utah, and Nevada in the United States, and British Columbia and the Yukon in Canada. Salmon migrate through wide expanses of the north Pacific Ocean. The salmon bioregion is too large and diverse to be managed as one unit. The part receiving most attention is the Pacific Northwest, which includes the

Columbia River basin, Puget Sound, and associated coastal regions.

Hydrologic units match up well with many of the ecological problems in the Pacific Northwest. River basins tie together fishery and forestry problems. Drainage basins have the advantage of clear boundaries that remain relatively stable throughout time. With climatic change the boundaries of physiographic regions will migrate north and south, as well as to higher or lower altitudes. In this sense, hydraulic units are adaptive units, in that the people living in a drainage basin must adjust their activities to cope with climatic change.

How large should watershed planning units be? The Washington watershed analysis program takes quite small areas, 10,000 to 35,000 hectares. According to FEMAT (1993), regional ecosystem planning should include river basin (approximately 250,000 to 2,500,000 hectares), watershed (approximately 2,500 to 25,000 hectares), and site (approximately 2.5 to 25 hectares) scales. Figure 1 shows the 11 major subbasins that drain to the Pacific and were identified by PNWRBC. The largest is the 9.5-million-hectare Central Snake (5 in Fig. 1), while the Willamette basin is 3.1 million hectares.

The 11 subbasins have widely varying conditions. In Puget Sound and the Willamette Valley subbasins, salmon inhabit urbanized systems. In the case of the Willamette, the existence of salmon above Willamette Falls prior to building of fish passage facilities in the 1890s, was more limited than now. Current spring and fall chinook runs exist with considerable help from human technologies. By contrast, the Salmon River basin of Idaho contains some of the least disturbed spawning areas anywhere in the Columbia basin. Salmon access to the upper Snake is blocked by dams and natural obstructions.

Assuming the Canadian portion of the Columbia basin and the linkage between Puget Sound and Canada can be handled through fishery, electric power, and other treaties, the bioregional unit becomes the 11 subbasins of what once was the planning unit for the PNWRBC. These subbasins could be further divided into their major drainages. For example, the Willamette (Fig. 2) is subdivided into 11 additional drainage basins. Each drainage can be divided into an equal number of watershed units. This means the Pacific Northwest can be subdivided into 11 subbasins (Fig. 1), about 120 (11 × 11) drainage basins, and more than 1,300 (11 × 11 × 11) watersheds. This is a staggering number of bioregional units with which to work in coordinating studies, designing plans, and addressing interactions between units.

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McNary Dam on the Columbia River is one of the main impediments to salmon migration into the upper Columbia and upper Snake rivers.

The number of political units are comparable to the number of watersheds. In Washington, Oregon, and Idaho, 115 counties have land use planning functions. Further, in 1990, more than 600 towns had populations of more than 1,000, and many of these places have planning and zoning capabilities. While the numbers of social and watershed units are similar, their boundaries show little correspondence.

Fragmentation

Ideally, each bioregion needs to be treated as an integrated social and ecological system. Bioregions that have close correspondence with sociopolitical boundaries have a

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Salmon gillnetters, such as Bill Puustinen at work in his traditional gillnet boat in 1980, are one of two commercial fisheries within the Columbia River.

Figure 1. Eleven Columbia basin, Puget Sound, and coastal subbasins could serve as bioregional planning units. The Pacific Northwest River Basins Commission (1969) designated these subbasins.

greater probability for successful management. Creators of many social and political boundaries in the Pacific Northwest did not consider ecosystem boundaries. Social and political boundaries were dictated by surveying technology, not ecology.

Specialized federal and state agency boundaries further complicate the picture. The Pacific Northwest region of the U.S. Forest Service encompasses the states of Oregon and Washington but not Idaho. Many eastern Oregon and Washington drainages extend into Idaho, which is divided between two Forest Service regions. National forest boundaries, too, cross state lines. Umatilla National Forest is in both Oregon and Washington. It also includes parts of 10 counties.

As a rule, national forest boundaries have more of a physiographic, rather than hydrologic, base. A key complication of the biogeography of national forests is that they sit along the crests of drainages. Oregon's Umatilla National Forest covers the uplands of five drainage basins—the Grande Ronde, Walla Walla, Umatilla, John Day, and Lower Snake. Mt. Baker-Snoqualmie, Gifford Pinchot, and Mt. Hood National Forests straddle the Cascades. Lands of the Bureau of Land Management (BLM), National Park Service, and state forestry agencies similarly do not have boundaries that match biogeography. BLM lands in western Oregon are referred to as the "billion-dollar checkerboard" (Richardson 1980).

A further complication is state-federal relations. Fragmentation of basin resource activities into specialized management agencies at the federal and state levels does not connect with growth-oriented planning interests in city and county governments. Most growth occurs downstream before reaching federal lands.

The need to coordinate regional activities has been recognized since the 1930s, when the Pacific Northwest Regional Commission was formed (Bessey 1963). The founders realized the need for an umbrella institution to coordinate activities throughout the region. Fishing and farming, mining and manufacturing, logging and livestock raising affect salmon habitats and compete with salmon for uses of streams and watersheds. Management of fish, forests, wetlands, wildlife, water supplies, navigation, stream channels, and rangelands is vested in different agencies with competing and conflicting federal and state mandates. In addition, there is local community-, county-, and state-mandated land use planning.

A succession of agencies has tried to get all the specialized

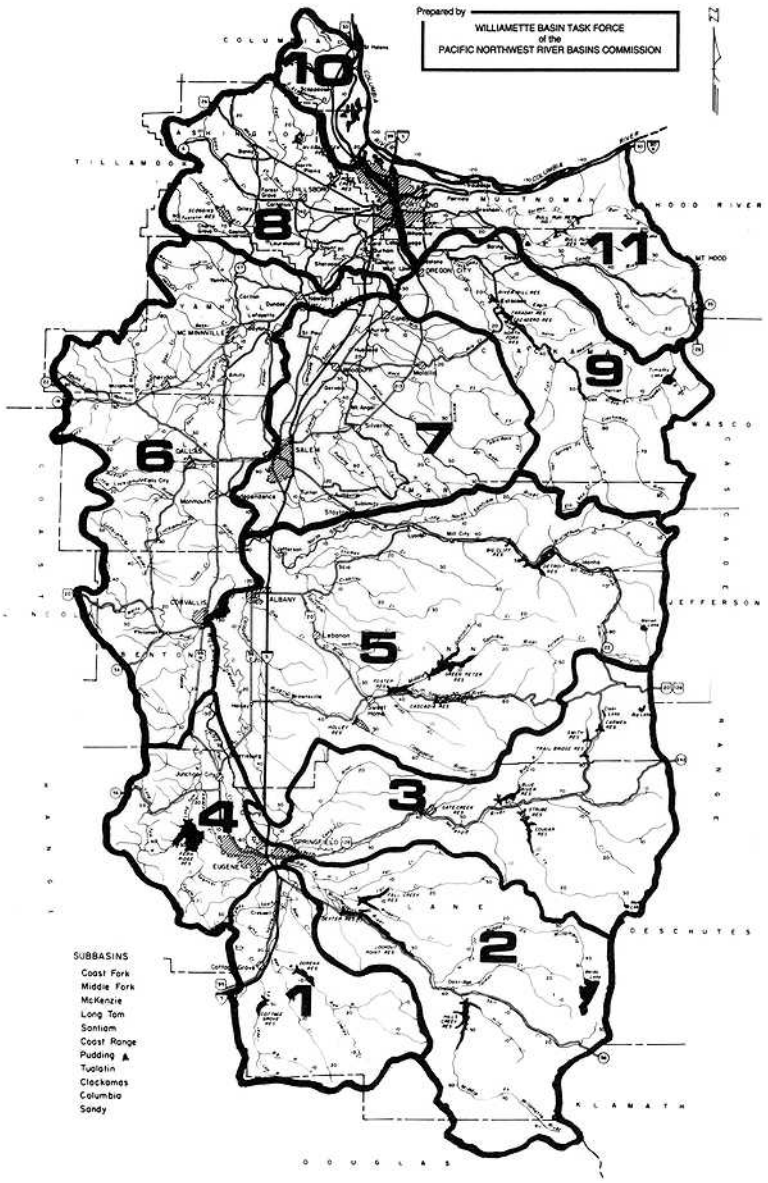

Figure 2. The Willamette Valley subbasin is divided into 11 drainage basins by the Pacific Northwest River Basins Commission (1969).

regional agencies together and coordinate their separate mandates. First was the Pacific Northwest Regional Commission. Its successors were the Columbia River Inter-Agency Committee, Pacific Northwest River Basins Commission, and Northwest Power Planning Council.

Institutional Inadequacy

Even if ecosystem and social system boundaries were better matched, adaptive, bioregional management to preserve diversity will have what we might call "stem" and "edge" problems. A highly irrigated drainage with an emphasis on silviculture and fish propagation could conflict with a drainage emphasizing wilderness and protection of wild salmon populations. Although the drainages may be far apart, the mainstream of the Columbia connects these drainages.

For example, the Snake River salmon problem is an example of a stem effect. Salmon River stocks of salmon have become threatened, endangered, and extinct because of the difficulty salmon have in migrating to their spawning habitats. Part of the problem is too high a harvest rate of wild salmon due to the hatchery programs that receive greater emphasis in the lower Columbia River. What is done in the lower Columbia, Willamette basin, and Yakima basin affects the more natural runs further upstream. These stem problems, the connections between each bioregion, are a driving force for a single, basinwide approach.

Edge effects come when two drainages take a different path, and events in one severely affect the other. The urbanization of Puget Sound and the Willamette Valley greatly affect coastal regions. People in urban areas have different views about how resources should be used, they come to the coast for recreation and increase demands for seafood alternatives in restaurants and for charter fishing opportunities. Further, many urbanites own and moor salmon fishing boats in coastal ports. Others who do not fish demand the preservation of natural areas and wild stocks.

The interactions among bioregions appear to be one of the forces driving policy toward the one best solution that can be applied everywhere. Hughes and Noss (1992) argue for moving toward a national environmental ethic and set of ecosystem rights extended to organisms and habitats. A national ethic would mean every agency and every basin must meet the same criteria. An adaptive, bioregional approach seeks to preserve diversity by allowing for cultural diversity among bioregions.

Cooperative Management

Universal ethics and basinwide agencies promote one approach to the entire basin. Because the future is unknown, and the Pacific Northwest has many

different cultural experiments already taking place, several bioregional experiments could be tried. Experimenting on the basis of thousands of watersheds is too many. Each of the 11 subbasins, however, could evaluate fish, forest, agricultural, grazing, land use, and other activities taking place.

If a subbasin is the basis for experiments in sustaining salmon stocks, what social institutions allow the integration across political boundaries, coordination of diverse interests, and connections of different federal, state, and local mandates? Cooperative management is an approach that can bridge these interests. For cooperative management "to achieve more effective and equitable systems of common-property resource management, representatives of user groups, the scientific community, and government agencies should share knowledge, power, and responsibility" (McCay 1988:327). The idea of cooperative management is to give people a stake in decisions about their region.

An advantage of cooperative management is that the members of each subbasin have unique knowledge about their region. Each subbasin has a diversity of residents. This knowledge enables them to make insightful contributions to the adaptive management approach to their subbasin. Since biodiversity embraces both scientific and human values (Cairns and Lackey 1992), subbasin level planning can promote diversity. Because government agencies have responsibilities for fish, forests, wetlands, wildlife, water supply and quality, energy use, transportation, and land use assigned by legislative bodies, they also must be involved. Government agencies represent the public mandate and concerns beyond the watershed. Scientists have an interest in how ecosystems work. They know the stem and edge issues that crosscut narrowly defined responsibilities and interconnect elements of the system.

Cooperative management is claimed for activities of the NPPC in the Columbia basin, but cooperative management works best on smaller bioregional units. The 11 PNWRBC subbasins (Fig. 1) could be used. To coordinate between subbasins, the NWPPC could have its territorial focus modified to include Puget Sound and coastal drainages. In addition, the council's purview would have to be expanded to include forestry, agriculture, grazing, and local land use planning. Historically, people have had great reticence to give too much authority to one agency. With the endangered species listings of salmon, the National Marine Fisheries Service (NMFS) is responsible for all the activities that interact with restoration of endangered salmon runs. The regional organization, whether a modified NPPC or NMFS, would coordinate between each subbasin experiment. The experiments need to be reviewed to minimize stem and edge problems, but the objective is not to ultimately select the one, best approach but rather to allow for diverse approaches to rebuilding salmon runs and habitats.

Let cultural diversity among bioregions generate several cooperative management experiments in adaptive management that preserve diversity. Each bioregion could be expected to act somewhat differently with respect to maintaining, preserving, and restoring salmon stocks. Different experiments might be tried due to the variability in participation, ecology, and people's interests. Each bioregion might have varying definitions of what constitutes improvement. Quite

likely some of what we think is best today will not stand the test of experience. Allowing diversity provides alternatives for adjusting to future conditions. Social institutions at two regional scales are suggested. One is a multistate regional organization patterned after the Pacific Northwest Regional Commission, Columbia River Inter-Agency Committee, and Pacific Northwest River Basins Commission. For this, the NPPC or NMFS could coordinate the experiments in each major subbasin and deal with the stem and edge problems. Some people will be concerned about developing an agency with such comprehensive interests, but if ecosystems are important, then all the activities that influence them must be considered. The other institution is multi-county, public-private cooperative management units for the 11 subbasins in the Pacific Northwest. Each subbasin would have integrated resource management with the goal of healthier ecosystems.

The pattern in the United States is not to devolve power from national and state governments to bioregional entities. Years of muddling through in the creation of resource management institutions, political boundaries, and the separation of powers are hard to redesign. In designing institutions to meet the needs of adaptive, bioregional management that preserves diversity, we should go in the direction of identifying management units. These units should manage resource activities in an integrated fashion. We also should allow different bioregional experiments to take place for a long time. If salmon populations are to regain health, each planning and zoning, fisheries and forest, hatchery and hydro, land and livestock, mining and manufacturing, urban and rural growth decision must be evaluated for its impacts on the overall health of watershed ecosystems.

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