

RESTORATION

A NEWSLETTER ABOUT SALMON, COASTAL WATERSHEDS, AND PEOPLE

Oregon Sea Grant • Issue No. 27

Salmon as Nutrient Pumps: New Lessons in Watershed Health

By Paul Hoobyar

Introduction

Images of silver-sided salmon leaping over improbable falls or swimming against the current from the ocean to high mountain streams are central to how we in the Pacific Northwest define our region. And the symbolism of a species swimming upstream, against the odds, to mate and die reinforces our vision of ourselves as independent, tenacious, and committed to family and place. At a conference held in Eugene in May, scientists presented evidence of other, more practical, ways salmon provide benefits.

Over 60 researchers from Europe, Russia, Japan, Alaska, Canada, and the Pacific Northwest explained how anadromous fish carcasses contribute directly to the health of watersheds in the Northwest and other places around the world where salmon exist.

According to Robert Bilby, of Weyerhaeuser, 95 percent of a salmon's body mass accumulates in the marine environment. Salmon are the primary mechanism, Bilby noted, by which marine-derived nutrients are transported into freshwater habitats. Researchers



Region 6, U.S. Forest Service

Scientists are finding that nutrients from salmon carcasses play a pivotal role in watershed health.

know about these nutrient contributions because nitrogen and carbon atoms from oceanic sources have unique atomic signatures. These telltale atoms, or "isotopes," are stable and can be traced as they are absorbed into the flora and fauna in a watershed. (The *American Heritage Dictionary* defines an isotope as "one of two or more atoms, the nuclei of which have the same number of protons but different numbers of neutrons.") The researchers have tracked how returning salmon release a pulse of nutrients into our region's watersheds. Indeed, salmon were referred to as "nutrient pumps" because of the value they provide in this capacity.

Watersheds on Steroids

No matter how many times these carbon and nitrogen atoms are transferred and absorbed from a salmon carcass to other aquatic and terrestrial species, researchers can track nitrogen 15 (N15) and carbon 13 (C13) as they are absorbed by other species. Aquatic insects that feed on decaying carcasses, emerging salmon fry that feed on the aquatic insects, and eagle and bear predators were all found to carry N15 and C13 in those watersheds where returning salmon were abundant.

For instance, Morgan Hocking, a university biologist, tracked dispersal of N15 and C13 through bear scat

Continued on page 2

In this Issue

- Legislative Updates 4
- North Umpqua Hydro Relicensing 6
- Media Received 11

Salmon as Nutrient Pumps

Continued from page 1

and urine in watersheds where salmon were present and in those where they were not. Hocking found that in those watersheds where an abundance of salmon return, spawn, and die, a corresponding abundance of marine-derived N15 and C13 existed in a host of aquatic and terrestrial insect populations that feed on the decaying carcasses or on bear scat and urine.

Several researchers, such as Rick Edwards with the U.S. Forest Service in Alaska, tracked the absorption of these marine nutrients into the hyporheic zone associated with rivers and streams. (The hyporheic zone is the area underneath the surface channel of a stream that is saturated with water.) Edwards found that salmon nutrients were retained in these zones for storage and subsequent release at a later time of year to insects and other species that live in these areas.

**“THE FLOW OF NUTRIENTS BACK
UPSTREAM VIA SPAWNING
SALMON...PLAYS A SIGNIFICANT
ROLE IN...THE OVERALL PRODUC-
TIVITY OF SALMON RUNS”**
—JEFF CEDERHOLM

Other researchers described how these nutrients are absorbed and retained by riparian vegetation and how the dispersal rates of these isotopes diminish the further away from the active stream channel researchers look.

In watersheds where marine isotopes were present, every species that preyed directly or indirectly on salmon showed statistically significant, positive effects. Aquatic and terrestrial insects, juvenile salmonids, bears, raptors, and other predator populations were all enhanced, both in terms of the number of individuals in each of these populations and, where measuring individual specimens was possible, the size and health of individual members. This fact is significant for salmon. When juve-

nile salmonids attain a larger size, their success in overwintering increases. Research shows that N15 and C13 supercharge the growth of juvenile salmonids.

One presenter characterized those watersheds that have an abundance of marine-derived N15 and C13 as “watersheds on steroids” because of the measurable increase in the size and abundance of biological communities in which these isotopes are present.

Implications for Management

This research has significant management implications. Commercial salmon harvesting and hatchery management in the West has been based on managing salmon populations for a maximum sustainable yield. As Eric Knudsen, a researcher with the USGS Alaska Biological Science Center in Anchorage, said in his presentation at the conference, “Salmon managers have traditionally assumed that, as long as sufficient spawners ascended streams to deliver the ‘right amount’ of eggs to the gravel, the salmon populations would provide an endless supply of excess for harvest.”

The flaw in this approach became apparent with the collapse of salmon populations throughout the region in the 1980s and 1990s. The litany of woes that led to this collapse has been well documented: overharvesting, degrading of habitat and water quality, managing hatcheries for salmon productivity and genetic simplification, and raising barriers to fish migration. All of these activities, and more, have contributed to salmon declines.

To counter some of the effects of these practices, we have curtailed harvest rates, scaled back our reliance on hatcheries as the panacea for salmon survival, and begun to educate ourselves about watershed and salmon habitat ecology and restoration throughout the region. Understanding the role of marine-derived isotopes helps further the goal of sustaining and recovering watershed health and native salmonid populations.

To sustain salmon throughout the region, strong, naturally spawning salmon populations are needed. To

sustain such populations, we must protect and restore the watersheds that provide the freshwater habitats and food sources salmon require at various stages of their life cycle. The conference’s presenters underscored the role of marine-derived nitrogen and carbon in this recovery process and its management implications.

**“COMMERCIAL FISHING HAS
DIVERTED MASSIVE AMOUNTS OF
NUTRIENTS AWAY FROM RIVERS.”**
—JEFF CEDERHOLM

For instance, Jeff Cederholm, a biologist with the Washington Department of Natural Resources, noted that commercial fishing has diverted “massive amounts of nutrients” away from Washington and Oregon rivers and has been a “management disaster.” Cederholm estimated that only 3 percent of the historic marine-derived nutrient biomass once delivered to these rivers reaches those streams today. Cederholm said that juvenile salmon feed directly on salmon carcass flesh, salmon eggs, and aquatic macroinvertebrates that may have previously fed on salmon carcasses. Research has discovered significant nutrient contributions from spawning salmon to the collector-gatherer macroinvertebrate community. Caddis flies, stone flies, and midges, for example, process the microbially conditioned salmon carcass flesh. Cederholm noted that a recent study of consumption of salmon by vertebrate wildlife identified 137 species of birds, mammals, amphibians, and reptiles that were predators or scavengers of salmon at one or more stages of the salmon life.

“The challenge for salmon, wildlife and land managers,” Cederholm said, “is to recognize and account for the importance of salmon not only as a commodity resource to be harvested for human consumption, but also for their crucial role in supporting overall ecosystem health.”

Cederholm suggested that salmon managers should begin managing salmon harvests using “ecologically-based escapement levels” that meet

the functional needs of a watershed. Enough salmon should be allowed to survive in a watershed that the decay of their carcasses and consumption by predators can contribute to the watershed's ecological health, he said. Cederholm contended that this model should be developed as an alternative to an escapement model based solely on harvest and human consumption purposes.

Research by Robert Bilby indicated that a target absorption rate of marine-derived isotopes can be prescribed within a watershed. Bilby's research in the early 1990s began the scientific inquiry into marine-derived nutrients. His latest research focused on 26 watersheds in western Washington where spawning coho salmon carcasses were present. Bilby's findings indicated that N15 rates plateaued at about 0.15 kilogram of carcass mass per square meter of streambed area. However, he found no absorption increase above this level. This threshold may provide a carcass abundance target for managers to shoot for, at least in watersheds west of the Cascade Range.

Jim Martin, who was the fisheries manager for the Oregon Department of Fish and Wildlife (ODFW) in the 1990s, has thought about the management implications of using an ecologically based approach to escapement. Martin thinks that in those watersheds that have depleted salmon populations more escapement is needed to meet nutrient goals. "But it's not exactly clear," Martin said, "when enough [nutri-

ent] is enough. From a management perspective, should you be trying to jam as many nutrients as possible into a watershed, or should you try to find some efficiencies and avoid diminishing returns?"

Martin suggested that management may need "to create a matrix, based on a watershed-by-watershed and species-population basis, that examines what the needs are for a given watershed (ecologically and for the species and populations)."

WATERSHEDS WITH AN ABUNDANCE OF MARINE-DERIVED NUTRIENTS ACT LIKE THEY'RE ON STEROIDS

"For instance," he explained, "in some watersheds, the management regime will necessarily be based on ecological needs of the ecosystem and the salmonid populations. However, for managers looking at watersheds where the ecosystem is in healthy condition and salmon populations are robust, the emphasis may be on the economic considerations."

Where Do We Swim from Here?

How policy addresses the nutrient findings may influence the success of our restoration efforts over time. In the meantime, researchers from around the globe continue to gather data on ways that N15 and

C13 affect how salmon and other species recover and maintain healthy populations.

In fact, according to Barry McPherson, of ODFW, the state's fisheries agency has already made significant changes to its management policy with respect to placing salmon carcasses in streams. "The number of carcasses placed in streams increased from about 1,000 in the 1996–1997 season to over 12,000 in the 1999–2000 season for a total of 25,000 over 5 spawning seasons," McPherson said. He also noted that salmon carcass placement during the 2000–01 season exceeded placement for any other year, but those numbers won't be available until later this year. The department's decision to place so many salmon carcasses in streams in western Oregon, McPherson said, is based on the research that "has shown the benefit of salmon carcasses in natural cycles of nutrients in watersheds."

Scientists are learning that nutrients move in a cyclical pattern in watersheds. Although the largest volume of a watershed's nutrients—those from the leaves, needles, branches, bark, and trunks of trees, as well as from terrestrial animal sources—move downhill and downstream, scientists are finding out that the comparatively small volume of marine-derived nutrients brought into a watershed by salmon plays a pivotal role in the overall health and vitality of a watershed. What impact this will have on hatchery and harvest policies remains to be seen.



The dispersal of salmon carcasses by bears and other predators has spread marine-derived nutrients through much of the watershed. (Courtesy of BPA.)

Legislative Updates

Editor's Note: The following bills passed the legislature and were signed by the governor. For a complete description of the bills, contact your legislator or check the legislative Web site at www.leg.state.or.us/billsset.htm.

House Bills

HB 2156

The bill directs the Department of Agriculture to assume all responsibility for permitting and enforcement for confined animal feeding operations if the EPA approves the NPDES transfer from the Department of Environmental Quality. The amount of waste that is permitted or "allowed" to enter streams will have a correlating effect on nearby watersheds.

HB 2181

Creates the Invasive Species Council to study how to better promote reporting of invasive species sightings, increase education about invasive species, and provide grants or loans for eradicating new introductions of them.

HB 2536

Requires that land purchased through a grant agreement with the Watershed Enhancement Board be subject to title restrictions that allow the board to approve, condition, or deny the sale or transfer of land.

HB 2713

Establishes a Water Measurement Cost Share Program Revolving Fund. Specifies that money in the fund is to be used for sharing the cost of installing, substantially repairing, or replacing stream flow gauges, measuring devices, and headgates with measuring devices.

HB 3002

This bill (1) requires fish passage in all waters of the state in which native migratory fish are currently or have historically been present,

with exceptions; (2) prohibits a person owning or operating an artificial obstruction from constructing or maintaining the artificial obstruction without providing passage for native migratory fish, with exceptions; (3) requires the commission to review exemptions at least once every seven years; (4) requires the state Department of Fish and Wildlife to complete a statewide inventory of artificial obstructions and to establish a list of priority projects for enforcement purposes; (5) requires the state Fish and Wildlife director to establish a Fish Passage Task Force to advise the director and the department; (6) creates the Salmon Recovery Task Force to define recovery for anadromous salmonid populations, establish criteria for evaluation of recovery, and develop legislation for recommendation to the legislative assembly. Sunsets December 31, 2002.

HB 3007

Prohibits or limits the manufacture, sale, installation, or disposal of specified mercury-containing items, providing civil penalties.

HB 3057

Allows cities and counties to authorize a partial property tax exemption for riparian designations on land that is located within the boundaries of a city and an urban growth boundary.

HB 3105

Creates a tax credit for agricultural riparian lands.

HB 3451

Directs the Land Conservation and Development Commission to evaluate whether the dredging of materials from estuaries to mitigate flooding should be authorized. At present, dredging for flood control is not authorized. LCDC will report the results to the 72nd legislature.

HB 3564

Expands the Department of Fish and Wildlife habitat conservation plan program.

HB 3637

Modifies membership of the state Fish and Wildlife Commission. Provides that members serve at the pleasure of the governor. Requires that the commission hold meetings at least once every two months in geographically diverse areas. Provides temporary confirmation authority to the senate for appointment of the state Fish and Wildlife director by the commission.

HB 3808

Repeals permission for the U.S. to acquire lands for the purpose of migratory waterfowl refuges. Without this permission, the U.S. faces more hurdles to acquire such lands. Less unproductive farmland is taken out of rotation, and thus, more pesticides and fertilizers enter watersheds.

HB 3815

Directs the Oregon Department of Agriculture to inspect fertilizer products for harmful substances such as heavy metals that pose a threat to streams, wildlife, or people. Adds labeling requirements to fertilizer so people know exactly what they're paying for.

HB 3948

Creates a Sustainability Board to evaluate and propose incentives for the purpose of encouraging activities that sustain, protect, and enhance the quality of the environment, the economy, and communities.

HB 3956

Requires the Department of Environmental Quality to develop and implement a pollutant-reduction trading program, with certain requirements. Allows the department to collect reasonable fees from traders for the administrative cost of the program. Requires the department to seek federal funding for the program.

HB 3981

Specifies that the state Fish and Wildlife Commission consider a host of social and economic factors that listing a species as threatened or

endangered will have on the affected communities and the state once. Further, the state will be required to help mitigate these costs when “practicable.”

HJM 4

Urges Congress to amend the Marine Mammal Protection Act so Oregon can “remove” certain pinnipeds preying on endangered salmonids.

HM 2

Requests amendment of the Endangered Species Act, a reevaluation of Lost River sucker fish biological opinion, development of long-term water storage solutions for Klamath Basin, and declaration of Klamath County as a natural disaster area.

Senate Bills

SB 50

Would require ODFW to relocate to Salem.

SB 172

Would amend removal and fill statutes in the event that the Division of State Lands assumes administration of the federal dredge and fill permitting program (Section 404) of the Clean Water Act.

SB 214

Repeals the sunset clause for plans for natural production of anadromous fish runs. The basins for which plans may be adopted are Hood, Deschutes, Fifteenmile Creek, John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha. The plans shall include a risk-versus-benefit analysis to wild fish.

SB 319

Ensures the ability of the Water Resources Department to participate in decommissioning of a hydroelectric project for purposes of protecting

public health, public safety, and the environment.

SB 529

This bill is a companion to SB 172, which attempts to streamline the Division of State Land’s permitting procedures. The bill would require the director of DSL to determine whether the application is complete within 40 days and to issue or deny the permit within 90 days, after the determination is complete.

SB 606

Invalidates permits for recreational placer mining within scenic waterways after December 31, 2003 if the mandated review requested by this act is not completed. Such recreational mining in scenic waterways is currently not allowed. This bill would allow recreational mining in scenic waterways and, at the same time, require that a study be done to determine the effects of the concurrent new mining taking place. Scenic waterways compose only 1 percent of all the rivers in Oregon, and recreational placer mining is allowed on the other 99 percent.

SB 764

Extends to 2007 the pollution control tax credit, which was set to expire in 2001. The pollution control tax credit funnels millions of dollars to companies for obeying pollution laws, effectively subsidizing heavily polluting companies.

SB 895

Attempts to ward off invasive species in Oregon by means of ballast water regulations and a task force to study the issue. The bill prohibits ships from entering Oregon’s ports without performing ballast water exchange and requires a reporting system to track how well ballast water exchange is being performed.

SB 945

Attempts to improve implementation of the Oregon Plan by requiring OWEB to perform a biennial assessment of activities undertaken in each of the state’s 18 drainage basins to implement the Oregon Plan, and to report on the progress and challenges facing the plan’s implementation.



North Umpqua Hydropower Relicensing: Rhetoric or Reality?

By Jeffrey J. Dose

Decisions about appropriate levels of environmental protection and restoration are usually complex: information is often missing or incomplete, and the atmosphere is often contentious. Special interests, driven by economic and political factors, abound. Few environmental issues in the Pacific Northwest are as complex and controversial as those surrounding salmon and hydroelectric dams. An example is the recently announced settlement “agreement” for the relicensing of the expired North Umpqua Hydropower Project between Scottish Power (the owners) and a consortium of state and federal agencies.

The hydro project, first licensed in 1947, consists of eight dam-reservoir-powerhouse complexes, over 30 miles of flumes and canals, 6 miles of penstocks and tunnels, and approximately 100 miles of project-related roads. The 185-megawatt project covers about 2,800 acres and lies on public land completely within the boundaries of the Umpqua National Forest. It also forms the upper terminus of the 34-mile North Umpqua Wild and Scenic River.

The project was designed and constructed with little thought for maintaining ecological processes such as sediment and large wood transport, adequate bypass flows, or passage facilities for fish or other aquatic- and riparian-dependent organisms. As a result, the hydro project has caused substantial adverse impacts to aquatic ecosystem processes and resource values, including several anadromous fish stocks indigenous to the North Umpqua River basin.

On June 13, 2001 in Salem, Pacificorp CEO Judi Johansen and U.S. Forest Service regional forester Harv Forsgren announced an agree-

ment regarding the hydro project, one that was made without public representation and involvement. The announcement included statements by Governor John Kitzhaber and other officials. All expressed great optimism for the future as a result of the agreement and praised the cooperative spirit in which it was reached.

Is this optimism justified? Will the agreement, if it actually becomes the basis for the new license, result in a substantial restoration of the North Umpqua River that will greatly benefit the people of Oregon and the nation? Sadly, the answer is no.

WE NEED THE POLITICAL LEADERSHIP TO PROMOTE THE GENUINE RESTORATION OF NATURAL SYSTEMS, INSTEAD OF ACTIONS AIMED AT PRESERVING AGENCIES AND INSTITUTIONS.

Although some relatively minor improvement over the current situation will be achieved, mandating more ecologically based measures using principles from restoration ecology and conservation biology would provide far better results. These are the same scientific principles, based on natural processes and disturbance regimes, used to develop the Aquatic Conservation Strategy that provides management direction for the U.S. Forest Service on many federal lands in the Pacific Northwest. Additionally, these principles are found in the Wild and Scenic River Plan for the North Umpqua, where the overall goal for

fisheries (an Outstandingly Remarkable Value, a priority of the act) is “a healthy, diverse aquatic system in near natural condition.” The plan’s guidelines direct federal agencies to “provide leadership to the Federal Energy Regulatory Commission relicensing process, rehabilitate streams that are below potential with appropriate measures, and *modify or remove existing facilities* or eliminate uses in order to achieve fisheries goals” (emphasis added).

The aquatic resource measures proposed in the recently announced agreement will not restore watershed processes. Many of the proposed measures are still conceptual (for example, they require more study or design work), are technofixes of dubious or no value, and require generous funding. Some will likely have continuing adverse impacts.

Numerous alternative measures, including those proposed in the settlement agreement, have been extensively studied and are well documented in the watershed analysis produced in response to the relicensing process. The most contentious of these measures is the removal of Soda Springs Dam, the lowest of the eight project dams. It is the only alternative that would begin to reverse the physical, biological, and water-quality effects of the project. Removing this dam would certainly have economic impacts on the utility. It is the only alternative analyzed that would reduce the generating capacity (by 11 megawatts, or about 6 percent) of the project, which is apparently why it became politically untenable.

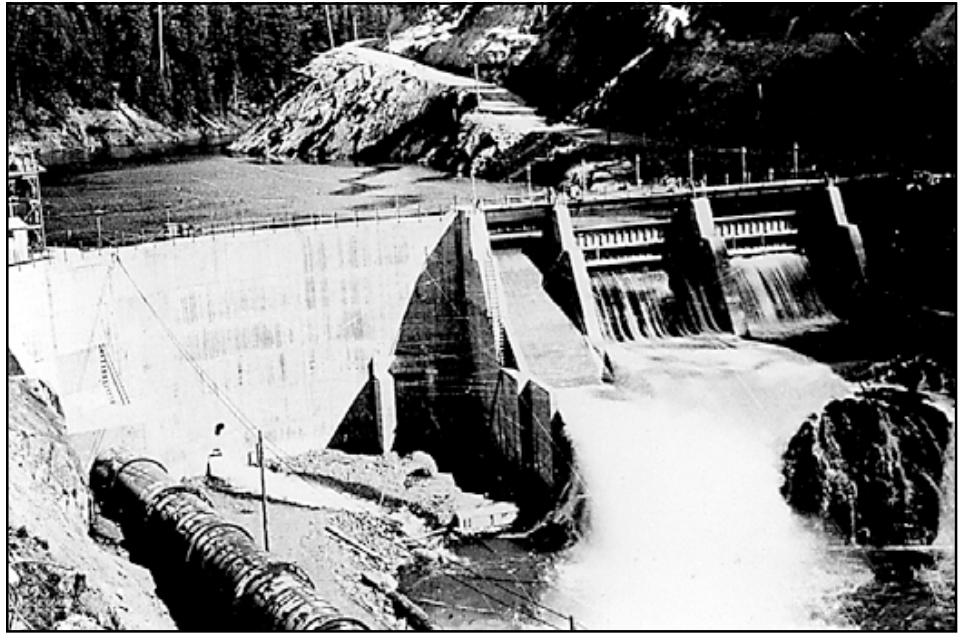
One way for public officials and policymakers to arrive at (and justify) overly optimistic predictions from what are really minor, yet expensive, tweaks of the status quo

is by deceiving the public about the full range of options available to resolve an issue (see sidebar, p. 9). One way this is accomplished is by arbitrarily restricting the range of alternative courses of action. When an alternative that is relatively “high” on this narrowly confined scale is selected, it can (falsely) be portrayed as having highly beneficial results.

For the portion of the North Umpqua hydro project located within the historical distribution of anadromous fish (the lower one-third), the true range of options available for restoration of the watershed includes, at one end of the spectrum, maintaining the status quo (no passage of any kind) and, at the other end, complete removal of the lowest two dams, Soda Springs and Slide Creek Dams. Providing fish passage using ladders and screens at one dam or two dams is another option. In terms of restoring ecological integrity, habitat quality, and watershed processes, dam removal is far superior to merely providing fish passage for a narrowly selected suite of species and life stages. Additionally, because of the respective physical characteristics and location of the two dams, the existing impacts and potential benefits from restoration at Soda Springs Dam would be of far greater consequence than at Slide Creek Dam. See figure 1.

At the announcement in Salem, Governor Kitzhaber was quoted as saying “Taking the dam out simply is not an option.” It appears that at some point in the negotiations, the range of alternatives was severely narrowed. At that point, all the dam removal options were portrayed as being unrealistic for social, economic, and political reasons and were summarily dismissed.

Once that premise was accepted, the scale of analysis—and consequently the entire focus of negotiations—was substantially changed. The focus and debate became restricted to whether, and by what means, fish passage facilities would be constructed at one or both of the dams and what types of habitat “improvements” could be implemented. Compared with the true range of options available for restoring ecological integrity and habitat



Soda Springs Dam, shown here shortly after construction in 1952, is at the heart of the controversy over the North Umpqua River. Source: J.C. Boyle/Copco.

quality, the terms that were discussed represented only about the lowest 20 percent of the potential ecological benefits available. The compromise arrived at through the settlement achieved only about 10 percent of the full range. See figure 2.

Whether a decision at this low level, based on a narrowly restricted scale of the total options available, is adequate to meet the responsibilities, mandates, and societal expectations for restoration of places such as the North Umpqua River is worthy of discussion and further review.

How did we get to the conclusion that “removal is not an option” from previous negotiations less than two years ago, when dam removal was the preferred option by the U.S. Forest Service, the U.S. Fish and Wildlife Service, and over half a dozen fishing and conservation groups? Local, state, and even national groups arrived at that preferred alternative after two years of intensive negotiation that included both an independent science component and strong public representation. This alternative would have accomplished far more in restoring ecological integrity and improving fish habitat than the proposed settlement agreement. Also, it would have done so with only a 6 percent decrease in generation capacity for the entire project.

The “how” question is easy to answer. After two years, Scottish Power pulled out of that first round of negotiations and went to work lobbying at much higher agency and governmental levels. After a brief second round of negotiations failed, one that saw the positions of the federal agencies waver, the fishing and conservation groups refused to enter into yet another round of negotiations (the existing license had expired in 1997) and requested that the Federal Energy Regulatory Commission move ahead with the “traditional” licensing process. That set the stage for the third, and final, round of negotiations. This round saw a new cast of players and a very different process from the previous two rounds.

1. These negotiations had no public representation.
2. Many agency representatives were replaced by or supplemented with personnel who were almost universally people higher up the line. These people were far less familiar with the project, but much more closely aligned to the political arena.
3. The process also changed.

In the first two rounds, independent science teams conducted a technical analysis of the relative merits of the alternative actions,

Continued on page 8

North Umpqua Hydropower

Continued from page 7

using a peer-review, consensus-based process. In the third round, some of the most knowledgeable, independent scientists (those who were not part of the negotiations or employed by the utility) ceased to participate. As a result, some of the analytical tools and conclusions that had been rejected in the earlier negotiations resurfaced as “fact” and were used by the later negotiators to justify their positions. All of this was conducted without public participation.

Answering the “why” question is, of course, far more difficult. There is no doubt that a tremendous incentive existed for the state and federal agencies to reach an agreement. Public bureaucracies are nearly always perceived as “better” when viewed as “agreeable,” versus the alternative. The electrical power industry also has considerable financial and legal resources as well as enormous political influence. Finally, substantial political and, for some state agencies—for example, the Oregon Department of Fish and Wildlife (ODFW)—financial benefits identified in the settlement agree-

ment could not be achieved any other way.

[Editor’s Note: The ODFW North Umpqua Hydropower memorandum of understanding can be reviewed on-line at <http://www.dfw.state.or.us/ODFWhtml/InfoCntrHbt/moupage.html>.]

The federal agencies, particularly the Forest Service (which is the only agency with mandatory conditioning authority), might also have feared legal action by the utility if they had prescribed conditions beyond those reached in the settlement. This fear of litigation from the utility was probably greater than the agencies’ fear of legal action from the public.

In their landmark 1993 *Science* article, “Uncertainty, Resource Exploitation, and Conservation: Lessons from History,” Ludwig et al. suggested that human motivation needs to be included as part of any system to be studied and managed. They also suggested that the short-sightedness and greed of humans often underlie difficulties in the management of natural resources. The authors found that a consistent pattern exists throughout history regarding the use of natural resources: resources are inevitably overexploited. They suggest that this

pattern is due to several common features, one of which is that wealth or the prospect of wealth generates political and social power that is used to promote further resource exploitation.

The rhetoric of the proposed agreement is that there has been a landmark change, that resource exploitation need not interfere with, in fact can even improve on, natural systems. This sounds wonderful. It’s what most of us want to hear. Unfortunately, in the case of salmon and other natural resource issues, this conspiracy of optimism is far too common and rarely withstands credible challenge, as recent court cases can attest.

This proposal is built on a paradigm of short-term economic desires, four-year political cycles, and ever-increasing growth. It is a paradigm better suited to preserving agencies and institutions than preserving native flora and fauna that have existed for billions of years.

The reality is that, despite the attendant fanfare that accompanied the signing of the settlement agreement, there will be only minor improvements to the ecological integrity of the North Umpqua River. Physical and biological connectivity will not be

Figure 1. Ecological Integrity Continuum

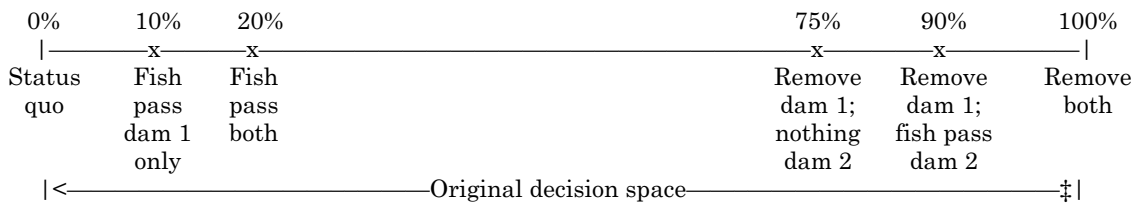
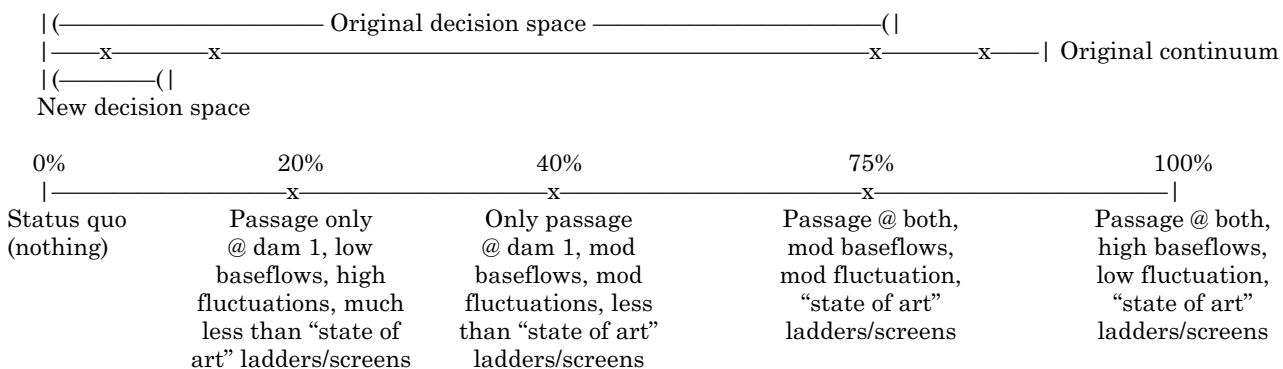


Figure 2. “New” Ecological Integrity Continuum



restored, high-quality habitat “hot spots” will not be recovered, flow fluctuations and instream flows will remain far outside natural regimes, and sediment transport and riparian vegetation will remain substantially altered.

Relicensing the North Umpqua Hydropower Project is a rare opportunity to make substantive changes to the North Umpqua River ecosystem. In fact, it is the first opportunity in over 50 years and the last for at least the next 35 years, perhaps

ever. Absent successful intervention, through litigation (which is likely) or other means, this opportunity will be squandered. We need the political leadership and courage to promote the genuine restoration of natural systems and disturbance regimes, instead of actions aimed at preserving agencies and institutions. Recovery grounded in the natural resilience of biological systems should be our goal. In the long run, it will be less painful, far less expensive, and infinitely more durable than depen-

dence on the treadmill of halfway technology.

Jeffrey J. Dose has been a professional fish biologist for over 23 years, the last 20 of which he has spent in the Umpqua River basin with two federal land management agencies. He has been involved in the North Umpqua Hydropower relicensing for the past decade. The above opinions are his own. Dose is not authorized to speak for the Umpqua National Forest or the Forest Service and does not, under any circumstances, intend to imply such.

Deception of Scale: How to Reach Faulty Decisions Without Even Trying

By Jeffrey J. Dose

Those whose interests are best served by maintaining the status quo of hydro systems in the Pacific Northwest have been very successful in using arguments based on “burden of proof” and “inadequate science” to prevent change in the region. Another, less obvious, strategy to prevent change is to alter the scale of analysis to minimize (or preclude) meaningful change.

At least two different strategies exist in which changing analysis scales can influence decisions. The first is to artificially truncate the temporal scale of the analysis. This is frequently done when assessing species population status. Decision makers select a time period when a target species’ population is stable or showing an increasing trend. Based on such limited data, an argument can be made to either preclude any changes at all (“things are fine!”) or set arbitrarily low recovery thresholds.

A second way that changing the scale of analysis can influence natural resource decisions is to artificially change the decision “space” itself. This method generally proceeds according to the following steps.

Step 1. First, reviewers develop a full suite of possible project modifications (alternatives) and probable ecological outcomes. From this analysis, on the basis of actual data, the literature review, and a consensus of professional opinion, reviewers complete an assessment for “ecological integrity.” Evaluation factors include the degree of restoration of important physical attributes (that is, sediment regime, flow regime, water quality, and so on), and the degree of restoration of the biological attributes (that is, connectivity, habitat quality and quantity, diversity, and so forth).

The potential decision points range from maintaining the status quo (no change) to taking the most aggressive action (for example, removing a dam).

Step 2. At this point, the most aggressive action (removal of the dam) is portrayed as being unrealistic

because of social, economic, and political reasons and are summarily dismissed. (Note: At this point, the decision process has left the physical and biological sciences.) Once the label “unrealistic” has been accepted, the scale of analysis—and consequently the decision space—has been substantially changed.

Step 3. The physical and biological sciences are then re-engaged to discuss the various alternatives and combinations. It is crucial that these discussions and ultimate conclusions be restricted to within the “new” decision space. Related factors—factors that were relatively unimportant at the larger decision scale—are now the primary points of discussion and are used to determine ecological integrity. In the case of the debate over a dam, for example, the discussion moves from actual dam removal to such topics as the amount of base flow and the rate and magnitude of flow fluctuation.

Step 4. Using a consensual decision-making process, policymakers select an alternative that represents a “compromise” decision (from the “new” continuum). On the surface, the decision appears fair and balanced and will contain a relatively high degree of consistency with ecological objectives. This is often referred to as a “win-win” situation. Those entities with responsibilities for fish or other ecological resources might conclude that they fared pretty well in the compromise decision-making process. When compared to the original continuum, however, that “win” is marginal, at best.

Society at large and decision makers at all levels deserve credible, objective science—as open and as blunt as it can be—if the enormous amounts of public resources that have been, and will be, expended are to achieve our objective of healthy, self-sustaining aquatic ecosystems and their ultimate symbol: abundant, well distributed runs of wild salmon.

Quantifying the Effects of New Development on Salmon Habitat: We Need to, but Can We?

By Paul Hoobyar

Population growth in Oregon is projected to increase by approximately two million by 2050. Over half this growth (1.3 million) will occur in the Willamette Valley. Given the demand for new housing and roads and the increased pressure on land use these numbers portend, planners and scientists are asking how the additional population—and the infrastructure needed to accommodate it—will affect fish and wildlife habitat and watershed health.

In the summer 2000 issue of *Restoration*, we described how several agencies and groups are developing assessment and guidance tools that encourage the kind of urban and residential development that supports healthy fish habitat and clean water. For instance, Portland Metro has been working on new riparian setbacks, stormwater management, and low-impact building codes in its Title 3 program for water quality and fish and wildlife. Likewise, the National Marine Fisheries Service, in its 4(d) ruling last year, included a “Municipal, Residential, Commercial and Industrial Limit” to guide municipalities in establishing ordinances for new development that avoids degrading salmonid habitat. The purpose of the guidelines is to protect cities from liability under the Endangered Species Act for new urban development.

At the state level, the Oregon Department of Environmental Quality and the Oregon Department of Land Conservation and Development have released a new publication, the *Water Quality Model Code and Guidebook* (available at www.lcd.state.or.us/coast/waterguidebook/watergb.html), which also addresses water quality and habitat needs in urban areas.

Now, the consulting firm of S. P. Kramer and Associates is developing a new tool that it hopes will answer

whether, and how much, development can occur in a watershed without adversely affecting in-stream habitat, water quality, or fish production. The Oregon Homebuilder’s Association and others are supporting this effort.

The STREAM tool (Salmon and Trout Response to Environmental Alteration Model) focuses on specific components of a watershed’s ecosystem to help predict impacts of future development on fish habitat and populations.

One assessment used in the STREAM tool looks at how new development may change surface runoff pathways and the amount of sediment delivered to a stream when more surface is paved. The goal is to develop an assessment that can show what changes will occur in a watershed under different development scenarios. The consultants hope this assessment will determine the amount of new development a watershed can sustain without adversely changing the patterns and speed of runoff or without increasing the amount of sediment delivered to a stream.

Another of the STREAM tool’s assessments is site-specific within the watershed. This assessment looks at the stream channel, riparian zone, and floodplain to determine how much new development can occur in a specific area without adversely affecting stream habitat and fish production.

The STREAM tool also has a forestry component. The forestry assessment looks at large wood recruitment to the stream and its role in creating habitat, the condition of the riparian zones and tree stands near the stream, and the changes in stream temperature that can result from alterations in the riparian zone, streambed configuration, or streamflow.

Most of the STREAM tool’s assessments use protocols that are

standard in other methods of analyzing watershed and natural resources. The STREAM tool starts with an assessment of historical conditions and then analyzes existing conditions before trying to quantify how proposed development may affect the watershed processes noted above. What’s different about this approach, and what causes some concern for the National Marine Fisheries Service, according to biologist Spencer Hovekamp, is that the STREAM tool attempts to anticipate and quantify the effects of new development actions and to establish fixed salmon production numbers. Nevertheless, Hovekamp said, NMFS encouraged Kramer’s group to develop and test the model because “We’re always looking for alternative analytical tools, and the urban sector is important. We just haven’t had successful experience with quantifying fixed production numbers yet.”

Other concerns about the STREAM tool also exist. For Ernie Platt, of the Homebuilder’s Association, the National Marine Fisheries Service’s 4(d) ruling itself is not helpful in giving developers usable tools for how to proceed with future development while avoiding harmful impacts. “There’s a belief that NMFS has overstated the habitats,” Platt said, “so we need to determine whether threatened and endangered species exist in a particular stream, and if so, which ones, and what needs and conditions . . . these species have. Then we can assess what impacts are possible in a specific area from proposed development and look for ways to mitigate that.”

Questions also exist about how the tool will be used. For instance, what if the tool predicts that development in a given area will negatively affect salmon habitat and production? Will developers then stop development in that area?

When asked that question, Platt was not sure how the STREAM tool would affect development decisions. "Will it lead to better development practices, smaller developments, green site building techniques, or pre-treatment of a site? I don't know. Maybe it's a timing situation, so that what won't work during the [salmon] migration period will not be a problem at another time. One thing we know is it will lead to rethinking what the developer can do for a site. What we hope is to isolate the problem at the site level and try and deal with that specific problem. That would be helpful to a developer."

The Homebuilders Association and the consulting firm have targeted three subbasins to test and refine the STREAM tool. All three basins face development pressures in the near future. One of the subbasins is Pringle Creek, an entirely urban stream in the city of Salem. Tina Schweickert, with the city of Salem, said, "We see potential value in what Kramer has come up with in terms of the limiting factors analysis for salmon habitat and the physical characteristics assessment of streams. The city has no plans at this point, however, for participating in the testing of the model."

Platt summed up why the developers support Kramer's effort. "NMFS has gone down a road that, frankly, they don't know where they're going. They've dealt with commercial fisheries, and now they're involved in consultation on development permits. . . . We think we're helping NMFS by developing a tool that will do that analysis," Platt said.

Media Received

New Water Quality Model Code and Guidebook CD

The Oregon Department of Environmental Quality and the Oregon Department of Land Conservation and Development have published a new resource for local governments striving to protect local water quality. *The Water Quality Model Code and Guidebook* will assist cities and counties interested in reducing impacts on water quality from urban development activities.

The Willamette Restoration Initiative anticipates that the *Water Quality Model Code* will help to fulfill Action 26 of the Willamette Restoration Strategy (increase the usefulness of land-use planning management programs for watershed issues). The model ordinances address urban nonpoint pollutant sources identified by the Environmental Protection Agency and the National Marine Fisheries Service as risks to surface water, groundwater, or aquatic habitat.

The document is designed to dovetail with the *Model Development Code for Small Cities*, developed by the state's Transportation and Growth Management Program, which is included on the CD.

The *Water Quality Model Code and Guidebook* is available on CD for local planning officials. For information, contact Amanda Punton at amanda.punton@state.or.us or visit <http://www.lcd.state.or.us/coast/waterguidebook/watergb.html>.

The Oregon Plan for Salmon and Watersheds 2001 Annual Report

The editors of the annual report continue to experiment with innovative ways to present a large amount of information in a 45-page document. New features this year include sections on fiscal resources and state agency use of Oregon Plan funds.

Both sections give a concise overview of where the money to support the plan comes from and how state agencies are spending most of those funds. They also contain a page of graphics showing how funds are allocated around the state, as well as the usual sections on restoration work accomplished, monitoring, and education. To receive a copy of the report, contact Teresa Trump 503-378-3589, x 821.

Web Sites of Interest

The Willamette Restoration Strategy (Full Report), with more detailed issue documentation and task identification, is now on-line at http://www.oregonwri.org/basin_strat.html. The full report is also available in limited quantities in both CD and hard copy.

Stream Crossing Web Sites

A number of on-line resources are available for landowners, watershed groups, and others interested in addressing or learning more about fish passage and stream-crossing problems and techniques.

Oregon Road/Stream Crossing Restoration Guide. For the Sake of the Salmon has a new guide explaining how landowners in Oregon can assess and restore fish passage at road-stream crossings. The site provides a guide for how to determine whether a problem exists and what action to take to fix it (that is, whether to replace, repair, or abandon the stream crossing). The URL is http://www.4sos.org/wssupport/ws_rest/OregonRestGuide/index.html

Fish Passage Short Course. This Web site includes the short course developed last year for watershed groups, landowners, and others who address fish passage issues. It includes a presentation by a team of professionals on various issues associated with fish passage. The URL is http://www.4sos.org/wssupport/ws_rest/fpsc/index.html

Fish Passage Technical Assistance. This site is an on-line manual that gives a broad overview of barriers to fish passage and tells how to establish priorities for which passage problems to address first. The URL is <http://www.wa.gov/wdfw/hab/engineer/fishbarr.htm>

Oregon Sea Grant
Oregon State University
322 Kerr Administration
Corvallis, OR 97331-2131

PRSRT STD
U.S. Postage
PAID
Corvallis, OR
Permit No. 200

Calendar of Events

Symposium on Forest Sustainability

The Oregon Board of Forestry and the Oregon State University College of Forestry will cosponsor a symposium on October 18, 2001 entitled "A Landmark Assessment of Oregon's Forest Sustainability." This free, one-day symposium will provide up-to-date information from ongoing assessments of conditions in Oregon's forests, using international criteria of sustainability. For more information, call Casey Norton, Oregon Department of Forestry, at 503-945-7407.

Watershed Restoration Workshop 2001: Integrating Practical Approaches

The Oregon chapter of the American Fisheries Society's watershed restoration workshop, "Integrating Practical Approaches," will be held November 13-15, 2001 in Eugene, Oregon. The workshop will convey lessons valuable to anyone involved in watershed restoration planning, education, field activities, and evaluations. Registration is \$130. The agenda, registration form, and trade show application are available on-line at www.osu.orst.edu/groups/orafs/wrw and via Richard Grost at rgrost@compuserve.com, 541-496-4580.

Restoration



Recycled
Paper

Restoration (ISSN 1521-5261) is a quarterly publication of Oregon Sea Grant, a marine research, education, and outreach program based at Oregon State University. The newsletter was partially supported by grant no. NA76RG0476 from the National Oceanic and Atmospheric Administration (NOAA) and by appropriations made by the Oregon State legislature. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

Editor in Chief: Joseph Cone

Editor: Paul Hoobyar

Managing Editor: Sandy Ridlington

Production: Rick Cooper

Circulation: Cynthia Newberry

Banner photograph by Trygve Steen

Office phone: 541-737-2716

E-mail: sea.grant.communications@orst.edu

Back issues of Restoration:

<http://seagrants.orst.edu/communications/restore.html>



Oregon Sea Grant acknowledges the partnership of the Governor's Natural Resources Office and the Oregon State Office of the U.S. Fish and Wildlife Service for Salmon and Watersheds in supporting the printing of *Restoration*.
OREGON STATE UNIVERSITY



September 2001