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Striking a Balance Between Energy and the Environment in the Columbia River Basin

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Council Decisions

In each issue of Council Quarterly, we include a synopsis of key recent Council decisions. In our last edition, we reported on decisions through February 2002.

March 2002

Subbasin planning contracting structure

Meeting in Eugene, Oregon, the Council approved a draft contracting and administration structure for subbasin planning in Idaho, Montana, Oregon and Washington. The draft structure includes a contract between the Council and the Bonneville Power Administration to provide funding for

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Power Planning Council and Bonneville Seek Proposals for Bonneville's Future

The Northwest Power Planning Council and the Bonneville Power Administration are beginning to think about the future of the federal power marketing agency, which supplies about 40 percent of the Northwest's electricity.

The Council and Bonneville believe that important questions about Bonneville's future should be addressed now, far in advance of the next five-year rate period, which begins in 2006 for some Bonneville customers. These questions need to be asked now in order to seek regional opinions about the future of the agency and, if Bonneville determines to change its current policies, to give surety to Bonneville customers. Key issues for discussion are how Bonneville's power should be divided among the region's electric utilities and whether Bonneville's direct-service industrial customers, primarily Northwest aluminum smelters, should continue to have access to the federal power supply and under what conditions.

A group of public and private electric utilities in the Northwest already has developed a proposal to allocate the output of the federal system, a proposal that would assign shares of the output to each utility and reduce Bonneville's involvement in the wholesale electricity market on the West Coast. Currently, Bonneville is required to supply all of the electricity demand placed on it by its public utility customers, even if the federal power system cannot produce enough electricity. In that event, Bonneville has to buy power on the wholesale market. The utilities' proposal would end that requirement by making Bonneville's customers that sign up for shares of the system responsible for meeting their own demand for power that is in excess of their share of the federal power base, or "slice of the system."

That's one view of the future, and the Council and Bonneville are interested in

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SPECIAL HATCHERY SECTION

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Bonneville's Future

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hearing what people think about it, and any other future scenarios for Bonneville and the Federal Columbia River Power System. A series of public meetings will be convened around the Northwest this fall. These will provide opportunities to learn about proposals, express ideas, and suggest issues for Bonneville to consider as it develops its own proposal. The Council also plans to develop a proposal and submit it to Bonneville before the end of the year.

There are three important reasons for beginning a regional dialogue on the future of Bonneville:

- The direct-service industrial customers, primarily aluminum companies, have only five-year commitments from Bonneville to supply them with power. These industries want certainty about their power supply after 2006 in order to make investment decisions about their plants.
- Some publicly owned utilities and investor-owned utilities have been meeting to settle a lawsuit filed by the public utilities regarding the Residential Exchange Settlement Agreement. That agreement allowed the investor-owned utilities to sign 10-year subscription contracts with Bonneville for federal power. It is important that this settlement fit into Bonneville's long-term future.
- Some utilities and independent power producers wish to make decisions soon regarding investments in existing and new power plants, which could require capital funding. This capital is needed to ensure that the region has the necessary power supply to support a healthy economy. However, capital often can be difficult to secure without clear evidence of future customers and the ability to reach them. Therefore, these entities would also like an understanding of Bonneville's role in the region after 2006.

> "...the Council and Bonneville are interested in hearing what people think about...future scenarios for Bonneville and the Federal Columbia River Power System."

Some issues are particularly important in considering the future of Bonneville. The Council and Bonneville invite comments and discussion on the following questions:

- Should the Federal Columbia River Power System be increased in size so that it can continue to serve load growth in the Pacific Northwest?
- If so, should Bonneville support the acquisition of new resources by 1) buying power in the market or 2) buying it directly from developers of new power plants?
- Should the direct-service industries receive cost-based power from Bonneville after 2006? If so, how much compared to the region's electric utilities?
- Should investor-owned utilities receive federal power, or only financial benefits in lieu of power?
- Should the existing federal power system be allocated among Bonneville's regional customers, as the current utility proposal suggests, with additional requirements for load growth being met by the customers themselves? If so, how should the available power be allocated, and is this type of allocation appropriate?
- If Bonneville does acquire new power, as it has for the current five-year rate period, how should its power be priced? Should Bonneville continue to meld all the costs of its power together into one rate? Or, should Bonneville adopt a "tiered rate" system whereby power produced by the existing federal system would continue to be sold at its cost while additional power purchased in the market or directly from developers would be sold at those market or project-based prices?

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Public Hearing Meeting Dates on the Future Role of Bonneville

The Council and Bonneville plan a series of eight public meetings to discuss the future of Bonneville and listen to comments from the public. Meetings have been scheduled on the following dates. Locations and times will be announced on the Council's website, www.nwcouncil.org/energy/bparole.

September 16, 2002	Tri Cities, WA	September 25, 2002	Seattle/Tacoma, WA
September 19, 2002	Missoula, MT	September 26, 2002	Boise, ID
September 24, 2002	Spokane, WA	September 30, 2002	Portland, OR

Council Decisions for 2002

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producing subbasin plans, including technical coordination, scientific assessment and analysis and information development and access. After discussing the draft structure at its March 5-6 meeting, the Council asked the staff to make revisions and have the documents ready for a decision at the April meeting in Boise. That decision later was postponed to the June meeting.

The draft subbasin planning budget is $15.25 million. That amount would cover two years of subbasin planning. The draft structure also includes the following schedule for developing subbasin plans in the 11 ecological provinces: By May 2003, Columbia Gorge, Intermountain, Mountain Columbia; by November 2003, Columbia Plateau, Mountain Snake, Blue Mountain, Middle Snake; by May 2004, Columbia Cascade, Upper Snake, Lower Columbia and Estuary, Mainstem and Systemwide.

At the March meeting in Eugene, the Council also discussed a draft public notice of request for subbasin plans to be developed and ultimately adopted into the Council's fish and wildlife program, but agreed not to issue the request until the Council and Bonneville agree on the terms of their contract.

Data management standards

The Council approved a $118,035 budget for development of two sets of standards for developing data on fish and wildlife, one for monitoring salmon habitat and the other for organizing the counting of fish. The work will be done by the Washington Department of Fish and Wildlife, the Columbia River Inter-Tribal Fish Commission and the Department of Fisheries and Oceans Canada. The Council's approval was contingent upon resolving issues that might be raised in a review of the project proposal by the Independent Scientific Review Panel.

Facilitation for the National Marine Fisheries Service's Regional Implementation Forum

The Regional Forum is intended to assist in implementation and oversight of the Fisheries Service's 2000 Biological Opinion on hydropower operations. Facilitation services for the Forum are provided by contractors through the Council's fish and wildlife program to improve communications among the Forum members, resolve conflicts and enhance decision-making. After reviewing the anticipated workload in 2002, the Fisheries Service requested a budget increase for the remainder of the fiscal year. The Council approved additional funding of $50,000 for that purpose.

April 2002

Blue Mountain and Mountain Snake province fish and wildlife projects

The Council recommended fish and wildlife projects that will total $36.3 million in Fiscal Year 2002, and similar amounts in each of the next two years, to improve fish and wildlife survival in northeastern Oregon, southeastern Washington and central Idaho.

Meeting in Boise, the Council recommended 20 ongoing projects and eight new projects in the Blue Mountain ecological province totaling $12.4 million. Major tributaries in this province include the Grande Ronde and Imnaha rivers, and Asotin Creek. The Council also recommended 38 ongoing projects and 21 new projects in the Mountain Snake ecological province totaling $23.9 million. Major tributaries in this province include the Clearwater and Salmon rivers.

May 2002

Fish Passage Center Oversight Board

The Council's 2000 Columbia River Basin Fish and Wildlife Program commits the Council to "establish and appoint an oversight board for the Fish Passage Center, with representation from the National Marine Fisheries Service, the tribes, the Council and others, to provide policy guidance and assure regional accountability and compatibility with the regional data management system." The Portland-based Fish Passage Center, which is funded by the Bonneville Power Administration through the Council's fish and wildlife program, coordinates development of Columbia and Snake river spill and flow requests for fish passage, implements the Smolt Monitoring Program, maintains various databases and makes fish passage information publicly available, and provides specific analysis on fish passage issues.

Meeting in Whitefish, Montana, the Council appointed eight members to the board, including one Council representative (Chairman Larry Cassidy), one member representing the National Marine Fisheries Service (John Ferguson), one member representing the Upper Columbia United Tribes (Keith Underwood), one representing

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non-tribal fish and wildlife managers (Tony Nigro of the Oregon Department of Fish and Wildlife), one representing the scientific community (Greg Schildwachter of the Idaho Office of Species Conservation), and two members from the public at large (Liz Hamilton of the Northwest Sportfishing Industry Association and Rob Walton of the Public Power Council).

The previous board of directors for the Fish Passage Center was appointed by the Columbia Basin Fish and Wildlife Authority with the Council's approval. The Council's 2000 Columbia River Basin Fish and Wildlife Program calls for the Council to appoint a board of directors with representation of state, federal and tribal fish and wildlife managers and the public at large. The new board replaces the existing board.

Draft fuel price forecast for the Fifth Northwest Power Plan

The Council released for public comment a paper that includes fuel price forecasts for natural gas, coal and fuel oil. Fuel price forecasts are important for estimating the future cost of electricity in the Pacific Northwest, which is an aspect of the Council's Northwest Power Plan. The Council updates its power plan at least every five years and currently is working on updating the 1998 plan. A key finding of the fuel price forecast is that natural gas prices are expected to rise in the future, while prices of coal and fuel oil are expected to remain relatively flat. Natural gas prices are expected to rise because demand is rising and new supplies are being added in small increments — new wells generally are smaller and are developed faster than those in the past. The paper is posted on the Council's website, www.nwcouncil.org.

Draft Fiscal Year 2004 and Revised Fiscal Year 2003 Council Budgets

The Council is seeking public comments on its Fiscal Year 2004 and revised Fiscal Year 2003 budgets, which are posted on the Council's website. The 2004 budget would be only $7,000 higher than the 2003 budget. This amount is the net difference between higher personnel costs and a reduction in the Power Division budget after the power plan is completed in late 2003.

RTO West Comments to the Federal Energy Regulatory Commission

The Council approved comments to the Federal Energy Regulatory Commission (FERC) on the creation of a regional transmission organization, RTO West, which would coordinate high-voltage electricity transmission in the Pacific Northwest. Nine utilities and the Bonneville Power Administration are proposing to create RTO West in response to an order by the FERC in 2000 that called for creating such organizations around the nation to improve the efficiency and decrease the cost of high-voltage transmission. The Council's staff participated in the discussions that led to the RTO West proposal.

In its comments to FERC, the Council begins by noting that while it recognizes the problems that the existing transmission system has, it is concerned about the high cost relative to potential benefits shown so far by the RTO West proposal. It goes on to recommend that FERC: 1) recognize and accommodate the unique situation in the Northwest in which a very large percentage of the energy is produced by an interconnected hydroelectric system; 2) protect existing transmission rights holders for an extended period of time; and 3) require least-cost planning to address future transmission problems in which RTO West plays an implementation role, which could include both construction of new transmission lines and so-called "non-wires" solutions such as management alternatives that do not require construction of new lines.

SPECIAL HATCHERY SECTION

The salmon cannery labels that help to illustrate the articles in this special section not only are unique works of art, they are reminders that the abundance of salmon once supported as many as 55 canneries along the lower Columbia River and its tributaries. In fact, the first salmon hatcheries were built by cannery owners to supply the commercial fishery.

All labels are from the collection of Bess Wong and Rick Applegate.

INCUBATING CHANGE

NEW MANAGEMENT PHILOSOPHIES WILL DIRECT FISH HATCHERIES OF THE FUTURE TO COMPLEMENT NATURAL FISH PRODUCTION

In 1877, the year Thomas Edison invented the phonograph and 12 years before Portland would have electric street lights, the first salmon hatchery was constructed in the Columbia River Basin.

Today, 135 years later, salmon hatcheries finally are emerging from the management philosophy that guided that first hatchery, and many others that were built since then in the Columbia River Basin. It is a paradigm borrowed from animal husbandry that assumes salmon, like pigs and cattle, can be domesticated and mass-produced in the water equivalent of farms.

Artificial production of fish in the Columbia River Basin is undergoing major changes in goals, philosophies and techniques as state, federal and tribal fish managers confront an ongoing crisis of major proportions in the Columbia River Basin. It is a crisis characterized by depleted fish populations (despite the large salmon runs of 2001), reduced range for spawning and rearing, collapsed fisheries, and large-scale protection under the federal Endangered Species Act for anadromous (ocean-going) fish such as salmon and steelhead, and also for resident (non-ocean) fish such as bull trout and sturgeon.

Fish hatcheries play a unique role in the crisis. They have been identified as part of the problem and also as part of the solution. In general, traditional hatchery management practices may have caused ecological and genetic impacts to wild stocks of fish, and the abundance of hatchery-bred salmon contributed to overfishing the wild stocks in mixed stock fisheries in the Columbia River. At the same time, changes in the philosophy and priorities of hatchery management are widely viewed as a means of addressing the crisis and rebuilding naturally spawning fish populations.

> The new management paradigm for fish hatcheries views hatchery fish as part of the ecosystem into which they are released. Thus, the rationale for modern hatchery management is to integrate fish life history traits and genetic principles in fish production, and produce fish for harvest while also using artificial production to rebuild naturally spawning runs.

The Northwest Power Planning Council's involvement in artificial production dates to a 1980 report by the Columbia River Inter-Tribal Fish Commission. The Commission represents the four lower Columbia River tribes — Nez Perce, Umatilla, Warm Springs and Yakama — that signed treaties with the United States in 1855. In those treaties, the tribes reserved the right to fish at their "usual and accustomed places."

The Commission's report, produced the same year that Congress authorized the four Northwest states to create the Northwest Power Planning Council, explored

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options for using artificial production to mitigate the impact of the hydrosystem. The Northwest Power Act of 1980 directs the Council to mitigate the impact of Columbia River Basin hydropower dams on fish and wildlife, and related spawning grounds and habitat, through the Columbia River Basin Fish and Wildlife Program. Prior to 1980, efforts to mitigate the impact of dams on fish in the Columbia River Basin, such as hatchery production funded under the 1937 Mitchell Act, focused fish production downstream of Bonneville Dam. But the tribes' usual and accustomed fishing sites primarily are upstream of Bonneville.

The Commission proposed that more fish should be raised and released upstream of Bonneville and produced in a way that would rebuild naturally spawning runs. Consistent with that recommendation, the Council's first fish and wildlife program, completed in November 1982, recommended a number of actions to improve hatchery propagation of fish, including "[fish] release strategies compatible with natural propagation and harvest management" and "development of techniques to supplement natural propagation through tributary releases of selected hatchery-reared stocks and prompt application of these techniques to appropriate stocks and areas."

That was a beginning. Today, through the Council's fish and wildlife program, the federal Bonneville Power Administration provides funding for both anadromous and resident fish hatcheries to mitigate the impact of hydropower dams. Artificial production is a major element of the Council's program, accounting for $389.8 million between 1978, when Bonneville began accounting for fish and wildlife expenditures, and 2000, the most recent year for which figures are available. This amounts to 28.6 percent of Bonneville's total expenditures on fish and wildlife. The hatchery programs funded through the Council's program are devoted to rebuilding stocks of fish that primarily spawn in the wild. This is a change from traditional hatchery practices, in which fish are released from the hatchery facility and return there to be spawned artificially.

> Optimistic predictions of adult returns based on numbers of juveniles released, while logical in terms of farm animal production, proved less reliable with fish because their survival depends on so many factors that cannot be controlled beyond the controllable environment of the hatchery.

This new management paradigm for fish hatcheries views hatchery fish as part of the ecosystem into which they are released. Thus, the rationale for modern hatchery management is to integrate fish life history traits and genetic principles into fish production, and produce fish for harvest while also using artificial production to rebuild naturally spawning runs. In this sense, many successful hatcheries will play a smaller and smaller role over time as naturally spawning runs rebuild.

While artificial production practices will vary from one facility to another, reflecting local conditions and characteristics, the way forward is clear — to forge a link between local environmental conditions, fish production and fish harvest.

In this special report, the Council explores the shift in management philosophy that is leading to new roles for fish hatcheries in the Columbia River Basin, a shift that resulted in part from a 1999 review of artificial production in the Columbia River Basin. Congress directed the Council to conduct the review with the assistance of the Independent Scientific Advisory Board. As part of the effort to rethink hatchery management and develop new and specific goals and priorities for hatcheries, the Council is leading an evaluation of all artificial production programs in the Columbia River Basin. This is another outcome of the 1999 Artificial Production Review. The purpose of the current evaluation process is to identify the goals and objectives for each hatchery program and integrate artificial production with fish recovery and habitat restoration plans developed for each of the 62 tributary subbasins of the Columbia River where artificial production occurs.

PROBLEMS

In the mid-1990s, three independent scientific panels reviewed the use of hatcheries in Pacific salmon management. These included the Council's Independent Scientific Group in 1996, the National Research Council, also in 1996, and the National Fish Hatchery Review Panel in 1994. The panels generally agreed on these important points:

- In spite of some success, hatcheries generally failed to meet their objectives

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- Hatcheries have contributed to the decline of wild salmon
- The region's salmon managers have failed to conduct adequate monitoring and evaluation to determine if hatchery objectives have been achieved
- Supplementation, which is the technique of incubating fish in hatcheries and then releasing them into streams and rivers for the purpose of rebuilding naturally spawning populations, should be linked with spawning habitat improvements
- Genetic considerations needed more emphasis in hatchery programs
- Stock transfers and introductions of non-native species should be eliminated
- A new role for artificial production needed to be developed, using more experimental approaches, and using hatcheries as temporary refuges, rather than in long-term production management

With the three reviews as guidance, in 1999 a panel of fish production experts assembled by the Council, called the Scientific Review Team, reviewed artificial production programs in the Columbia River Basin. In its report, entitled Artificial Production Review (available as Council Document 99-15), the Scientific Review Team concluded that there never has been a clear, basinwide scientific foundation for hatchery management decisions in the basin. A scientific foundation is a set of scientific assumptions, theories and principles that describe how the salmon ecosystem functions. The foundation is useful to interpret information, identify problems, and select restoration strategies.

When the first hatcheries were built in the basin, science taught that fish production could be simplified, controlled, and made more productive. Hatchery technology not only simplified and controlled production, it circumvented natural ecological processes, and the need for adequate freshwater habitat. It was based on principles of animal husbandry. Unfortunately, optimistic predictions of adult returns based on numbers of juveniles released, while logical in terms of farm animal production, proved less reliable with fish because their survival depends on so many factors outside the hatchery environment.

> "As a society, we should be able to create hatchery fish that are healthy and that, genetically, mirror the wild stock of a tributary so that they can regenerate naturally at levels equal to wild fish."
>
> *Larry Cassidy*
> *NWPPC Chair*

Regardless, many hatchery programs were expanded in expectation that producing more juvenile fish would yield more adult fish. Experience demonstrated, however, that successful production of juvenile fish in hatcheries by itself cannot guarantee a sustained increase in fish harvest.

In short, there are probably natural limits on fish production that hatchery programs must recognize.

Today, fish managers know that naturally spawning fish populations are genetically programmed to survive and behave in their spawning and rearing environment in ways that maximize long-term fitness. So hatchery management must address the biological needs of the fish being propagated. Scientific understanding of nutrition, disease, stress and water quality is improving, but only recently have genetic concerns been raised; artificial production may lead to unwanted or unanticipated genetic changes in wild and hatchery populations. These changes are a concern because the productivity and resiliency of populations to environmental change depend on the genetic diversity they contain. Unlike disease or nutritional problems, which can be controlled nearly immediately, the impacts of unwanted genetic changes affect productivity for many years. Hatchery managers are responding to this concern by developing genetic management plans to ensure that the fish raised in a particular facility are developed from locally adapted stocks.

HARVEST

The ecosystem approach to fish management fundamentally conflicts with hatchery management that historically focused on maximum fish production for harvest. Most of the hatcheries in the Columbia River Basin were built to augment harvest. Over time it became clear that the traditional hatchery focus on producing pounds of fish or numbers of fish adversely affected the less numerous wild runs. In particular, large hatchery returns can encourage the overharvest of weaker wild runs in mixed stock fisheries. As a result, hatchery managers are rethinking the relationship between hatcheries and harvest.

For some hatcheries, particularly those in lower Columbia tributaries, harvest augmentation remains the preferred objective. But for others, particularly in tributaries farther upriver where wild runs have declined, the goal of augmenting harvest is being reconsidered in light of issues such as genetic impacts on wild stocks and the capacity of the aquatic environment to support fish when they are released from the hatchery.

The key question is whether hatchery management can be integrated into management of the ecosystem. But that's not

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the only question. Some artificial production programs are tied to harvest opportunities established in law, such as the Columbia River Fish Management Plan (currently, the plan is in the form of an interim management agreement for 2001-2003) that results from the ongoing salmon harvest litigation known as U.S. v. Oregon. Changes in hatchery management that lead to producing fewer fish may conflict with harvest regimes that have been negotiated in court.

IT'S TIME FOR A NEW APPROACH TO MANAGEMENT

In its 1999 review of Columbia River Basin hatchery programs, which resulted from direction to the Council by Congress two years earlier, the Scientific Review Team concluded that, based on our region's experiences to date with artificial production, it would not be wise to proceed into the future with business as usual. The team recommended old assumptions need to be modified in light of what is known about specific life history requirements of the different fish species.

Hatchery management must address changing philosophies of resource management, the team advised, because human impacts on the environment are pervasive and destructive; fish populations are less resilient than in the past to these impacts. Managing the ecosystem where hatchery-bred fish will spawn, as opposed to managing fish in a hatchery, requires addressing all impacts on fish in their environment. The team called ecosystem management "the exercise of common sense to curb the loss of natural productivity and to maintain the health of fisheries resources for public use."

The 1999 Artificial Production Review and the Artificial Production Review and Evaluation (APRE) now under way are pushing hatchery programs in the right direction, Council Chairman Larry Cassidy said.

"As a society, we should be able to create hatchery fish that are healthy and that, genetically, mirror the wild stock of a tributary so that they can regenerate naturally at levels equal to wild fish," Cassidy said. "Hatchery practices need immediate review and improvement toward this goal."

THE CHANGING SALMON ECONOMY

Commercial salmon fishing has been a long and cherished tradition in the Northwest, both as an important part of the economy and as part of our cultural identity. Since the late 1800s, conventional wisdom held that hatcheries would solve the problem of dwindling fish runs. Most of the salmon now caught by commercial fishermen, tribes and recreational fishers in the Northwest are hatchery fish.

But globally, the Northwest produces less than one percent of the total world production of fish, and increasingly, salmon are being bred on "farms" in many parts of the world.

Fish farmers breed and raise fish in fresh water facilities and rear fish to adults in net pens sited in bays or the ocean until they are ready to be harvested and processed. It is an incredibly efficient and cost-effective method of production compared to some fisheries as they are conducted today, and the trend is growing.

In countries like Chile and Norway, salmon farmers continue to improve the breeding of fish, as well as the efficiency in the processing and distribution of their product. It costs far less for fish to be farmed than to be produced through a hatchery and then caught. Although the farmed salmon industry is relatively young — only about two decades old — it produces 60 percent of the salmon sold worldwide.

For our fishing industry to be viable, economists believe we must address the changes that have come with a global economy: low cost competitors and a dramatically changed marketplace with new products and industry standards for quality, availability, predictability and freshness.

Along with the challenges of competing globally, fundamental questions about the management of hatcheries are also at issue. For example, do the production plans of some hatcheries really make sense from a harvest standpoint? Looking at the rates of return for multiple years shows that the large number of fall Chinook programs currently operating has resulted in massive returns of fish within a one-to-two month period — many more fish than can be reasonably harvested within such a short timeframe. From a marketing perspective, it would be better to cultivate a more consistent rate of return throughout the year, and to include other species of fish to accomplish this.

Some analysts have suggested the need for our salmon industry to develop specialty markets for the kinds of fish we harvest, possibly using the example of the much advertised and highly desired Copper River, Alaska, salmon as a model. But that would require strict quality control, as well as research to identify niche markets like upscale restaurants, fresh markets, and smoked, canned and pouch markets. Again, a new way of doing things.

Ultimately, say economists, the disconnect between the production of salmon in the Northwest — which has primarily been through hatcheries — and how these fish are used, needs to be addressed. Hans Radtke, a resource economist and member of the Council's Independent Economic Analysis Board and the Pacific Fishery Management Council suggests that one important improvement would be to establish better communication between each aspect of the fishing industry: between the management of hatcheries and the marketing of those fish. "We need to know why a hatchery is producing fish and what the fish will be used for," he says. "That is the first step."

1999 Review Resulted in Policy Recommendations for Future Hatchery Operations

Contemporary thinking about hatchery management centers on integrating hatchery fish as a component of the ecosystem. Standard hatchery procedures no longer are accepted as a means of addressing augmentation or mitigation, and much greater emphasis is placed on developing a new scientific foundation for artificial production.

Artificial production programs will work at cross purposes unless better regionwide policies are developed and adopted. To that end, in the 1999 Artificial Production Review, the Council and the Scientific Review Team made six recommendations for implementing new artificial production policies in the Columbia River Basin:

1. Tribal, state and federal agencies should evaluate the purposes for each artificial production facility and program in the basin within three years.
2. Program managers should evaluate and improve the operation of artificial production programs that have agreed-upon purposes, consistent with the proposed policies in this report.
3. Program managers should use existing processes to implement artificial production reforms. Examples of existing processes include the annual federal agency and Northwest Power Planning Council funding processes, Endangered Species Act implementation and the Council's periodic revisions of its Columbia River Basin Fish and Wildlife Program.
4. Congress and the Bonneville Power Administration need to ensure that money to implement the reforms is available.
5. The Council should assist in the formation of an interagency team to oversee and evaluate the reforms.
6. The Council, other regional decision-makers and Congress should assess the success of the recommended reforms after five years.

Based on the review, the Council believes that artificial production must be used in a manner consistent with an ecologically based scientific foundation for fish recovery so that fish can be raised for harvest while minimizing the impact on, or benefiting, fish that spawn naturally. Accordingly, the Council recommended 10 policies to guide the future use of artificial production:

1. The purpose and use of artificial production must be considered in the context of the environment in which it is used.
2. Artificial production remains experimental. Adaptive management practices that evaluate benefits and address scientific uncertainties are critical.

> Artificial production programs will work at cross purposes unless better regionwide policies are developed and adopted.

3. Artificial production programs must recognize the regional and global environmental factors that constrain fish survival.
4. Species diversity must be maintained to sustain populations in the face of environmental variation.
5. Naturally spawning populations should be the model for artificially reared populations.
6. Fish managers must specify the purpose of each artificial production program in the basin.
7. Decisions about artificial production must be based on fish and wildlife goals, objectives and strategies at the subbasin and basin levels.
8. Because artificial production poses risks, risk management strategies must be implemented.
9. Production for harvest is a legitimate management objective of artificial production. But to minimize adverse impacts on naturally spawning populations, harvest rates and practices must be dictated by the need to sustain naturally spawning populations.
10. Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.

As the next step in redesigning hatcheries, the Council, working in cooperation with the National Marine Fisheries Service, is conducting a review of all production facilities and programs in the Columbia River Basin. The review constitutes part of the implementation stage of the Artificial Production Review to determine how well a program conforms to the policies described in the APR.

The objectives of the review are to:

- Determine whether or not a program meets its stated purpose
- Evaluate whether a program is consistent with legal, policy and scientific criteria
- Examine the operational costs
- Outline the benefits and risks
- Recommend changes

The collected information and data also will be used by the NMFS to aid in the completion of its draft Hatchery and Genetic Management Plans. These plans will be used by the fisheries service and the U.S. Fish and Wildlife Service to assess the affects of artificial production programs on listed species.

A final set of documents with the conclusions and recommendations for all hatchery programs will incorporate comments from regional managers and hatchery operators for each province. The goal of the final report is to provide accurate and complete information on artificial programs by province and subbasin. With this information, subbasin planners will then be able to identify and prioritize needed changes in artificial production programs and include them in their subbasin plans.

Raising Expectations - Hatchery Management is Changing to Make Fish That Fit the Local Environment

A paradigm shift is underway in fish hatchery management.

It is a shift from a historic and primary focus on producing fish for harvest to a new focus that includes harvest but also utilizes the hatchery environment to raise fish that will spawn in the wild.

It is a difficult, but necessary transition, and one recommended in the Northwest Power Planning Council's 1999 Artificial Production Review, a review of all federally funded artificial production facilities in the Columbia River Basin. The review was conducted by the Council and the Scientific Review Team, a subcommittee of the Council's 11-member Independent Scientific Review Panel, at the request of Congress.

"Changing the manner in which hatcheries address their role is the hope that hatcheries can succeed," according to the Review. "The hope is that with care given to appropriate changes in the hatchery environment, the response of hatchery fish can be compatible and complementary to the natural population structure of the native species."

To that end, a group of fish production experts empaneled by the Council as the Artificial Production Advisory Committee is evaluating the purposes of Columbia Basin hatcheries and will advise the Council on how to implement the polices and recommendations of the Artificial Production Review. Meanwhile, fish and wildlife agencies and tribes that manage hatcheries are developing genetic management plans for hatcheries — biologically based strategies designed to ensure the conservation and recovery of threatened and endangered populations of salmon and steelhead while providing for other needs such as harvest. The plans will be used by the National Marine Fisheries Service and U.S. Fish and Wildlife Service to evaluate potential hatchery impacts on Endangered Species Act-listed species. The plans also will be useful in deciding whether to allow capture — or "takings" — of listed fish and also for regional fish production and management planning. The current schedule calls for the plans to be developed by the end of 2003.

Changes already were underway at some hatcheries in the basin when the 1999 Artificial Production Review was completed, and the review informed the Power Planning Council's policy position on artificial production in the 2000 Columbia River Basin Fish and Wildlife Program. In the program, the Council's strategy for artificial production reads:

> "Changing the manner in which hatcheries address their role is the hope that hatcheries can succeed. The hope is that with care given to appropriate changes in the hatchery environment, the response of hatchery fish can be compatible and complementary to the natural population structure of the native species."
>
> *Scientific Review Team*

"Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas."

Two salmon hatcheries some four hundred miles apart typify the changes that are underway in the Columbia River Basin, changes that are consistent with the strategy adopted by the Council. One is the Cowlitz hatchery complex, located on the Cowlitz River, a lower Columbia River tributary in Washington. The other is the Lookingglass Hatchery, located on a tributary of the Grand Ronde River in northeastern Oregon.

The Cowlitz hatchery complex includes separate trout and salmon hatcheries. The trout hatchery is at river mile 41, and the salmon hatchery is at river mile 50, as measured from the confluence of the Cowlitz and Columbia rivers. The hatcheries are located a short distance downstream from Mayfield Dam, which is owned and operated by Tacoma Power, the municipal utility in Tacoma, Washington. Tacoma Power built the hatcheries and funds them to mitigate the impact of its Mayfield and Mossyrock hydroelectric dams. Both hatcheries are operated by the Washington Department of Fish and Wildlife.

Mayfield Dam, at river mile 52, and Mossyrock Dam, at river mile 65.5, contributed to the decline of anadromous and resident fish in the Cowlitz basin. Mayfield Dam was completed in 1961 and Mossyrock in 1968. In a 1994 report on reintroducing anadromous fish above the two dams, GAIA Northwest, a consulting firm, estimated that all of the spring chinook, 46 percent of the fall chinook, 77 percent of the coho and 80 percent of the steelhead that existed in the Cowlitz Basin before the dams were constructed spawned in the area now blocked by the two dams. The salmon hatchery produces spring and fall chinook salmon, and coho salmon, and the trout hatchery produces steelhead and sea-run cutthroat trout. Today, Cowlitz River steelhead and chinook salmon are included in the Lower Columbia River populations that were listed as threatened

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species in March 1999. Cowlitz River coho were recognized as candidate species for listing in July 1995.

The Cowlitz hatchery complex was built in conjunction with the dams to raise and release fish to mitigate the impact of the dams by providing fish for commercial and sport fisheries. Tacoma Power's 2000 annual report on the hatchery complex lists its production as 912,000 spring chinook, 4 million yearling coho, 6.5 million fall chinook, 30,000 summer steelhead and 120,000 winter steelhead.

Despite this high production, however, the salmon hatchery, where the bulk of the stocks are raised, has a troubled past, primarily with disease. According to a 2000 report by the Washington Department of Fish and Wildlife, Cowlitz Hatchery salmon stocks have had serious disease problems that have not been adequately controlled. Changes in the fish production program, fish culture practices and chemical treatments have improved the situation, but fish deaths remain unacceptably high. The main problem is the design of the fish rearing ponds and raceways, which share a common, circulating water supply, according to the report.

The completion of Cowlitz Falls Dam in 1994 helped to focus attention on rebuilding naturally spawning stocks of salmon and steelhead in the basin. Cowlitz Falls Dam is situated at the upper end of Riffe Lake upriver from Mayfield and Mossyrock dams. The Bonneville Power Administration buys all of the power generated at the Cowlitz Falls project.

As a result of an out-of-court settlement with a citizens' group, Friends of the Cowlitz, Bonneville paid for construction of a surface bypass collection system for juvenile salmon and steelhead at Cowlitz Falls Dam in 1996. Bonneville continues to support ongoing efforts at the bypass facility as part of the salmon reintroduction effort. This includes collecting and transporting smolts to a release site at the Cowlitz Salmon Hatchery downstream. The collection system is a key component of the effort to reintroduce salmon and steelhead to the watershed above the dam.

Meanwhile, changes are underway at the Cowlitz Salmon Hatchery, both in mission and design. Tacoma Power's federal license to operate Mayfield and Mossyrock dams requires the utility to develop a wild salmon recovery plan that utilizes a remodeled salmon hatchery. After five years of study and negotiation, an agreement was signed in 2000 between the utility, federal and state agencies, Indian tribes and conservation groups. The central focus of the agreement is the wild salmon recovery plan.

> "Balancing fish production for harvest and fish production to rebuild naturally spawning runs is a real challenge."
>
> *Charles Morrill*
> *Washington Department of Fish and Wildlife*

Mike Kohn, who works for the Bonneville Power Administration as the project biologist for Cowlitz Falls Dam, credits Bonneville for providing important assistance in developing the plan, which balances harvest with rebuilding naturally spawning runs of fish, and calls for acquiring salmon spawning and rearing habitat, as well as extensively remodeling the Cowlitz salmon and trout hatcheries to provide for rearing and release of salmon and steelhead. Transforming the salmon hatchery itself will be a chore.

"It's an antiquated facility with some real problems," said Wolf Dammers, a biologist with the Washington Department of Fish and Wildlife who oversees the natural production project at the hatchery. "It needs to be revamped. It has deep raceways that are difficult to manage and clean. Water supply and water treatment are issues, as there are separate adult and juvenile holding areas with a single water supply. We are working on a design to separate adult and juvenile fish to protect against disease. The adult fish collector and separator facility needs to be rebuilt. The overall concept is to build a hatchery that is more modern and will support natural production of fish."

As part of the agreement, Tacoma Power will construct three acclimation ponds in the watershed above Cowlitz Falls Dam to support natural production. Some of the juvenile fish released into those ponds will be marked to provide a fishery above the dam; others will be collected at the dam, trucked downriver and released to go to the ocean, and then trucked back when they return as adults and are collected at the hatchery. All of the fish will be raised from indigenous stocks.

It is too soon to say whether the experiment will be successful.

"Balancing fish production for harvest and fish production to rebuild naturally spawning runs is a real challenge," said Charles Morrill, a Washington Department of Fish and Wildlife biologist who is working on the reintroduction effort with Dammers and others. But the Cowlitz effort has a good head start, in that there are more than 240 miles of good habitat above the dam for the fish to utilize, Morrill said.

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RAISING EXPECTATIONS

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Meanwhile, some 230 miles southeast, in the eastern foothills of Oregon's Blue Mountains, the Lookingglass Hatchery is undergoing a similar mission change. Originally constructed in 1982 by the U.S. Army Corps of Engineers, Lookingglass is one of 10 hatcheries and 16 other facilities in the Lower Snake River Compensation Program, which mitigates the impact on salmon and steelhead by the four federal hydropower dams on the lower Snake River. The Fish and Wildlife Service administers the Lower Snake program and funds the operations and evaluations at Lookingglass.

The hatchery was intended to produce spring chinook salmon for sport and tribal fisheries upstream from Bonneville Dam and specifically to compensate for adult returns to the Snake River Basin. Originally, the hatchery raised two stocks of fish for release into local streams. But over time, it acquired two additional missions — rebuilding three local, endemic stocks of spring chinook and raising some of those fish to adults as part of a captive brood program to preserve the locally adapted wild populations. Today, managing the complementary functions of the Lookingglass Hatchery is a little like playing three-dimensional checkers, said hatchery manager Bob Lund.

"When it opened, the directive was for supplementation," Lund said. "We were geared for fish production. Then, in 1992, the Imnaha spring chinook were listed as a threatened species, and that caused us a great deal of concern because of the dwindling stock. At that point, we went from a supplementation hatchery to what is called a mitigation hatchery with a recovery goal and limited production. Finally, because other salmon and steelhead stocks in the Grande Ronde Basin were listed, we went into a conservation mode."

> "We're trying to come up with a stock that we could rear in this basin that could be a donor stock if the others crash. By spawning them here, we are keeping a foothold in the river system for those fish."
>
> *Bob Lund*
> *Manager*
> *Lookingglass Hatchery*

Today, a portion of the hatchery production is funded under the umbrella of the Northeast Oregon Hatchery (NEOH) project, a multi-agency and tribal effort to rescue dwindling salmon and steelhead populations in Northeast Oregon rivers. As a result, funding for the hatchery comes from two sources — the U.S. Fish and Wildlife Service through the Lower Snake River Compensation Program and the Bonneville Power Administration for the NEOH component, which includes the captive brood program and the effort to resuscitate endemic Grande Ronde spring chinook stocks. If approved by the Council and funded by Bonneville, additional facilities will be built under the NEOH project to relieve some of the production pressure at Lookingglass.

Thus, the history of Lookingglass Hatchery boils down to two words: compensation and conservation. The facility has progressed from providing fish to compensate for dam-caused losses to a combination of compensation and conservation of weak runs. "We went from the macro approach to a microscopic approach, from a General Motors approach to something like the Saturn car approach; some people call it performing triage on the streams," Lund said. "We are racing to preserve the integrity of the stocks that remain in these streams because they hold the genetic keys to future survival of those populations."

In the late 1980s, before Endangered Species Act petitions were filed to list spring chinook in the Snake River Basin, Lookingglass was releasing as many as 1.4 million smolts per year. In 2001, about 450,000 smolts were released. From an administrative perspective, the listings have meant greater scrutiny of hatchery management and the scientific techniques involved in raising fish.

"There is an increased intensity in the technical work," Lund said. "You examine every step or practice that you ever did in fish culture. You are rewriting the book."

Lund, his fish culturists, Oregon Department of Fish and Wildlife fish managers and researchers, and the Nez Perce and Umatilla tribes are working cooperatively to develop an endemic Grande Ronde River stock of spring chinook using wild fish that return to the river and its tributaries. This effort differs from past fish culture practices at the

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hatchery, where two non-local stocks were used, one from Washington and another from Idaho. Fish culturists and tribal fish biologists have been trying new techniques at Lookingglass, like freezing the fish sperm for later use, checking salmon eggs for fertility with ultrasound, and improving sterilization processes. It's been the fish production equivalent of a moon shot, Lund said, in that new techniques have been developed to address a unique set of challenges.

"We brought in Imnaha River stocks, and also stocks from Catherine Creek and the upper Grande Ronde River, to raise in captivity. We treat the fish like fine china. When you are down to between 10 and 30 returning adults, you can't afford to have any losses," he said. "We're trying to come up with a stock that we could rear in this basin that could be a donor stock if the others crash. By spawning them here, we are keeping a foothold in the river system for those fish."

To evaluate and assist the technical work, Lookingglass has a panel of expert advisors from state and federal fish and wildlife agencies and the Nez Perce and Umatilla tribes to oversee the work, particularly that related to raising and spawning the captive spring chinook broodstock. Their help has been timely and valuable, Lund said.

The bottom line for any hatchery is whether all of the effort is paying off in numbers of returning fish. And as with any other hatchery program, success at Lookingglass will take time to judge. The salmon life cycle is four years, and multiple generations will be necessary to determine whether the sought-after foothold is there or not.

"Last year, we had a big return of Lostine River jacks, but not many adults," Lund said. "The adult numbers were not a surprise because we are not releasing large numbers of smolts — maybe one-tenth as many smolts as a production facility of this size could put out. But one of the downsides of this work is waiting the long time you have to wait to see if you are successful. It takes a hearty capital investment and a hearty soul to make this work."

COLUMBIA RIVER BASIN HATCHERIES FOCUS ON PROVIDING FISH FOR HARVEST AND MITIGATING HUMAN-CAUSED IMPACTS

There are two primary types of fish hatcheries in the Columbia River Basin: augmentation and mitigation. Augmentation hatcheries are intended to increase fish harvest by contributing adult fish to the fishery. Mitigation hatcheries are intended to maintain, recover, preserve or restore fish populations.

Like augmentation hatcheries, mitigation hatcheries produce fish for harvest. But unlike augmentation hatcheries, mitigation hatcheries produce fish to replace harvest opportunities lost as the result of impacts such as dams, water diversions and habitat degradation. Most of the hatcheries in the Columbia River Basin are operated for mitigation purposes.

There are four types of mitigation hatcheries, based on the seriousness of the impacts on local fish populations: maintenance (maintaining fish runs affected by dams); recovery (rebuilding a depleted run to sustainable levels), preservation (preserving a severely depleted run from extinction); and restoration (re-establishing an extinct run). An additional category of hatcheries for resident fish — those that don't go to the ocean — involves substitution programs. These produce resident fish such as trout and kokanee to replace fish, including extinct salmon and steelhead populations, lost as the result of dams.

As a tool for managing fish within the local ecosystem, mitigation can involve the technique of supplementation. Supplementation involves incubating fish at a hatchery and then releasing them into local streams or rivers, where they will return as adults to spawn and, it is hoped, rebuild or increase naturally spawning populations. At some supplementation facilities, juvenile fish are reared in partially covered raceways or raceways with woody debris and rocks on the bottom to mimic natural stream conditions. It is believed this helps the fish acclimate to conditions in the wild before actually experiencing them.

As fish managers place greater emphasis on sustaining naturally spawning runs of fish, particularly salmon and steelhead runs, supplementation has been given a much greater role in maintenance conservation. Conceptually, supplementation is meant to reinforce populations without loss of the genetic structure. Supplementation, therefore, is employed to enhance native stocks of salmon and steelhead by increasing their reproductive base through artificial production, using only the locally adapted gene pool in the process.

Supplementation is at the heart of several key artificial production programs funded by the Bonneville Power Administration through the Council's Columbia River Basin Fish and Wildlife Program. These include production programs managed by Indian tribes in Idaho, Oregon and Washington.

STATE POLICIES REGARDING SPECIES AND HARVEST COMPLICATE RESIDENT FISH HATCHERY REFORMS

What's good for salmon and steelhead is good for resident fish, as well. At the same time that salmon and steelhead hatcheries are being revamped to make their production more compatible with local ecosystems, resident fish hatcheries are being revamped in the same way. But because resident fish production and harvest policies are set by individual states and tribes, and because resident fish don't migrate the distances that salmon and steelhead do, coordinated policies for production and harvest will be more difficult to achieve.

Resident fish spend their entire lives in freshwater, unlike salmon and steelhead. Like salmon and steelhead, however, resident fish were affected by the construction and operation of hydropower dams in the Columbia River Basin, and like salmon and steelhead they are raised in hatcheries to produce fish for harvest and also to mitigate for losses caused by hydropower. A component of this production compensates for the losses of salmon in areas permanently blocked to anadromous fish passage, such as upstream from Chief Joseph Dam on the Columbia and the Hells Canyon complex of dams on the Snake River.

Many of the federal mitigation hatchery programs for salmon and steelhead also produce resident fish. These include the Lower Snake River Compensation Program, the Dworshak Dam mitigation program for the North Fork Clearwater River in Idaho, Willamette River Basin dam mitigation programs in Oregon and the Power Planning Council's Columbia River Basin Fish and Wildlife Program.

These programs focus fish production both on rivers affected by hydropower dams and also on the reservoirs behind the dams. In some areas, dams blocked the natural migration corridors for resident fish that spawned in one area and spent their adult lives in other areas.

Some of the key resident fish hatcheries funded through the Council's program include:

- The Colville Tribal Fish Hatchery, which produces brook trout, rainbow trout and Iahontan cutthroat trout for release into waters on the Colville Reservation in northeastern Washington to provide a subsistence and recreational fishery for members of the Colville Confederated Tribes. The hatchery production is considered partial mitigation for the loss of salmon and steelhead above Grand Coulee and Chief Joseph dams.

> Like salmon and steelhead, resident fish were affected by the construction and operation of hydropower dams in the Columbia River Basin, and like salmon and steelhead they are raised in hatcheries to produce fish for harvest and also to mitigate for losses caused by hydropower.

- The Lake Roosevelt Rainbow Net Pens. Rainbow trout are raised in net pens and released into Lake Roosevelt, the reservoir behind Grand Coulee Dam. The production is part of the Spokane Tribal Hatchery and is operated in conjunction with the Washington Department of Fish and Wildlife's Sherman Creek Hatchery. The Lake Roosevelt Monitoring/Data Collection Program provides management recommendations.
- The Kootenai River White Sturgeon and Conservation Aquaculture Study. An international effort involving fish and wildlife agencies in British Columbia and Idaho, and the Kootenai Tribe, this program is working to restore the sturgeon population in the river and in Kootenay Lake, British Columbia.

In some areas, resident fish hatcheries are intended to support fisheries; in other areas, resident fish hatcheries are used to supplement naturally spawning populations.

Resident fish include trout, bull trout, kokanee and sturgeon; in some areas warm-water fishes such as bass are raised in hatcheries as compensation for lost trout and salmon. And for some resident species, such as the Kootenai River white sturgeon, an endangered species, the rescue work that is being performed at a hatchery in Bonners Ferry, Idaho, and another near Cranbrook, British Columbia, is critical to the survival of the species.

In the 1999 Artificial Production Review, the Scientific Review Team of the Independent Scientific Advisory Board, which advises both the Power Planning Council and the National Marine Fisheries Service, noted that some of the same problems that cause concern at anadromous fish hatcheries also cause concern at resident fish hatcheries.

"Here too, we find questions about the efficacy of this [fish] production, such as concerns about impacts of artificial production and the introduction of non-native species on native stocks, including listed species such as bull trout," the Scientific Review Team wrote.

The problem of stock transfers — raising non-native fishes in hatcheries — is a prob-

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HATCHERY REFORMS

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lem with resident fish hatcheries as well as with anadromous fish hatcheries, said Ernie Brannon, a fisheries professor at the University of Idaho and a member of the team that conducted the Artificial Production Review for the Council. Cutthroat trout, redband trout and bull trout are key native resident species, but only bull trout have not been the subject of stock transfers and transplants. As with anadromous stock transfers, introducing fish from another part of the Columbia River Basin can alter the genetic structure of the local stocks and the resulting species may not adapt as well to local conditions.

"It leads to a changed genetic structure," Brannon said. "It means you lose fitness in the native population. It continually erodes the genetic structure."

Therein lies a debate that is at the core of artificial production, for both anadromous and resident fish: should hatcheries only raise fish from local stocks? If local stocks are extinct or otherwise unavailable, should artificial production proceed with stocks that are as similar as possible to local stocks, or not proceed at all?

The Scientific Review Team addressed the issue in its recommended policies to guide artificial production, which provide guidance for reviewing the purpose of each artificial production facility in the basin — an effort now underway by a committee appointed by the Council. The recommended policy for all hatcheries — anadromous and resident — is:

"Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling and other biological characteristics."

The team commented that "… naturally selected populations … provide a model that should at least guide the efforts to sustain successful artificially reared populations, even if replicating all natural conditions is not feasible. The use of locally adapted or compatible broodstocks, and a corresponding reduction in the use of population transfers and non-endemic populations, is a significant part of this policy."

Brannon said he believes it would be possible to develop a basinwide, coordinated policy and good management practices for resident fish hatcheries, but that it will be difficult or impossible to develop a coordinated, regionwide policy on harvest regulations because that would impose on state authority, and state policies are geared to producing fish for harvest — often nonnative species like perch that are predators of juvenile salmon where they occur in the same waters.

"I suspect the states will continue to follow their pattern of the last 30 to 40 years — to try to address the needs of local fishermen," Brannon said. "Idaho, for example, has a program of spiny ray enhancement for the fishery, but those species didn't exist historically in the waters where they are planted today. The issue is more complicated than for anadromous species because if fishermen want to have perch in a lake that historically is rainbow habitat, the state puts them in there."

HOW A SALMON HATCHERY WORKS

Hatcheries are facilities that breed and raise fish for part of their life. Although the techniques used to artificially produce salmon vary, depending on the goals of a particular program, their operations generally include the following steps.

COLLECTING BROODSTOCK

Adult salmon either return on their own or are captured live and brought to the hatchery. Once in the hatchery, the adults are kept in holding ponds until they are ready to spawn. The fish are examined every few days to check if they are "ripe." For females, this is when their eggs have reached maturity and are loose in the body cavity; for males, it is when they have developed their sperm, called milt.

FERTILIZING THE EGGS

When the fish are ready to spawn, the adults are killed — usually by a blow to the head — and their eggs and milt are mixed. Water is added to activate the sperm and complete the fertilization process.

INCUBATION

The fertilized eggs are poured into screened trays that are stacked in rows of incubators. Water flows over the trays until the fish hatch, which usually takes about 50 days, depending on the temperature of the water.

DEVELOPING FISH ARE PLACED IN HOLDING PONDS

The newly hatched fish, called alevins, continue to develop in the incubators for five or six weeks, living off the nourishment from their yolk sacs. Once they have absorbed their yolk sac, they are transferred to rearing ponds and fed a diet of artificially produced fish food. At this stage they are called fry and will be fed and grown until they can be distributed to larger ponds and raceways. A raceway can be as large as 75 feet long by 16 feet wide and 3 feet deep and can hold as many as 300,000 juveniles.

RELEASING THE FISH FOR OCEAN MIGRATION

The juveniles will generally be reared in the hatchery for a period of 11 to 15 months. When they are large enough and physiologically ready, the smolts — or young salmon — are released to migrate downstream to the ocean. There, they will live out their adult life for one to three years, and the fish that are not harvested or preyed upon will return to the hatchery or spawning ground to complete their lifecycle and spawn the next generation of salmon.

Success Stories — Upper Salmon River

Habitat Improvements are Helping Fish in the Mountains of Central Idaho

In the upper Salmon River Basin of Idaho, the Idaho Soil Conservation Commission and the Custer and Lemhi county soil and water conservation districts are working to improve fish habitat and fish survival.

A group of related projects is financed by the Bonneville Power Administration through the Power Planning Council's Columbia River Basin Fish and Wildlife Program. The effort is coordinated by a local advisory committee representing private, state, federal, tribal and local land managers and other interests, with a technical scientific team assisting in the prioritization of on-the-ground projects.

The Upper Salmon Basin Watershed Project is the largest collaborative effort to restore salmon habitat on non-federal lands in Idaho. The project covers four hydrologic units that include the Lemhi, Upper Salmon, Pahsimeroi and Middle-Salmon Panther Creek watersheds. The project is coordinated through the Idaho Soil Conservation Commission, with the Lemhi and Custer Soil and Water Conservation Districts doing most of the direct work with private landowners. The program has resulted in habitat restoration projects in areas where such activities previously had been quite limited.

The work began in 1993. Since then, a number of projects have been completed. Two primary types of projects are illustrated in the photos above. Fences have been built along riparian areas of fish-bearing streams. These encourage vegetation growth, which in turn stabilizes the streambanks and reduces erosion. Riparian vegetation attracts insects that fish eat, and also helps shade and cool the water. Reduced erosion helps keep the gravel clean in areas where fish spawn. Another primary type of project involves rebuilding and repairing irrigation intakes, where rotating screens keep juvenile fish from being swept into irrigation canals. The screens divert fish back into the main stream.

These projects, and others like them, have been completed under the auspices of the Model Watershed Project, which was established in 1992. The Model Watershed Project covers 2,640 square miles of the Lemhi River, Pahsimeroi River and East Fork tributaries of the upper Salmon River. The goal of the project is to improve anadromous fish habitat in specific local river reaches and also to improve overall aquatic health by 1) improving scientific methodology to identify problems and solutions, 2) reducing the amount of fine sediments in the spawning gravel, 3) reducing the number of physical barriers to fish migration, 4) restoring natural ecological functions to enhance river channels, 5) increasing riparian vegetation adjacent to channels, and 6) providing adequate water flows for migration, spawning and rearing of fish. The project also seeks to increase the number, density and composition of fish species in the rivers and increase the use of habitat by multiple fish species.

Subbasin Planning Update: Summer 2002

Two important steps in the subbasin planning effort were made recently with the approval of a master contract, and clarification from the National Marine Fisheries Service on how subbasin plans will be used by it to fulfill Endangered Species Act requirements.

The Council's review and selection process for fish and wildlife projects in the Columbia River Basin calls for the development of local plans to identify and prioritize the most critical problems that need attention to help fish and wildlife within a particular geographic area.

The approval of the master contract by the Council and the Bonneville Power Administration establishes the administrative structure and contract process for subbasin planning. Management is organized into three levels: 1) A subbasin level, made up of representatives from tribes, the state, local government, the federal government, and other stakeholders who will be responsible for developing the subbasin plan; 2) A statewide/provincial/tribal level with representatives from tribes and states to provide policy guidance and organizational assistance; and 3) A regional level with representatives from the Council, tribes, Bonneville and NMFS to advise the Council on basinwide policy and coordination issues.

In May, NMFS responded to the Council's question on whether its guidance for subbasin planning is adequate for ESA purposes. In his letter to Council Chair Larry Cassidy, NMFS Regional Administrator Robert Lohn states, "In the Columbia Basin, the Council's subbasin planning program engages communities and interests at the local level in salmon recovery and, by providing resources to help complete the plans, creates an excellent opportunity to join ESA obligations with those of the Council's Fish and Wildlife Program." Included with his letter was a guideline on NMFS's recovery plan that is organized according to the outline of the Council's Technical Guide for Subbasin Planners. The guideline details the relationship between subbasin planning and the Endangered Species Act. The letter and guideline are available on the Council's website, www.nwcouncil.org.

With progress on these issues, the Council anticipates announcing the request for recommendations for subbasin plans by the end of summer. Key information in the request for recommendations will include the schedule for submitting subbasin plan recommendations; the criteria to be met in order to receive funding for plan development; and the review and adoption process, including the elements in the scientific review.

And in another development, the Flathead subbasin workplan was approved by the Council in June—the first workplan to be approved—and will serve as a model for future subbasin planning efforts.

Council Recommends Funding for Fish Science Center to be Run by Tribes and the University of Idaho

In May, the Northwest Power Planning Council asked the Bonneville Power Administration to contribute $1.69 million to the cost of a new regional fish science and education center in Idaho, to be known as the Collaborative Center for Applied Fish Science.

The Center, which would be an expansion of the University of Idaho's Hagerman Fish Culture Experimental Station in Hagerman, Idaho, would be operated by the University, the Columbia River Inter-Tribal Fish Commission (CRITFC) and, by separate contract, the Shoshone Bannock and Shoshone Paiute tribes in southern Idaho. Other tribes also are encouraged to participate.

"This will be an important research facility for Columbia River Basin fish, and it will assist the tribes and their collaborators in investigating key factors in the management of fish restoration strategies," Council Chairman Larry Cassidy said. "This research includes key unresolved questions about the management of hatchery-bred fish and reform of the region's fish hatcheries."

The Center will support analytical and monitoring requirements that are conditions of many projects funded through the Council's Columbia River Basin Fish and Wildlife Program. Additionally, the Center will be a place where Columbia River Basin tribal fish managers can receive advanced education in the aquatic sciences.

Working closely with Governor Dirk Kempthorne, Idaho Council members Judi Danielson and Jim Kempton strongly advocated Council support for Bonneville funding of the Hagerman facility as an opportunity to expand the role of research in addressing hatchery supplementation alternatives for salmon recovery in the Northwest.

Research at the Center will support ongoing works such as the development of fish population management plans, hatchery operations, genetic monitoring plans and research, monitoring and evaluation plans. The University and cooperating tribes plan to create an advisory panel with representatives of upper Snake River and upper Columbia River tribes to help shape the research agenda for the Center.

Bonneville's $1,690,425 contribution would pay for tribal participation in the Center. That amount includes $794,575 for construction and $895,850 in equipment costs. The remainder of the $3.3 million expansion project would be paid by the University of Idaho, which owns and operates the existing facility at Hagerman.

Bonneville's Future

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- What's the impact of the proposal on the reliability of the Pacific Northwest electricity grid?
- If Bonneville's power supply role is limited, what should be Bonneville's responsibility for conservation and renewable resources?

The Council and Bonneville also identified the following questions for those who submit proposals:

- Does the proposal provide for the opportunity for the formation of new public utilities?
- How does the proposal affect Bonneville's ability to fulfill its fish and wildlife obligations?
- Will the proposal maintain or enhance the reliability of the Northwest power grid?
- How does the proposal account for factors such as Bonneville's legal responsibilities — its obligation to the U.S. Treasury and its business needs and those of its customers?

Comments and proposals may be addressed to Bonneville at:

Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208-3621
e-mail: comment@bpa.gov

Calendar

Council Meetings & Other Events

August	13-14	Northwest Power Planning Council Meeting in Helena, Montana.
September	10-11	Northwest Power Planning Council Meeting in Spokane, Washington.
September	12-13	The Mighty Columbia - The Organic Machine Seminar, The World Trade Center, Portland, Oregon, (800) 574-4852 or www.theseminargroup.net.
September	12-13	Power Supply in the Pacific Northwest Conference, Seattle, Washington, (800) 854-8009 or www.lawseminars.com.
October	12-13	2002 Oxbow Salmon Festival, Oxbow Regional Park on the Sandy River, Oregon, (503) 222-9091, Bill Smiley with Oregon Trout
October	15-17	Northwest Power Planning Council Meeting in Spokane, Washington.
October	21-23	The Energy Technology Showcase 2002, Double Tree Jantzen Beach, Portland, Oregon, (206) 285-4848 or www.newsdata.com.

Calendar for Public Comment Periods

August		Projected Public Comment Period for Draft Demand Forecast for the Fifth Power Plan
September		Projected Public Comment Period for Generating Resource Characteristics for the Fifth Power Plan
September		Projected Public Comment Period for Draft Electricity Price Forecast for the Fifth Power Plan
September	12	Public Comment Period for Written Comments and Proposals for Discussion in Public Meetings on the Future Role of the Bonneville Power Administration
October	18	Final Comment Period Deadline for Comments on the Future Role of Bonneville Power Administration

Notice of Public Meetings

Bonneville Power Administration's Financial & Program Options www.bpa.gov/power/financialchoices

August	15	Portland	Time: 1:00 - 4:00 PM, Sheraton Hotel - Portland Airport, 8235 NE Airport Way
August	15*	Portland	Time: 6:00 - 9:00 PM, Bonneville Headquarters Bldg./Rm 122, 905 NE 11th Avenue
August	20	Seattle	Time: 1:00 - 4:00 PM, Hilton Hotel - Seattle Airport, 17620 Pacific Hwy. South
August	20	Seattle	Time: 6:00 - 9:00 PM, Mountaineers Headquarters, Pinnacle Room, 300 Third Avenue W.
August	21	Spokane	Time: 1:00 - 4:00 PM, Ramada Inn, Spokane Airport, 8909 Airport Road
August	28	Burley	Time: 1:00 - 4:00 PM, United Electric Co-op, Inc., 330 21st Street, Heyburn, Idaho

*Attendees to the Portland meeting located at Bonneville headquarters should plan on arriving early to pass through security. Valid picture id will be required. Non US citizens must provide a valid passport.

Northwest Power Planning Council

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