BONNEVILLE POWER ADMINISTRATION

backgrounder

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Columbia River hatcheries: an evolving role

Hatcheries are a major element of Columbia Basin salmon management efforts and have been for more than 100 years. In the last three decades, the role of hatcheries has changed and continues to change today.

Part of the Northwest salmon story

The first hatchery in the Northwest was built in 1877 on the Clackamas River south of Portland, Ore. More soon followed to restore salmon populations affected by booming harvests.

Eagle Creek National Fish Hatchery above Bonneville Dam is one of the many operated by the U.S. Fish and Wildlife Service with funding from BPA.

Today, there are about 200 salmon hatchery programs in the Columbia River Basin, and 80 percent of the salmon and steelhead that return as adults were hatched and reared in hatcheries.

The Bonneville Power Administration financially supports about 45 percent of the basin's hatcheries under three different mandates. In all cases, BPA funding fulfills the agency's responsibility to offset damage done by construction and operation of the region's federal dams for hydro power. BPA funds:

1. Hatcheries built and operated at the direction of Congress to offset the impacts of federal hydro power dams.
2. Hatcheries built and operated as part of the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program.
3. Hatchery programs conducted as part of the federal effort to recover salmon, steelhead and other fish listed under the Endangered Species Act.

BPA's annual funding for Columbia Basin hatcheries is about $60 million, nearly half of the agency's annual budget for fish and wildlife projects.

Evolving management techniques

Initially, hatcheries were designed to increase salmon runs for ocean and in-river harvest. They also bolstered numbers reduced by habitat degradation from logging, mining, agriculture and urbanization. Still, in the first half of the 20th century, Columbia River salmon runs

declined significantly, leading government agencies to ban certain fishing techniques, such as horse seins and fish wheels.

Early hatcheries planted salmon fry directly in rivers as soon as they hatched. Over the decades, hatchery managers learned to produce better returns by growing fish until they were ready to migrate to sea. This approach significantly increased salmon returns in the 1960s-70s, and led to a boom in hatchery construction and a dramatic increase in the Oregon commercial fishing fleet from 2,500 in 1960 to 8,500 in 1978.

Rearing salmon to smolt size and then releasing them to migrate downstream is still the dominant hatchery management technique today. Survival from egg to smolt in Northwest hatcheries today runs 60 to 90 percent, compared to 2 to 9 percent for wild fish. In 2005, Northwest hatcheries released 134 million salmon and steelhead in Columbia Basin streams.

In recent years, fish biologists and hatchery managers have launched a new hatchery strategy, "supplementation," in which hatcheries are specifically designed to jump-start the natural restoration of decimated runs. For example, the Yakama Hatchery in Cle Elum, Wash., is the centerpiece of a joint Yakama Nation/Washington Dept. of Fish and Wildlife program to rebuild salmon runs in the Yakima River, which had dropped from historic estimates of 900,000 fish per year to fewer than 5,000 in the early 1980s due to numerous water diversions from the river for irrigation. A number of supplementation hatcheries raise fish under conditions that mimic conditions of natural streams. These fish typically are planted in ponds next to natural streams where they acclimate to the river well before they are ready to migrate downstream. Later, as adults, they return to the stream to spawn naturally.

Shifting priorities and purposes

The Northwest Power Act of 1980 called for a comprehensive Columbia River Basin Fish and Wildlife Program, to be prepared by the interstate Northwest Power and Conservation Council (also created by that act) in consultation with federal, state and tribal fish and wildlife managers.

The Council first set a goal of "doubling the runs" of Columbia River salmon to 5 million returning adults per year. Hatcheries were and are a significant tool in this program. From 1981-1991, hatcheries accounted for 40 percent of the budget for salmon restoration under the Council's program. Most of these hatcheries were designed to restore runs that originate above Bonneville Dam for tribal as well as non-tribal harvest.

In 1991, the first of now 13 Columbia Basin salmon and steelhead runs was listed under the Endangered Species Act. Among other techniques, the federal government uses specific safety-net hatchery programs to prevent extinction of a run where too few wild fish remain to sustain a population. Such programs are now in place for Snake River sockeye, Snake River spring/summer chinook, Columbia River chum, and mid-and lower Columbia steelhead.

Because ESA focuses on the wild runs, it raised questions about the broader role of hatcheries in the Columbia River system. Questions remain today about both the reproductive viability of hatchery fish and their effect on the salmon ecosystem. There are four key issues.

1. Historically, hatchery fish have not reproduced as well as wild fish, raising concerns that interbreeding between hatchery and wild fish could weaken the stocks.
2. Hatchery fish introduced in numbers may compete with wild fish for food and habitat. If there's a big size difference, the larger may out-compete the smaller.
3. Hatchery fish whose ancestors originated in a different stream could overwhelm native runs, reducing the genetic diversity of salmon.
4. Uncertainties remain about supplementation hatcheries' long-term ability to spur naturally sustained salmon production.

Supplementation hatcheries raise fish in a more natural environment.

Defining best management practices

In the last decade, fish scientists and hatchery managers have identified a number of "best management practices" designed to integrate hatchery programs with the natural population, offset supplementation hatcheries' potential negative consequences and enhance their benefits. These include:

1. Use local brood stock in the hatchery program. Don't transfer stock between basins.
2. Use some fish of natural origin as brood stock, not just returning hatchery fish.
3. Control the number of hatchery fish on the spawning grounds. For example, trap returning adult fish at a weir, send the appropriate number of natural-origin and hatchery-origin fish on their way and harvest the surplus hatchery fish.
4. As closely as possible, mimic natural rearing conditions in the hatchery. For example, raise fish at the temperature of the natural stream they'll be released in.
5. BPA also funds research to evaluate the effectiveness of hatchery supplementation. This research will help fish managers understand the effects of hatchery-bred fish on naturally spawning populations.

Fish managers explore their options

Federal, state and tribal fish managers are exploring hatcheries' long-term role in the Columbia River Basin in a congressionally mandated review due to be completed in 2008. BPA has funded development of a Hatchery Genetic Management Plan for each federally funded hatchery program that could be used by NOAA Fisheries to identify and prioritize hatchery facilities and practices for reform. Its goal is to reduce potentially harmful effects of artificial production on wild salmon recovery.

Meanwhile, the Council's most recent 2000 Fish and Wildlife Program calls for "abundant, productive, and diverse community of fish and wildlife" with "abundant opportunities" for tribal and non-tribal harvest and

Outlet channel from acclamation facility to Yakima River.

recovery of runs listed under the Endangered Species Act. Until salmon runs are fully recovered, hatchery production is expected to continue to play a major role in both the recovery and harvest aspects of this effort.

Conclusion

For more than a century, the Northwest has used hatcheries to produce fish. Today, hatcheries are called on to balance a number of objectives — to supplement wild fish populations, to meet Endangered Species Act and other legal requirements and to provide fish for harvest. Hatcheries, along with hydro passage, habitat improvement and harvest management, are a major part of the Northwest's effort to protect and restore its salmon runs. How they can best contribute is the key question for the future of hatcheries in this region.

For more information

To find out more, visit the following Web sites:

- Bonneville Power Administration – *www.bpa.gov*
- "Artificial Production Review," Northwest Power and Conservation Council report to Congress, 1999, "Review of Salmon and Steelhead Supplementation," Independent Scientific Review Board, 2003, Northwest Power and Conservation Council – *www.nwcouncil.org/library/isab/isab*2003-3.*htm*