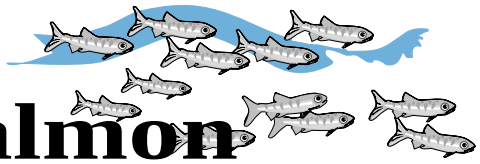
US Army Corps of Engineers
North Pacific Division

Salmon Passage Notes

Snake and Columbia River Fish Programs

August 1996

Water Everywhere
1996 Operations for Salmon



The Technical Management Team began meeting again in late March to manage system operations for salmon. The team meets every Wednesday during the salmon migration season to take a look at river and weather forecasts, hear reports on movement of juvenile and adult fish through the river system, review the previous week's operations, and plan operations for the next week.

This year the states and tribes were invited to join the Technical Management Team, along with participants from the federal agencies—NMFS, Corps, US Fish & Wildlife Service, Bonneville Power Administration, and Bureau of Reclamation.

Is there enough water for fish? Are we doing what we can to control gas supersaturation in the river? Should we go to flow augmentation? The team considers questions such as these and recommends operations at the dams to manage flows and spill for fish for the coming week.

Above-normal flows in the Columbia and Snake Rivers for April brought promise of good conditions for the juvenile spring chinook migration this year. But the high flows may have turned out to be too much of a good thing.

In recent years drought or near-drought conditions made it difficult for river operators to provide adequate water for fish migration. For over a decade, the region has been augmenting flows in the spring months, by calling for water releases from upstream storage dams, to help overcome the drought conditions and provide a "spring freshet" effect for the fish. For subyearlings—juvenile fall chinook that begin their migration at about nine months of age—summer flows were augmented during the past several years.

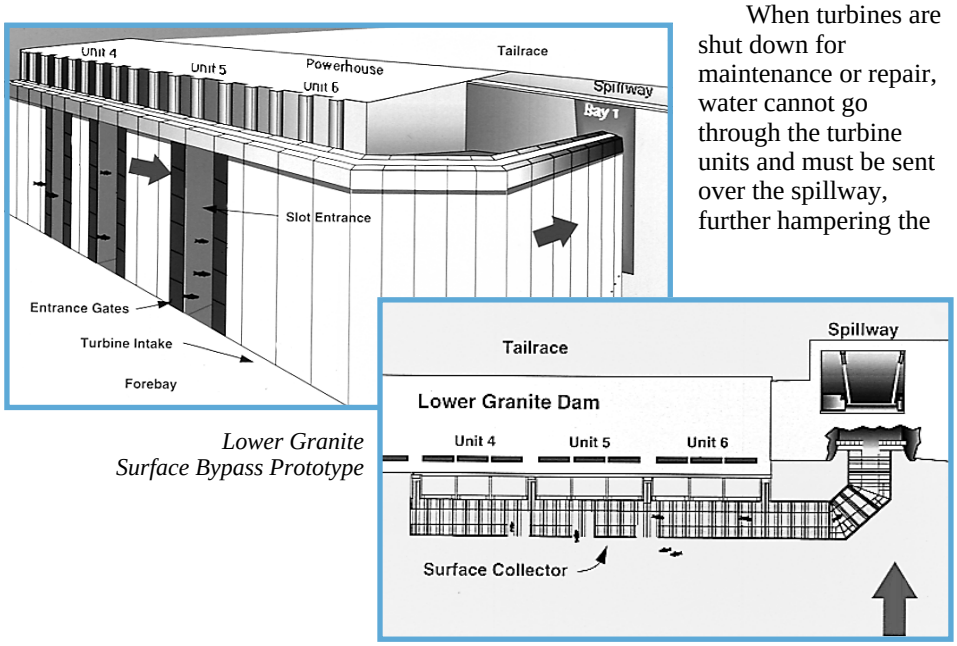
This year, early runoff from snowmelt, and higher than normal spring precipitation, increased river flows above average levels. Added to this was the need to let water out of upstream storage dams to keep reservoir levels low enough to store water for flood control in the event of continued high precipitation or runoff. At the dams, the high water levels began to overwhelm the system.

At Lower Granite Dam, the first dam the migrating juvenile salmon pass on the Snake River, nearly 180 thousand cubic feet per second (cfs) of water flowed past the dam at times. Some of this water went through the turbines to produce electricity, but the excess water created a high spill level.

The installation of the test surface bypass collector at Lower Granite Dam took three weeks longer than anticipated. While divers worked underwater to bolt the collector device to the face of the dam, three and sometimes four of the six turbines were shut down for safety. This added more spill since water cannot be sent through non-operating turbines and instead goes over the spillways. Installation of the collector device was completed April 23, in time for spring testing of the prototype device.

In what have become normal operations over the past several years, the Corps, at the request of the region and in accordance with the Biological Opinion, has intentionally spilled water at the dams, to divert juvenile fish away from the turbines and over the spillways. With the high flow and spill periods this spring, nitrogen gas supersaturation levels at times reached 140 percent, well above the state standard of 110 percent. Oregon, Washington and Idaho granted waivers to their dissolved gas standards to allow for higher spill for fish, but gas levels exceeded the 120 percent limits allowed in the waivers. At times this season, signs of gas bubble trauma have been detected in large percentages of the juvenile salmon examined, from 30 to 70 percent during one period.

When turbines are shut down for maintenance or repair, water cannot go through the turbine units and must be sent over the spillway, further hampering the



Lower Granite Surface Bypass Prototype

ability to control spill. Ice Harbor Dam had two turbines down for maintenance for all of last year's fish season, and into April of this year. One of the turbines was back in operation by mid-April. The other was started up on May 1, after completion of a two-year major rehabilitation, but shut down again immediately when the rotor poles—the main rotating parts of the generator—failed. That unit is expected to be out until fall to repair damages that occurred during the failed start-up.

River operators did what they could to manage the flows. Excess water was stored at upstream projects when possible. Spill forced by high water levels was spread out over many dams to control the production of gas supersaturation at the individual projects. Bonneville Power Administration sold energy to utilities outside the region and exchanged energy with other utilities to increase power demands so that more water could be put through the turbines rather than spilled.

Toward the middle of July, precipitation and runoff had begun to recede. Total dissolved gas levels were generally at or below 120 percent at most of the projects. Flows were being augmented in the Snake River.

The Corps' Water Management office provides information on Technical Management Team activities and related information on the Internet at http://www.npd-wc.usace.army.mil/TMT/welcome.html.

$1.4 Billion Salmon Program

The President's fiscal year 1997 budget proposal to Congress identifies a $1.4 billion total cost estimate for the host of past, present, and future modifications to eight Lower Columbia and Lower Snake River dams, for improved salmon survival. These are the items identified in the NMFS biological opinion on hydropower operations, most of which are also called for in the Northwest Power Planning Council's Fish and Wildlife Program. Project completion is anticipated by the year 2006.

This estimate includes two major categories. The first accounts for $800 million for work that has already been completed and activities that have begun or are planned. Approximately $300 million of this will have been spent by this September, the end of fiscal year 1996. The second category of about $600 million covers "decision-dependent" measures. To get to this number, Corps analysts made assumptions about the major choices that will be made by the region when the multi-path evaluations now underway are complete. Under the region's adaptive management framework for salmon recovery, the real decisions on major structural measures will not be made for several years.

The completed and planned measures include:

- improvements to juvenile bypass systems such as new extended-length fish guidance screens, and the new juvenile bypass system just completed at Ice Harbor Dam
- new barges and improvements to existing equipment for the juvenile fish transportation system
- improvements to the adult fish ladders, such as auxiliary water supply, and
- changes in the spillways to reduce problems with gas supersaturation.

A major portion of this money will go to design, test and evaluate juvenile fish surface bypass technology, develop measures such as raised stilling basins to abate dissolved gas, and to evaluate the feasibility of reservoir drawdowns on the Lower Snake River.

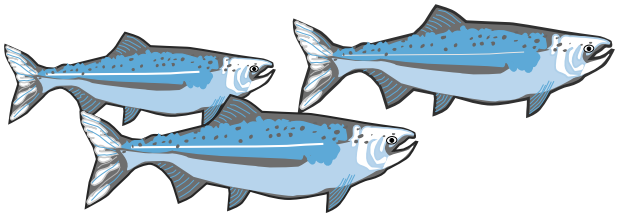
The decision-dependent portion assumes that the long-term efforts will focus on:

- installing surface bypass systems at four dams
- installing extended length fish guidance screens for the John Day Dam juvenile bypass system
- installing a screened juvenile bypass system at The Dalles Dam, and
- improving the juvenile bypass systems at the Bonneville Dam powerhouses.

According to Witt Anderson, a fishery biologist in the Corps' Pacific Salmon Coordination Office, the estimate is intended to give Congress and the public an idea of likely future costs and total project cost. Some measures may or may not be implemented pending decisions on results of ongoing work in the Mitigation Analysis, he notes. "The budget reflects the regional adaptive management framework for salmon recovery actions, and the long-term costs in the estimate can be viewed as a place holder," says Anderson.

Funds for the project are requested in the federal budget process and are appropriated annually by Congress. In the current fiscal year Congress provided $72.3 million to the project. The proposed budget for fiscal year 1997 requests $107 million.

Although the work is carried out with Congressional appropriations, about 80 percent of the costs are reimbursed to the federal treasury by Bonneville Power Administration. Repayment of hydropower costs is required by law and fish passage costs are jointly assigned to all project purposes, including hydropower. Bonneville Power collects necessary revenues through its electricity rate structure and repays the costs over time rather than in a one time payment. Repayment begins at the time a particular measure or facility is completed and providing improvements in fish passage.



The hydropower share of the capital investments in fish passage improvements is included under the Bonneville Power Administration fish and wildlife spending cap for salmon recovery. The cap was established by the federal government to ensure the hydropower responsibility for fish and wildlife protection and recovery is met and is within Bonneville Power's ability to pay. Comparisons of capital expenditures for fish passage measures in the spending cap with the Corps cost estimate and schedule indicate the cost of the project will not exceed ceilings over the 6 year period of the cap.

The Corps coordinates implementation of these measures with regional interests including states, Tribes, Northwest Power Planning Council, and other federal agencies. Technical review groups of engineers and fishery biologists define engineering and biological criteria and facility designs. Planning and policy groups determine overall priorities and

strategies for configuration modifications at the dams. The regional System Configuration Team and the Implementation Team, established by NMFS to coordinate salmon recovery efforts, serve as the planning and policy groups overseeing the project.

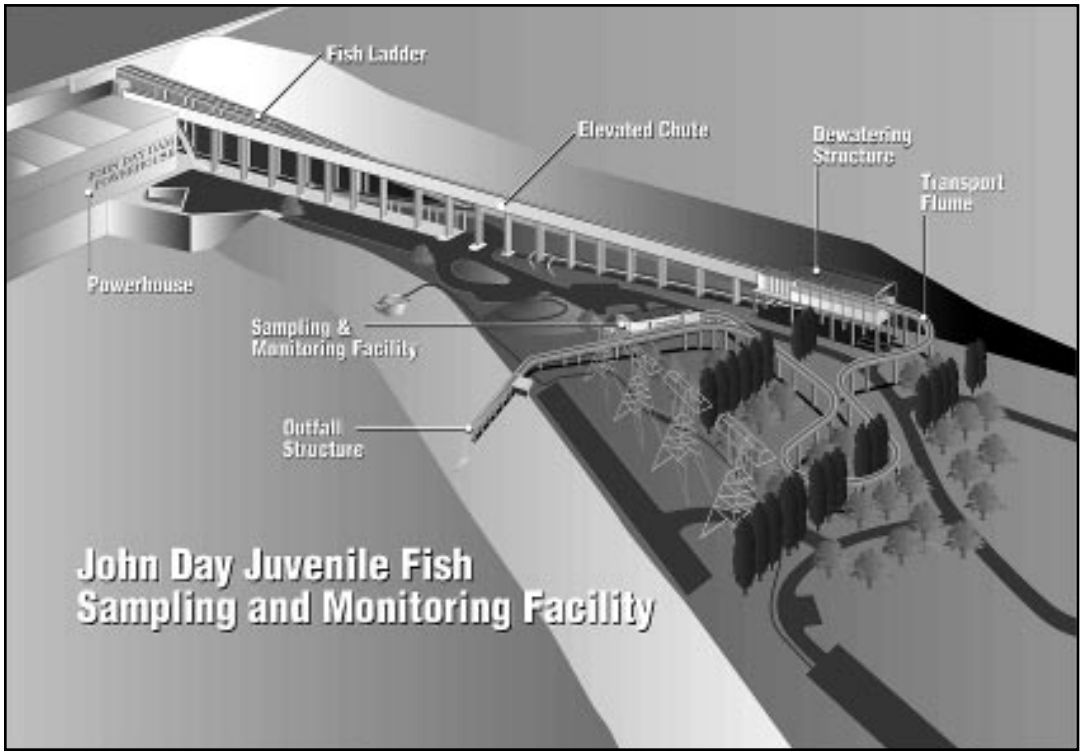
Construction Progress Report

Surface Bypass Evaluations. At Lower Granite Dam, installation of an $8 million test surface bypass collector was completed April 23. Testing was carried out in April and May to determine which configurations of the collector gates attract juvenile fish better. Some preliminary observations:

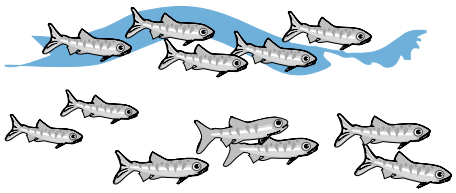
- Balloon-tag and PIT (passive integrated transponder) tag studies showed that injury and mortality to juvenile chinook salmon that passed through the prototype unit was comparable to that which occurred in spillway passage.
- It appears that relatively few squawfish (salmon predators) were present in the Lower Granite forebay during the study, and the few that were collected and radio-tagged did not congregate in or near the surface bypass collector.
- Radio-tagged squawfish in the tailrace did not concentrate at the smolt release point.
- Radio-tagged adult chinook salmon have not been delayed in dam passage due to dam operations for the surface bypass collector evaluation, nor have any fallen back through the collector.
- Based on both hydroacoustics and radiotelemetry, substantial numbers of smolts entered and passed through the test unit. Hydroacoustic estimates of passage of smolts through the surface bypass collector ranged from about 5,000 to 60,000 smolts per day.
- Based on hydroacoustics, entrance into the surface bypass collector was relatively evenly distributed through the day and night.

John Day Smolt Monitoring Facility. Construction on the John Day Smolt Monitoring Facility is underway. Threatened with delay earlier due to funding problems, the schedule was restored when the Northwest Power Planning Council worked with NMFS and the Bonneville Power Administration to provide an added $6 million for work in 1996. Several weeks later, the contractor encountered problems with the foundation for the facility. Federal executives and the Council decided to accept a delay and a several-million dollar cost increase as the best option for solving the construction problem. Completion is scheduled for the end of 1997.

John Day Smolt Monitoring Facility



A new juvenile fish bypass facility has been completed at Ice Harbor Dam. The facility is a state-of-the-art screened bypass. Transport facilities were not included. With the addition of Ice Harbor, seven of the eight lower Columbia and Snake projects have the screened juvenile bypass facilities. Installation of such a facility at The Dalles is on hold pending results of surface bypass studies.



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