BONNEVILLE POWER ADMINISTRATION

backgrounder

December 2006

Managing the Columbia River system to help fish

Fish migrating through the Columbia and Snake rivers today must pass up to eight federal dams built in the last century to provide hydropower, flood control, irrigation, navigation and public recreation.

In recent decades, the U.S. Army Corps of Engineers, which owns and operates these dams, has dramatically improved fish passage through them. Working together with federal and state fish and wildlife agencies and Northwest tribes, the Corps has added juvenile fish passage systems to these dams and reconfigured the way water is passed through them.

As a result, yearling chinook passage through the federal hydro system today is as good as or better than it was when there were only four dams on the lower Columbia and Snake rivers, according to the National Oceanic and Atmospheric Administration (NOAA).

Here's an overview of how the river system is managed today to help fish migrate.

Spring and summer fish operations

Salmon and steelhead are born in fresh water, migrate to the sea as juveniles, spend their adult lives in the ocean and return to their natal waters to spawn.

As juvenile fish approach each dam in their downstream migration, they are either collected, transported by barge and released below Bonneville Dam or migrate further in the river. River routes past each dam include a spillway, a bypass system or the turbines. Throughout the year, the Columbia River system is carefully operated to help juvenile fish survive passage through the dams and reservoirs.

Federal Columbia River dams have been revamped and their operation overhauled to help juvenile salmon survive their downstream migration.

The biggest push occurs from April through August during the downstream migration when river flows are managed to help juvenile fish reach the ocean in a timely and safe manner. Specifically, river operations support protection and recovery efforts for 13 salmon and steelhead species in the Columbia, Snake and Willamette rivers listed as endangered or threatened under the Endangered Species Act.

Thirteen runs of Columbia River salmon and steelhead plus resident bull trout and Kootenai River white sturgeon are listed under the Endangered Species Act. The salmon and steelhead listings include nine runs in the mainstem Columbia and Willamette rivers and four in the Snake River. Bull trout populations are listed in several parts of Idaho and Montana.

In addition to listed fish, these operations also generally aid all migrating smolts in the river as well as some resident (nonmigrating) fish.

The 2004 biological opinion on Columbia River hydropower operation issued by the National Oceanic and Atmospheric Administration Fisheries lays out the specific operational steps that are carried out by what are called the "action agencies"— the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and BPA. These operations are not static. Rather, they are carefully choreographed to respond quickly to changing water and temperature conditions and to the migratory patterns of the fish. The key is to provide the greatest benefit when the most fish are present in the river.

Key river operations include:

Spill: Spill is used to help fish in the river pass through a spillway instead of a dam's turbines or bypass systems. In average water conditions, a portion of the river's flow is spilled during spring and summer for salmon migrating in the river. More spill is not necessarily better because too much falling water can trap nitrogen bubbles and cause an illness in fish similar to "the bends" in humans. Water turbulence also can harm fish.

Flow Augmentation: Each year, coordinated water releases from upstream storage reservoirs augment flows during the juvenile salmon migration. Flow augmentation is designed to simulate a natural freshet that helps speed fish on their journey between dams and to the sea.

Transportation: While some smolts make their downstream journey in the river, in most years, more than half the smolts arriving at four dams are collected and transported through the hydro system on barges. These fish are released below Bonneville Dam to complete their migration to the sea. Approximately 98 percent of the transported juveniles survive to the point of release below Bonneville Dam. There is evidence that transportation especially improves juvenile survival in dry years, such as 2001. During such years, spill is decreased and more fish are transported.

Columbia River flows are managed from April through August each year to help juvenile salmon.

In addition to these efforts for salmon passage, BPA and the U.S. Army Corps of Engineers manage spring flows from Montana's Libby Dam to benefit the endangered Kootenai River white sturgeon and for other fish that reside in that river.

Winter fish flows and reservoir operations

In autumn and winter, between juvenile salmon runs, most major storage dams on the Columbia River system and several major run-of-the river projects are still operated to support the needs of fish, for example, to protect spawning beds for next year's brood. Fall and winter fish operations establish minimum streamflows for weeks and months at a time on specific river reaches. Natural streamflows vary widely, so maintaining steady streamflows means manipulating water releases from reservoirs upstream to protect redds or recently emerged fish.

In addition, specific reservoir operations in fall and winter support burbot, bull trout and kokanee in Lake Pend Oreille in Idaho and in Lake Roosevelt behind Grand Coulee Dam in Washington.

Downstream, the hydro system is operated from winter through early spring to protect the eggs and emerging fry of chinook salmon at Vernita Bar on the Hanford Reservation in the mid-Columbia and chum salmon below Bonneville Dam near Portland. Accommodating these needs adds to the constraints the hydro system must work within, but both fish runs are increasing. The Vernita Bar now produces the largest naturally spawning salmon run on the Columbia River system.

From chum below Bonneville to burbot below Libby, major dams throughout the region are operated throughout each winter to help fish.

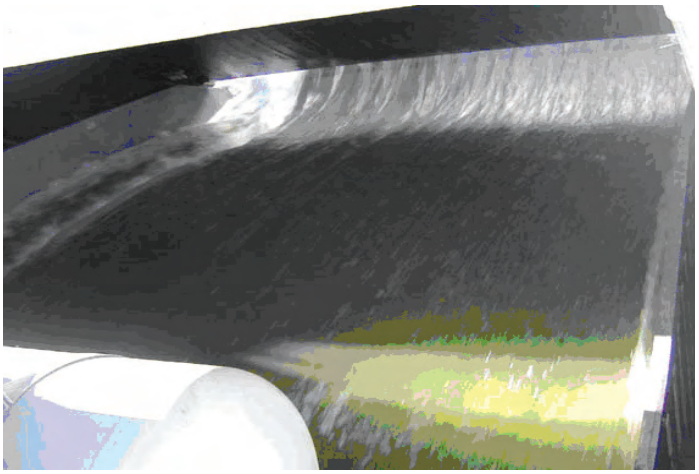
Dam configuration

Adult fish migrating upstream use the fish ladders to pass by dams. Research on adult fish passage shows that adult salmon survival through Columbia and Snake river fish ladders is about 98 percent or higher through the entire system.

Northwest ratepayers have invested hundreds of millions of dollars in the last two decades upgrading federal dams to make passage safer for juvenile fish migrating downstream. All of the Lower Snake and three of the Columbia River dams have had fish bypass systems installed, and newer improvements are still being added.

Fish screens and bypass systems: Nearly all of the lower Snake and Columbia river dams now guide fish away from turbines by submerged screens installed in front of the turbine intakes. The screens guide the fish to channels in the dams that route the fish to the river below or to transportation facilities that allow them to pass the remaining dams in a barge.

Fish slides and the corner collector: In the last few years, fish slides, also called removable spillway weirs, have been installed at two Snake River dams and are proving highly effective. The weir fits inside a dam spillway and allows juvenile fish to slide over the spillway



The fish slide at Lower Granite Dam gives fish a smoother ride. (photo U.S. Army Corps of Engineers)

near the water surface rather than having to submerge up to 50 feet to reach the bypass system. This less-stressful route produces higher fish survival than spill without the fish slides, while also spilling less water. Similar slides are slated for more dams. At Bonneville Dam, nearly 100 percent of the fish that ride through a new "corner collector" survive the trip. About 30 percent of all fish that pass through Bonneville Dam go through the corner collector.

Fish-friendly turbines: Over time, dam operators are replacing old turbines with new ones designed to be safer for fish and more efficient.

Selective water withdrawals: Two high dams, Dworshak in Idaho and Hungry Horse in Montana, have been fitted with special systems that allow operators to release cold water from deep within the reservoirs. This cold water helps keep downstream rivers cool, a vital aid to salmon and other temperature-sensitive fish.

For more information

To learn more, visit the following Web sites:

www.bpa.gov

www.salmonrecovery.gov

Annual water management plan: *www.nwd-wc.usace.army.mil/tmt/documents/wmp/*