US Army Corps of Engineers ®
Walla Walla District

FACT SHEET
LSR Dams' Fish Passage Improvements
Ice Harbor • Little Goose • Lower Monumental • Lower Granite Dams

To improve fish survival, the U.S. Army Corps of Engineers Walla Walla District developed an Advanced Technology Turbine, fish cooling systems, spillway weirs and juvenile bypass systems at the Lower Snake River dams in eastern Washington.

These multiple-use facilities provide navigation, hydropower, recreation and fish and wildlife conservation benefits. When originally built, the Corps built adult fish ladders to allow adult salmon and steelhead to migrate past dams as they return to their natural spawning areas. These system upgrades are improvements to the environmental performance of a critical Northwest power resource.

A new advanced technology turbine was installed at Ice Harbor Dam in 2018.

The replacement of Ice Harbor Unit 2 runner with a fixed blade runner designed for fish passage survival improvement is nearing completion.

Corps officials anticipate the improved design will help reduce maintenance costs, increase power generation by 3 to 4 percent and may increase fish survival.

Ice Harbor Dam is a valuable site for developing technical innovations aimed at raising survival rates of endangered and threatened fish in the region. The process to develop the new turbine designs is a model for future modernizations planned at McNary Dam and other Federal dams in the Northwest.

The design process combined the Corps' expertise in physical hydraulic modeling and fish passage, Bonneville Power Administration's economic expertise, and NOAA Fisheries' knowledge of anadromous fish biology, with Voith Hydro Inc.'s industry expertise in designing, fabricating and installing large-scale hydro-turbines. The collaboration developed turbines that improve hydraulic that improve hydraulic conditions for juvenile salmon and steelhead passage.

The $73 million contract, including options, calls for installing new runner replacements on three turbines -- one fixed-blade runner into Unit 2, plus two adjustable runners into Unit 1 and Unit 3 -- along with other turbine improvements for fish at Ice Harbor during the next few years.

All 3 turbine units utilized greaseless bushings in the turbine wicket gates to reduce oil infiltration into the river. The adjustable blade designs for Units 1 and 3 are scheduled to be completed over the next three years.

Juvenile Bypass System built at Lower Granite Lock and Dam

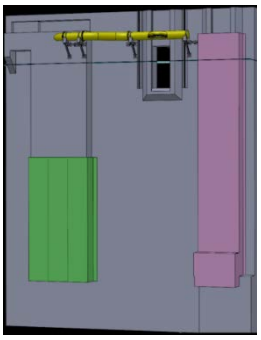
The Corps developed the Juvenile Collection and Bypass System at Lower Granite Lock and Dam to minimize turbine passage, increase fish survivability, and reduce injury in the existing bypass system. Work included the following:

* Replace or "daylight" the existing underground pressurized fish passage with an elevated, above-ground, screen-covered flume about 2,700 feet long, or more than a half a mile. Parts of this flume will be 60 feet above ground.
* Enlarge the dam's fish passage orifices and collection channel.
* Reuses water removed from the juvenile fish bypass channel for adult fish ladder attraction.
* Install new passive integrated transponder (PIT) tag detectors to provide fish research, monitoring data and validate survival rates.
* Create a new primary bypass outfall pipe that returns fish to the river at the location that is expected to improve survival.

Water cooling systems were installed at Lower Granite and Little Goose dams in 2016 and 2017.

2015, 2016 and 2017 were the hottest years on record and warm water temperatures above 68 degrees aren't beneficial for salmon and steelhead in the Columbia and Snake River systems.

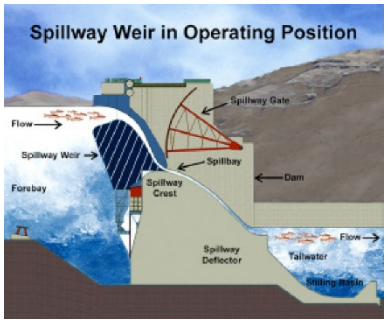
When summer temperatures spiked, the Walla Walla District's scientists, biologists and engineers responded to regional concerns by developing water cooling systems at Lower Granite and Little Goose dams.



The system cools the Snake River by augmenting it with flows with colder, denser water released from Dworshak Dam, and by incorporating additional upgrades to promote cooling within the Lower Granite and Little Goose Dams' fish ladders.

To reduce water temperatures, a large chimney with an open top and bottom was designed to encapsulate the fish ladder intake conduit and draw cooler water from 60 feet beneath the water surface. A large spray bar was developed which uses cooler water pumped from deep in the forebay to improve conditions for the fish ladder exit and the nearby forebay.

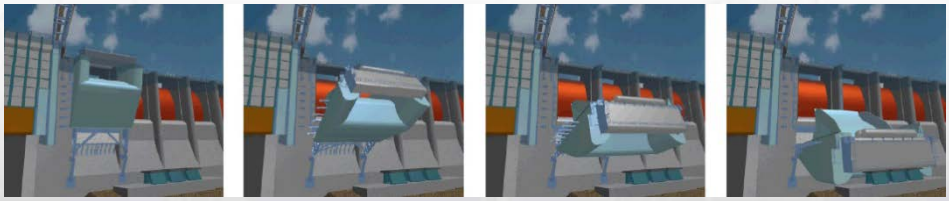
Spillway Weirs



Spillway weirs allow juvenile salmon and steelhead to pass the dam near the water surface under lower accelerations and lower pressures, providing a more efficient and less stressful dam passage route.

Most Columbia River Basin juvenile salmon and steelhead tend to stay in the upper 10 to 20 feet of the water column as they migrate downstream to the ocean. The configuration of other juvenile fish passage routes at the Corps' lower Columbia and Snake River dams (such as through spillway gates or powerhouse intake bypass systems) cause juvenile fish to dive to depths of 50 to 60 feet to find passage routes. The weirs are mounted into a spillway bay where they draw fish from the forebay toward the spillway's smoother water flow.

Little Goose Dam has an adjustable spillway weir while the weirs at Ice Harbor, Lower Granite and Lower Monumental dams are designed to be 'removable,' by controlled descent to the bottom of the dam forebay. Air is added or removed from tanks incorporated into the structure to either raise it to its operational position in the spillway, or lower it to its stowed position on the riverbed during major flood events, rotating on large hinges on the upstream face of the dam. Fish survival through spillway weirs ranges from 95-100%.



The Corps is committed to fish recovery, and improving systems like these are some of the many ways the U.S. Army Corps of Engineers is pioneering some of the world's most advanced fish passage technology.

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Oct 2018

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