



**US Army Corps
of Engineers**®
Walla Walla District

Salmon Survival

Surface Bypass Systems

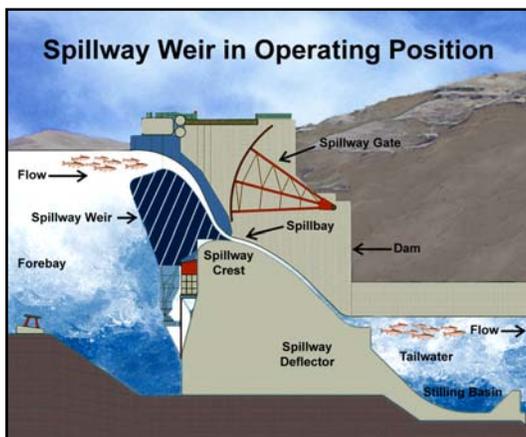
Most Columbia River Basin juvenile anadromous salmon and steelhead tend to stay in the upper 10 to 20 feet of the water column as they migrate downstream to the ocean. Juvenile fish passage routes at the Corps' lower Columbia and Snake river dams, because of the dams' configurations, cause the juvenile fish to dive to depths of 50 to 60 feet to find the passage routes.

Engineers and biologists have been pursuing new technologies that would provide more surface-oriented, less stressful, passage routes for juvenile fish.

Surface bypass structures are currently used at five of the eight Corps dams on the lower Columbia and Snake rivers. Three types of surface bypass structures are installed – removable spillway weirs, temporary spillway weirs and surface bypass channels. Additional structures are in various stages of planning, design, construction and installation for the remaining three dams.



A removable spillway weir was installed in February 2005 at Ice Harbor Lock and Dam, near Burbank, Wash.



Removable Spillway Weirs (RSWs) are installed at Lower Granite and Ice Harbor dams on the lower Snake River. The RSW, nicknamed “fish slide,” is attached to the upstream side of the dam and fitted into a spillbay, raising the spillway opening to the salmon’s preferred depth. Juvenile salmon and steelhead are safely passed over a raised spillway crest, similar to a waterslide, more efficiently than with conventional spill while reducing migration delays at the dam.

The first RSW was installed at Lower Granite Dam in 2001. The Corps installed an RSW at Ice Harbor Dam in 2005 and plans to complete installation of another at Lower Monumental Dam during 2007.

Testing at Lower Granite and Ice Harbor noted an average of 98-percent survival for fish passing the dams via the fish slides.

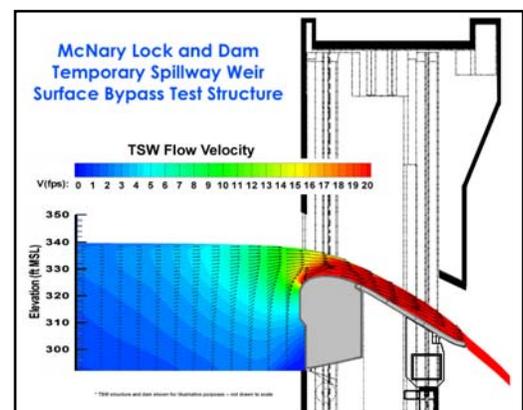
The structure also is designed to be “removable” by controlled descent to the bottom of the dam forebay. This capability permits returning the spillway to original flow capacity during major flood events.

Temporary Spillway Weirs (TSWs) were installed during March 2007 in two spillway bays at McNary Dam on the Columbia River. The TSW is a test device based on design elements of an RSW – a raised spillway crest that creates a surface-oriented passage route that juvenile fish seem to prefer.

The TSW does not have the pump-operated ballast system used in RSWs to raise and lower the structure during flood operations – TSWs can be removed using the dam’s gantry crane to accommodate increased spill operations.

Two styles of TSWs are being tested over a two-year period – one has a “slide” section that comes in contact with the spillway, the other TSW has only the crest structure.

Initial testing of both devices in March 2007 showed 98 percent survival for fish used in that research. The TSWs will help the Corps decide what type of permanent surface-oriented bypass system might be suitable and effective for McNary Dam.





SPILLWAY WEIR FAST FACTS

Advantages

- Safe – RSW & TSW tests showed 98% survival
- Reduces reservoir delays – reduces passage delays
- Improved efficiency of passages – more fish with less flow
- If less flow, opportunity to improve water quality – lower total dissolved gases
- If less flow, improves the opportunity for power generation

Differences from Conventional Spill

- HOW water and fish are passed – surface “overflow” versus under deep gates
- HOW MUCH flow is required – less flow is required to pass comparable numbers of fish

Removable

- To maintain flood flow capacity at the spillways, the RSW structures can be “removed” by controlled sinking.
- TSWs can be removed by a gantry crane.

Surface Bypass Channels are used at two dams on the lower Columbia River to safely pass outmigrating fish. Bonneville Dam's corner collector, completed in 2004, provides effective surface bypass – the ice and trash chute at the second powerhouse was modified for safer passage, and a 2,800-foot-long transport channel and 500-foot-long outfall channel were constructed to guide fish around the dam. Tests in 2004 and 2005 indicate a survival rate of nearly 100 percent for spring Chinook, steelhead and fall Chinook through the Corner Collector, and a 94 -99 percent survival rate, depending on the species, through all passage routes combined at this dam. The ice and trash sluiceway at The Dalles Dam is also used by outmigrating fish as a surface bypass route with similar survival rates. Additionally, a spill wall was completed in 2004, designed to move juvenile fish more quickly and safely downstream once they passed through the spillway with a two to four percent survival improvement.

FOR MORE INFORMATION

Spillway Weirs: www.nww.usace.army.mil/spillway_weir/default.html

Fish Recovery Efforts in the Region: www.salmonrecovery.gov/

