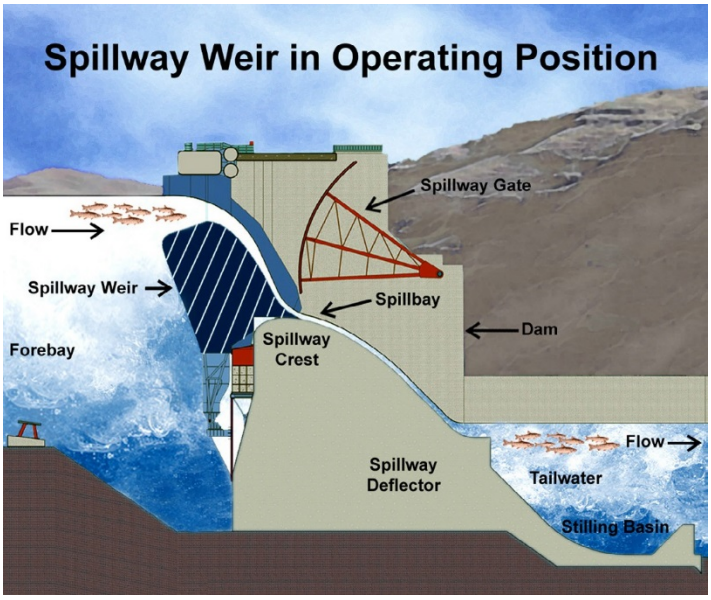
US Army Corps of Engineers ®
Walla Walla District

Spillway Weirs Help Juvenile Salmon and Steelhead Migrate Downstream Past Dams More Safely

Columbia-Snake Rivers • Oregon & Washington

Ice Harbor Spillway Weir under construction in 2004.



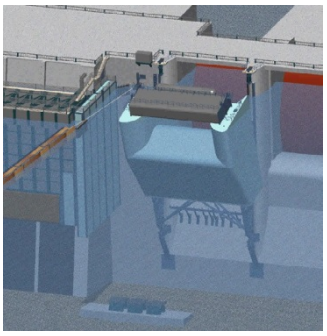
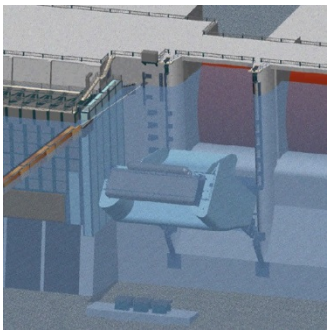
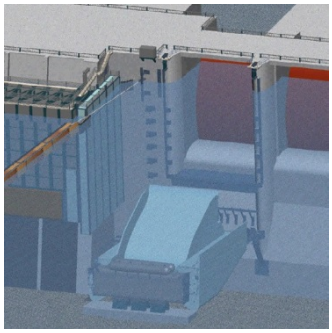
Spillway weirs allow juvenile salmon and steelhead to pass a dam near the water surface, under lower accelerations and lower pressures, providing a more efficient and less stressful dam passage route.

A prototype spillway weir was installed at Lower Granite Dam on the lower Snake River in 2001, followed by the Ice Harbor Spillway Weir in 2005, Lower Monumental Dam Spillway Weir in 2008, and Little Goose Dam Spillway Weir in 2009.

Ice Harbor Spillway Weir after installation.

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. The configuration of juvenile fish passage routes at the Corps' lower Columbia and Snake rivers dams causes juvenile fish to dive to depths of 50 to 60 feet to find passage routes.

The design of the spillway weir is different from existing spillways. Existing spillway gates open 50 feet below the water surface at the face of the dam and pass juvenile fish under high pressure and high velocities. The spillway weir passes juvenile salmon and steelhead over a raised spillway crest, similar to a waterslide. Juvenile fish are safely passed over the weir more efficiently than with conventional spill, while reducing migration delays at the dam.

Above: The Ice Harbor Spillway Weir is designed to be "removable" by controlled rotational sinking to the river bottom. When removed, it returns the spillway to original flood flow capacity to pass water during major flood events.

Evolution of Spillway Weirs

1990s: Ice Harbor - Used an ice/trash sluice to test fish attraction to surface routes

1996-2001: Lower Granite - Installed a prototype "Surface Bypass Collector." It tested various depths and amounts of flow for juvenile fish attraction.

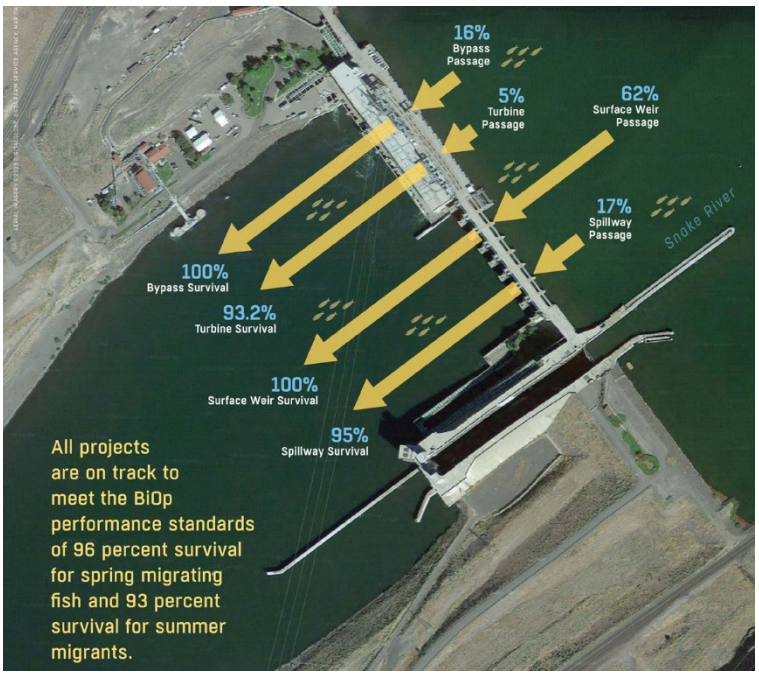
2001: Lower Granite - Based on SBC testing results, the first prototype "Removable Spillway Weir" (RSW) was installed at Lower Granite Dam. Results were a high percentage of fish passed the RSW with high survival.

2004/05: Ice Harbor - Installed a second improved RSW at Ice Harbor based on prototype testing at Lower Granite. The Ice Harbor system used water ballast for controlled sinking similar to a submarine.

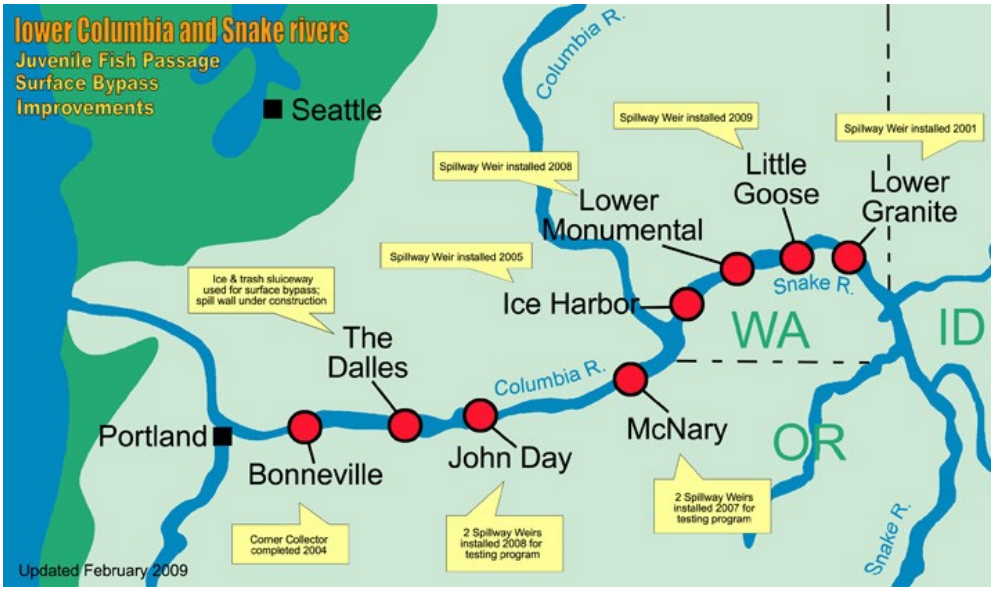
2006/07: McNary - Installed "Temporary Spillway Weirs" (TSW) at McNary to test simplified "topspill" concept. (Waterfall versus Waterslide). Successful testing led to permanent topspill at McNary and TSW at Little Goose.

2007/08: Lower Monumental - Installed an RSW, similar to the Ice Harbor RSW.

2008/09: "TSW Spillway Weir" (with adjustable crest) installed at Little Goose for testing and to determine a permanent design. This structure results in surface passage systems at all four lower Snake River and McNary dams, retrofitted with surface bypass structures.



Above: Lower Monumental Dam and fish passage and survival rates for a typical lower Snake River Dam.
Left: Spillway Weirs, like this one at McNary Dam, improve fish passage efficiency by using less flow, resulting in lower total dissolved gases and improved water quality.



SPILLWAY WEIR FAST FACTS

Advantages

- Safe – RSW & TSW tests showed about 98% survival at each dam
- Reduces delays – fish spend less time in reservoirs
- Improved passage efficiency – more fish with less flow
- Less flow=opportunity to improve water quality, lower total dissolved gasses

Difference vs. Conventional Spill

- HOW water and fish are passed – surface "overflow" vs. 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 spillways, RSWs can be "removed" by controlled sinking
- TSWs can be removed by gantry crane

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