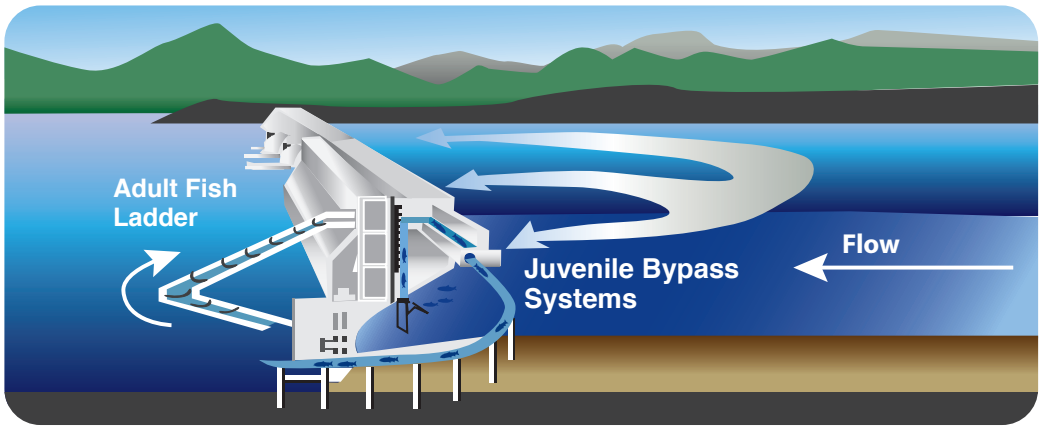
Hydropower and Fish Protection

Fish, particularly salmon and steelhead that travel long distances between fresh and ocean waters, pass through multiple environments during their life cycle.

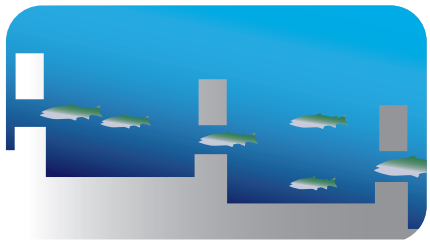
Since 1991, 13 specific populations of salmon and steelhead have been listed as threatened or endangered in the Columbia River Basin. In addition, bull trout and Kootenai River white sturgeon (resident fish that migrate only within freshwater), have been listed for protection.

For salmon and steelhead on the Columbia River, federal performance standards call for 96 percent of spring fish migrating downstream to successfully pass through each hydropower project, and 93 percent for summer migrants. Thanks to fish bypass systems, turbine design, spillway improvements and other efforts, hydropower projects are meeting these standards.

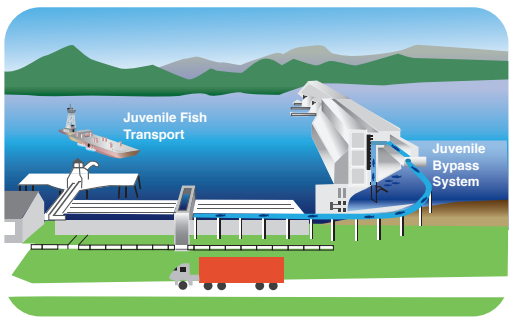
Fish Passage Tour



When young salmon (smolts) migrating downstream encounter a hydroelectric project, they will either pass over a spillway, through the turbine area, be transported around a dam or enter a bypass system.

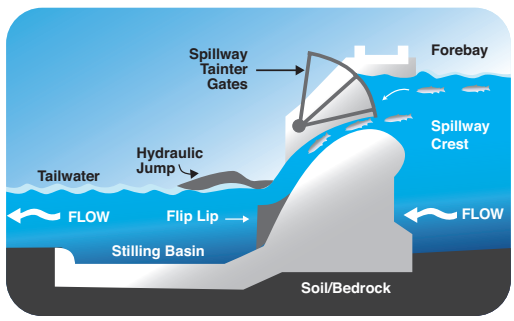


***Fish Ladders** are the most common way for adult salmon to migrate upstream as they journey to their spawning grounds. Upstream options also include trap-and-haul, bypass channels and other innovations.*



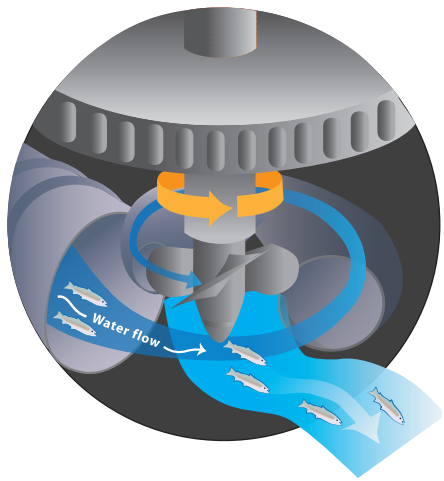
***Fish Bypass Systems and Transportation:** Surface collectors are a common means of guiding juvenile salmon around a project.*

One method is to use fish screens to guide fish into a bypass system. Another method is to use a surface collector to channel fish into a bypass system. Along the main stem of the Columbia and Snake rivers, some migrating smolts are collected in barges and then transported up to several hundred miles downstream.



***Spillway Improvements:** Migrating smolts can pass over a spillway, fall into the pool of water below, and then continue their journey downstream. Some weirs now provide a water ramp that allow fish to slide down to the river below.*

Flip lips, also called spill deflectors, are sometimes used to reduce the effect of total dissolved gas, or TDG, which can cause gas bubble disease in fish.



***Advanced Turbine Designs:** Migrating smolts can pass into the turbine area and exit via the tail race. A new generation of turbines include minimum gap runners to increase turbine efficiency while decreasing the likelihood of smolts being trapped, bruised, stressed or disoriented.*

The fish passage tour shows upstream and downstream migration. These investments, combined with managing river flows, have dramatically improved salmon survival past dams.

Beginning in 2017, however, returns dipped to levels common in the 1990s. Scientists believe that poor ocean conditions related to Pacific Decadal Oscillation (multi-
year patterns of variation in sea surface temperature), El Niño (abnormal warming of the Pacific Ocean off northern Peru and Ecuador causing nutrient-poor water), and marine heatwaves are major contributors to lower salmon returns.

NOAA's Northwest Science Fisheries Center is researching these patterns, noting that “The listing of several salmon stocks as threatened or endangered under the U.S. Endangered Species Act coincides with a prolonged period of poor ocean conditions that began in the early 1990s. …Returns of both spring and fall Chinook declined from 2017 to present, likely from poor ocean conditions associated with the marine heatwave that affected feeding conditions for out-migrating juveniles in 2015 onward.”

Climate change is also contributing to less snowpack and hotter summers, thus raising river temperatures to levels that negatively affect adult salmon survival. This is further impacted by extensive fish harvesting in international waters and growing predation from sea lions, terns and other species.

The complex era of climate change makes supporting hydropower more important than ever. Generators of hydropower are investing millions of dollars annually to support and ensure fish survival while providing the foundation for a renewable, carbon-free power generation future.