Approach to river restoration

Fish passage is important to the protection and restoration of fish and their habitats. NOAA Fisheries works with other federal agencies, conservation organizations, energy companies, states, tribes, and citizens to evaluate barriers—big and small—to improve fish passage. Most barriers have the same general impact on fish, they block migrations, but each requires a unique solution to either pass fish through the barrier or remove it from the landscape completely.

Through programs like the Pacific Coastal Salmon Recovery Fund and the NOAA Restoration Center, NOAA Fisheries opens rivers by completely removing fish passage barriers. At the same time, NOAA Fisheries West Coast Region's fish passage engineers and biologists are designing solutions that facilitate safe, timely, and effective fish passage through barriers that remain. Working with our partners, NOAA Fisheries establishes the science-based requirements for dam operators to implement. These requirements are based on the needs of fish and are guided by the Federal Power Act and Endangered Species Act. Taken together, NOAA Fisheries' programs, authorities, and innovative fish passage solutions have restored access to thousands of river miles of habitat. This, in turn, helps to sustain ecosystems that support a diversity of species and our region's fisheries.

Dam Removal

Many dams provide important social benefits. Hydropower, for example, provides a clean source of renewable, carbon-free energy. Other dams serve as flood control facilities, protecting local communities downstream. They also provide value to those who recreate at the reservoirs. Many dams serve these important benefits while also providing safe, effective fish passage. Other dams are antiquated, with limited utility and inadequate or non-existent passage for fish. Where facilities are outdated and do not provide fish passage, NOAA Fisheries works with partners to open streams and restore ecosystems for fish and other wildlife. Sometimes these efforts result in dam removal.

Providing safe passage contributes to fish recovery

Throughout the West Coast, 28 salmon and steelhead species are listed under the Endangered Species Act. Several additional fish species, like eulachon and green sturgeon, are also listed. Providing downstream and upstream passage ensures fish are able to complete their life cycle and return to reproduce the next generation of fish. This, in turn, supports efforts to recover endangered species. NOAA Fisheries develops and implements plans to recover protected fish populations. A key component of each recovery plan is to identify actions that provide safe downstream and upstream fish passage.

LEARN MORE...

Fish passage on the West Coast
www.westcoast.fisheries.noaa.gov/fish_passage/solutions/index.html

Management of Federal Dams
www.westcoast.fisheries.noaa.gov/fish_passage/dams/index.html

Salmon & Steelhead
www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead.html

Pacific Eulachon
www.westcoast.fisheries.noaa.gov/protected_species/eulachon/pacific_eulachon.html

Green Sturgeon
www.westcoast.fisheries.noaa.gov/protected_species/green_sturgeon/green_sturgeon_pg.html

West Coast Region

Making Way for Migrating Fish

NOAA Fisheries works to ensure safe downstream and upstream fish passage

Salmon and other migrating fish, such as steelhead, eulachon, and green sturgeon, need access to freshwater habitat for spawning and rearing young. In some cases, fish swim thousands of miles to reach their destination.

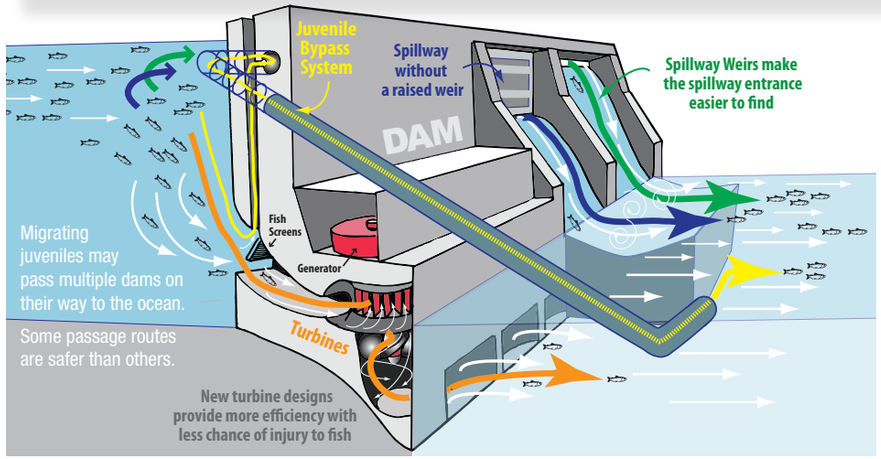
Sockeye salmon from Idaho's Snake River migrate over 900 miles to and from the ocean. Green sturgeon make rapid, long-distance seasonal migrations between central California and central British Columbia, beginning at their Sacramento River spawning grounds - a round-trip distance of well over 2,000 miles.

Ensuring fish are able to complete their life cycle safely is a key element of NOAA Fisheries' work on the West Coast and critical to advancing the agency's mission of stewardship.

NOAA FISHERIES

Designing Solutions That Work

Dams, culverts, and tidegates, among other barriers, can impede fish from migrating both downstream and upstream. NOAA Fisheries works with its partners to design passage technology to meet the biological and physiological needs of fish. Some of these solutions are shown here.



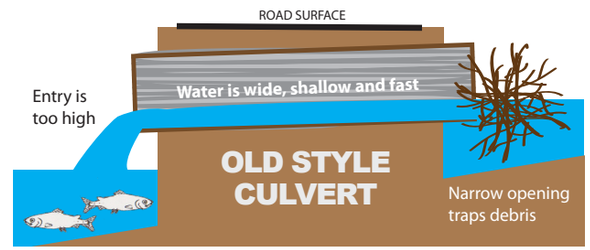
Surface Passage Structures

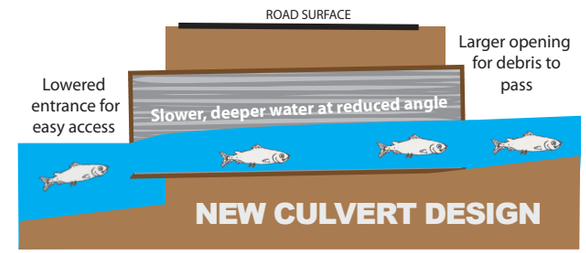
Spillways can be the safest route for juvenile fish to pass a dam, but they may have difficulty finding their way. Most juvenile salmonids like to stay in the top 20' of the water column. Spillway openings may be 50' or more below the surface, too deep for the fish to easily find. Some dams have been equipped with spillway weirs. These are movable gates on the upriver side. When juvenile fish are migrating, water flows over the top of the weir and out through the spill gate. Since fish do not have to dive to find the spillway entrance, more fish are passed with less water spilled. And since the fish quickly find passage, they also may escape predators.

Culverts

Large pipes pass water under roads to protect against erosion or flooding. Culverts, especially popular for small streams or in remote areas, do not always allow fish passage. The downstream end may be too high for upstream migrating fish to enter; or water in the culvert may be too shallow, or moving too swiftly for fish to pass in either direction. Culverts also collect debris, blocking fish passage and water.

To improve fish passage, culverts can be replaced with bridges or "bottomless" culverts that simulate a natural stream on the bottom and are wide enough for fish, water, and debris to pass through. In some cases, existing culverts are improved by lowering the downstream end, reducing the steepness, and making other modifications to reduce water velocity and increase water depth.

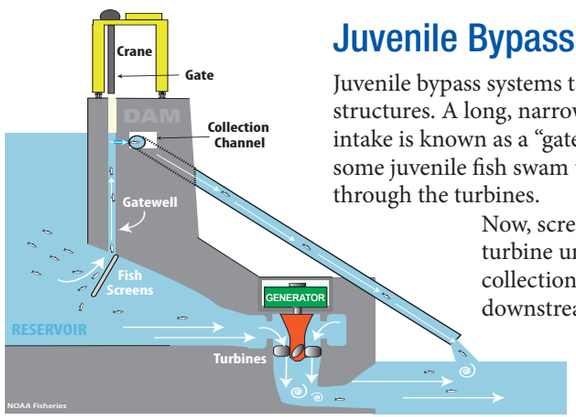


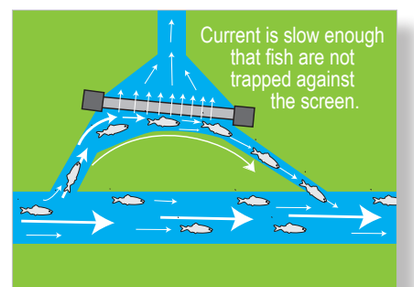


Juvenile Bypass Systems

Juvenile bypass systems take advantage of existing dam structures. A long, narrow slot above each turbine intake is known as a "gatewell." Scientists noticed that some juvenile fish swam up the gatewells rather than through the turbines.

Now, screen systems divert fish from turbine units into gatewells and collection channels to pass them downstream of the dam.





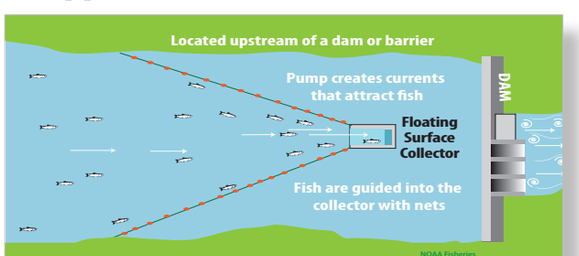
Fish Screens

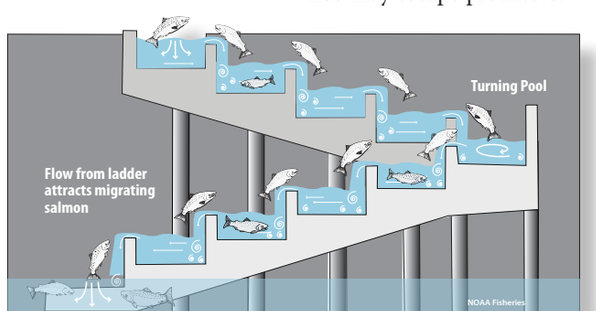
Fish screens physically exclude fish from pipes, canals, or other structures that collect water from their habitat. Properly functioning screens must:

- Include holes small enough to prevent fish from passing through the screen, or becoming stuck;
- Allow sufficient water to pass to serve its purpose;
- Provide a slow current so fish are not pulled into the screen; and
- Provide flow along the face of the screen to guide fish away from the screen and back to the river.

Floating Surface Collectors

Water flowing into the entrance of the surface collector attracts juvenile fish. The fish enter and are held for transport around the dam by truck or barge, or guided into a pipe that carries them downstream of the dam.

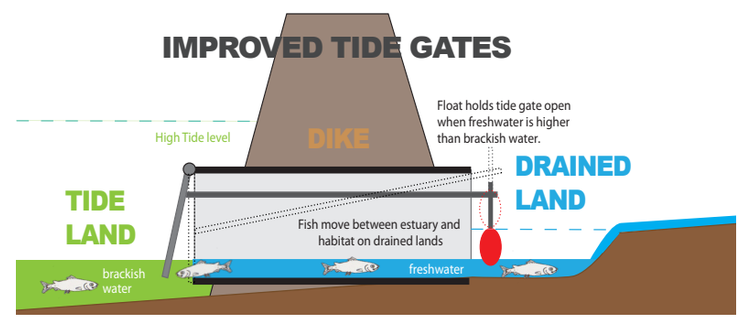




Fish Ladders

Adult fish typically pass dams through fish ladders, water-filled structures that allow fish to pass up and over in a series of steps. Migrating fish are attracted to current at the base of an extended concrete stairway. The fish swim or jump from step to step.

Tide Gates

Tide gates and dikes drain estuary land for agricultural or other uses. A large pipe in the dike has a hinged door on the tidal side. When water on the draining side rises, the door allows freshwater to escape into the bay or estuary. When the tide rises, the door closes so brackish water does not flow back.

Drained areas often have habitat for small fish in streams or marshes. With traditional tide gates, fish passage can be limited. Access to the habitat may be blocked, and the fish trapped or injured by the hardware. Newly designed tide gates stay open longer--until the freshwater reaches a particular level. The water level and the extra time make it easier for fish to make use of quality habitat in the drained area.