



Fish Enhancement

Puget Sound Energy shares the region's deep-rooted environmental ethic and embraces our responsibility to protect natural resources, including our cherished salmon runs. Our biologists and fisheries technicians have been working for decades with Native American tribes and government agencies to boost salmon and trout populations, particularly in rivers where PSE has hydropower operations.

The Baker River Hydroelectric Project

The Baker River Hydroelectric Project, PSE's largest hydropower operation, is a 215-megawatt facility in northwest Washington. It features the Upper Baker Dam and Lower Baker Dam, each with its own powerhouse. Each dam also has its own reservoir: Lake Shannon behind the Lower Baker Dam and Baker Lake behind the Upper Baker Dam.

The Baker River is a major tributary of the Skagit River, one of Washington state's most prolific river systems for fish. Over the years, advances in technology, greater knowledge of fish biology, ongoing PSE investments in fisheries systems and continued collaboration with resource agencies and Northwest Indian tribes have produced significant gains in the river's fish stocks. These gains show great promise to continue in the years ahead.



▲ Baker River hydroelectric project

Fish profile in Skagit-Baker watershed

The basin contains a variety of anadromous (migratory) fish species. The Baker River's most abundant stocks are sockeye and coho salmon. Its annual adult-sockeye returns have averaged about 3,500 since the 1920s, but plunged to a low return of just 99 fish in 1985, imperiling the stock.

Fish-restoration efforts since the mid-1980s have had a dramatic effect in the recovery of Baker sockeye, with eight of the 10 highest annual returns on record occurring since 1994, including an all-time high of 48,367 in 2012.



▲ Sockeye, Chinook and Coho salmon

New license's fish initiatives

The Federal Energy Regulatory Commission in 2008 issued PSE a new, 50-year operating license for the Baker River Hydroelectric Project after eight years of collaborative consultation between PSE and 23 other parties, including government agencies, Indian tribes, and environmental groups.

The project's license calls for major PSE initiatives to further enhance fish populations in the Skagit-Baker watershed, including installation of new upstream and downstream fish-passage facilities, construction of a new fish hatchery, construction of a second Lower Baker powerhouse for better river-flow control, and riparian-habitat protection. Fisheries managers expect PSE's Baker River investments to produce continued increases in the river's salmon runs and expanded recreational, tribal and commercial fishing opportunities.

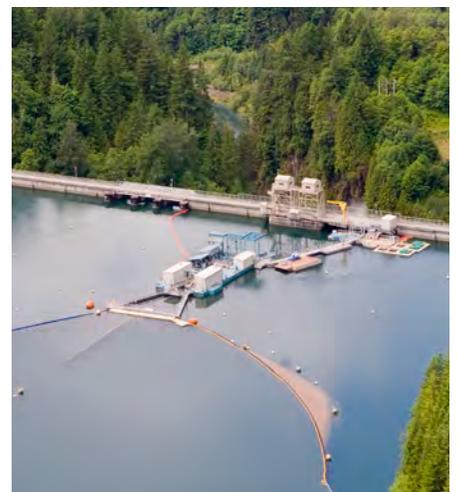
Juvenile-salmon downstream fish trap (floating surface collector)

Both of PSE's Baker River facilities use an innovative "floating surface collector" (FSC) to improve downstream migration of juvenile salmon around both PSE dams. The first FSC received national acclaim when it was installed on Baker Lake, above the Upper Baker Dam, in 2008. A similar FSC was completed in 2013 on Lake Shannon, behind the Lower Baker Dam.

Key FSC features include:

- Shore-to-shore, surface-to-lakebed guide nets covering five acres of surface area.
- A specially designed "net transition structure" linking the guide nets with the 130-foot-by-60-foot, barge-like FSC, which weighs 1,000 tons.
- An elaborate fish-sampling station.
- Enhanced fish-loading facilities for downstream "fish taxi" transport past the dams.

Now that both are operational, the two FSCs set a combined record for downstream juvenile fish outmigration with a growing sockeye population in excess of 850,000 and close to a million total fish, including sockeye, coho, Chinook, trout and char.



▲ Floating surface collector

New adult-salmon upstream fish trap

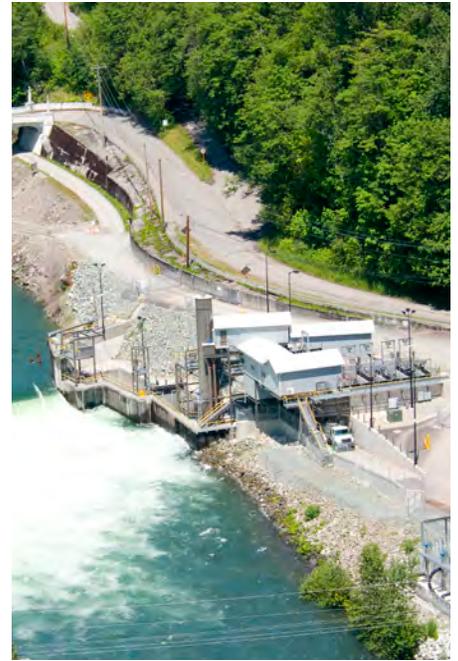
In 2010, PSE replaced the original fish trap below Lower Baker Dam with a new, enhanced fish trap to capture migrating adult salmon for upstream “fish taxi” transport around both Baker River dams.

Key features of the trap include:

- A water-filled “aquatic elevator” that stands 60 feet tall and 7 feet in diameter and raises captured fish from river level to the trap’s elevated facilities.
- A programmable control system and operator’s booth for sorting fish by species and segregating them into six separate holding pools.
- A sampling area with electronic data-management equipment for collecting a wide range of biological information about captured fish before they are transported upstream.

Three of the four highest sockeye returns have occurred since the new trap system was put into operation. In 2013, 12,534 sockeye were collected at the trap (8th highest) and 17,032 estimated total sockeye returned to Skagit/Baker River system (5th highest).

The highest returns were recorded in 2012 – the trap collected 28,410 sockeye and an estimated 48,014 total sockeye returned to Skagit/Baker River system.



▲ Lower Baker River fish trap

State-of-the-art fish hatchery

In 2010, PSE completed construction of an advanced fish hatchery and refurbished sockeye spawning beach located near the Upper Baker Dam. The performance of these facilities increased sockeye fry production two-fold from levels prior to 2008. Each year since completion, more than 5 million sockeye fry have been produced and released into the Baker Basin reservoirs. By comparison, PSE’s previous Baker River fish-culture facility, which slowly expanded from its start in the early 1970s, could produce about 1.7 million fry per year.



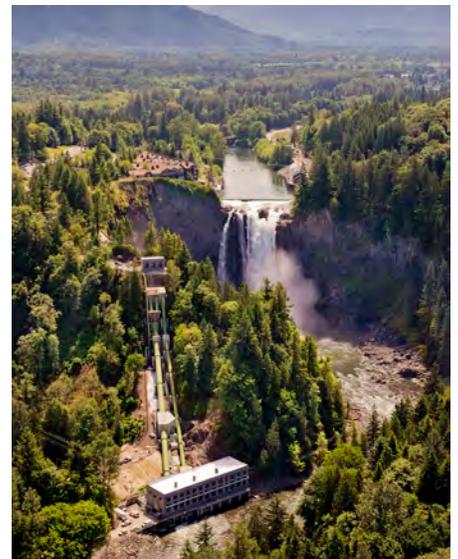
▲ Baker River fish hatchery

Snoqualmie Falls Hydroelectric Project

The Snoqualmie Falls Hydroelectric Project is PSE’s oldest power-generating operation and the world’s first completely underground power plant. The facility, located along the Snoqualmie River in Snoqualmie, Washington, about 30 miles east of Seattle, recently underwent a four-year redevelopment project, which included substantial upgrades and enhancements to the power-generating infrastructure and public recreational facilities.

Because the falls provide a natural barrier, PSE’s fish program doesn’t need to be as extensive as the one at Baker River. Here’s how PSE protects fish at Snoqualmie Falls:

- Minimum instream flows in the Plant 1 tailrace and the plunge pool below the falls
- Modified the Plant 1 and Plant 2 tailraces to prevent the stranding of fish in these areas
- Manage the project operations to meet the rate of river-level fluctuations
- Included bypass valves at the new Plant 2 to help manage ramping of the units
- Funded the Snoqualmie River Game Fish Enhancement Plan and study conducted by the Washington Department of Fish and Wildlife – a comprehensive inventory and ecological study of the fishery resources in the upper Snoqualmie River watershed.



▲ Snoqualmie Falls hydroelectric project