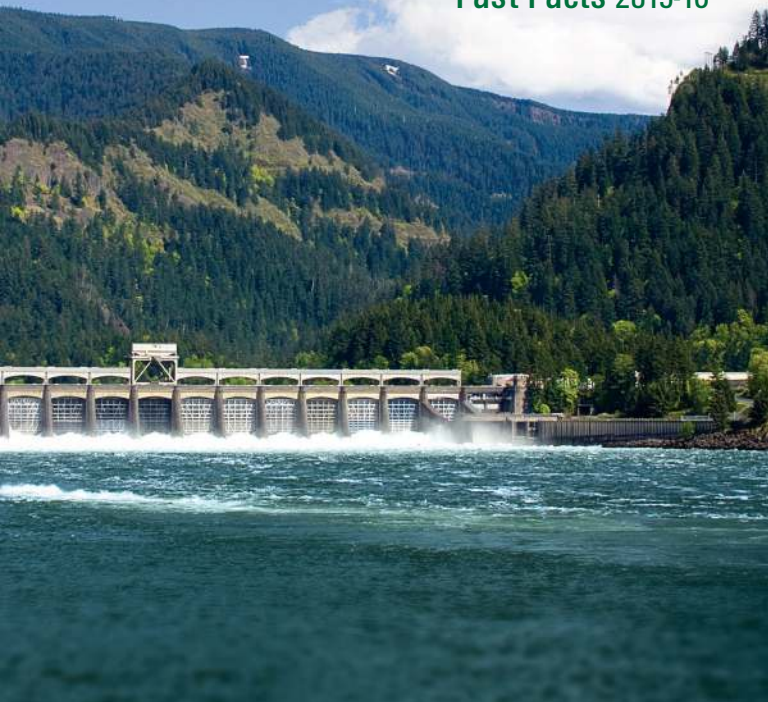


Northwest RiverPartners

For salmon, our economy and quality of life

Northwest Hydropower and Columbia Basin River Benefits

Fast Facts 2015-16





CLEAN HYDRO

Northwest RiverPartners is an alliance of farmers, utilities, ports and businesses that promotes

- Hydroelectricity generation as the region's premier clean, renewable, and reliable resource;
- the economic and environmental benefits of the Columbia and Snake rivers; and
- fish and wildlife policies and programs based on sound science.

RiverPartners' 120 member organizations represent more than 4 million electric utility customers, 40,000 farmers, thousands of port employees, and large and small businesses that provide hundreds of thousands of Northwest jobs.

RiverPartners promotes all of the benefits of these working rivers, including fish and wildlife, clean and renewable hydropower, water for agriculture, flood control, river commerce and recreation.

For a list of the RiverPartners' board of directors and members, and facts and news on the Northwest's hydropower system, salmon and related issues, go to www.nwriverpartners.org and www.cleanhydro.com.

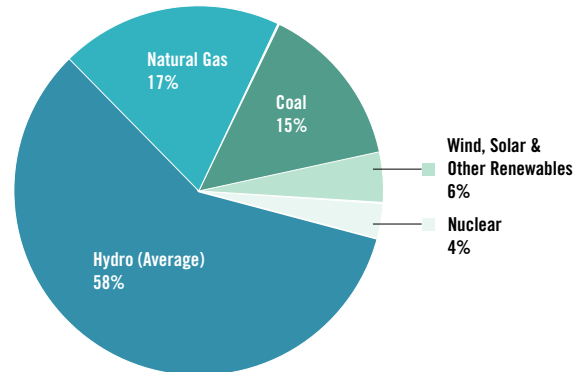
Rich in Hydropower

The Northwest today is an oasis of clean, renewable energy, the result of its hydro heritage.

- Northwest dams provide nearly 60 percent of the region's electricity under normal rain and snow conditions. Almost two-thirds of that output comes from federal hydroelectric projects on the Columbia and Snake Rivers.
- Overall, Northwest dams produce about 14,000 average megawatts of electricity every year under normal precipitation, equivalent to powering more than 11 cities the size of Seattle on average every year.
- About 95 percent of the region's hydroelectric power supply comes from Columbia River Basin dams.

Northwest Utility Firm Resources

Source: 2015 PNUCC Northwest Regional Forecast (average water conditions)



Columbia River Basin



Map Source: <http://www.lrf.org/AboutLR/ColBasinMap.html>

- The Columbia River is the largest river in the Pacific Northwest flowing from the Rocky Mountains in Canada into Washington before emptying into the Pacific Ocean. Its drainage basin is roughly the size of France extending into seven U.S. states and a Canadian province.
- The dams on the Columbia River and its tributaries produce more electricity than any other North American river and account for 40 percent of all U.S. hydropower.
- Several very large storage dams in Canada and the Columbia Basin provide critical flood control benefits and allow the release of the stored water to generate electricity when needed.
- The Snake River is the largest tributary of the Columbia River. Its drainage encompasses parts of six U.S. states.
- There are more than 100 private dams in the Northwest. The federal government owns and operates 31; the remaining dams are owned by private and public utilities.
- The federal dams on the Columbia and Snake rivers are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation, and the Bonneville Power Administration markets the power they produce to Northwest utilities throughout the West.
- The eight federal dams on the lower mainstem Columbia and Snake rivers alone provide the region with about 4,300 megawatts of firm (consistently available) energy under normal precipitation, enough to power almost four cities the size of Seattle.

Hydropower's Many Attributes

Renewable and Clean

- Hydroelectricity is the original northwest renewable resource. Dams store water from melting snow and rainfall in reservoirs, which is then released and passes through turbines to generate electricity. The water (fuel) is reused over and over as it moves downriver through multiple dams.
- Hydropower provides nearly 60% of the Northwest's electric energy and 90% of its renewable energy.
- Hydropower produces no emissions. As a result, the Northwest's energy production carbon footprint is nearly half that of other parts of the country for energy production.
- Hydropower is more efficient than any other form of electricity generation converting 90 percent of the available energy into electricity. Coal or natural gas plants are about 50 percent efficient. Wind turbines are 33 percent efficient at best.
- The "marine highway" created by the Columbia and Snake River dams is the most environmentally friendly way to move cargo, keeping 700,000 trucks off Northwest highways every year.

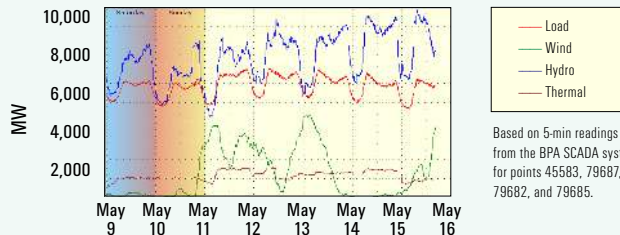


Flexible, Reliable and Affordable

- Hydro is a flexible resource available nearly instantaneously to meet the ups and downs in electricity demand. Hydro is there at the flip of a switch.
- Hydropower is a reliable energy source because it can be stored and released when needed. Even in low water conditions, hydropower can still be relied on to meet the energy needs of Northwest citizens.
- Because it can be stored, hydro is used to back-up intermittent wind or solar. Hydro generation can be quickly adjusted to follow changes in wind production, as shown below.

BPA Balancing Authority Load and Total Wind, Hydro, and Thermal Generation, 7 days

May 9, 2015 – May 15, 2015



- Hydropower helps to stabilize the transmission system and keep it reliable. High-voltage transmission lines require a steady back and forth electric flow, and flexible hydro generation meets changing conditions to ensure reliability.
- Electricity from Northwest hydropower facilities typically cost three to 10 times less (per megawatt hour) than nuclear, coal, and natural gas plants. It's also cheaper than wind and solar.

Rivers with Multiple Benefits

The Columbia Basin and dams keep clean, reliable and affordable electricity flowing into our homes and businesses, provide irrigation, control catastrophic flood waters, and help move locally grown food and other products destined for the Northwest and the world.

Agriculture

- The Northwest has a rich agricultural landscape with a variety of farmed crops including wheat, barley, potatoes, corn, peas, lentils, alfalfa, apples, grapes and more.
- Six percent of the Columbia River Basin's yearly runoff is used to irrigate about 7.8 million acres of Northwest farmland. Idaho has the region's most irrigated acreage with over 3 million acres. Washington and Oregon have a combined 3.3 million acres of irrigated farmland.
- Greater irrigation efficiency in the Columbia River Basin has decreased water use by 10 to 25 percent per acre over the last decade.
- The Northwest's economy is greatly enhanced by irrigated agricultural land that would otherwise be too dry to farm successfully. Northwest crops are nurtured with water stored behind dams.
- Annual net earned income from Northwest agriculture production exceeds \$8 billion.



Commerce and Jobs

- High technology firms such as Apple, Amazon, Intel, Google and Facebook have located facilities in the Northwest because of the availability of reliable, clean hydropower, creating jobs and boosting local economies.
- Traditional energy-intensive industries, such as timber, paper, chemical, food processing, aluminum and manufacturing, all representing hundreds of thousands of Northwest jobs, continue to rely on low-cost hydro to stay in business and prosper.
- The Columbia and Snake rivers provide a 465-mile navigable river highway, with 36 deep water and inland ports and locks through the dams for transporting Northwest goods and products, fueling the Northwest's economy.
- More than 42 million tons of commercial cargo, valued at over \$20 billion, is moved down the Columbia and Snake rivers annually.
- The Northwest is ranked as the nation's #1 U.S. export gateway for wheat and barley, #1 on the West Coast for wood exports and #2 on the West Coast for automobile imports.
- Tourism from river cruise ships brings \$15 to \$20 million annually to local economies.
- A study by the Columbia River ports identified 40,000 port-related Northwest jobs. Firms that ship cargo via the Columbia River employ an additional 59,000 workers.

Snake River Dams Provide Irreplaceable Benefits

Flood Control

- Prior to the federal dams on the Columbia and Willamette rivers, Portland and other cities and towns were subject to severe flooding. Controlling flood waters in the Columbia River became a high priority in 1948 when Vanport, Oregon was destroyed in a late spring deluge.
- The Army Corps of Engineers responded to the devastation by developing a reservoir storage plan for the Columbia River Basin.
- A 1964 treaty with Canada led to the development of millions of acre-feet of water storage for flood control and power generation. Reservoir storage in the Northwest and British Columbia is used to prevent floods in the Columbia River Basin.
- In February, 1996, when floods threatened Portland, Oregon, dam operations on the Columbia and Willamette Rivers kept the river level a foot to a foot and a half lower than it would have been otherwise. Estimates show that flood control operations saved the region \$3.2 billion from what would have been devastating flood damage.



The four federal dams on the lower Snake River provide clean renewable energy to meet Northwest power needs, stabilize the region's transmission system and keep carbon emissions down. Yet, some have called for their removal. Consider the facts:

- Together, the Snake River dams supply 12 percent of all the energy produced on average by the entire federal hydro system and 5 percent of the Northwest's total hydro energy. This is enough electricity to power a city the size of Seattle every year.
- According to the Northwest Power and Conservation Council, without the Snake River dams, 3.0 to 4.5 million tons of CO₂ would be added into the air every year.
- Much of the year, the Bonneville Power Administration relies on the four Snake River dams to produce energy when it is most needed: to meet customers' "peak" needs.
- The locks at the Snake River dams allow agricultural goods to be shipped downstream, further reducing high carbon emissions from trucks and train transportation.
- The Snake River dams help in dealing with power emergencies, providing 2,650 megawatts of energy for 10 hours a day up to five days. They also help keep the Northwest's transmission system stable.
- It would take two nuclear, three coal-fired, or six gas-fired power plants to replace the average annual power produced by the four lower Snake River dams.

Strong Laws to Protect Fish and Wildlife

Dam operators are required by several federal laws to lessen the impact of hydro operations on fish, wildlife, water quality and the surrounding environment. As examples:

- The 1980 Northwest Power Act calls for moderating the impacts of construction and operation of the federal dams on fish and wildlife.
- The Mitchell Act of 1938 required fish hatcheries be built and maintained throughout the Northwest to compensate for the impacts dams have had on commercial, sport and tribal salmon harvests.
- The 1972 Clean Water Act provided the Environmental Protection Agency with authority to address river pollutants, temperatures, and dissolved gas levels (created by high river flows and spilling water over the dams) that can be harmful to fish and wildlife.
- The 1973 Endangered Species Act requires dam operators to address impacts of operations on species listed for protection. There are 13 species of Columbia Basin salmon and steelhead listed under the ESA.



A lot more than water flows from these rivers.

The Salmon Plan

The 2014 federal salmon plan (called the Federal Columbia River Power System Biological Opinion) addresses the dams' impacts on salmon listed for protection under the ESA. It was developed and is being implemented by agencies and tribes, and it is working to protect salmon.

The BiOp is the most comprehensive plan for a species anywhere in the nation and is comprised of many actions. Highlights include:

- New fish protection technologies have been installed at all eight dams, including fish bypass systems, screens and slides to help young fish migrate downstream to the ocean.
- Hydro system operations have been modified to increase flows and the spill of water through the dams to move young fish downstream faster. Storage reservoirs used for irrigation now release additional water to help increase river flows downstream for fish.
- The plan includes \$1 billion in funding to Northwest states and tribes for habitat improvements in river tributaries and the Columbia River estuary to repair and enhance spawning and rearing grounds for salmon.
- The plan calls for improvements to hatcheries to address their impacts on salmon. Currently over \$45 million is spent annually for hatcheries to support commercial, sport and tribal harvest.

Northwest families and businesses pay for fish and wildlife mitigation activities through their electricity bills. About 15 to 20 percent of a typical utility bill goes to fish and wildlife programs.

Great Outlook for Salmon

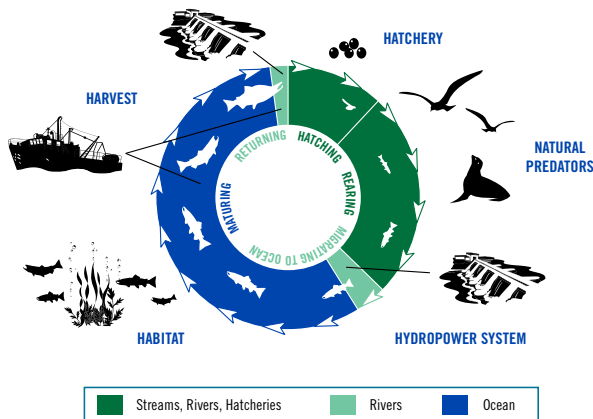
Many factors have contributed to declines in Northwest salmon populations. Overfishing, lack of passage at dams, loss of habitat from logging and urban growth, poor ocean conditions, bird and sea lion predation, and hatchery practices have been major culprits. However, improvements at the dams and in their operations, habitat restoration, hatchery reforms and good ocean conditions are working together to benefit salmon:

- Today there are more fish in the Columbia River than at any time since the first lower Columbia mainstem dam was built at Bonneville in 1938. Many are hatchery fish, but wild populations are trending upward too.

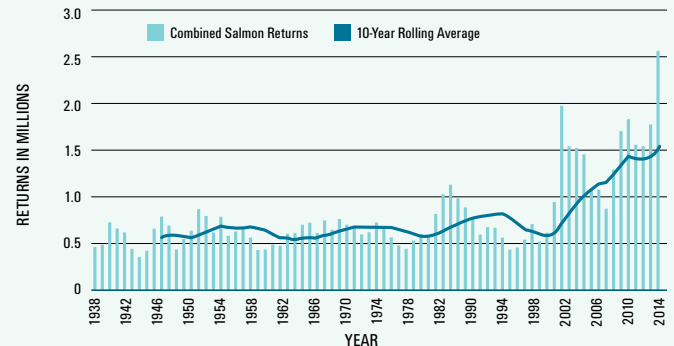
- In 2014, over 2.5 million adult salmon and steelhead passed Bonneville Dam, setting a new overall record since counts began in 1938.
- Of the fish returning in 2014, the sockeye, fall chinook, and coho were record or near-record runs, including the Snake River stocks.
- In 2014, young salmon survived the downstream trip through each of the eight federal dams at a high survival rate of 97% on average
- Snake River sockeye, on the brink of extinction in the 1990s, have been rebuilding. Nearly 3,000 sockeye passed Lower Granite Dam in 2014, trumping the previous record of 2,201 in 2010.

For fish run data, go to www.cbr.washington.edu/dart.

Salmon life cycle and habitat



Combined Chinook, coho, sockeye and steelhead returns (adult and jack) to Bonneville Dam



Northwest RiverPartners

For salmon, our economy and quality of life



Northwest RiverPartners

101 SW Main, Suite 1605 • Portland, OR 97204

503-274-7792

For additional resources, go to
www.riverpartners.org or www.cleanhydro.com.