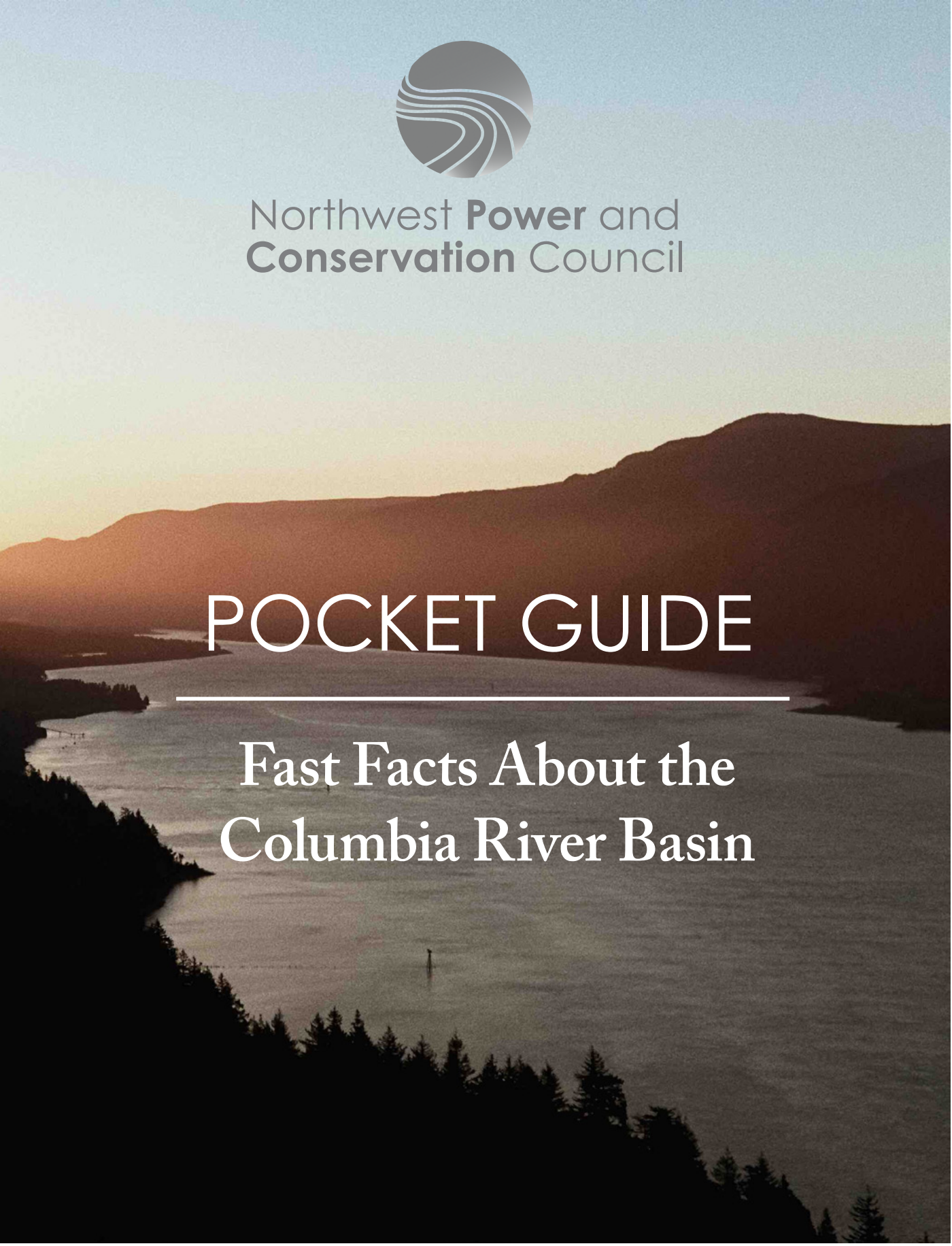


Northwest **Power** and
Conservation Council

POCKET GUIDE

Fast Facts About the Columbia River Basin

2018 Edition

The Northwest Power and Conservation Council was authorized by Congress through the 1980 Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act)

to give the citizens of **Idaho, Montana, Oregon,** and **Washington** a stronger voice in determining the future of key resources common to all four states – namely, the electricity generated at, and fish and wildlife affected by, the Columbia River Basin hydropower dams.

The Council is a unique organization that helps the Pacific Northwest make critical decisions that balance the multiple uses of the Columbia River and its tributaries.

Public Responsibilities

The principal duties of the Council under the Act are to:

1. **Develop a regional power plan to assure the Northwest an adequate, efficient, economical, and reliable power supply.**
2. **Develop a fish and wildlife program as part of the power plan to protect, mitigate, and enhance fish and wildlife affected by hydroelectric development in the Columbia River Basin, and make annual funding recommendations to the Bonneville Power Administration for projects to implement the program.**
3. **Encourage broad public participation in these processes and inform the public about regional issues.**

Council Organization

The Council was authorized by Congress through enactment of the 1980 Northwest Power Act (Public Law 96-501) and approved by a vote of the legislatures in all four states. The governor of each state appoints two members to serve on the Council.

The Council is funded by wholesale power-sales revenues from the Bonneville Power Administration, the federal agency that markets the electricity generated at federal dams in the Columbia River Basin.

The plans the Council develops and approves are implemented by numerous agencies, including: Bonneville; the U.S. Army Corps of Engineers; the Bureau of Reclamation; the Federal Energy Regulatory Commission; electric utilities; and state fish and wildlife and energy regulatory agencies.

State, tribal, and local governments work closely with the Council as it develops its power plan and fish and wildlife program. The plan and program are updated at least every five years.

Council Priorities

- In addition to developing the power plan, work with regional interests to meet energy efficiency and generating resource goals, and analyze: 1) regional electricity demand, capacity, flexibility, and reliability; 2) the regional electricity market; and 3) interactions between fish and wildlife and the Columbia River hydropower system.
- In addition to developing the fish and wildlife program (more than $250 million annually, 350 projects), utilize panels of independent scientists and economists to inform decision-making and improve and discipline the region's efforts to protect and restore fish and wildlife.
- Develop and maintain comprehensive programs to educate and inform the public about major regional power and fish and wildlife issues and obtain feedback, and encourage regional cooperation on activities that support the Power Act.

Columbia River Basin

- The Columbia River Basin includes parts of Washington, Oregon, Idaho, Montana, Wyoming, Utah, Nevada, and British Columbia – 259,000 square miles (671,000 square kilometers), an area the size of France.
- The river and its tributaries are the dominant water system in the Pacific Northwest.
- The Columbia is 1,243 miles (2,000 kilometers) long.

- The Columbia originates at Columbia Lake, British Columbia, and about 25 percent of the river flow comes from Canada, with a portion of that amount contributed by rivers in Northwestern Montana.
- The largest tributary is the Snake River, which is 1,036 miles (1,670 kilometers) long.
- The Columbia is a snow-charged river that fluctuates seasonally and annually in volume.
- Average annual runoff at its mouth is about 192 million acre-feet.
- The highest volumes of water flow between April and September. The lowest volumes are from December to February.
- From its source at 2,650 feet (808 meters) above sea level, the river falls an average of more than two feet per mile before reaching the ocean.

- Humans have lived along the river for more than 10,000 years, with a large increase in population when Euro-American settlers arrived in the 1800s.
- Fourteen dams span the mainstem Columbia from Bonneville Dam at river mile 146 to Mica Dam in British Columbia at river mile 1,018.
- Dams in the Columbia River Basin (U.S. and British Columbia) are capable of storing 55.8 million acre-feet of water (42 million acre-feet is releasable), or about 22 percent of the average annual flow of the river at the mouth.

Fish and Wildlife

Five species of Pacific salmon – chum, sockeye, coho, Chinook, and from time to time a small number of pink salmon – and two species of anadromous (ocean-going) trout – steelhead and sea-run cutthroat – are found in the Columbia River Basin.

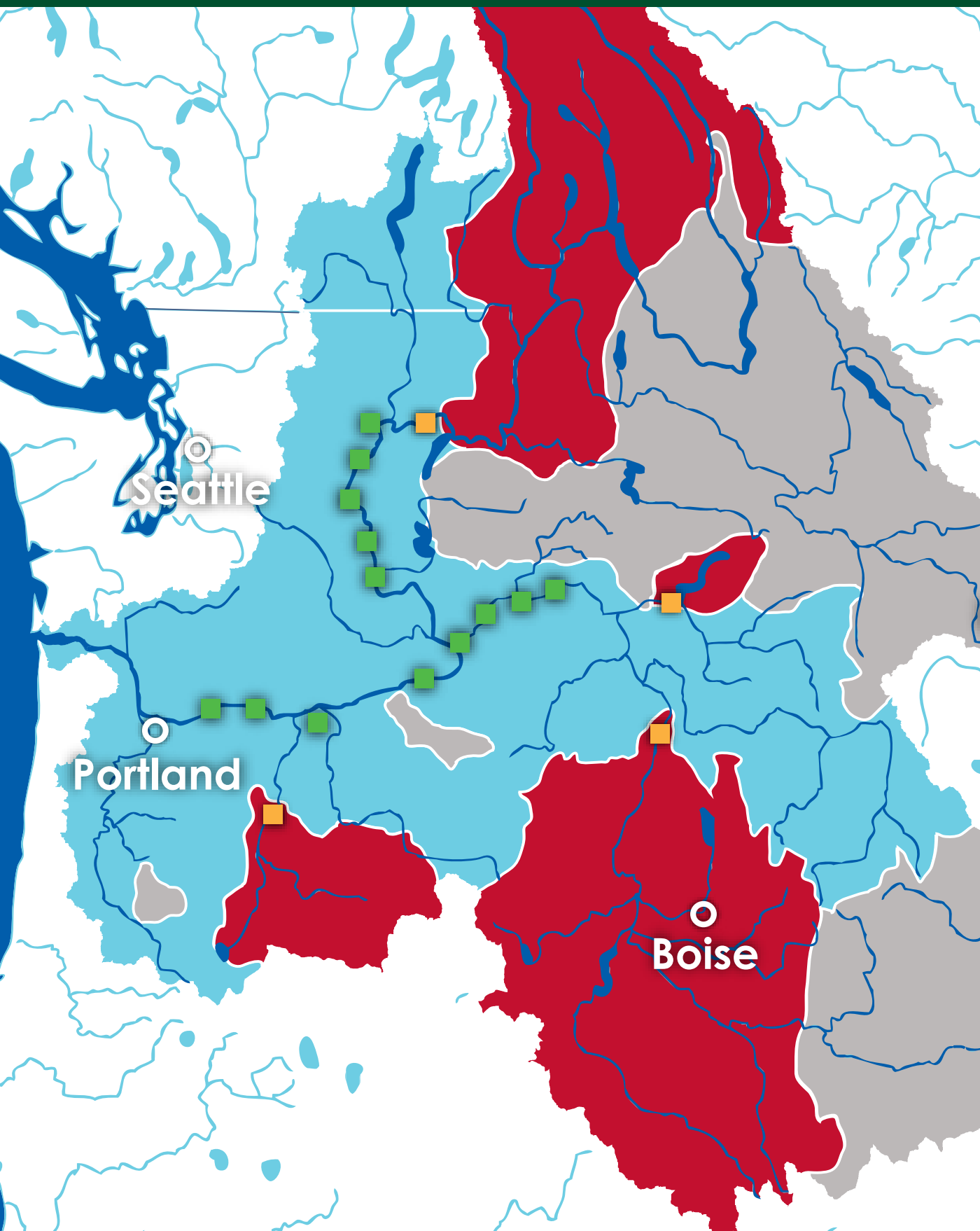
Anadromous fish have existed in the river for about 12 million years. Historic annual runs of salmon and steelhead were believed to have

numbered 5.5-9.3 million fish at the mouth of the river, according to the Independent Scientific Advisory Board, which serves NOAA Fisheries, Columbia River Indian tribes, and the Northwest Power and Conservation Council.

The lower Columbia River once had one of the largest salmon-canning industries in the world. The number of canneries, most of them located near Astoria, Oregon, peaked at 40 in the 1880s. By the early 20th century, overfishing and habitat degradation had depleted the runs, particularly spring and summer runs of Chinook salmon, consumer preferences changed, and fish production and processing declined steadily as a result. The last major cannery on the river closed in 1980.

Fish counting at Bonneville Dam, the first dam inland from the ocean, began in 1938 when the dam was completed. In the first five years of counting, salmon and steelhead runs averaged 597,350 fish per year at the dam. Today, the runs are 1.5-2.5 million at the dam. The Bonneville

Map of the Columbia River B



Basin

Of the original salmon and steelhead habitat available in the Columbia River Basin, **55 percent** of the area and **31 percent** of the stream miles have been blocked by dam construction.

- Areas blocked by dams
- Areas blocked by natural obstructions
- Areas open to anadromous fish
- Major dams that block fish passage
- Major dams that allow fish passage

counts do not include runs in Columbia River tributaries downstream of the dam. Also, harvests of fish in the river downstream of the dam are lower today than when the dam was built.

Columbia River Basin resident fish spend their entire life cycle in freshwater and include warm water species such as bass and walleye, and coldwater species such as cutthroat trout, bull trout, and kokanee. Hydropower development also affected a diverse mixture of wildlife, including song birds, deer, elk, moose, turtles, squirrels, rabbits, and many other species. The Council's fish and wildlife program mitigates the impacts of hydropower on these species, as well as on anadromous fish such as salmon and steelhead.

In 1988, the Council designated 44,000 miles of river and stream reaches in the Columbia River Basin as "protected areas" where hydroelectric development is prohibited in order to protect fish and wildlife.

Regional Power System

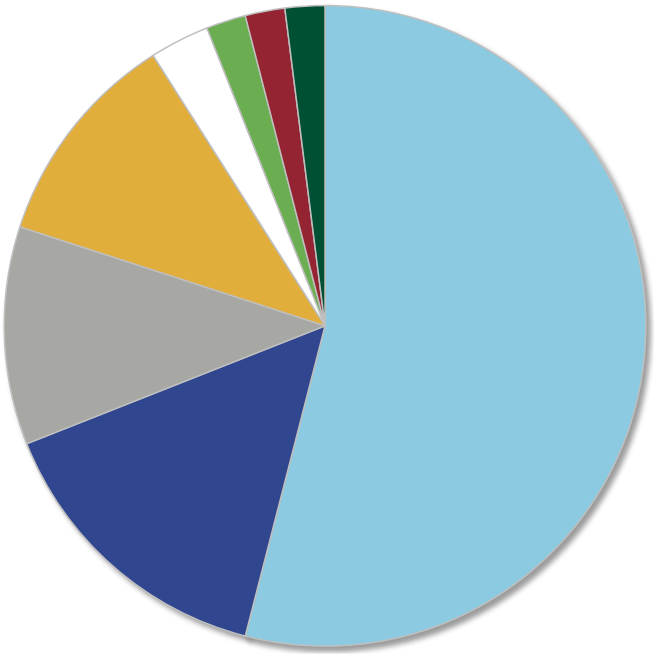
In this guide we rely on two terms to measure electricity generation and supply: capacity and annual energy. Capacity is the maximum rate that a power plant can generate electricity at full-load operation. Annual energy is the quantity of electricity that a power plant can produce over the course of a year. Capacity is measured in million-watt units called megawatts. Annual energy is measured in units called average megawatts. One average megawatt is one million watts delivered continuously 24 hours a day for a year, or 8,760 (24 x 365) megawatt-hours. One average megawatt is enough electricity to power about 850 Northwest homes for a year.

In total, interconnected power plants in the Pacific Northwest can provide 63,500 megawatts of capacity. About 54 percent (34,000 megawatts) is from hydroelectric dams. These same power plants can provide about 34,500 average megawatts of annual energy

Pacific Northwest Generating Capacity

- Hydropower (54%)
- Wind (15%)
- Coal (11%)
- Natural Gas Baseload (11%)
- Natural Gas Peaking (3%)
- Biomass (2%)
- Nuclear (2%)
- Other (2%)

63,500 total megawatts

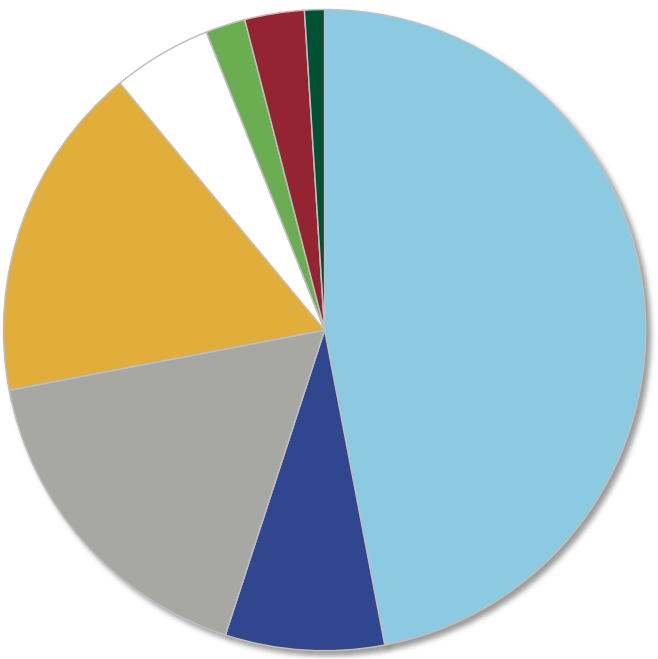


(This chart shows the maximum possible contribution of each resource to the regional power supply.)

Pacific Northwest Annual Energy Generation

- Hydropower (47%)
- Wind (8%)
- Coal (17%)
- Natural Gas Baseload (17%)
- Natural Gas Peaking (5%)
- Biomass (2%)
- Nuclear (3%)
- Other (1%)

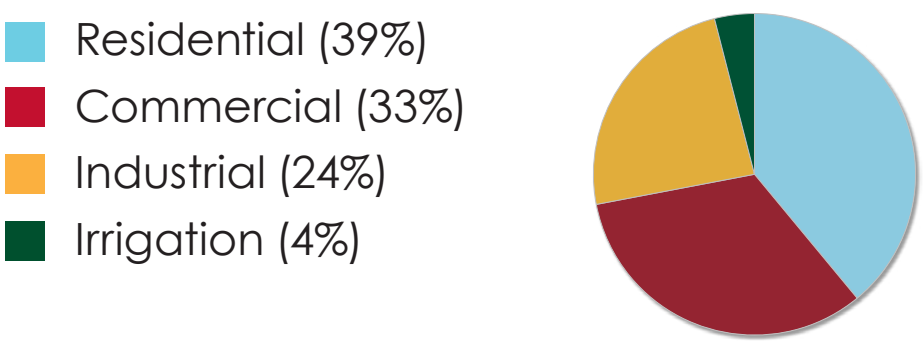
34,500 avg megawatts



(47 percent, or about 16,000 average megawatts, from hydropower). The Federal Columbia River Power System of dams and one non-federal nuclear power plant provides about 23,700 megawatts of the total capacity and about 10,300 average megawatts of the average annual energy.

- Approximately 95 percent of the region's hydroelectric power supply comes from dams in the Columbia River Basin, federal and non-federal combined.
- It takes about 1,100 average megawatts of electricity to power a city the size of Seattle.

Pacific Northwest Energy Loads by Sector



20,283 avg megawatts

- Grand Coulee Dam (1941) has the greatest generating capacity of any dam in the United States at 6,809 megawatts.
- The Pacific Northwest is one of the best wind resource areas in North America, particularly the mostly untapped central Montana region.
- Wind turbines account for over 9,000 megawatts of capacity and 2,500 average megawatts of energy (including wind plants in Wyoming that serve load in the Northwest).
- The Bonneville Power Administration owns and operates more than three-fourths of the high-voltage transmission grid in the Pacific Northwest.
- The total transmission system in circuit miles is 15,328.

Energy Efficiency

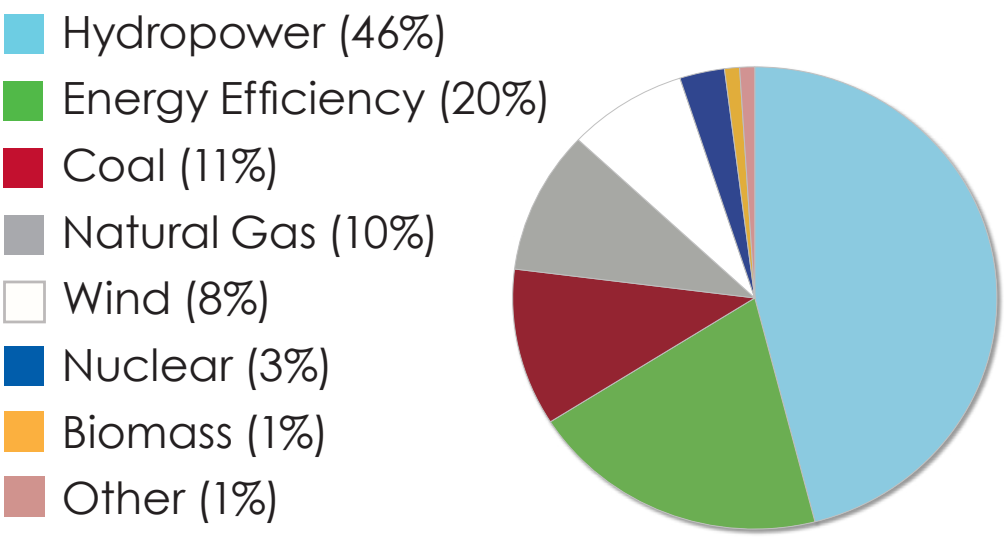
Since 1978, the region has reduced electricity demand by more than 6,600 average megawatts through energy-efficiency measures.

The average cost of energy efficiency is less than 2.4 cents per kilowatt-hour, which is less expensive than running an existing gas-fired plant and much less expensive than constructing a new gas plant.

The Council's 2015 assessment of the remaining energy efficiency potential in the region identified approximately 4,300 average megawatts over 20 years at a cost less than $100 per megawatt-hour, compared to 5,700 at that same cost in the Council's Sixth Northwest Power Plan (2010).

The Northwest invests about twice the national average share (3.0 percent versus 1.2 percent) of its retail electricity revenues in energy efficiency.

Pacific Northwest Energy Resources, **Including Energy Efficiency**



33,056 avg megawatts

Expressed as electricity, 6,600 average megawatts is enough to meet the annual power demand of six cities the size of Seattle, or more than enough to serve all of Montana and Idaho, or roughly the equivalent power demand of 5.4 million Northwest homes. This efficiency saves Northwest ratepayers more than $4.8 billion per year compared to the average cost of generated

electricity and lowers regional carbon emissions by an estimated 35.6 million metric tons annually.

Over the past 37 years, 1980-2016, and after adjustments for weather, energy efficiency grew to become the second-largest electricity resource in the Northwest, meeting about 66 percent of the increase in the region's electricity demand during that time. Since 2012, efficiency has comprised about 17 percent of the region's electricity resources.

The chart on page 17 shows the average annual contribution to the regional power supply by major resources. The total is more than the annual loads shown on page 18 because 1) the hydropower total includes non-firm energy consumed outside the Northwest; and 2) transmission and line loses, and the demand-reducing effect of energy efficiency, are reflected in loads (page 18) and not in the actual generation (Page 17). The chart on page 22 shows the actual generation from major resources, including energy efficiency in 2016.

Agriculture

According to the U.S. Department of Agriculture (2013 Farm and Ranch Irrigation Survey), Idaho has the most irrigated acres of the four Northwest states, 6,424,081. Next is Montana, 2,502,345, followed by Washington, 3,662,524, and Oregon, 2,970,591. One acre-ft is 325,851 gallons.

In 2013, Washington ranked 17th in the nation in the total value of its agricultural products ($9.1 billion); Idaho was in 19th place ($7.8 billion); Oregon 28th ($4.8 billion), and Montana 29th ($4.2 billion).

The four states are among the top 10 producers in the nation of a variety of products, including tree fruits, nuts, grains, grass seed, hay, milk, and Christmas trees. In terms of value of agricultural products in 2013, hay, potatoes, and wheat were the biggest crops in Idaho; wheat, hay, and barley in Montana; hay, wheat, and potatoes in Oregon; and apples, wheat, and potatoes in Washington.

Navigation

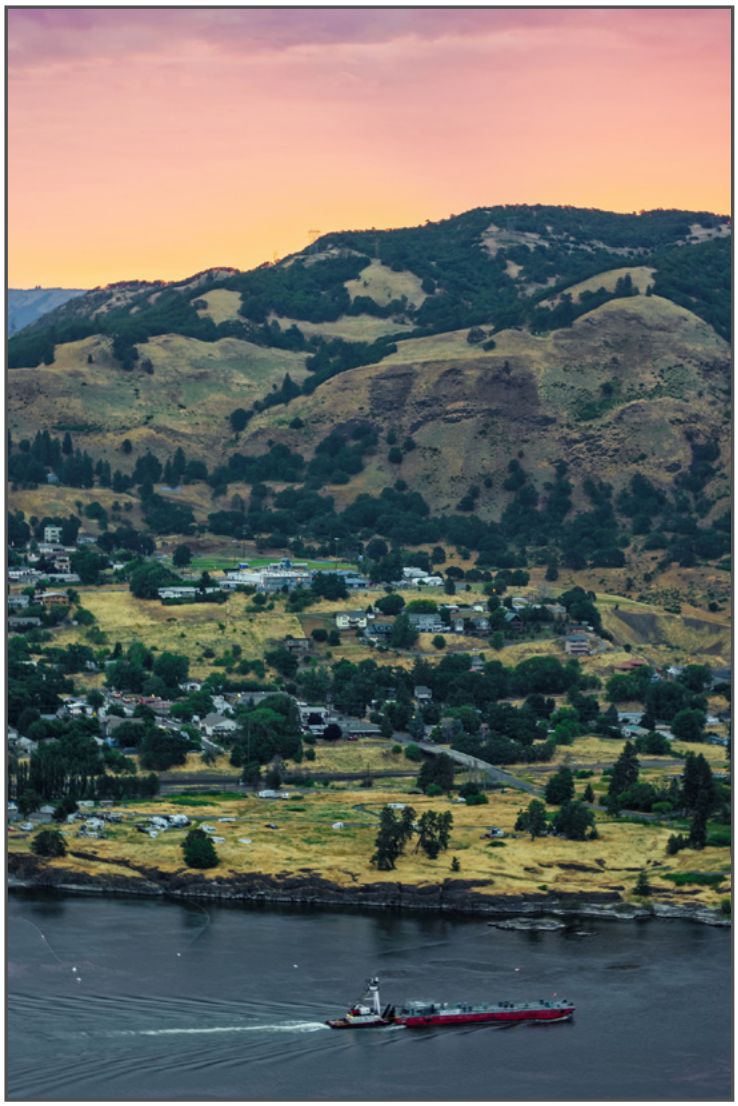
The Columbia and Snake rivers form a 465-mile transportation system with 36 deepwater and inland barge ports.

The 43-foot deep navigation channel for ocean-going vessels extends 106 miles from the ocean to Vancouver, Washington on the Columbia River, and at 40 feet for an additional 11 miles on the Willamette River into Portland.

A 359-mile inland barge system carries cargo upriver from Vancouver into eastern

Washington and Idaho.

According to the Pacific Northwest Waterways Association, more than 50 million tons of cargo – worth $24 billion – is transported through the system. It's the third largest grain gateway in the world, moving wheat, soy, and corn, as well as wood products and mineral bulks like potash and soda ash. It's also a major destination for auto imports and exports.



Flood Control

In 1948, flood control became a priority after Vanport, Oregon, north of Portland along the Columbia River, was destroyed in a flood in late May and early June. The U.S. Army Corps of Engineers responded by developing a multiple-use reservoir storage plan for the Columbia River Basin.

In February 1996, the region was reminded of the importance of flood control when heavy rains combined with warm temperatures and nearly saturated soil from more than three months of above-normal precipitation caused severe flooding west of the Cascade Mountains, particularly along the Willamette and Columbia rivers. Government agencies and non-federal dam operators worked together to reduce flood damage by an estimated $3.2 billion.

Major flood-control dams in the Columbia River Basin are Mica, Keenleyside, and Duncan in Canada, and Libby, Hungry Horse, Grand Coulee, and Dworshak in the United States.

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