



a better
environment,
a better future

BPA's environmental stewardship in the Pacific Northwest







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a resource
steward

Proud to serve the Northwest

A fish jumps. Another darts out from under a ledge, snatches a floating speck and disappears. Birds sing. Wind ripples the water.

This scene repeats daily in streams and creeks throughout the Pacific Northwest as young salmon grow, waiting for their great migration to the sea.

But these particular salmon are not in a creek; they're in the Yakama Nation's Cle Elum Hatchery of central Washington, where technology mimics nature. Soon, they'll be planted in local streams to keep growing on their own, waiting to ride next spring's runoff to the Pacific. Most of those who return two or three years later will spawn naturally and help recover a once-depleted salmon run.

The tribal hatchery is the centerpiece of a successful decades-long effort to restore wild, harvestable salmon runs to central Washington's Yakima Basin. It's also a good example of what's happening across the Northwest through the environmental stewardship of the Bonneville Power Administration. BPA is part of and proud to serve the Pacific Northwest.

BPA is a steward of the Northwest's federal hydroelectric system.

Since 1937, BPA has been a steward of the Northwest's federal hydroelectric system. The 1980 Northwest Power Act increased BPA's role in protecting and enhancing the

environment while still providing power at cost. BPA sees its job as providing an environmentally sustainable engine of the Northwest's economic prosperity.

Under this mandate BPA has:

- Invested more than \$8 billion to protect fish and wildlife affected by the hydro system or transmission grid, now funding more than 350 fish and wildlife projects each year.
- Invested more than \$2 billion in energy conservation, adding enough energy conservation to the region's power sources to supply a city the size of Portland, Ore.
- Facilitated the Northwest's emergence as a major national producer of wind power and purchased the output from six wind projects.
- Delayed the need to build new transmission lines through energy conservation, high-tech additions to the grid and other non-wires alternatives.

BPA's annual budget runs about \$3 billion. Environmental responsibilities are an important part of this whole. BPA operates as a not-for-profit federal agency and is funded not by tax dollars but by the power and transmission services it sells to Northwest utilities. Northwest citizens pay for BPA's programs through their electricity bills. This brochure summarizes what citizens are getting through BPA's environmental stewardship.

The river is a valuable public resource.

A network of regional partnerships

Regional cooperation is a long tradition in operation of the Northwest's power system. Since the 1960s, BPA and Northwest utilities have coordinated water releases from their various dams and other resources to allow optimum use of the system's



About BPA

The Bonneville Power Administration is a federal agency under the U.S. Department of Energy. BPA markets wholesale electrical power and operates three-fourths of the high-voltage transmission grid in the Pacific Northwest.

The power comes from the Federal Columbia River Power System — 31 federal hydro projects owned by the U.S. Army Corps of Engineers and the Bureau of Reclamation — plus one nonfederal nuclear plant owned by Energy Northwest and several other small nonfederal power plants. About 35 percent of the electric power used in the Northwest comes from BPA.

BPA is a self-financed public agency. It pays its way through power and transmission sales, primarily to Northwest utilities. Both power and transmission are sold at cost, and BPA repays any borrowing from the U.S. Treasury with interest. BPA also sells or exchanges power with utilities in Canada and the Western United States.



renewed
by nature

water and storage for power production within constraints for flood control, fish protection, irrigation, navigation, recreation and other river uses.

Organizations and citizens throughout the region help make the federal power system work for the common good. BPA's regional partners include:

- The U.S. Army Corps of Engineers and Bureau of Reclamation, which own and operate the region's federal dams;
- Northwest utilities that own other dams, power plants and transmission lines;
- The interstate Northwest Power and Conservation Council, which produces the region's power plan and a regional fish and wildlife program;
- Sovereign tribal governments;
- State energy, water resources, land use and fish and wildlife agencies;
- Nonprofit organizations; and

- Individual citizens who participate in BPA programs for energy conservation, wildlife restoration or right-of-way maintenance.

Especially on environmental undertakings, collaboration among the federal agencies, states, tribes and other interested parties is an important element of success.

The Northwest's renewable power base

Renewable resources rely on fuel naturally replenished by nature, such as wind, sun, rain and snow.

The power system is fueled by annual snowpack and runoff of the Columbia River.

The Northwest's power system is fueled by the annual snowpack and runoff of the Columbia River, from its source high in the Rocky Mountains of British Columbia through Bonneville Dam near

Portland, Ore. The Northwest gets more of its electricity from renewable resources than any other area of the country. In an average year, three-fourths of the region's electricity comes from falling water — hydro-power — and significant amounts of wind power are beginning to come on line as well.

Because it's fueled by water, the Northwest's hydro base does not produce air pollution, avoiding the equivalent greenhouse gas emissions of more than 10 million cars on the road.

The Northwest's power system is the cleanest in the nation.

Federal dams provide the lion's share of the region's hydropower. BPA invests millions of dollars a year through the U.S. Army Corps of Engineers and the Bureau of Reclamation to improve the efficiency of federal dams, so that they can

produce more electricity with each passing drop of water, and to reduce impacts on fish and wildlife. BPA supports the Corps and Reclamation in non-toxic, environmentally compatible operation and maintenance practices at the dams and funds monitoring and preservation of tribal cultural resources at the major federal reservoirs.

Our clean-energy mandate

The 1980 Northwest Power Act expanded BPA's role in the Northwest, allowing the agency to build on the Northwest's federal power resource base. Congress set priorities for the kinds of resources BPA should acquire:

- 1) Energy conservation;
- 2) Renewable resources;
- 3) Cogeneration (using one steam source to do industrial work and to make electricity); and
- 4) Nonrenewable power sources, such as coal, natural gas and nuclear.

Working with the Council and the region's utilities, BPA has made the Northwest a world leader in treating energy conservation as a power resource and integrating large amounts of wind energy into the power system. The Northwest's power system is the cleanest in the nation.

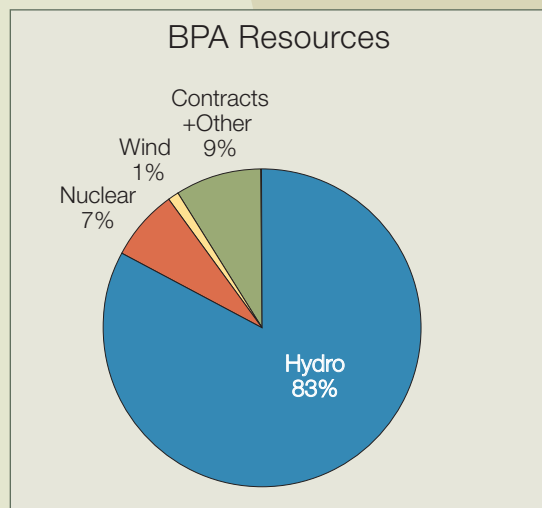
Conservation comes first

In the 25 years since the Northwest Power Act, BPA conservation programs have saved more than 1,000 average megawatts annually, as much electricity as a large nuclear plant produces. The agency has promoted energy-efficient building codes and influenced the market emergence of energy-efficient appliances.

Today, BPA and its utility customers add enough additional energy conservation each year to serve a city the size of Richland, Wash. The savings occur throughout the region



BPA conservation programs save enough electricity to serve a city the size of Portland, Ore.



None of BPA's major power sources causes air-pollution.



Compact fluorescent light bulbs use less energy.



clean
energy

and in all sectors of the economy. Savings are captured throughly in energy-efficient home construction, low-income weatherization programs, industries switching to energy-saving variable-speed motors and consumers using BPA coupons to replace old-fashioned light bulbs with energy-saving compact fluorescent lights. In 2006, BPA was named a national champion of energy efficiency by the American Council for an Energy-Efficient Economy. BPA now invests about \$80 million a year in energy efficiency, primarily through local utilities.

Adding more renewables

BPA began funding research on renewable resources nearly 30 years ago. It established a Northwest solar monitoring network in 1977, demonstrated large-scale wind power in 1980 and began publishing assessments of Northwest geothermal and wind resources in 1985.

Under the Northwest Power Act, BPA has added 198 megawatts of wind power, almost 100 megawatts of new hydropower and about half a megawatt of solar photovoltaic installations to its permanent power supply.

The Northwest
pioneered the use of
energy conservation
as an energy resource.

BPA has budgeted more than \$10 million a year in fiscal years 2007-2009 for new renewable resource facilitation — actions and investments that reduce barriers or costs to renewable resource development in the Northwest.

BPA also supports renewable resources through the independent nonprofit Bonneville Environmental Foundation. Since 1999, BPA has sold power from certified environmentally preferred resources such as wind farms at a premium.

A portion of the premium goes to BEF to fund small-scale renewable energy projects, research and development efforts and education programs in the Northwest. For fiscal years 2007-2009, BPA has committed to reinvest the remainder of the premiums in renewable resource research, development and demonstration projects. (Citizens can buy Green Tags from BEF. See www.b-e-f.org.)

Marrying wind with hydro

The Columbia River system helps realize the potential of wind power. When the wind blows, BPA takes wind energy into its system and reduces water flows through dams, storing water for later power generation. When the wind doesn't blow, additional water is released to generate power.

Today, the Northwest is one of the fastest growing areas in the nation for wind power. Wind farms in the

region have expanded from two in 1998 to a dozen today. By the end of 2007, wind power capacity in the Northwest should reach 2,178 megawatts. Wind is going from ½ of 1 percent to 5 percent of the region's power capacity in just a few years, with more to come.

The Northwest is one of the fastest growing areas in the nation for wind power.

As more wind enters BPA's system, new techniques beyond hydro flexibility may be needed to mesh growing wind resources effectively into the power system. BPA and the Northwest Power and Conservation Council are cosponsoring a Northwest Wind Integration Action Plan to identify steps to effectively integrate large amounts of wind into the Northwest power system.

High wires, low impact

In the West's wide-open spaces, transmission lines are key to carrying electricity from remote dams and wind farms to cities. The trick is to assure reliable transmission with as little impact and as little cost as possible.

BPA provides about three-fourths of the Northwest's high-voltage transmission grid and about one-tenth of the grid for the Western United States, Alberta, British Columbia and a small portion of Mexico. Like the hydro system, this grid is deeply interconnected with similar facilities owned by other Western utilities. Under Federal Energy Regulatory Commission regulations, BPA's transmission grid, like that of other major utilities, serves as a common carrier for all major transmission users on a nondiscriminatory open-access basis.



Stateline wind turbines on Vansycle Ridge on the Washington-Oregon border.



BPA integrates new renewable resources, such as solar, into its transmission grid.



Farmers in the Columbia Basin are adding wind to their cash crops.



treasured
landscape

Seeking alternatives to wires in the air

The best way to avoid the environmental impacts of new transmission lines is to make the best possible use of the lines that already exist. Since the late 1980s, BPA has first sought, and sometimes found, alternatives to new transmission lines. It calls this approach its “non-wires solutions.”

In 1989, faced with a need to build a new high-voltage transmission line across the Cascade Range to Puget Sound to keep the lights on, BPA joined with local utilities and others to produce an alternative approach that has so far succeeded in delaying that need. Instead, BPA and Puget Sound area utilities ramped up energy conservation programs. BPA built a new substation to tie existing lines together and also added high-tech equipment that stretched the capacity of existing lines. So far, a new cross-Cascades line is still in the distant future.

BPA considers non-wires alternatives in its transmission planning to determine when approaches such as those used in Puget Sound can reduce or delay the need for new transmission lines.

Non-wires approaches can reduce or delay the need for new transmission lines.

In one pilot project, BPA paid two paper mills and a naval base on Washington’s Olympic Peninsula to curtail their power consumption at specific times to help reduce transmission line loads. In another, BPA and the city of Ashland, Ore., are testing whether consumers will accept direct control of some appliances via the Internet, while allowing the utility to better control loads on its distribution system.

BPA’s non-wires work dovetails with the U.S. Department of Energy’s GridWise Initiative to apply advanced

transmission and distribution concepts across the country.

The non-wires approach goes beyond transmission and power resources to reshape how and when society uses power to fill societal needs at the lowest economic and environmental cost.

Building in low impacts

As power loads grow, sometimes the only way to keep the power flow reliable is to put wire in the air. In the last several years, BPA has invested more than \$1 billion in new transmission line construction and has added the first major new lines to its grid since 1987.

When a new line is necessary, BPA works with local communities, governments and citizens to mitigate the impacts on people and the environment.

BPA's new line in the Puget Sound area illustrates the challenges.

The best routes for the nine-mile Kangley-Echo Lake Project went by new subdivisions or through Seattle's municipal watershed. BPA built though the watershed next to an existing line — with full approval of the city of Seattle and kudos from the environmental community. BPA purchased offsetting habitat and habitat easements and took extreme care to avoid contaminating the water supply during and after construction.

BPA works with local communities.

In building transmission lines, BPA relocates burrowing owl nests, moves river crossings away from sensitive riparian areas and routinely sites lines to keep as low a profile as possible. It uses non-reflective conductor wire and tower steel to help equipment blend with the landscape and locates lines away from public view where possible.

Cultural resources such as tribal artifacts are a high priority. All lines are surveyed for cultural resources in advance, and lines are either rerouted or resources preserved when they are found. When unexpected resources are found during construction, construction halts until the resource is protected.

Assuring a clean system

BPA's environmental responsibilities extend throughout its transmission facilities. BPA designs its substation yards to contain any spills that might occur if a transformer, capacitor or piece of other electrical equipment fails. It switched to citrus-based cleaners for scrubbing power transformers two decades ago. BPA continues to replace toxic chemicals with nontoxic products.

In the field, BPA manages vegetation on its transmission line rights-of-way to promote low-growing plant communities that won't grow into



Flying towers by helicopter cuts construction impacts.



Replanting rights-of-way with low-growing vegetation reduces erosion and creates wildlife habitat.



improving
fish
habitat

electrical hazards. BPA works to control noxious weeds through nontoxic means wherever possible. BPA's vegetation management program has been cited as a model for the electricity industry by the North American Electric Reliability Council.

A world-class fish restoration program

Two mandates have made BPA's fish and wildlife effort one of the most complex and significant environmental restoration programs anywhere.

- In 1980, the Northwest Power Act instructed BPA to “protect, mitigate and enhance” fish and wildlife affected by construction and operation of the Federal Columbia River Power System.

Under the Act, the Northwest Power and Conservation Council develops a comprehensive Columbia Basin Fish and Wildlife Program and recommends projects to BPA for

funding. The Council's program is structured as an “all-H” approach — hydropower, habitat, hatcheries and harvest.

Fish survival is a top priority in managing the hydro system.

- Since 1991, 13 runs of Columbia River system salmon and steelhead have been listed under the Endangered Species Act. Several resident fish also have been listed. Hydro operations have been changed to protect these species. In addition, BPA funds efforts that help recover these species.

BPA integrates actions for endangered species with the broader Northwest Power Act fish and wildlife program. BPA spends about \$150 million a year on fish and wildlife projects. BPA also supports a number of fish hatcheries; pays for improvements to federal dams for fish; and manages water flows,

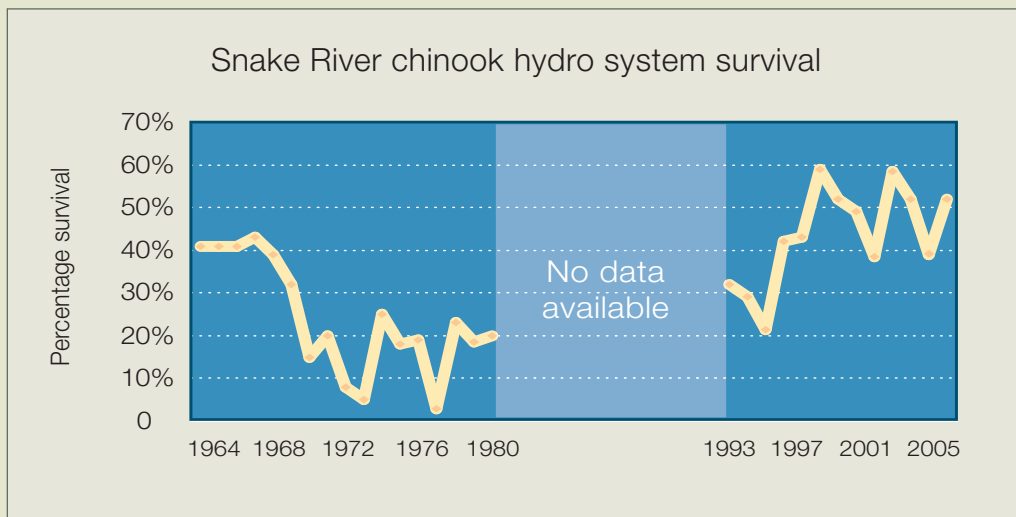
power sales and purchases to help salmon pass safely through the dams. BPA's total fish and wildlife investment is about \$700 million a year. This includes lost revenues due to fish operations and the cost of replacement power.

Fish passage through dams has improved

In the last two decades, fish passage has become a high priority in dam operation, and the dams have gone through significant redesign to allow more fish to survive their migration to and from the ocean.

And it's worked. Today, adult fish survival through the hydro system is roughly equivalent to natural conditions. About 98 percent of adult fish survive their upstream passage through the dams. Juvenile fish survival through the hydro system is as good as or better today with eight dams as it was in the 1960s when there were only four dams on the lower Columbia and Snake rivers.

Juvenile fish bypass systems now guide fish away from turbines at lower Columbia and Snake river dams. Water is spilled in spring and summer to help juvenile salmon pass the dams.



BPA-funded investments in safe fish passage are working.

Today, adult fish survival through the hydro system is roughly equivalent to natural conditions.

At some dams, new technologies such as fish slides or spillway weirs provide less stressful passage routes that send 97-99 percent of young fish successfully downstream. Similar facilities are planned for all eight lower Columbia and Snake river dams.

BPA has funded installation of selective water withdrawal systems on the U.S. Army Corps of Engineers' Dworshak Dam in Idaho and Bureau of Reclamation's Hungry Horse Dam in Montana. These systems let dam operators draw very cold water from the depths of these reservoirs to cool water temperatures downstream for salmon.



Ninety-eight percent of adult fish survive Columbia and Snake river fish ladders.



Water transactions funded by BPA help provide more streamflows.



Moving a Caspian tern colony reduced its salmon consumption. (Photo courtesy OSU-RTR)



healthy
watersheds

The water that flows through the hydro system is managed year-round with fish survival as a top priority. Operations in fall and winter position reservoirs to provide passage conditions in April through August similar to natural flow patterns to help juvenile salmon and steelhead pass through the dams and reservoirs.

Dams and reservoirs have given some predators a competitive edge over salmon and steelhead. One major predator is the Northern Pikeminnow. BPA funds a program that pays anglers to pull this fish out of the river. More than two million pikeminnow have been removed since 1990, and biologists estimate that two to four million juvenile salmon have survived annually as a result.

Birds such as Caspian terns and double-crested cormorants also consume large numbers of migrating juvenile salmon. BPA helped fund an effort led by the

U.S. Army Corps of Engineers to relocate a large colony of Caspian terns to an area where they could feed on foods other than young salmon and steelhead. The relocated terns now consume about four million juvenile salmon a year instead of the 12 million they ate in their previous location.

Each year BPA funds hundreds of projects to improve salmon habitat.

Improving watersheds for fish and wildlife

Salmon and steelhead are born and live their early lives in small streams and rivers. Much of the spawning and rearing habitat in the Columbia River Basin has been damaged over the last 150 years by logging, farming, the growth of cities and towns and many other factors.

BPA funds hundreds of projects to improve watersheds, give fish access to healthy streams and increase tributary flows. BPA funds projects that fence stream banks to keep cattle out and that replant or restore natural, winding channels to create cool, deep, shaded pools. BPA funds solar-powered pumps to provide water for cattle in the fields away from fragile stream banks. The agency has replaced fish-blocking culverts on rural roads and logging roads, restoring more than 1,400 miles of good salmon habitat. BPA also funds projects to screen fish safely out of irrigation channels.

More than 1,400 miles
of salmon habitat
have been restored.

Working with federal, state and tribal fish and wildlife agencies and local communities, BPA funds transactions administered by the National Fish and Wildlife Foundation in which

farmers and others agree to leave water in a stream when it will benefit fish instead of withdrawing water for irrigation or other uses.

Hatcheries in new roles

Hatcheries have been used to increase Columbia River salmon runs since the 1870s, when runs began their steep decline. Today, about 130 million young salmon and steelhead are released from hatcheries each year into the Columbia River and its tributaries. Hatcheries can increase opportunities for fishing, supplement depleted runs and conserve critically imperiled stocks. BPA and federal dam operators fund about two-thirds of the hatcheries in the Columbia Basin as mitigation for impacts of the federal dams.

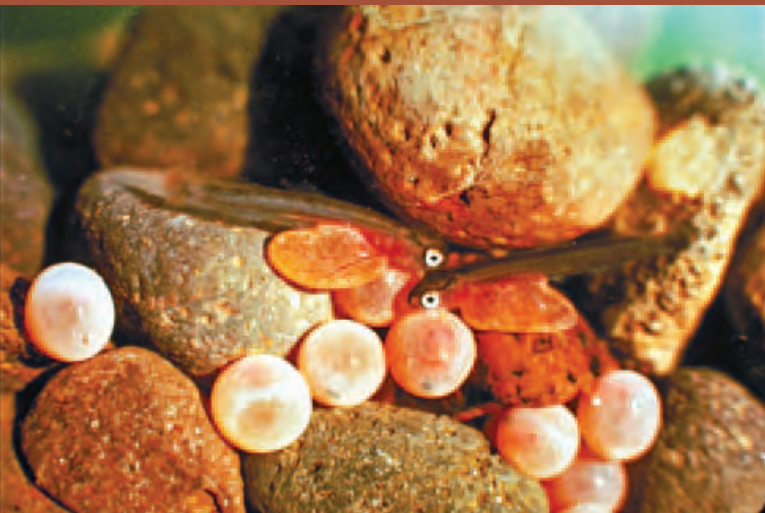
The role of hatcheries in the Columbia River system today is under debate. Some see hatcheries as critical to support harvest, while

HAPPY BIRTHDAY Vernita Bar

Chinook salmon fry emerge from their eggs in the gravel of the Vernita Bar in the mid-Columbia River. These babies are kept happily cold and wet under a blanket of water.

BPA and Grant County Public Utility District manage streamflows at Vernita Bar from fall through May to keep fish nests submerged until the fry move into deeper water. It's not natural, but it increases salmon survival rates. Natural streamflows of the Columbia vary widely with the weather. Holding streamflows steady through winter is achieved by holding water behind Grand Coulee Dam and releasing a smooth flow from there through six intervening dams.

The Vernita Bar now produces the largest run of wild chinook in the Columbia River system.





restoring
wildlife
habitat

others feel that hatcheries are not compatible with wild fish.

Traditionally, hatcheries were designed to support continued commercial, sport and tribal harvest. However, returning hatchery fish can have negative effects on populations of wild or naturally spawning fish. Various reform concepts and practices are now being implemented to reduce or eliminate the negative effects of hatcheries on naturally spawning wild fish and use them for fish recovery. BPA has funded hatchery genetic management plans for Columbia and Snake river hatcheries to advance this effort.

BPA funds a wide range of hatchery programs for anadromous and resident fish. BPA funds some federal hatchery programs, such as the 11 hatcheries of the Lower Snake River Compensation Program.

BPA also funds other state-of-the-art hatchery programs

through the Council's Fish and Wildlife Program, such as the Nez Perce Tribal Hatchery, Cle Elum Hatchery on the Yakima River, the Umatilla Hatchery to rebuild Umatilla River runs, and the Redfish Lake sockeye salmon safety net program for endangered species protection.

Harvest without harm

Harvest is managed by state agencies, NOAA Fisheries and an international commission under the Pacific Salmon Treaty between the United States and Canada.

BPA is involved in efforts to find ways to preserve the economic benefits of fishing without affecting wild fish survival. For example, BPA has funded a terminal fishery project in Young's Bay in the Columbia River estuary. Hatchery-raised coho return to the bay at a time when wild fish are not present, allowing hatchery fish to be caught there without harming wild fish.

BPA also is participating in an international program that will track tagged juvenile salmon via electronic sensors from the first dam they reach on the Columbia or Snake river, through the estuary and along the Pacific Coast. Sensors on the ocean floor will track fish movements from Cascade Head south of the Columbia to Icy Strait off southeast Alaska. This program will help scientists discern what happens to fish in the ocean.

Resident fish also need care

Many resident fish that spend their entire lives in the Columbia River system are also suffering reduced populations and need help. BPA supports many habitat projects and seasonal dam operations in Montana for bull trout, Kootenai River sturgeon, burbot and kokanee (a freshwater form of sockeye salmon).

Saving space for wildlife

After the Northwest Power Act passed, BPA funded wildlife impact assessments to document the actual impacts of each dam on wildlife. BPA mitigates for the habitat that was lost to dam construction and land inundation. So far, BPA has protected approximately 300,000 acres across the Northwest.

BPA mitigates for wildlife habitat lost to dam construction.

BPA works with the state fish and wildlife agencies, tribal governments, the U.S. Fish and Wildlife Service and nongovernmental organizations such as the Nature Conservancy, Trust for Public Lands and various land trusts. They propose projects to the Northwest Power and Conservation Council. BPA funds acquisition of land, conservation ease-

ments and grazing leases. Wildlife managers then control use of the habitat.

For example, on Craig Mountain near Lewiston, Idaho, one of the nation's most successful efforts is taking place to restore and maintain an ecosystem for wildlife habitat. In 1992, BPA purchased a 60,000-acre ranch on the mountain. Cattle grazing, logging and unrestricted recreational vehicle use had abused the land. Elk and deer herds dwindled. Noxious weeds had invaded grasslands. Mature ponderosa pine forests were stripped. Today, the mountain supports thriving populations of elk, white tail and mule deer and bighorn sheep. Other big game include black bear and cougar, Hungarian partridge, wild turkey and quail. More than 15 species living in the area enjoy protected status.



Elk



Sharp-tailed grouse



Grizzly and black bear are among the wildlife that live on BPA-protected habitat.



regional
accountability

Accountable to the Pacific Northwest

BPA is a steward of the Columbia River system, a valuable public resource. Serving society with low-cost, reliable power, accountable to and in collaboration with regional partners, BPA strives to work in ways that sustain the region's environment.

BPA is a steward of the
Columbia River system,
a valuable
public resource.

A fish slides in a long, swift current. It rides backwards down a fall and plops into swirling waters. Righting itself, the smolt continues downstream. It has just passed through Bonneville Dam and into the Columbia River estuary.

Like the fish, the region has come a long way and has a long way yet to go. Through collaborative partnerships in the region, we can achieve a healthy environment and a strong economy.

For more information

You can sign up for the monthly BPA Journal to read more about BPA news and current projects. Or, call us at 1-800-622-4520.

To learn more about BPA's service to the Pacific Northwest, go to www.bpa.gov.



There's a great and peaceful river
in a land that's fair to see,

Where the Douglas fir tree whispers
to the snowcapped mountain breeze.

Now river you can ramble
where the sun sets in the sea,

But while you're rambling river
you can do some work for me.

—Woody Guthrie, 1941

bonneville
power
administration



