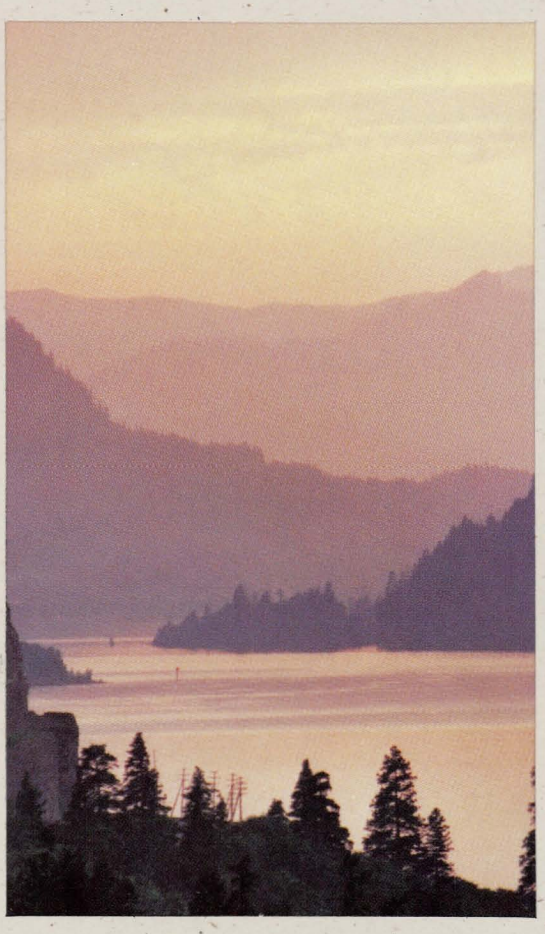


Strategy for Salmon

Northwest
Power Planning
Council

It falls to our generation to be more than river users.
We must be caretakers.

Columbia River Basin Fish and Wildlife Program

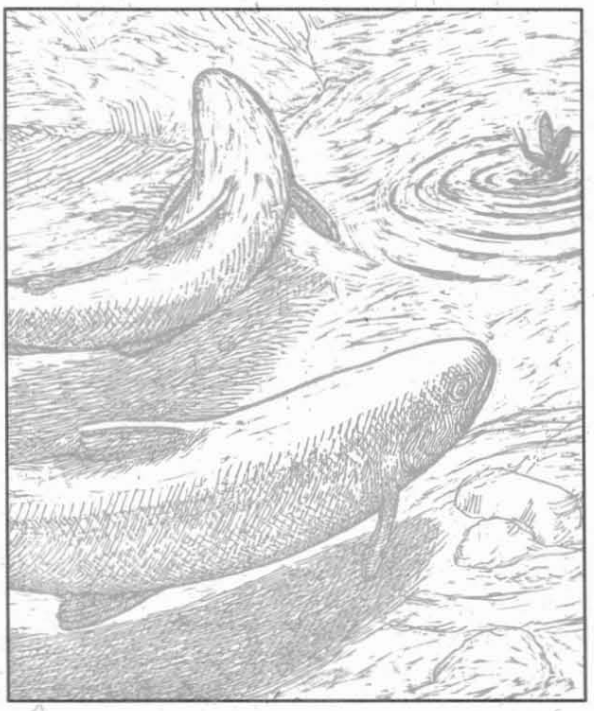
The Northwest Power Planning Council was established by an Act of Congress to develop a program to protect and enhance the Columbia Basin's fish and wildlife and a regional power plan that provides a reliable electricity supply at the lowest cost. For further information, see Pacific Northwest Electric Power Planning and Conservation Act—Public Law 96–501.

About our cover

The petroglyphs on our cover are reproductions of rock carvings on the ancient basalt cliffs overlooking Celilo Falls and the Long Narrows, an area near The Dalles, Oregon, that once was the site of the greatest fishery in the Columbia River Basin. The renderings of deer, birds, turtles and other figures are ancient evidence of human occupation along the river. That's why we chose them for our cover. For generations, people drank from the river, pulled fish from its waters and, in more recent times, irrigated crops, generated electricity and shipped products using the Columbia. Today, the cumulative effects of those uses are clear, and the river and its fish are more threatened by human activities than ever before.

The photograph is of the Columbia River Gorge near Hood River, Oregon.

A Challenge in the Columbia



No single element of the Pacific Northwest landscape is more critical to this region's economic prosperity than the Columbia River and its vast watershed—an area larger than France.

Inexpensive electricity from the Columbia's dams powers our homes, businesses and industries. Much of the bountiful agricultural industry of the Northwest depends on the Columbia's irrigation and on its barge lines to transport products to buyers. Commercial and recreational fishing is not only an industry, but also a culture along the Columbia and its tributaries. And thousands of Northwesterners use the Columbia and its tributaries for recreation.

Our prosperity has had a price: dramatically reduced salmon runs. Salmon, our most potent symbols of endurance and vigor, are now, ironically, among the region's most vulnerable species. A century ago, between 10 million and 16 million salmon returned to the Columbia each year. Today, there are only about 2.5 million salmon, and most of those return to hatcheries.

We have lost not only numbers of fish, but whole runs and more than a third of their original habitat. Additional runs could disappear entirely. As recently as 1962, nearly 30,000 adult fall chinook salmon migrated past Ice Harbor Dam on the Snake River on their way to spawn. Today, the Snake River fall chinook population hovers around 600 fish.

Salmon: The price of prosperity

The price for the region's prosperity is being paid by people, businesses and river communities that once thrived on salmon. It is a price realized in lost jobs, business failures and lost community income from business investments and tourism.

It is a price that hits Columbia Basin Indian tribes particularly hard. Salmon are important to the tribes for religious, cultural, economic and subsistence purposes. Some tribes are guaranteed the right to fish for Columbia salmon by treaties with the United States dating to 1855.

> The goal of this salmon strategy is to double Columbia River Basin adult salmon populations without losing biological diversity.

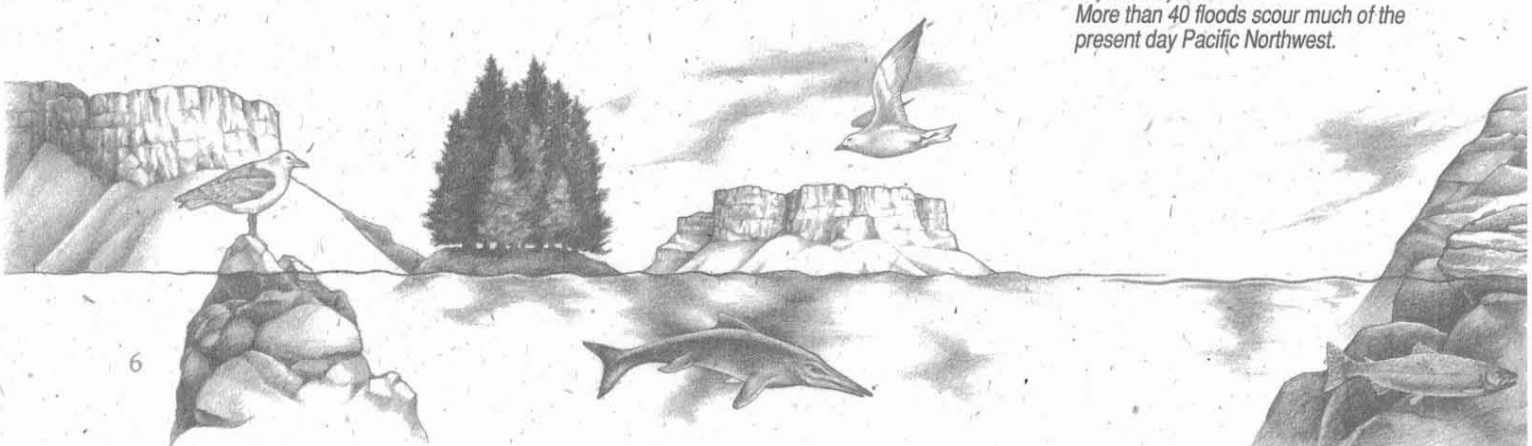
At one time, hatcheries were seen as the solution to the problem of declining salmon runs. But in the last 50 years, as hatcheries pumped millions of fish into the Columbia system and runs still declined, it became clear that hatcheries alone won't protect or rebuild salmon runs. Salmon that spawn in streams, we have learned, are critical to the ongoing survival of the species. To safeguard these naturally spawning salmon runs, we must look beyond hatcheries. We must address all of the elements that impair salmon survival.

We can rebuild salmon populations in the Columbia Basin if we act quickly, carefully and cooperatively. And we can accomplish this goal without eliminating other uses of the river, or jeopardizing our efficient and economical supply of electricity.

What follows is a comprehensive strategy that calls on everyone in the Northwest to help us double the size of salmon runs in ways that ensure continued returns for many generations. Salmon rebuilding efforts must address every stage of the salmon life cycle if they are to be effective. Otherwise, our region could invest millions of dollars on a few aspects of the problem, while the salmon are killed because of other problems.

The Pacific Northwest Through Time

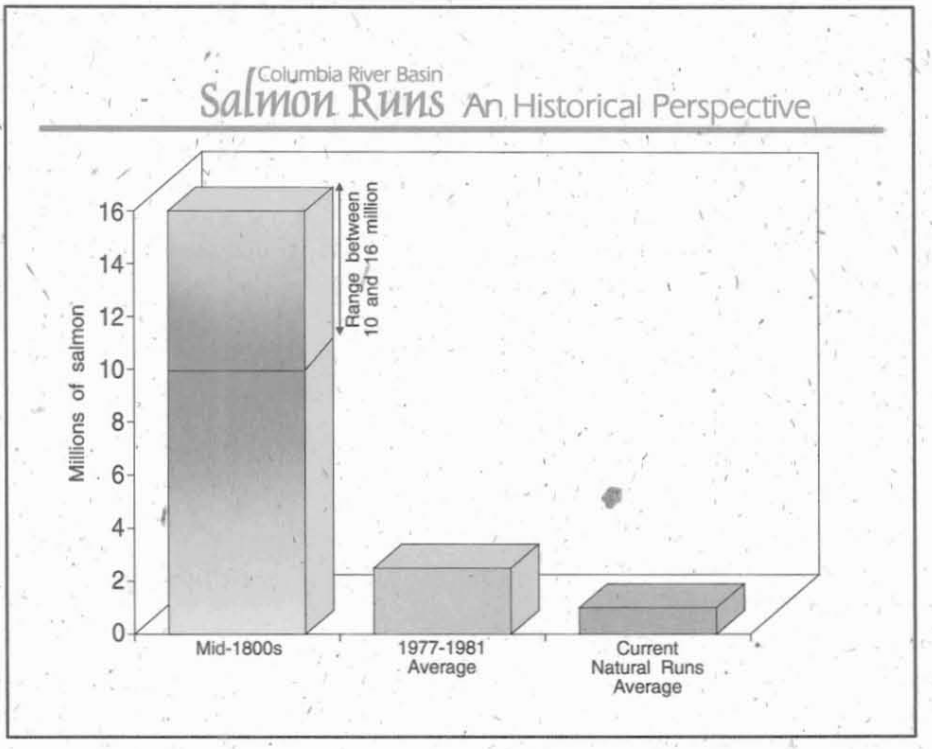
Evolution of a River Basin



13,000–10,800 B.C.
More than 40 floods scour much of the present day Pacific Northwest.

Double the runs

The principal goal of this salmon strategy is to double Columbia River Basin adult salmon populations without losing the biological diversity that now exists. The balance must be struck between multiplying numbers of fish, and preserving the survival traits and other characteristics inherent in salmon that spawn naturally in our streams.



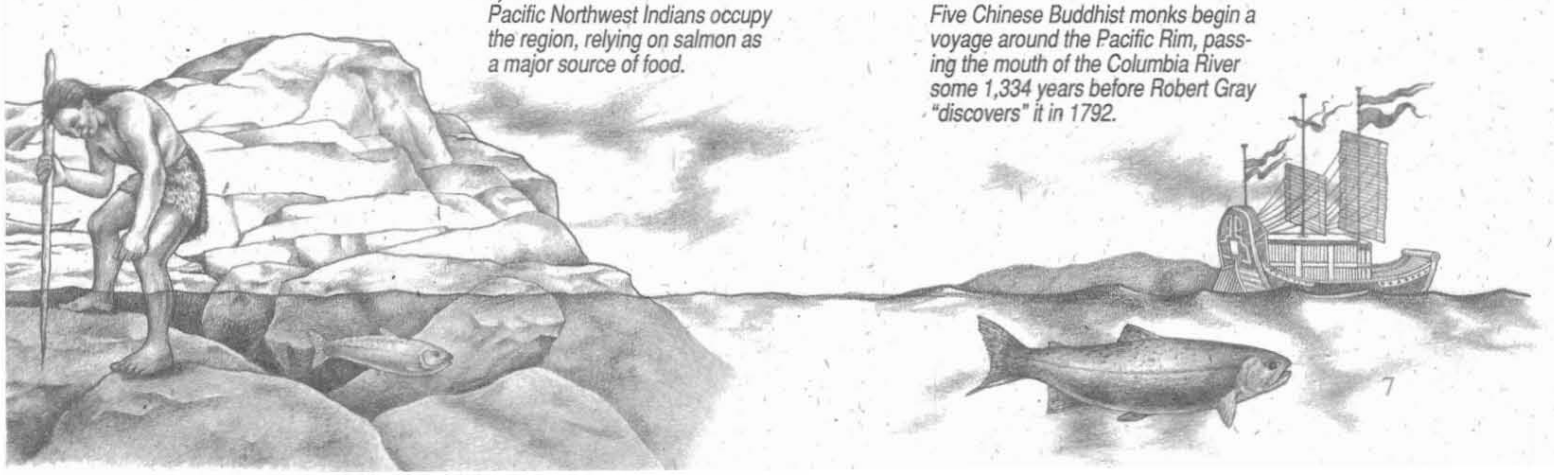
This strategy also establishes numerical targets for rapidly rebuilding salmon runs in the Snake River Basin, where the salmon decline is most dramatic. For Snake River spring chinook, that rebuilding target is 50,000 adult salmon returning to the Snake Basin. For Snake River summer chinook, the target is 20,000 adults. For fall chinook, the rebuilding target is 1,000 fish. These are ambitious, but achievable, targets if we begin to act now.

The Columbia River Basin Fish and Wildlife Program

This salmon strategy grows out of and builds upon the Northwest Power Planning Council's 10–year–old Columbia River Basin Fish and Wildlife Program. Our fish and wildlife program was the first natural resource effort to treat the entire Columbia River Basin as a single system. That program, which we developed in response to Congress' Northwest Power Act of 1980, set in motion hundreds of activities across

8,000 B.C.
Pacific Northwest Indians occupy the region, relying on salmon as a major source of food.

458 A.D.
Five Chinese Buddhist monks begin a voyage around the Pacific Rim, passing the mouth of the Columbia River some 1,334 years before Robert Gray "discovers" it in 1792.



Idaho, Montana, Oregon and Washington. All of those actions focused on protecting fish and wildlife that have suffered because of the development of hydropower in the river basin.

Many salmon runs and other wildlife have shown improvement since the program's inception. In the mid–1980s, salmon runs appeared to be rebuilding. Then a combination of factors—drought and poor ocean feeding conditions, for example—tempered those brief gains. Salmon runs in the Snake River, in particular, have plummeted.

> We can rebuild salmon populations in the Columbia Basin if we act quickly, carefully and cooperatively.

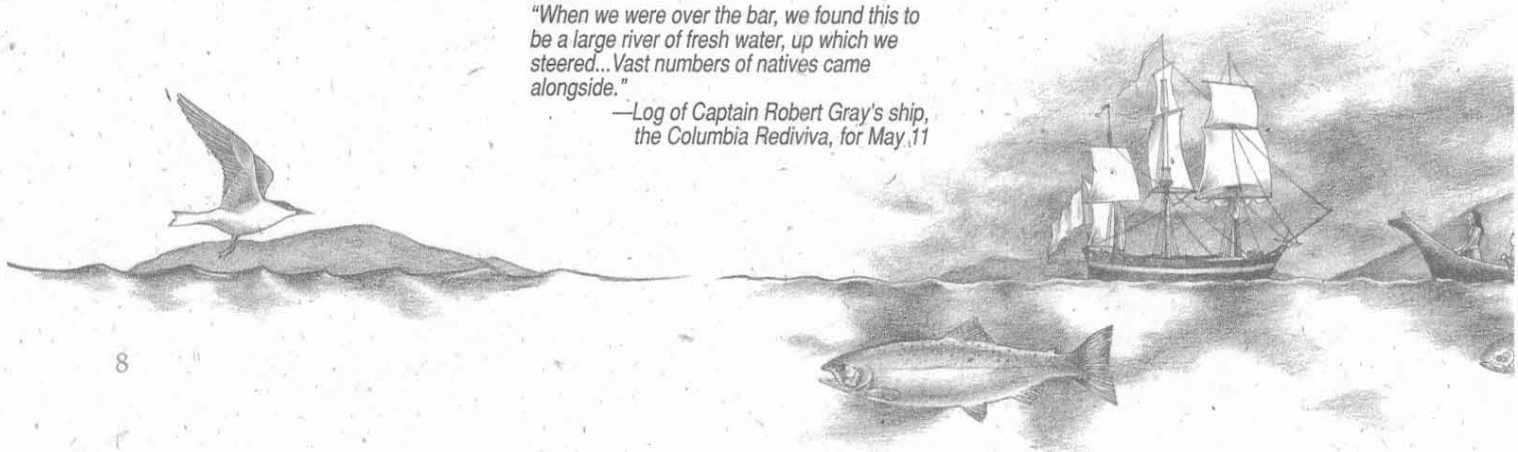
More than 100 new actions

This strategy represents an intensified focus within the Columbia River Basin Fish and Wildlife Program. It is based on a painstaking re–evaluation of the salmon's life cycle, from the time it is hatched in the gravel of freshwater streams to the time it returns to those streams to reproduce. It relies on the best available scientific understanding of the causes of the salmon's decline and calls for solutions for each problem. It integrates more than 100 near–term and longer–term actions.

Because salmon are killed in large numbers as they attempt to migrate through reservoirs and past hydropower dams, we call for higher flows and increased river speed, protective screens in front of dam turbines, new ways to operate the dams so they kill fewer salmon, controls on predators that eat salmon, and improved barge transportation of salmon to carry them past the dams.

Because so many of our fall chinook are caught in both the ocean and in the Columbia, we call for more effective control of these harvests.

1792
"When we were over the bar, we found this to be a large river of fresh water, up which we steered...Vast numbers of natives came alongside."
—Log of Captain Robert Gray's ship, the Columbia Rediviva, for May 11



Because more than a third of all the salmon habitat in the region has been blocked by dams and more has been degraded by numerous human activities, we emphasize habitat repairs that will increase the productivity of salmon in the wild.

> Salmon that spawn in streams are critical to the ongoing survival of the species.

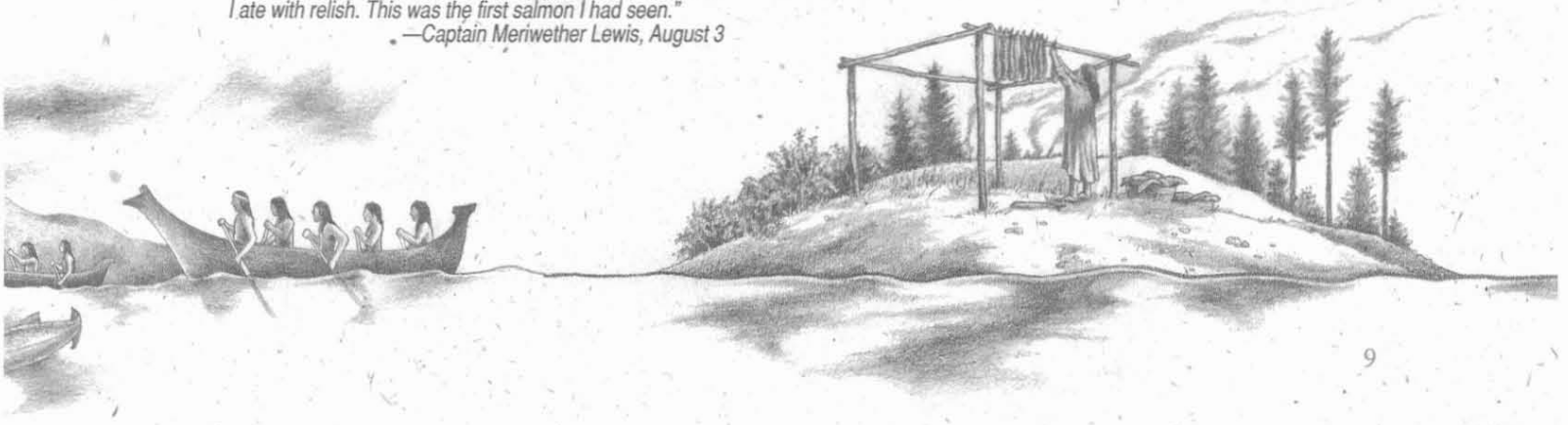
Because fish hatcheries can play an important supporting role in rebuilding salmon runs, we incorporate activities to improve hatchery practices.

Even the best available scientific knowledge can be incomplete where these fish are concerned, so our strategy also is flexible. It incorporates rigorous monitoring procedures to track and evaluate the progress of every measure. And it is designed to be reshaped as new data points up new directions to take.

Before adopting this strategy, we sought the advice of fishery experts throughout the region. We relied on the counsel of fish and wildlife agencies, water resource and land use managers, Indian tribes, utilities, dam operators, environmental groups, business organizations, commercial and sport fishers, farmers and other citizens.

Now we are asking these same groups and individuals to work with us to carry out these actions. With regional cooperation, our salmon strategy will lead to a steady rebuilding. We don't want "museum fish"—run sizes so small they only remind us of past abundance. We want sustainable and expanding populations of salmon. That is our goal: increased and diverse salmon runs that can once again contribute to the region's economy.

1805
"An Indian gave me a piece of fresh salmon roasted, which I ate with relish. This was the first salmon I had seen."
—Captain Meriwether Lewis, August 3



Without regionwide cooperation, we will have continuing decline in the runs. If this strategy fails for lack of cooperation, the region could narrow its focus to only those runs that are particularly depleted. Other runs could then worsen.

We need to act now—as a region—while we still have the chance to involve all river users in a cooperative salmon rebuilding strategy. For the sake of the salmon, we should not let this critical effort fracture into bitter disputes between river users.

> This strategy incorporates rigorous monitoring procedures to track and evaluate the progress of every measure.

Causes of the decline

Our salmon strategy does not focus blame on any one cause of the salmon's decline. Impacts occurred throughout the basin. Hydroelectric and irrigation dams—and the reservoirs they create—took a toll. They are imposing barriers that kill millions of salmon migrating to and from the ocean. Other salmon are consumed by predators at the dams.

Both commercial and sport fishing result in the loss of millions of fish each year.

Hatcheries, as was mentioned earlier, were designed as a solution, but also contribute to the problem by increasing the likelihood of diseases and adding competitor fish that can overwhelm salmon spawning in streams. Other fishery management decisions sometimes favored one salmon stock at the expense of others.

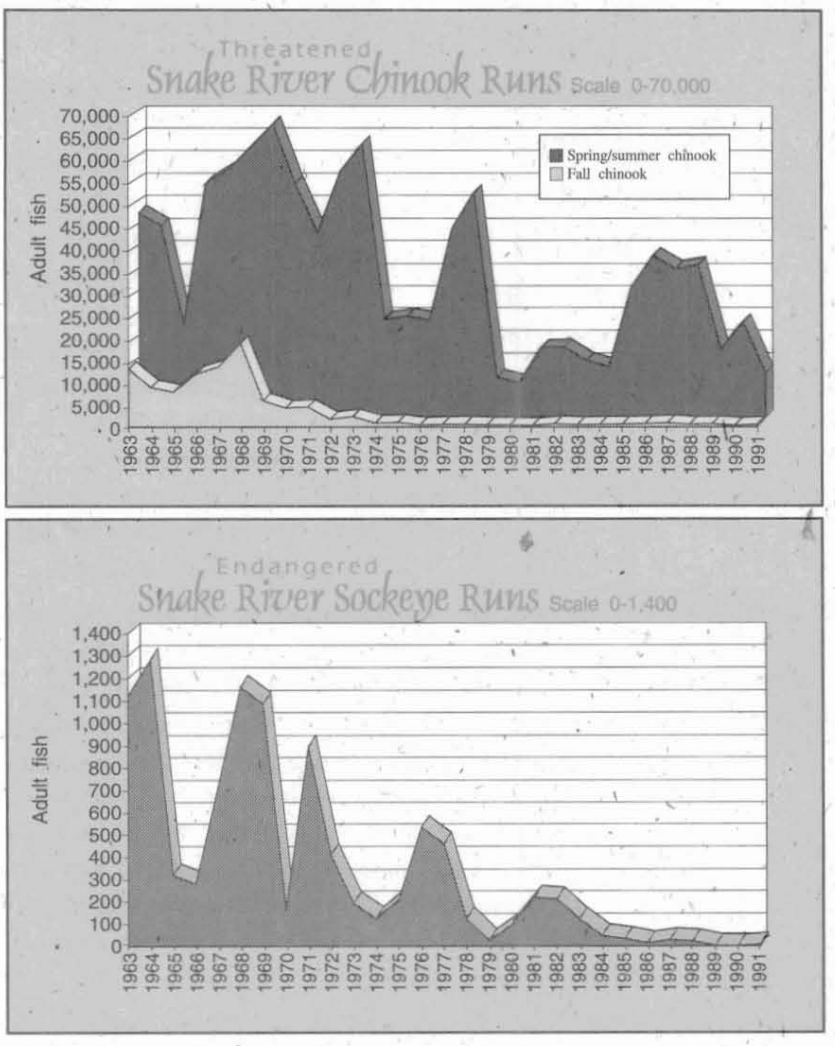
Irrigated farming leaves many streams too dry for salmon to reproduce in, and unscreened water diversions can draw fish out into fields. Logging, mining and livestock grazing destroy salmon habitat by eliminating water–protecting plants along streams and causing silt to clog spawning beds. Water use by cities and towns, and municipal and industrial pollution also limit the productivity of streams.

1806
"There was great joy with the natives last night, in consequence of the arrival of the salmon."
—Captain Meriwether Lewis, April 19

Even natural events, such as flooding, landslides and drought, inflict a toll on fish. Currently, the Northwest is experiencing a drought that has lasted nearly a decade in some parts of the basin. This has made it more difficult to provide adequate water to aid salmon migrations.

Endangered Species Act

In the late 1970s, petitions were filed to protect certain salmon runs under the federal Endangered Species Act. These petitions were deferred pending creation of the Council, and our fish and wildlife program.

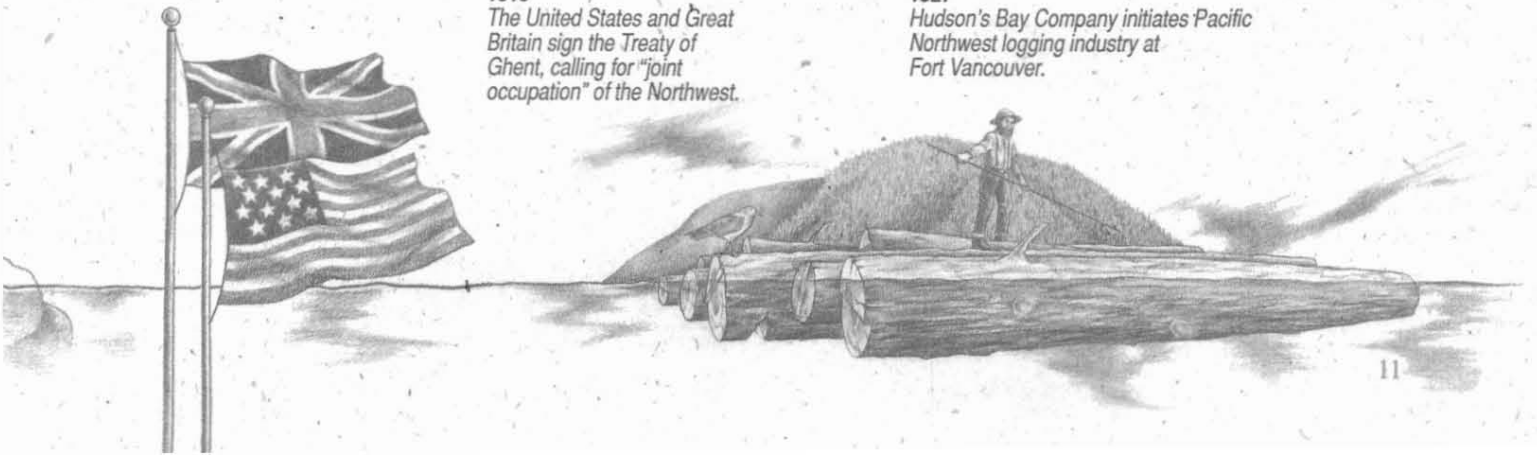


The Status of Snake River Salmon

In 1991 and 1992, Snake River runs of chinook and sockeye salmon were listed under the federal Endangered Species Act. These charts are based on fish counts at dams. Note that the sockeye run is on a different scale, given its extremely low numbers.

1818
The United States and Great Britain sign the Treaty of Ghent, calling for "joint occupation" of the Northwest.

1827
Hudson's Bay Company initiates Pacific Northwest logging industry at Fort Vancouver.



The Council's 1982 Fish and Wildlife Program contained more than 220 actions. Despite delays in implementing some parts of the program, most actions were undertaken in the mid–1980s, and the salmon rebuilding effort got under way.

Some salmon runs, particularly in eastern Washington, improved, producing some of the best runs in decades. But other runs did not improve.

In 1991, for example, only four sockeye salmon returned to spawn in Idaho's Redfish Lake. These fish swam 900 miles from the Pacific Ocean up the Columbia, Snake and Salmon rivers, past eight huge dams and finally to the lake that was named for sockeye, which turn bright red when they reach spawning age.

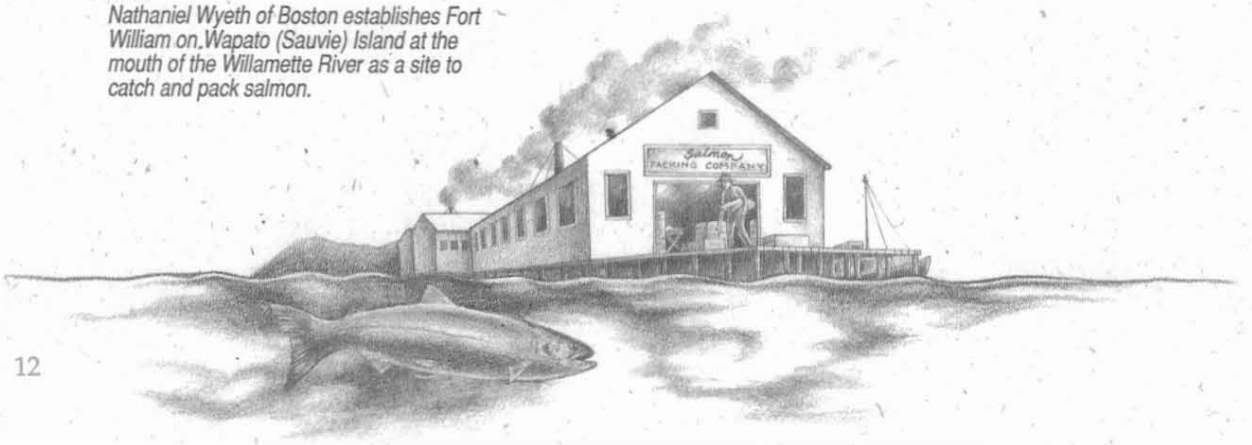
> For the sake of the salmon, we should not let this critical rebuilding effort fracture into bitter disputes between river users.

In November 1991, to no one's surprise, the National Marine Fisheries Service declared Snake River sockeye an endangered species. Five months later, after returns of Snake River spring, summer and fall chinook had declined to a total of about 10,000 fish, the Service declared them to be threatened species.

Under the Endangered Species Act, agencies of the federal government—in this case, the National Marine Fisheries Service—must devise recovery plans for animals that are listed.

This revised fish and wildlife program is, in part, our response to a request from the Northwest Governors, the region's Congressional delegation and the National Marine Fisheries Service to expand the charge we were given by the Northwest Power Act. Under the Power Act, we must address the hydropower system's effect on fish and wildlife in the Columbia Basin.

1832
Nathaniel Wyeth of Boston establishes Fort William on Wapato (Sauvie) Island at the mouth of the Willamette River as a site to catch and pack salmon.



Our new charge is more extensive. We must look at all impacts on salmon and devise a comprehensive, regionally accepted and economically balanced salmon recovery strategy.

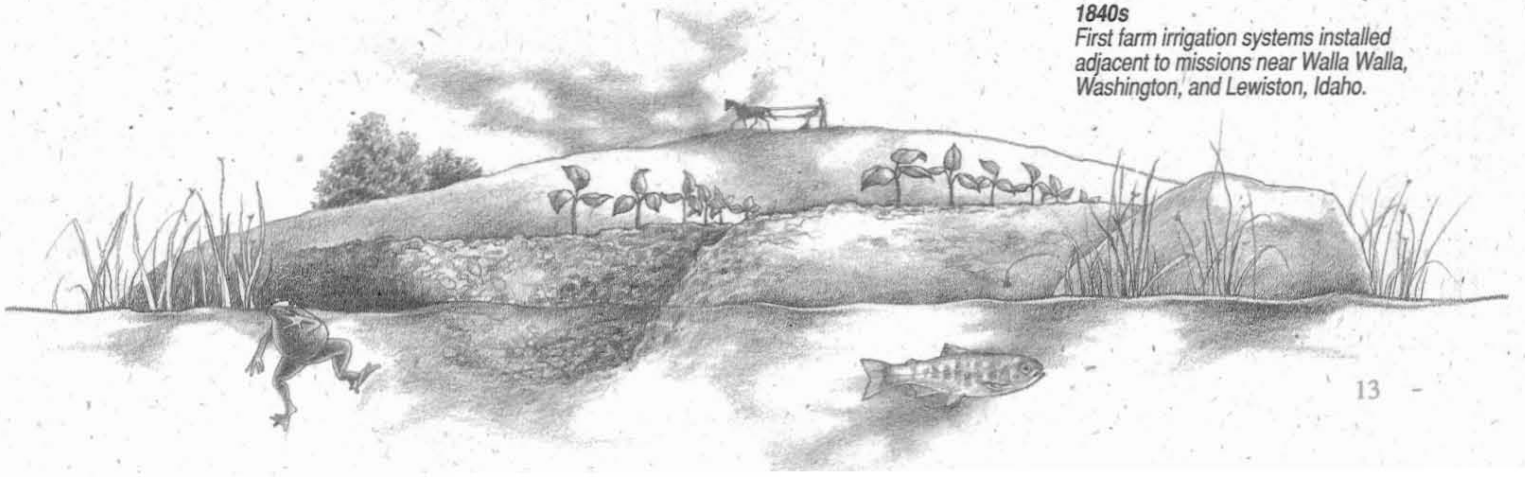
We worked closely with the National Marine Fisheries Service in developing this strategy, and the Service has pledged that it will use our amended fish and wildlife program as the foundation for its own Snake River salmon recovery plans.

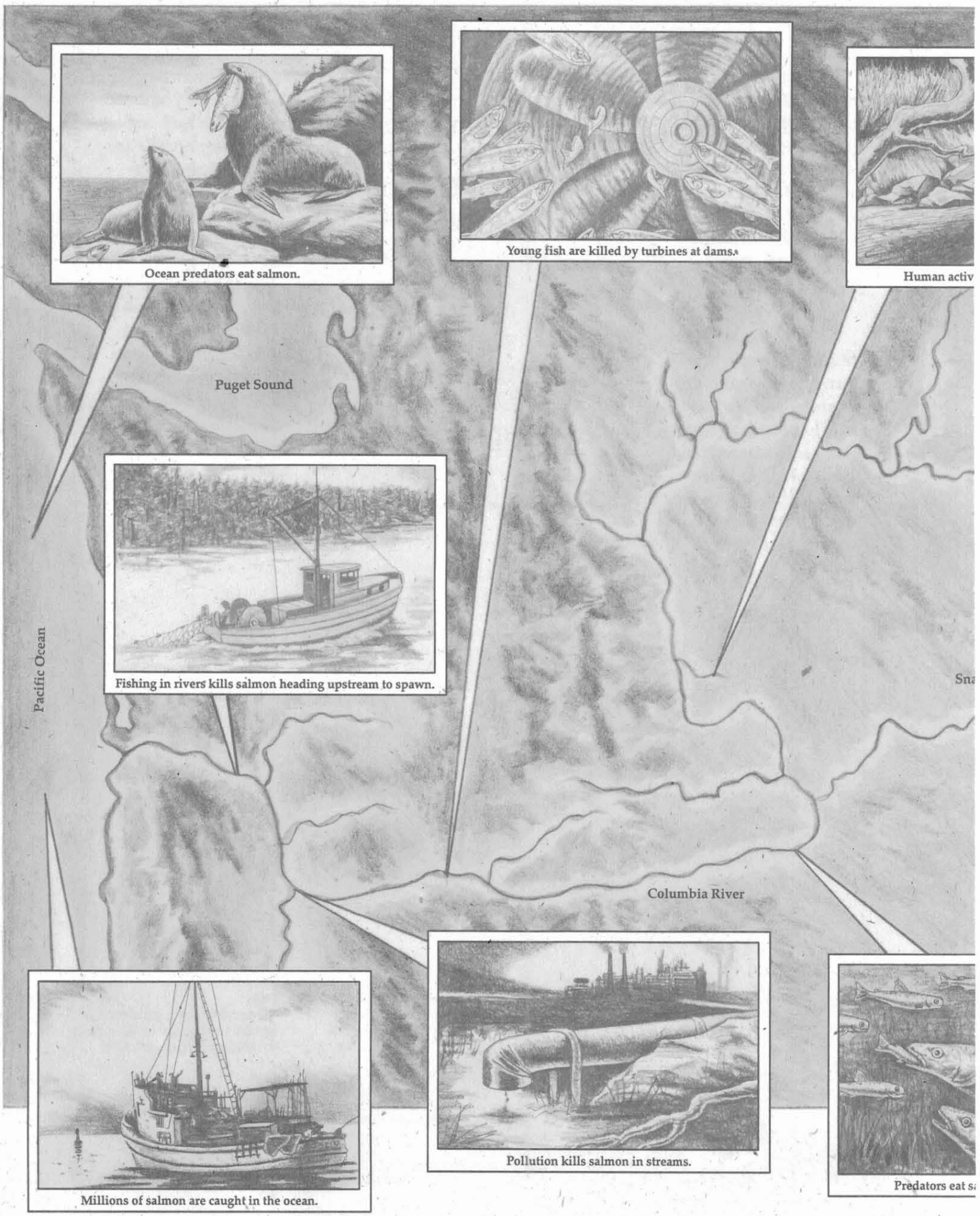
> Salmon, our most potent symbols of endurance and vigor, are now among the region's most vulnerable species.

The Council is uniquely situated to devise a regional salmon plan. We are a regional planning agency. We represent the states and Governors of Idaho, Montana, Oregon and Washington.

The Northwest Power Act directs us to develop our fish and wildlife program with the assistance of others, particularly state and federal fish and wildlife agencies and Indian tribes. This is what we have done.

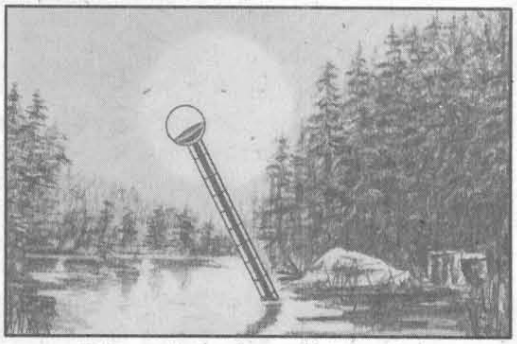
1840s
First farm irrigation systems installed adjacent to missions near Walla Walla, Washington, and Lewiston, Idaho.




Ocean predators eat salmon.
Young fish are killed by turbines at dams.
Human activ
Puget Sound
Fishing in rivers kills salmon heading upstream to spawn.
Pacific Ocean
Sna
Columbia River
Pollution kills salmon in streams.
Predators eat s
Millions of salmon are caught in the ocean.

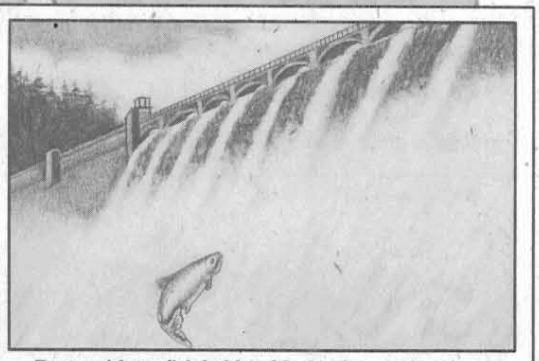
The Long Struggle of Columbia River Salmon

ies damage salmon habitat.

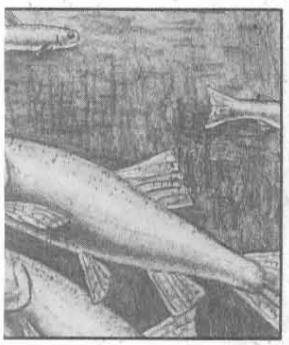


Water can be too slow and hot for salmon.

ce River



Dams without fish ladders block salmon migrations.



mon in the reservoirs.

Note: The pointers used here are graphic devices. These impacts occur throughout the basin.

From the time they are hatched to the time they die, salmon are in motion—and in peril. While still quite young, they drift on a wash of runoff that carries them down from their freshwater birthing streams to the saltwater sea. For some young salmon, this first trip of their lives can be 900 miles long. They must pass as many as nine major hydroelectric dams, where turbines can kill or stun them, leaving them easy prey for waiting predators.

Before the dams were built, the journey to the sea was a quick one, lasting a week or less. With the dams, the salmon are often stalled in reservoirs. The hazard here is a biological one. Their instinct to migrate can be lost.

Only about a quarter of the young salmon survive the first leg in their long migration.

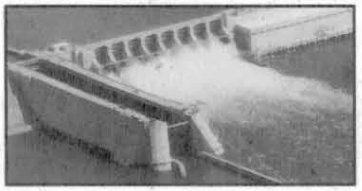
Once in the Pacific Ocean, most of the Columbia's salmon swim north, traveling thousands of miles, feeding on small sea creatures along the way. Larger sea creatures, in turn, feed on them.

In the ocean, Columbia River salmon also are the target of major commercial and sport fishing industries. By the time they turn back toward the mouth of the Columbia, only a fraction of their original number remain.

In the lowest reaches of the Columbia, fishers again await the salmon. Fish that escape capture here are the remnant hope of future runs, but they must first struggle back past the dams.

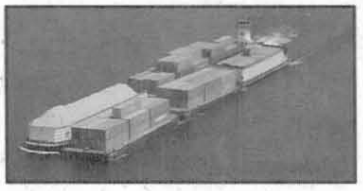
The final survivors—typically less than 1 percent of the original tiny migrants—seek the stream of their origin, where they will reproduce, then die. But more than a third of the spawning streams in the basin have been blocked off by dams that lack fish ladders. Much of the remaining habitat was degraded by siltation, pollution, excessive water temperature and the loss of spawning gravel and deep holes where salmon rest and feed. The poor condition of these streams will be the first, and last, constraint on the survival of Columbia River salmon.

The River who NEEDS it?



Hydropower—Two-thirds of the electricity used in the Northwest comes from hydropower dams. In even the driest years, the dams supply enough electricity for 12 cities the size of Seattle.

Industry—Aluminum companies use Columbia River hydropower to produce 43 percent of the U.S. aluminum supply. These companies account for 30 percent of the Bonneville Power Administration's revenues.



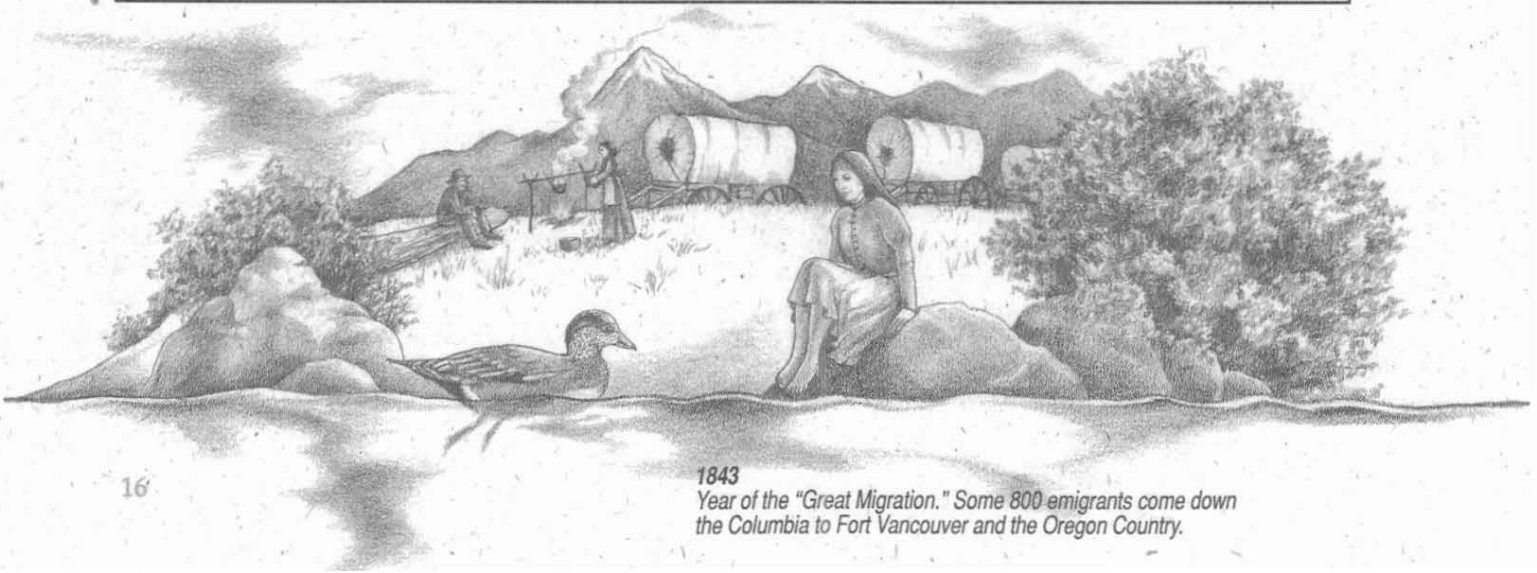
Navigation—The Columbia is second to only the Mississippi River in shipping. It is the West Coast's top port system in export cargo, which includes 35 percent of all U.S. wheat exports.

Agriculture—The Columbia is the primary source for irrigation water and pumping power on 8 million acres of Northwest farms. This land provides nearly 75 percent of the region's farm revenues—or $5 billion worth.

Fishing—Estimates of the value of Columbia River salmon for commercial and sport fishing and related industries are in the hundreds of millions of dollars.

Recreation—The Columbia River and its tributaries attract hundreds of thousands of people each year.

Sources: Columbia River Alliance, Bonneville Power Administration, Northwest Power Planning Council.

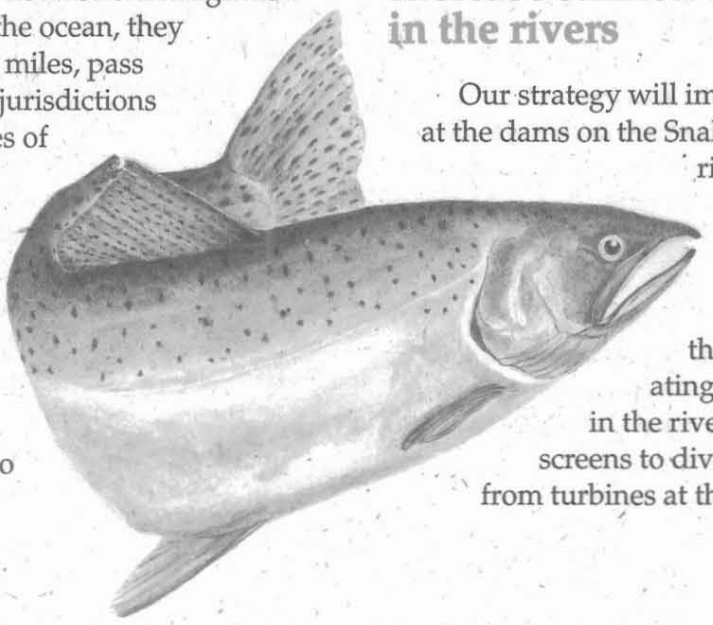


1843
Year of the "Great Migration." Some 800 emigrants come down the Columbia to Fort Vancouver and the Oregon Country.

A Comprehensive Strategy

Rebuilding salmon runs is a complex process because the salmon lead complex lives. They spawn in freshwater, but grow to maturity in the saltwater sea. They are carried hundreds of miles down streams and rivers by the early thaws and mountain runoff. They pass as many as nine major Columbia and Snake river dams on their downstream migration.

As adult fish in the ocean, they travel thousands of miles, pass through numerous jurisdictions and along the shores of two nations. They are the subject of intense fishing both at sea and in the lower Columbia. Finally, those that survive must push back up the rivers to spawn where they were hatched.

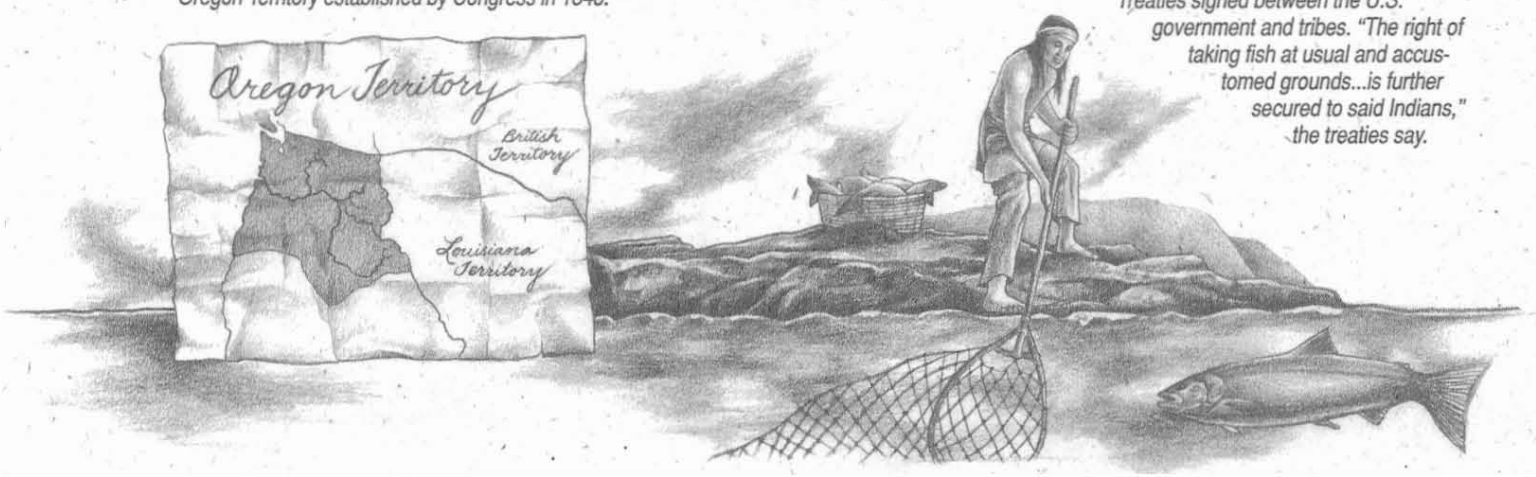


This program has measures for every stage of that journey. And we have structured those measures to help coordinate the effort, and ensure monitoring and evaluation. We must be able to shift emphasis or direction as new information becomes available.

Increase salmon survival in the rivers

Our strategy will improve fish survival at the dams on the Snake and Columbia rivers, as well as in tributaries. The plan speeds the migration of juvenile fish to the ocean by accelerating the flow of water in the rivers. It calls for screens to divert migrating fish from turbines at the dams and from

1846
Oregon Country border established through treaty with England. Oregon Territory established by Congress in 1848.



1855
Treaties signed between the U.S. government and tribes. "The right of taking fish at usual and accustomed grounds...is further secured to said Indians," the treaties say.

irrigation and other diversions of water. It calls for improved barging of juvenile fish past the dams. And it seeks to control predators, particularly squawfish.

Some actions in our strategy can begin immediately. Other measures need additional study before they can begin.

> Rebuilding salmon runs is a complex process because salmon lead complex lives.

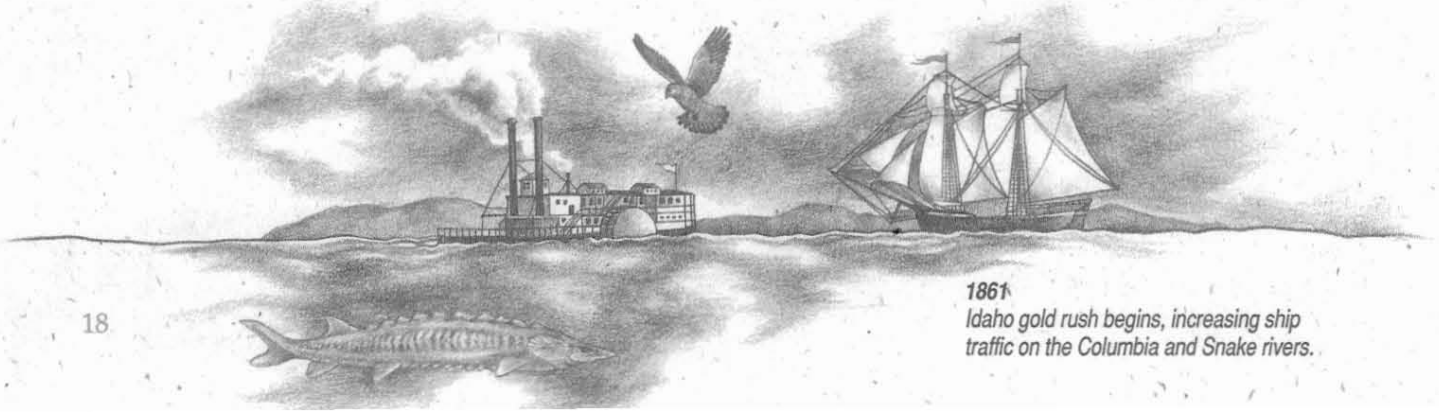
Immediate flow measures

Dams changed the Columbia and Snake from fast–flowing rivers to a series of slow–moving reservoirs. Young salmon, whose biology is attuned to a swift transition from freshwater to saltwater during the spring and early summer, need to move quickly to the ocean. Before the dams, they did. Our plan calls for many actions to improve the survival of salmon during their migration.

This is not a new idea. Since our first fish and wildlife program was adopted, the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers, which operate the federal dams on the Snake and Columbia rivers, have been boosting flows to speed salmon migrations. A specified amount of water is held behind upriver storage dams during winter and then released in the spring.

Our salmon strategy substantially increases the amount of water stored for these annual salmon flows.

Except in the lowest water years, we want to achieve a Snake River speed that is equivalent to a flow of at least 85,000 cubic feet per second during the migration period. To reach this speed, reservoirs would be lowered behind John Day Dam and the four dams on the lower Snake River to the lowest level at which navigation locks and irrigation pumps can still operate. The Corps of Engineers would provide additional water to the Snake from Dworshak Dam, which is located upstream on the North Fork Clearwater River, and Idaho Power Company and the Bureau of Reclamation would provide water from the upper Snake River.



1861
Idaho gold rush begins, increasing ship traffic on the Columbia and Snake rivers.

Our strategy also addresses the plight of adult fish migrating upstream. Releases of cool water from storage reservoirs should help these fish. We've asked the Idaho

Immediate ACTIONS at the Dams

Flows

Store more water in the winter and release it in the spring and summer to boost flows when juvenile salmon migrate to the ocean.

Transportation

Improve barge transportation of juvenile fish past Snake and Columbia river dams.

Screens and Bypass

Screen turbines and improve bypass systems that carry young salmon past dams.

Spill

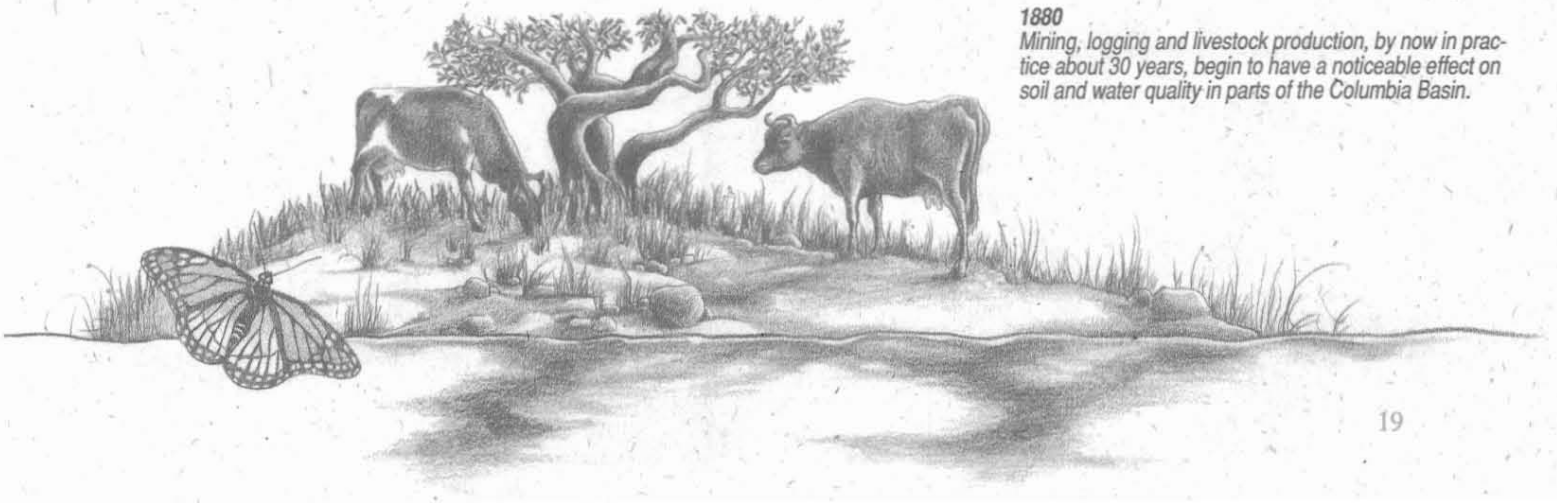
Move young salmon downstream by spilling them over dams, until adequate turbine screens are in place.

Minimum Operating Pools

Lower reservoirs to the minimum levels at which navigation locks will still operate, to make the current faster for salmon migration.

Control Predators

Reduce the number of salmon predators, particularly squawfish.



1880
Mining, logging and livestock production, by now in practice about 30 years, begin to have a noticeable effect on soil and water quality in parts of the Columbia Basin.

Power Company and the Bureau of Reclamation to release additional water from Snake River reservoirs to assist spring–migrating adult salmon. In addition, Idaho Power, which owns and operates Brownlee Dam, will make water available to keep fall chinook redds (nests of eggs) wet.

Intermediate–term measures

In preparing this strategy, we recognized that actions the region can take immediately are not sufficient to rebuild some weak populations of salmon or meet the Council's targets. So we identified a set of longer–term measures that will be needed, but which require further planning before they can begin. Some of these measures are controversial, and there is disagreement about their cost and effectiveness.

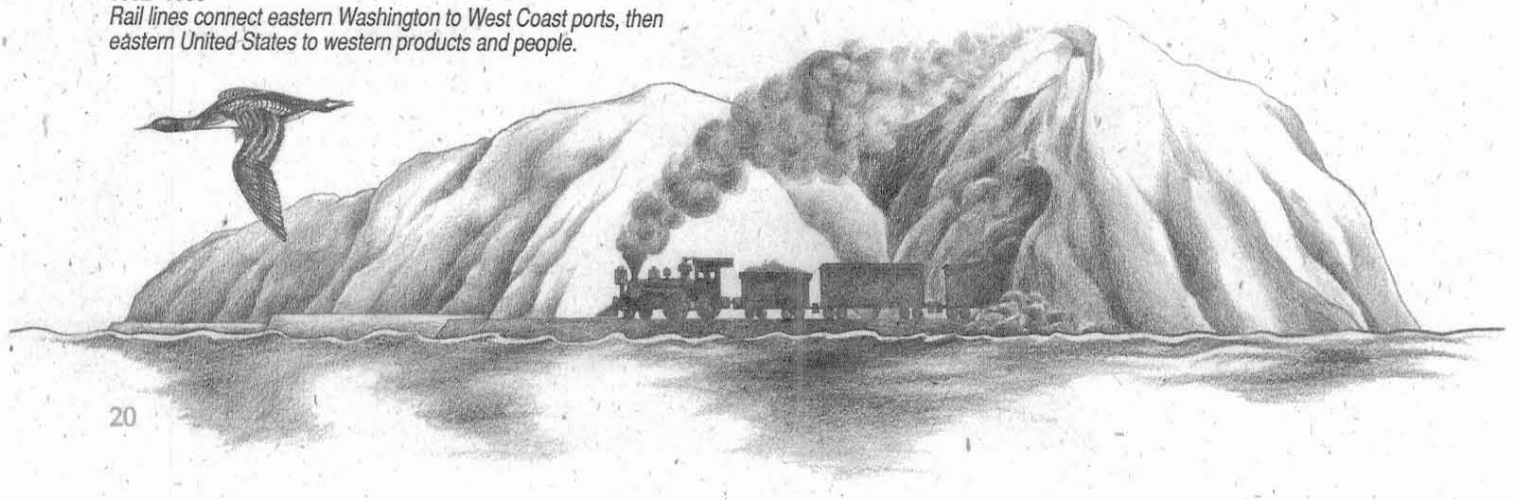
> One of the most effective actions to improve the survival of young salmon is to guide them away from turbines and water diversions.

One intermediate–term measure involves moving water more quickly past the dams. By dropping water levels in the four lower Snake River reservoirs, the river channel narrows, causing water to rush more quickly.

Because this degree of drawdown will take the water below the levels where navigation locks and even fish passage facilities can operate, the dams and fish passage facilities would require modifications.

We call on the Corps of Engineers, other agencies and Indian tribes to help us evaluate the effectiveness of drawdowns in combination with other flow measures. This involves preparing plans on drawdown design, operations, biological impacts and mitigation of economic consequences. Drafts of these plans are due by November 1992, with final reports by November 1993.

1882–1893
Rail lines connect eastern Washington to West Coast ports, then eastern United States to western products and people.



At our request, the Corps of Engineers carried out a test drawdown of Lower Granite and Little Goose reservoirs in March 1992. The Corps is preparing a detailed analysis of that test.

It is the intent of the Council to have the Snake River drawdown implemented by April 1995, unless it is shown to be structurally or economically infeasible, biologically imprudent or inconsistent with the Northwest Power Act.

Our salmon strategy also calls for water conservation measures that will yield an additional 1 million acre–feet of water each year for salmon. Other measures, such as more water storage in reservoirs, could yield additional water.

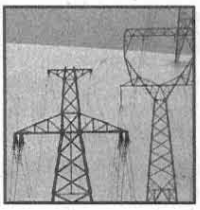
Intermediate-term ACTIONS Around the Basin

Drawdown

Increase the speed of the river current by lowering the reservoirs behind the four lower Snake River dams and John Day Dam.

Storage

Increase water storage in the upper Snake River Basin to help boost flows for migrating salmon.



Seasonal Power Exchanges

Increase river flows by selling hydroelectricity to the Southwest in summer, when power use is highest there, and buying it back in winter.

Water Conservation

Conserve water in the Columbia and Snake basins, thus leaving more water in the rivers for salmon.

1902

Reclamation Act authorizes federal aid to settle land and develop farms. By 1910, irrigated acreage in the basin increased fourfold.

1908

"The salmon fisheries of the Columbia River are now but a fraction of what they were 25 years ago."

—President Theodore Roosevelt, arguing for Congressional fishing regulations on the Columbia

State water agencies also are urged to find ways to ensure that flows will be adequate to protect fish. We call for water availability studies, establishment of minimum streamflow levels, a halt to new water appropriations that could harm salmon and acquisition of existing water rights on a "willing–seller" basis to improve river flows.

> Young salmon need to move quickly to the ocean. Before the dams, they did.

Fix dams and water diversions

One of the most effective actions to improve the survival of young salmon is to guide them away from turbines and water diversions. The reason is simple: fish can die or be stunned if they are drawn through the turbines at dams, and they can become lost and die if they swim down water diversion channels. Screens and bypass channels are the answer to this problem.

Without screens, each Columbia and Snake river dam can kill between 10 percent and 30 percent of the young salmon that pass through the turbines.

In our first fish and wildlife program, we called for screens and bypass channels at all Columbia and Snake river dams that didn't have them already. Initially, there was resistance from the federal Office of Management and Budget. Screens for the big dams are big themselves, and expensive. Many are needed. The Dalles Dam, for example, will need more than 60 screens to cover all of its turbine intakes, and each screen is bigger than a billboard sign. But the region and Congress support screening the dams, and the work should be completed by March 1998.

Next, we focus on installing screens at water diversions. Because there are so many unscreened diversions—literally thousands—we ask fishery managers to prioritize screening projects in areas that support depleted salmon runs. This will help ensure timely construction and installation where the need is greatest.

1912
Ocean commercial trolling for salmon begins off the mouth of the Columbia. By 1919, there are more than 1,000 trolling boats.

1915
Washington and Oregon form Columbia River Fish Compact to regulate commercial fishing in the river.

Improve smolt barging

Some salmon get a ride past the dams.

They are collected at McNary, Little Goose and Lower Granite dams, then transported in special barges past the downriver dams. They are released below Bonneville Dam to continue their journey to the ocean.

The current barge transportation system began in 1981. At the time, it was considered an interim measure to move smolts past the dams until diversion screens were in place.

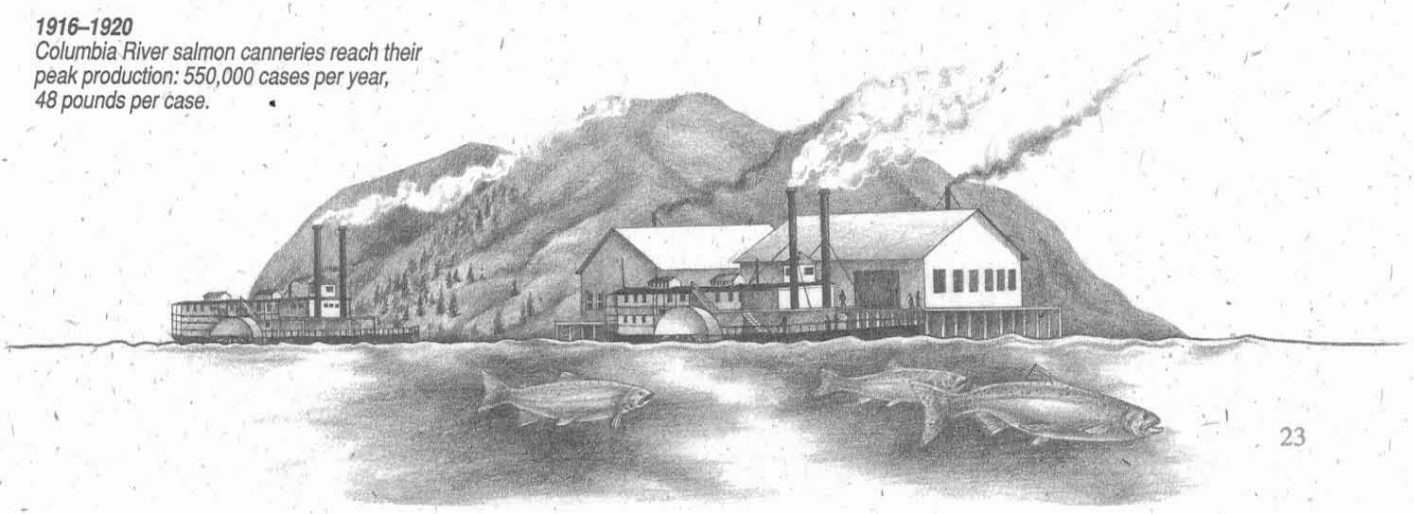
Over the years, the Corps of Engineers, regional fishery managers have analyzed the benefits of transportation. The conclusion: benefits vary widely among salmon species. Steelhead and fall chinook appear to benefit the most. Benefits for spring and summer chinook and sockeye are less clear. Generally, scientists maintain that transporting salmon around the dams can increase survival under some conditions.

Barge transportation of salmon should be improved immediately to boost salmon survival.

We recognize that despite extensive research on barging of salmon, much disagreement remains about its benefits. Nonetheless, in the immediate years ahead, barging is one of the few tools the region has to improve salmon survival, particularly in low–water conditions. Barge transportation of salmon should be improved immediately to boost salmon survival in the near term.

In our salmon strategy, we call on the Corps of Engineers to expedite improvements in transportation. Cooler water and less crowded conditions in the barges, for example, may help reduce stress and improve survival. When the fish are released from barges below Bonneville Dam, survival may increase if the fish are dispersed more widely along the river. This could help them avoid predators and adapt to river conditions.

1916–1920
Columbia River salmon canneries reach their peak production: 550,000 cases per year, 48 pounds per case.



Control salmon predators

Conditions in the modern Columbia and Snake rivers, because of the dams, are ideal for salmon predators, particularly squawfish. They thrive in the warm, slow–moving water of the reservoirs.

Other factors also favor salmon predators. For example, hatchery smolts sometimes are weakened by disease or don't know how to avoid predators. Smolts are easy prey below dams because they are stunned after passing through the turbines.

One solution to this problem is to reduce the number of predators. Our strategy calls for reducing the squawfish population by 20 percent within five years. Experts believe this, in turn, could lead to a 25–percent reduction in predation.

We also are concerned about the survival of adult salmon. Many are killed by seals and sea lions in the lower Columbia River. But seals and sea lions are protected by federal law, so we can only urge the National Marine Fisheries Service to continue evaluating the impact these creatures have on salmon.

Our strategy calls for reducing the squawfish population by 20 percent within five years.

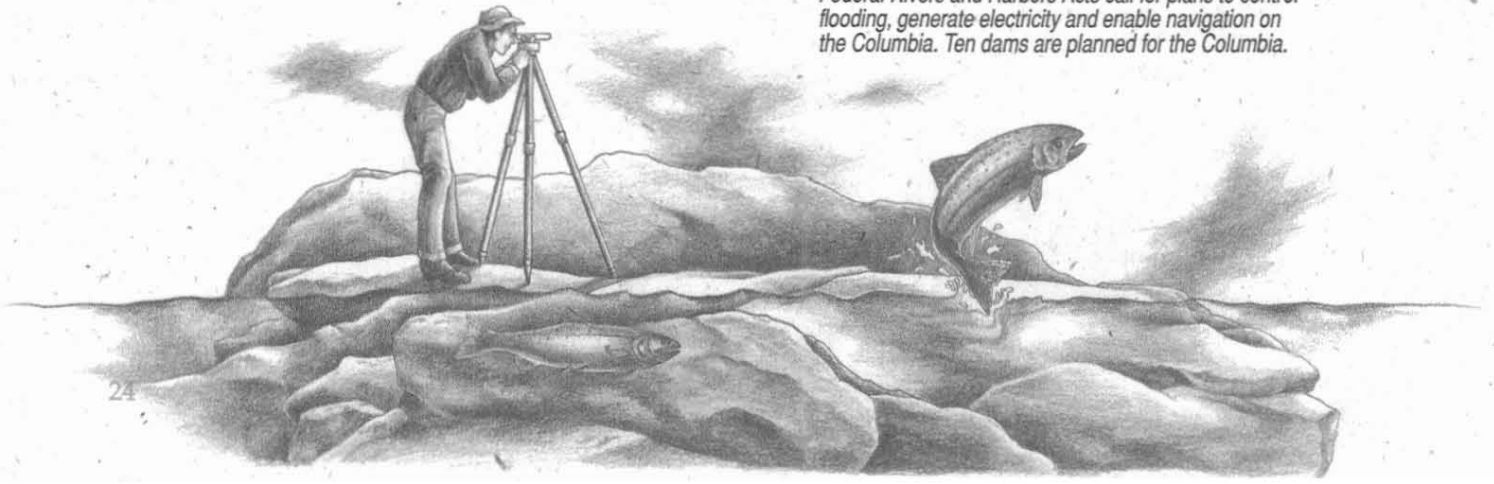
Reduce and refine salmon fishing

Fishing for salmon always has been a central part of Northwest life. Salmon are caught and sold, and the resulting income supports thousands of people regionwide—particularly in fishing towns near the mouth of the Columbia River. Salmon are prized by sport anglers, too.

Indians have treaty rights to catch salmon for cultural and religious celebrations, for sale and to feed their families.

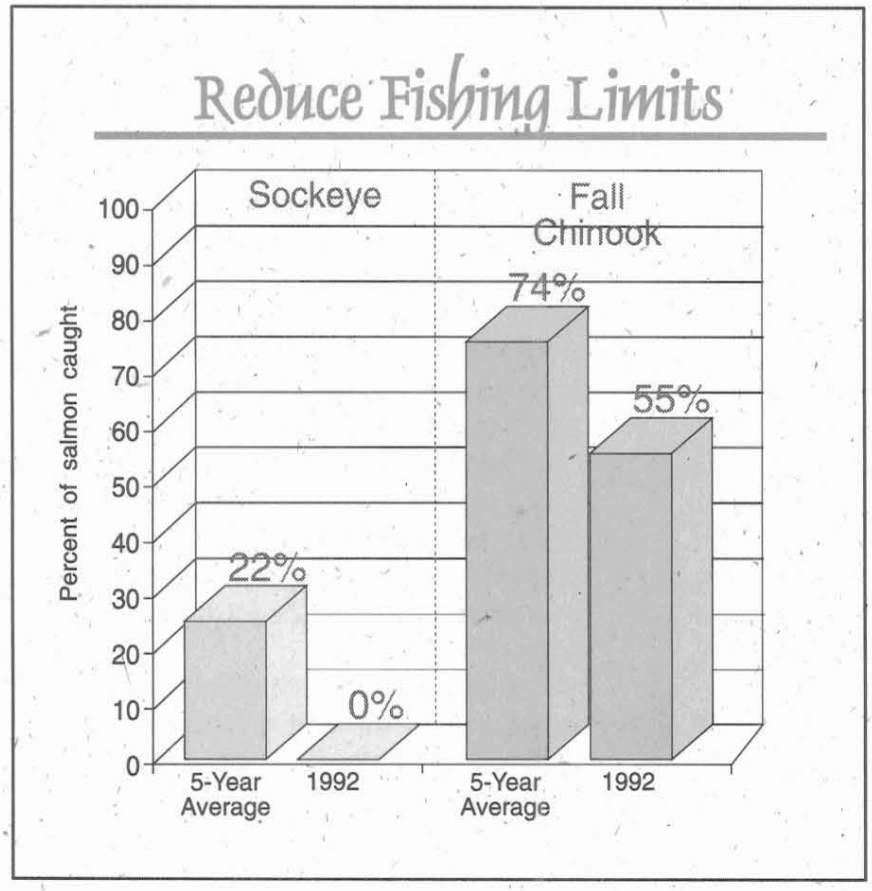
Beginning about the mid–1800s, commercial salmon harvesters steadily increased their catch. Fish wheels, nets and traps took large numbers of salmon out of the Columbia to feed the booming canning industry. Harvesters took so many salmon that by the 1870s there was concern for the future of the runs, and the first salmon hatcheries were built.

1925 and 1927
Federal Rivers and Harbors Acts call for plans to control flooding, generate electricity and enable navigation on the Columbia. Ten dams are planned for the Columbia.



Since the 1960s, state, federal and international fishery managers have been steadily cutting harvest rates to protect salmon runs. For example, there has been no commercial fishing for Columbia River summer chinook salmon since 1964. The last fishing season for any Snake River chinook salmon was in 1975, although limited fishing continues for salmon returning to a hatchery on the Rapid River, a Salmon River tributary. And the United States and Canada signed a treaty in 1985 that set limits on harvests of salmon originating in both nations.

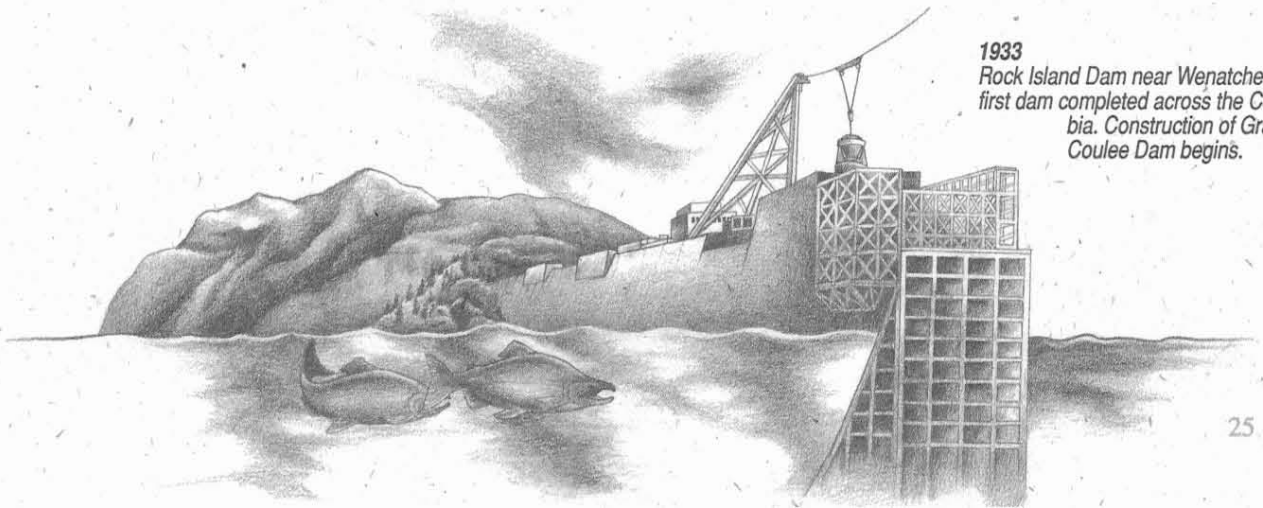
Because our Council lacks the authority to regulate harvest seasons, we ask fishery managers to continue their moratorium on commercial fishing for summer chinook, and to halt commercial harvest of sockeye below the confluence of the



Harvest Protection for Snake River Salmon

Snake River sockeye are caught mostly in the Columbia River, while Snake River fall chinook harvests are greatest at sea. We call for important harvest reductions in both fisheries.

Harvest rates on Snake River spring and summer chinook already are low, and we ask that they be kept at or below those low levels.



1933
Rock Island Dam near Wenatchee is the first dam completed across the Columbia. Construction of Grand Coulee Dam begins.

Snake and Columbia rivers to protect endangered Snake River sockeye. The Governors of Washington and Oregon have directed their state fishery agencies to follow our harvest restrictions.

We also call for immediate reduction of overall harvest rates on Snake River fall chinook—another threatened species—to no more than 55 percent of the run. In recent years, the harvest rate has been as high as 77 percent. Non–treaty river harvest of spring chinook should be limited to about 4 percent of the upriver run, just under the 1987–1991 average catches.

> We call for immediate reduction in the harvest of Snake River fall chinook.

In addition, we urge the Pacific Salmon Commission, which represents the United States and Canada under the Pacific Salmon Treaty, to further reduce harvests of salmon from the Columbia River Basin.

Traditional commercial fishing techniques were designed to catch large numbers of fish, but because salmon from different runs swim together at sea, both abundant and depleted runs are harvested. In light of declining runs, we need new ways of fishing to focus on stronger runs and avoid weaker ones.

For example, fishing could take advantage of the timing and location of abundant runs. This selective fisheries practice would allow upriver salmon to pass. In the same way, abundant runs could be targeted with modern forms of fish wheels or traps. Fish that spawn in rivers could be released, and hatchery fish could be kept.

At our suggestion, commercial fishers, Bonneville, and the states of Oregon and Washington are developing a voluntary program to reduce the number of commercial fishing licenses in the region. Again, the goal is to cut harvests and enable more adult fish to reproduce.

The salmon plan also calls for a review of sport fishing regulations and adoption of more rigorous catch–and–release rules to protect depleted runs. We seek an accounting of incidental harvest of salmon in other fisheries, and increased law enforcement and public education to deter illegal fishing.

To further protect Columbia Basin salmon, we endorse the United Nations resolution to phase out the high seas drift–net fishery by the end of this year.

1937
Lowest Columbia River flow on record.
Bonneville Power Administration created.

1937
"The transmission of electricity is making such scientific strides today that we can well visualize a date...when every community in this great area will be wholly electrified."
—President Franklin Roosevelt dedicating Bonneville Dam.

Finally, fishery regulators need a better understanding of how many salmon are being caught and where they are being caught. This would help them set harvest seasons. So we ask the National Marine Fisheries Service to report each year on all ocean and river harvests, and the number of fish that escape capture and head upriver to reproduce.

Improve salmon habitat

Salmon habitat includes the streams where spawners lay their eggs, where eggs hatch and where young fish spend the first year or two of their lives. It includes the rivers, the tributaries, the Columbia estuary and the Pacific Ocean.

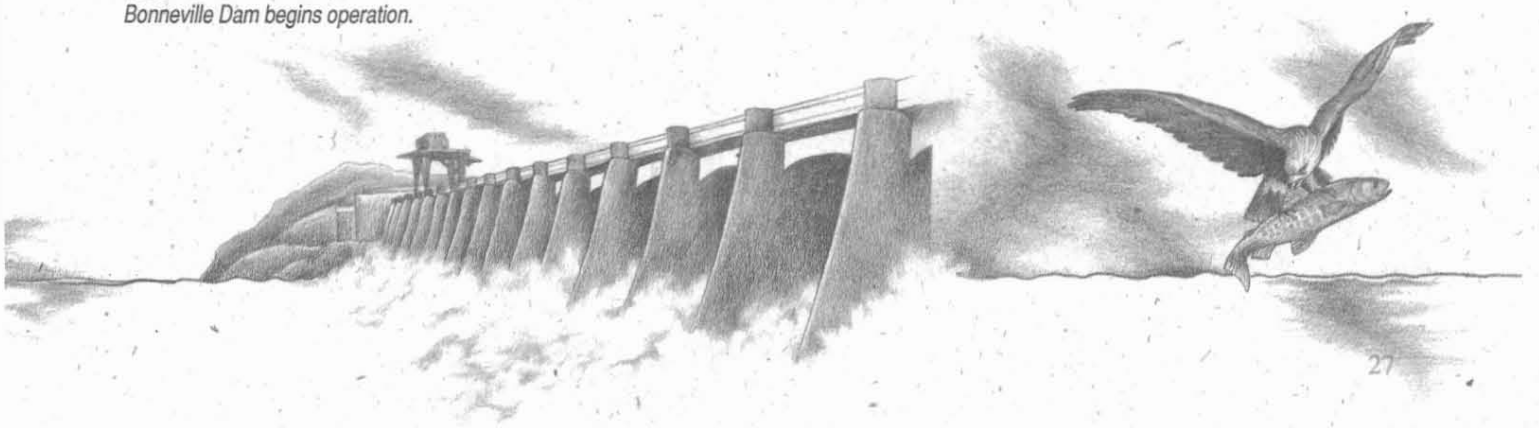
HABITAT

Before and After

Salmon need cool, clean water in the shallow streams where they reproduce. Where shorelines have been stripped of grasses, shrubs and trees that shade the water, the stream heats up. Erosion is more likely, and erosion can silt up the gravel in the stream, making it less suitable for the salmon to build nests and lay eggs.

Planting the shorelines with quick–growing grasses and shrubs, and keeping livestock away from the plants restores the stream to a healthier environment for the salmon.

1938
Bonneville Dam begins operation.

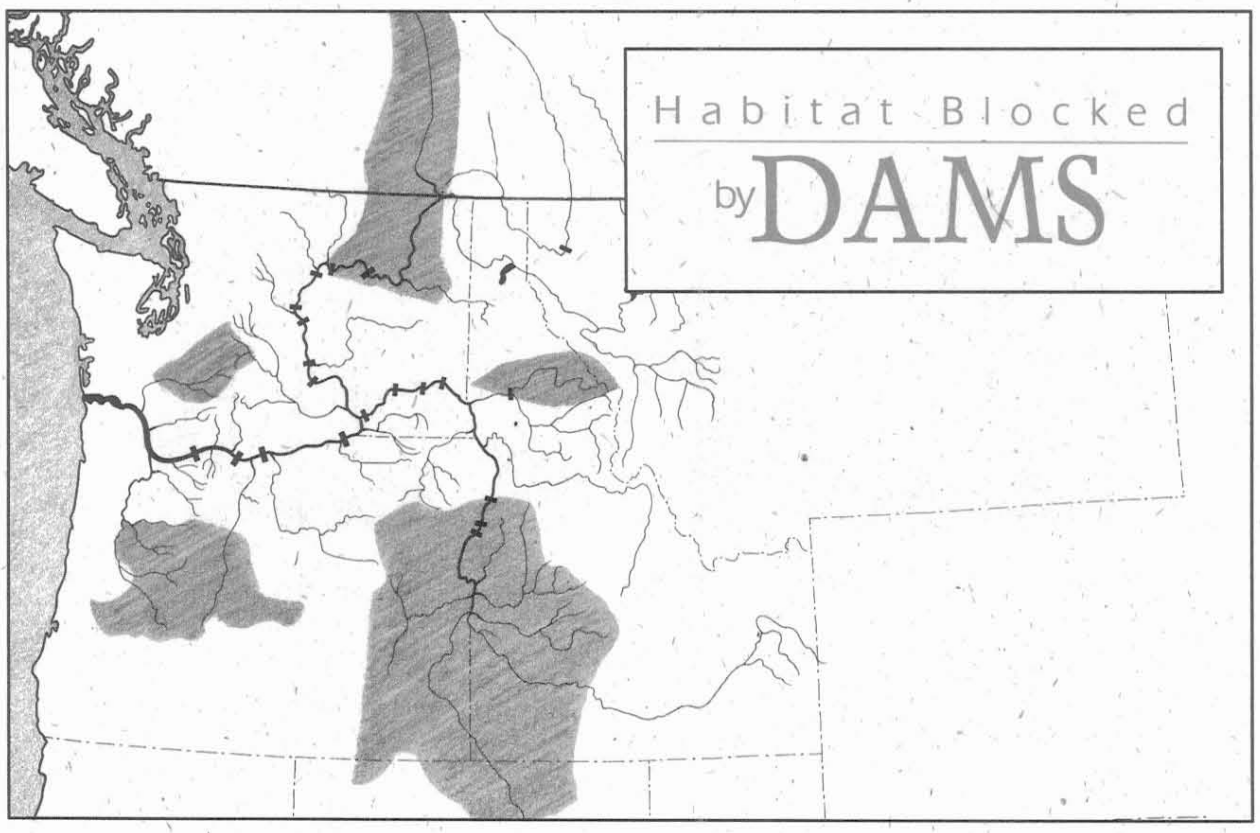


The quality of habitat determines how many fish survive. Ideally, good spawning habitat has clean, cool water. Streambanks are well–shaded by vegetation. Spawning gravel is abundant and clean. Rocks and woody debris in the water create pools for resting and feeding.

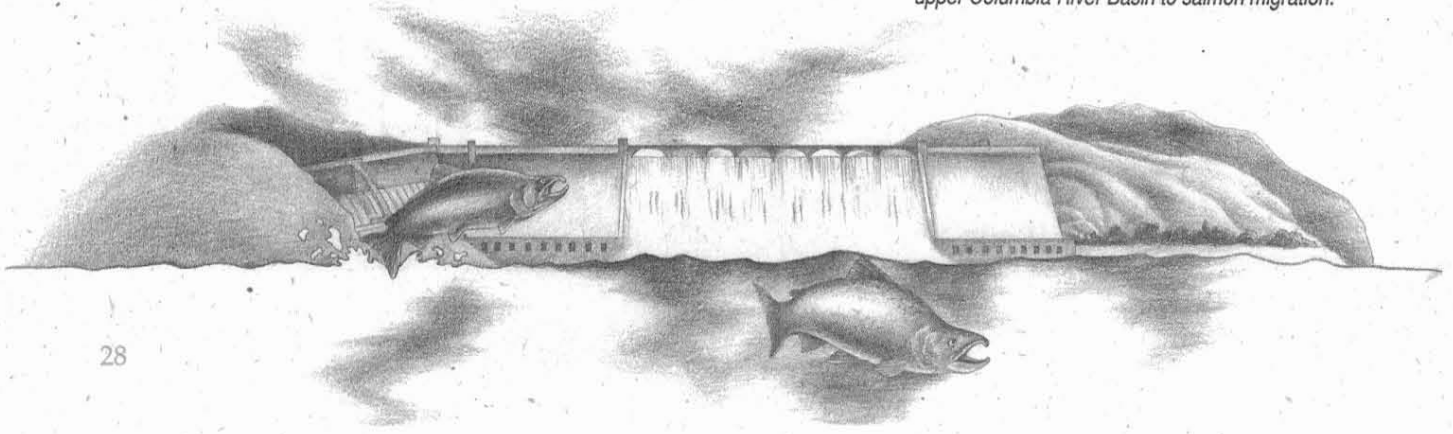
As human populations increased, so did impacts on salmon habitat. For example, the construction of Grand Coulee and Hells Canyon dams, which have no fish ladders, eliminated one–third of the available salmon habitat in the basin. Other activities degraded the quality of remaining habitat.

Our highest priority for salmon habitat is to maintain its quantity and productivity. We are especially concerned about preserving or restoring streams where salmon and steelhead can spawn naturally.

One objective of our strategy is to ensure that activities to improve salmon production are coordinated for each watershed. We don't see this as a



1941
Grand Coulee Dam begins operation, closing off entire upper Columbia River Basin to salmon migration.



planning process. We see it as a way of doing business. It accounts for all interests, including the salmon's.

Because about 40 percent of the remaining salmon and steelhead habitat in the Columbia Basin is bordered by private land, it is essential that public and private landowners cooperate in comprehensive efforts to manage salmon habitat.

> We have emphasized habitat repairs that will increase the productivity of salmon in the wild.

We are encouraged by cooperative habitat improvements already being undertaken in partnerships between private individuals and governments around the basin. These projects not only improve conditions for salmon, but many of them improve agricultural practices and provide educational opportunities, too. Controlling erosion, for example, can make farmland more productive and also improve conditions for salmon by reducing the amount of silt that flows into rivers.

We also call on federal and state land and water managers to improve salmon habitat by revising timber, mining and livestock management practices. Land and water managers need to focus their attention on protecting streamside areas.

Improve hatchery practices

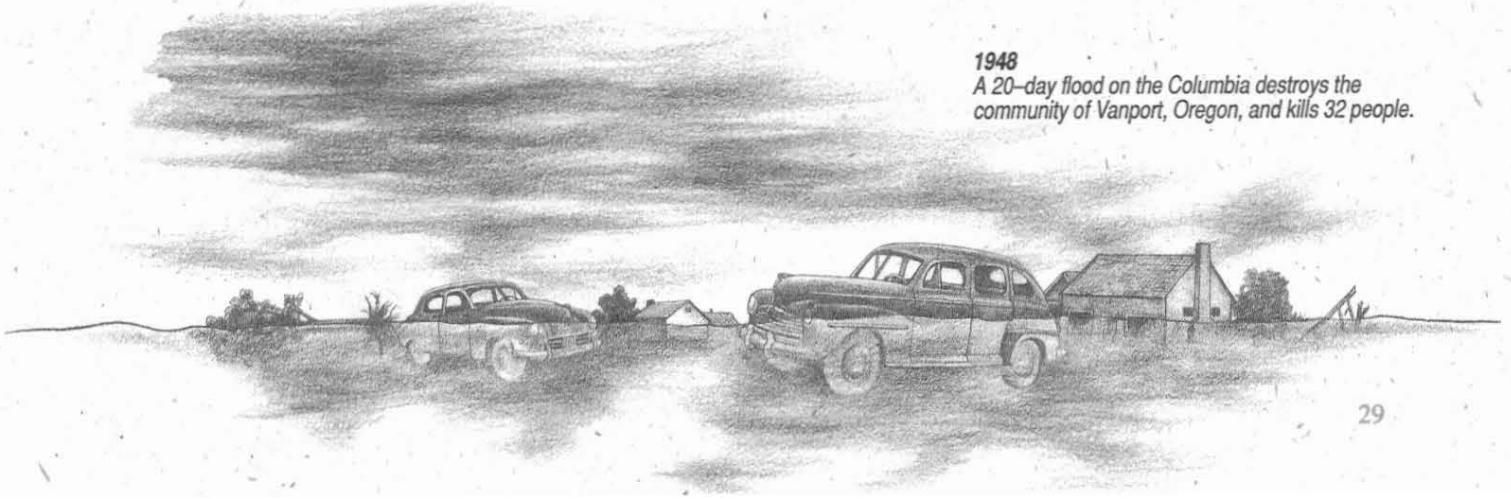
The ancient Columbia Basin had no fish hatcheries. Salmon reproduced in the shallow, graveled areas of rivers and streams.

As overfishing, dams and other developments took their toll, fish hatcheries were built to compensate for the loss of salmon. Nearly everyone agreed with this approach.

The remarkable homing instinct of salmon worked well with hatchery production. Salmon return to the waters of their birth—in this case, to the hatcheries where they were released as juveniles.

But there have been problems. Some fish hatcheries failed because there was a critical lack of knowledge about fish biology, disease and genetics.

Ironically, as understanding increased and hatcheries became more successful, problems occurred elsewhere. Hatchery fish mix in the ocean with salmon spawned in rivers, and both are caught by fishers. In this mixed–stock fishery, fish that spawn naturally are overharvested.



1948
A 20–day flood on the Columbia destroys the community of Vanport, Oregon, and kills 32 people.

In the rivers, too, hatchery fish are a problem because they can overwhelm salmon from those rivers. There needs to be a better understanding of how many juvenile fish the Columbia Basin can support. This "carrying capacity" has an impact on the survival of all salmon in the river.

It is a vexing puzzle: the number of fish spawning in rivers is declining, and hatchery fish could help; yet interbreeding could further imperil the naturally spawning species.

What to do?

State and federal fishery managers must develop consistent hatchery practices that enable hatchery fish to survive in the natural environment without harming the fish that spawn there naturally.

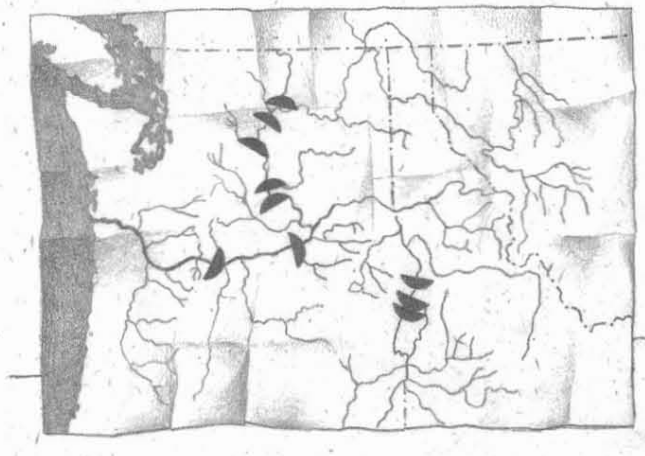
Fishery managers must develop consistent hatchery practices that enable hatchery fish to survive in the natural environment, without harming fish that spawn naturally in our rivers.

When hatchery fish are released into streams to rebuild runs that are facing extinction—a practice called "supplementation"—caution must be taken to measure and minimize genetic and environmental impacts.

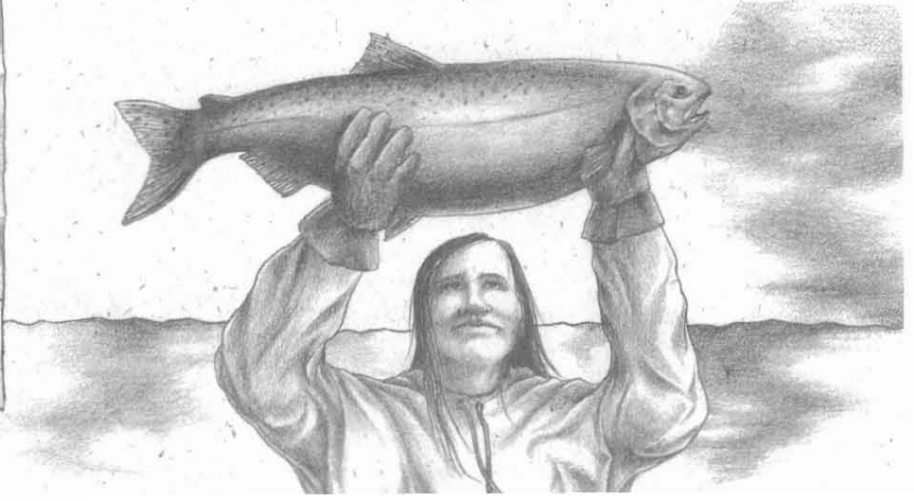
We call for experiments to test supplementation as a means of conserving and rebuilding naturally reproducing salmon populations. Both existing and new supplementation projects must be evaluated in terms of their cumulative effects on salmon runs.

Finally, we need additional research into fish survival requirements so that we can tailor our actions to improve conditions for all salmon. In particular, we need a clearer understanding of how many salmon are needed to sustain a given run over many future generations, and what protections these fish need in their environment.

1949–1957
Ten new dams planned or completed in Columbia River Basin.



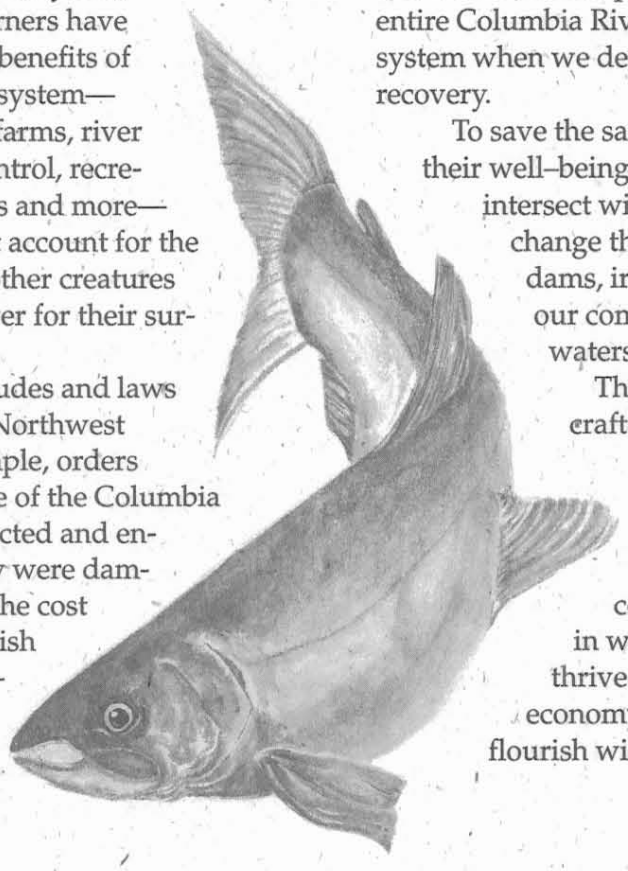
1956
On April 20, Columbia Basin Indians conduct the last of the "First Salmon" rites at Celilo Village before it is flooded by the reservoir behind The Dalles Dam.



A Call for Cooperation

For more than 50 years, Northwesterners have enjoyed the benefits of the Columbia River system—electricity, irrigated farms, river navigation, flood control, recreational opportunities and more—at a cost that doesn't account for the loss of salmon and other creatures that relied on the river for their survival.

But regional attitudes and laws have changed. The Northwest Power Act, for example, orders that fish and wildlife of the Columbia River Basin be protected and enhanced because they were damaged by the dams. The cost of rebuilding these fish and wildlife populations is part of the cost of electricity from these dams.

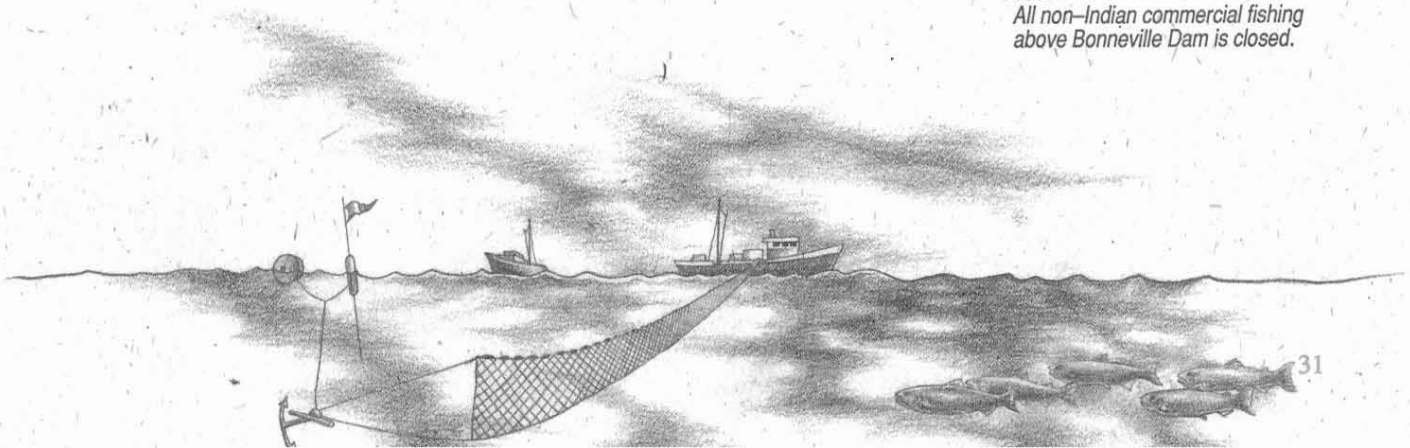


The Act further requires that we treat the entire Columbia River Basin as a single system when we design our program of recovery.

To save the salmon, we must consider their well–being whenever our actions intersect with theirs. We must change the way we operate our dams, irrigate our farms, ship our commodities and fish in our waters.

This salmon strategy was crafted with all of these elements in mind. It is designed to help guide the regional transition to a more conscientious future, one in which the salmon can thrive without hobbling our economy, and the economy can flourish without killing off the fish.

1958
All non–Indian commercial fishing above Bonneville Dam is closed.



Who pays?

We have no doubt that the Northwest can make this transition, but it will not come cheaply, quickly or without complications. The first steps taken over the past decade have already cost hundreds of millions of dollars. Much of that came from electricity ratepayers.

In 1991, Bonneville Power Administration costs to implement the Council's fish and wildlife program totaled approximately $110 million. These costs include both program projects and lost power revenues from changes in the operation of the hydroelectric system. Estimates of fish and wildlife program costs for 1993 range from $180 million to $210 million, depending on the amount of revenue lost when river flows are increased to improve salmon survival.

The cost of the new ratepayer–funded actions in this strategy translate into an increase of about 4 percent in Bonneville wholesale power rates. The increase at the retail level will vary by utility, but on average, the retail increase will be about 2 percent.

> The salmon can thrive without hobbling our economy, and the economy can flourish without killing off the fish.

Bonneville also is repaying past investments for fish ladders that were installed when the dams were built, for salmon barging facilities, and for protective screens and bypass systems at the dams.

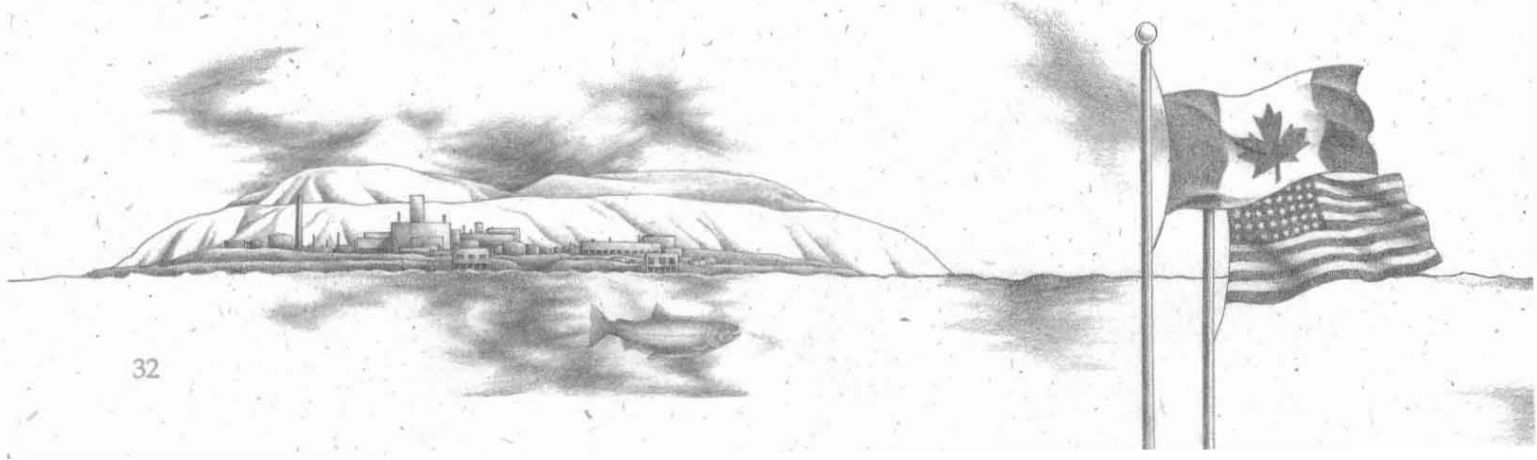
But this strategy recognizes that the dams were not the only cause of the salmon decline. So, funding to address damages not caused by the dams must also be provided by regional, national and local sources.

We ask the states to absorb some costs, such as the expense of administering necessary changes in salmon management. In addition, the Endangered Species Act is federal legislation, and regional actions to comply with the Act address national as well as regional concerns. Federal agencies must assume an appropriate share of responsibility for paying the cost of salmon recovery.

Congress has appropriated approximately $100 million for 1993 Columbia Basin salmon rebuilding activities. These appropriations will enable the Bureau of Reclamation, National Marine Fisheries

1963
First nuclear power plant at the Hanford Nuclear Reservation in Washington, ending the "all–hydropower era" in the Northwest.

1963
Columbia River Treaty between the United States and Canada signed to coordinate water storage in the upper Columbia Basin and maximize power production in the United States.



Service, U.S. Forest Service, Soil Conservation Service and Bureau of Land Management to participate in the salmon rebuilding effort. About half of the $100 million will go to the Corps of Engineers for installation of additional screens and bypass systems at federal dams. That amount will be repaid by Bonneville over the life of the hydropower projects.

Additional actions that will be implemented over time will increase program costs in the future. The Council is committed to carefully evaluating the biological effectiveness and cost–effectiveness of these measures before they are implemented.

> To save these salmon we must change the way we operate our dams, irrigate our farms, ship our commodities and fish in our waters.

Who does the work?

Just as the salmon need our help all along their journey, each of us along that path must participate. We've included a wide range of activities in this strategy involving many interests—government agencies, the tribes, private landowners, fishers, industries and others throughout the Columbia Basin.

Because the Bonneville Power Administration provides the majority of program funding, we ask the agency to work with other implementors to coordinate and manage these efforts.

The success or failure of these efforts will be evaluated by an independent group of scientists. We at the Council will also monitor these efforts continuously.

We are prepared to open a new amendment process in March 1993 to review and update actions called for in this program. We expect to conclude that process in October 1993.

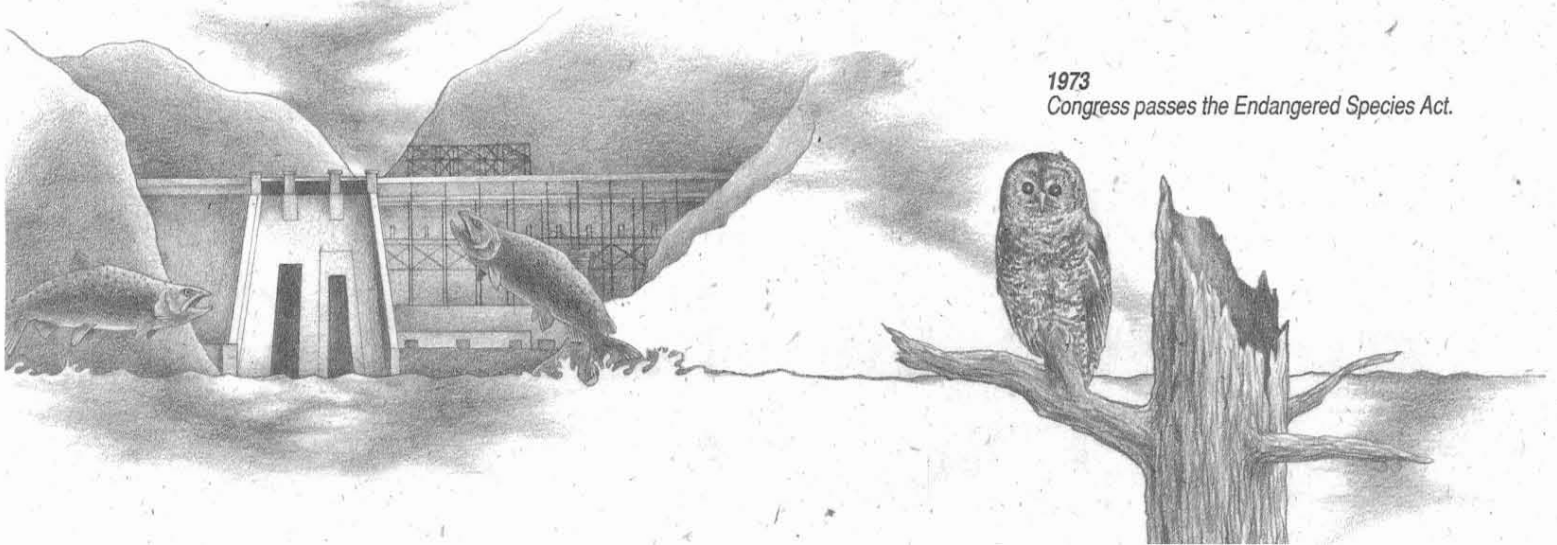
The public spoke

Salmon are worth saving.

That's not just our position. That's an underlying theme of comments we heard at more than 20 public hearings around the region. It was the conclusion of the majority of the more than 1,000 written comments we were sent. But the public is deeply divided on how to proceed and who should pay.

1967
Hells Canyon Dam begins operation, blocking salmon from the upper Snake River.

1973
Congress passes the Endangered Species Act.



Some said our flow proposals were too high. Others said they were too low. Some said our recommendations for harvest cuts were too drastic. Others said they were not severe enough. Some said our amendments were long on process, committees and reports, but short on actions. Others said we proposed to move ahead too quickly with certain actions and that we should wait until more studies give us a better understanding of salmon biology. Some argued that our program is inadequate and overly cautious. Others said it is excessive, aggressive and could damage the region's economy.

> This program reflects not only our best scientific knowledge of the salmon and its complex life, but also the unique values and perspectives of our people.

While it may appear impossibly frustrating, this is the value of a regional process. All sides were heard.

Our job is to weave together a program that will aid the salmon while responding fairly to the diverse interests of all who use the river. This is not a static program. We intend to refine and adapt it as needed and as new information becomes available.

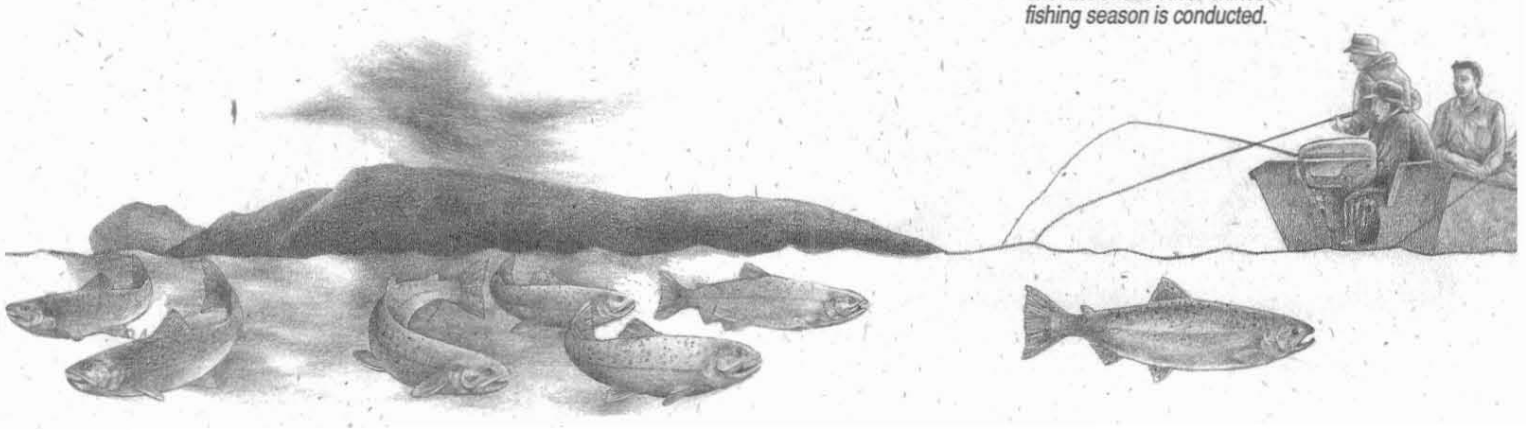
We have adopted an approach known as "adaptive management." It begins with the recognition that we don't know everything we need to know to always do the best possible thing. But we also don't have the luxury of waiting until we know everything.

We have to take action, trusting our judgment as much as our analysis. Then we must carefully study the effects of our actions. If we're wrong, we change course—we adapt. If our actions provide benefits, we continue them.

We are particularly concerned that new ideas and innovations not be lost in the debate over measures we've adopted. Our strategy includes a simple process for adding promising new approaches to our salmon strategy.

1974
U.S. District Court Judge George Boldt rules that Indian tribes with treaty rights to fish can take half the harvestable salmon.

1975
The last Snake River chinook fishing season is conducted.



Because this program was developed in cooperation with so many people from throughout the Pacific Northwest, we have great confidence in it. It reflects not only our best scientific knowledge of the salmon and its complex life, but also the unique values and perspectives of our people.

A Long-term COMMITMENT to Salmon

Saving the salmon of the Columbia River Basin is neither a recent, nor merely a regional, concern. It has been a long–term commitment of the United States, Canada and the sovereign Indian nations of the Pacific Northwest.

Nearly 150 years ago, the U.S. government negotiated treaties with many of the Northwest's tribes to secure for the United States millions of acres of tribal land. These treaties guaranteed tribes the right to fish, hunt and harvest the foods that provided them both physical and spiritual sustenance. These treaty rights have been consistently reaffirmed in federal court challenges.

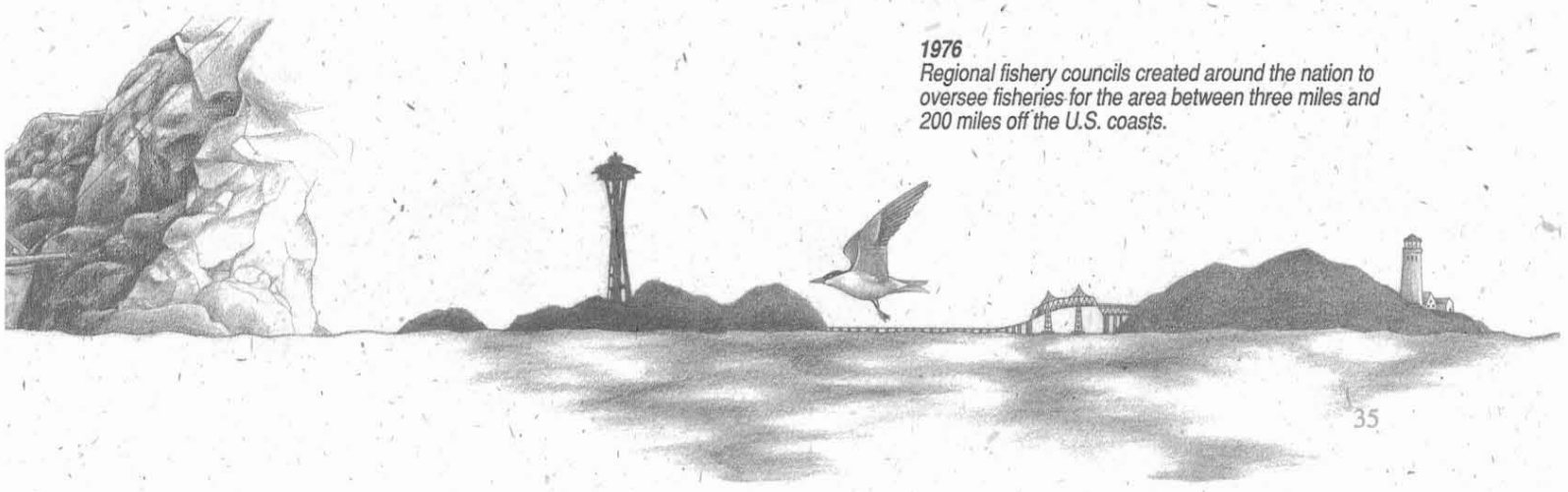
Federal and Northwest state legislation has also supported protection of and rebuilding efforts for Columbia River salmon since the first decades of this century. These laws called for limiting harvests of salmon, as well as hatcheries and other efforts to increase salmon production.

In 1980, Congress passed the Northwest Power Act, which included the directive to "protect, mitigate and enhance" Columbia Basin fish and wildlife, particularly the salmon, "which are of significant importance to the social and economic well–being of the Pacific Northwest and the Nation." The Act specifically ordered federal agencies that manage, operate or regulate both federal and non–federal dams in the Columbia River Basin to provide "equitable treatment" for fish and wildlife with the other purposes for which the dams are operated.

In 1985, the United States and Canada signed a treaty committing these two nations to reducing salmon fishing in the ocean and rebuilding salmon populations in both countries. Salmon from the Columbia River Basin, which are critical to the viability of both countries' fishing economies, received particular attention in that treaty.

In 1991 and 1992, the National Marine Fisheries Service declared three Columbia River Basin salmon runs to be threatened or endangered under the federal Endangered Species Act. The Endangered Species Act is one of the most rigorous pieces of legislation ever enacted to protect natural resources.

1976
Regional fishery councils created around the nation to oversee fisheries for the area between three miles and 200 miles off the U.S. coasts.



The ACTIONS

The Columbia River Basin Fish and Wildlife Program's Strategy for Salmon is a complex and ambitious set of actions aimed at rebuilding salmon runs without unmanageable disruptions in the Northwest's economy. If viewed geographically, it could be said that both the costs and the benefits of these measures are distributed along the entire migratory route of the fish. That was our goal: to improve the lives of salmon at every stage in their life cycle and share the cost of those improvements regionwide.

What follows are highlights of the actions we call for in this strategy. All of the actions are described in more detail in Volume II of the 1992 Columbia River Basin Fish and Wildlife Program. To receive copies of Volume II, see page 42.

The Northwest Power Planning Council reports monthly on the status of implementation of these measures. Copies of these reports are also available. See page 42.

Goal

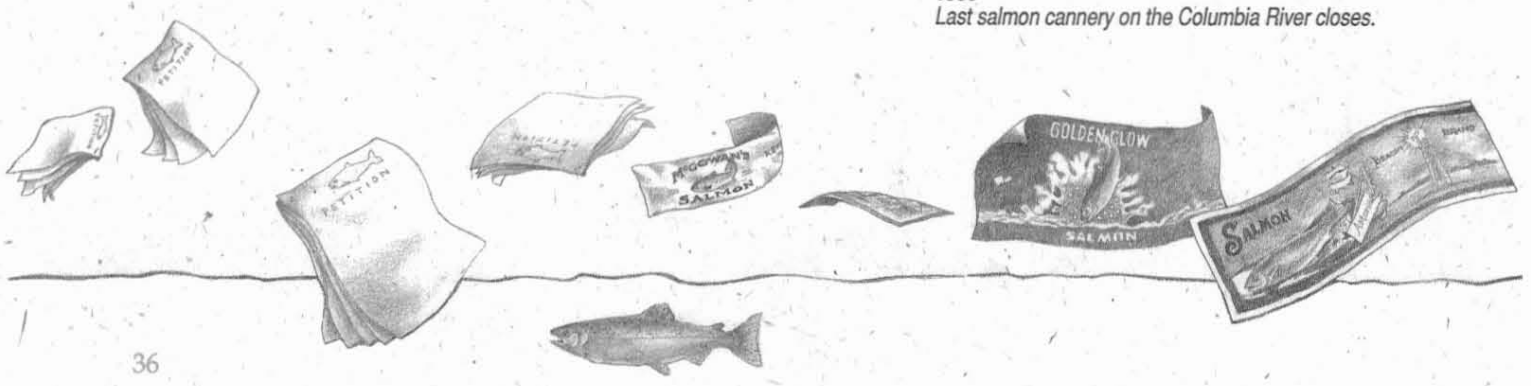
- Double annual salmon production in the Columbia Basin from approximately 2.5 million adult to 5 million fish.
- Accomplish the doubling goal with no appreciable risk to the biological diversity of fish populations.

Framework

- Rebuild Snake River salmon runs to the following numbers: 1) 50,000 spring chinook; 2) 20,000 summer chinook; 3) 1,000 fall chinook.
- Evaluate salmon rebuilding actions in light of these six principles: 1) give priority to weak, upriver runs; 2) cause no appreciable risk to biological diversity among or within fish populations, including resident fish; 3) take a watershedwide approach to habitat and production improvements; 4) respect obligations to Indian tribes and other harvesters; 5) focus research on key uncertainties; and 6) use existing hatcheries unless the need for fish cannot be met with existing facilities.
- Coordinate program implementation under a structure devised by the Bonneville Power Administration, working with fishery managers and others.

1979
Petitions filed to list some runs of Columbia River salmon under the federal Endangered Species Act. Petitions are withdrawn pending passage of the Northwest Power Act.

1980
Last salmon cannery on the Columbia River closes.



Enhance salmon survival in the rivers

Increase river velocities to reduce fish travel time

Immediate actions

- Increase the speed of the Snake River during the spring salmon migration by lowering Snake River reservoirs to near minimum operating levels and providing additional water from Dworshak Dam and the upper Snake River.
- Increase water storage and flows in the Columbia River.
- Lower John Day Reservoir to minimum operating pool as soon as irrigation systems are relocated or modified so they can operate at this lower level.
- Operate Brownlee Reservoir on the Snake River in a manner that assists adult salmon migrating upstream in spring and ensures that fall chinook redds (nests of eggs) remain wet.

Intermediate–term actions

- Begin deeper Snake River drawdowns in April 1995, unless they are shown to be structurally or economically infeasible, biologically imprudent or inconsistent with the Northwest Power Act.
- Provide additional water storage and improve water–use efficiency in the Snake River Basin through water leases, use of uncontracted storage space and other measures.
- Evaluate alternatives for providing additional water in the Columbia to aid summer–migrating salmon.
- Secure options on power–generating resources that could reduce the load on hydroelectric dams, thereby ensuring greater flows for fish.
- Investigate other water–saving measures to help ease the demand for hydroelectricity, such as seasonal power exchanges and accelerated acquisition of energy conservation measures.
- Coordinate river flow and temperature measures through the Fish Operations Executive Committee (FOEC), which includes policy–level representatives of the affected state and federal agencies and Indian tribes.
- Research and conduct an amendment proceeding on the relationship between increased flows, increased water velocity and salmon survival.

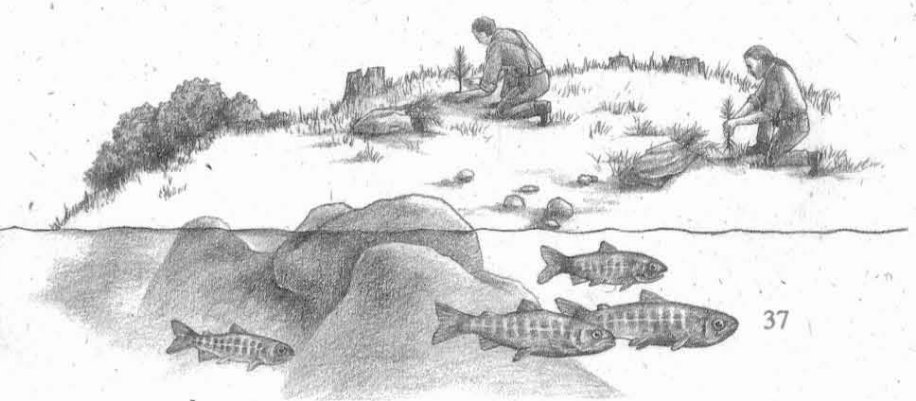
Screen dams and spill water to protect juvenile fish

Immediate actions

- Improve and/or install screens to divert juvenile fish away from turbines at Snake and Columbia river dams.
- Spill water over the tops of dams to aid juvenile salmon migration until adequate turbine screens are in place.

1980
Congress passes the Northwest Power Act, which allows Idaho, Montana, Oregon and Washington to form the Northwest Power Planning Council.

1982
Northwest Power Planning Council approves first Columbia River Basin Fish and Wildlife Program.



Intermediate–term actions

- Evaluate, design and test prototype extended–length screens at Snake and Columbia dams.
- Continue working on fish passage improvements at Bonneville Dam.
- Improve screening and bypass for both juvenile and adult fish at the Leaburg and Walterville hydroelectric projects in the Willamette River Basin. Similar actions are called for at the mid–Columbia public utility district dams.

Reduce losses to predators

- As an experiment, reduce the population of squawfish, a salmon predator, by 20 percent in the Columbia River.
- Evaluate and report on predation of salmon by seals and sea lions in the lower Columbia River.

Barge juvenile fish past dams

Immediate actions

- Accelerate improvements in barge transportation of juvenile salmon past Snake and Columbia dams, including use of cooler water and reduced densities of fish in barges and broader dispersion of the fish at release sites.

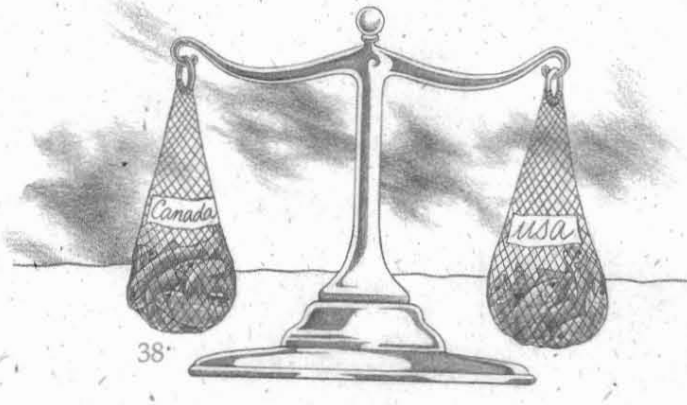
Intermediate–term actions

- Study improved fish holding and loading facilities, alternative fish collection sites and alternative transportation technologies.

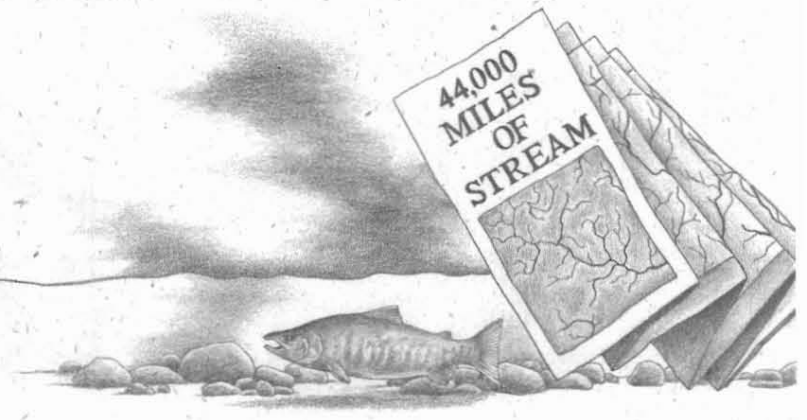
Additional river actions

- Conduct water availability studies, establish minimum instream flow levels, deny new water appropriations that would harm anadromous fish and acquire existing water rights on a "willing–seller" basis to improve fish flows.
- Enforce water rights and withdrawal limits at diversions, including measuring devices.
- Seek mitigation for lower water levels behind Dworshak Dam.
- Install juvenile PIT tag detectors at mainstem dams to better track migration.
- Evaluate impacts of flow operations on resident fish at Hungry Horse, Libby, Grand Coulee and Dworshak dams.
- Study gas supersaturation resulting from increased flows.
- Evaluate modifications to bypass release systems at dams to reduce juvenile mortality and use of sound to guide fish away from turbines.
- Report on the extent of predation and predator research in the mid–Columbia reservoirs.
- Evaluate feasibility of using video–based counting of adult fish passing dams. Institute if feasible.
- Evaluate adult fish losses between dams.
- Evaluate the effects of recent shad population increases.
- Continue to upgrade existing adult fish passage facilities.
- Upgrade the U.S. Army Corps of Engineers' Snake/Clearwater River temperature model with 1991 data.

1985
United States and Canada sign Pacific Salmon Treaty, limiting ocean harvests of salmon and committing to fish enhancement efforts.



1988
Power Planning Council designates 44,000 miles of stream as protected from new hydropower development because they contain important fish or wildlife habitat.



- Evaluate methods for decreasing water temperature in fish ladders.
- Evaluate effects of zero nighttime flow.

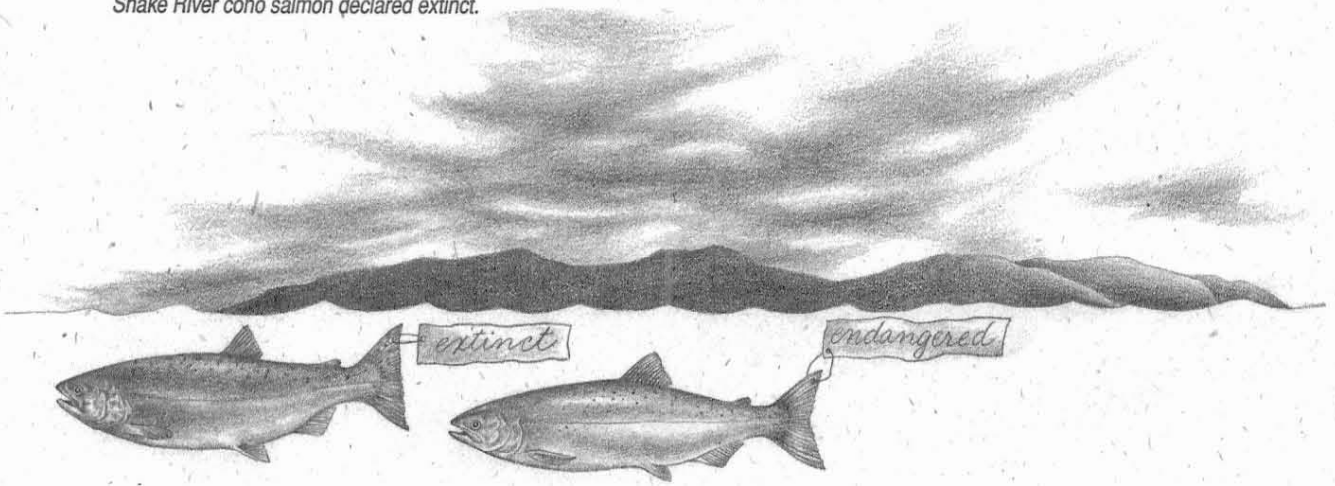
Improve harvest management

- Continue to limit harvest to allow a sufficient number of adult fish to return to spawn.
- Prohibit commercial harvest of sockeye below the confluence of the Snake and Columbia rivers to protect endangered Snake River sockeye.
- Reduce overall harvest rates on Snake River fall chinook to 55 percent of the run.
- Limit non–treaty river harvest of spring chinook to about 4 percent of the upriver run.
- Prohibit commercial fishing for summer chinook until rebuilding allows it, continuing the ban that has been in place since the mid–1960s.
- Substantially reduce Canadian harvest of U.S. salmon, and end the high seas drift–net fishery.
- Lease or buy Columbia River commercial fishing licenses and develop a compensation plan for fishers.
- Demonstrate and evaluate harvest alternatives, such as live–catch, known–stock and terminal harvest fisheries.
- Review sport fishing regulations and adopt catch–and–release rules where appropriate, account for and report on incidental harvest of salmon in other fisheries, and increase law enforcement and public education to deter illegal fishing.
- National Marine Fisheries Service should report each year on harvest and escapement of various Columbia Basin salmon stocks.
- Develop and implement genetic stock identification program.

Improve hatchery practices/ protect fish in the wild

- Improve hatchery practices and make them consistent throughout the Columbia Basin so that hatchery fish are better able to survive in the natural environment and do not harm fish that spawn in streams.
- Audit hatchery practices throughout the basin.
- National Marine Fisheries Service should quickly develop guidelines on when to use captive brood stock technology and other emergency measures to save seriously depleted salmon runs.
- Collect additional information on naturally spawning salmon populations, such as population status, life history and other data.
- Develop a process for screening proposed artificial production projects for meeting National Environmental Policy Act requirements.
- Pursue experiments in natural and artificial salmon production to measure the relative success of each approach for rebuilding depleted populations.
- Study the juvenile fish carrying capacity of the Columbia River mainstem and estuary to ensure that hatchery releases are not exceeding that capacity.

1988
Snake River coho salmon declared extinct.

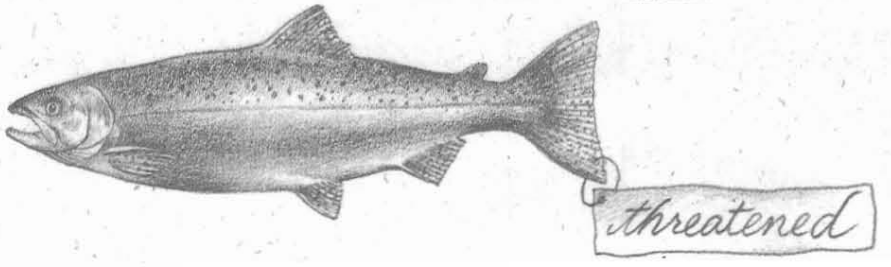


- Continue to involve appropriate genetics experts in discussions of how to sustain the diversity of salmon runs.
- Evaluate reintroduction of anadromous fish into the upper Cowlitz River Basin above the new Cowlitz Falls Dam.
- Develop appropriate recommendations for protecting and enhancing runs of sockeye, coho and chum salmon, sea–run cutthroat trout and lamprey in the Columbia River Basin.
- Identify populations of salmon that spawn in streams.
- Encourage establishment of a Pacific Northwest "biodiversity institute."
- Analyze existing data on basinwide trends in hatchery fish survival.
- Mark salmon from hatcheries with high stray rates.
- Determine the feasibility of marking all hatchery fish.
- Plan and construct spring chinook trapping facilities on Grande Ronde River tributaries.
- Demonstrate portable fish holding and juvenile acclimation facilities for adult fish.
- Secure 100 cubic feet per second water right at Ringold Hatchery in Washington.
- Develop feasibility study for reintroduction of sockeye into appropriate production areas.
- Research improvements in cryopreservation technology, and develop applications to preserve salmon eggs for future use.

Protect and restore habitat

- Give highest priority to habitat protection and improvement in areas of the Columbia Basin where there is low productivity or low survival of adult fish.
- Emphasize actions that yield the greatest value for a reasonable cost.
- Focus habitat improvement projects on approaches that involve local landowners and governments.
- Develop habitat performance standards that acknowledge and incorporate local characteristics for each watershed in the basin.
- Expand the cooperative approach to watershedwide salmon habitat and production improvements.
- Use private sector as well as public resources to ensure timely construction and installation of priority screens and water measuring devices at water diversions in salmon rearing areas.
- Inspect all underwater diversions in the mainstem Columbia and Snake rivers to determine whether screens that deflect fish from the intakes are installed and operating.
- Identify and protect permanent riparian management areas. Promote revegetation where it is needed.
- Give high priority to property easements as a means of protecting salmon habitat and low priority to government acquisition of property.

1991–1992
National Marine Fisheries Service lists Snake River sockeye as an endangered species, and Snake River spring/summer and fall chinook as threatened species.



- Review and, if necessary, improve water quantity and quality standards, and mining laws to promote salmon productivity.
- Land managers should pay special attention to insect infestations that may kill trees, lead to catastrophic fires and, in turn, result in increased erosion that damages salmon habitat.
- Expand the Columbia River Estuary Bi–State Study on water quality to include all of the Columbia River Basin.
- Study the feasibility of installing devices to control the temperature of water discharged from Cougar and Blue River dams on the McKenzie River and Detroit Dam on the Santiam River.
- Revise livestock management plans on federal lands for riparian enhancement.
- Secure funding and select watersheds for water conservation demonstration projects.
- Provide work plan for regional assessment of water availability in the Columbia River Basin.
- Provide power or reimbursement for power costs for Umatilla Basin Project water exchange.
- Complete prioritized list of tributary screening and passage projects for expeditious action.
- Establish funding for state coordinators to implement watershed management.
- Streamline procedures for funding priority habitat projects.

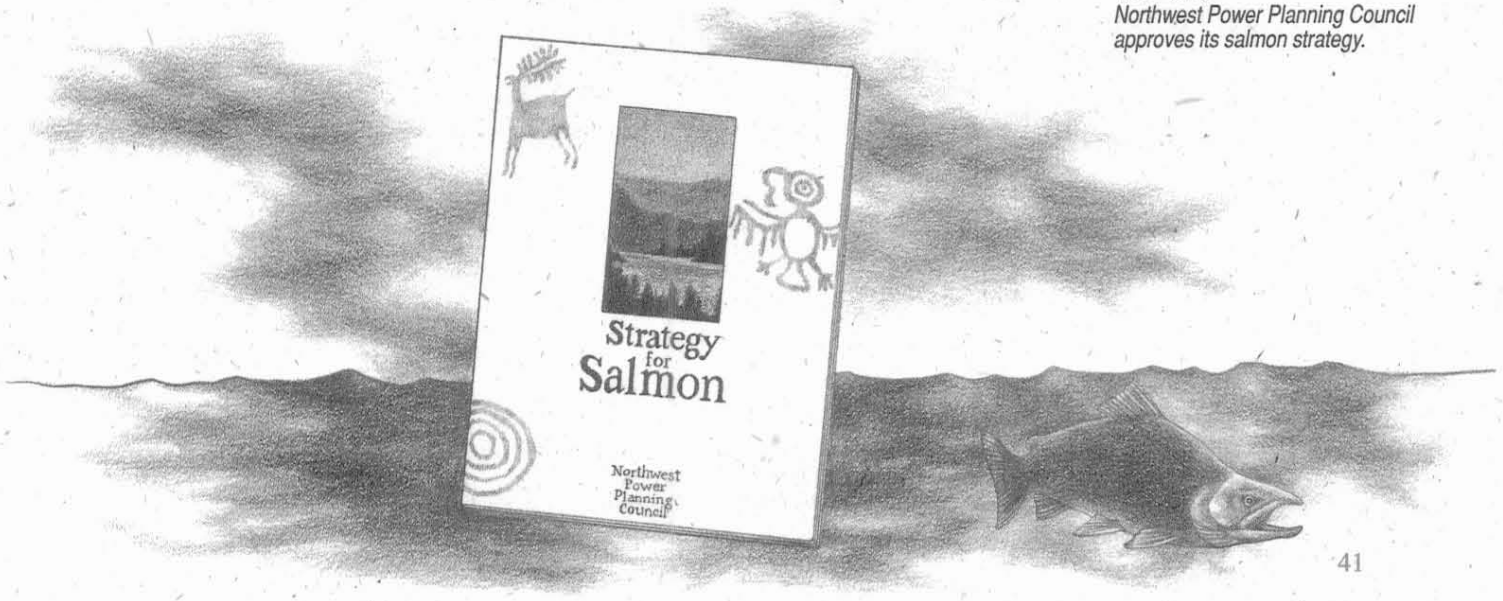
Monitor and evaluate

- Conduct independent, unbiased monitoring and scientific review of the amended fish and wildlife program, including its cost–effectiveness and biological impacts.
- Develop analytical tools to respond to critical uncertainties.
- Publish results from studies performed under program; conduct annual symposium.
- Implement Coordinated Information System.
- Develop project data base to track projects.
- Determine range, limiting factors, spawning and rearing habitat, genetic structure and population status of Snake River fall chinook, and develop experimental design for supplementing Snake River fall chinook.
- Monitor life history and survival of Snake River spring, summer and fall chinook.
- Submit schedule and work plan for development of rebuilding schedules for other regional stocks.
- Submit final list of recommended populations for biodiversity base line.

Economic mitigation

- Evaluate adverse economic effects of salmon recovery and identify funding sources for mitigation of economic consequences of salmon enhancement efforts.

1991–1992
Northwest Power Planning Council approves its salmon strategy.



To Order

Volume I is this overview of the fish program. Volume II contains the program measures. Volume II also lays the foundation for Volume I and discusses in greater detail the conclusions and recommendations of Volume I. To order, please call the Council's central office, 503–222–5161, or toll free 1–800–222–3355.

92–21 Columbia River Basin Fish and Wildlife Program—Strategy for Salmon—Volume I

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Monthly Salmon Strategy Implementation Status Reports

Note: Additional complete copies of both Volume I and Volume II will be available at many public libraries.

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