

Executive Summary

In July 1999, the Governors of Idaho, Montana, Oregon and Washington asked the Northwest Power Planning Council to prepare an annual report that provides an ongoing accounting and assessment of the Bonneville Power Administration's fish and wildlife expenditures. Additionally in their letter, the Governors requested that the first report summarize, to the degree possible, historical documentation on past expenditures and program successes and failures, and that the Council devise a method of assessing the impact of funding decisions on the basin's fish and wildlife resources.

This report is the Council's response to the Governors. The report includes:

1. A brief history of the Northwest Power Act, the Power Planning Council and the Council's program;
2. An accounting of Bonneville's fish and wildlife expenditures, which are primarily for the purpose of implementing the

Council's Columbia River Basin Fish and Wildlife Program and those Bonneville obligations that result from ESA requirements;

3. Information about fish and wildlife populations in the basin that are addressed by the program, including salmon and steelhead (anadromous fish), resident fish, and wildlife.
4. A brief discussion of the Council's current fish and wildlife program, which includes amendments for improving data collection and management to increase the public accountability for Bonneville's substantial investment in fish and wildlife.

Bonneville reports its fish and wildlife expenditures as the combined totals of spending on 1) the Council's direct program, 2) federal agency expenditures that are reimbursed by Bonneville, 3) the total repayment of capital investments for fish and wildlife projects, and 4) revenue impacts, which are the estimated net impacts on Bonneville's revenue from

adjusting dam operations to benefit fish.

Since 1978, Bonneville's fish and wildlife expenditures total \$3.48 billion. Of this total, approximately 39 percent was attributed to hydro-power operations generally intended to support migrating fish. These costs are calculated based on changes in electricity generation caused by altering water flows or implementing increased spill at the dams. The direct program, for which the Council provides more oversight, constitutes approximately 23 percent of the total Bonneville expenditure. Most of the direct program budget is dedicated to habitat (42 percent) with significant amounts allocated to artificial production (32 percent) and mainstem passage (23 percent). Most of this money is directed toward anadromous fish (76 percent), especially salmon and steelhead, with the remainder benefiting resident fish (12 percent) and wildlife (12 percent). Bonneville Fish and Wildlife expenditures prior to 1978 are not included in this report.

While we report on Bonneville's fish and wildlife expenditures, our report also notes the confusing state of fish and wildlife data collection and reporting in the basin. This must improve. When it does, accountability to the public for the Council's program and Bonneville's expenditures also will improve by making results more accessible not only to specialists, but also to the public at large. Thus, this report is an important step in developing even higher levels of public understanding about the fish and wildlife program, on the one hand, and enhanced accountability to the public for Bonneville's expenditures, on the other.

Finally, we gratefully acknowledge the assistance of Bonneville's fish and wildlife staff in preparing this report, especially David Thomas, Kim Erdman and Rollie Sivyer. We also wish to thank Streamnet, fish and wildlife agencies and Indian tribes, the Fish Passage Center and the National Marine Fisheries Service for contributing data for the report.

I. Introduction

The Northwest Power Act of 1980¹, the federal law that authorized the states of Idaho, Montana, Oregon and Washington to form the Northwest Power Planning Council, directs the Council to prepare a program “to protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply.”² The Act also directs the Administrator of the Bonneville Power Administration to “use the Bonneville fund to protect, mitigate and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries

in a manner consistent with” the Council’s fish and wildlife program.³ The Council adopted its first fish and wildlife program in 1982 and amended it in 1984, 1987, 1991-93, 1994-95 and 2000.⁴

The Council is a planning, policy-making and reviewing body. It develops the fish and wildlife program and monitors its implementation primarily by Bonneville but also by the region’s fish and wildlife agencies and tribes, the U.S. Army Corps of Engineers, the Bureau of Reclamation and the Federal Energy Regulatory Commission and its licensees. Through an annual process since 1996, the Council solicits projects to implement the program, submits them for review by the Columbia Basin Fish and Wildlife Authority,⁵ the Independent Scientific Review Panel⁶ and the general public and then recommends projects to

Bonneville for funding in the coming year. Under the terms of a six-year memorandum of agreement (MOA) signed by federal agencies in 1996, Bonneville’s annual fish and wildlife budgets were anticipated to average \$435 million, of which \$183 million was estimated for hydro-power operations.

Bonneville is not the only entity that spends money on fish and wildlife mitigation and recovery in the Columbia River Basin. State and federal fish and wildlife agencies, Indian tribes, electric utilities, local governments and private groups and citizens contribute to fish and wildlife recovery in a variety of ways. It is not our intent in this report to document those other activities. The

Governors specifically requested we report on Bonneville’s expenditures, which constitute the largest in the region.

In compiling the information for our report, we were struck by the complexity and, in some cases, the confusion, of data collection, assembly and reporting regarding Columbia River Basin fish and wildlife. As a result of the impetus provided by the Governors in requesting this report, the Council is working with the region’s fish and wildlife agencies and Indian tribes to improve data collection and management. Improved project monitoring is a key element of the Council’s 2000 Fish and Wildlife Program.



II. Bonneville's Fish and Wildlife Expenditures

A. History

With an expenditure of \$800,000 in 1978, Bonneville's fish and wildlife expenditures have grown in size and complexity to \$399 million in 1995.⁷ With carryover from one year to another and the fluctuating amount of forgone revenue and power purchases, which vary with annual water conditions, the amount can be more or less in a given year. Bonneville anticipates this amount will increase during its next five-year rate period, 2002-2006, and has reported that its proposed rates should be sufficient to accommodate as much as \$300 million per year in additional fish and wildlife

costs as well as ongoing hydropower operations. The actual amount will not be known until Bonneville implements the Council's amended program and the hydrosystem biological opinions, and when hydrosystem reimbursable expenses are known.

B. Total expenditures

Bonneville's annual fish and wildlife budget, anticipated to be \$435 million in the 1996-2001 Memorandum of Agreement (MOA), is divided into four major categories. These include:

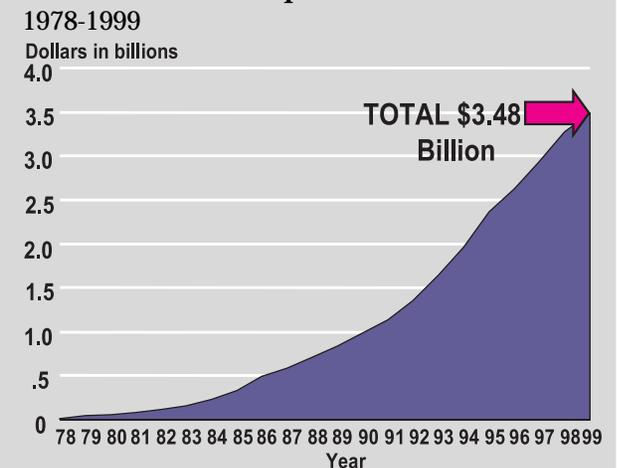
Direct program expenditures:
Through this budget, Bonneville

funds many of the initiatives in the Council's fish and wildlife program. This is perhaps the most diverse category of spending including research, monitoring and evaluation, hatchery construction and operation, wildlife land acquisitions, habitat projects and even Caspian tern decoys. In the MOA, the budget for these expenditures averages \$127 million per year, \$100 million in expense plus \$27 million in capital funding. From 1978 to 1999, the actual amount paid out as expense totaled \$810.9 million. Capital investment: Bonneville repays the U.S. Treasury for the

interest and amortization costs of fish facilities, many of which are constructed or operated by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service and the Bureau of Reclamation on the Columbia River and its tributaries. In effect, the Treasury loans money for these projects, and Bonneville makes annual "mortgage" payments on these loans. Specifically, Bonneville repays the Treasury for federal agency investments in certain fish projects including hatcheries, dam modifications to abate dissolved gas, new barges for transportation of juvenile salmon, ladders for adult fish and bypass systems for juvenile fish at the dams. In the MOA, the budget for



FIG 1
BPA Fish and Wildlife
Cumulative Expenditures



these repayments average \$112 million per year, including the capital funding for the direct program. From 1978 to 1999 the actual amount totaled \$803.3 million.

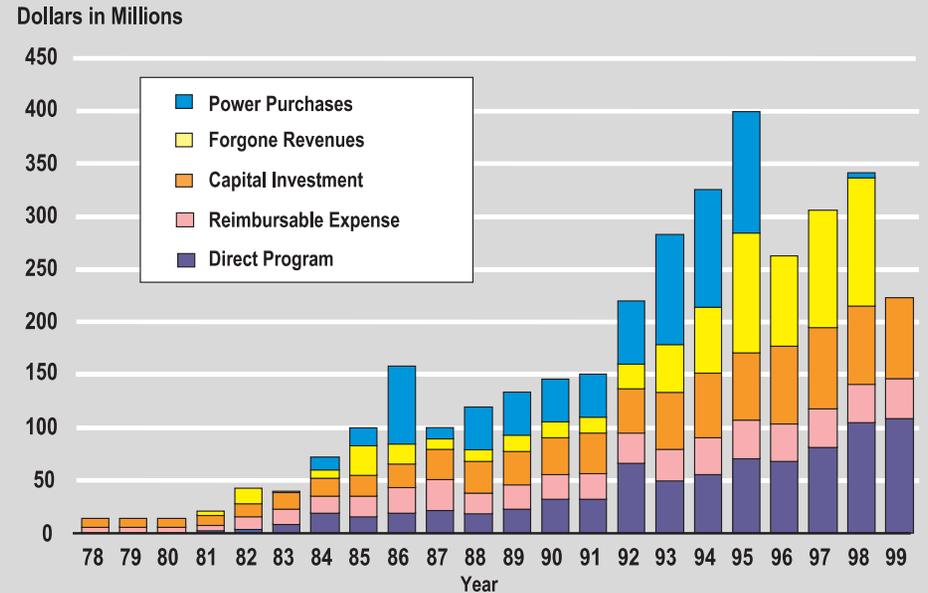
Reimbursable expenses: These are the operations and maintenance costs of some of the facilities mentioned in the capital investment budget above. This category also includes that part of the Northwest Power Planning Council's budget dedicated to fish and wildlife. In the MOA, budgets for reimbursable expenses average \$40 million per year; from 1978 to 1999 they totaled \$502.9 million.

Forgone revenue: In a good water year, Bonneville can meet its water flow targets for fish more easily, but during a dry year the needs are more demanding. Bonneville calculates the value of electric-

ity that it must forgo producing in order to reschedule flows or divert water over the spillways for fish as required by the biological opinions of the National Marine Fisheries Service or U.S. Fish and Wildlife Service, or called for in the Council's program. For example, the Council's program includes measures to change river operations to provide improved flows for salmon and steelhead in the Columbia and Snake rivers, and also for endangered white sturgeon in the Kootenai River below Libby Dam. This forgone revenue is charged against Bonneville's fish and wildlife budget as an annual expense. From 1978 to 1998, estimates of forgone revenue totaled \$698 million.

Power purchases: Also as a result of the annual water storage and river operations adopted to protect threatened and endangered species of fish, and to

FIG 2
BPA Fish and Wildlife
Total Annual Expenditures
1978-1999



Note: Power purchases and forgone revenue are not available for 1999



mitigate impacts to other species of affected by the hydrosystem, Bonneville sometimes must buy power from other suppliers in order to meet its load requirements. Bonneville also charges these purchases against its fish and wildlife budget as an expense. In the MOA, forgone revenue and power purchases combined were expected to average \$183 million per year. From 1978 to 1998, actual estimates of power purchases totaled \$668.1 million.



C. Obligations by species

The Northwest Power Act assigns special significance to anadromous fish, those that migrate between fresh and salt water, among all of the fish and wildlife of the Columbia River Basin that have been affected by the construction and operation of hydro-

power dams. Thus, the Council has devoted much of its program, and therefore guided many of Bonneville's expenditures to mitigating the impacts of hydro-power on anadromous fish, primarily salmon and steelhead.

The record shows that

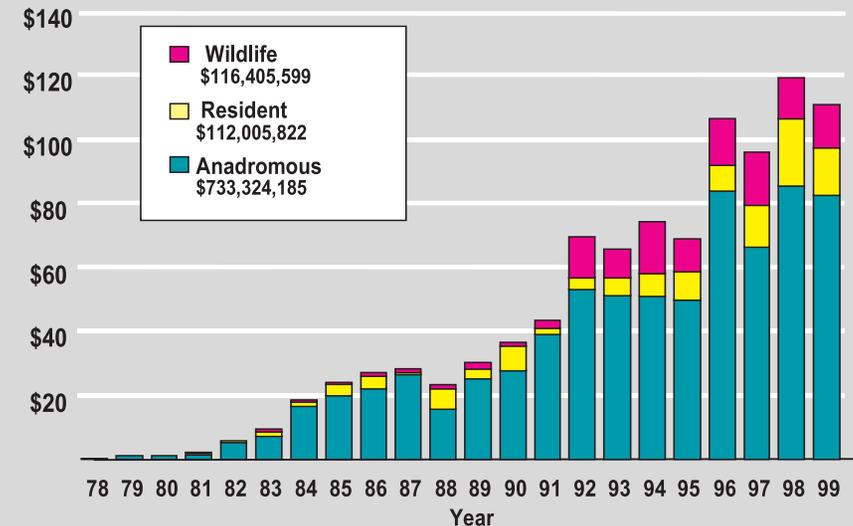
anadromous fish have been the primary beneficiaries of Bonneville's fish and wildlife expenditures. There are some small exceptions, but four of Bonneville's five major fish and wildlife budget categories — these are forgone revenue, power purchases, capital investment and reimbursable

low levels in the past, will be accorded a higher percentage of budget outlay in the future.”⁹ Accordingly, beginning in Fiscal Year 1996 the Council recommended that Bonneville allocate not less than 15 percent of its direct program budget to resident fish (those that spend their lives in fresh



FIG 3
BPA Direct Program Budget
Obligations by Species
1978-1999

Dollars in millions



expense — primarily are for measures to improve anadromous fish survival and production.⁸

In the 1994-95 program revision, however, the Council noted that “funding for resident fish and wildlife mitigation, having proceeded at

water) and not less than 15 percent to wildlife, leaving 70 percent for anadromous fish.

Figure 3 shows that most of Bonneville's expenditures in the fifth category, the direct program budget, are also dedicated to anadromous fish.

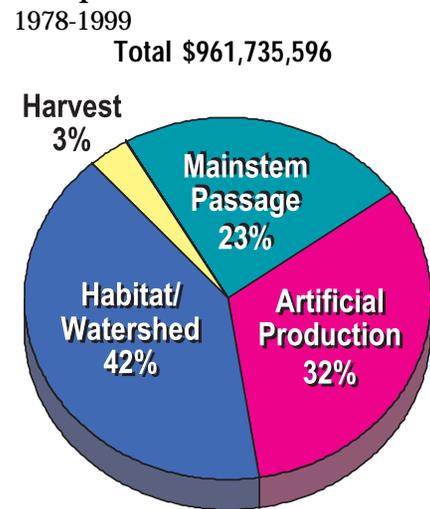
D. Obligations by Purpose

Of the five major categories of fish and wildlife expenditures, three focus primarily on improving mainstem passage: capital investment,¹⁰ forgone revenue and power purchases. Combined, these account for \$2.67 billion between 1978 and 1999, or about 76 percent of Bonneville's total fish and wildlife expenditures of \$3.48 billion in that period. The fourth category, reimbursable expense, is primarily dedicated to artificial production and the fifth, the direct program, is spread over a variety of purposes. Direct program expenditures are detailed in the following figures, which show budget obligations by general purpose and also by specific purpose.

For example, between 1978 and 1999, habitat and watershed projects, primarily enhancement and restoration efforts, have totaled \$390.6 million (42 percent of the direct program expenses); artificial production facilities, primarily hatchery construction, have accounted for \$312.3 million (32 percent of the direct program); mainstem projects, primarily monitoring of anadromous fish passage at dams, totaled \$225.6 million (23 percent of the direct program); and harvest activities, primarily law enforcement, totaled \$33.1 million (3 percent of the direct program).

This is essentially broken down by the four Hs — habitat, harvest, hatcheries and hydropower — in Figure 4, where mainstem passage is related to hydropower and artificial production represents hatcheries.

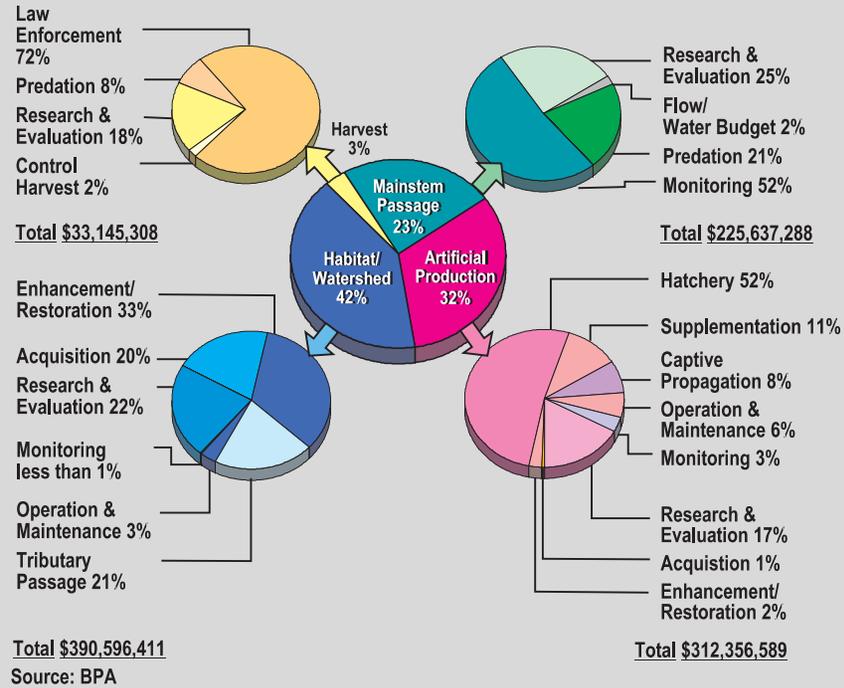
FIG 4
BPA Direct Program Budget
Obligations General
Purpose



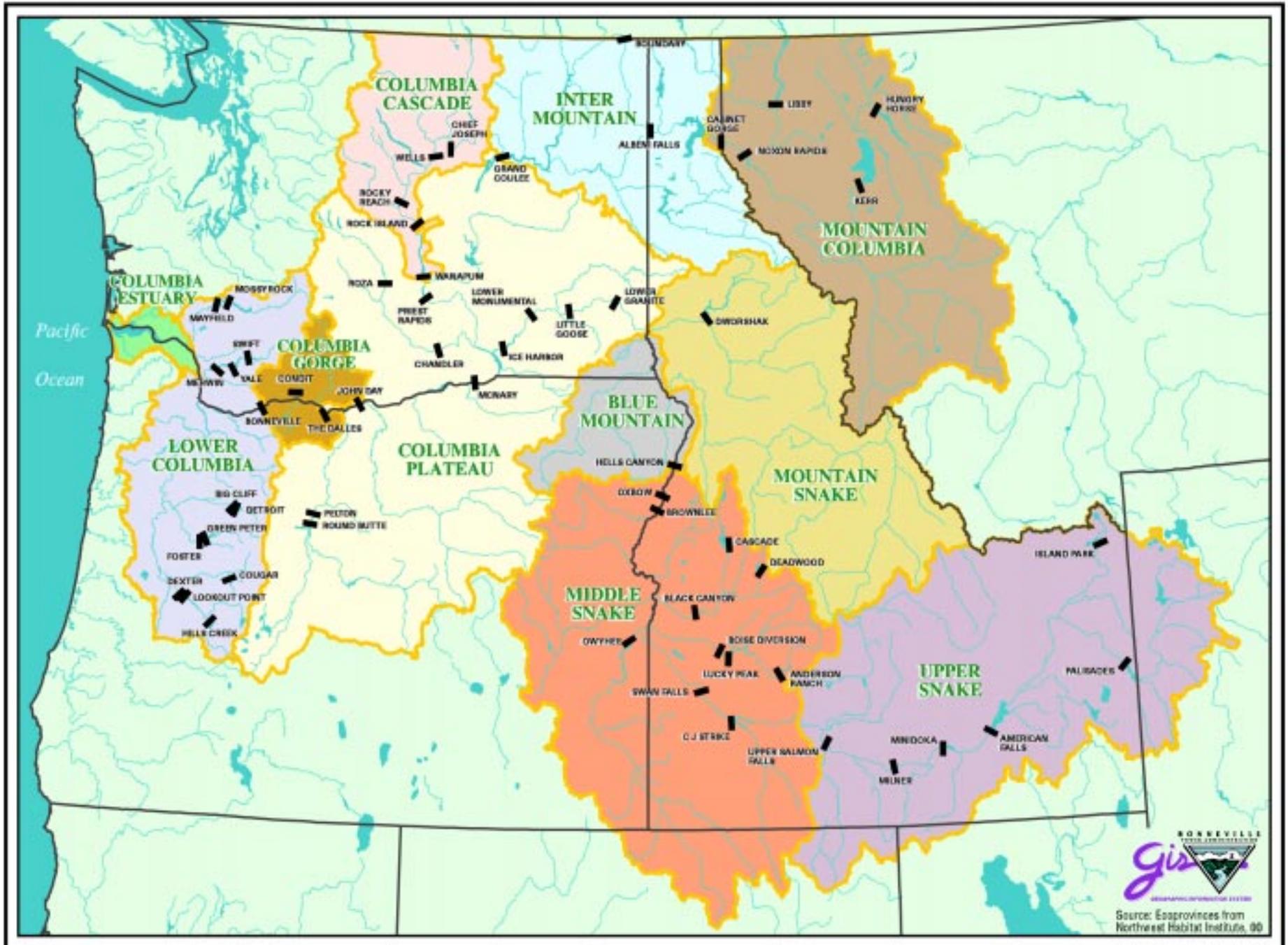
These spending patterns are broken down further into more specific categories in Figure 5. For example, research and evaluation is a prominent component of all four general purposes. Over the period from 1978 to 1999, \$202.1 million was spent on research and evaluation in all four areas, representing 21 percent of the direct program budget (excluding overhead). If we include monitoring, the numbers increase to \$330.5 million or 34.3 percent of the total budget. Obviously a significant share of the direct program budget has been spent on research, monitoring and evaluation. Most of this is focused on the freshwater part of the life cycle, with about 1 percent going to ocean and estuary research.



FIG 5
BPA Direct Program Budget
Obligations Specific Purpose
1978-1999



Ecological Provinces of the Columbia River Basin



E. Obligations by Province

Another way to describe Bonneville's direct program expenditures is geographically across the basin. Bonneville divides its expenditures into geographic divisions or provinces, as shown in the map on page 8.

Figure 6 shows that projects with general application across the basin, including general research and data centers, classified in the systemwide province, accounted for the largest share of the direct-program

expenditures, \$362 million. In dollar amounts, the next three most heavily funded provinces over the past 21 years have been the Columbia Plateau, the Mountain Snake, and the Mountain Columbia.

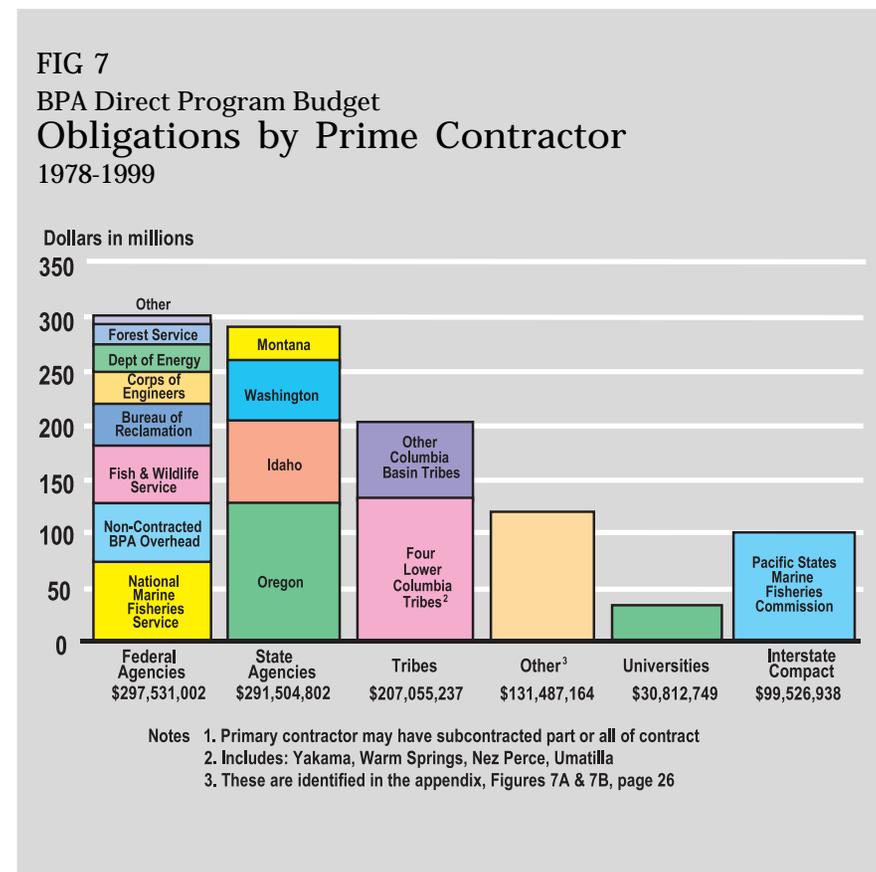
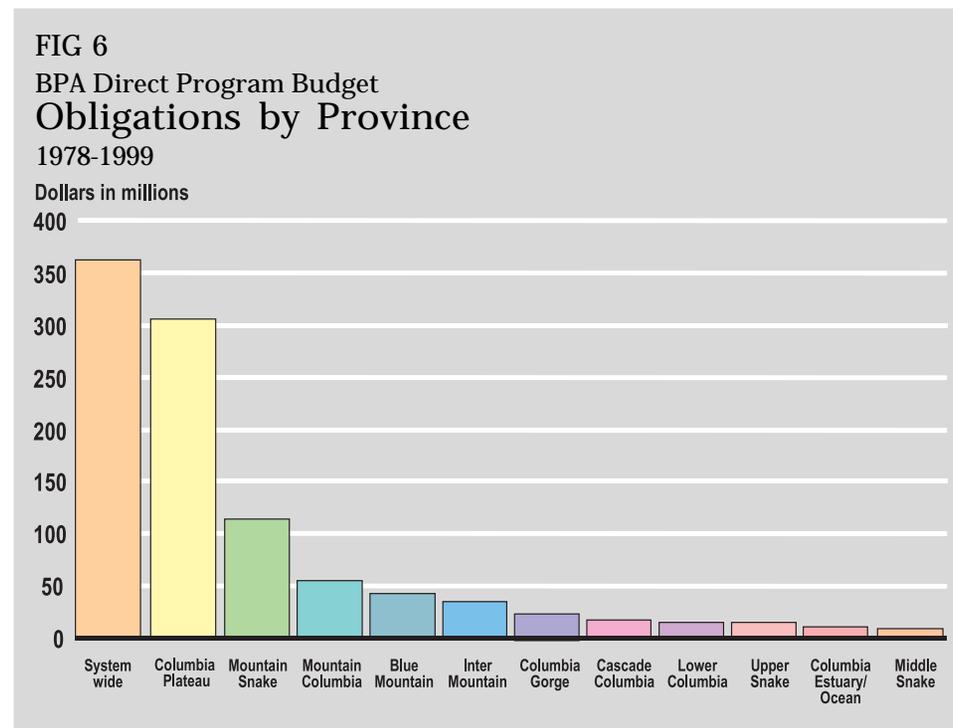
F. Obligations by Primary Contractor

The Council's program is implemented by a number of different entities, including state and federal fish and wildlife agencies, Indian tribes, university researchers,

local soil and water conservation districts and independent contractors and researchers. Prime contractors often assign the work to subcontractors, and so the entities receiving the largest amounts of money may be acting only as coordinating and contracting entities for those who do the work. An example is the Pacific States Marine Fisheries Commission which received nearly \$100 million as a prime contractor through the direct program between 1978 and 1999. A list of specific prime contractors, arranged in order of the amount

they received between 1996 and 1999, the only years such a list was available, is in the appendix to this report. Recipients of the largest amounts, along with the PSMFC, include the fish and wildlife departments in Oregon, Idaho, and Washington, and the Nez Perce and Yakama tribes.

For purposes of this report, Figure 7 divides primary contractors into six types: 1) federal agencies; 2) state agencies; 3) tribes; 4) universities; 5) interstate compacts and 6) all others. Federal and state agencies and tribes received the largest shares.



III. Anadromous Fish

As discussed earlier in this report, the Northwest Power Act notes the “significant importance” of anadromous fish in the Columbia River Basin “to the social and economic well-being of the Pacific Northwest and the Nation” and asserts these fish “are dependent on suitable environmental conditions substantially obtainable from the management and operation of the Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries.”¹¹

In its first fish and wildlife program, adopted in November 1982, the Council established measures that would lead to program goals for anadromous fish, noting that “in calculating losses and goals, the Council is limited to the effects caused by the hydroelectric system.”¹² In its 1987 program revision, the Council estimated the annual loss of salmon and steelhead attributable to the hydrosystem “to be 5-11 million fish.”¹³ With the annual runs at that time numbering about 2.5 million adult fish, the Council established a program goal to double the run size to 5 million fish.¹⁴ The Council reasserted this goal in the 1994 anadromous fish amendments to the program, and added four systemwide subgoals that emphasized rebuilding populations to biologically sustainable and harvestable levels over the next 100 years.

In the last few years, we have seen both encouraging and discouraging trends in salmon and steelhead

populations. Nine years ago only Snake River Sockeye were listed for protection under the Endangered Species Act. Today 14 fish species are listed as threatened or endangered in the Columbia Basin including 12 species of salmon and steelhead as well as bull trout and white sturgeon.

Some anadromous fish populations have improved in the last ten years, and others have declined. Figure 8 reports estimates of total adult fish returns to the Columbia River and counts of specific fish species crossing the first mainstem dam, Bonneville. Clearly not all the fish returning to the river cross the first dam as some head up tributaries, stray or are caught. While we include these numbers in this report, we do so with the understanding that they should not be used as a measure of the success or failure of individual actions that have been funded through the program over time. That is because there are myriad impacts on fish survival, some of which may be affected by individual actions in the program — restoration of spawning habitat, for example — and many that are not, such as drought and ocean conditions.

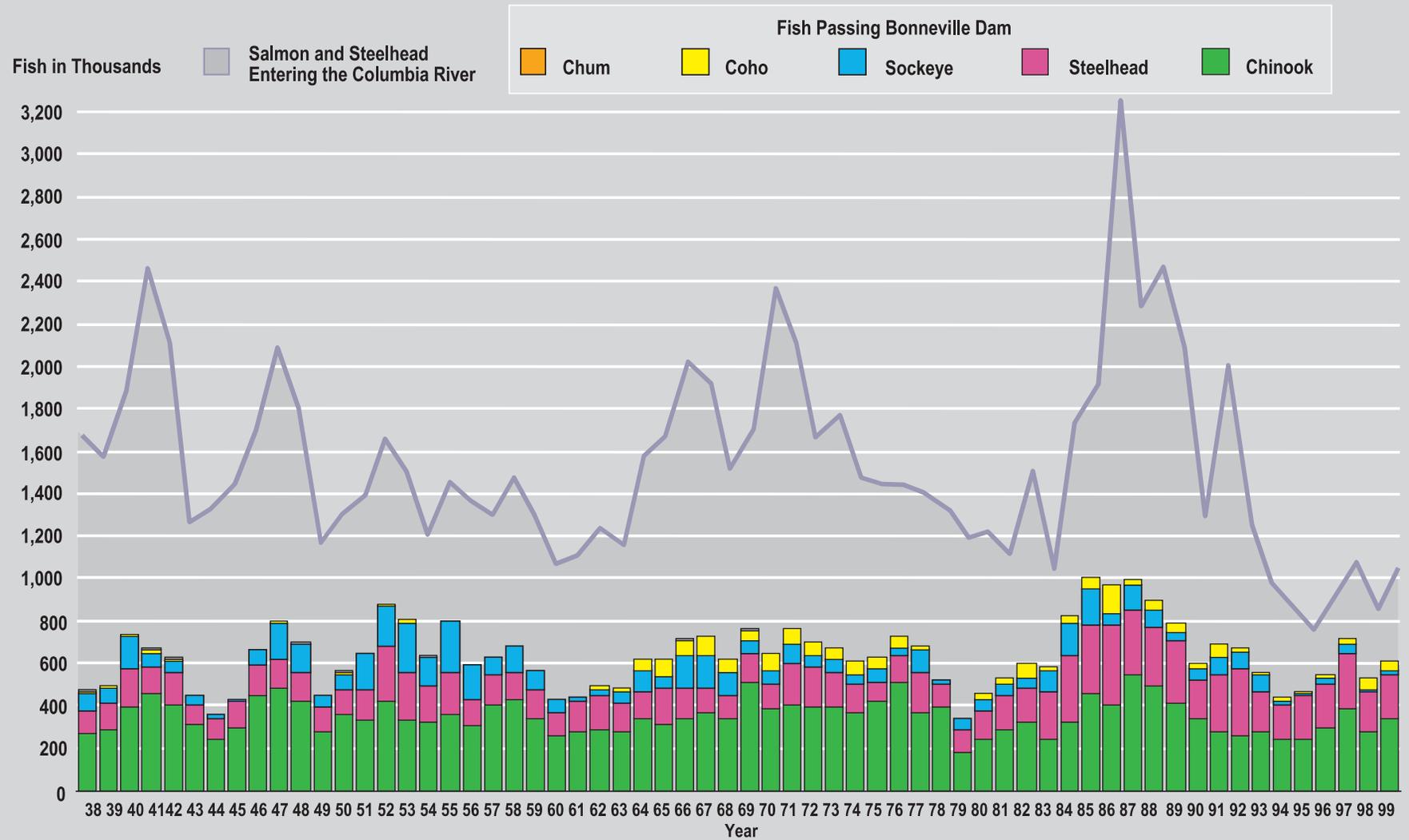
Ocean conditions vary from year to year and over longer cycles as depicted in Figure 9. Warmer ocean temperatures have been associated with weaker runs of Columbia Basin salmon and steelhead, a relationship that reverses during periods of cooler ocean temperatures. Nevertheless, run sizes do present a snapshot of

Endangered Species Act Status of Northwest Fish Populations

Species	Status	Date listed
Sockeye, Snake River	Endangered	1991
Chinook, Snake River Fall-run	Threatened	1992
Chinook, Snake River Spring/Summer-run	Threatened	1992
White Sturgeon, Kootenai River	Endangered	1994
Steelhead, Upper Columbia	Endangered	1997
Steelhead, Snake River Basin	Threatened	1997
Steelhead, Lower Columbia River	Threatened	1998
Bull Trout, Columbia Basin	Threatened	1998
Chinook, Lower Columbia River	Threatened	1999
Chinook, Upper Willamette River	Threatened	1999
Chinook, Upper Columbia River Spring-run	Endangered	1999
Chum, Columbia River	Threatened	1999
Steelhead, Upper Willamette	Threatened	1999
Steelhead, Middle Columbia River	Threatened	1999



FIG 8
 Salmon and Steelhead Entering the Columbia River and Passing Bonneville Dam
 1938-1999



stock abundance and are useful to illuminate trends. That information, coupled with information about factors such as ocean climate conditions, is useful in developing future recovery and mitigation activities.

In general, wild populations of salmon and steelhead have continued to decline while stocks composed primarily of hatchery fish — particularly those runs that return to hatcheries upstream of Bonneville Dam — have generally increased. While we fully understand that salmon and steelhead run sizes can vary from year to year, we are encouraged by the dramatic increases of primarily hatchery fish that were recorded this year. For example, 178,302 adult spring chinook salmon crossed Bonneville Dam this year, compared to the ten-year average of 62,347. The number of spring chinook jacks (sexually immature fish that are an indicator of the size of next year's run) suggests the 2001 run will be even larger, perhaps substantially so.

Historical trends for adult and jack spring chinook are reported in Figure 10. Through August, other runs also showed increases. Summer chinook, fall chinook, coho, sockeye and steelhead counted at Bonneville all were above 10-year averages, and increases also were noted at dams farther upstream. The reasons for the increased run sizes are not clear, but improved ocean conditions, spawning and rearing habitat improvements, favorable conditions in the rivers and the estuary when the fish migrated as juveniles, improved dam passage and harvest restrictions likely were instrumental.

Estimates of juvenile fish

FIG 9
Ocean Temperature Cycles
1900-2000

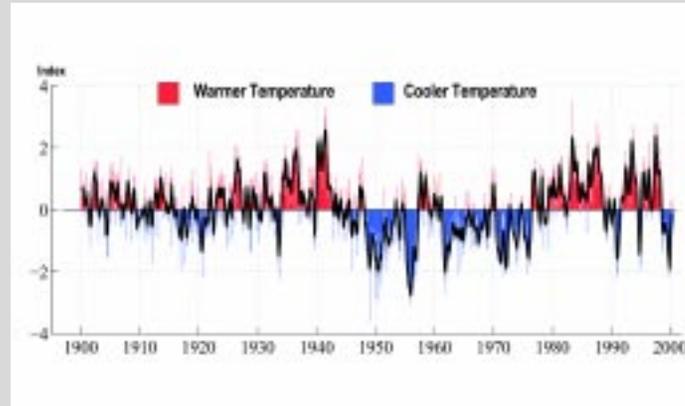
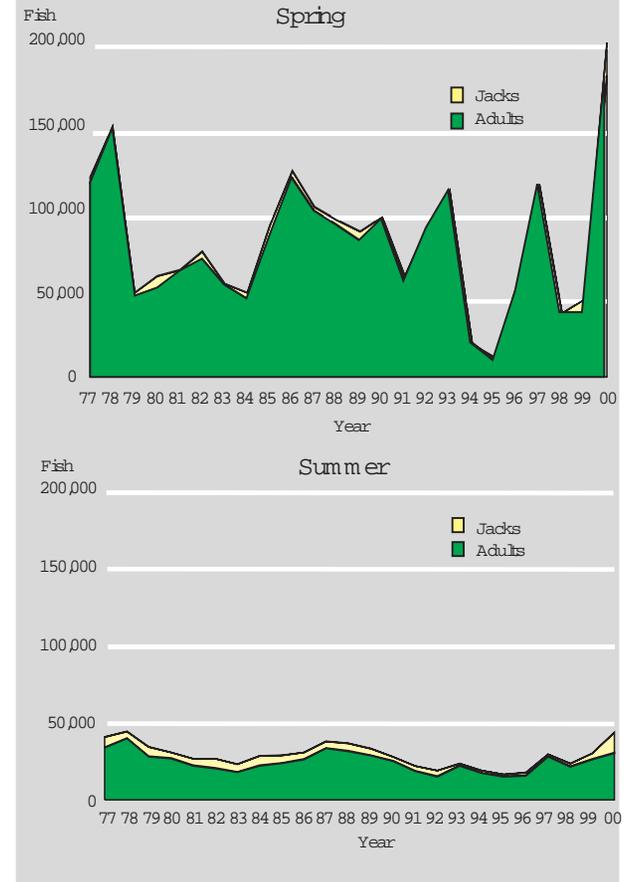


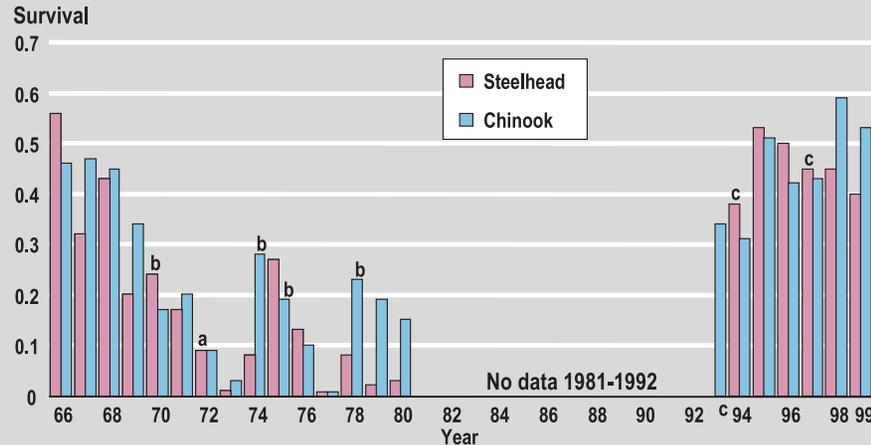
FIG 10
Spring and Summer Chinook
Passing Bonneville Dam
1977-2000



survival through the hydrosystem typically are based on observations of fish tagged with a tiny electronic chip. Based on the results of these estimates, the National Marine Fisheries Service has reported in its studies that survival of juvenile spring chinook salmon migrating past dams in the Snake River is higher today than it was in the

FIG 11
Estimated Juvenile Survival through the
Hydrosystem, Upper Snake through Bonneville
Dam

1966-1980, 1993-1999



a. Extrapolation based on three dams and reservoirs as survival estimates between Ice Harbor Dam and The Dalles Dam did not change between 1966 and 1970 after completion of John Day Dam in 1968.
 b. Based on product of two non-rounded numbers
 c. No data for steelhead in this year



1960s, which predates some of the Snake River dams. Others have questioned this conclusion because research techniques are different today than 30 years ago. In fact, the collection of data was suspended from 1981 to 1992 as the early techniques were not considered sufficiently reliable. Since 1992, the new electronic chip technology is viewed as a better evaluation tool. The results are presented in Figure 11. NMFS says the higher survival likely is the result of good flow conditions, dam operations and fish passage improvements at the dams.

Adult salmon survival also is difficult to estimate. Adult fish are counted as they pass dams, either by

observers, video cameras or detection devices. Some fish have identifying marks or tags, and others don't. Some fish fall back through dam bypass systems and are counted twice. Generally speaking, dam counts are subject to counting errors. In addition, some fish will stray into tributaries between dams or try to return downstream past a dam in search of their home tributaries, further complicating dam counts and survival estimates.¹⁵ The Council has recommended that actions be taken to improve the quality of counting adult fish at dams.

While the adult returns in 2000 are impressive, the numbers mask a disturbing trend — most of the fish

are returning to hatcheries, and the number of fish that spawn in the wild continues to be low, through 1999, as shown in Fig. 13. At least that appears to be the case, based on dam counts, but it is difficult to enumerate the actual number of fish that spawn in the wild because we do not have detailed surveys of spawning and rearing areas. Some biologists say that if the number of wild fish declines, the risk of losing the genetic diversity of unique stocks increases. This is important because wild fish may preserve the unique genetic material that provides for the long term ability of the species to adapt to environmental change.

Columbia River fish are har-

vested in both the ocean and in the river. Harvest rates in the river, presented in Figure 14, actually peaked shortly after the turn of the century and have declined steadily over time as fewer and fewer fish have returned to the river. In some cases the declining abundance of wild fish and endangered listings have forced a further reduction in harvest rates. However, another way to look at this is that permitted harvest rates continue to remain unusually high for fish at risk of extinction. For example, NMFS allows 31 percent of the threatened Snake River fall chinook to be harvested in the river every year along with 9 percent of the spring chinook.

FIG 12
Where do the fish go? Fish counted at each mainstem dam.

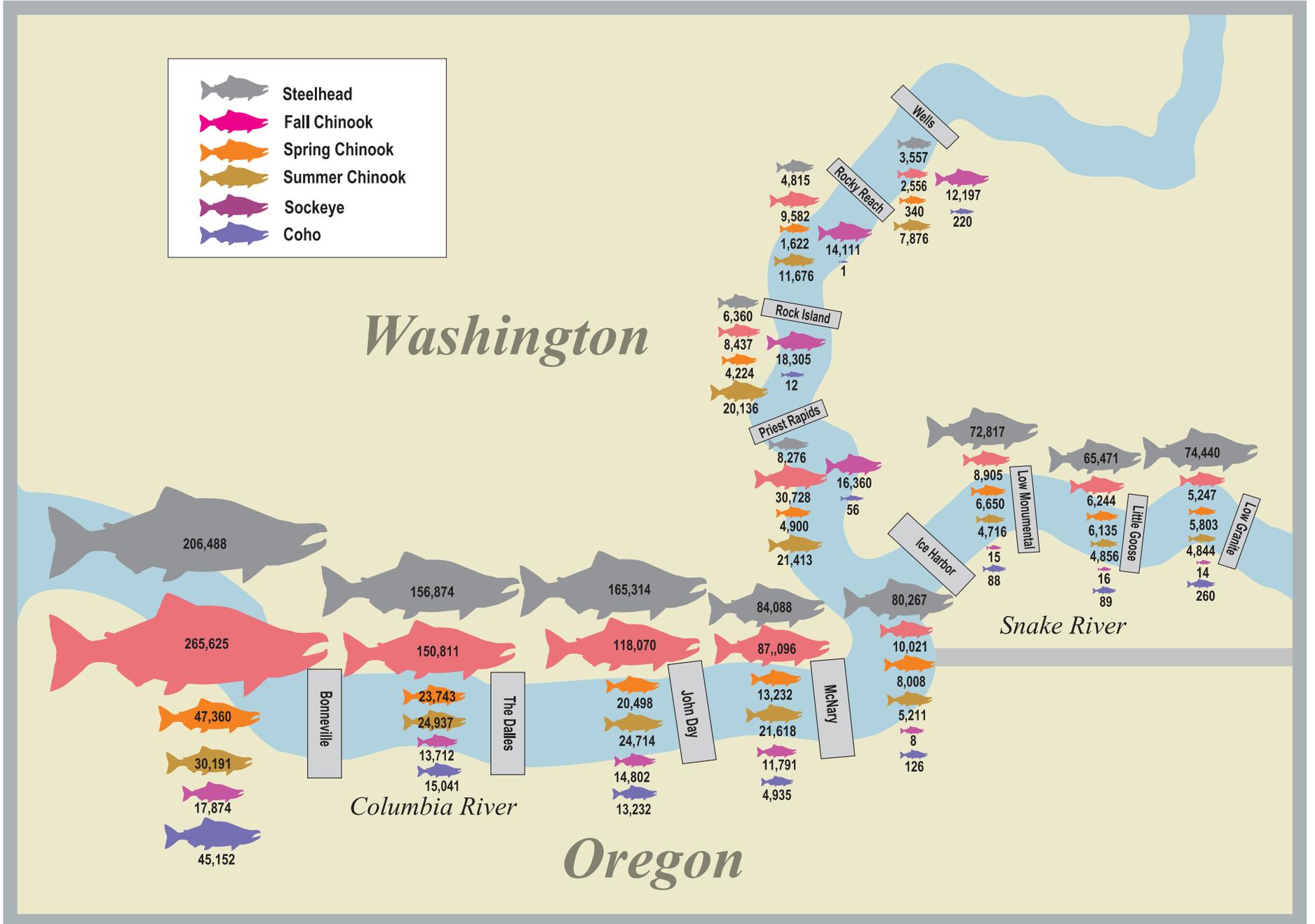




FIG 13
Wild Fish Passing Bonneville Dam
1990-1999

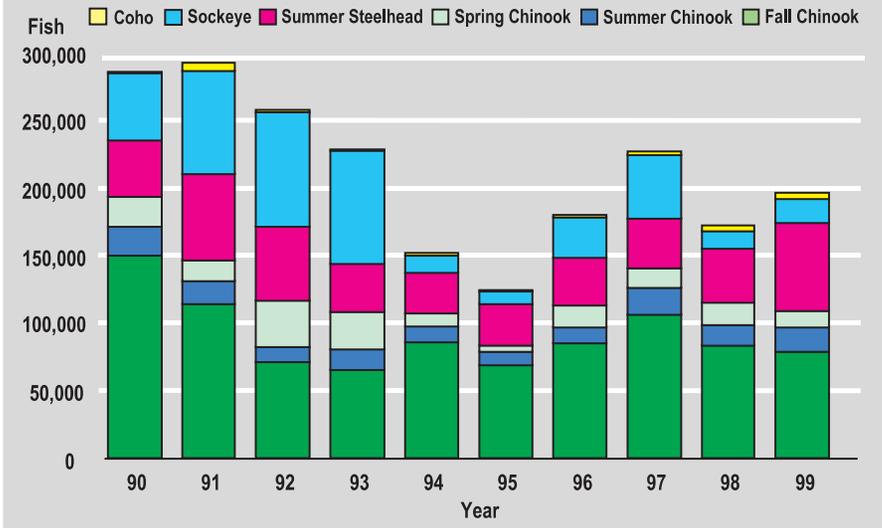
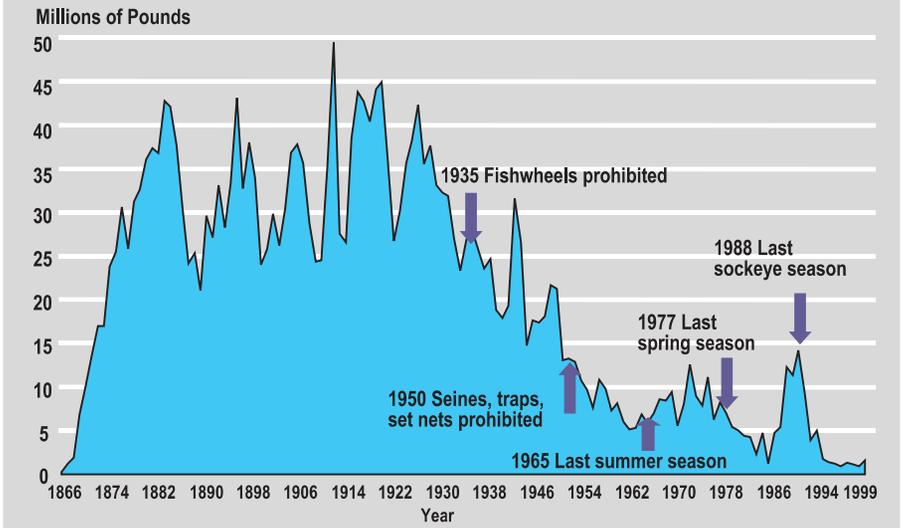


FIG 14
Commercial Landings of Salmon and Steelhead from the Columbia River
1866-1999



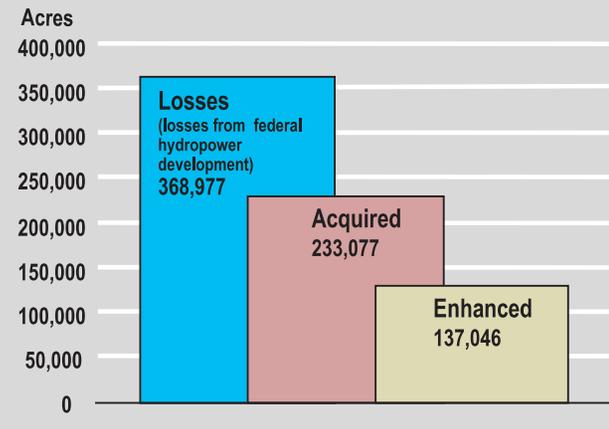
IV. Wildlife

Development of the Columbia Basin hydropower system affected many species of wildlife as well as fish. Some floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. These losses are presented in Figure 15 along with acquired acreage, including purchases and conservation easements, and enhanced acreage. Taken together, acquired and enhanced acres are counted as mitigation against total losses.

In some cases, fluctuating water levels caused by dam operations created barren vegetation zones, which expose wildlife to increased predation. In addition to these reservoir-related effects, a number of other activities associated with hydroelectric development altered land and stream areas in ways that affect wildlife. These include road construction, draining and filling of wetlands, stream channelization, construction of transmission lines and corridors and the ongoing operation of the dams. Thus, there are losses attributable to both the construction of dams and their related facilities and to the continuing operation of the dams.

Through the program, wildlife species affected by hydropower development were identified and loss estimates were determined for each mainstem dam. The Council and Bonneville worked with the region's wildlife managers and Indian tribes to develop a system of crediting habitat acquisitions against the losses.

FIG 15
Wildlife Acres, Lost, Acquired and Enhanced



Mitigation is summarized in Figure 16 and is measured in terms of habitat units in order to account for habitat quantity as well as quality. A habitat unit is an amount of habitat that supports one animal of a particular species, and the size of habitat units varies among species. A habitat unit for an elk, for example, is much different than a habitat unit for a sage grouse.

The Council estimates that the development of the hydrosystem caused a total loss of 433,085 habitat units for all affected species. Consistent with the Council's program, Bonneville negotiated wildlife mitigation agreements with the states and Indian tribes to mitigate for lost habitat units. In many of these agreements the states or tribes also manage the acquisitions. To date, about 150,000 habitat units have been

credited through acquisitions of habitat or habitat-protection agreements. The question remains unsettled as to how much credit to grant for acquired habitat, although the Council has recently provided a compromise solution.

The Council's program recognizes that some projects to improve fish habitat also provide benefits to wildlife, and so the program allows crediting of wildlife benefits from these projects. While habitat has been acquired and habitat units credited through the Council's program, there has been little direct monitoring of wildlife



Before

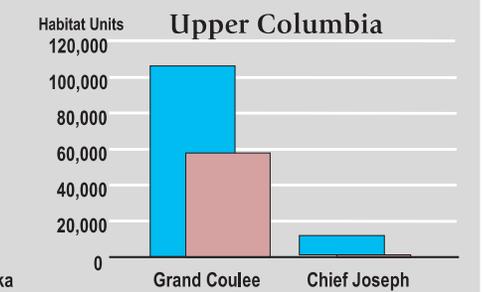
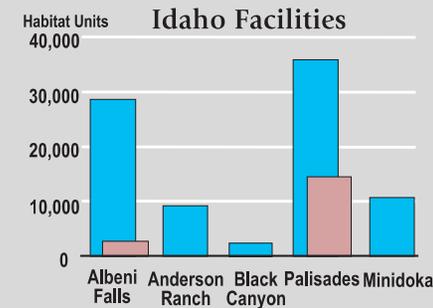
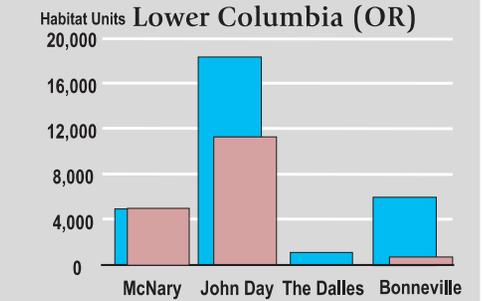
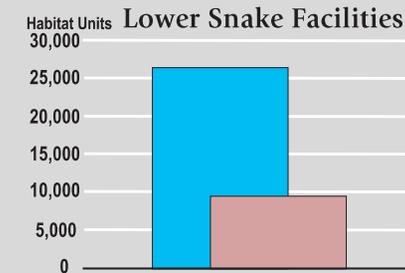
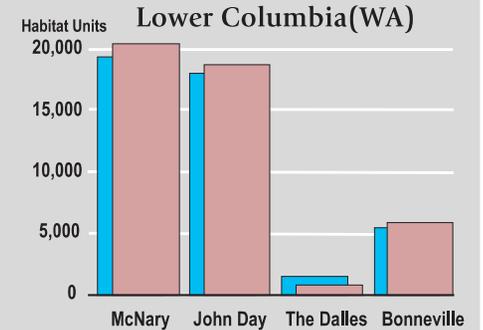
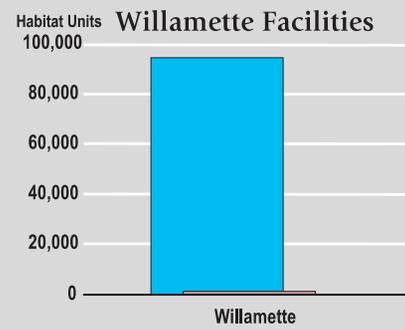
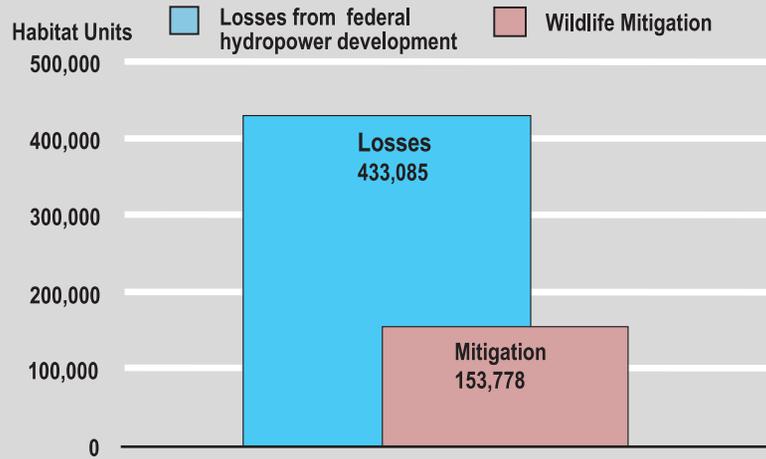
Habitat restoration and protection is occurring throughout the Basin. Restoration includes the planting of native grasses along streams and rivers.

After



populations by fish and wildlife managers to determine the effectiveness of the acquisitions. The Council has asked that monitoring be improved in the future.

FIG 16
Wildlife Habitat Units: Lost & Mitigated
 1978-1999



* Note: "Acres acquired within the state of Idaho for Dworshak agreement are not measured in habitat units and are not included in these totals."

FIG 17
Properties Protected by BPA for Wildlife Purposes
 1978-2000

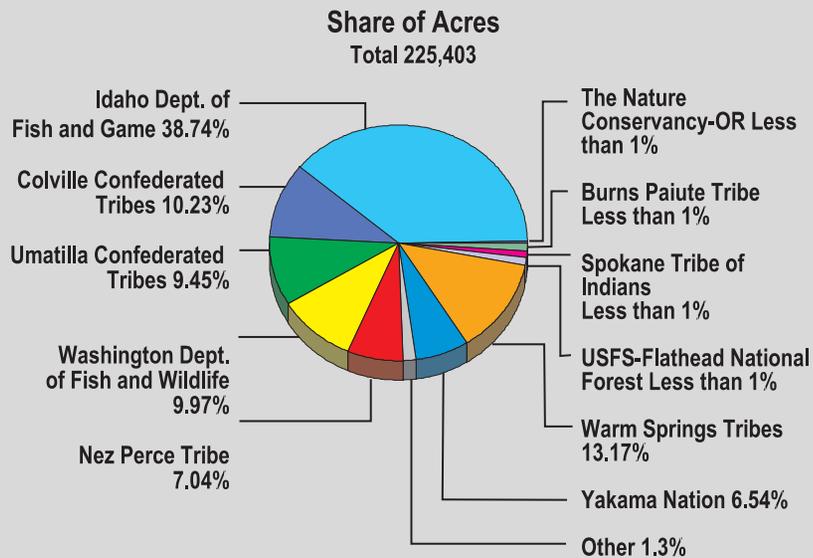
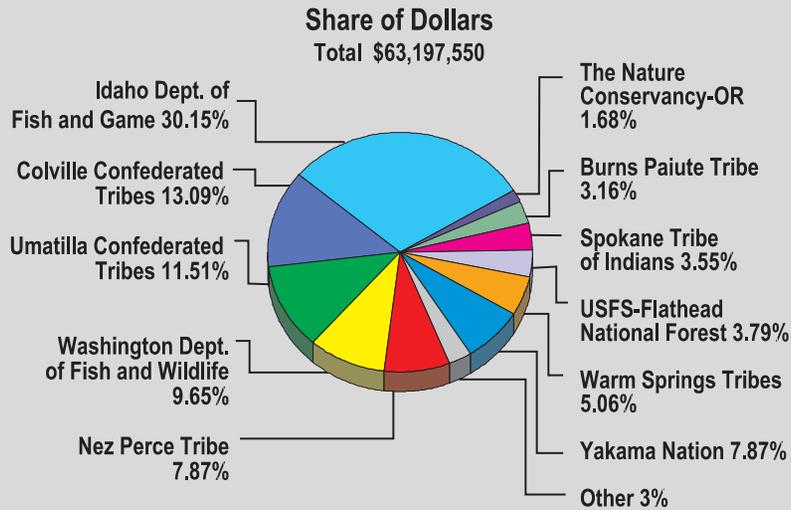
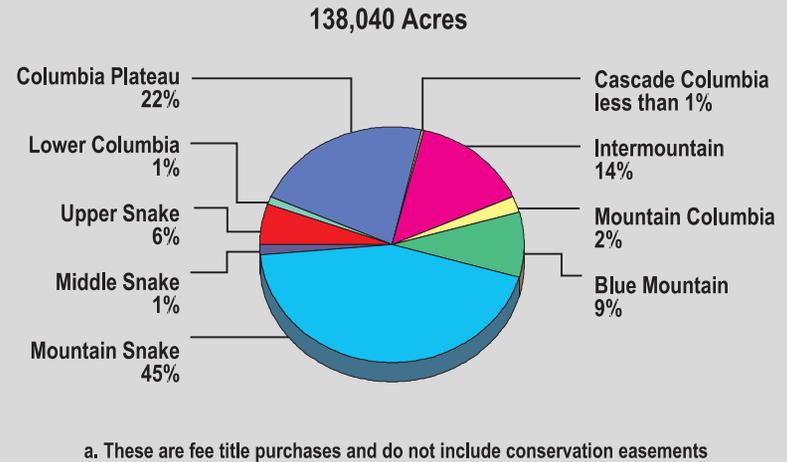


FIG 18
Properties Purchased by BPA for Wildlife Purposes by Province
 1978-2000



V. Resident Fish

Resident fish are those that live and migrate within freshwater rivers, streams and lakes of the Columbia River Basin, but do not travel to the ocean. Resident fish exist throughout the basin and are particularly important in areas where anadromous fish runs are blocked by natural or manmade obstructions. Hydroelectric projects created a number of problems for resident fish, altering river flows, inundating spawning and rearing areas and blocking natural migration patterns.

The Council's program addresses resident fish losses caused by hydro-



power development and operation, and substitution of resident fish to compensate for losses of salmon and steelhead in areas permanently blocked by hydro-power projects. In fact, vast areas that were once the destination for large runs of salmon and steelhead were permanently blocked by the construction of two federal dams, Grand Coulee and Chief Joseph. Mitigation is provided by substituting other fish species primarily through the construction and operation of fish hatcheries, such as those for trout and kokanee in Lake Roosevelt. An effort is also being made to

conserve the endangered white sturgeon in the Kootenai River. This is one example of a project that addresses a transboundary species whose habitat crosses the border with Canada. The Council works with Canadian entities on other transboundary fish and wildlife species that also are affected by the hydropower system.

The program establishes certain reservoir elevations and flow requirements to protect resident fish and their habitat. Other measures call for using stored water to maintain appropriate water temperatures and protect streambeds.

The program goal for resident

fish emphasizes the long-term sustainability of native fish in native habitats where possible, but also recognizes that where impacts have irrevocably changed the native ecosystem, we can only protect and enhance the ecosystem that remains.

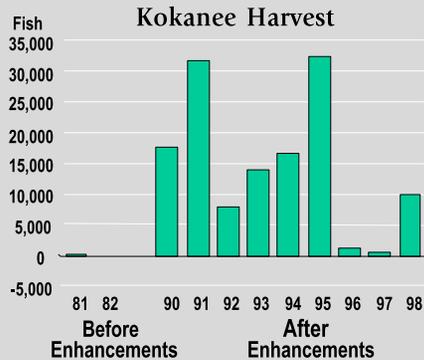
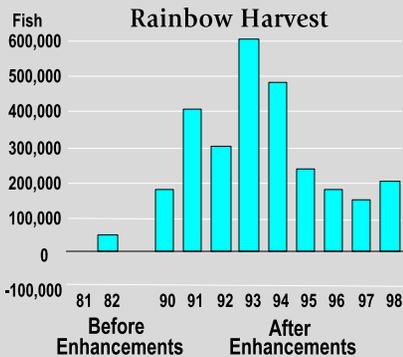
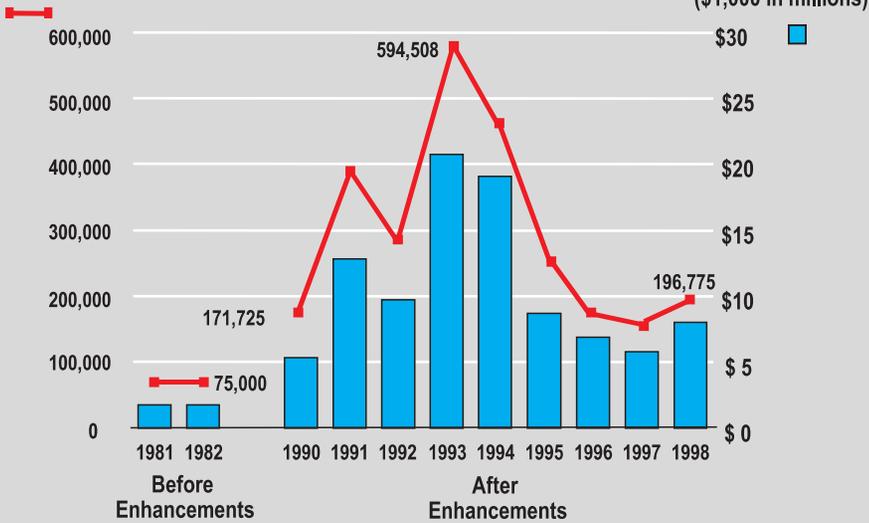
Good examples from the resident fish program are the rainbow trout and kokanee enhancement projects in Lake Roosevelt summarized in Figure 19. The salmon runs that once existed in this region were terminated with the construction of Chief Joseph and Grand Coulee dams. By the early 1980s there was relatively little fishing in the reservoir, and what was there primarily targeted a

FIG 19 Lake Roosevelt Resident Fish Program

Before and After Enhancement

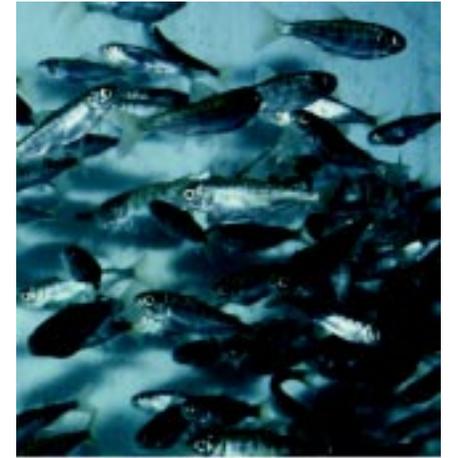
1981-1998

Angler
Trips



small population of walleye. With the construction of hatcheries and the release of kokanee and rainbow trout into the lake beginning in 1988, the number of fish harvested increased dramatically. The sharp rise in the number of angler trips contributed significantly to the economic development of the region.

While some regions have made significant progress, there remains a need to establish quantitative biological goals for all resident fish projects and to evaluate progress in meeting these goals.

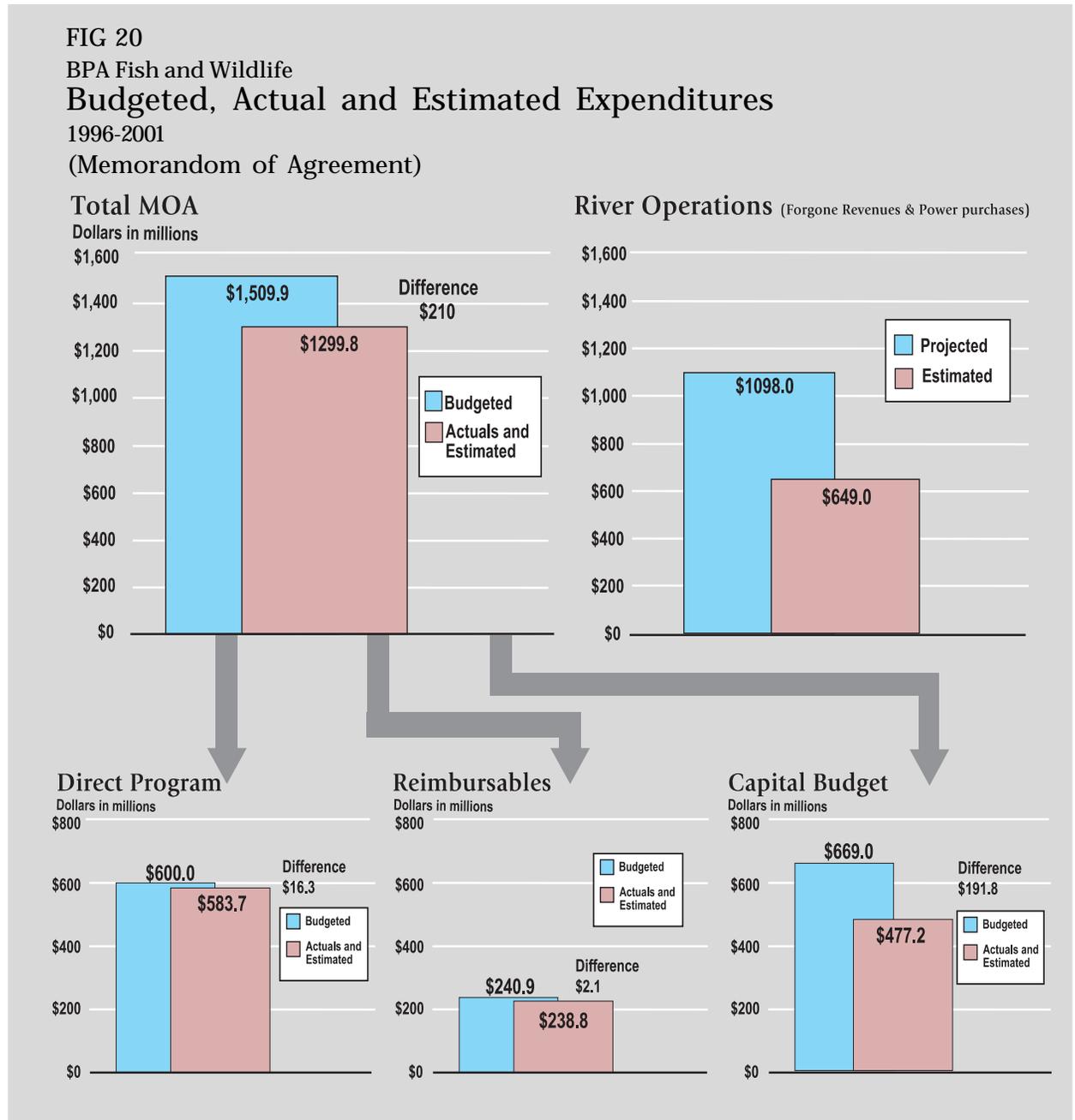


VI. Fish and Wildlife Funding Agreement

Actual expenditures for different budget categories are likely to fall short of the MOA levels by 2001, some by a small amount and others by a considerable magnitude. Spending in the direct program and the reimbursable budgets is anticipated to come remarkably close to expectations, approaching the total of \$840 million. The capital funding reallocated to the direct program (\$27 million per year) was also generally spent, but overall the capital repayment budget is likely to fall short of the anticipated spending level by as much as \$192 million. The reason for the shortfall is primarily due to Congress appropriating less money for retrofitting dams for salmon passage than originally expected. Because Bonneville pays interest and amortization to the U.S. Treasury for these expenditures, Bonneville's capital funding was lower than budgeted.

In a separate category, Bonneville estimated that river operations would cost \$183 million per year for a total of \$1.098 billion over the six-year period. In reality, water conditions were relatively good and the price of power in the wholesale markets reflected a regional surplus during most of these years. Thus, the calculated costs of river operations now are anticipated to be \$649 million, or \$449 million less than originally estimated. These forecasts are highly dependent on future water conditions.

While the MOA provides some budget certainty, there have been no official discussions to date about renewing or renegotiating the MOA when it expires. As noted earlier, it is anticipated that direct-program costs will rise in the future as the result of new projects approved for funding through the Council's program and requirements that may be imposed on Bonneville by federal fish and wildlife agencies under the Endangered Species Act.



VII. The Future

1. Population-specific goals should be adopted for fish and wildlife affected by hydropower in the Columbia River Basin in order to improve the effectiveness of Bonneville's fish and wildlife expenditures and Council decision-making, and also to ensure that actions are more effectively monitored and evaluated for their success.

The Council is working to implement its fish and wildlife program which provides direction for developing quantitative production and harvest goals for fish and wildlife in the Columbia River Basin. The program articulates broad goals including 1) halting declining trends in salmon and steelhead populations above Bonneville Dam by 2005 and increasing runs to 5 million by 2025, 2) restoring native resident fish species to near historical abundance where feasible, and 3) fully mitigating the impact of hydropower on wildlife. The goals in the program are consistent with the statutory requirements of the Northwest Power Act, address the entire Columbia Basin ecosystem,

and focus on improving ecological conditions in individual subbasins and recovery of ESA listed fish.

Future subbasin plans will identify fish and wildlife populations, opportunities for enhancement, explicit population goals, strategies to protect and recover listed fish and, where appropriate, opportunities for artificial and natural production of fish and anticipated contributions to harvest. It is essential that the Council's subbasin plans not duplicate the plans of state, tribal or federal entities, and the program even recommends adopting these plans when warranted.

2. Collection and coordination of fish and wildlife data in the Columbia River Basin must improve.

In compiling this inaugural report on Bonneville's fish and wildlife expenditures we were hindered by the confusing state of data storage and availability in the basin. There was universal support among those we contacted

at Bonneville, fish and wildlife agencies and others involved in mitigation and recovery activities to improve data collection and management. In the last several years, Bonneville has vastly improved its own fish and wildlife data collection and management. It goes without saying that improving data management will improve the public accountability of the Council's program and Bonneville's expenditures by making results accessible not only to specialists, but also to the public at large.

In its May 2000 report to the Council regarding regional databases, the Independent Scientific Review Panel made a number of general and specific recommendations for improving data collection, assembly, reporting and archiving. The Panel concluded, in part, that no organization currently is taking responsibility for comprehensive design of data collection in the basin. The ISRP found that among the region's fish and wildlife agencies and others involved in recovery efforts, data often are requested that is not being collected and that some collected data are not useful to other researchers because of inconsistent protocols used in its collection.¹⁶ We will not repeat all of the conclusions here, but we will highlight two that are key, and

which we addressed in our recent fish and wildlife program revision:

- A comprehensive monitoring program should be designed to provide the data needed to ensure progress in meeting the goals of the amended fish and wildlife program, and also the needs identified by federal agencies to meet their ESA obligations.
- The Columbia Basin states (Idaho, Montana, Oregon and Washington) and other entities, such as tribes and federal agencies, need to standardize their methods for collecting data.

Bonneville funds continue to protect, mitigate and enhance fish and wildlife of the Columbia River Basin impacted by the hydrosystem. During the past 20 years, spending levels have changed, project review has become more scientifically based and financial accounting has been refined. With improvements in data management and more locally based planning processes, we anticipate that Bonneville's fish and wildlife expenditures will become even more efficient and effective in the coming years.

NOTES

— Tables in the Appendix are numbered to correspond with the figures in the text.

- 1 Public Law 96-501, 16 United States Code (USC) Sections 839-839h
- 2 16 USC 839b(h)(5)
- 3 16 USC 839b(h)(10)(A)
- 4 The Council adopted revisions to the resident fish and wildlife sections of the program on September 13, 1995 (Council Document 95-20).
The anadromous fish chapters of the program were amended on Dec. 14, 1994 (Council Document 94-13).
- 5 The Authority is an association of state and federal fish and wildlife agencies and the 13 Indian tribes in the Columbia River Basin. The Authority coordinates planning and implementation of fish and wildlife management issues among its members.
- 6 The Independent Scientific Review Panel was created by the Council in response to a 1996 amendment to the Northwest Power Act that called for greater scientific scrutiny and public accountability of expenditures through the Council's program. The 11 members of the Panel are nominated by the National Academy of Sciences and appointed by the Council.
- 7 Bonneville reports its fish and wildlife expenses in two formats: 1) money that is obligated to a particular purpose in a particular year, and 2) actual accruals year by year. Thus, an amount obligated in one year may be spent in installments over several years. For the figures in this report, Bonneville provided obligations for some expenses and accruals for others, and we note which format is being used in each figure.
- 8 The exceptions would include the cost of Libby Dam operations on the Kootenai River to benefit endangered white sturgeon, and Albeni Falls Dam operations on the Pend Oreille River as part of an experiment to improve the survival of kokanee in Lake Pend Oreille, both in northern Idaho.
- 9 1994-95 Fish and Wildlife Program, Section 2.2F, Page 2-4.
- 10 As noted earlier, a portion of the reimbursable expenses and capital investment fixed costs are for fish hatcheries and other activities, but primarily these expenses are for fish passage and survival improvements at Columbia and Snake river dams.
- 11 16 USC 839(6)
- 12 1982 Fish and Wildlife Program, Page 2-2.
- 13 Appendix D of the 1987 Fish and Wildlife Program, Page 22.
- 14 1987 Fish and Wildlife Program, Page 34.
- 15 See, "Report and Recommendations of the NW Power Planning Council upon Review of the Corps of Engineer's Columbia River Fish Mitigation Program
"ISAB report 99-5, April 28, 1999 and NMFS White Paper entitled "Passage of Juvenile and Adult Salmonids Past Columbia and Snake River Dams," April 2000.
- 16 "Review of Databases Funded through the Columbia River Basin Fish and Wildlife Program," Council Document ISRP 2000-3, May 2000.

VIII. Appendix:

Fig 1 & 2 Cumulative and Total annual expenditures

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
DIRECT PROGRAM																							
Planning & Administration (StreamNet/CBFWA) Obs	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.4	\$0.7	\$0.7	\$0.5	\$0.6	\$0.6	\$1.9	\$1.5	\$2.4	\$2.4	\$2.5	\$14.3
Program Coordination (BPA O/H)	n/a	\$1.8	\$1.5	\$1.7	\$2.1	\$2.8	\$3.2	\$4.0	\$4.5	\$2.9	\$6.4	\$5.6	\$5.2	\$4.6	\$46.2								
Direct Program Expense	\$0.8	\$0.8	\$0.8	\$2.3	\$4.6	\$9.1	\$19.6	\$15.9	\$19.6	\$20.4	\$17.3	\$20.9	\$30.0	\$29.4	\$63.3	\$45.0	\$50.8	\$66.6	\$60.6	\$74.2	\$97.3	\$101.1	\$750.3
Subtotal	\$0.8	\$0.8	\$0.8	\$2.3	\$4.6	\$9.1	\$19.6	\$15.9	\$19.6	\$22.2	\$18.8	\$23.0	\$32.8	\$33.0	\$67.0	\$49.6	\$55.9	\$71.4	\$68.5	\$82.2	\$104.9	\$108.2	\$810.9
REIMBURSABLE EXPENSE	\$5.0	\$5.0	\$5.0	\$6.1	\$11.5	\$14.2	\$16.0	\$19.9	\$23.7	\$29.7	\$19.0	\$23.6	\$23.4	\$24.3	\$28.4	\$30.5	\$34.9	\$36.1	\$35.4	\$35.9	\$36.4	\$38.9	\$502.9
CAPITAL INVESTMENT FIXED EXPENSE	\$8.0	\$8.0	\$8.0	\$8.8	\$12.4	\$15.9	\$16.6	\$19.7	\$22.1	\$28.5	\$31.0	\$31.9	\$34.3	\$38.2	\$41.9	\$53.6	\$61.3	\$63.6	\$73.1	\$76.3	\$74.1	\$76.0	\$803.3
RIVER OPERATIONS																							
Forgone Revenues	\$0.0	\$0.0	\$0.0	\$3.0	\$14.0	\$1.0	\$8.0	\$27.0	\$19.0	\$9.0	\$10.0	\$15.0	\$15.0	\$15.0	\$23.0	\$45.0	\$62.0	\$114.0	\$85.7	\$111.8	\$120.5	n/a	\$698.0
Power Purchases	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$12.0	\$17.0	\$74.0	\$11.0	\$40.0	\$40.0	\$40.0	\$40.0	\$59.0	\$104.0	\$111.7	\$114.0	\$0.0	\$0.0	\$5.4	n/a	\$668.1
Subtotal	\$0.0	\$0.0	\$0.0	\$3.0	\$14.0	\$1.0	\$20.0	\$44.0	\$93.0	\$20.0	\$50.0	\$55.0	\$55.0	\$55.0	\$82.0	\$149.0	\$173.7	\$228.0	\$85.7	\$111.8	\$125.9	-	\$1,366.1
TOTAL	\$13.8	\$13.8	\$13.8	\$20.2	\$42.5	\$40.2	\$72.2	\$99.5	\$158.4	\$100.4	\$118.8	\$133.5	\$145.5	\$150.5	\$219.3	\$282.7	\$325.8	\$399.1	\$262.7	\$306.2	\$341.3	\$223.1	\$3,483.2

1/ Beginning of Accrual Accounting. Prior year information was Obligations based Accounting.

2/ FY 1999 River 2/Operations calculations are not available at this time

Source: Bonneville Power Administration

Fig. 3 Obligations by Species 1978-1999

FY	Anadromous Fish	Resident Fish	Wildlife	Total	FY	Anadromous Fish	Resident Fish	Wildlife	Total
1978	\$400,00	\$0	\$0	\$400,000	1990	\$27,737,779	\$7,795,641	\$1,058,418	\$36,591,838
1979	\$979,628	\$0	\$0	\$979,628	1991	\$38,973,827	\$2,028,859	\$2,530,970	\$43,533,656
1980	\$1,232,775	\$0	\$0	\$1,232,775	1992	\$53,119,662	\$3,550,209	\$12,847,109	\$69,516,980
1981	\$1,512,801	\$251,000	\$0	\$1,763,801	1993	\$51,129,495	\$5,457,600	\$8,936,699	\$65,523,794
1982	\$5,349,333	\$355,390	\$0	\$5,704,723	1994	\$51,044,466	\$7,072,137	\$16,090,951	\$74,207,554
1983	\$7,222,161	\$1,441,440	\$789,026	\$9,452,627	1995	\$49,894,315	\$8,692,253	\$10,206,415	\$68,792,983
1984	\$16,675,925	\$1,263,895	\$589,066	\$18,528,886	1996	\$83,789,352	\$7,962,544	\$14,815,773	\$106,567,669
1985	\$19,945,958	\$3,571,308	\$553,022	\$24,070,288	1997	\$66,524,626	\$12,944,597	\$16,615,431	\$96,084,654
1986	\$22,208,357	\$3,779,463	\$1,009,667	\$26,997,487	1998	\$85,533,382	\$20,991,620	\$12,675,870	\$119,200,872
1987	\$26,560,517	\$591,182	\$1,149,655	\$28,301,354	1999	\$82,415,426	\$14,850,466	\$13,443,429	\$110,709,321
1988	\$15,848,972	\$6,389,391	\$1,040,601	\$23,278,964		\$733,324,185	\$112,005,822	\$116,405,599	\$961,735,606
1989	\$25,225,428	\$3,016,827	\$2,053,497	\$30,295,752					\$37,999,235
									\$58,183,051
									Contracted Coordination
									Non-Contracted BPA Overhead

Source: Bonneville Power Administration

**Fig. 4 Obligations by General Purpose -
Direct Program Obligation Expense 1978-1999**

General Purpose	Amount	Specific Purpose	Detail
		Research and Evaluation	\$202,082,661
		Hatchery	\$162,596,705
		Enhancement / Restoration	\$138,049,904
		Monitoring	\$128,414,853
		Tributary Passage	\$81,288,307
		Acquisition (Wildlife)	\$77,652,247
		Predation	\$50,347,152
		Supplementation	\$34,417,819
		Operations and Maintenance	\$31,105,938
		Captive Propagation	\$24,140,963
		Law enforcement	\$23,969,590
Habitat / Watershed	\$390,596,411	Flow / Water Budget	\$4,662,553
Production	\$312,356,589	Acquisition (Other)	\$2,209,393
Mainstem	\$225,637,298	Control Harvest	\$687,521
Harvest	\$33,145,308	Other	\$110,000
	\$961,735,606		\$961,735,606

Source: Bonneville Power Administration

**Fig. 5 Breakdown of Expenditures for
Mainstem, Production, Habitat and Harvest 1978-1999**

General Purpose	Specific Purpose	Amount
Mainstem	Monitoring	\$117,078,266.00
Mainstem	Research and Evaluation	\$56,063,317.00
Mainstem	Predation	\$47,832,162.00
Mainstem	Flow / Water Budget	\$4,662,553.00
Mainstem	Other	\$1,000.00
		\$225,637,298.00
Production	Hatchery	\$162,596,705.00
Production	Research and Evaluation	\$53,120,911.00
Production	Supplementation	\$34,417,819.00
Production	Captive Propagation	\$24,140,963.00
Production	Operations and Maintenance	\$18,256,307.00
Production	Monitoring	\$10,681,793.00
Production	Enhancement / Restoration	\$7,346,240.00
Production	Acquisition	\$1,685,851.00
Production	Other	\$110,000.00
		\$312,356,589.00
Habitat	Enhancement / Restoration	\$130,702,664.00
Habitat	Research and Evaluation	\$86,925,226.00
Habitat	Tributary Passage	\$81,288,307.00
Habitat	Acquisition	\$78,175,789.00
Habitat	Operations and Maintenance	\$12,849,631.00
Habitat	Monitoring	\$654,794.00
		\$390,596,411.00
Harvest	Law enforcement	\$23,969,590.00
Harvest	Research and Evaluation	\$5,973,207.00
Harvest	Predation	\$2,514,990.00
Harvest	Control Harvest	\$687,521.00
		\$33,145,308.00

Source: Bonneville Power Administration

Fig. 6 Obligations by Province 1978-1999

Province	Sum Of Contract Amount
Systemwide	\$362,121,685.00
Columbia Plateau	\$301,567,736.00
Mountain Snake	\$113,500,614.00
Mountain Columbia	\$55,261,562.00
Blue Mountain	\$42,887,733.00
Intermountain	\$34,871,205.00
Columbia Gorge	\$25,721,338.00
Cascade Columbia	\$17,118,260.00
Lower Columbia	\$15,256,708.00
Upper Snake	\$14,266,671.00
Columbia Estuary /Ocean	\$9,437,273.00
Middle Snake	\$7,724,056.00
	\$999,734,841.00
Non-Contracted BPA Overhead	\$58,183,051

Source: Bonneville Power Administration

Fig. 7A Obligations by Prime Contractor 1978-1999

Contractor Type	Prime Contractor	Amount	
FEDERAL	NATIONAL MARINE FISHERIES SERVICE	\$70,736,586	
	NON-CONTRACTED BPA OVERHEAD	\$58,183,051	
	FISH AND WILDLIFE SERVICE	\$53,109,604	
	BUREAU OF RECLAMATION	\$39,870,334	
	CORPS OF ENGINEERS	\$25,829,517	
	DEPARTMENT OF ENERGY	\$23,288,004	
	FOREST SERVICE	\$20,826,134	
	OTHER	\$5,687,772	
		\$297,531,002	
	STATE	OREGON DEPARTMENT OF FISH & WILDLIFE	\$121,397,049
IDAHO DEPARTMENT OF FISH & GAME		\$71,751,549	
WASHINGTON DEPARTMENT OF FISH & WILDLIFE		\$52,770,525	
MONTANA DEPARTMENT OF FISH & WILDLIFE		\$31,067,533	
OREGON STATE POLICE - FISH AND WILDLIFE		\$3,480,952	
WASHINGTON WILDLIFE COALITION MEMBERS		\$3,445,738	
IDAHO SOIL & WATER CONSERVATION COMMISSION		\$3,423,070	
WASHINGTON DEPT OF ECOLOGY		\$2,831,271	
WASHINGTON STATE CONSERVATION COMMISSION.		\$694,411	
WASHINGTON STATE ENERGY OFFICE		\$242,857	
OREGON DEPARTMENT OF ENERGY		\$131,391	
OREGON DEPARTMENT OF TRANSPORTATION		\$106,422	
WASHINGTON DEPARTMENT OF TRANSPORTATION		\$101,700	
OREGON DEPT OF ENVIRONMENTAL QUALITY		\$50,334	
OREGON DEPARTMENT OF PARKS & RECREATION		\$5,000	
WASHINGTON DEPARTMENT OF NATURAL RESOURCES		\$5,000	
		\$291,504,802	
TRIBE		YAKAMA INDIAN NATION	\$43,349,245
		NEZ PERCE TRIBE	\$36,253,043
	UMATILLA CONFEDERATED TRIBES	\$27,297,098	
	COLVILLE CONFEDERATED TRIBES	\$21,979,085	
	SHOSHONE-BANNOCK TRIBES	\$15,222,047	
	SPOKANE TRIBE of INDIANS	\$12,410,724	
	KOOTENAI TRIBE of IDAHO	\$8,342,330	
	COLUMBIA BASIN FISH & WILDLIFE FOUNDATION	\$8,239,947	
	COLUMBIA RIVER INTERTRIBAL FISH COMMISSION	\$7,586,035	
	WARM SPRINGS TRIBES	\$5,971,167	
	SHOSHONE-PAIUTE TRIBES	\$5,885,222	
	KALISPEL TRIBE of INDIANS	\$5,546,899	
	COEUR D'ALENE TRIBE of IDAHO	\$4,644,877	
	SALISH-KOOTENAI TRIBES	\$3,401,810	
	BURNS PAIUTE TRIBE	\$900,862	
	POINT NO POINT TRIBE	\$11,960	
	TULALIP TRIBE	\$4,988	
	KLAMATH TRIBE	\$4,512	
	CHEHALIS INDIAN TRIBE	\$2,082	
	SQUAXIN ISLAND TRIBE	\$1,304	
	\$207,055,237		
INTERSTATE COMPACT	PSMFC	\$99,526,938	
UNIVERSITY	University	\$30,812,749	
OTHER	Local/Semi governmental	\$17,557,563	
	Utility	\$10,195,863	
	Not Specified (Land)	\$11,257,473	
	Private/Other	\$92,476,265	
		\$131,487,164	
	\$1,057,917,892		

Source: Bonneville Power Administration

Fig. 7B Expenditure of Direct BPA funds by Contractor 1996-2000

Contractor	Amount
PACIFIC STATES MARINE FISH COMMISSION	\$58,268,622
OREGON DEPARTMENT OF FISH & WILDLIFE- HQ	\$44,071,981
IDAHO DEPARTMENT OF FISH & GAME	\$36,997,520
YAKAMA NATION	\$36,241,179
NEZ PERCE TRIBE	\$35,333,830
WASHINGTON DEPARTMENT OF FISH & WILDLIFE	\$33,564,385
NATIONAL MARINE FISHERIES SERVICE - SEATTLE OFFICE	\$28,833,857
UMATILLA CONFEDERATED TRIBES	\$19,929,478
NATT MCDUGALL COMPANY	\$15,876,408
BONNEVILLE POWER ADMINISTRATION - TRANSMISSION BUSINESS LINE	\$11,860,217
COLVILLE CONFEDERATED TRIBES	\$11,045,191
IMPERO CONSTRUCTION COMPANY	\$10,716,321
NATIONAL BIOLOGICAL SERVICE/ US FISH AND WILDLIFE SERVICE -	
NATIONAL FISH RESEARCH CENTER - SEATTLE	\$9,844,736
COLUMBIA BASIN FISH & WILDLIFE FOUNDATION	\$9,594,211
MONTGOMERY WATSON	\$9,451,970
FISHPRO, INC.	\$9,320,021
SPOKANE TRIBE of INDIANS	\$8,750,266
US FISH AND WILDLIFE SERVICE - PORTLAND REGION	\$8,719,894
US BUREAU OF RECLAMATION - PACIFIC NW REGION (BOISE)	\$7,716,494
US ARMY CORPS OF ENGINEERS - PORTLAND DISTRICT	\$7,367,824
KOOTENAI TRIBE of IDAHO	\$6,294,000
UNIVERSITY of WASHINGTON	\$6,161,062
SHOSHONE-BANNOCK TRIBES	\$5,914,723
MONTANA DEPARTMENT OF FISH & WILDLIFE - HELENA	\$5,697,907
SHOSHONE-PAIUTE TRIBES	\$5,482,792
WARM SPRINGS TRIBES	\$5,350,382
NORTHWEST POWER PLANNING COUNCIL	\$5,278,358
KALISPEL TRIBE of INDIANS	\$5,037,265
CH2M HILL - NORTHWEST INC.	\$5,005,786
COEUR D'ALENE TRIBE of IDAHO	\$4,492,205
CONCORD CONSTRUCTION, INC	\$3,540,383
CUSTER SOIL & WATER CONSERVATION DISTRICT	\$3,275,771
BURNS PAIUTE TRIBE	\$3,241,866
COLUMBIA RIVER INTERTRIBAL FISH COMMISSION	\$2,929,357
WASHINGTON DEPT OF ECOLOGY	\$2,831,271
IDAHO SOIL & WATER CONSERVATION COMMISSION	\$2,760,301
US DEPARTMENT OF ENERGY - BATTELLE PACIFIC NORTHWEST LABORATORY - (RICHLAND)	\$2,650,798
SLAYDEN CONSTRUCTION INC	\$2,582,316
US FISH AND WILDLIFE SERVICE - FISHERIES PROGRAM OFFICE	\$2,307,235
DESTRON - FEARING	\$2,254,524
CONTRACTOR UNKNOWN TO EMIS	\$2,167,074
UMATILLA ELECTRIC COOP ASSOCIATION	\$2,106,150
ESSA TECHNOLOGIES LTD.	\$2,027,236
OREGON STATE UNIVERSITY	\$1,931,337
YAKIMA CO-OP	\$1,479,863
NATIONAL MARINE FISHERIES SERVICE - PORTLAND OFFICE	\$1,341,100
UNIVERSITY of IDAHO	\$1,281,748
US BUREAU OF RECLAMATION (WA)	\$1,205,799
WESTLAND IRRIGATION DISTRICT	\$1,180,312
US GEOLOGICAL SURVEY - BIOLOGICAL RESOURCES DIVISION - COLUMBIA RIVER RESEARCH LAB	\$1,047,958
WALLOWA COUNTY SOIL & WATER CONSERVATION DISTRICT	\$994,541
US FISH AND WILDLIFE SERVICE - DENVER REGION	\$978,033
US FISH AND WILDLIFE SERVICE - AHSAHKA	\$937,531
PAULSEN ENVIRONMENTAL RESEARCH	\$918,119
CLATSOP ECONOMIC DEVELOPMENT COMMITTEE	\$903,765
USFS - WALLOWA-WHITMAN NATIONAL FOREST - LAGRANDE DISTRICT.	\$838,422
USFS - FLATHEAD NATIONAL FOREST	\$837,468
ASOTIN COUNTY CONSERVATION DISTRICT	\$832,666
COLUMBIA COUNTY SOIL & WATER CONSERVATION DISTRICT	\$824,631
MOSS-ADAMS ADVISORY SERVICES	\$807,207
UNION COUNTY SOIL & WATER CONSERVATION DISTRICT	\$792,200
US FISH AND WILDLIFE SERVICE - FISH ASST. VANCOUVER	\$775,613
HARZA NORTHWEST INC	\$746,286
SALISH-KOOTENAI TRIBES	\$722,532
POMEROY SOIL & WATER CONSERVATION DISTRICT	\$621,822
PORTLAND GENERAL ELECTRIC	\$613,073
US BUREAU OF RECLAMATION - YAKIMA	\$580,303
CASCADE PACIFIC RESOURCE	\$552,235
USFS - UMATILLA NATIONAL FOREST	\$534,198
LEMHI SOIL & WATER CONSERVATION DISTRICT	\$527,835
BIOANALYSTS INC (D. CHAPMAN)	\$518,303
LAKE ROOSEVELT DEVELOPMENT ASSOCIATION	\$483,900
US DEPARTMENT OF ENERGY - OAK RIDGE NATIONAL LABORATORY	\$468,744
USFS - PACIFIC NW RESEARCH STATION	\$448,919
USFS - GIFFORD PINCHOT NATIONAL FOREST - MT ADAMS RANGER DISTRICT, WIND RIVER DIVISION	\$444,891
WASCO COUNTY SOIL & WATER CONSERVATION DISTRICT	\$433,489

EDUCATIONAL SERVICES DISTRICT #105 (YAKIMA)	\$427,427
RESEARCH INTO ACTION	\$414,555
PACIFIC POWER & LIGHT COMPANY	\$412,000
USFS - MT. HOOD NATIONAL FOREST	\$391,000
LEWIS SOIL & WATER CONSERVATION DISTRICT	\$383,509
MILLER ECOLOGICAL CONSULTANTS	\$369,515
NEZ PERCE SOIL & WATER CONSERVATION DISTRICT	\$357,992
EASTERN OREGON STATE COLLEGE	\$355,062
RICHARD HINRICHSEN	\$344,480
USFS - INTERMOUNTAIN REGION (4) - OGDEN	\$340,057
JEFFERSON COUNTY SOIL & WATER CONSERVATION DISTRICT	\$339,343
SYNERGY CONSULTING INC	\$330,1170
DONNA SILVERBERG	\$328,212
INTERMOUNTAIN COMMUNICATIONS	\$301,450
USFS - MT HOOD NATIONAL FOREST - HOOD RIVER RANGER DISTRICT	\$296,082
WASHINGTON TROUT	\$289,421
DEPT OF FISHERIES & OCEANS (CANADIAN)	\$285,600
WASHINGTON STATE CONSERVATION COMMISSION.	\$284,479
KITTITAS COUNTY CONSERVATION DISTRICT	\$283,359
BIOMARK INC.	\$278,353
UNION COUNTY	\$249,028
WALLA WALLA COUNTY CONSERVATION DISTRICT	\$242,711
JEFF KUECHLE	\$231,627
EASTERN WASHINGTON UNIVERSITY - ARCHAEOLOGY & HISTORY DEPARTMENT	\$225,719
US FISH AND WILDLIFE SERVICE - (LONGVIEW WA)	\$214,203
USFS - PACIFIC NW REGION (6) - PORTLAND	\$213,180
WALLOWA PUBLIC WORKS DEPARTMENT	\$206,426
US ARMY CORPS OF ENGINEERS - NORTHWEST DIVISION	\$204,998
UNION COUNTY PUBLIC WORKS DEPARTMENT	\$203,650
RESOURCE CONSERVATION & DEVELOPMENT	\$200,000
CRATE'S POINT	\$200,000
COLUMBIA SOIL & WATER CONSERVATION DISTRICT	\$196,036
MOBRAND BIOMETRIC, INC.	\$193,132
COLE & WEBER	\$188,237
LEMHI IRRIGATION DISTRICT	\$182,938
USFWS - CRESTON NATIONAL FISH HATCHERY	\$181,088
UNIVERSITY of MONTANA	\$180,539
UNDERWOOD CONSERVATION DISTRICT	\$178,018
US ARMY CORPS OF ENGINEERS - WALLA WALLA DIST	\$165,938
THE NATURE CONSERVANCY - OR	\$162,458
GOLDEN PACIFIC HOMES	\$160,000
KRUGEL & ASSOCIATES	\$152,000
OXARC	\$143,340
USFS - NEZ PERCE NATIONAL FOREST	\$142,878
JEAN EDWARDS	\$135,711
KATHLEEN A CONCANNON	\$135,160
NSRI	\$133,000
ARCHAEOLOGICAL & HISTORICAL SERVICE	\$127,894
WALLOWA COUNTY	\$118,500
MONUMENT SOIL & WATER CONSERVATION DISTRICT	\$116,500
ENERGY NEWSDATA INC	\$114,600
PACIFIC WATERSHED INSTITUTE	\$104,200
FOSTER WHEELER ENVIRONMENTAL CO	\$101,955
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION	\$101,700
JAMES J ANDERSON MD	\$100,000
US DEPT OF JUSTICE	\$100,000
AG-WEST SUPPLY	\$99,823
ASOTIN COUNTY LANDFILL	\$97,725
ADVANCED TELEMETRY SYSTEMS INC	\$90,765
GORDON, THOMAS, ETC., P.L.L.C.	\$89,097
HI-TECH INDUSTRIAL COATINGS	\$86,368
USFS - WALLOWA-WHITMAN NATIONAL FOREST - WALLOWA VALLEY DISTRICT.	\$82,219
AL WRIGHT CONSULTING	\$80,000
ALLFLEX	\$75,000
S. P. CRAMER & ASSOCIATES	\$72,747
UMATILLA COUNTY	\$72,000
USFS - PACIFIC NW RESEARCH. STATION	\$64,997
METRO REGIONAL PARKS AND GREENSPACES	\$64,100
NATIONAL PARK SERVICE - COULEE DAM NATIONAL REC. AREA	\$62,000
SHERMAN SOIL & WATER CONSERVATION DISTRICT	\$60,897
USFS - WALLOWA-WHITMAN NATIONAL FOREST	\$58,995
NEWSDATA CORP	\$55,000
LANE COUNTY ORGANIZATION OF GOVERNMENTS	\$55,000
PUGET SOUND ENERGY	\$54,369
OREGON DEPARTMENT of TRANSPORTATION - LA GRANDE	\$51,500
OREGON DEPT OF ENVIRONMENTAL QUALITY - BUSINESS OFFICE	\$50,334
CHRISTOPHER BOEHME	\$50,240
KITTITAS-YAKIMA RES CONS & DEV	\$49,794
HERKE ROCK & CONSTRUCTION	\$48,000
JD WHITE CO INC THE	\$46,996
WALLOWA VALLEY GOLF ASSOC	\$46,200
OREGON DEPARTMENT of TRANSPORTATION - SALEM	\$46,000

RANDY'S BLUE DOT EXCAVATION INC	\$45,947
MAGIC VALLEY INTER INC	\$44,811
ONSET COMPUTER CORP	\$42,135
USDA - NATURAL RESOURCES CONSERVATION SERVICE	\$40,880
USFS - UMATILLA NATIONAL FOREST - WALLA WALLA DISTRICT	\$40,435
INTER-FLUVE INC	\$35,849
HIDDEN VALLEY GUEST RANCH	\$35,634
US DEPT OF INTERIOR - FORT SIMCOE JOB CORPS CIVILIAN CONSERVATION CENTER	\$31,608
MIKE WATTERS EXCAVATION	\$25,800
FORESTRY SUPPLIERS	\$25,681
JUDITH L. WOODWARD	\$24,005
GEOMAX	\$23,730
NATURE CONSERVANCY - MONTANA	\$21,500
APPLIED POWER CORPORATION	\$21,364
UNION COUNTY COMMISSIONERS OFFICE	\$20,400
OREGON WATER TRUST	\$19,630
WEYERHAEUSER COMPANY	\$18,633
MAGIC VALLEY HELI-ARC & MFG	\$18,609
INTERNATIONAL INSTITUTE OF LEARNING	\$17,625
MAD RIVER DECOYS	\$17,500
BOISE CASCADE CORPORATION	\$16,000
RICK FRANKLIN CORP	\$15,400
US WEST COM FED SERVICES	\$13,273
JUDITH H MONTGOMERY	\$12,944
LUANNA GROW CONSULTING	\$12,500
GREGORY'S PUMP SERVICE	\$11,411
GLOBAL SHELTERS	\$10,890
CITY OF UNION	\$10,500
MURREMAID MUSIC BOXES	\$10,424
CHEMICAL WASTE MANAGEMENT, INC.	\$10,422
EAST LANE SOIL & WATER CONSERVATION DISTRICT	\$10,000
ENVIRONMENTAL SERVICES NW INC	\$9,207
HYDROLAB CORP	\$8,735
DAVID EVANS & ASSOCIATES INC	\$7,800
WASHINGTON DEPARTMENT OF NATURAL RESOURCES	\$7,500
MUNTERS CORP	\$7,330
US GEOLOGICAL SURVEY - BIOLOGICAL RESOURCES DIVISION	\$7,100
AQUATECNICS INC	\$7,090
OS SYSTEMS INC	\$5,804
H&L PLUMBING & HEATING	\$5,422
ECOLOGIC UNLIMITED	\$5,040
OREGON STATE DEPARTMENT OF PARKS & RECREATION	\$5,000
SUSTAINABLE FISHERIES FOUNDATION	\$5,000
CITY OF MILTON-FREEWATER	\$4,500
DR. LYLE CALVIN	\$4,250
WORKMAN AND SONS INC	\$4,120
HERITAGE RESEARCH ASSOCIATES	\$3,954
MERIDAN INSTRUMENT CO INC	\$3,912
TRACY CAMP	\$3,328
SUE FOSTER	\$3,084
DR STEPHEN W KRESS	\$2,467
ARGENTEA INTERNATIONAL	\$2,330
CENTRAL COMMUNICATIONS	\$2,000
US WEST COM SERVICES INC	\$1,886
BUSINESS EDUCATION COMPACT	\$1,500
MARC M SPATT CONSULTING HYDRO	\$1,047
OREGON TROUT INC	\$1,000
MARY ANNE BISHOP	\$1,000
PACIFIC BIOLOGICAL STATION (CANADIAN)	\$1,000
AYRES ASSOCIATES	\$1,000
WEST CONSULTANTS INC	\$1,000
PAT E VIVIAN	\$874
R.S. ANDERSON & ANDERSON, INC.	\$800
WEAVER ASSOCIATES	\$700
BOB TONSETH	\$650
THE BRICK KICKER	\$550
DR. DAVID WELCH	\$500
WESTERN / ALLWASTE	\$304

Source: Bonneville Power Administration

Fig. 8A Salmon and Steelhead passing Bonneville Dam, 1938-1977

These dam counts can not be utilized for year to year comparison of abundance or population size without evaluating and quantifying the affects of facility modifications, dam operations, dam modifications, upstream development, fisheries, hatchery production, counting schedules, counting techniques, between dam counting discrepancies, counting station modification, fishway modifications, fall back and dam passage efficiencies.

Yearly Totals of All Fish Passing Bonneville Dam 1938 - 1977

Year	Chinook	Steelhead	Sockeye	Coho	total salmon
1938	271,799	107,003	75,040	15,185	471,144
1939	286,236	121,922	73,382	14,383	497,091
1940	391,573	185,161	148,805	11,870	739,138
1941	461,443	118,087	65,741	17,911	668,455
1942	401,998	151,345	55,464	12,401	623,084
1943	313,123	92,131	39,845	2,547	448,436
1944	240,763	100,521	15,071	4,207	361,517
1945	297,488	120,144	9,501	791	428,652
1946	445,743	142,548	74,354	3,897	667,720
1947	480,377	135,444	171,139	11,174	798,336
1948	419,555	139,062	131,541	4,081	697,877
1949	277,697	119,285	51,444	1,004	451,464
1950***	357,375	114,087	77,993	10,151	560,683
1951***	331,788	140,689	169,428	5,201	648,157
1952	420,879	260,990	184,645	7,768	875,796
1953	332,479	223,914	235,215	13,018	806,364
1954 ¹	320,947	176,260	130,107	4,062	632,949
1955 ²	359,853	198,411	237,748	3,725	800,064
1956 ³	300,917	131,116	156,418	6,127	595,275
1957 ⁴	403,286	139,183	82,915	4,675	630,640
1958 ⁵	426,419	131,437	122,389	3,673	684,379
1959 ⁶	345,028	129,026	86,560	2,695	564,237
1960 ⁷	256,049	113,676	59,713	3,268	433,732
1961 ⁸	281,980	139,719	17,111	3,456	443,174
1962 ⁹	286,625	164,025	28,179	14,788	494,657
1963 ¹⁰	278,560	129,418	60,319	12,658	481,728
1964 ¹¹	344,422	117,252	99,856	53,602	615,809
1965 ¹²	317,957	166,453	55,125	76,032	616,127
1966	340,111	143,661	156,661	71,891	713,254
1967	366,237	121,872	144,158	96,488	729,157
1968	341,154	106,974	108,207	63,488	619,923
1969	507,543	140,782	59,636	49,378	757,568
1970	384,780	113,510	70,762	80,116	649,526
1971	405,702	193,966	87,447	75,989	763,309
1972	394,456	185,886	56,323	65,932	702,649
1973	398,635	157,823	58,979	54,609	670,101
1974	366,759	137,054	43,837	60,955	608,630
1975	425,566	85,540	58,212	58,307	627,945
1976	507,773	124,177	43,611	53,150	728,724

- * bass, carp, trout, sturgeon, squawfish, dace, perch, shad
 - ** An audit of the hourly Shad counts for 1938-1950 was made in 1950, hence the yearly totals for fish other than Salmon and the yearly totals for all fish appearing in this report differ somewhat from those previously published.
 - *** Fish counting discontinued for annual winter maintenance on Nov. 29, 1950.
 - ¹ Fish counting initiated Feb. 28, 1954 and discontinued Nov. 27, 1954.
 - ² Fish counting initiated Feb. 28 and discontinued Nov. 29, 1955.
 - ³ Fish counting initiated March 1 and discontinued Dec. 1, 1956.
 - ⁴ Fish counting initiated March 1 and discontinued Nov. 30, 1957.
 - ⁵ Fish counting initiated March 2, and Nov. 30, 1958.
 - ⁶ Fish counting initiated March 1 and discontinued Nov. 28 1959.
 - ⁷ Fish counting initiated March 1 and discontinued on Nov. 30, 1960.
 - ⁸ Fish counting initiated March 1 and discontinued Nov. 30, 1961.
 - ⁹ Fish counting initiated on March 1 and discontinued on Nov. 30, 1962.
 - ¹⁰ Fish counting initiated on March 1 and discontinued on Nov. 30, 1963.
 - ¹¹ Fish counting initiated on March 1 and discontinued on Nov. 28, 1964.
 - ¹² Fish counting initiated March 28 and discontinued on Nov. 30, 1965.
- From : Annual Fish passage Reports - Corps of Engineers
Tables 1 and 2. Yearly Totals of Salmonids counted Over Bonneville Dam

Source: Fish Passage Center

Fig 8B Adult Salmon Passage at Bonneville Dam 1977-1999

Year	Chinook	Steelhead	Sockeye	Coho
1977	366,657	193,437	99,829	19,408
1978	394,590	104,431	18,436	52,590
1979	176,292	114,010	52,627	45,238
1980	245,518	129,254	58,882	22,052
1981	285,650	159,270	56,037	30,510
1982	322,809	157,640	50,219	73,832
1983	244,476	218,419	100,542	15,178
1984	323,346	315,795	152,540	29,332
1985	454,753	326,194	165,928	55,529
1986	571,189	376,752	58,099	130,786
1987	547,409	300,335	116,956	27,628
1988	494,028	279,277	79,721	39,617
1989	416,170	287,802	41,884	39,243
1990	340,798	183,011	49,581	24,764
1991	274,644	274,535	76,482	65,508
1992	256,271	314,963	84,993	18,151
1993	277,657	188,377	80,182	11,732
1994	243,450	161,978	12,678	22,795
1995	240,017	202,478	8,771	12,034
1996	296,635	205,213	30,252	18,747
1997	383,133	258,385	47,008	27,267
1998	280,944	185,094	13,218	49,920
1999	343,176	206,488	17,875	45,152

Adult Passage (ladder) count data from the Army Corps of Engineers.

Source: Fish Passage Center

Fig. 8C Minimum Numbers (in Thousands) of Salmon and Steelhead, Including Jacks, Entering the Columbia River, 1938-99.

Year	Chinook						Steelhead		Total	Year	Chinook						Steelhead		Total	
	Spring 1/	Summer	Fall	Sockeye	Coho 2/	Chum 3/	Winter 4/	Summer			Spring 1/	Summer	Fall	Sockeye	Coho 2/	Chum 3/	Winter 4/	Summer		
1938	118.4	122.7	582.2	168.0	271.9	157.0	—	249.6	1,669.8	1971	266.9	89.5	488.6	150.5	648.7	1.1	169.2	248.5	2,063.0	
1939	155.5	191.8	550.3	124.8	184.2	96.3	—	232.0	1,534.9	1972	353.3	77.5	338.3	123.3	362.6	2.4	113.0	257.8	1,628.2	
							—			1973	326.1	48.9	562.1	61.3	422.8	1.8	90.9	217.0	1,730.9	
1940	97.6	112.7	742.9	196.0	64.4	102.8	—	422.8	1,839.2	1974	224.1	34.0	357.1	43.8	534.0	1.2	77.7	168.9	1,440.8	
1941	129.0	106.5	1,175.7	173.6	131.5	340.1	—	336.8	2,393.2	1975	176.1	44.4	525.9	58.2	437.7	0.8	62.0	105.4	1,410.5	
1942	87.9	94.8	979.0	94.5	83.8	425.5	—	297.2	2,062.7	1976	165.5	42.1	563.7	43.7	384.1	1.5	55.4	147.8	1,403.8	
1943	133.8	57.0	600.9	73.4	80.9	78.7	—	216.0	1,240.7	1977	239.6	41.4	449.3	99.8	199.0	0.8	112.1	238.5	1,380.5	
1944	78.4	67.1	709.8	24.6	174.2	22.6	—	232.3	1,309.0	1978	241.8	43.6	395.6	18.4	382.7	1.9	77.1	154.5	1,315.6	
							—			1979	126.2	34.5	356.2	52.6	330.7	0.3	114.1	146.3	1,160.9	
1945	118.8	52.6	711.7	10.9	204.6	48.3	—	268.4	1,415.3											
1946	199.3	72.0	831.9	101.1	121.5	72.7	—	268.0	1,666.5	1980	143.1	31.2	356.9	58.9	343.0	0.5	80.6	177.4	1,191.6	
1947	251.8	86.3	903.6	335.3	176.2	40.7	—	261.8	2,055.7	1981	164.6	27.1	349.1	56.0	208.0	1.5	67.0	217.7	1,091.0	
1948	173.3	86.9	899.2	143.2	134.5	85.6	—	240.1	1,762.8	1982	195.9	26.7	438.3	50.2	518.6	2.9	46.0	207.9	1,486.5	
1949	178.3	57.8	550.5	52.6	100.7	44.7	—	162.5	1,147.1	1983	159.8	23.7	298.9	100.5	143.4	0.6	67.7	240.2	1,034.8	
							—			1984	170.7	28.7	413.7	161.6	446.9	2.3	94.4	388.4	1,706.7	
1950	146.1	69.3	588.6	112.6	125.9	58.9	—	179.0	1,280.4											
1951	259.0	116.4	385.6	203.7	112.4	46.1	—	244.5	1,367.7	1985	179.0	30.3	548.0	200.4	435.3	1.3	77.3	405.3	1,876.9	
1952	319.8	114.5	323.0	318.9	126.3	28.9	—	383.1	1,614.5	1986	224.2	31.4	730.1	59.9	1,574.1	3.0	85.0	474.2	3,181.9	
1953	342.4	95.0	257.3	260.0	61.3	22.9	76.8	361.3	1,477.0	1987	241.8	38.3	956.8	145.3	388.7	2.5	91.7	364.3	2,229.4	
1954	237.4	114.8	231.9	180.0	37.4	28.5	49.8	289.5	1,169.3	1988	250.4	36.7	869.1	99.6	726.6	4.8	59.3	362.8	2,409.3	
										1989	231.9	33.1	592.5	47.4	752.4	2.0	68.0	327.8	2,055.1	
1955	317.1	147.6	281.5	245.0	64.3	10.7	56.0	298.8	1,421.0											
1956	297.9	195.2	312.7	202.0	64.4	4.7	51.2	200.7	1,328.8	1990	257.9	28.1	369.4	49.6	262.1	2.9	44.7	247.4	1,262.1	
1957	307.8	207.0	276.6	147.8	55.1	4.2	54.8	229.6	1,282.9	1991	201.8	22.1	332.4	76.5	957.1	1.3	63.2	311.0	1,965.4	
1958	268.5	187.5	393.2	313.3	24.2	8.3	48.4	211.2	1,454.6	1992	199.0	19.2	263.4	85.0	237.0	4.9	55.9	372.1	1,236.5	
1959	198.2	169.8	296.0	270.7	21.2	5.5	61.0	231.6	1,254.0	1993	206.2	23.6	235.7	84.2	118.2	4.5	36.4	242.8	951.6	
										1994	83.0	19.5	295.4	12.7	178.2	1.2	(55.2)	212.1	857.3	
1960	175.2	142.6	246.1	179.1	47.7	3.0	56.5	199.8	1,050.0											
1961	203.8	129.2	252.3	60.2	112.4	3.1	94.4	227.9	1,083.3	1995	64.9	17.1	300.1	9.2	88.9	1.5	(21.0)	247.1	749.8	
1962	255.4	108.0	290.6	42.9	184.7	5.7	78.7	251.7	1,217.7	1996	100.0	18.0	353.7	30.3	129.7	3.3	(33.4)	243.3	911.7	
1963	219.0	100.0	265.1	79.9	161.9	3.0	79.4	228.8	1,137.1	1997	162.2	29.9	352.8	46.9	154.5	1.7	(12.6)	300.0	1,060.6	
1964	247.2	97.0	372.2	104.9	453.9	3.2	79.9	178.6	1,536.9	1998	94.3	24.2	295.6	13.2	193.6	2.0	(13.5)	(222.3)	858.7	
										1999	111.8	30.3	335.5	17.9	290.2	2.4	(14.5)	(246.3)	1,048.9	
1965	241.9	82.1	399.2	55.2	519.0	1.5	120.3	227.3	1,646.5											
1966	236.1	74.8	347.8	174.8	785.9	3.1	133.1	208.6	1,964.2											
1967	240.5	100.7	385.0	180.2	694.2	2.1	111.5	167.3	1,881.5											
1968	199.5	89.4	346.3	134.8	423.9	0.6	122.5	161.2	1,478.2											
1969	295.0	106.2	471.0	75.8	463.4	1.1	66.8	191.2	1,670.5											
1970	252.7	72.9	532.2	95.4	1,079.0	1.2	134.5	157.0	2,324.9											

1/ Counting began at Bonneville Dam on May 7, 1938. Estimates for tributary runs below Bonneville Dam are not included for 1938-45.

2/ Commercial catch and dam counts only, 1938-59.

3/ Commercial catch numbers only, 1938-49.

4/ Abundance index.

() indicates estimate.

Source: Status Report: Columbia River Fish Runs and Fisheries, 1938-1998, Oregon Dept. of Fish and Wildlife and Washington Dept. of Fish and Wildlife.

Fig. 9 Ocean Temperature Cycles

Source:

Mantua, Nathan J., Steven R. Hare, Yuan Zhang, John M. Wallace, and Robert C. Francis. 1993. "A Pacific interdecadal climate oscillation with impacts on salmon production." *Bulletin of the American Meteorological Society* 78: 1069-1079

Fig. 10 Spring and Summer Chinook Passing Bonneville Dam, 1977-2000

	Spring Chinook		Summer Chinook	
	Adults	Jacks	Adults	Jacks
2000	178,302	21,259	30,598	13,386
1999	38,669	8,691	26,169	4,022
1998	38,342	775	21,433	2,678
1997	114,000	963	27,939	1,926
1996	51,493	4,687	16,034	1,960
1995	10,194	2,375	15,030	2,030
1994	20,169	397	17,631	1,900
1993	10,820	1,352	22,045	1,571
1992	88,425	2,157	15,063	4,182
1991	57,346	3,889	18,897	3,056
1990	94,014	2,090	24,983	3,038
1989	81,267	5,992	28,786	4,185
1988	90,532	4,214	31,315	5,209
1987	98,573	3,234	33,033	4,674
1986	118,371	4,963	26,300	4,820
1985	83,113	7,851	23,898	5,455
1984	46,870	4,272	22,321	6,127
1983	54,898	1,940	18,046	5,412
1982	70,011	6,033	20,129	6,485
1981	62,827	2,182	22,363	4,566
1980	53,100	7,887	26,952	4,113
1979	48,638	2,824	27,742	6,475
1978	147,680	2,183	39,730	4,593
1977	115,551	3,957	34,083	6,940

Adult Passage (ladder) count data from the Army Corps of Engineers.

Source: Fish Passage Center

Fig. 11 Estimated Juvenile Survival through Hydrosystem, 1966-1980, 1993-1999

Chinook			Chinook			Chinook			Chinook		
Year	Salmon	Steelhead									
1966	0.46	0.56	1972	0.09	0.09 a	1978	0.23 b	0.08	1995	0.51	0.53
1967	0.47	0.32	1973	0.03	0.01	1979	0.19	0.02	1996	0.42	0.50
1968	0.45	0.43	1974	0.28 b	0.08	1980	0.15	0.03	1997	0.43	0.45 c
1969	0.34	0.20	1975	0.19 b	0.27				1998	0.59	0.45
1970	0.17	0.24 b	1976	0.10	0.13	1993	0.34		1999	0.53	0.40
1971	0.20	0.17	1977	<0.01	<0.01	1994	0.31	0.38 c			

Williams, John G., Steven G. Smith and William D. Muir. "Survival Estimates for Downstream Migrant Yearling Juvenile Salmonids Through the Snake and Columbia River Hydropower System, 1966-1980 and 1993-1999," August 2000. In press, North American Journal of Fisheries Management. The study concludes that while survival through the hydropower system in the 1990s "... is substantially greater than in the 1970s, adult return rates in the 1990s have remained low. Thus, in the 1990s, the cause of the continuing low adult return rates does not appear related to direct mortality of downstream migrant fish within the hydropower system."

Fig. 12 Where do the Fish go? Fish counted at each mainstem dam in 1999

	Chinook						
	Spring	Summer	Fall	Coho	Sockeye	Steelhead	
Bonneville	47,360	30,191	265,625	45,152	17,875	206,488	
The Dalles	23,743	24,937	150,811	15,041	13,715	156,874	
John Day	20,498	24,714	118,070	13,232	14,809	165,314	
McNary	13,232	21,618	87,096	4,935	11,794	84,088	
Ice Harbor	8,008	5,211	10,021	126	8	80,267	
Lower Monumental	6,650	4,716	8,905	88	15	72,817	
Little Goose	6,135	4,856	6,244	89	16	65,471	
Lower Granite	5,803	4,844	5,247	260	14	74,440	
Priest Rapids	4,900	21,413	30,728	56	16,360	8,276	
Rock Island	4,224	20,136	8,437	12	18,371	6,360	
Rocky Reach	1,622	11,676	9,582	1	14,111	4,815	
Wells	340	7,876	2,556	220	12,228	3,557	

Note: Includes adults and jack. In some cases fish counts increase going upstream. This likely indicates counting errors.
Source: Fish Passage Center

Fig. 13 Wild Fish Passing Bonneville Dam 1990-1999

Spring Chinook	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990
Snake River Wild Spring Chinook	11,853	16,285	14,694	16,389	4,034	8,757	26,947	33,748	15,941	22,326
Upper Columbia Wild Spring Chinook	2,765	9,451	3,281	3,901	1,829	1,976	7,894	15,907	5,212	5,812
	510	1,006	306	712	677	1,471	7,425	5,562	2,652	5,748
Summer Chinook @Bonn	17,783	15,556	19,121	12,090	10,755	12,686	15,666	11,027	16,694	21,370
Snake River Wild Summer Chinook @Bonn	2,109	4,670	6,947	3,032	533	410	3,383	1,831	3,364	4,399
Priest Rapids Dam count summ chin	20,898	13,387	13,107	10,995	12,162	14,859	16,377	8,523	14,811	15,576
Upper Columbia Wild Summer Chinook @PR	15,674	10,040	9,830	8,246	9,122	11,144	12,283	7,671	13,330	14,018
Upper Columbia Wild Summer Chinook @Bonn	15,674	10,886	12,174	9,058	10,222	12,276	12,283	9,196	13,330	16,971
Fall Chinook @Bonn	79,141	83,183	106,504	84,640	68,259	85,449	65,219	71,403	114,335	150,334
Snake River Wild Fall Chinook @Bonn	2,533	835	1,929	1,849	1,205	1,054	1,490	1,412	1,899	569
Hanford Reach	26,898	29,682	37,685	37,548	38,381	48,295	30,555	41,255	50,773	56,204
Deschutes River	6,527	10,925	20,687	8,763	7,588	5,801	8,239	2,776	3,532	2,224
Wind, Klickitat White Salmon rivers	16,067	12,510	10,556	7,569	4,129	7,114	4,291	5,090	4,230	4,960
Umatilla	279	96	65	175	697	785	100	181	203	0
Hanford Reach @Bonn	53,735	58,817	73,267	66,284	54,640	70,695	51,099	61,944	104,471	142,581
Summer Steelhead	65,600	39,800	37,200	34,800	30,800	30,500	35,800	54,900	63,500	41,700

Source: Washington Dept. of Fish and Wildlife

Figure 14. Commercial Landings of Salmon and Steelhead in the Columbia River, 1866-1999

(Non-Indian and Treaty Indian combined)
Zone 1-6

Year	Millions(LBS)	Year	Millions(LBS)	Year	Millions(LBS)
1866	0.2720	1911	49.4800	1956	9.7863
1867	1.2240	1912	27.5302	1957	7.3229
1868	1.9040	1913	26.5562	1958	8.1144
1869	6.8000	1914	38.5013	1959	6.0212
1870	10.2000	1915	43.8387	1960	5.1539
1871	13.6000	1916	42.7463	1961	5.3304
1872	17.0000	1917	40.4480	1962	6.8824
1873	17.0000	1918	44.1254	1963	5.8842
1874	23.8000	1919	44.9345	1964	6.9606
1875	25.5000	1920	36.3115	1965	8.5838
1876	30.6000	1921	26.7125	1966	8.4225
1877	25.8400	1922	30.1527	1967	9.4424
1878	31.2800	1923	35.6673	1968	5.5862
1879	32.6400	1924	38.1671	1969	8.0427
1880	36.0400	1925	42.3334	1970	12.5828
1881	37.4000	1926	35.5667	1971	9.0041
1882	36.8084	1927	37.6884	1972	7.8827
1883	42.7992	1928	33.1271	1973	11.1252
1884	42.1600	1929	32.3213	1974	6.2666
1885	37.6584	1930	31.9234	1975	8.2431
1886	30.4980	1931	27.0318	1976	7.0193
1887	24.2080	1932	23.3302	1977	5.4335
1888	25.3284	1933	26.8468	1978	5.0410
1889	21.0722	1934	27.9019	1979	4.3933
1890	29.6326	1935	25.7560	1980	4.2635
1891	27.1288	1936	23.5286	1981	2.3291
1892	33.1390	1937	24.6735	1982	4.7556
1893	28.2796	1938	18.8339	1983	1.2495
1894	33.3268	1939	17.9112	1984	4.7313
1895	43.1593	1940	19.3201	1985	5.3825
1896	32.7554	1941	31.6027	1986	12.2769
1897	38.0250	1942	26.5462	1987	11.3547
1898	33.9502	1943	14.7533	1988	14.1987
1899	24.0036	1944	17.6432	1989	9.4118
1900	25.7990	1945	17.3686	1990	3.9369
1901	29.8324	1946	18.0781	1991	5.0364
1902	26.2000	1947	21.6640	1992	1.7282
1903	30.4887	1948	21.2466	1993	1.4127
1904	36.8639	1949	13.0507	1994	1.2203
1905	37.8001	1950	13.2843	1995	0.8985
1906	35.6531	1951	12.9132	1996	1.3349
1907	28.7206	1952	10.7243	1997	1.1596
1908	24.3409	1953	9.7178	1998	0.9012
1909	24.5353	1954	7.6303	1999	1.6181
1910	35.3304	1955	10.8267		

Source: Status Report: Columbia River Fish Runs and Fisheries, 1938-1998,
Oregon Dept. of Fish and Wildlife and Washington Dept. of Fish and

Wildlife.

Fig. 15 & 16 HUs Wildlife Habitat Units: Lost & Mitigated, 1978-1999

Dam Group	Dam	Acres Lost	HUs Lost	Acquisition HUs
Willamette	Big Cliff	141	413	
Willamette	Detroit	3580	11298	
Willamette	Dexter	1025	6648	15
Willamette	Foster	1195	3544	
Willamette	Green Peter	3605	16432	
Willamette	Lookout Point	4255	25454	
Willamette	Cougar	1280	11124	207
Willamette	Hills Creek	2710	19489	1496
		17791	94402	1718
Lower Columbia Washington	Bonneville WA	10375	6159	6231
Lower Columbia Washington	John Day WA	24000	18280	18551
Lower Columbia Washington	McNary WA	31200	18834	20851
Lower Columbia Washington	The Dalles WA	4600	1165	825
		70175	44438	46458
Lower Columbia Oregon	Bonneville OR	10374	6159	590
Lower Columbia Oregon	John Day OR	24000	18280	11879
Lower Columbia Oregon	McNary OR	7800	4710	4710
Lower Columbia Oregon	The Dalles OR	4600	1165	
		46774	30314	17179
Upper Columbia	Chief Joseph	8600	8833	1458
Upper Columbia	Grand Coulee	82270	111785	59714
		90870	120618	61172
Lower Snake	Lower Snake Projects	33890	26775	10336
Idaho	Albeni Falls	6617	28658	3159
Idaho	Anderson Ranch	4740	9619	
Idaho	Black Canyon	1100	2238	46
Idaho	Dworshak	16970	28452	
Idaho	Minidoka	11850	10503	
Idaho	Palisade	15600	37068	14482
		56877	116538	17687

Source: Bonneville Power Administration

Fig. 15 Wildlife Acres Protected and Enhanced, 1978-2000

Province	Subbasin	State	Site Name	Tract Name	Status	Acres Protected	Purchase Type	BPA Cost	BPA Cost/ Acre	Year	Acres Enhanced	Total HUs	HU Status*
Lower Columbia	LOWER COLUMBIA	WA	Steigerwald NWR	Bliss	Complete	11	Fee Title	\$110,000	\$10,000	1996		9	
Lower Columbia	LOWER COLUMBIA	WA	Steigerwald NWR	James	Complete	90	Fee Title	\$594,000	\$6,600	1996		48	
Lower Columbia	LOWER COLUMBIA	WA	Steigerwald NWR	Burlington Northern	Complete	30	Fee Title	\$139,000	\$4,633	1999		72	
Lower Columbia	LOWER COLUMBIA	WA	Steigerwald NWR	Straub	Complete	196	Fee Title	\$872,852	\$4,453	1995		107	
Lower Columbia	LOWER COLUMBIA	WA	Vancouver Lowlands	Vancouver Lowlands (Shillapoo)	Complete	612	Fee Title	\$1,740,657	\$2,844		1549	2202	
Lower Columbia	SANDY	OR	Sandy River Delta	Sandy River Delta	Ongoing	0	none/unknown	\$0		2000	120	0	N/A
Lower Columbia	WILLAMETTE	OR	Burlington Bottoms	Burlington Bottoms	Complete	417	Fee Title	\$414,283	\$993	1994		1436	
Lower Columbia	WILLAMETTE	OR	Willow Creek	Willow Creek	Complete	329	Easement	\$1,058,000	\$3,216	1995		857	
Lower Columbia	WILLAMETTE	OR	Tualatin NWR	Oleson Tract	Complete	132	Fee Title	\$717,858	\$5,438	1999		0	Not Complete
Lower Columbia	WILLAMETTE	OR	Sorenson	Sorenson	Complete	42	Fee Title	\$172,955	\$4,118	1998		15	
Columbia Gorge	COLUMBIA GORGE	OR	Crates Point	Crates Point	Unknown	0	none/unknown					0	Not Complete
Cascade Columbia	OKANOGAN	WA	Scotch Creek	Tunk	Complete	320	Fee Title	\$158,665	\$496			0	Not Complete
Cascade Columbia	OKANOGAN	WA	Scotch Creek	Chesaw	Complete	3	Fee Title	\$9,000	\$3,000			0	Not Complete
Cascade Columbia	OKANOGAN	WA	Scotch Creek	Scotch Creek	Complete	385	Fee Title	\$63,813	\$166		15487	6493	
Cascade Columbia	UPPER MID-COL	WA	Sage Flat	Sage Flat	Complete	4540	Mix	\$1,057,586	\$233		3740	2912	
Intermountain	SPOKANE LOWER	WA	Wellpinit Mtn WA	Wynecoop (A 67B)	Complete	80	Fee Title	\$83,000	\$1,038	1996		89	
Intermountain	SPOKANE LOWER	WA	Blue Creek Winter Range	Abrahamson Property (A 322)	Complete	78	Fee Title	\$42,237	\$542	1991		120	
Intermountain	SPOKANE LOWER	WA	Blue Creek Winter Range	Blue Creek Land Swap	Complete	701	Exchange	\$812,000	\$1,158	1999		1121	
Intermountain	SPOKANE LOWER	WA	McCoy Lake Watershed	People Living God Prop.	Complete	440	Fee Title	\$498,000	\$1,132	1999		528	
Intermountain	SPOKANE LOWER	WA	McCoy Lake Watershed	McCrea Property (A 401 A)	Complete	35	Fee Title	\$19,530	\$558	1996		57	
Intermountain	SPOKANE LOWER	WA	McCoy Lake Watershed	Kenworthy Property	Complete	40	Fee Title	\$60,000	\$1,500	1996		78	
Intermountain	SPOKANE LOWER	WA	McCoy Lake Watershed	Etue Property	Complete	74	Fee Title	\$148,720	\$2,010	1999		123	
Intermountain	SPOKANE LOWER	WA	McCoy Lake Watershed	Harris Property	Complete	180	Fee Title	\$194,940	\$1,083	1997		291	
Intermountain	SPOKANE LOWER	WA	Fox Creek	Smith Property	Complete	160	Fee Title	\$320,000	\$2,000	1998		141	
Intermountain	SPOKANE LOWER	WA	Fox Creek	Kieffer Property	Complete	40	Fee Title	\$64,000	\$1,600	1997		38	
Intermountain	UPPER COLUMBIA	WA	Hellsgate	Redford Canyon	Complete	221	Fee Title	\$175,000	\$792	1997		118	
Intermountain	UPPER COLUMBIA	WA	Hellsgate	Nespelem Bend	Complete	517	Fee Title	\$95,000	\$184	1997		263	
Intermountain	UPPER COLUMBIA	WA	Hellsgate	Sand Hills	Complete	1394	Fee Title	\$575,000	\$412	1998		431	
Intermountain	UPPER COLUMBIA	WA	Hellsgate	Berg	Complete	6300	Fee Title	\$2,000,000	\$317	1995		3564	
Intermountain	UPPER COLUMBIA	WA	Lake Roosevelt Peregrine Falcon	Lake Roosevelt Peregrine Falcon	Complete	0	none/unknown			1998		0	N/A
Intermountain	SAN POIL	WA	Hellsgate	Henry Kuehne	Complete	4860	Fee Title	\$3,000,000	\$617	1994		3795	
Intermountain	POIL	WA	Hellsgate	Hinman	Complete	770	Fee Title	\$154,042	\$200	1998		308	
Intermountain	SAN POIL	WA	Hellsgate	Bill Kuenhe	Complete	4824	Fee Title	\$2,275,000	\$472	1993		4089	
Intermountain	SAN POIL	WA	Hellsgate	Colville Tribal Land	Ongoing	0	none/unknown	\$0		1999	2388	539	
Mountain Columbia	CLARK FORK	ID	Hungry Horse Mitigation	Bull River	Complete	48	Partnerships	\$5,132	\$107	1999		0	N/A
Mountain Columbia	CLARK FORK	ID	The Pend Oreille WMA	Henderson Ranch	Complete	240	Fee Title	\$511,000	\$2,129	1997		373	
Mountain Columbia	CLARK FORK	ID	The Pend Oreille WMA	Carter Island	Complete	96	Fee Title	\$288,000	\$3,000	1997		311	
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Hanson-Doyle	Complete	20	Partnerships	\$2,077	\$104	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	St Ignatius - Flathead	Complete	80	Partnerships	\$5,000	\$63	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Bond Creek - Swan Lake	Complete	205	Partnerships	\$5,880	\$29	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Buck Creek #2	Complete	95	Partnerships	\$2,700	\$28	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Buck Creek #1	Complete	80	Partnerships	\$2,700	\$34	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	RNF Landenburg (Grizzly)	Complete	1094	Mix	\$400,000	\$366	1988		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Rhodes Draw	Complete	40	Partnerships	\$1,521	\$38	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	FNF Cedar Ridge	Complete	0	none/unknown			1989	300	0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	MLR Keeva	Complete	220	Easement	\$7,076	\$32	1995		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	FNF Firefighter	Complete	0	none/unknown			N/A	793	0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Lake Co. Purple Loosestrife Control	Complete	0	none/unknown			N/A		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Big Mountain Exchange	Complete	1289	Exchange	\$16,000	\$12	1998		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	FWP Morris Island	Complete	40	Fee Title	\$55,087	\$1,377	1998		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Wild Drake (Coriell) Island	Complete	73	Fee Title	\$22,212	\$304	1999		0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	FNF Dry Parks	Complete	0	none/unknown			N/A	2213	0	N/A

Fig. 15 Wildlife Acres Protected and Enhanced, 1978-2000 (Continued)

Province	Subbasin	State	Site Name	Tract Name	Status	Acres Protected	Purchase Type	BPA Cost	BPA Cost/ Acre	Year	Acres Enhanced	Total HUs	HU Status*
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	FNF Red Bench	Complete	0	none/unknown			N/A	279	0	N/A
Mountain Columbia	FLATHEAD	MT	Hungry Horse Mitigation	Swan River - Condon	Complete	80	Partnerships	\$2,500	\$31	1999		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	KNF Ural-Tweed	Complete	0	none/unknown			1990	1100	0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	FWP Dancing Prairie	Complete	680	Easement	\$175,272	\$258	1995		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	KNF Libby Dam Wildlife Habitat	Complete	0	none/unknown			1991	840	0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	TNC Copper Creek	Complete	107	Easement	\$2,200	\$21	1990		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	FWP Cramer	Complete	234	Easement	\$200,000	\$855	1995		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	MLR Posten/Lance	Complete	160	Easement	\$4,250	\$27	1995		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	Thompson Chain-of-Lakes	Complete	235	Exchange	\$156,462	\$666	1999		0	N/A
Mountain Columbia	KOOTENAI	MT	Libby Dam Mitigation	KNF Kootenai River	Complete	0	none/unknown			N/A	6800	0	N/A
Mountain Columbia	KOOTENAI	MT	Boundary Creek WMA	Boundary Creek	Complete	1405	Fee Title	\$672,885	\$479	1999		991	
Mountain Columbia	KOOTENAI	MT	Boundary Creek WMA	BoundaryCreekWMA Enhancement	Ongoing	0	none/unknown			1998	230	122	
Mountain Columbia	PEND OREILLE	ID	Pend Oreille Wetlands (Kalispel)	Pend Oreille Wetlands I	Complete	436	Fee Title	\$427,185	\$980	1994		344	
Mountain Columbia	PEND OREILLE	ID	Pend Oreille Wetlands (Kalispel)	Pend Oreille Wetlands II	Complete	164	Fee Title	\$199,500	\$1,216	1997		225	
Mountain Columbia	PEND OREILLE	ID	Little Pend Oreille NWR	Weir	Complete	220	Fee Title	\$275,707	\$1,253	1998		106	
Mountain Columbia	PEND OREILLE	WA	Little Pend Oreille NWR	Kaniksu Addition	Complete	716	Mix	\$313,000	\$437	2000		105	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Cocolalla Lake	Complete	98	Fee Title	\$290,500	\$2,964	2000		100	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Albeni Cove	Complete	70	Fee Title	\$56,000	\$800	2000		35	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Ginter	Complete	110	Fee Title	\$219,900	\$1,999	1999		187	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Westmond Lake	Complete	65	Fee Title	\$118,000	\$1,815	2000		70	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Pack River	Complete	30	Fee Title	\$42,500	\$1,417	2000		45	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Denton Slough	Complete	17	Fee Title	\$44,000	\$2,588	1997		41	
Mountain Columbia	PEND OREILLE	ID	The Pend Oreille WMA	Hunter Ranch	Complete	216	Fee Title	\$875,500	\$4,053	2000		315	
Blue Mountain	GRANDE RONDE	OR	Northeast Oregon	Gramm	Complete	158	Fee Title			1998		0	Not Complete
Blue Mountain	GRANDE RONDE	OR	Northeast Oregon	Beach	Complete	1538	Fee Title			1999		0	Not Complete
Blue Mountain	GRANDE RONDE	OR	Northeast Oregon	Helm Tract	Complete	10300	Fee Title	\$4,500,000	\$437	1999		9669	
Blue Mountain	GRANDE RONDE	OR	Ladd Marsh	Ladd Marsh	New/In Process	0	Purchase in process					0	Not Complete
Mountain Snake	CLEARWATER	ID	Buck Creek Old Growth	Buck Creek Old Growth	Complete	67	Fee Title	\$542,767	\$8,101	1994		0	N/A
Mountain Snake	CLEARWATER	ID	Dworshak Tribal	Bond	Complete	38	Fee Title			2000		0	Not Complete
Mountain Snake	CLEARWATER	ID	Dworshak Tribal	Posthole/Gifford	Complete	960	Fee Title	\$476,200	\$496	1998		0	Not Complete
Mountain Snake	LOWER SNAKE	ID	Dworshak Mitigation (Craig Mtn)	Dworshak Mitigation (Craig Mtn)	Complete	59991	Fee Title	\$7,100,000	\$118	1994		0	N/A
Middle Snake	BOISE	ID	Boise River WMA	Boise River	Complete	166	Fee Title	\$332,500	\$2,003	1999		46	
Middle Snake	MALHEUR	OR	Logan Valley	Logan Valley	Ongoing	1700	Fee Title	\$2,000,000	\$1,176	2000		667	
Middle Snake	MALHEUR	OR	Denny Jones	Denny Jones	Complete	6385	Purchase in process	\$0	\$0			0	Not Complete
Upper Snake	UPPER SNAKE	ID	Deer Parks WMU	Boyle Ranch	Complete	2556	Fee Title	\$5,200,000	\$2,034	1999		6918	
Upper Snake	UPPER SNAKE	ID	Deer Parks WMU	Menan	Complete	140	Fee Title	\$220,350	\$1,574	1997		317	
Upper Snake	UPPER SNAKE	ID	Deer Parks WMU	BeaverDick (Klinghorn Property)	Complete	310	Fee Title	\$465,000	\$1,500	1998		901	
Upper Snake	UPPER SNAKE	ID	Tex Creek WMA	Quarter Circle	Complete	2135	Fee Title	\$260,000	\$122	1998		1254	
Upper Snake	UPPER SNAKE	ID	Soda Hills WHMA	Soda Hills	Complete	2563	Fee Title	\$1,282,000	\$500	1998		3896	
Upper Snake	UPPER SNAKE	ID	Winterfield Easement	Winterfield	Complete	422	Easement	\$225,000	\$533	1997		383	
Upper Snake	UPPER SNAKE	ID	Kruse Easement	Kruse (Pine Creek)	Complete	800	Easement	\$310,000	\$388	1997		813	
Columbia Plateau No.	CRAB CREEK	WA	Columbia Basin Wetlands	Columbia Basin Wetlands	New/In Process	100	Fee Title				1000	4030	
Columbia Plateau No.	CRAB CREEK	WA	Eagle Lakes	Eagle Lakes	New/In Process	7500	Purchase in process	\$0	\$0			0	Not Complete
Columbia Plateau No.	CRAB CREEK	WA	Swanson Lakes	Swanson Lakes	Complete	14464	Fee Title	\$3,071,856	\$212		5225	15984	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Wanity	Complete	400	Mix	\$120,000	\$300	N/A		854	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Toppenish	Complete	1600	Mix	\$809,925	\$506			2610	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Satus	Complete	4479	Mix	\$975,750	\$218	N/A		6888	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Knight Property	Complete	80	Easement	\$79,000	\$988	N/A		0	Not Complete
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	S. Campbell Rd.	New/In Process	280	Lease	\$229,875	\$821			0	Not Complete
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Buena	New/In Process	92	Lease	\$102,200	\$1,111			0	Not Complete

Fig. 15 Wildlife Acres Protected and Enhanced, 1978-2000 (Continued)

Province	Subbasin	State	Site Name	Tract Name	Status	Acres Protected	Purchase Type	BPA Cost	BPA Cost/ Acre	Year	Acres Enhanced	Total HUs	HU Status*
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	S Barkes Rd.	New/In Process	81	Lease	\$91,000	\$1,123			0	Not Complete
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Lower Satus	Complete	1791	Mix	\$393,000	\$219	N/A		9272	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	W. Satus Rd.	New/In Process	160	Lease	\$147,175	\$920			0	Not Complete
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Lateral A	Complete	417	Easement	\$830,000	\$1,990	N/A		1137	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Mosebar	Complete	733	Mix	\$167,725	\$229	N/A		1894	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	North Satus	Complete	1110	Mix	\$331,150	\$298	N/A		2694	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Wapato	Complete	660	Easement	\$395,750	\$600	N/A		1592	
Columbia Plateau No.	YAKIMA	WA	Lower Yakima	Old Goldendale Rd	New/In Process	193	Easement	\$89,250	\$462	0			Not Complete
Columbia Plateau No.	YAKIMA	WA	Sunnyside	Sunnyside	Unknown	1280	Lease				9258	4995	
Columbia Plateau No.	YAKIMA	WA	Wenas	Complete		30053	Lease				74746	22446	
Columbia Plateau So.	JOHN DAY	OR	Pine Creek	Pine Creek	Complete	24304	Purchase in process	\$3,200,000	\$132	1999		10000	
Columbia Plateau So.	LOW-MID-COL	OR	Wanaket	Wanaket (Conforth Ranch)	Complete	2817	Fee Title	\$1,042,976	\$370			2334	
Columbia Plateau So.	UMATILLA	OR	Squaw Creek	Squaw Creek	Complete	5937	Fee Title	\$2,260,625	\$381		10978	3833	
Columbia Plateau So.	WALLA WALLA	WA	Rainwater Ranch	Rainwater Ranch	Complete	8681	Fee Title	\$4,089,550	\$471	1999		4337	
						233,925		\$64,365,508			137,046	152,978	

*HU Status: N/A refers to tracts where no HU accounting was required, hence 0 in the HU column. If the HU accounting has not been completed, there is also a 0 in the HU column.
 Source: Bonneville Power Administration

Fig. 17A BPA wildlife acres protected by agency

Agency Name	Sum Of BPA Acres Protected
IDAHO DEPARTMENT OF FISH & GAME	71497
WASHINGTON DEPARTMENT OF FISH & WILDLIFE	51757
WARM SPRINGS TRIBE	24304
COLVILLE CONFEDERATED TRIBES	18886
UMATILLA CONFEDERATED TRIBES	17435
NEZ PERCE TRIBE	12994
YAKAMA NATION	12076
US FISH AND WILDLIFE SERVICE - PORTLAND REGION	8047
SPOKANE TRIBE OF INDIANS	1828
BURNS PAIUTE TRIBE	1700
MONTANA DEPARTMENT OF FISH & WILDLIFE - HELENA	1262
USFS - FLATHEAD NATIONAL FOREST	1094
MONTANA LAND RELIANCE	888
KALISPEL TRIBE OF INDIANS	600
OREGON DEPARTMENT OF FISH & WILDLIFE - HQ	459
THE NATURE CONSERVANCY - OR	329
THE NATURE CONSERVANCY - MT	107
US FISH AND WILDLIFE SERVICE - DENVER REGION	80
FLATHEAD LAND TRUST	60
	225,403

Source: Bonneville Power Administration

Fig. 17B BPA wildlife acquisition costs by agencies

Agency Name	Cost (BPA)
IDAHO DEPARTMENT OF FISH & GAME	\$19,055,902
COLVILLE CONFEDERATED TRIBES	\$8,274,042
UMATILLA CONFEDERATED TRIBES	\$7,272,051
WASHINGTON DEPARTMENT OF FISH & WILDLIFE	\$6,101,577
NEZ PERCE TRIBE	\$4,976,200
YAKAMA NATION	\$4,761,800
WARM SPRINGS TRIBES	\$3,200,000
SPOKANE TRIBE OF INDIANS	\$2,242,427
BURNS PAIUTE TRIBE	\$2,000,000
US FISH AND WILDLIFE SERVICE - PORTLAND REGION	\$1,991,559
THE NATURE CONSERVANCY - OR	\$1,058,000
KALISPEL TRIBE OF INDIANS	\$626,685
MONTANA DEPARTMENT OF FISH & WILDLIFE - HELENA	\$609,033
OREGON DEPARTMENT OF FISH & WILDLIFE - HQ	\$587,238
USFS - FLATHEAD NATIONAL FOREST	\$400,000
MONTANA LAND RELIANCE	\$30,238
US FISH AND WILDLIFE SERVICE - DENVER REGION	\$5,000
FLATHEAD LAND TRUST	\$3,598
THE NATURE CONSERVANCY - MT	\$2,200
	\$63,197,550

Source: Bonneville Power Administration

Fig. 18 Properties Purchased by BPA for Wildlife Purposes 1978-2000

Province	Subbasin	Site	BPA Acres Purchased	Type
Lower Columbia	LOWER COLUMBIA	Steigerwald NWR	327	Fee Title
Lower Columbia	LOWER COLUMBIA	Vancouver Lowlands	612	Fee Title
Lower Columbia	WILLAMETTE	Burlington Bottoms	417	Fee Title
Lower Columbia	WILLAMETTE	Sorenson	42	Fee Title
Columbia Plateau	CRAB CREEK	Columbia Basin Wetlands	100	Fee Title
Columbia Plateau	CRAB CREEK	Swanson Lakes	12807	Fee Title
Columbia Plateau	LOWER MID-COLUMBIA	Wanaket	2817	Fee Title
Columbia Plateau	UMATILLA	Squaw Creek	5937	Fee Title
Columbia Plateau	WALLA WALLA	Rainwater Ranch	8681	Fee Title
Cascade Columbia	OKANOGAN	Scotch Creek	385	Fee Title
Intermountain	SAN POIL	Hellsgate	10454	Fee Title
Intermountain	SPOKANE LOWER	Wellpinit Mtn WA	80	Fee Title
Intermountain	SPOKANE LOWER	Blue Creek Winter Range	7	Fee Title
Intermountain	SPOKANE LOWER	McCoy Lake Watershed	769	Fee Title
Intermountain	SPOKANE LOWER	Fox Creek	200	Fee Title
Intermountain	UPPER COLUMBIA	Hellsgate	8432	Fee Title
Mountain Columbia	CLARK FORK	The Pend Oreille WMA	336	Fee Title
Mountain Columbia	FLATHEAD	Hungry Horse Mitigation	113	Fee Title
Mountain Columbia	KOOTENAI	Boundary Creek WMA	1405	Fee Title
Mountain Columbia	PEND OREILLE	Pend Oreille Wetlands (Kalispel)	600	Fee Title
Mountain Columbia	PEND OREILLE	Pend Oreille NWR	220	Fee Title
Mountain Columbia	PEND OREILLE	The Pend Oreille WMA	606	Fee Title
Blue Mountain	GRANDERONDE	Northeast Oregon	11996	Fee Title
Mountain Snake	CLEARWATER	Buck Creek Old Growth	67	Fee Title
Mountain Snake	CLEARWATER	Dworshak Tribal	998	Fee Title
Mountain Snake	LOWER SNAKE	Dworshak Mitigation (Craig Mtn)	59991	Fee Title
Middle Snake	BOISE	Boise River WMA	166	Fee Title
Middle Snake	MALHEUR	Logan Valley	1700	Fee Title
Upper Snake	UPPER SNAKE	Deer Parks WMU	3006	Fee Title
Upper Snake	UPPER SNAKE	Tex Creek WMA	2135	Fee Title
Upper Snake	UPPER SNAKE	Soda Hills WHMA	2563	Fee Title
			138,040	

Source: Bonneville Power Administration

Fig. 19 Angler use, economic value and harvest rates of the three principal sport fishes in Lake Roosevelt before and after enhancements made under the NPPC Columbia Basin Fish and Wildlife Program

	Before Enhancements ¹				After Enhancements ²						
	1981	1982	1990	1991	1992	1993	1994	1995	1996	1997	1998
Angler Trips	75,000	75,000	171,725	398,408	291,380	594,508	469,998	232,202	176,769	146,264	196,775
Economic Value (Millions of \$)	1.7	1.7	5.3	12.8	9.7	20.7	19.1	8.7	6.9	5.8	8.0
Kokanee Harvest	284	<100	17,515	31,651	8,021	13,960	16,567	32,353	1,265	588	9,980
Rainbow Harvest	1,517	<300	79,683	73,777	140,609	398,843	499,293	122,939	76,782	5,356	226,809
Walleye Harvest	128,156	108,532	82,284	168,736	118,863	307,663	53,589	40,185	104,055	87,515	119,346

Sources

- Harper et al. (1981), Beckman et al. (1985). Data collected April-October
- Peone et al. (1990), Griffin and Scholz (1990), Thatcher et al. (1993), Underwood and Shields (1996a,b), Underwood et al. (1996) and Cichosz et al. (1997). Data collected January to December.

Fig. 20, Budgeted, Actual, and Projected Expenditures, 1996-2001

	FY	Actual 1996	Actual 1997	Actual 1998	Actual 1999	Est 2000	Est 2001	96-01 Total
Direct Program Expenses								
MOA Plan		100.0	100.0	100.0	100.0	100.0	100.0	600.0
Avg Expenditure Amount Available 1/ Actual (FY96-99); Planned (FYs 00-01) 2/		100.0	133.1	153.5	150.7	144.6	136.3	
Carry Forward Balance 3/ 4/		68.5	82.2	104.9	108.2	110.0	110.0	583.7
		31.5	50.9	48.6	42.5	34.6	26.3	
Reimbursable F&W Expenses of Other Agencies								
MOA Plan		38.4	40.5	40.5	40.5	40.5	40.5	240.9
Avg Expenditure Amount Available Actual (FY96-99); Planned (FYs 00-01)		40.2	45.3	50.0	54.4	56.4	53.5	
Carry Forward Balance 4/		35.4	35.9	36.4	38.9	43.7	48.5	238.8
		4.8	9.4	13.6	15.5	12.7	5.0	
Capital Investments Fixed Expenses								
MOA Plan		73.1	87.2	105.7	117.7	129.3	156.0	669.0
Avg Expenditure Amount Available 1/ Actual (FY96-99); Planned (FYs 00-01)		111.5	151.9	190.3	233.4	276.6	319.8	
Carry Forward Balance 4/		73.1	76.3	74.1	76.0	78.0	99.7	477.2
		38.4	75.6	116.2	157.4	198.6	220.1	
Total								
MOA Plan		211.5	227.7	246.2	258.2	269.8	296.5	1,509.9
Avg Expenditure Amount Available 1/ Actual Expenditures		251.7	330.3	393.8	438.5	477.6	509.6	
Carry Forward Balance 4/		177.0	194.4	215.4	223.1	231.7	258.2	
		74.7	136.0	178.4	215.4	245.9	251.3	
River Operations								
MOA Plan (Projected Avg. Cost)		183.0	183.0	183.0	183.0	183.0	183.0	1,098.0
Power Purchases 5/		0.0	0.0	5.4		93.6	95.9	194.9
Foregone Revenues 5		81.7	107.8	116.5		63.0	64.6	433.6
Other 7/		4.0	4.0	4.0		4.2	4.3	20.5
Total		85.7	111.8	125.9	0.0	160.8	164.8	649.0
Actual Expenditures Grand Total		\$262.7	\$306.2	\$341.3	\$223.1	\$392.5	\$423.0	\$1,948.8 6/
ESA Related Transmission Enhancements		0.0	12.7	0.0	0.0	0.0	0.0	12.7

Assumptions:

Expenditure Plan and River Operations equal display in BPA's FY 2001 Congressional Budget. Actual Expenditures for all expenses and capital investments reflect FY 1996-1999 actual results. For FY's 2000 through 2001, program expenses and capital investments are consistent with the Fish and Wildlife Budget Memorandum of Agreement for fiscal years 1996-2001. This funding stream shows in the most likely accruals related to Obligations from the NWPPC prioritization process. Actual accruals may be more or less during a given year within the 6 year MOA period. No agreement has been reached at this time on BPA's Fish and Wildlife Budget for the fiscal years beyond 2001. However, under the Fish and Wildlife Funding Principles, announced September 16, 1998, Bonneville will assure that its' post - 2001 rate case provides for a wide range of future

Notes:

- 1/ In addition, \$27 million per year in capital funding (borrowing) will be provided by BPA for the Direct Program through 2001. The Interest and Amortization for this is reflected in the Expenditures Plan for the Capital Investment category.
- 2/ This information is reported on an accrual basis. For Direct Program management purposes, BPA also reports these expenditures on an obligations basis. Typically the accruals lag the obligations, since not all funds are expended in the year in which they are obligated.
- 3/ BPA's FY 1996-2001 Fish and Wildlife Program Expense Budget is \$100 million per year. Actual expenses for FY 1996-1999 were approximately \$42.5 million less than what was available. BPA, in accordance with the MOA, will carry forward this amount with interest.
- 4/ Original MOA Plan included interest at 5.093 percent for FY 1999-2001. The actual interest rate is determined annually (10/1). the interest rate for FY1996 is 5.083%, 1997 is 5.093%, 1998 is 4.221% and is 4.864% in FY 1999. Estimated interest for FY 2001-2001 is 4.864%.
- 5/ Estimated for FY 1996-1998, actual amount will change when the river models are executed. For FY 1999, final hydro operations require information on actual hydrological conditions. This information is not yet available.
- 6/ During the initial discussions when developing the MOA, the "96-01 Avg" was estimated to be about \$435 million.
- 7/ These estimated costs are related to limitations placed on operating ranges (forebay levels and generator efficiency) and other

Source: Bonneville Power Administration