IV. FUNCTIONAL ACCOMPLISHMENTS

Flood Damages *Electric Energy* *Irrigation* *Navigation* *Recreation* *Water Quality* *Fisheries Operation*

The hydrological conditions and the reservoir regulation described in the preceding two chapters have produced significant effects on many aspects of life in the Pacific Northwest. These effects are discussed and quantified within the following benefit categories: flood control, energy generation, irrigation, navigation, recreation, water quality, and fishery operation. These discussions are not intended to be thorough or complete but are cursory and contain only the salient features.

A. FLOOD DAMAGES

The effect of reservoir regulation on downstream river flow is determined by routing (the calculation of travel time, diversions, etc) and comparing regulated and unregulated (*i.e.*, natural or pre-project) flows. The flood damages given in Table 17 are for selected sites associated with reservoir flood control operation and show both the observed flows and damages and the unregulated flows (those that would have been observed without the flood control dams) and the damages prevented (the additional damages that would have occurred without the flood control reservoir operation). The reduction in the river stage or flow that resulted from the reservoir regulation was used to index the value of damages prevented.

The flood damages prevented by reservoir operation in the Northwest was $124,386,000. These tables of damages and damages prevented are for Corps projects and do not include damages on uncontrolled streams or at Section 7 projects.

Table 18 is a tabulation of damages prevented by major flood control projects in the Columbia Basin for the period since 1948 through 2002. Damages prevented for the lower Columbia and for the entire Columbia Basin represent the damage for the cost and development of the year of occurrence. At today's cost and development level, the amounts in past years would be much larger. The damage prevented by control of winter floods on tributary streams is not shown.

B. ELECTRIC ENERGY

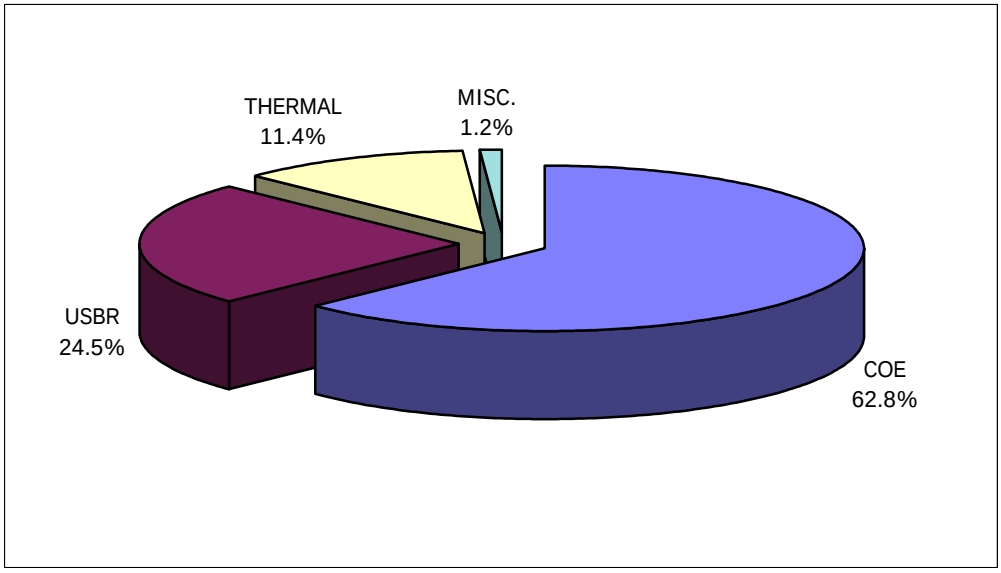
Power operations in this report reference two major entities, the Coordinated System and the Federal Columbia River Power System (FCRPS). The former includes most of the generating facilities, hydro and thermal, in the Pacific Northwest, including the FCRPS projects, which are Federally owned. The Columbia Generating Station (formerly WNP-2) contributes its output to the Federal System. Although participants of the Coordinated System operate their own reservoirs, the power system is operated as a “one owner” system to optimize both energy production and management of the water resources in the Pacific Northwest. Renewable-energy projects continued to come online, most notably wind energy, and additional BPA acquisitions stimulated this new power source. Table (A) displays the sources of the generation received by BPA.

BPA is a self-funding agency, which pays for its costs through power and transmission sales. Both power and transmission are sold at cost, and BPA repays any borrowing from the U.S. Treasury with interest. BPA’s customers include publicly owned and investor-owned utilities, as well as some large industries. BPA also sells or exchanges power with utilities in Canada and the western United States. Revenues BPA earns help it fulfill public responsibilities that include low-cost and reliable power and investments in energy conservation and renewable resources. BPA also funds the region’s efforts to protect and rebuild fish and wildlife populations in the Columbia River Basin.

Table 19 shows the breakdown of Federal generation sources: the COE, USBR, thermal, and miscellaneous energy sources. Also tabulated are the percentage changes over the previous year.

Table 19
SOURCES OF BPA ENERGY

Source	Amount (MWh)	Percentage	Change from last year (%)
COE	51,439,513	62.8%	25.01%
USBR	20,072,475	24.5%	41.16%
THERMAL	9,370,870	11.4%	7.76%
MISC.	1,019,591	1.2%	-15.57%
TOTAL	81,902,449		25.48%



1. Generation

Columbia-basin water year runoff in 2002 came in just below normal, at 126.6 million-acre feet or 92% of the 30 year normal (1971-2000) at The Dalles. The 2001 drought resulted in low reservoirs at the beginning of the year, but Federal reservoirs were able to recover to about 93 percent full on July 31, the end of the operating year. The normal levels are defined in a 2002 Biological Opinion for hydro system operations to protect endangered and threatened fish.

At the beginning of the 2001-02 operating year, the Coordinated System storage level was 67.1 percent full as measured in the Pacific Coordination Agreement (PNCA) Actual Energy Regulation (AER), which includes the Canadian Storage operation from the TSR study. Actual Canadian storage levels on 31 July 2001 were 65.7 percent full due to a supplemental operating agreement for summer

storage. Due to the record low unregulated streamflows during the prior operating year, the hydro system continued to draft proportionally well below the ORC through April in order to create the firm load carrying capability determined in the critical period studies. During May through July most of the coordinated system recovered to the ORC, with the main exception of Mica, which was limited by minimum flow requirements. Actual Canadian storage on 31 July 2002 reached 91.3 percent full, and the TSR storage level for Canadian storage was 91.8 percent full.

The Columbia River was operated to meet chum needs below Bonneville Dam from November 2001 through 8 May 2002. U.S. reservoirs were operated to target the 10 April flood control elevation per the NMFS 2000 BiOp for juvenile fish needs. For 2002 Libby Dam conducted an operation that focused on the Kootenai River white sturgeon larvae stage instead of the standard sturgeon pulsing operation. U.S.storage projects refilled by July 31, 2002. Projects were then drafted to the NMFS 2000 BiOp draft limits for 31 August, except for Dworshak Dam, which reached the draft limit in September.

2. Marketing

In comparison with the FY01 marketing year that included record high market prices coupled with a near record low water condition, the marketing year in FY02 marked a return to somewhat normal conditions as shown in **Table 20**. Despite the January-July volume at 103 MAF (@ TDA) and CGS not down for refueling, BPA had slightly less energy production due to stored energy needed to replenish depleted reservoir levels from the FY01 drought. However, market prices plummeted from the high levels in FY01 and, although consistent with pre-FY01 levels, they were considerably lower than expectations at the start of FY02 as shown in **Table 21**. As a result, BPA surplus marketing revenues were also less than start of year expectations.

Table 20
HISTORICAL POWER PURCHASES

Fiscal Year	*$(million)*
F.Y. 2002	$877
F.Y. 2001	$3,046
F.Y. 2000	$368
F.Y. 1999	$223
F.Y. 1998	$118
F.Y. 1997	$39
F.Y. 1996	$55
F.Y. 1995	$155
F.Y. 1994	$207

Note: Purchases do not include storage costs.

Table 21
BPA Market Purchases and Sales
(MW-Months)

Period	Purchases	Sales
Oct-01	3124	1673
Nov-01	3330	2641
Dec-01	3277	2125
Jan-02	3191	2652
Feb-02	3184	2694
Mar-02	3350	2280
Apr-02	2917	4036
May-02	2459	3884
Jun-02	2562	5390
Jul-02	3466	5741
Aug-02	3522	4600
Sep-02	3417	2956
TOTAL	**37798**	**40672**

*Sales do not include totals from non-scheduling utilities

3. Intertie / Transmission

Pursuant to FERC Order 2000, Bonneville Power Administration is participating with other transmission providers in the formation of a regional transmission organization known as "RTO West." RTO West would be an independent non-profit corporation that would operate the region's electric transmission lines as a common carrier of wholesale electricity. The service area includes the Northwest, Nevada and Utah. On September 18 2002, the Federal Energy Regulatory Commission ruled that the RTO West "stage 2" filing, with a few modifications, meets FERC's minimum characteristics and functions for a regional transmission organization. The full implications of the ruling are still undergoing extensive review and debate within the region. Regional stakeholders continue to refine the proposal in a way that addresses the feedback from FERC while protecting the benefits of the unique hydro-thermal system in the Northwest.

4. Subscription / Power Rates

For the first time BPA offered power and transmission contracts under separate rate schedules.

Power Rates: When BPA and its customers agreed on the agency's power rate in June 2001, they opted to depart from the traditional five-year fixed rate because that power rate would have to have been very high to compensate for the risk of market uncertainty. Instead, they adopted the lowest-possible base rates and added three cost recovery adjustment clauses (CRACs) to cover risk, including that from market fluctuation. The need for these became apparent sooner than BPA and customers had hoped. The extreme high prices for spot-market power in 2001 disappeared in 2002; this resulted in much lower revenues from these sales than were assumed in the rate case. BPA aggressively cut its costs, but was compelled to trigger the load-based CRAC (LB CRAC), starting the year with a 46% rate increase to cover the additional load customers placed on the agency when more than expected opted to escape the market by returning their load to BPA. Late in FY 2002, BPA estimates showed that the financial-based CRAC would trigger with the beginning of FY2003. It triggers for one year in addition to the LB CRAC adjustment if third quarter

projection of year-end adjusted accumulated net revenue fall below a predetermined amount.

Transmission Rates: Transmission costs are now recovered under separate rate schedules. The Transmission Line implemented new two-year rates for transmission this year. Rates remained approximately level for the year after reducing expenses significantly during FY 2002.

Perhaps the most dramatic departure among BPA's new 2002 power sales contracts is the "Slice of the System" product. This new concept in BPA power sales was proposed by several BPA customer utilities and developed through a public process. Twenty-five publicly owned utilities bought "slices" that total 22.5 percent of the generation capability of the Federal Columbia River Power System. They now share BPA's power costs, risks and rewards. Slice purchasers get firm power plus a proportional share of any surplus power a good water year might produce. They can use the surplus power for their own loads or sell it. They also take the risk of poor water conditions and they have to pay their percentage share of the maintenance and upkeep costs of the system.

5. <u>BPA's Financial Picture</u>

BPA met its annual repayment obligation to the U.S. Treasury of $1.056 billion in full and on time. However, the financial circumstances were challenging, and year-end financial reserves were $188 million, compared to $625 million in 2001. Revenue credits were much lower in 2002 given the average water conditions; the total 4(h)(10)(c) and Fish Cost Contingency Fund credits amounted to $46 million, compared to $601 million the year before. BPA's FY 2002 Treasury payment included $483 million in interest and $505 million in principal, and also included $266 million to repay higher-cost Treasury borrowing in advance of its due date. BPA also paid $255 million directly to the U.S. Army Corps of Engineers and Bureau of Reclamation to fund operation and maintenance of federal power projects.

C. IRRIGATION

Irrigation service from Bureau of Reclamation projects was available to an estimated 2,870,000 acres in 2000 and there were no reported water shortages. The water came from 52 reservoirs with an active capacity of about 10,090,000 acre-ft (af). This does not include 8,214,000 af of storage in Franklin D. Roosevelt Lake (behind Grand Coulee Dam) and Hungry Horse Reservoir in western Montana.

D. NAVIGATION

The Corps of Engineers operates navigation locks on three waterways in the Pacific Northwest: the Columbia-Snake River Inland Waterway in Washington, Oregon, and Idaho, the Willamette Falls Lock in western Oregon, and the Lake Washington Ship Canal in Seattle. The Columbia-Snake River Inland Waterway, extending 465 river miles from the Pacific Ocean to Lewiston, Idaho, provides safe passage for ocean-going vessels for more than 100 river miles up to Vancouver, Washington, (on the Columbia River) and Portland (on the Willamette River) and for shallow-draft tugs, barges, log rafts, and recreational vessels from Portland, Oregon, to Lewiston, Idaho. Four of the nations top 100 ports, based on total domestic and foreign cargo tonnage, are located on the Columbia/Willamette Rivers, downstream of the dams and navigation locks. The combined tonnage of these ports would place them twelfth in the nation, more than that of either Los Angeles or Norfolk Harbor. The major commodities exported through these ports are farm and timber products while the imports are petroleum products and chemicals.

Navigation on the shallow draft portion of the Columbia Inland Waterway from Portland to Pasco, Washington, is made possible by four locks that elevate the river from 8 ft mean sea level (msl) below Bonneville Dam (river mile 146), 42 miles east of Portland, to the mouth of the Snake River (river mile 324) in McNary Reservoir at an elevation of 340 ft msl. This latter pool extends to Pasco on the Columbia and to Ice Harbor Dam (river mile 9.7) on the Snake River. Navigation on the Snake River from its confluence with

the Columbia near Pasco, to Lewiston (river mile 140), is made possible by four locks that elevate the river from 340 ft at Ice Harbor Dam to 738 ft at Lewiston on the Lower Granite reservoir.

The nominal size of these eight locks is 86 ft wide and 675 ft long. All the locks were closed simultaneously during March for annual maintenance.

Navigational flow requirements on the Columbia and Snake rivers were met by streamflows and pool levels determined from other project requirements. Cargo was generally transported without any special operational requirements, although occasionally some unusual navigation requirements demand special regulation. However, these special requirements did not generally alter the Columbia River regulation enough to have a significant effect on other project purposes.

The special project operations were necessary to meet navigational requirements during this year had to do with vessel groundings, emergency operation at projects, and for transportation and off loading of decommissioned defueled submarine nuclear reactor cores at Hanford, Washington. The latter special operations were required at both upstream and downstream projects to hold the McNary pool at a constant elevation during the several hours required to off load the reactor cores.

Commercial cargo through the Columbia-Snake locks consists chiefly of farm, lumber, and petroleum products with down-bound cargo consists mostly of the first two and up-bound the latter. March tonnages are less than other months due to the annual closure for maintenance. More information on these projects can be found on the Corps web site at: https://www.nwp.usace.army.mil/op/s/nl/

The Willamette Falls Lock, located on the Willamette River at Oregon City, uses four chambers to lock vessels, loaded mainly with sand and gravel or wood by-products, around the 40-foot high Willamette Falls. Efforts to rebuild the locks with a single chamber have never been funded. More information on this project can be found on the Corps web site at: http://www.nwp.usace.army.mil/op/B/wfl.htm

E. RECREATION

Although many agencies provide recreational facilities, the only agencies to also have project operational activities are the Corps of Engineers and the Bureau of Reclamation. These operational activities include not only those activities for which the projects were authorized but also those ancillary activities which benefit the public without adversely impacting the authorized operations. The added benefits include maintaining some reservoirs within certain elevation ranges throughout the recreation season while at other projects it may be regulating downstream discharges for the activities. Recreational activities include boating, fishing, sailing, hunting, rafting, wind surfing, hydroplane racing, and cross channel swimming. In some cases, the reservoirs are maintained at high elevations during the camping and picnicking season for aesthetic reasons.

Historically, the Corps and Reclamation use different methods to count visitation-days and consequently they could not be directly compared. Now both agencies will be using the visitor-hour/visitor-day method. The difference in the two systems used in the past was that a recreation-day equaled a visit by one person to an area for all of or any part of a 24-hour day; whereas a visitor-hour equated to actual time spent on an area. Twelve visitor-hours equals one visitor day.

1. Corps of Engineers

The total capital investment in recreation development is over $45 million that generates significant benefits each year. Recreational use at Corps administered water resource projects was an estimated 9.0 million 12-hour visitor-days, or 110 million visitor-hours. Three Corps projects each exceeded half-million visitor-days of use and one project, Bonneville Dam, exceeded 1 million visitor-days.

Sightseeing continues to be the leading recreation activity. Facilities such as visitor centers, overlooks, and interpretive facilities are provided to accommodate this use. Swimming, boating, fishing, and general day use activities are other recreational opportunities sought by visitors to Corps projects. Wind surfing, particularly on the Columbia River projects, has become a highly visible activity over the past several years.

2. Bureau of Reclamation

Reclamation reservoirs provide water-based recreation opportunities unique to the surrounding areas in some of the more arid portions of the region. Reclamation's Pacific Northwest Region has 79 recreation areas on 66 reservoirs, providing 395,000 acres of water surface and 2,400 miles of shoreline. Reclamation works cooperatively with state, county, irrigation districts, and federal agencies, as well as private concessionaires in developing and managing many of the recreation areas at Reclamation reservoirs. Recreation facilities include 6,250 campsites in 148 campgrounds; 150 picnic areas; 39 swimming beaches, and 196 boat-launch ramps. Recreation facilities are evaluated in terms of visitor safety and accessibility and upgraded as needed.

The 2000 recreation season was extremely successful for water dependent recreation activities at Reclamation reservoirs. A new Recreation Use Data Report developed by Reclamation with OMB approval will be implemented in the Fall of 2001 which will more accurately inventory Reclamation recreation facilities, survey the user public and identify the growth rate of recreation use on Reclamation reservoirs. Unfortunately, visitor use data has not been collected since 1992, but demand for water-relation recreation activities on Federal manmade lakes is growing and becoming a powerful recreation attraction according to a National Recreation Lakes Commission study conducted published in June 1999.

The Bureau of Reclamation's general legislative authority to manage recreation on Reclamation lands is the Federal Water Project Recreation Act, (PL 89-72) as amended by the Recreation Management Act of 1992 (Title 28). The major focus and direction of this legislation is developing partnerships to manage and administer the recreation areas and resources at Reclamation projects. These partnerships with state and local governments require that Reclamation participate, on a cost-sharing basis, in the planning, development and expansion of the recreation facilities to meet the recreation and resource needs associated with the area. These partnerships are critical to the continued efficient management of Reclamation lands for public recreation purposes. In general, Reclamation has been able to minimize O&M costs and insure high quality recreation facilities under these authorities. A GAO audit in 1993 directed Reclamation to find non-Federal management partners for recreation areas that did not have them.

The PN Region Title 28 Program obligated $1,096,000, or 99.06 percent of funding in FY 2000. The budget totaled $1,165,000 (includes administrative costs) and a total of 26 projects were cost shared; 19 projects at 50/50 for a total of $958,000 and 7 projects at 75/25 for a total of $138,000. Reclamation=s non-Federal partners have matched or surpassed Federal levels of cost sharing since inception of the Program. This serves as testimony to both the need for rehabilitation of facilities and the good faith efforts of Reclamation in promoting the Program. Examples of Title 28 partnerships in action follow.

#Reclamation cost shared with Washington County, Oregon, at Henry Hagg Lake to continue improving access to and safety of recreation facilities at Scoggins day use area and for a South Shore water conversion project. Henry Haag Lake is located about 1-hour out of Portland and receives very high levels of visitation. These improvements will help to alleviate crowding, sanitation and accessibility problems.

#Reclamation cost shared with Oregon State Parks at Prineville Reservoir in Central Oregon to construct and provide parking at the state managed boat ramp. The site will be paved and designates parking for vehicles and trailers. Public safety will be improved and reservoir water quality protected.

#Reclamation cost shared with Jackson County at Emigrant Lake for RV campground development, a fish habitat enhancement project, and implement needed improvements identified in the Agate Lake Resource Management Plan at Agate Lake.

#In addition, Reclamation has ongoing cost-sharing agreements with the Washington Parks and Recreation Department at Banks Lake, and Potholes Reservoir, Idaho Department of Parks and Recreation at Lake Cascade

and lands adjacent to Reclamation's diversion dam below Lucky Peak reservoir, Bonneville County at Ririe Reservoir, and the city of American Falls at American Falls reservoir.

F. WATER QUALITY

The Corps of Engineers lower four Snake River dams and the Corps lower Columbia River dams were operated for consistency with the total dissolved gas variance standards for Oregon, and for the total dissolved gas rule change related to anadromous fish passage for Washington. Project operations to meet 115 percent in the project forebays and 120 percent in the project tailwaters were good for 2002.

Water year 2002 was characterized with almost average weather conditions. The unregulated runoff from January through July at The Dalles was 103.8 Maf, 97% of the 1971-2000 average. The unregulated runoff from April through August was 93.8 Maf at the Dalles, 101% of the 1971 to 2000 average. Two high runoff conditions over 300 kcfs occurred in June 2002. Runoff in June 2002 caused two flow events that were above system generation capacity causing increased total dissolved gas exceedances over previous years.

1. Total Dissolved Gas (TDG) Monitoring. The Columbia/Snake River Total Dissolved Gas Monitoring Program was an annual continuing activity started in 1984. Its primary objective was to collect total dissolved gas and water temperature data needed to schedule real-time reservoir releases and spill operations during the anadromous fish migration season (April-August). Monitoring also continued at a few stations past August of each year and through the following winter seasons.

Total Dissolved Gas (TDG) and temperature were monitored throughout the Columbia River basin using fixed monitoring stations (FMSs). There were a total of 41 FMSs in the United States portion of the Columbia River basin. The US Bureau of Reclamation, Chelan and Grant County Public Utility District (PUD) maintain four stations each. Two stations were maintained by Douglas County PUD. The US Army Corps of Engineers maintained the remaining stations. It should be noted that the Corps dams on the Pend Oreille River (Albeni Falls Dam) and on the Kootenai River (Libby Dam) were not part of the fixed monitoring station program. Readers can reference the 2000 Total Dissolved Gas Monitoring Columbia and Snake Rivers Report. Appendix A contains a map of the fixed monitoring stations and a brief description of each of the Corps FMSs.

All the data collection instruments were fully automated. All data was compiled and posted along with pertinent reservoir and flow information on the CROHMS database, and the Technical Management Team (TMT) webpage. Reference web site: http://www.nwd-wc.usace.army.mil

The number of total dissolved gas (TDG) exceedances was more than previous water years (since the 2000 US Fish and Wildlife and the National Marine Fisheries Service Biological Opinions). Washington and Oregon State standards, during the spill season, had a total of 491 exceedances on the Lower Columbia and Snake Rivers. Most of the exceedances were caused by forced spill, not fish passage spill. The exceedances of the TDG variance standards were ascribed to a combination of factors, such as intertie line derating; unit outages; lack of load; too high volume of spill for fish passage and spilling for flood control operations caused by a combination of late season rains and warm temperatures. Only a small number of exceedances were attributed to spill amounts for fish passage.

Idaho State standards were exceeded for 272 hours (11.3 days) at Dworshak during the summer spill period. This performance is consistent with spilling for flood control operations, creating unavoidable high TDG levels at Dworshak Dam from June 20 to July 1, 2002.

2. Water Temperature Monitoring. Monitoring of water temperature conditions throughout the Columbia and Snake River main stems were conducted as part of the dissolved gas monitoring. Water temperature had also been recorded at the project turbine scroll case (or comparable location) since construction of each project. These daily data provide an historical database of water temperatures since project construction. Water temperatures were also recorded at the forebay and tailwater FMS.

Water temperature above 68ºF, a threshold level important for anadromous fish, ranged between 41 and 71 days at the monitoring sites on the Columbia River, and between 3 and 63 days at the Snake River sites, and 0 days at the Clearwater sites. Generally, the forebay sites experienced the long-term values above 68ºF because of near-field conditions at the dams while the tailwater sites experiences the lower periods because of the more fully mixed river conditions of the tailwater. Forebay water temperatures generally peaked about 69oF while the tailwater temperatures were generally slightly above, but near, 68 oF at the Snake River dams. At the lower Columbia dams, the forebay location water temperatures peaked slightly above, but near, 70 oF. The lower Columbia dams experienced tailwater temperatures in the 68 to 70 oF range.

3. Reports. See web site at: http://www.nwd-wc.usace.army.mil/TMT/wqwebpage/mainpage.htm

G. FISHERY OPERATIONS

Fishery operations were implemented in accordance with the Corps' Fish Passage Plan (FPP), which describes the manner in which the Corps' mainstem projects on the lower Snake and Columbia Rivers will operate throughout the year to provide safe fish passage. This was in compliance with National Marine Fisheries Service (NMFS) Biological Opinion (BiOp), dated 1995 and with NMFS 1998 and 2000 Supplemental BiOps, which contains other measures, including flow augmentation in the Columbia River, additional 427 kaf from the upper Snake River, in-season water management process, flows for chum spawning below Bonneville and operating the lower Snake River reservoirs at minimum operating pool (MOP) and John Day reservoir to the minimum level needed for irrigation pumping. The Technical Management Team (TMT) provided in-season management of river operations. The Implementation Team (IT), consisting of representatives from the Corps, USBR, BPA, NMFS, USFWS, ODFW, WDFW, IDFG, and state of Montana, provided dispute resolution and policy guidance. CRITFC still remained withdrawn from the in-season process although they participated in some meetings and made system operations requests.

More detail information on the BiOps can be found at http://www.salmonrecovery.gov/

1. Actual Operation. This water year, the Columbia Basin runoff was slightly below normal. At The Dalles the January – July runoff volume was 104 MAF (Million acre-feet) normal is 107 MAF. This was much higher the 58 MAF runoff, during the same period in 2001. This "normal" amount of runoff allowed the action agencies to implement the hydro system related BiOp actions.

2. Spill and Flows for Fish. The full BiOp spill program was carried out except at Lower Monumental where no voluntary spill was provided due to construction work going on in the tailrace. See details in table 24 below. For the annual Spring Creek Hatchery release a volume of 200 kaf was provided. Spill was from March 12 to March 15 and ranged between 50 kcfs to 100 kcfs.

The flows provide were close to the flow objectives. At Lower Granite the spring flow objective was 97 Kcfs. Actual flow during the spring period was 83 kcfs. The action agencies were able to meet the flow objective 3 out of the 10 weeks. At McNary the spring flow objective was 246 kcfs. Actual flow during the spring period was 269 kcfs. The flow objective was met 7 out of 11 weeks. At Priest Rapids the spring flow objective was 135 kcfs. The actual flow during the spring period was 181 kcfs. The flow objective was met all 11 weeks. At Lower Granite the summer flow objective was 51 kcfs. The actual flow during the summer period was 41 kcfs. The flow objective

was met 2 out of the 10 weeks. At McNary the summer flow objective was 200 kcfs. The actual flow during the summer period was 189 kcfs. The flow objective was met 3 out of 8 weeks. Table 22 summarizes the actual spill of the projects this year.

3. Juvenile Fish Runs. Salmonids are hatched either in hatcheries or in rivers (called wild fish) where they grow until their time for migration to the ocean. In some case, selected hatchery fry are placed in the river to grow in a natural setting before beginning their natural migration to the ocean. Some species begin their migration in the year of their hatching while others winter in the river before beginning their migration to the ocean. Juveniles are subjected to many perils while migrating, including predation from other fish and birds, spill at dams that can cause high levels of total dissolved gas and gas bubble disease, physical injuries that may occur during dam passage, stress, diseases, and other problems. Depending upon the location in the basin of the hatcheries or redds, young fish traverse up to nine dams on their out-migration. To help mitigate these dangers an alternate method of transportation has been developed for the juveniles. Specially designed barges and tanker trucks transport the young fish past the dams where they are released back into the river downstream of Bonneville Dam. This reduces their in-river travel mortality rate for most species while maintaining their biological timing for arrival at the ocean

a. HATCHERY RELEASES. Hatchery fish released into the Columbia basin streams and rivers above Bonneville Dam totaled approximately 87 million juvenile salmon, about 16 million more than in 2001. The primary factors affecting the 2002 hatchery release numbers were:

The main factors affecting change in the 2002 hatchery release numbers included:

- The numbers of hatchery spring chinook released in 2002 increased by nearly 8.0 million.
- The tule fall chinook released from Spring Creek National Fish Hatchery totaled 19.2 million about 4.0 million above normal production for the facility, and about 8.5 million greater than the total released in 2001.
- Coho and steelhead production were similar to previous years relative to release totals.
- Sockeye production was increased slightly from the preceding year, while the combined numbers of hatchery summer chinook in the Snake and Mid-Columbia rivers were slightly decreased from the 2001 total.

The data above are from the Fish Passage Center's 2001 annual report. A summary of the hatchery releases for the Columbia River basin can be obtained from the FPC website. http://www.fpc.org/

b. COLLECTION OF JUVENILES. Lower Granite, Little Goose, Lower Monumental, and McNary dams are "collector dams" that are equipped with submersible traveling screens, bypass facilities, and raceways capable of holding large number of fish for later transport past the dams in barges or trucks. Operation of the fish collection facilities at Lower Granite, Little Goose, and Lower Monumental continued through October. The facilities at McNary were scheduled to operate as long as fish were present and passing the project and while conditions permitted. It should be noted in the onset that the number of juveniles collected, bypassed, or transported is not a very accurate indicator of the size of the juvenile fish run. Collection efficiency, spill rate and timing, and other factors all play key rolls in juvenile passage. In 2002 the number of juvenile fish collected was 85% of the number collected in 2001. The number of juvenile fish bypassed was 275% of the number bypassed in 2001. This year's change in numbers can be explained because in 2001 spill for juvenile fish passage was limited because of the low water supply. The this year's counts of juvenile fish collected, transported and bypassed are summarized in Table 23.The last several years' counts of juvenile fish collected, transported and bypassed are summarized in Table 24.

c. TRANSPORTATION. Barge transportation of fish on the lower Snake and Columbia rivers began in

1977, replacing most of the truck transportation which had begun several years earlier. Transportation was initiated to reduce juvenile mortality resulting from passage through powerhouse turbines and project reservoirs. Juveniles are transported from upstream collector projects to a location downstream of Bonneville, the most downstream dam. The juvenile transport season began in late March/ early April and ended in October at Lower Granite, Little Goose, and Lower Monumental. In 2002 juvenile fish were collected and transported at McNary starting in the middle of June. Collection facilities at McNary remained in operation as long as juvenile fish continued to arrive at the project or until the facilities had to be closed for safety. In general trucking was limited to periods when daily collection was less than 20,000 fish per day. The total number of fish transported by barge and truck was 63% of the number transported last year.

4. Adult Fish Runs. Adult fish counts were obtained at twelve of the thirteen mainstream Columbia and Snake River dams that have fish passage facilities. Although many species were counted only the salmonid race and species counts at three major dams are reported here, showing their 10-year averages and counts of the previous four years (Table 25). The difference between the McNary and Ice Harbor counts is an index to the mid-Columbia return. This again was a very excellent year for adult fish passage. As shown on Table 25 counts were not quite high as in 2001 but were well above the 10-year averages. Summer and Fall chinook counts were the highest recorded in the time period beginning in 1977. All counts shown in Table 25 were higher than the 10-year averages.

More detailed information on fish passage can be found on the world wide web at the following sites.
https://www.nwp.usace.army.mil/op/fishdata/fish/home.asp (the Corps' new adult count page site)
or http://www.fpc.org/adult.html (the Fish Passage Center's adult count page)
or http://www.cqs.washington.edu/dart/adult.html (University of Washington adult count page)