

ANNUAL REPORT
FISCAL YEAR 1991
DWORSHAK NATIONAL FISH HATCHERY
AHSAHKA, IDAHO



Project Leader

12/23/91

Date



Associate Manager

12/31/91

Date



Assistant Regional Director

12/31/91

Date

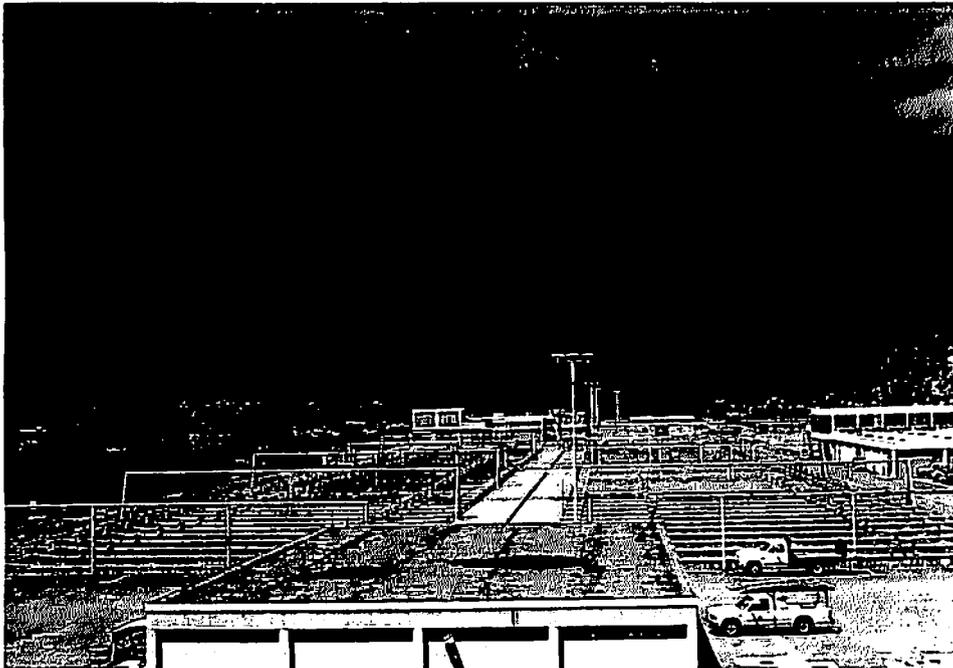
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INTRODUCTION

Dworshak National Fish Hatchery is located at the confluence of the North Fork of the Clearwater River and the main stem Clearwater River near the unincorporated town of Ahsahka, in north central Idaho. The site is 3 miles west of Orofino (population 3,800) on the north bank of the Clearwater River, 1 mile downstream from Dworshak Dam. Land was purchased by the U.S. Army Corps of Engineers (COE) in 1967 from several owners with title remaining with the COE.

Construction of the Dworshak hatchery was included in the authorization for Dworshak Dam and Reservoir, Public Law 87-874, dated 23 October 1962. Design and construction was by the COE with administration and operation since 1968 by the U.S. Fish and Wildlife Service (FWS). Purpose of the hatchery is to mitigate for steelhead losses caused by construction of Dworshak Dam and to supplement Dworshak Reservoir with resident fish production.



Operations began in 1969 with completion of the first phase of construction. This provided a total reuse system for 25 ponds and a single-pass system for 59 ponds. A second phase in 1972 placed all ponds on recycled flow. The hatchery has option to operate the outside ponds on either single pass or recycled flow; the latter option used only for heating water during the winter months for added growth in steelhead production. Subsequent construction has modified many of the earlier features. New design concepts continue to be incorporated into the hatchery.

Additional construction, completed in 1982 under the Lower Snake River Compensation Plan (LSRCP), expanded facilities to rear spring chinook salmon. First release of chinook yearling smolts occurred in spring 1983.

Egg incubation units consist of 58 vertical (16 tray) Heath incubators, 204 colanders and 128 hatching jars for a total eyed egg capacity of 7.5 million steelhead or 5 million spring chinook.

There are 128 inside nursery tanks used for fingerling production, 84 Burrows ponds for steelhead smolts and 30 raceways for spring chinook smolt production. In addition, there are nine (9) adult holding ponds (17'x75') of which six (6) are modified into twelve (12) 8'x75' raceways to hold rainbow trout production.

Steelhead and rainbow trout are mitigation production assigned to the hatchery with construction of Dworshak Dam. Steelhead and spring chinook are released into the Clearwater River drainage and rainbow into Dworshak Reservoir. As the result of Dworshak's Infectious Hematopoietic Necrosis Virus (IHNV) disease status, rainbow trout production has been assigned elsewhere since 1983 for stocking Dworshak Reservoir. Costs for this program remains with the Dworshak hatchery. Spring chinook are presently being reared in 12 raceways previously identified for rainbow production. This additional rearing space allows for an increased chinook production capacity of 400,000 smolts weighing 20,000 pounds.

Total production capacity is as follows:

Steelhead	2.3 million	450,000 pounds (200 mm)
Spring Chinook	1.7 million	90,000 pounds (140 mm)

Kooskia National Fish Hatchery (KNFH), located 35 miles upriver, has operated as a complex with Dworshak since 1978 to produce spring chinook smolts. Steelhead fingerlings have, since 1982, been added to their program in an effort to manage around Dworshak's IHNV disease problem. Fish are returned to Dworshak at 250 per pound.

This report covers the period of hatchery activities from October 1, 1990 to September 30, 1991.

STATION HIGHLIGHTS

Operating funds (1935 account) transferred from the Corps of Engineers (COE) were \$1,153,300. An amount of \$9,000 (8610 account) was used from quarters rental reimbursements for a total of \$1,162,300. In addition, \$50,000 was budgeted to the Dworshak Fish Health Center (FHC) for their assistance and \$75,000 to the Idaho Fishery Resource Office (FRO) for continuation of a broodstock evaluation study.

Included in the hatchery's funding was a transfer of \$11,900 to Hagerman National Fish Hatchery (HNFH) for the production and distribution of rainbow trout for stocking Dworshak Reservoir; a mitigation responsibility of Dworshak hatchery. Also, \$2500 was transferred to Kooskia National Fish Hatchery (KNFH) for pumping costs to rear Dworshak steelhead fingerlings, another \$10,700 to HNFH for rearing and transporting steelhead fingerlings (Brood Year 1991) to Dworshak in summer 1991. The total cost, \$25,100 for the above programs, represents Dworshak's share of expenses to rear rainbow and steelhead trout at other hatchery locations in an effort to manage around IHN virus disease.

Fish marking costs included \$54,000 to ad-clip 2.7 million steelhead fingerlings and \$10,000 for coded-wire tagging of contribution groups released.

The Lower Snake River Compensation Plan (LSRCP) funded \$234,000 (4710 account) for production of spring chinook salmon. The Youth Conservation Corps (YCC), an 8-week summer work program, was also funded by the LSRCP.

Total hatchery operation and maintenance funding, excluding FHC, FRO and YCC, was \$1,396,300. Salaries and benefits accounted for 53 percent of this total or \$741,700.

A total of 21.8 full-time staff years were employed during the year. Permanent employees represented 20.0 and temporaries 1.8 years. Another 0.62 staff years were covered by high school students employed part-time, 1.1 years through staffing of an 8-week YCC program, and 0.15 years from an employee hired under the "Older Worker Program" administered by Lewis-Clark State College. Thirty-six (36) employees were represented in the staff year totals.

Overall feed conversion was 1.41 (less than 2 pounds of food to produce 1 pound of fish gain); spring chinook (1.74) and steelhead (1.34). Total feed cost per pound of fish produced was \$0.41; chinook (0.73) and steelhead (0.35). This was a reduction of \$0.05 for steelhead from the previous year as a result of a decrease in feed costs, spring chinook remaining nearly the same.

The hatchery's gain in steelhead production was 396,751 pounds for the year (10/01/90 - 9/30/91) compared to last year's production of 378,314 pounds. The weight gain was primarily from Brood Year 1990's program released as smolts in spring 1991. Dworshak released 2,655,998 steelhead smolts, weighing 431,273 pounds (197 mm), both off-site and directly from the hatchery.

Spring chinook production of 82,966 pounds reflects a reduction in production from the previous year of 92,093 pounds as a result of a reduced density study in progress. Release totals included 1,427,344 yearling smolts weighing 68,511 pounds (138 mm) from Brood Year 1989; March-April 1991 planting. Another 834,588 fingerlings weighing 7,325 pounds (50-150 mm) from Brood Year 1990 were transferred to LSRCF satellite facilities in 1991.

Ending the reporting year of September 30, 1991, Dworshak was holding 1.5 million spring chinook fingerlings Brood Year 1990 for a planned yearling smolt release in spring 1992 of 1.4 million. Steelhead fingerlings on station were 2.5 million to meet a scheduled smolt release of 2.3 million the following spring. Success of this program was again attributed to a loss of less than 20 percent to IHN virus in Dworshak's nursery rearing resulting from maximizing the use of ozone treatment of the nursery water supply.

Ladder operation was begun on October 23, 1990 to collect the early segment of the returning Brood Year 1991 steelhead run. A total of 444 steelhead were collected before closing the ladder on November 28 and reopening again on February 6.

Steelhead adipose fin clipping was begun on October 9. An Idaho Department of Fish and Game trailer was on the station with a crew of 19 people for marking nearly 2.7 million fish. Work was completed in late November.

Four weeks of pipeline construction in the immediate area of the hatchery caused periods of high turbidity. Work included a river crossing near Dworshak's water intake across to the new Clearwater hatchery site. This phase of construction was completed November 15.

Above normal precipitation in December increased water spillage from Dworshak Dam. During one 24-hour period, 25,000 cfs was flowing in the North Fork. Flows were at 15,000 during this period with 5,000 cfs spilling. Despite the fluctuating water flows, steelhead fishing remained excellent in the river. This year's return was another highlight to fishing success stories on the Clearwater.

Selector gates from Dworshak Dam were removed on December 18 causing water temperatures at the hatchery to drop to 41°F. This is a normal procedure that is followed when warmer temperature from the reservoir is no longer available.

Steelhead spawning was begun in January 1991 on an early group of fish returning to the hatchery in October-November. An estimated 400,000 green eggs were collected in January.

Spawning was completed on April 30. A total of 7,710 fish were collected during the season and an estimated 9.7 million green eggs were taken. Dworshak provided eggs to both Kooskia and Hagerman hatcheries for later return as fingerlings to Dworshak's program and also additional eggs to the Magic Valley and Hagerman East Fork programs. Some 2,700 returning steelhead were outplanted as excess to the program. Nearly 5,500 fish carcasses, including fish that came back to Dworshak from the outplants, were given to the Department of Education commodity programs.

Region One's hatchery "generic" video "Your National Fish Hatchery" was installed for public viewing. The operating techniques designed by the station to synchronize an on/off switch with the VCR and TV set continued to work well. Excellent response was received from the visiting public regarding the video.

Joe McMichael and Joe Rasmussen, Corps of Engineers, Walla Walla District, visited the hatchery on February 1 to discuss Dworshak's reservoir water supply. As a result of this meeting, the hatchery would be provided 6,400 gpm of water for the outside production ponds if not needed for incubation and early nursery rearing. The COE had originally deleted this alternate use for the new pipeline.

Employee Dave Owsley was recognized by IDFG at a banquet, March 16, for his 10 years as instructor of Idaho's hunter safety education in the local community.

Steelhead releases in April-May 1991 included nearly 1.5 million smolts trucked over a 2-week period to various sites in the Basin. Another 1.2 million were direct released from the hatchery. COE drivers and trucks assisted in transferring fish to off-site locations.

Water flow from Dworshak Reservoir was 25,000 cfs at the beginning of May, dropping to 11,000 on May 5. Flows were later increased to 20,000 cfs on May 12 and continued at this level until May 19, dropping to 5,000 cfs. A cool and wet month along with normal runoff from snow melt added to increased flows in the Clearwater River.

Dworshak's fish ladder operation was begun on May 23 for the collection of returning adult salmon. The first returning fish were counted on May 25.

A new station brochure was developed with new photos and text similar in format to the 1981 design. The colored printing was completed in time for Dworshak's "Open House" in June.

Dworshak's "Open House" on June 15 was a great success. Over 1,400 visitors viewed the exhibits, videos, and other special events. FHC, FRO and Kooskia were all involved in planning and in the day's activities. The fishing pond was highlighted with 504 kids registered to catch two fish each. Manager Olson gave a presentation at the Regional Fisheries meeting, in Reno, regarding the highly successful event.

The 8-week Youth Conservation Corps (YCC) program ended on August 2 with 6 enrollees and 1 crew leader participating in activities. This program has been made available to the hatchery through LSRCF funding since 1983. Prior to YCC and since 1977, the station has been actively involved in the Young Adult Conservation (YACC) program. The YCC program, alone, has contributed over 27,000 hours of work to the project since initiated.

Pipeline construction for the new Clearwater State Hatchery in August included 6,400 gpm water flow for Dworshak from Dworshak Reservoir. Work was begun at the hatchery site to block the existing 30" pipe carrying water to incubation

and early rearing facilities from the river intake and connecting the new reservoir supply line with completion expected by mid-November. The new supply line will furnish the hatchery gravity fed water; warmer temperatures if needed for egg incubation and early fingerling rearing; and, hopefully, a reduction in fish health problems notably, IHN virus.

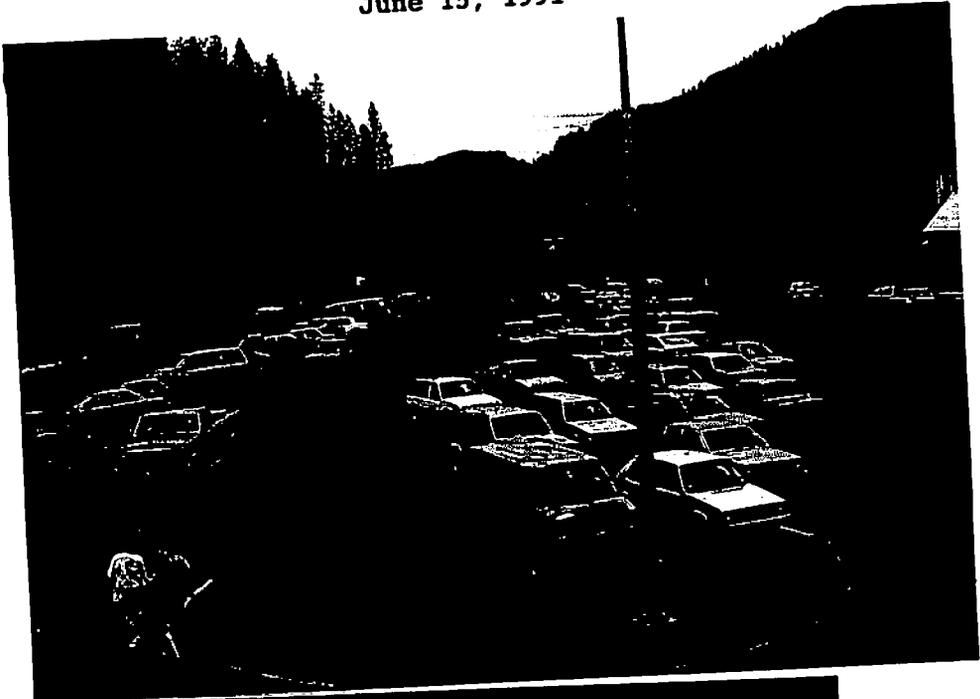
Spring chinook adults to the Dworshak-Kooskia Complex reached a low number when only 632 fish returned. The surprisingly low figure at Dworshak, only 165 fish, is far short of last year's total of 2,042. Kooskia's 467 fish was the primary egg contributor to this year's program. Spawning began on August 26. Only 900,000 eggs were collected; a shortage of 3.6 million to meet Clearwater Basin requirements. This year's low return will result in less than 700,000 yearling smolts for release in 1993. The Complex has a production capacity of 2.2 million.

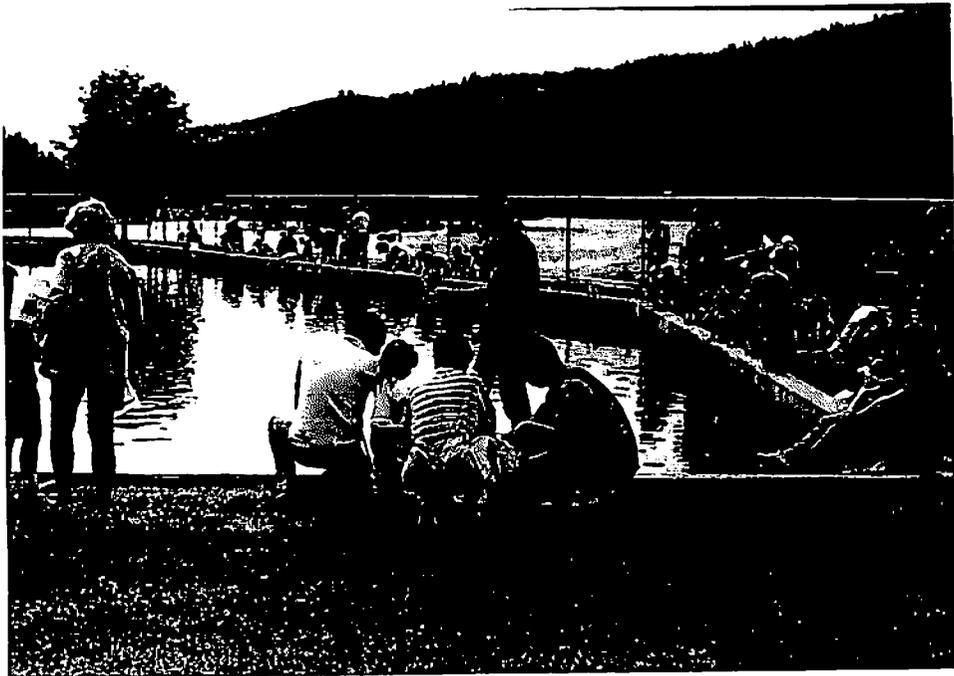
A major maintenance activity for the year included a complete rehab of the hatchery's cold food storage involving all new compressors, electrical and miscellaneous equipment to replace older existing equipment that had been down 3 months since June 1991. Total cost in FY 1991 was \$29,100 with additional funding of \$5000 in FY 1992 to finalize the project. Temporary cold storage space was rented in town and feed deliveries were reduced to manage around the limited holding capability.

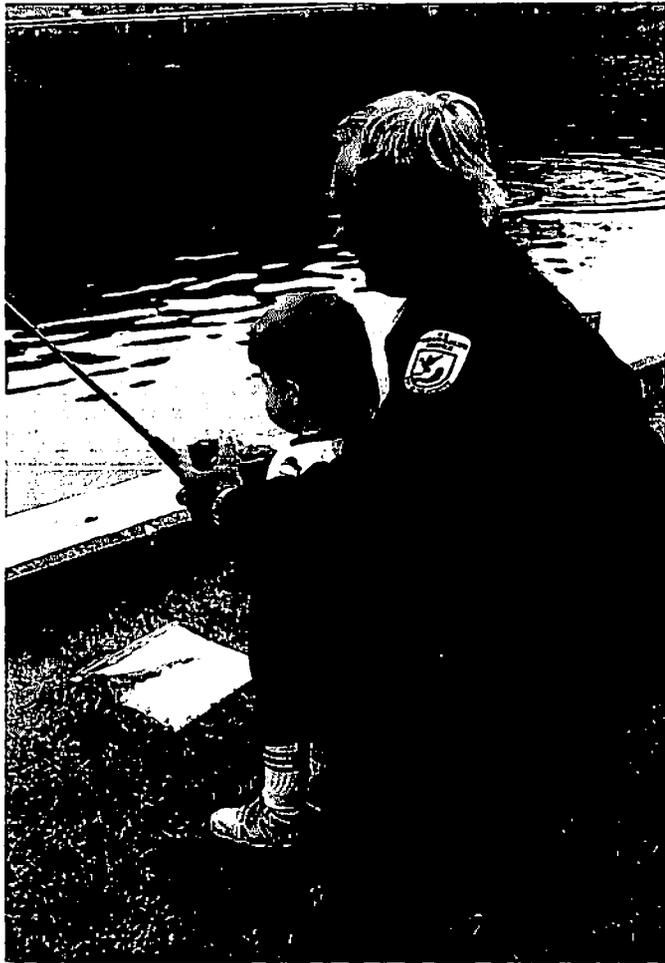
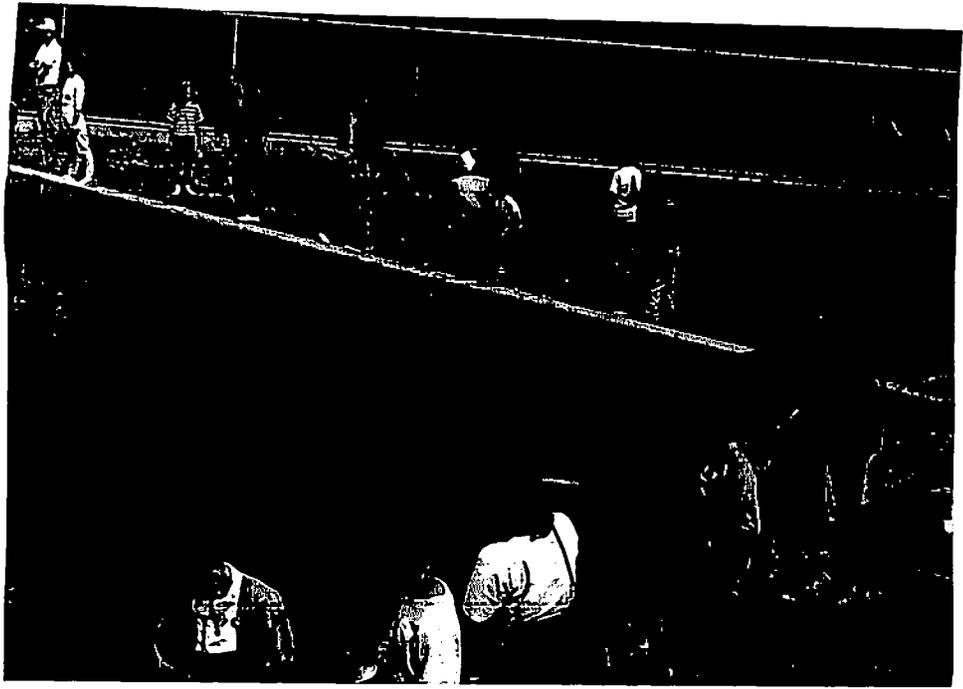
The station continues its approach towards a safe free work environment with only a few minor injuries reported for medical attention. However, an injury on May 13 to employee Hank Jenks resulted in the amputation of a finger. The accident occurred when Mr. Jenks was dismantling and removing a major pump at Dworshak. Prior to this time, Dworshak had maintained an excellent safety record of over 22 years with few days of lost time accidents being reported. Regular safety meetings continued to be held with a chairperson and committee actively participating.

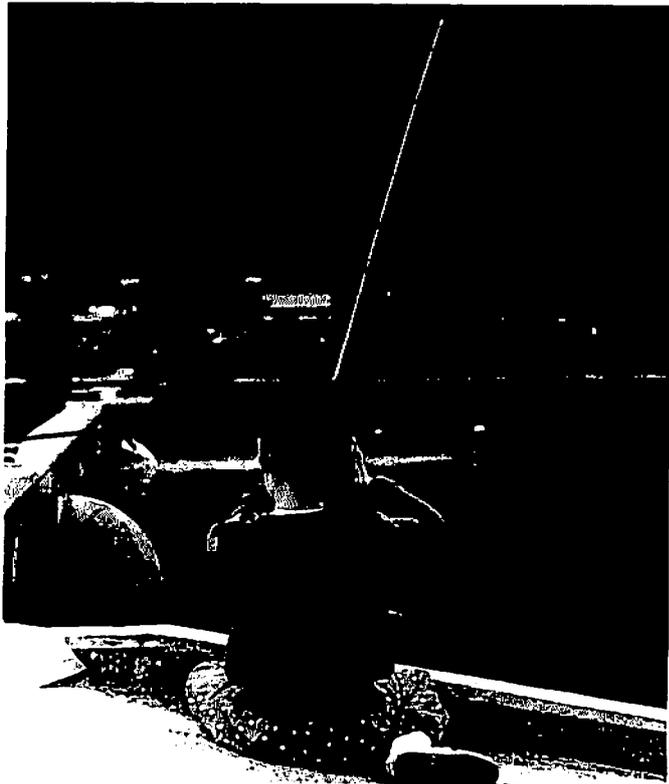
To accomplish Region One's "Vision Action Planning" - "Fisheries: A Future Legacy," an action team was formed with several station members represented. Accomplishments included (1) continuation of public outreach with a station "Open House" as a highlight, (2) expanding training activities for all employees, (3) routine meetings of maintenance and production sections, and (4) employee representation on action planning teams.

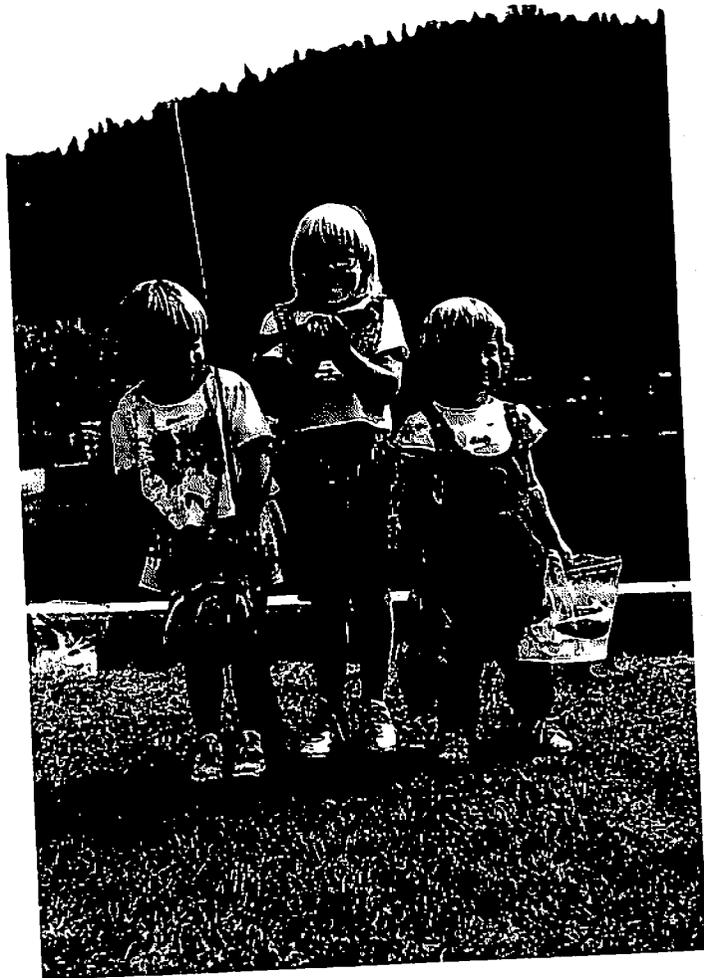
"OPEN HOUSE" PHOTOS
June 15, 1991











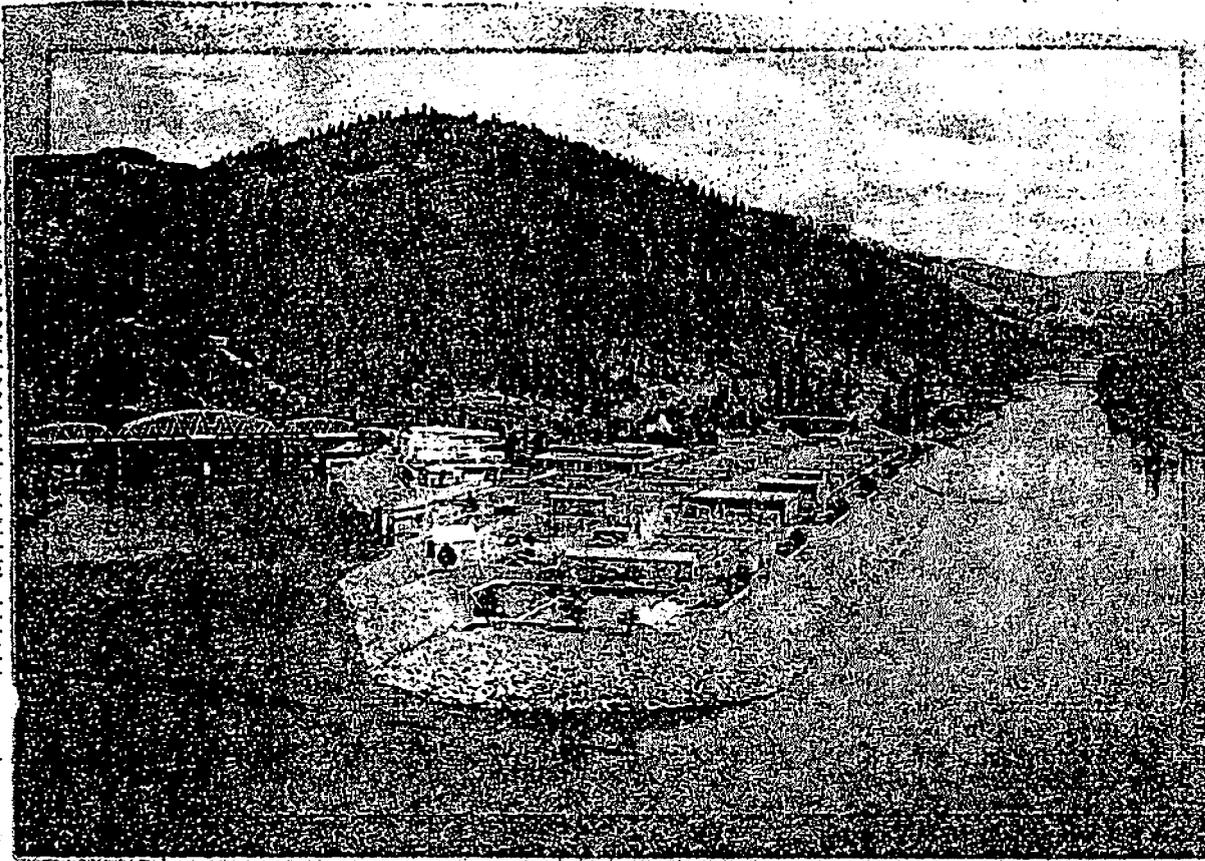
"OPEN HOUSE"
NEWSPAPER CLIPPINGS

CLEARWATER

Thursday, June 13, 1991

Volume 78, Number 23

Published every Thursday at Orofino, Idaho 83544 - Clearw



Dworshak National Fish Hatchery is the scene Saturday of an open house and fun fishing day for kids. The hatchery actually provides almost year-round entertainment and interesting information for tourists and residents alike. During spawning season in the spring the hatchery always has visitors every Tuesday to observe that operation.

Free fishing for kids at Dworshak Open House

A free fishing pond for children under 12 is just one of the exciting events scheduled during the Dworshak National Fish Hatchery's Open House, Saturday, June 15. Hours are 9 a. m. to 4 p. m.

Poles and tackle will be furnished. There will be a two fish limit per child.

Special door prizes will be available for the children.

There will be a special showing of the video "Journey of the Kings."

Slide shows will be shown throughout the day. Concessions will be available. Door prizes will be awarded.

It will be possible to see the

Chinook salmon arrive. A contest will be held to guess the number of steelhead eggs in the jar.

The special events are sponsored by the Dworshak Fish Health Center, Idaho Fishery Resource Office and the Dworshak Production Crew.

The fishing poles were donated by Coast to Coast, Riverside Sport Shop, Snyder's, Inc., West's Sporting Goods, Dale's Cashway and J&S Sales.

Orofino Boosters Club will have a concession stand on location.

Walk the self-guided tour route leading to numerous in-

formation signs and fishery activities. Employees of the hatchery, Idaho Fishery Resource Office and Dworshak Fish Health Center will assist in answering questions and making your visit most enjoyable.

Health Dept. comments on hard measles outbreak

The North Central District Health Department is advising steps to prevent the spread of rubeola (hard measles) due to an outbreak in Moscow.

In response to numerous questions and concerns, the

Council

by Nancy C. Butler
Applications of an and the state inspector work as city b spector were denied Orofino City Council regular meeting Monday.

The individual, witnessed in the building disqualified because certified. The council state inspector was able to spend an amount of time in Orofino.

The council discussed options including the ability of the applicant to be certified. The council administrator will do administrative work and if qualified, they will be on a contract.

Laam discussed council income and conveyances that will be distributed to residents of the city. This will help to show qualifications for future grants such as the water project income and census; these have to be separate from state requirements.

Walrath to Idaho state insurance department

Orofino insurance owner Harry C. Walrath named director of the department of Insurance.

When Gov. Cecil announced the appointment, Walrath told reporters at a press conference.

Walrath, 53, is president of Walrath Insurance Agency.

The appointment was announced July 1.

Outdoors

Hatchery schedules open house

By Bill Loftus
of the Tribune

The U.S. Fish and Wildlife Service plans an open house Saturday at Dworshak National Fish Hatchery to celebrate fishing and offer some inside information about one of the world's largest salmon and steelhead hatcheries.

The open house, the first since Dworshak's formal dedication in 1969, will feature a free-fishing pond for children and displays of information and equipment, said

Wayne Olson, hatchery manager.

About 200 adult chinook salmon, which can range up to 20 pounds, will also be on hand for the open house, which will run from 9 a.m. to 4 p.m.

The hatchery is three miles west of Orofino on the north shore of the Clearwater River.

Children age 12 and younger will be able to fish for 10- to 12-inch rainbow trout in a pond on the hatchery grounds, Olson said. Fishing equipment will be sup-

See *Hatchery*, Page 6D

plied and each young angler will be able to take home two trout on ice.

The fishing pond is part of a celebration of National Fishing Month, Olson said. The U.S. Fish and Wildlife Service also planned the event as part of a national campaign to turn kids on to fishing and away from drugs.

The pond is likely to be the most popular part of the day's events. Olson and Dave Owsley of the Dworshak staff estimate 500 kids may show up for their turn to cast a line.

The trout in the pond will actually be young steelhead that had not yet begun to turn silvery for their migration to the Pacific Ocean.

The 3,000 to 4,000 fish in the pond are the last of the 2.7 million young steelhead the hatchery raised for release this spring. The hatchery also released about 2 million spring chinook salmon this spring.

Hatchery workers will be handling adult spring chinook Saturday to inoculate them with an antibiotic. The drug, erythromycin, will help them survive in the hatchery's tanks until they're ready to spawn in July and August.

About 50 of the spring chinook returned to Dworshak directly. The rest were collected at Kooskia National Fish Hatchery upriver near Kooskia.

Hatchery workers will also be on hand to demonstrate how

they mark young salmon and steelhead each year.

Olson said the open house is part of a national effort by the U.S. Fish and Wildlife Service to acquaint the public with its operations.

Staff members from the Idaho Fishery Resource Office and Dworshak Fish Health Center will be on hand to explain how they monitor the hatchery's operations and guard the health of the fish.

Dworshak has been one of the key players in the restoration of Idaho's steelhead runs despite outbreaks of IHN virus that has killed 95 percent or more of its young steelhead some years.

Olson adapted to the disease by shifting steelhead eggs to Kooskia and Hagerman national fish hatcheries, then bringing back the young steelhead when they were big enough to survive the disease.

The hatchery's success with spring chinook has been less clear. Enough chinook have been returning to Dworshak and Kooskia hatcheries in recent years to supply eggs for the next generation.

But anglers have not been able to pursue chinook in the Clearwater with the exception of last year's experimental fishing season.

The spring chinook migrating up the Snake River were proposed for threatened species status Friday by the National Marine Fisheries Service.

Clearwater Tribune
6/14/91

OPEN HOUSE

DWORSHAK NATIONAL FISH HATCHERY COMPLEX

Saturday, June 15, 1991

9 a.m. to 4 p.m.

Many fun-filled events for the whole family!

Special videos....Slide shows....Equipment displays

See the truckload of spring chinook salmon unloaded....

Watch the biologists measure and inject salmon

Visit the Idaho Fish and Game fish marking trailer....

Free activity books for the kids....balloons and buttons for EVERYONE!

Guess the number of fish eggs in the jar....register for door prizes!!

FREE Fishing Pond for Children Under 13

Poles and tackle furnished

2 Fish Limit

Special Door Prizes for Children

--OTHER DISPLAYS OF SPECIAL INTEREST--

Fishing Poles Donated by:

Coast to Coast

Dale's Cashway

J&S Sales

Riverside Sport Shop

Snyder's, Inc.

West's Sporting Goods

Concessions by:

Orofino Boosters Club



CLEARWATER

Thursday, June 20, 1991

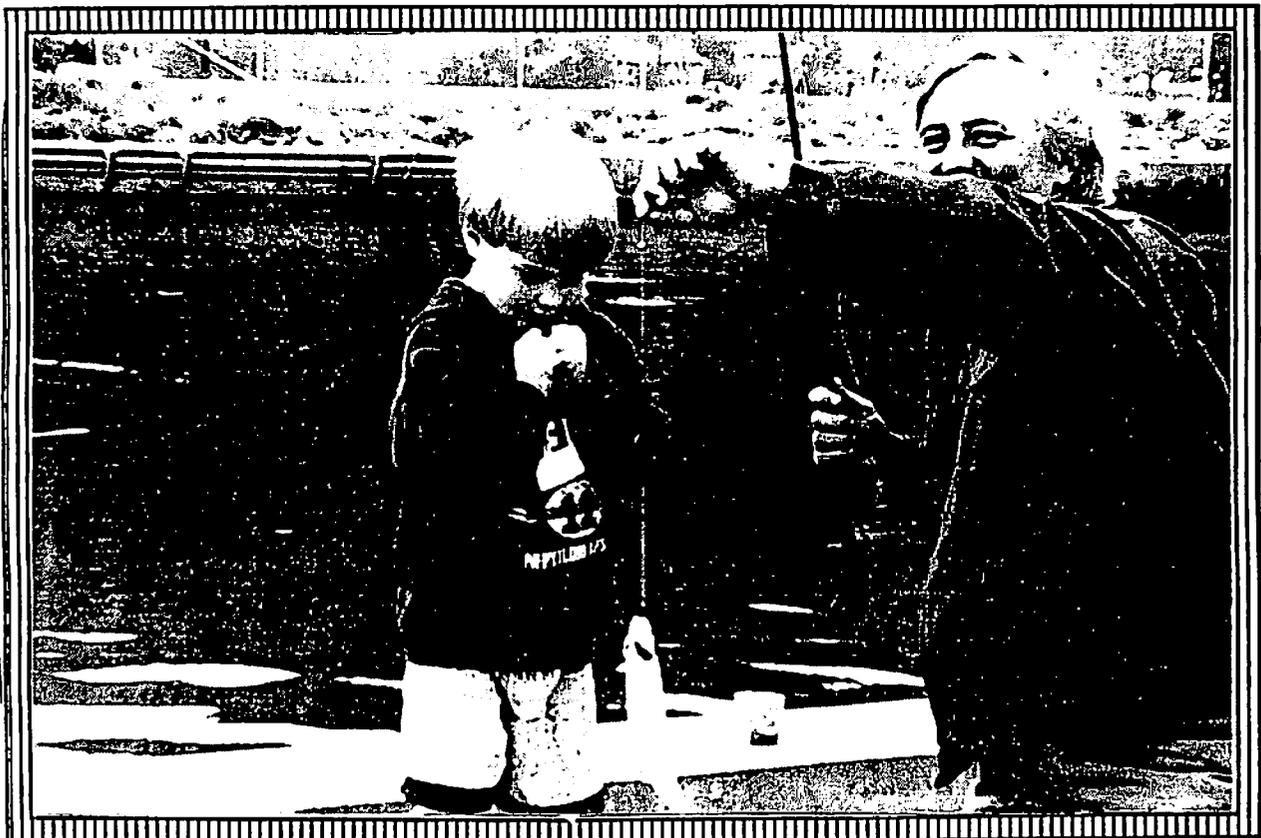
Volume 78, Number 24

Published every Thursday at Orofino, Idaho 83544 - Clearwater County

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Its fun to fish, but hold it no way, there is "blood" was the expression of Shane Dooley after catching a steelhead trout during the open house activities of Dworshak National Fish Hatchery Saturday. Hatchery employee John Rueth assisted Shane. 504 children registered to fish and according to Wayne Olson, hatchery manager, they all caught their limit of two fish. About 1500 people attended the open house. Olson said, it was a great success, especially the children's fishing pond. They are considering making it an annual event. There was a much larger attendance than anticipated, but no problems, and everyone had a good time, he said. Prize winners have all been notified.

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Dave Owsley, at left, from Dworshak National Fish Hatchery, presented OES Principal Dave Wright with two videos, "Kids and Fishing" and "Hooked on Fishing Not On Drugs" Monday. The visit was also to extend an invitation to the students to attend the open house at the hatchery on June 15. Shown here with them are, from left, Mark Maskill, John Rueth, Jay Bigelow and Jerry Berg, also employees at the hatchery. The men are holding some of the rod and reel combos donated for use at a free fishing pond during the open house by J&S of Ahsahka, West's Sporting Goods, Riverside Sport Shop, Coast to Coast and Snyders, Inc. all of Orofino. The men also brought along the "Take a Friend Fishing" poster telling of National Fishing Week June 3-9, and a "Hooked on Fishing Not On Drugs" poster.

Hunter Education Course completed

Forty-two students and one adult completed the Hunter Education Course recently held at the Orofino Junior High School. Twenty hours of classroom instruction and four hours at the range over a two week period made up the course.

Five instructors including Dave Owsley, Bill Miller, Allen Brockman, Jim Johnston and George Fischer, taught the course.

Any child born after January 1, 1975 must take and pass a Hunter Education Course in order to obtain an Idaho hunting license. Adults must take the Hunter Education Course, along with other requirements, in order to obtain a concealed weapons permit.

The Hunter Education Course in Orofino is sponsored by the Veterans of Foreign Wars Post #3296. The Post supplies ten

single shot .22 caliber rifles for the students to shoot at the range. The next Hunter Education Class will be held in September, prior to the opening of general hunting that starts in October.

For any information regarding the next class call Dave Owsley 476-3622.

Sturgeon fishing clinic

LEWISTON-Area anglers are invited to attend a free clinic on how to fish for Idaho's largest fish species, the white sturgeon, scheduled for Friday, June 7, at 7 p.m. in Meriwether-Lewis Hall, room 100, on the Lewis-Clark State College campus in Lewiston.

The first practical phonograph was invented in 1877 by Thomas Edison.

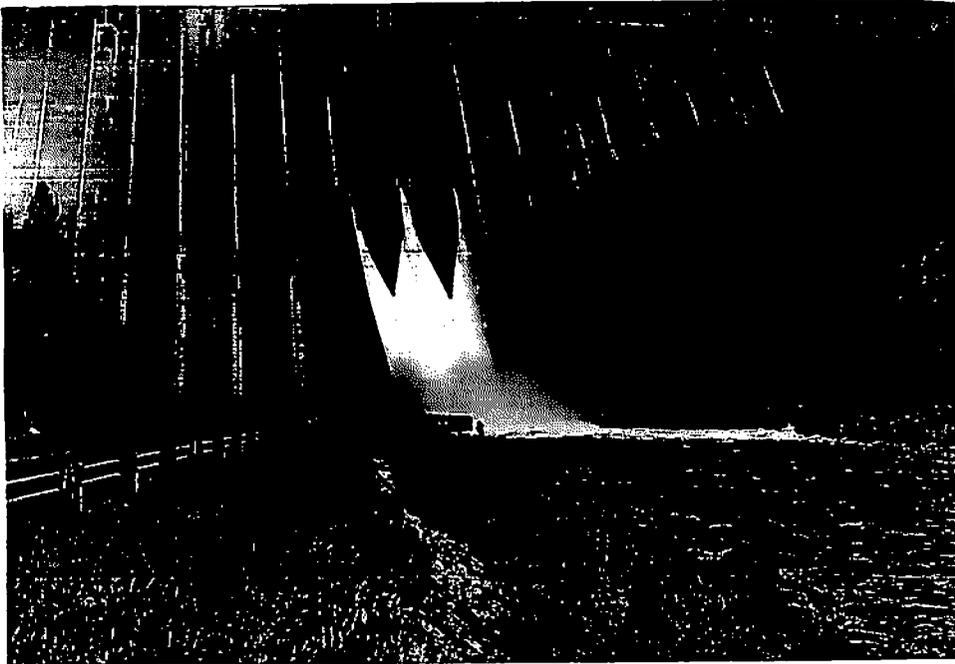
INFLATION FIGHTER!



Men's Leather
Lug Sole
Summer Boot

\$39.99

Orofino Builder's
Supply will be



Water from Dworshak Dam during period of increased discharge from the reservoir.



Increased river flows in area of pipeline construction for new Clearwater hatchery.

FISH CULTURE OPERATIONS

Steelhead Trout Production

The hatchery's gain in steelhead production was 396,751 pounds for the fiscal year (10/01/90 - 9/30/91) compared to last year's production of 378,314 pounds. The increase basically reflected Brood Year 1990 fish achieving a larger size at time of smolt release in spring 1991 than did Brood Year 1989. Dworshak released 2,655,998 steelhead smolts, weighing 431,273 pounds, both off-site and directly from the hatchery.

- Brood Year 1990 -

Steelhead production exceeded the scheduled mitigation of 2.3 million smolts by 300,000 with the release of 2.66 million Brood Year STT in April and May of 1991. The fish weighed 431,273 pounds and averaged 197 mm in length at time of release.

As shown in Table 1 below, the steelhead fingerlings returned to Dworshak from Kooskia NFH and from Hagerman NFH had relatively high survival rates. None of the STT early-reared elsewhere and returned to System 1 were ever confirmed positive for IHN. System 1 fish remained on ambient raw water while at Dworshak. Two of eight rearing units of fish returned from Kooskia to System 3 (on reuse) had outbreaks of IHN, while all seven returned from Hagerman underwent slight IHN outbreaks. Losses were minor, generally averaging under five percent total losses.

Table 1. Relative survival of STT fingerlings at Dworshak by early-rearing station - STT Brood Year 1990.

Early-rearing Station	Initial Dworshak No.	Appxmt. Date On Station	Release No.	Survival
Dworshak	2,096,780	6/1/90	1,399,476	66.7 %
Kooskia	373,630	6/10/90	326,241	87.3 %
Hagerman	949,745	8/1/90	930,281	98.0 %

			2,655,998	

It might be mentioned that the 66.7 percent survival from Dworshak feeding fry shown in Table 1 represents a cumulative survival of 51.7 percent from green eggs. This contrasts to the average 18 percent survival for Dworshak-reared STT the previous two brood years.

System 1

This 25 pond system was made up of three ponds of steelhead returned from Kooskia in August 1990 at 58.1 FPP and of 22 ponds of fish brought back from Hagerman. Of the ponds of STT returned from Hagerman two came back on July 10 at about 75 FPP, while the other 20 ponds contained fish returned in August at 30 to 50 FPP.

Not a single pond from System 1 was ever confirmed with IHNV. This stands in stark contrast to Kooskia and Hagerman fish placed directly into System 3, nine out of ten of which were confirmed positive for the virus. System 1 fish were not without their problems, however, as 13 of the 25 ponds received one formalin bath treatment for external parasites, especially Trichodina spp. In addition, the Dworshak FHC reported that, as in past years, the fish in this system exhibited symptoms of chemical imbalance due to their raw water (untreated) supply. These symptoms included internal hemorrhaging, loss of body fat, pink body fat, and water retention. Despite such problems, these fish performed fairly well, with low overall losses (Table 2).

Table 2. System 1 steelhead performance (1990-1991) - BY 1990.

Month	--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	90 778,331	18.8	0.83	0.14	53.5
November	90 775,016	12.2	0.53	0.08	49.1
December	90 774,376	9.53	0.25	0.24	42.9
January	91 775,514	8.51	0.16	0.28	38.9
February	91 802,023	7.95	0.05	0.30	37.1
March	91 799,509	7.77	0.18	0.23	38.3
April	91 797,580	7.22	0.33	0.25	40.7
Release	795,486	6.49	-	-	-

These fish did not quite make it to release target length of 200 mm, achieving only 193 mm. This was largely due to a 13-day water temperature drop from 53°F to 49°F instituted by the U. S. Corps of Engineers in September 1990 to attempt breaking a thermal block where the Snake River entered the Columbia River. Growth, fish health, and feed conversion in System 1 were quite good overall, with conversion averaging 1.43. Winter growth was abnormally low due to near record low water temperatures. A Length Deviation Index (LDI) of only 2.41 indicated very little variation in average pond length at release. The lower this index value, the less variation from pond to pond in average length.

Most STT in the system were ad-clipped and inventoried in October 1990. Two ponds were CWT marked and freeze branded in December, and two groups of fish were PIT tagged during February by IDFG marking crews. Inventory numbers of all ponds in System 1 showed a gain of 800 fish, or 0.1 percent over book values.

System 2

Eight different egg takes were represented in the fish comprising System 2 this year, although the majority of fish were from the last part of the run, Takes 9 through 13. This system was put on reuse November 20 as the smaller fish needed the warmer water for accelerated growth. Overall these fish performed quite well, with monthly growth increments generally half an inch or more (Table 3). This enabled the attainment of an average 198 mm fish by release time.

Table 3. System 2 steelhead performance (1990-1991) - BY 1990.

Month	--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	90 918,941	78.0	0.55	2.33	53.5
November	90 897,559	49.7	0.38	1.09	51.6
December	90 909,129	37.4	0.66	0.54	54.0
January	91 903,264	24.2	0.67	0.48	54.0
February	91 864,533	16.4	0.89	0.86	54.2
March	91 857,098	10.5	0.81	1.85	53.5
April	91 841,232	7.33	0.52	0.72	47.1
Release	829,944	6.06	-	-	-

Healthwise, these STT also did fairly well, all things considered. Twelve of the 25 ponds were either confirmed with IHN or showed definite signs of the disease by release time. Most confirmations occurred in late fall before the system went onto reuse. The IHN loss pattern in affected ponds resembled that of other ponds stricken with the virus in outside ponds as opposed to nursery tank infections. These pond afflictions are generally chronic three- to six-week affairs, with total pond losses seldom exceeding 10 percent. Two ponds were confirmed with the virus fairly late in April 1991. Despite these losses, other health problems were few, and no treatments had to be made for bacterial gill disease or external parasites. March 1991 losses of 1.85 percent were mostly pinheads. Generally good health was also reflected in a cumulative feed conversion of only 1.23.

Most steelhead in System 2 were ad-clipped by IDFG marking crews during November 1990, with two ponds receiving CWT marks, freeze brands, and ad-clips in December. Final inventories were just 2.3 percent short of book values. Fish in two ponds were also PIT-tagged by state crews in February 1991. STT in BP 36 had dorsal fin measurements taken monthly as part of a fin erosion study conducted for the Fish Technology Center in Bozeman, Montana.

System 2 remained on heated reuse water through the 19th, after which date the reuse system was shut down. FHC stated that the fish in general looked very good and released smolts' health should be excellent. Slightly more than half

these fish were outplanted from April 18 through 23, with the remainder released directly into the main stem of the Clearwater River on May 1, 1991. The LDI at release was an excellent 3.21, indicating minimal variation in the average fish length measured from pond to pond.

System 3

Approximately half the fish in System 3 were early-reared at Dworshak, while one fourth came back from Kooskia and one fourth from Hagerman. Overall, these fish performed quite well with few health problems. Only two ponds received two-day formalin treatments for light Ichthyophthirius spp. infestations in October. The two previous brood years both required multiple treatments for external parasites in a number of ponds. IHN was eventually confirmed in 24 of the 34 ponds of fish in this system. Most confirmations occurred in September and October of 1990, before the system went on reuse. One confirmation was noted on 12/12/90 and another on 3/22/91. Most losses occurred during October when 2.71 percent of the population was lost. Few ponds had more than five percent total losses, however.

It is curious that all seven ponds of fish returned from Hagerman to System 3 were confirmed with the virus this brood year. One of these, BP 52, had returned at 75 FPP in July 1990, and had been partially split to two System 1 ponds, neither of which contracted IHN. Of the 28 ponds of STT returned to System 3 from Hagerman last year, Brood Year 1989, not a single pond broke with the disease. Of the eight System 3 ponds containing steelhead returned from Kooskia, five had initially been put directly into ozonated water in Dworshak's nursery. None of these fish broke with IHN. Two of the three remaining ponds of Kooskia fish which were placed into Burrows ponds immediately upon return did break with the virus.

As in years past, there is much more here than meets the eye. In a number of instances all ponds of a particular group get IHN, or all do not. Now that several cultural practices in the nursery rearing of steelhead have proven to lessen losses to the IHN virus, it might be appropriate to begin planning evaluations of pond rearing strategies. These could both aid in understanding the virus more fully as well as enabling adequate management around it.

As seen in Table 4 below, the fish in this system achieved relatively good growth increments their last seven months on station. Feed conversion averaged a very satisfactory 1.38. For whatever reason, most fish in this system went "off feed" in late March while they were still on heated reuse. While Dworshak FHC declared them to be in generally good health, it may have been that the total oxygen load on the reuse system prompted these STT to drastically cut back in feeding. Nothing definitive was ever determined to be the cause.

Table 4. System 3 steelhead performance (1990-1991) - BY 1990.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	90	1,065,611	38.7	0.58	2.71	53.5
November	90	1,053,531	26.3	0.47	1.05	49.1
December	90	1,043,547	19.8	0.51	0.56	50.2
January	91	1,038,097	15.0	0.59	0.16	51.4
February	91	1,042,210	11.5	0.70	0.12	52.3
March	91	1,040,895	8.36	0.66	0.23	52.1
April	91	1,038,508	6.39	0.34	1.00	42.2
Release		1,030,568	6.00	-	-	-

System 3 went on reuse November 29, 1990, without heat initially. Temperature was increased during December, with the STT subsequently maintaining good growth and fairly good health through spring of 1991. On April 9, 1991, the reuse system was shut down and raw, unheated water used thereafter.

Ad-clipping of System 3 steelhead began October 18, 1991, and was fairly well completed by 1 November. CWT marking for contribution studies, as well as accompanying ad-clipping and freeze branding, was completed on three ponds in December by IDFG personnel. State crews PIT tagged additional fish in February 1991 for water budget and for early-returning adult offspring evaluations. When fish marking was completed, inventories indicated an increase of 2 percent over book value.

Outplanting STT from the system began on 4/15/91, with just over half of the system's fish being shipped off-station at an average length of 192 mm. STT smolts released directly from the system on April 29 and May 1 averaged 205 mm (5.40 FPP). The LDI for all releases from System 3 was 4.93, demonstrating fairly low variation between average pond lengths.

Marking/Sampling

As related in the system accounts above, general ad-clipping of steelhead by IDFG marking crews occurred from early October through November 1990. The seven ponds earmarked for CWT marking for contribution studies were marked during December, when freeze brands were also applied. PIT tags were given in February to fish in the seven contribution ponds for contribution and adult return estimates. When all numbers had been tallied, over 2.7 million STT had been marked. Final inventory numbers ended up 1.6 percent above book values.

In addition to all the marking, several agencies took samples of fish over the rearing cycle for various studies. NMFS sampled fish for meristic and electrophoretic studies during February and March, while Washington State University took 40 steelhead for a genetics study in March.

Distribution

Releases of steelhead smolts began on April 15, 1991, with upriver outplants and continued through May 1, when direct releases into the main stem of the Clearwater River were completed. Just under 2.7 million STT smolts were released (Table 5), well above the mitigation requirement of 2.3 million smolts due to higher survival than anticipated through the nursery rearing stage.

Table 5. Distribution summary by type release - STT
Brood Year 1990 (April 15 - May 1, 1991).

System	No.	Wt.	No/Lb	-----Length-----	
				in	mm
Outplant (4/15-24/91):					
Sys 1	427,860	64,527	6.63	7.55	192
Sys 2	465,028	75,134	6.19	7.73	196
Sys 3	570,607	86,751	6.58	7.57	192
Subttl	1,463,495	226,412	6.46	7.62	194
Direct (4/29/91,5/1/91):					
Sys 1	367,626	58,026	6.34	7.67	195
Sys 2	364,916	61,725	5.91	7.85	199
Sys 3	459,961	85,110	5.40	8.09	205
Subttl	1,192,503	204,861	5.82	7.89	200
Grand Ttl	2,655,998	431,273	6.16	7.74	197

source: FRST91RY.wk1-910522

Outplants of STT smolts were made by Corps of Engineers trucks and drivers. More than 6,000 miles were driven in 49 trips with four tankers hauling daily from April 15 to 25. A summary of sites planted is provided in Table 6 below.

Table 6. Release summary by water and site - Steelhead BY 1990
(April 15 - May 1, 1991).

WATER	AT (Site)	No.	Wt.	---Length---		
				No/Lb	in mm	
<u>OUTPLANTS (4/15-24/91):</u>						
S.F. CLEARWTR. R. MILL CR. BDG		290,421	45,340	6.41	7.64	194
CLEAR CR.		369,190	57,038	6.47	7.62	194
ELDORADO CR.		201,847	32,139	6.28	7.69	195
S.F. CLEARWTR. R. MT. IDAHO BDG		177,336	28,773	6.16	7.74	197
RED R.		213,827	31,760	6.73	7.52	191
AMERICAN R.		210,874	31,362	6.72	7.52	191
	Subtotal/Avg.	1,463,495	226,412	6.46	7.62	194
<u>DIRECT (4/29/91, 5/1/91)</u>						
M.S. CLEARWTR. R.		1,192,503	204,861	5.82	7.89	200
	Grand Total	2,655,998	431,273	6.16	7.74	197

source: frst91ry.wk1-910522

Release of the 2.66 million Brood Year 1990 STT smolts culminated an extraordinarily successful steelhead rearing program. IHN losses were less than 15 percent, a nine year low, and even System 2 steelhead - comprised of late takes - were able to achieve an overall average release length of 198 mm (Table 7).

Table 7. Distribution summary by system - STT
Brood Year 1990 (April 15 - May 1, 1991).

System	No.	Wt.	No/Lb	-----Length-----	
				in	mm
Sys 1	795,486	122,553	6.49	7.61	193
Sys 2	829,944	136,859	6.06	7.78	198
Sys 3	1,030,568	171,861	6.00	7.81	198
	-----	-----			
Grand Ttl	2,655,998	431,273	6.16	7.74	197

source: FRST91RY.wk1 - 910522

- Brood Year 1991 -

A thorough summary of Brood Year 1991's spawning season is referred to in "Spawning Report - Steelhead Trout, Brood Year 1991," dated September 27, 1991.

Summary of Run

The collection of adult steelhead at Dworshak NFH for Brood Year 1991 included a portion of the very early as well as the normal run spectrum. Initial opening of the ladder was from October 23 through November 28, 1990, in which time 444 early-returning STT entered the trap. The ladder reopened on February 6 and ran until May 6, 1991, at which time it was closed for the season.

During the collection period 7,870 adult STT returned to Dworshak, more than enough to allow sufficient eggs to be taken for the various programs involved. 31.5 percent of the adults were males and 68.5 percent were females, values approximating historical averages (Table 8). The run was fairly well dominated by II-ocean fish, which constituted 93.2 percent of all returning adults.

Table 8. Age and sex structure summary - STT adults Brood Year 1991.

	---Males---		---Females---		----Totals----	
	No.	(%)	No.	(%)	No.	(%)
I-ocean	185	(0.2)	33	(0.8)	218	(2.8)
II-ocean	2,102	(0.1)	5,231	(0.9)	7,333	(93.2)
III-ocean	192	(0.1)	122	(0.9)	314	(4.0)
	-----		-----		-----	
	2,482	(31.5)	5,388	(68.5)	7,865	(100.0)*

* Total in run = 7,870 (5 were unmeasured throwbacks).

source: IFRO Final Dw STT Weekly Review - 910510

Early-returning adult STT were treated with a one-hour malachite treatment (one mg/l) three times each week from January 9 until February 18. Pre-spawning mortality totaled 83 fish out of 444, or 18.7 percent of the fish on hand the first day of spawning.

Spawning Summary

Over 11 million green eggs were taken in 14 egg takes from 1,549 females and 1,034 males (Table 9). This total was more than enough to not only cover mitigation needs, but also to ship eggs to other federal and state hatcheries. Fecundity this brood year averaged 7,115 eggs per female and eye-up was 80.3 percent, which produced 7.04 million eyed eggs. The overall male to female spawning ratio was 1.0:1.5.

Table 9. Spawning summary - Steelhead Brood Year 1991.

Take Date	NO. spawned Fmls. Mls.	Green Eggs	Eyed Eggs	Eye- Up(%)	Eggs/ Female	Eggs Culled	%Adult IHNpos
Ttl/Avg	1549 1034	11,000,296	7,043,000	80.3	7,115	2,424,421	16.9

Note: Culled green eggs not included in eye-up determinations.

source: EGUP91ST.wk1 - 910530

Spawning Procedures

Spawning operations took place every Tuesday from January 22 through April 30. Procedures were basically the same as in previous years. Adults were moved from holding ponds into the crowding channel, then crowded into the channel basket and dumped into one of two anesthetic bins. Anesthetic was a buffered 200 to 300 mg/l CO₂ solution. Anesthetized adult fish were then lifted to the sorting table to be checked for ripeness.

Ripe adults were sent to the spawning table, with the females killed by the pneumatic knife at the sorting table. Green and excess ripe adults were returned to holding ponds. Sperm from usable males was placed in a cooler until needed, and the fish were sampled for disease. Eggs from one or two females were fertilized with the sperm from one or two males, and then placed in Heath incubator trays. The eggs were water hardened and iodophored for 30 minutes in 75 ppm iodine. Aseptic procedures were employed throughout spawning operations. After eye-up, the eggs were shocked, passed through an electronic egg picker, and then counted. Most eyed eggs were placed into hatching jars over nursery tanks for hatching, although some were put back into incubator trays.

Dworshak FHC sampled all spawned adults for IHN, using male spleens and female ovarian fluid (Table 10). While the overall IHN positive incidence in adults fish sampled this year was 16.9 percent, 37.5 percent of the early returning adults were positive and 33.3 percent of those sampled from the last three takes. This pattern parallels IHN incidence in previous brood years.

Table 10. IHN Incidence in Sampled STT Adults - Brood Year 1991.

	No. Sampled*		-----IHN Positive Fish-----				Totals	
	Females	Males	No.	%	No.	%	No.	%
TOTALS	1541	1074	236	15.3	207	19.3	443	16.9

* Note that usually more fish were sampled than were spawned.

source: Viral Sampling Results - Dworshak FHC

IHNV incidence in early-returning adults on a yearly basis is presented in Table 11 below. Brood Year 1991 early returns had a 37.5 percent incidence level, significantly above 1990's levels and somewhat above those of 1989. At present, there are few clues to provide insights into the varying IHNV levels in these early returnees.

Table 11. Comparison of IHNV incidence in STT adults returning early (Oct.-Dec.) to Dworshak trap.

	-Brood Year 1989-		-Brood Year 1990-		-Brood Year 1991-				
	Male	Female	Ttl.	Male	Female	Total			
% Positive	7.9	38.0	28.0	10.1	5.6	7.4	21.6	51.4	37.5

Egg Disposition

About half the 7.0 million eyed eggs produced this year were retained at Dworshak NFH this season for its own production program (Table 12). Kooskia and Hagerman NFHs each received over 700,000 eyed eggs to early-rear for later return to Dworshak. This strategy has reduced the risk of losing too many STT to IHNV at Dworshak. Hagerman NFH and Magic Valley SFH also received eyed eggs, as part of LSRCP, for the B-run being established in the East Fork of the Salmon River.

Table 12. Eyed egg disposition - STT Brood Year 1991.

TK Date	Eyed Eggs	-----Eyed Egg Disposition-----				Eggs Destroyed
		Dw	Kk	Hg	MV	
Totals	7,043,000	3,285,415	769,000	1,549,750	1,239,000	2,424,421

10K eggs were also sent to the Tunison Nutrition Lab at Hagerman.

source: EGUP91ST.wk1 - 910530

Only eggs from negative IHN parentage were shipped outside the Clearwater River drainage. Kooskia also received only negative parentage eggs. Dworshak retained eggs from 13 of the 14 egg takes, with Take 11 being shipped entirely off-station.

Adult Disposition

Carcasses of adults from spawning and health sampling were processed, then donated to Idaho Department of Education for distribution to food banks and public institutions. Family Meats of Pierce, Idaho, once again had the contract to process the adults for the State's use.

When it became apparent that sufficient adults were returning to the hatchery to meet egg commitments, the hatchery began outplanting surplus adults. Dworshak NFH outplanted more adults this brood year than it has since 1987.

Table 13. Excess adult STT outplant summary - BY 1991.

Date	Water Body	Site	--No. Outplanted--		
			Males	Females	Ttl.
3/06/91	LOWER CLEARWATER R.	N. LEWISTON RAMP	134	406	540
3/07/91	LOWER SNAKE R.	HELLS GATE RAMP	47	202	249
3/20/91	MAIN S. CLEARWTR. R.	AHSAHKA RAMP	161	364	525
3/20/91	MAIN S. CLEARWTR. R.	PECK RAMP	152	365	517
4/15/91	CROOKED R.		58	120	178
4/17/91	CROOKED R.		103	189	292
4/18/91	CROOKED R.		85	195	280
5/06/91	MAIN S. CLEARWTR. R.	AHSAHKA RAMP	14	58	72
Totals			768	1,911	2,653*

* Does not include 26 adults which died during transport.

The STT put back into the Clearwater River for sport fishing enhancement all had their caudal fins clipped to enable recognition should they return to the hatchery a second time. Of these fish, 63.4 percent came back to Dworshak's trap.

Production Methods

Almost 3.29 million eyed eggs were retained at Dworshak for early rearing. All eggs were disinfected for 10 minutes in 75 ppm iodophor at eye-up. Most were put into hatching jars over nursery tanks for hatching at 30,000 eggs per jar. Take 10 eggs, however, had to be put back into incubator trays for hatching because Brood Year 1990 spring chinook salmon were still in nursery tanks at the time.

As far as tanking strategy was concerned, proven approaches were used for the most part. These were, however, modified by the insights and possibilities gleaned from everyday observation and deliberate experimentation.

The use of heated, ozonated water was maximized by loading B-bank tanks with a total of 1.36 million fry (30-60,000 fry per tank). Normal loads of 30,000 fry would have provided a virus-free water supply for under one million STT. The intention was to grow these fish to 500 FPP, and then split any high density populations. Tanks with 50-60,000 fish densities suffered chronic losses to cold water disease (CWD). Extended treatments with terramycin were given with questionable results. At present, analysis of mortality data shows no clear advantage or disadvantage to these increased initial densities. There is a general consensus, however, that loads over 50,000 fish per tank should be avoided.

Most other STT fry were initially placed into concrete tanks in raw, heated water. Some of these were at normal densities (30,000) while others were at double densities (60,000). Again, the point was to maximize the use of known and suspected good cultural conditions. Twelve fiberglass tanks receiving raw, heated water were also initially loaded with 30-60,000 fry each for iodine, ultraviolet disinfection, and tank material investigations (see the Special Studies section which follows). Another twelve concrete tanks in C- and D-banks on raw, unheated water received 30-60,000 fish each, even though fiberglass tanks with raw, heated water supplies were available. Fiberglass tanks were generally avoided in raw water because of higher losses observed in years past.

Tanks were disinfected and refilled with STT from raw water supplies as the early takes were moved from ozonated to outside raceways. Densities were dropped to 30,000 fish per tank as soon as space became available.

IHNV problems were somewhat limited in nursery rearing. Losses were generally high in those few tanks that came down with the virus. The severity might be attributed to the muddy water that occurred regularly this summer as the new pipeline was being installed. Suspended silt may have been a vector for the virus. One curiosity, however, is the fact that only two of the twelve tanks of steelhead that were early reared in cold water (42°F) broke with IHNV in the nursery. Several tanks had to be treated for Costia spp. and Trichodina spp. infestations. Also, one of the tanks receiving ultraviolet disinfection came down with Enteric Redmouth Disease, subsequently treated with a seven-day treatment of Romet 30.

One problem became evident as fish were being ponded and inventoried. Inventories of Takes 5 through 9 averaged 22.7 percent short of book values, compared with only a 1.8 percent shortage of Takes 1 through 4 and a 11.2 percent shortage in Takes 10 through 14. These inventory shortages were actually continuations of a problem that began in spawning. Takes 5 through 9 eggs were water hardened and disinfected at the green egg stage in a solution of an iodophor known as Draw 476. This unbuffered iodophor was thought to have been an aquacultural product. A return to using Argentyne iodophor was made, when poor eye-up and other problems became evident. As shown in the Survival Summary presented below, eye-up for Brood Year 1991 dropped to 80.3 percent, largely as a result of using Draw 476 in five takes.

Table 14. Survival summary - Steelhead Trout at Dworshak NFH.

Brood Year	----Percent Surviving From Previous Stage---				Cumulative Survival
	EYEDeggs	TANKfry	PONDfing	RLSDsmlt	
1988	88.7	94.2	29.5	79.2	19.5
1989	86.7	97.9	21.9	92.3	17.2
1990	84.1	97.0	71.1	89.1	51.7
1991	80.3	87.5	55.9	0.0	na
Average	85.0	94.2	44.6	86.9	29.5

Note: Data are only for STT reared entirely at Dworshak NFH.

Source: SRVSUMST.wk1 - 911204

Eye-up was actually less than 80 percent. Scores of blank eggs did not turn white when shocked at eye-up, but were picked out of hatching jars later. Other eyed eggs' shells did not weaken and the fry were unable to emerge. These eventually died and were removed, leading to a sizable inventory shortage in the affected takes. Both Kooskia and Hagerman also noted a **significant increase** in blanks this year from these particular egg takes. A memo was sent the Regional Office addressing this situation on August 2, 1991.

In all, 1.49 million fingerlings were ponded from Dworshak's nursery, which represented a 55.9 percent survival from tanked fry and a 39.3 percent survival from green eggs. Kooskia returned 408,692 fingerlings to Dworshak in June 1991, while Hagerman sent back another 527,074 fish during August.

Losses to the IHN virus in Burrows ponds have been fairly light. No ponds in System 1 had broken by the fiscal year's end. It is curious that no pond in this system broke with the virus the last two brood years either. Three of eleven ponds in System 2 did break with the virus, although total losses were under two percent. Only three of 12 ponds in System 3 had broken by September 30. Burrows Pond 65 lost just over one-third of its population during August and September, a substantial loss for such large fish. The other two ponds took six to eight percent losses during September. Despite these losses, fish health has been generally good, with only a few parasite treatment necessary. Assuming five percent losses through release, spring of 1992 should see 2.3 million steelhead smolts released from Dworshak (Table 15).

Table 15. Inventory/projected release summary - STT BY 1991 (September 30, 1991).

System	Number	Weight(lb)	No/Lb	-Length- (in/mm)	==Projected to Release==		
					%Loss	Number	L (mm)
Sys 1	666,536	29,256	22.8	5.01/127	5.0	633,000	190
Sys 2	741,602	6,931	107	2.99/76	5.0	704,000	200
Sys 3	1,025,090	23,152	44.3	4.02/102	5.0	974,000	200
Ttl/Avg	2,433,228	59,339	41.0	4.11/105		2,311,000	197

It might be noted that the STT in System 1 are projected to be only 190 mm at release time. The hatchery experienced 38 days of 46°F water during August and September, a significant drop from historical averages of 53-54°F. While this slowed the growth of all STT by about 10 mm, only System 2 and 3 fish should be able to regain this growth using heated reuse water supplies during the winter months.

Special Studies

Tanking Strategy Evaluation

A steelhead tanking evaluation study was conducted using 600,000 IHN negative eggs from Take 10. The purposes of the study were to 1) compare losses to IHN of fish reared in concrete tanks with those of fish reared in fiberglass tanks, all of which would have a raw, heated water supply, and 2) compare losses to IHN of fish reared in concrete tanks and a raw, unheated water supply with losses of fish reared in concrete tanks and a raw, heated water supply.

At eye-up these eggs were thoroughly mixed, disinfected for 10 minutes in 75 ppm iodophor, then counted into 10,000 egg groups and placed back in incubator tray until hatching. On May 2, 1991, three days after 100 percent hatching occurred, these groups of 10,000 sac fry were randomly combined into 12 tanks. Four replicates each of the following three treatments resulted:

- 1) 60,000 fry per fiberglass tank with a heated, raw water supply.
- 2) 60,000 fry per concrete tank with a heated, raw water supply.
- 3) 30,000 fry per concrete tank with an unheated, raw water supply.

These fish were then allowed to button-up, begin feeding, and grow until August 14, at which time fish from several tanks were moved to outside ponds and the experiment was ended.

As the fry buttoned up one complication developed. Two of the four replicates of fish in concrete tanks supposedly on raw, heated (54°F) water inadvertently received raw, unheated (42°F) water for their first seven days in nursery tanks. Their retarded development prompted a temperature check, and they were immediately switched to a raw, heated water supply. This became of interest as the fish grew and as the virus became evident. As it turns out, IHNV was confirmed only in the six experimental tanks (four fiberglass, two concrete) in which the fish received only heated, raw water. IHNV confirmation never occurred in the four tanks on unheated, raw water or in the two tanks which received unheated water during button-up. Table 16 presents the experimental mortality data.

Table 16. Experimental mortality summary - Steelhead Brood Year 1991. (May 2 - August 14, 1991).

Treatment	Appx.No. Fish	IHNV		Loss (%)	Average Loss (%)
		Tank	Confirm		
Fiberglass	60,000	5	Yes	93.3	
Raw/Heat	60,000	6	Yes	90.7	
	60,000	7	Yes	89.5	91.9
	60,000	8	Yes	94.0	
Concrete	60,000	15	Yes	67.0	
Raw/Heat	60,000	16	Yes	77.3	72.2
Concrete					
Raw/Heat	60,000	31	No	14.0	
7DAYcold	60,000	32	No	57.5*	35.8
Concrete	30,000	78	No	8.8	
Raw/Cold	30,000	94	No	1.1	
	30,000	110	No	4.6	5.5
	30,000	126	No	7.6	

* Cold Water Disease.

In comparing the effect of tank material on mortality of steelhead in heated, raw water a significant difference can be noted in that fiberglass tanks average loss was 91.9 percent while concrete tanks loss was only 72.2 percent. This difference corroborates data from a 1990 experiment as well as fish cultural observations, both indicating greater losses in fiberglass tanks. These severe losses in all six tanks stands in marked contrast to a BY 1990 study in which only fish from eggs which had not been disinfected and which were reared in fiberglass tanks experienced such high mortality. Again, the heavy silt loads due to pipeline construction may have been responsible.

The 57.5 percent lost in Tank 32, one of the two tanks which received 7 days of cold water at buttoning up, was largely due to an outbreak of CWD. This caused chronic losses despite extended treatment with terramycin. In spite of higher densities and the CWD episode, overall losses in these two tanks (31 and 32) were just 35.8 percent.

The four tanks at lower densities and in cold, raw water performed the best of all. No IHNV incidence and only a 5.5 percent overall average loss, significantly lower than the 72.2 percent loss of their counterparts in raw heated water.

The conspicuous absence of IHNV in the six experimental tanks of fish which buttoned up on cold water and the conspicuous presence of the virus in those which buttoned up on warm surely provides an insight into the dynamics of the disease. In some severe cases, it may be that the virus infects the steelhead at the sac fry stage before the fish's immune system is fully developed. If the buttoning up period takes place in warm 54°F water perhaps the virus is able to outpace the immune system and so cause massive losses. If buttoning

up takes place in cold 42°F water, the immune system is able to outpace the virus and so not only prevent massive losses, but even prevent the disease at times.

It might be mentioned that three additional groups of these same fish were reared in concrete tanks on heated, raw water. Two of these tanks also inadvertently received seven days of cold water while buttoning up before being switched to heated water. These two never broke with IHN. The other tank had a warm water buttoning up period and, sure enough, came down with IHNV!

Iodine and Ultraviolet Light Studies

Another investigation attempted to determine what benefits a low level iodinated water supply would have in steelhead rearing. Four tanks of STT fry were reared in fiberglass tanks receiving heated water which had a 0.15 mg/l iodine concentration. After six weeks of rearing, these fish never did contract IHNV, but their growth was abnormally low and they eventually began dying. This study was ended at that time, with no further intent to investigate iodine's use in the water supply.

A study was also set up to examine what effects ultraviolet light disinfection would have on steelhead fry losses to the IHN virus. Two replicates of Take 14 fry received irradiated water, while two replicates receiving untreated heated, raw water served as controls. Heavy silt loads evidently interfered with the equipment's effectiveness, because both irradiated water supply tanks broke with IHNV, while the two controls did not.

Rainbow Trout Production

This year, as in recent years, Hagerman NFH was contracted to produce and supply 200,000 RBT. Due to the discovery of IHN virus in their trout production, no fish were returned as planned. The Dworshak hatchery, however, reimbursed Hagerman \$11,872.90 in costs to rear and distribute these fish elsewhere.

Beginning with next year's program, the Kooskia NFH will supply rainbow trout sub-catchables to Dworshak Reservoir. Plans are underway for Ennis NFH to supply the eggs with Kooskia making their first rainbow release in June 1992. Costs for this program will continue to be funded from Dworshak.

Spring Chinook Salmon Production
- Brood Year 1989 -

This brood year entered Fiscal Year 1991 with 1.48 million fish weighing 36,535 pounds. These fish, averaging 40.6 FPP, were slightly smaller than targeted because of a 16-day water temperature drop from 54°F to 48°F the previous month. Fish performed fairly well for the remaining production cycle, achieving an overall 1.81 conversion by release time. Only one raceway received treatment for external parasites (*Costia* spp.), indicating generally good rearing conditions. However, the historical pattern of rising BKD losses shortly before release repeated itself. No epidemic, but many raceways exhibited kidney disease symptoms. This, together with erythrocytic inclusion body syndrome (EIBS) being eventually confirmed in 40 of the 42 raceways, resulted in monthly mortalities rising to just under one percent at the production cycle's end (Table 17). This compares with 0.1 to 0.3 percent mortalities the last half year for Brood Year 1988.

Table 17. 1990-91 Spring Chinook Salmon Performance -
 Brood Year 1989.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	90	1,483,314	40.6	0.36	0.3	53.5
November	90	1,470,567	31.9	0.30	0.3	49.1
December	90	1,476,776	26.6	0.16	0.4	42.9
January	91	1,461,240	24.2	0.07	0.6	39.0
February	91	1,452,193	23.2	0.04	0.6	37.1
March	91	1,443,342	22.7	0.15	0.9	38.3
Release		1,427,344	20.8	-	-	-

Marking and Sampling

As in past years, many SCS received marks or were sampled for various studies. The following table presents a basic summary of marked groups from this brood year.

Table 18. Marked group summary - SCS Brood Year 1989.

	CWT	PIT	Freeze-brand
Density/Low	9 X 15,000*	3 X 500	-
Density/Medium	6 X 30,000	3 X 500	-
Density/High	3 X 45,000	3 X 500	-
Pascho-Elliott/High	83,000 (3)	3 X 1,500	-
Pascho-Elliott/Low	118,000 (3)	3 X 750	-
Water budget	-	-	2 X 20,000

* Number of groups times number of fish per group (estimate of number marked, not of number released).

source: MRKSUM91.wk1 - 910327

IDFG marking crews began CWT marking fish in November 1990, finishing the job in January 1991. PIT tagging was also initiated during the November with assistance from the Vancouver FRO office. Revised inventory numbers associated with marking showed an overall gain of 5,899 chinook, or 0.8 percent over book values.

Beginning in September of 1990, NMFS took monthly samples of salmon for smolt quality assessment. In other sampling, the Nez Perce Tribe PIT tagged and Panjet dye-marked 4,000 fish and used another 4,000 as a control group for a spawning, incubation, and rearing assessment study. The University of Idaho was given 2,335 chinook in October 1990 and 1,818 in December 1990 for erythromycin studies. The Seattle lab of the NFRC also sampled 324 salmon for an asymmetry study. NFRCS-Marrowstone Field Station sampled several raceways for an evaluation of hatchery rearing practices and smolt quality as related to growth and mortality in seawater.

Distribution

The release of Brood Year 1989 SCS took place from March 25 through April 4, 1991. As shown in Table 19, over 300,000 chinook smolts were outplanted and almost 1.1 million were directly released into the North Fork of the Clearwater River giving a total of over 1.4 million smolts. The health of the fish at release was generally good, although, as mentioned above, BKD symptoms increased towards release time. Ponds which experienced EIBS in early winter seemed to have recovered by late March, judging by generally rising hematocrit levels. Fish afflicted later with EIBS still had depressed hematocrit levels at release, and were more affected by the stress of outplanting.

Table 19. Release summary - SCS BY 1989 (March 25 to April 4, 1991).

	Number	Wt. (Lbs.)	FPP	L (in.)
<u>Outplant (3/25-27/91):</u>				
Eldorado Creek	199,456	9,302	21.4	5.38
Papoose Creek	70,000	3,216	21.8	5.35
Red River	63,004	2,916	21.6	5.36
Subtotal/Avg.	332,460	15,434	21.5	5.37
<u>Direct (4/3,4/91):</u>				
N.F. Clwtr. R.	1,094,884	53,077	20.6	5.44
Grand Totals/Avgs.	1,427,344	68,511	20.8	5.43

source: PDNR9105 - 910605

The chinook were released at an average 20.8 FPP, with a LDI of only 2.49. This year's low LDI indicated relatively little variation in average lengths between ponds.

Special Studies

Two major studies completed their on-station phases with the release of chinook smolts in spring of 1991. The first involved over 500,000 chinook in a rearing density study. In this experiment, nine raceways of SCS were reared at 15,000 fish per raceway, six raceways at 30,000 fish per raceway, and three at 45,000 fish per raceway - the previous normal rearing density. Table 20 below gives some indication of on-station performance of these fish. Aside from a generally slight decrease in growth as density rose, there were no apparent differences between groups. Cumulative 10-month mortality in outside ponds was below one percent in all three groups. All fifteen density groups were fed two 21-day feedings of 4.5 percent erythromycin-supplemented feed. Further insights into the effects of rearing at different densities should be seen as these fish move out into the ocean and then back again. CWT marks, freeze brands, and PIT tags applied to these groups will provide this additional information.

Table 20. Special studies summary - SCS BY 1989, Release Year 1991.

Study	Number Released	Weight (Lbs.)	FPP	Length (in.)	Cumulative Morts (%)*
Density/Low	158,484	7,920	20.0	5.50	0.47
Density/Medium	207,584	9,752	21.3	5.39	0.26
Density/High	151,320	6,614	22.9	5.26	0.36
<u>BKD</u>					
Pascho-Elliott/High	82,342	4,508	18.3	5.67	21.0
Pascho-Elliott/Low	121,366	5,446	22.3	5.31	5.0

* Mortality in outside raceways only.

The other study completed was the second run of the Pascho/Elliott (BKD segregation) experiment in which three raceways of fish from high-BKD parentage and three from low-BKD parentage were tracked and reared through release. The primary objective of this study was to evaluate outmigration performance regarding barge transportation versus natural downstream migration. On-station performance of the two groups for the second year in a row showed greater losses and probably poorer released-fish quality in the high-BKD group. Table 20 indicates these fish had cumulative losses after ponding of 21.0 percent while the low-BKD fish experienced losses of 5.0 percent, very similar to the 18 and 4 percent respective results from the previous year's study. These fish were never fed erythromycin-treated feed. The high-BKD groups grew faster and more because ever-declining populations in these ponds inadvertently resulted in more food per fish.

In an effort to understand the pattern of increasing BKD symptoms and losses just prior to release, Dworshak FHC began a program of sampling 30 fish from five particular raceways every two weeks four times prior to release (120 fish sampled from each). Raceways were selected to represent various studies or possible groups of different SCS. Fish sampled were all checked for BKD levels using the ELISA technique. Individual fish BKD levels were then identified as negative (0.00-0.99 Optical Density Units or ODUs), low (0.10-0.19 ODUs), medium (0.20-0.449 ODUs), and high (>0.45 ODUs).

Table 21. Comparison of BKD incidence as determined by ELISA in five raceways of BY 1989 SCS (2/14/91 to 3/29/91).

RW	General Group	Percent		
		Negative	High-BKD	Total-BKD
B19	Pascho/Elliott (HiBKD)	34.2	25.0	65.8
A 8	Density Study (Low)	98.3	0.8	1.7
A13	Density Study (Medium)	95.8	0.0	4.2
B27	Density Study (High)	99.2	0.1	0.1
C 7	C-bank (no study)	90.8	5.0	9.2

30 fish per group sampled every 2 weeks.

source: Dworshak FHC - May 91 Monthly Activity Report

The groups selected for tracking were the high-BKD group from the Pascho/Elliott BKD segregation study, the three density rearing groups, and the C-bank of raceways (selected because of suspected sub-par cultural conditions). One representation of the data (Table 21) clearly shows the high incidence of the disease in fish derived from high-BKD parents. The 9.2 percent incidence in the one C-bank raceway sampled may give some indication of poorer cultural conditions in these lower raceways. None of these particular fish were from high-BKD parentage, as far as the records indicate. All three density study raceways show remarkable consistency in that total fish positive for BKD was less than five percent in each, and under one percent being highly positive. Density study fish were all from medium- and low-BKD parentage, and were all fed erythromycin twice. C-bank and BKD segregation study fish were not fed medication.

- SCS Brood Year 1990 -

Production

As the reporting period began, Brood Year 1990 SCS were eyeing-up in incubators with approximately 2.9 million eyed eggs on station. Most of these fry went on feed in November 1990. Contrary to previous years' experience, cases of chronic losses during early rearing were extremely uncommon. November and December losses totaled just 2.8 percent, almost half the previous brood year's five percent plus losses. It is believed that one major contributor to this significant survival improvement was the regular back-flushing of the incubator water supply sand filters. Egg and fry loss in incubator stacks was just 1.8 percent this year, compared with an average 6.9 percent loss the last three years. This excellent survival carried forward to ponding and first inventory, which showed a drop of only 4.4 percent in feeding fry to ponded fingerling numbers, compared with a previous 3-year average loss of 10.3 percent (Table 22).

Table 22. Survival Summary - Spring Chinook Salmon, Dworshak NFH.

Brood Year	---Percent Surviving from Previous Stage---				Cumulative Survival
	EYEDegg	TANKfry	PONDfing	RLSDsmlt	
1987	92.5	86.2	97.4	93.8	72.8
1988	96.0	93.9	76.5	93.0	64.1
1989	92.8	94.2	89.2	96.5	75.2
1990	94.2	98.2	95.6	0.0	0.0
1991	89.0	96.1	0.0	0.0	0.0
Average	92.9	93.7	89.7	94.4	70.7

Note: Data are only for SCS reared entirely at Dworshak NFH.

Source: SRVSUMSC.wk1 - 911206

In general, this indicates good rearing conditions. This is somewhat confirmed by only three formalin treatments having to be given to fish in Dworshak's nursery for Costia spp. This despite an expanded program to provide 700,000 SCS fingerlings for satellite rearing in spring of 1991, plus the need to accommodate a density study that began at tanking. The reduced loadings in 25 density study tanks together with the greater numbers of fry being reared resulted in most tanks being loaded at 32-40,000 fish per tank in contrast to the 20-25,000 per tank loadings generally used.

Developing a strategy for moving this brood year to outside raceways was especially difficult because of 1) a delay in ponding fish due to tailscreen being modified to eliminate the need to silicone seal them, 2) initial lack of clarity regarding the early marking of fingerlings, and 3) the need to give the first erythromycin feeding early in May to end at least 10 days before the marking began. However, consultation with Idaho Fisheries Resource Office (IFRO) and with IDFG eventually resolved most problems.

Table 23. SCS Performance - Brood Year 1990.

Month	Year	---1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)	
November	90	Not on the books until month's end					
December	90	2,821,313	1125	0.15	2.0	42.9	
January	91	2,764,153	824	0.13	1.3	39.1	
February	91	2,720,576	661	0.13	0.6	37.1	
March	91	2,703,746	526	0.25	0.4	38.4	
April	91	2,686,818	358	0.33	0.2	40.8	
May	91	2,678,506	241	0.39	0.5	44.6	
June	91	2,694,203	159	0.46	0.2	44.6	
July	91	1,999,283	99.4	0.45	0.1	52.6	
August	91	1,808,532	67.3	0.42	0.1	49.6	
September	91	1,806,305	48.6	0.31	0.5	49.6	

This brood year was slightly behind schedule for most of its rearing cycle for two reasons. Extremely cold water temperatures were experienced in early rearing, averaging 37.1°F in March, for example, resulting in monthly growth increments under 0.20 inches (Table 23). Also, a 38-day period of cold water drafted from Dworshak Reservoir for water temperature modeling studies and for other purposes caused fall growth to be less than normal. Some growth retardation can be a good thing for the SCS program because the 17-month program generally calls for sub-optimal growth so the fish do not get too big. Health problems have plagued chinook at Dworshak when they got much bigger than 18 FPP. Despite growth setbacks, however, these fish should be put back on track shortly by increased feeding. These chinook began a second 21-day erythromycin feeding in late September.

Marking

Idaho Fish and Game marking crews arrived on station in early June and marked SCS in this manner: 1) left-vent fin clipped the SCS programmed for satellite facilities, 2) CWT marked (and ad-clipped) approximately 65,000 fish going to the Powell facility, and 3) CWT/ad-clipped all eighteen raceways of SCS involved in the density study.

Further markings are expected to be made in late 1991 for contribution and fish passage studies.

Distribution

In June 1991 714,567 chinook fingerlings weighing 5,064 pounds were sent to Red River and to Powell Rearing facilities (Table 24). These fish had all been vent-clipped or CWT marked, an effort to begin distinguishing hatchery reared chinook from naturally reared fish.

Table 24. Fingerling transfer/release summary - SCS BY 1990.

Site	Dates	Number	Wt. (Lbs.)	FPP	L (in)
Powell (LSRCP)	6/12	359,402	2,429	148.0	2.68
Red River (LSRCP)	6/19,20	355,165	2,635	135.0	2.77
Newsome Creek	7/16,17	165,588	1,952	84.8	3.23
Crooked River (LSRCP)	9/16,17	120,021	2,261	53.1	3.78
Kooskia NFH	10/16,17	100,000	2,310	43.3	4.04
Totals		1,100,176	11,587		

After first inventory at ponding it was determined that over 400,000 chinook were surplus to Dworshak's normal program needs. After consultation with other agencies, it was decided to keep 130,000 additional SCS through release in spring of 1992, to outplant 165,000 in July, and to hold the remainder until fall. Newsome Creek received surplus fish in July and the remaining 120,000 fingerlings were shipped to Crooked River Rearing Facility in September to replace salmon that had been lost there earlier. Another 100,000 SCS were shipped to Kooskia in October.

Special Studies

The major study undertaken with 500,000 fish from this brood year is a repeat of the density study, with three different rearing densities from first tanking through release. Nursery rearing performance was quite similar for the three groups overall, although cumulative mortality rose slightly for the medium- and high-density lots. Growth and health of these fish in raceways was also similar at first, but by the end of September two of the three high-density groups and one of the six medium-density groups had been confirmed with BKD. Cumulative mortalities for raceway rearing at fiscal year's end stood at 0.39, 0.83, and 3.40 percent for the low-, medium-, and high-density groups, respectively. There are presently nine raceways of low densities (15,000 per raceway), six at medium (30,000 per raceway), and three at high (45,000 per raceway).

Another evaluation was being made of offspring of high-BKD males and medium- and low-BKD females. The literature and first-hand observations indicated vertical transmission of the disease primarily through the female gamete. To evaluate this probability 120,000 fish from the aforementioned matings were retained in the production program. Observations to date seem to confirm the fact that these fish perform as well as other production salmon, with cumulative raceway mortality in the high-BKD male offspring being only 0.26 percent versus 0.45 percent losses in production fish controls, not a significant difference.

It was also decided to reduce C-bank raceway loadings from the historical 40-42,000 fish to 30,000 fish. This was done to address the observation that fish health problems were more prevalent in this group of rearing units. The extra 120,000 chinook were placed in Burrows ponds in System 1, together with

an additional 120,000 SCS being reared through smolting for this production program. Because of previous problems with rearing chinook in Burrows ponds, special attention is being given these fish and comparison will be made between the on-station performance of these fish and that of some of their siblings being reared in raceways. By the end of September there were no discernable differences in either growth or in general fish health.

As mentioned earlier, there have been health problems associated with growing SCS smolts at Dworshak much larger than 18 FPP. To reevaluate this it was proposed to grow six raceways of chinook in C-bank to 12 FPP and the other six raceways to 18 FPP. Because of cold water, however, no difference in size had been achieved by the end of September. With winter approaching, it appears unlikely that much size difference will be attained by release time.

Another study was begun comparing early rearing losses of fry which had been incubated in chilled water with that of fry receiving ambient temperature water. Initial analysis of losses shows no clear differences between the two groups.

One last study that merits mention was an experiment conducted in cooperation with University of Idaho researchers attempting to identify fish using genetic markers. This Muscle Allele Study, as it was referred to, required the initial tracking of approximately fifty individual chinook spawns, isolating the eggs during incubation, and the further rearing of 16 individual spawns in nursery tanks from November 1990 through January 1991. These tanks were eventually required for other programs, and the study was then terminated. U of I personnel sampled approximately 300 of these fish for genetic confirmation, and took another 1,800 to their own rearing facilities at that time.

- SCS Brood Year 1991 -

Summary of Run

Dworshak ladder was open to collect returning adult spring chinook salmon from May 23 until September 12, 1991, while Kooskia kept its trap functional from May 2 through mid-August.

The proposed combined target for the Dworshak-Kooskia Complex was initially 2,800 adults, or 1,250 females and 4.7 million green eggs. Although IFRO forecast a reduced return of 1,500 adults, even this prediction seemed optimistic as the fish appeared at collection sites. When the last SCS adult had been counted, the final number of 632 returning fish proved to be the lowest since 1986 (Table 25). Three-fourths of these came back to Kooskia, which ended up with slightly under half its previous year's return of 1,141 fish. Dworshak, on the other hand, received only one-twelfth its previous year's return number. As shown in the table, most were III-ocean fish simply because of the poor showing in the II-ocean class. Lack of I-ocean returns does not bode well for next year's run.

Table 25. Age Structure Summary - SCS Adults Brood Year 1991.

	Kooskia NFH	Dworshak NFH	Totals
I-ocean	10	16	26 (4.1 %)
II-ocean	98	77	175 (27.7 %)
III-ocean	359	72	422 (66.8 %)
Unmeasured	9	0	9 (1.4 %)
	---	---	---
Totals	467 (73.9 %)	165 (26.1 %)	632

The male to female chinook ratio was not determinable when the fish first came across the sorting table because of lack of secondary sex characteristics development. However, during the weeks of spawning, male and female numbers became more apparent. Out of 632 fish, 304 (48.1 percent) were males and 328 (51.9 percent) were females, yielding a male to female ratio of 1:1.08.

Pre-spawning Summary

Returning brood stock were anesthetized with Tricaine Methanesulfonate (MS-222) buffered with sodium bicarbonate, sexed, measured, and inoculated with Erythromycin Phosphate (20 mg/kg body weight). Open wounds were swabbed with malachite green and fish placed into one of two holding ponds. The adults were treated three times weekly with a flow-through 1 mg/l malachite green treatment, with a last treatment given August 23. Treatment lasted for one hour with effluent neutralized with 6.1 mg/l sodium sulfite. Adult mortality was removed daily, with sex, size, jaw tag numbers, and fin clips recorded.

Pre-spawning mortality was 20.8 percent this year, a third of which was due to an accidental chlorine leakage on July 8. Total mortality was 23.7 percent, which compares with an 11 percent loss in 1990, 23 percent in 1989, and 12.5 percent in 1988.

Table 26. Spawning Mortalities - SCS Brood Year 1990.

Type	No.	Total No. Held	Total (%)
Pre-spawn	125	601	20.8
Total	150	632	23.7

Spawning Summary

Spawning operations began August 26 and ended on September 12, 1991. Six egg takes were completed, with a total of only 995,842 green eggs being collected (Table 27). 242 females were spawned along with 191 males, giving a male to female spawning ratio of 1.0:1.3.

Table 27. Spawning summary - Spring Chinook Salmon BY 1991.

	NO. spawned		Green	Eyed	Eye-	Eggs/	Eggs
	Fmls.	Mls.	Eggs	Eggs	Up(%)	Female	Culled
Totals	242	191	995,842	883,250	89.0	4,117	3,598

Note: Culled green eggs excluded from eye-up determination.

source: EGUP91SC.wk1 - 911028

Fecundity rose somewhat this year to 4,117, basically as a result of III-ocean fish predominating. The 883,000 eyed eggs produced reflected an eye-up of 89.0 percent. In late September and early October Dworshak also received eggs spawned from two females at Red River and from two at Powell that had eyed-up at Kooskia.

A comparison of this year's SCS spawning with that of the previous five years is presented below in Table 28. The sex ratio, fecundity, and eye-up resembled those of past years.

Table 28. Comparison of BY 1991 spawning with 5-year average. Spring Chinook Salmon.

Brood Year	Adult Returns*	Fmls. (%)	Green Eggs	Eggs /Fml.	Eye-up (%)	II-salt (%)
1986	799	50.6	1,241,176	3,760	73.0	63.1
1987	2,704	59.3	4,075,666	3,526	92.5	82.1
1988	2,567	52.6	4,890,970	4,615	96.0	36.3
1989	2,673	48.7	3,516,306	3,701	92.8	76.3
1990	3,183	54.9	4,833,104	3,623	94.2	88.4
5yr Average	2,385	53.2	3,711,444	3,845	89.7	69.2
1991	632	51.9	995,842	4,117	89.0	27.7

* Includes trap mortalities and strays from other hatcheries.

This year adults from Kooskia were kept separate from adults returning to Dworshak through Take 2. This was done to address concerns over the two groups representing different runs of chinook. Eggs from the two groups are being tracked independently so that it can be guaranteed that any fish transferred to Kooskia came from adults which returned to Kooskia.

Spawning Procedures

Spawning procedures were basically taken from 1990, and were accompanied by additional extensive health lab sampling for Infectious Hematopoietic Necrosis Virus (IHNV) and BKD.

On a given spawning day all adults were anesthetized with MS-222 (buffered with sodium bicarbonate with oxygen addition) and checked for ripeness. Males were sent directly to the spawning table while females were killed using a pneumatic knife and bled for 5-10 minutes in a spawning rack. Green females were sent back to the holding ponds along with unnecessary males. To facilitate record-keeping, spawned adults were identified with numbered, stainless steel pins for later culling and segregation due to disease status. Sperm was collected in styrofoam cups and kept on ice in a cooler until used. Females were cut and eggs collected in pre-iodinated colanders to drain ovarian fluid. Gametes from both males and females were then combined and mixed by hand.

One change to standard operating procedures was the multiple rinsing of sperm and debris from fertilized eggs before the eggs were put into incubator stacks. Other stations claim increased eye-up warrants the extra time involved. While no significant rise in this year's eye-up was observed, fungal problems were not as noticeable in developing eggs. Routinely going through each egg tray and removing dead and fungused eggs also helped reduce fungus. Crosses were made between one male and one female, with occasional exception when males were running low or when exceptional amounts of milt were obtained from a male. This resulted in a male to female spawning ratio of 1.0 to 1.3.

Aseptic procedures were used throughout the entire spawning period to prevent possible cross-contamination of IHNV positive parents or high-BKD parentage, or contamination of health lab sampling equipment. Males, however, were not iodophored this year because of concerns over extra iodophor dripping into the sperm. Iodophor solutions of 500 mg/l and 250 mg/l were used to disinfect equipment and workers' hands. Fertilized eggs were placed in individual Heath trays or individual colanders, and allowed to water harden for 30 minutes in iodophor (75 mg/l) buffered with sodium bicarbonate.

Adult Disease Sampling

With only 632 fish returning to the complex this year, it was possible to sample every fish spawned for BKD and IHNV. This was accomplished by sampling kidneys, spleens, and ovarian fluid. The ELISA technique for determining BKD levels in adults was used exclusively this year by the Seattle NFRC (they sampled 50 of the mated single pairs) and the Fish Health Center. Spleens from males and ovarian fluids from females were checked to determine IHNV status.

Eggs from females with gross BKD kidney lesions were placed in a separate incubator stack and are presumed high-BKD. In addition, ELISA based BKD levels were used to designate egg lots according to the following scheme:

		Male Parent		
		Low	Medium	High
Female Parent	Low	Low	Low	Medium
	Medium	Medium	Medium	Medium
	High	High	High	High

This simply assumes, as the literature and on-station observations indicate, that the BKD status of the female should carry more weight in the designation of the offspring than that of the male. BKD levels are separated using 0.000 to 0.199 optical density unit (ODU) sample readings as low-BKD parentage, 0.200 to 0.499 ODUs as medium-, and 0.500 and greater as high-. High-BKD parentage eggs were not culled this year as was generally done in the past because of the shortage of eggs. High-BKD offspring will be reared as isolated as possible from other fish lots, using separate cultural utensils, low densities (20 K/raceway), feeding erythromycin feed twice, as well as any other cultural device or method to minimize stress in this group as well as minimizing risks to other fish lots.

Subsampling for IPN, VEN, ERM, furunculosis, Myxobolus spp., and Ceratomyxa shasta was also carried out by the Dworshak FHC. IHNV results showed 3.64 percent of the adults IHNV positive. BKD sampling indicated 15 percent were positive, 3.9 percent high, 2.2 percent medium, and 8.9 percent low. Ceratomyxa shasta seemed to occur at higher than normal levels this year in SCS adult spawners.

Incubation

With the exception of 50 spawns individually incubated for a NFRC-Seattle experiment (which was later canceled) all eggs were incubated in Heath incubator trays. Dworshak incubation temperatures averaged between 52°F and 54°F. After eye-up the eggs were picked, counted, and put back in trays at 5,000 per tray. Strategy for this year was to tank the fry when 50 to 75 percent reached swim-up in the trays. Tanking may be delayed this year because of the construction of new pipelines from Dworshak Reservoir to both Dworshak and to the new Clearwater Hatchery.

Special Studies

No special studies were planned because of the limited number of chinook fry in this brood year.

Program Objectives

Disposition of the eyed eggs has yet to be determined. Program details that remain to be worked out should still result in egg, fry, or fingerling distribution similar to the following plan:

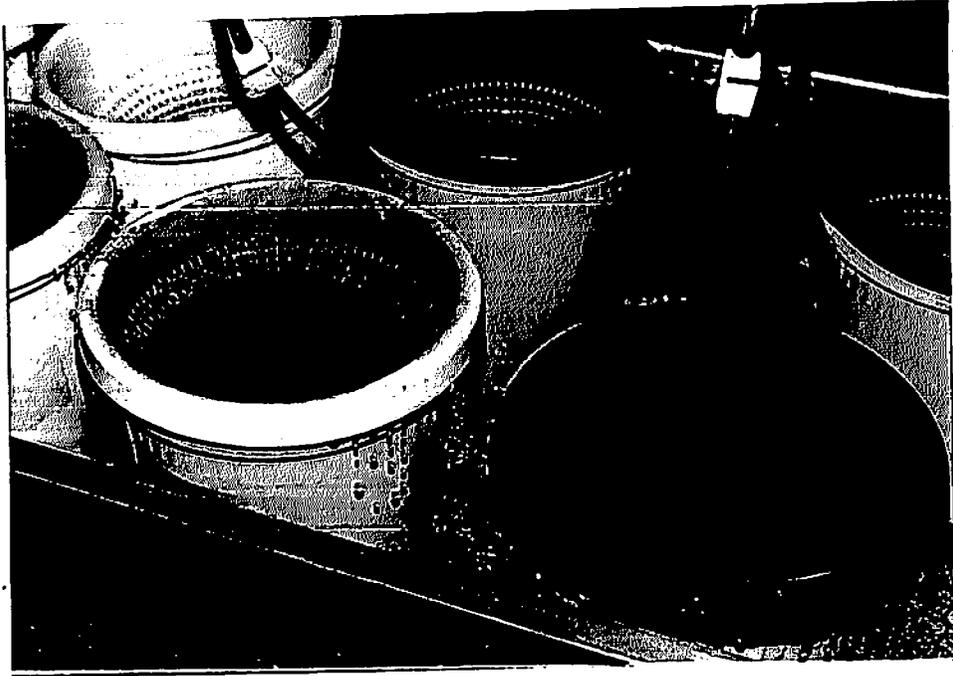
Table 29. Program proposal - Spring Chinook Salmon Brood Year 1991.

Location	Number at Rls/Tnfr	Type of Release/Transfer	FPP at Rsl/Tnfr	Date of Rls/Tnfr
Dworshak	300,000	Smolt	17/lb	Apr 93
(0.88M eyed)	150,000	Fingerling to KK	35/lb	Oct 92
	150,000	Fingerling to KK	20/lb	Feb 93
Kooskia				
(0.0 M eyed)	295,500	Smolt	18/lb	Apr 93
	=====	<u>Objectives based on appx. morts of:</u>		
		Eyed to ponding	= 14%	
Total Smolts	595,500	Ponding to release	= 6%	

FISH CULTURE PHOTOS



Fish Culturist John Vargas shocking and cleaning chinook eggs.



Chinook eggs in colander incubation showing "dirty" and "clean" or "before" and "after" comparisons from turbidity caused by inriver construction of new water supply line.



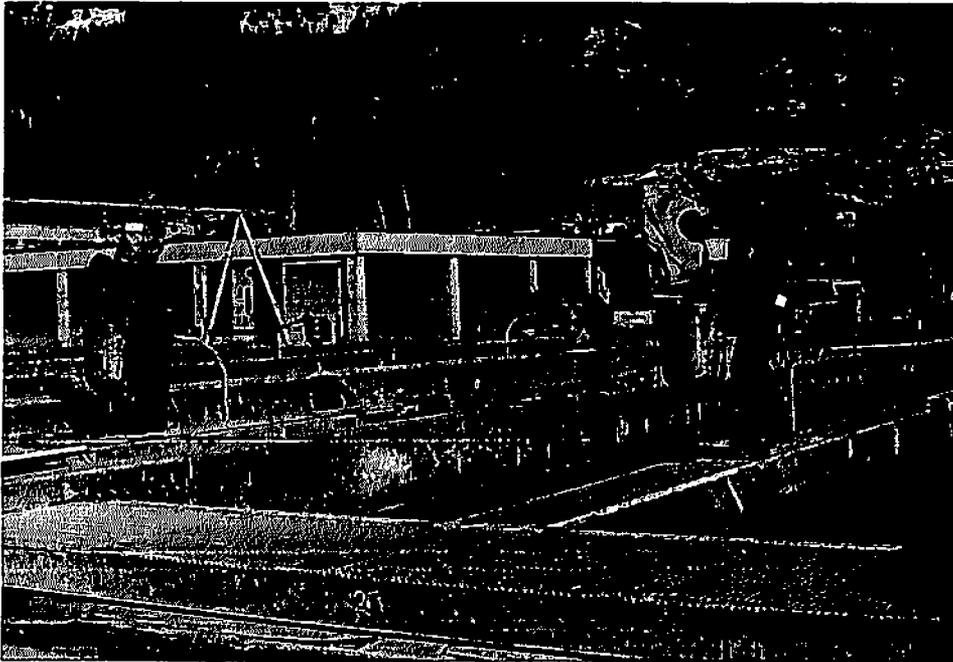
View of steelhead spawning work activities.



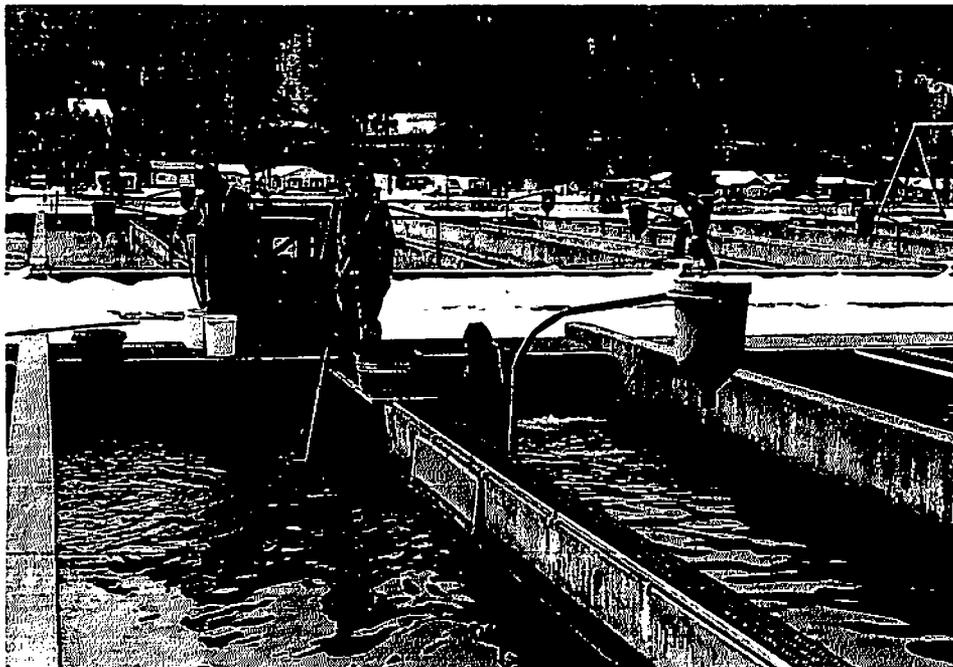
Nursery rearing area with 128 - 16'x3' tanks for starting young steelhead and spring chinook fry.



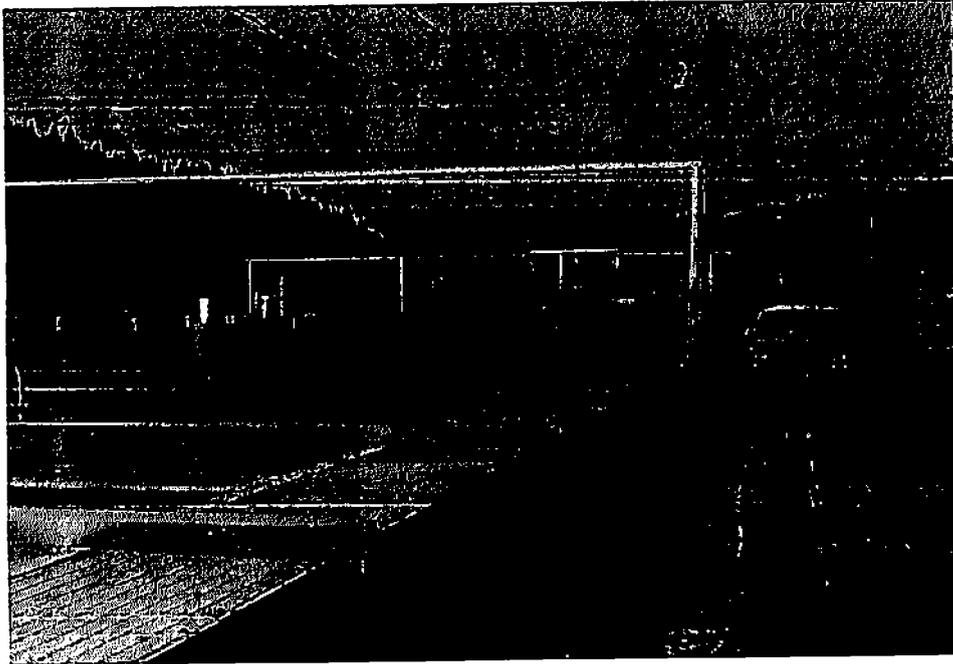
Hatchery workers unloading fish feed to demand feeders.



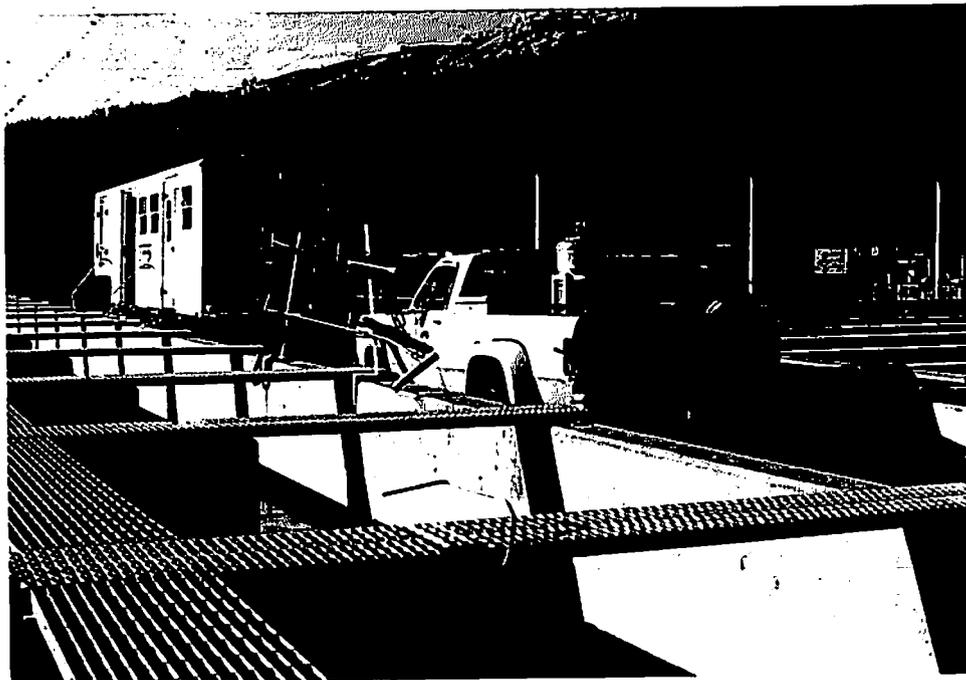
Workers filling feeders on a cold January day.



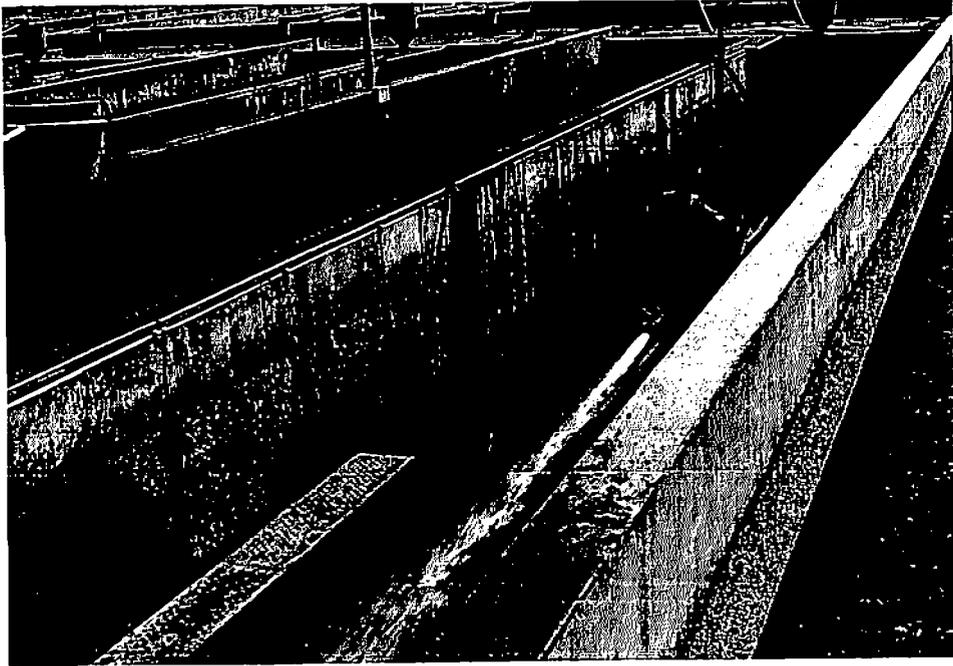
Preparing to monthly sample count steelhead production.



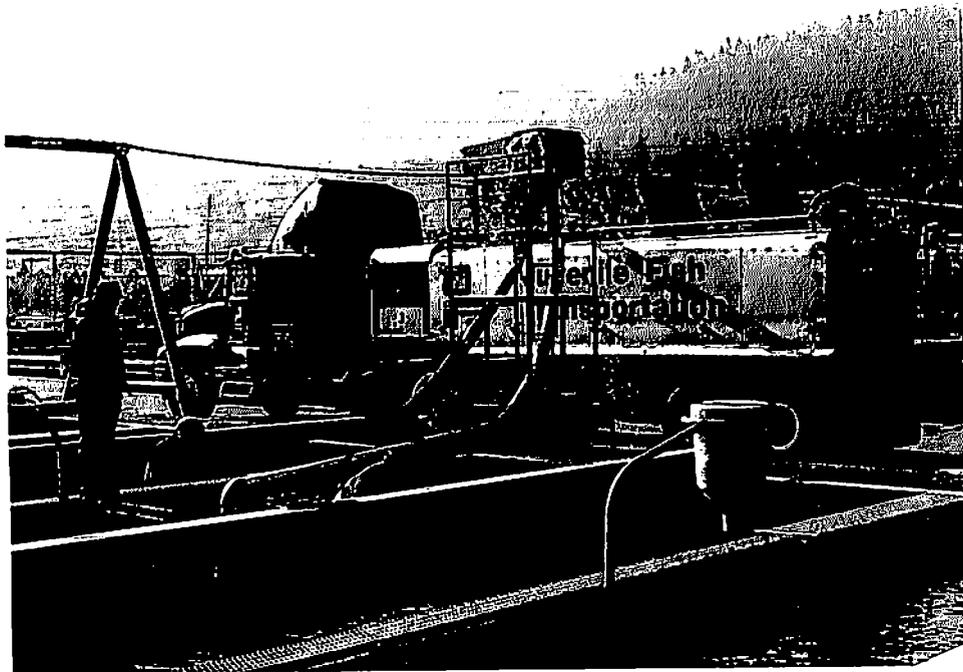
Warmer water temperature from the steelhead rearing ponds mixing with the cold winter air.



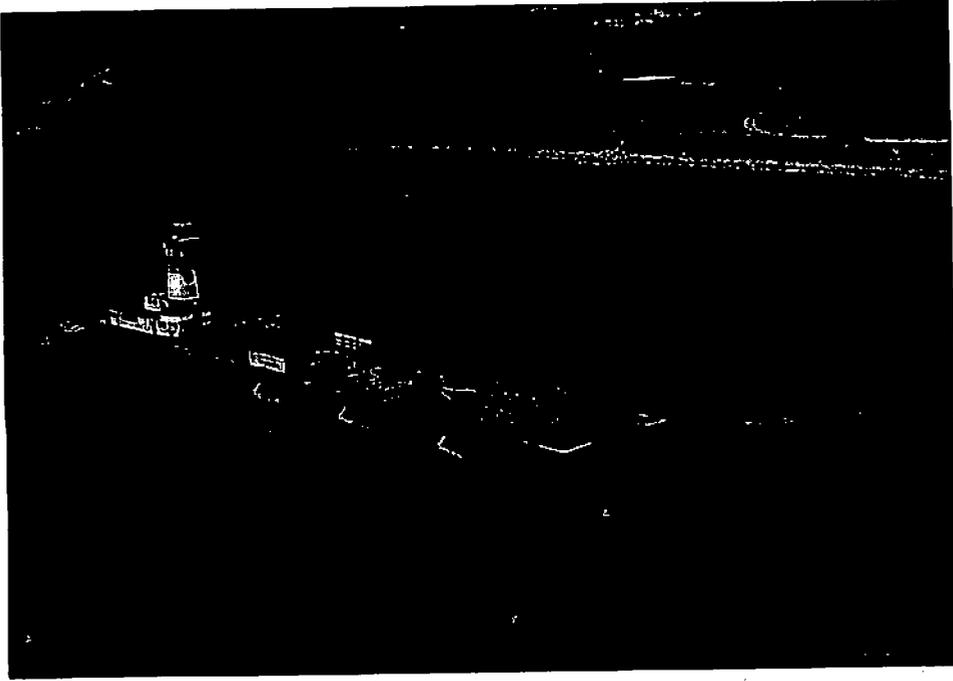
IDFG marking trailer adipose fin clipping 2.7 million steelhead - October/November 1990.



Cleaning steelhead ponds prior to moving new brood year population from nursery tanks.



Loading steelhead smolts for transfer to off-site release locations.



Barging steelhead and spring chinook smolts from Lower Granite Dam.

Division of Fish Hatcheries

HATCHERY PRODUCTION SUMMARY

Station:
 DWORSHAK NFH
 Period covered:
 10/1/90 through 9/30/91

HPDW9109.WK1
 08-Oct-91
 03:38 PM

Density Index: 0.11				Flow Index 0.59				Total Flow 41300 gpm				
Species and Lot	FISH ON HAND END OF MONTH			FISH SHIPPED THIS F.Y.	GAIN THIS F.Y.	FISH FEED EXPENDED THIS F.Y.		Conversion	UNIT FEED COST Per Lb.	T.U. per Inch	T.U. to Date	LENGTH INCREASE 30 DAY MONTH
	Number	Weight	Length			Number	Weight					Pounds
	1	2	3	4	5	6	7	8	9	10	12	13
STT-NFW-90-DWO-1	0	0	0.00	795564	79809	115354	28062.52	1.45	0.35	0.0	0.0	0.00
STT-NFW-90-DWO-2	0	0	0.00	829944	128329	155285	39212.83	1.21	0.31	0.0	0.0	0.00
STT-NFW-90-DWO-3	0	0	0.00	1030568	145421	197219	48480.49	1.36	0.33	0.0	0.0	0.00
STT-NFW-91-DWO-0	0	0	0.00	0	16431	26032	11432.53	1.58	0.70	0.0	0.0	0.00
STT-NFW-91-DWO-1	666536	29256	5.01	0	15884	22804	5698.93	1.44	0.36	23.5	35.2	0.65
STT-NFW-91-DWO-2	741602	6931	2.99	0	2479	3415	1230.34	1.38	0.50	42.4	22.5	0.35
STT-NFW-91-DWO-3	1025090	23152	4.02	0	8398	13530	3601.67	1.61	0.43	27.5	35.2	0.53
SCS-CRW-89-DWO-0	0	0	0.00	1439492	32294	70707	26861.09	2.19	0.83	0.0	0.0	0.00
SCS-CRW-90-DWO-0	1673008	42958	4.40	1011126	50672	73974	33351.40	1.46	0.66	41.0	130.1	0.31
Subtotal SCS	1673008	42958	4.40	2450618	82966	144681	60212.49	1.74	0.73	41.0	130.1	0.31
Subtotal STT	2433228	59339	4.11	2656076	396751	533639	137719.31	1.35	0.35	31.1	31.0	0.51
TOTALS	4106236	102297		5106694	479717	678320	197931.80					
AVERAGES			4.23					1.41	0.41	33.6	55.8	0.46

FISH AND EGG FISCAL YEAR DISTRIBUTION SUMMARY

Fiscal Year: 1991

FY Ending (MM/DD/YY): 09/30/91

Delivering Hatchery: Dworshak NFH FY 1991

L i n e #	P r o g r a m	A g e n c y	S t a t e	W T Y P e	Management Area	Water Name	Acres/ Miles	S p e c i o s	S t r a i n	Fish & Fish Egg Numbers	Fish	
											L e n g t h	Total Weight
1	2	3	4	5	6	7	8	9	10	11	12	13
01	BS	FWS	ID	HF	Kooskia NFH	Kooskia NFH	0	SCS	CRW	809,000	0	0
02	BS	FWS	ID	HF	Kooskia NFH	Kooskia NFH	0	STT	NFW	769,000	0	0
03	BS	FWS	WA	RE	Washington	Seattle Lab FWS	0	SCS	CRW	11,000	0	0
04	BS	FWS	ID	RE	Idaho	Hg Nutrition Lab	0	SCS	CRW	20,000	0	0
05	BS	FWS	ID	RE	Idaho	Hg Nutrition Lab	0	STT	NFW	10,000	0	0
06	RE	INT	ID	SR	Idaho	Main S. Clrwtr R.	450	SCS	CRW	7,995	4.18	175
07	RM	INT	ID	SR	Idaho	Main S. Clrwtr R.	500	STT	NFW	1,582	32.5	18,984
08	RM	INT	ID	SR	Idaho	Main S. Clrwtr R.	500	STT	NFW	1,192,503	7.89	204,861
09	RE	UNV	ID	RE	Idaho	U. of Idaho	0	SCS	CRW	4,153	5.16	168
10	RE	UNV	ID	RE	Idaho	U. of Idaho	0	SCS	CRW	10,950	1.74	17
11	RE	UNV	ID	RE	Idaho	U. of Idaho	0	STT	NFW	78	7.33	11
12	RM	INT	ID	SR	Idaho	Snake R.	470	STT	NFW	249	32.5	2,988
13	OT	STG	ID	AQ	Idaho	Boise R. Observ	0	STT	NFW	6	32.5	72

54-b

FISH AND EGG FISCAL YEAR DISTRIBUTION SUMMARY

Fiscal Year: 1991

FY Ending (MM/DD/YY): 09/30/91

Delivering Hatchery: Dworshak NFH FY 1991

Page 2 of 3

L i n e #	P r o g r a m	A g e n c y	S t a t e	W T y p e	Management Area	Water Name	Acres/ Miles	S p e c i e s	S t r a i n	Fish & Fish Egg Numbers	Fish	
											L e n g t h	Total Weight
1	2	3	4	5	6	7	8	9	10	11	12	13
14	RM	INT	ID	SR	Idaho	Red River	635	SCS	CRW	63,004	5.36	2,916
15	RM	INT	ID	SR	Idaho	Red River	635	STT	NFW	213,827	7.52	31,760
16	RM	INT	ID	SR	Idaho	Papoose Cr.	650	SCS	CRW	70,000	5.35	3,219
17	RM	INT	ID	SR	Idaho	Eldorado Cr.	575	SCS	CRW	199,456	5.38	9,302
18	RM	INT	ID	SR	Idaho	Eldorado Cr.	575	STT	NFW	201,847	7.69	32,139
19	RM	INT	ID	SR	Idaho	N.F. Clrwtr R.	500	SCS	CRW	1,094,884	5.45	53,077
20	BS	FWS	ID	HF	Hagerman NFH	Hagerman NFH	0	STT	NFW	1,549,750	0	0
21	BS	STG	ID	HO	Magic Vly SFH	Magic Vly SFH	0	STT	NFW	1,239,000	0	0
22	RM	INT	ID	SR	Idaho	American River	635	STT	NFW	210,874	7.52	31,362
23	RM	INT	ID	SR	Idaho	Clear Creek	540	STT	NFW	369,190	7.62	57,038
24	RM	INT	ID	SR	Idaho	S.F. Clrwtr R.	580	STT	NFW	467,757	7.68	74,113
25	RM	INT	ID	SR	Idaho	Crooked River	635	STT	NFW	776	32.5	9,312
26	RM	STG	ID	HO	Powell Rearing Facility	Powell Rearing F.	0	SCS	CRW	359,402	2.82	2,429

FISH AND EGG FISCAL YEAR DISTRIBUTION SUMMARY

Fiscal Year: 1991

FY Ending (MM/DD/YY): 09/30/91

Delivering Hatchery: Dworshak NFH FY 1991

Line #	Program	Agency	State	WType	Management Area	Water Name	Acres/Miles	Species	Strain	Fish & Fish Egg Numbers	Fish	
											Length	Total Weight
1	2	3	4	5	6	7	8	9	10	11	12	13
27	RM	STG	ID	HO	Red River Hatchery	Red River Hatch	0	SCS	CRW	355,165	2.91	2,635
28	RM	STG	ID	SR	Idaho	Newsome Creek	590	SCS	CRW	165,588	3.40	1,952
29	RM	STG	ID	HO	Crooked River Fac.	Crooked River F.	0	SCS	CRW	120,021	3.98	2,261
					Eggs			STT		3,567,750		0
					Eggs			SCS		840,000		0
					Smolts/Fing.			STT		2,656,076		431,284
					Smolts/Fing.			SCS		2,450,618		78,151
					Adults			STT		2,613		31,356
					FY 91 Distribution					9,517,057		540,791

REPAIRS/IMPROVEMENTS/NEW EQUIPMENT

Numerous maintenance projects were completed during the year. Among those of special note were as follows:

- Completion of the perimeter fencing project with 84 feet of retaining wall and fencing material constructed and installed. This completes nearly 1,100 feet of fencing initiated in 1987 - \$2275.
- Finger weir barriers fabricated and installed at the upper end of the fish ladder near the entrance to Holding Pond 9 - \$1335.
- Three electric carts were rehabilitated and repainted to like new condition - \$2935.
- Rehab of the fire and maintenance water system - \$13,800
- Electrical breaker rehab - \$2225.
- New telephone system with total cost \$20,000 shared with Idaho Fishery Resource Office, and Fish Health Center - \$11,050.
- Quarters No. 1 sprinkler system - \$1500.
- Overhead vehicle bridge inspection by State Highway Transportation Department - \$2900.
- Complete overhaul of the cold feed storage refrigeration systems with new systems replacing units that had malfunctioned. This job was a major undertaking of the maintenance crew, completed at a cost of \$29,115 with an additional \$5000 scheduled in FY 1992 to lower a ceiling in one of three rooms. The final cost of approximately \$34,000 compares to \$225,000; a figure identified in the COE's rehab requirements for Dworshak.
- Major pumps No. 2 and No. 6 were replaced with new units including upgrading of electrical supply - \$11,700.
- A treatment system for pumping formalin to the egg incubators was plumbed and completed to 32 stacked units - \$1675.
- Carpet purchase and installation in residences No. 3 and 4 - \$3225.
- Repairs of 30 raceway tail screens to prevent fish escapement. Originally estimated at \$10,000 was completed for \$800 using an innovative design of wedging the screens in place.
- Removal of 3 large ponderosa pines from the housing area - \$300.
- Replacement of nursery stock and replanting as part of an ongoing landscaping project - \$3175.

-Asphalt repairs of existing pavement - \$4900.

-Construction of an audio visual cabinet for public viewing of "Your National Fish Hatchery" video - \$1050.

A partial section of the hatchery's main aeration system broke and all support material and column degassers for pump No. 6 dropped into the main chamber under 18 feet of water. Emergency action has been requested of the COE for a temporary repair until a more permanent correction can be completed. Work is anticipated in FY 1992.

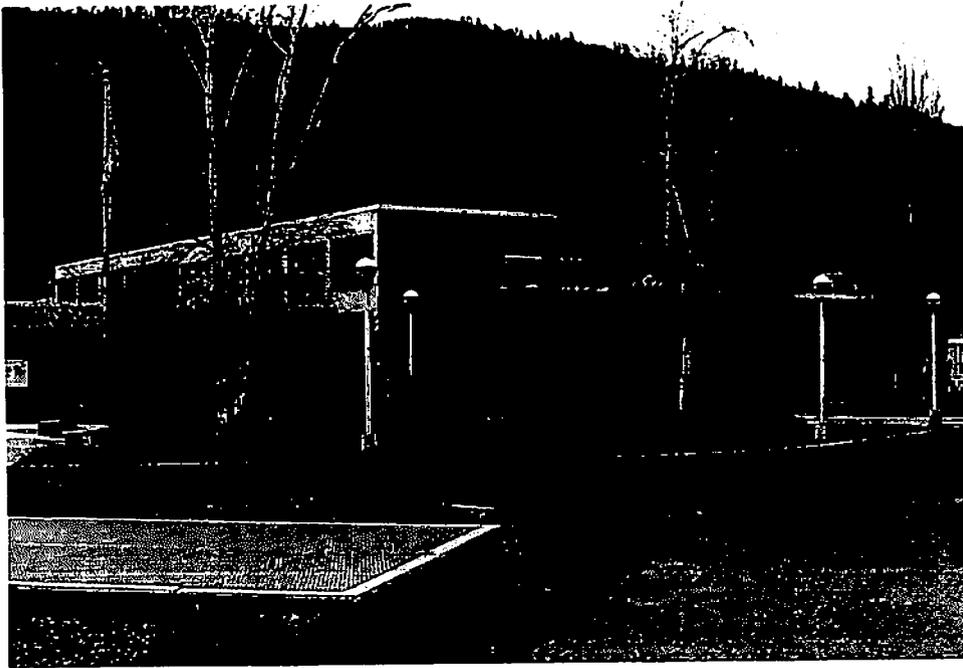
The availability of 6400 gpm from Dworshak Reservoir, as part of the new Clearwater State Hatchery water supply construction, will become a reality by November 1991. This new supply will add great flexibility to the overall water requirements of the Dworshak hatchery in both quality and quantity.

Status of the COE's major rehabilitation plan for the hatchery remains pending. Funding to complete the projects is approaching \$20 million. Initiation of work continues to "slip back" a year and concern is being expressed regarding the hatchery's immediate needs for correcting existing and potential problem areas.

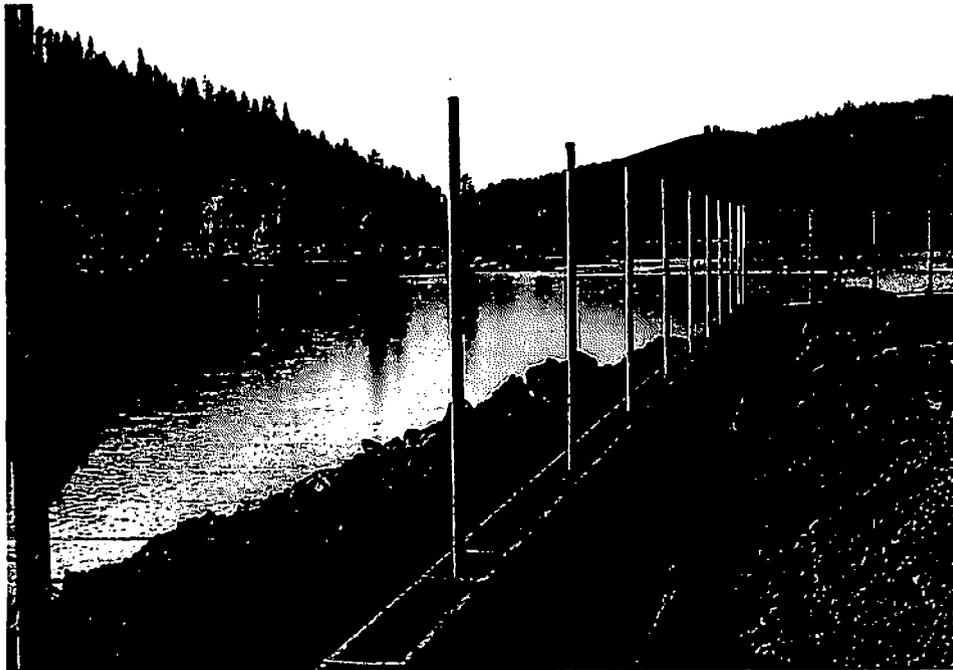
Several of the major equipment purchases were made as follows:

-Office furniture consisting of new chairs, cabinets and desks . . .	\$ 5,275
-Power washer	1,645
-Temperature recorders (3)	1,650
-Refrigerator for feed storage in nursery area	3,400
-Hydraulic pump for loading fish from ponds	10,725
-Air compressors	2,000
-Utility tractor	19,500

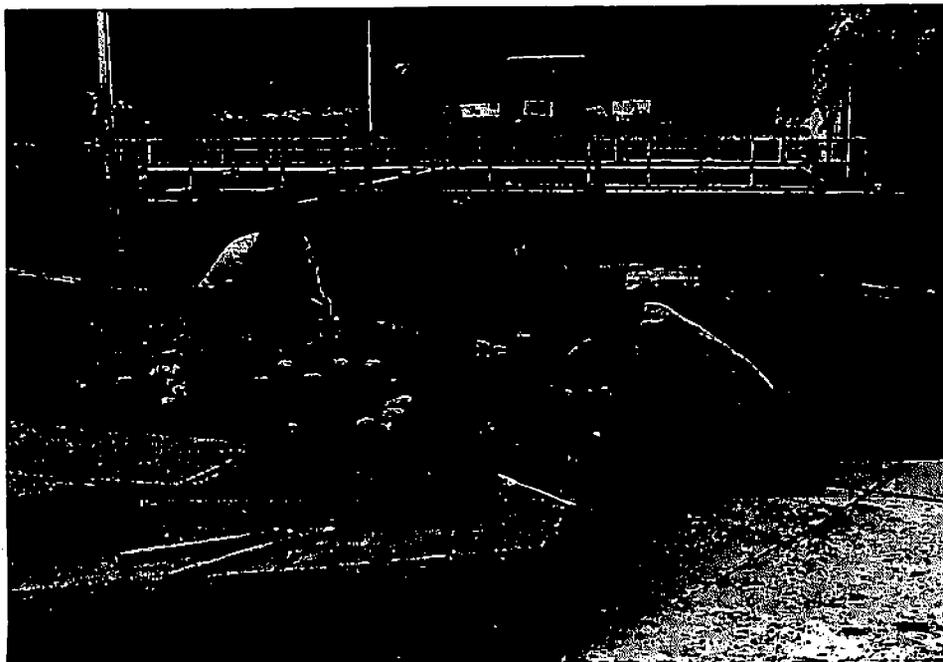
PHOTOS



Front of hatchery with old growth trees and shrubbery before removal.



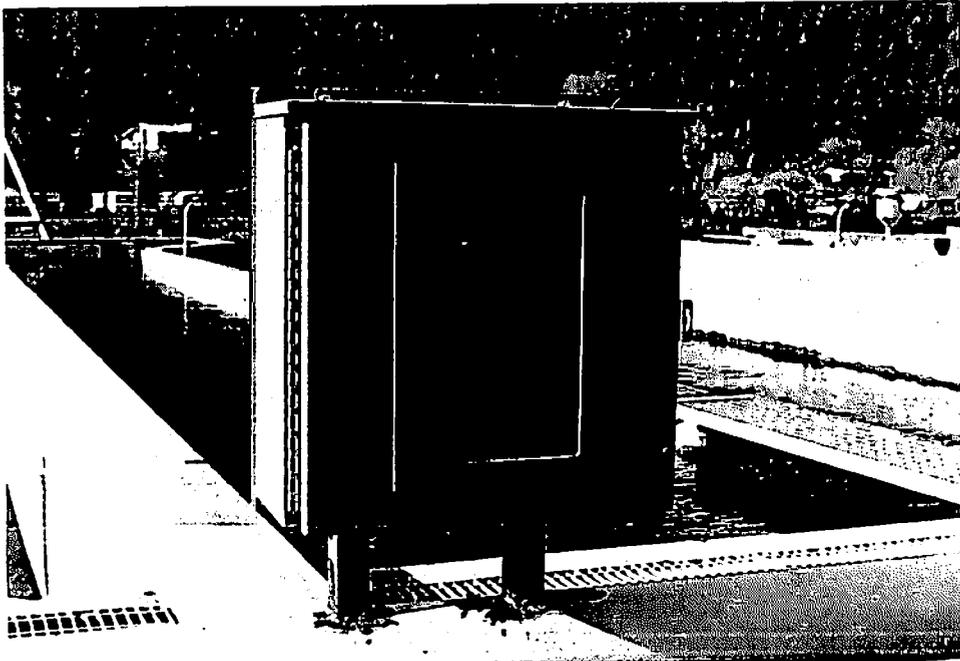
Completion of perimeter fencing project at west end of hatchery.



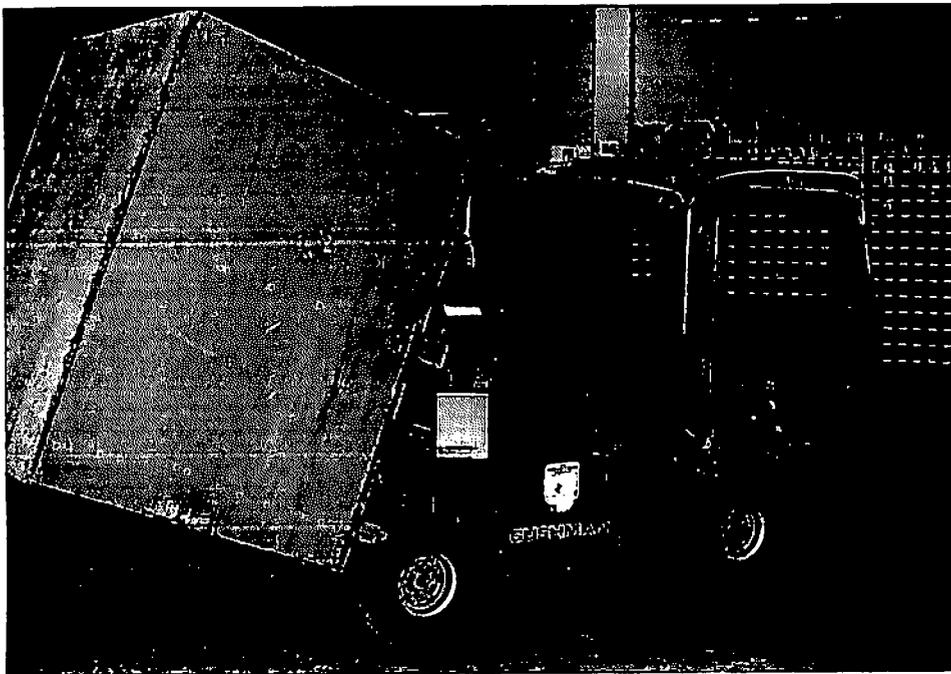
Station employees landscaping station grounds for June 15, "Open House."



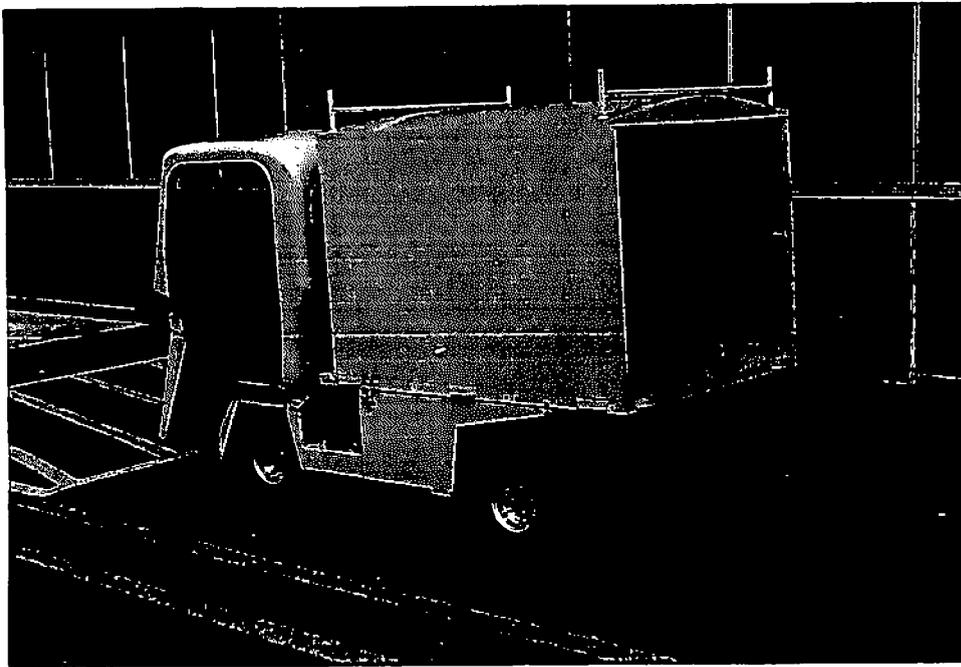
Removing old shrubbery near main hatchery building entrance for replacement with new plantings.



New temperature recorders installed on each of three pond systems.



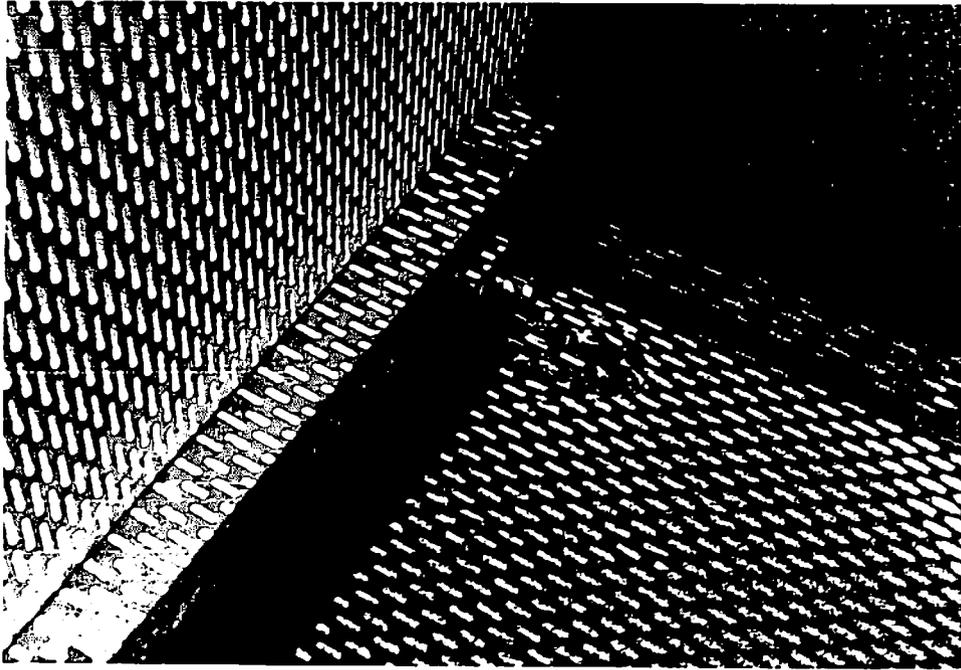
View of electric cart before rehab and painting.



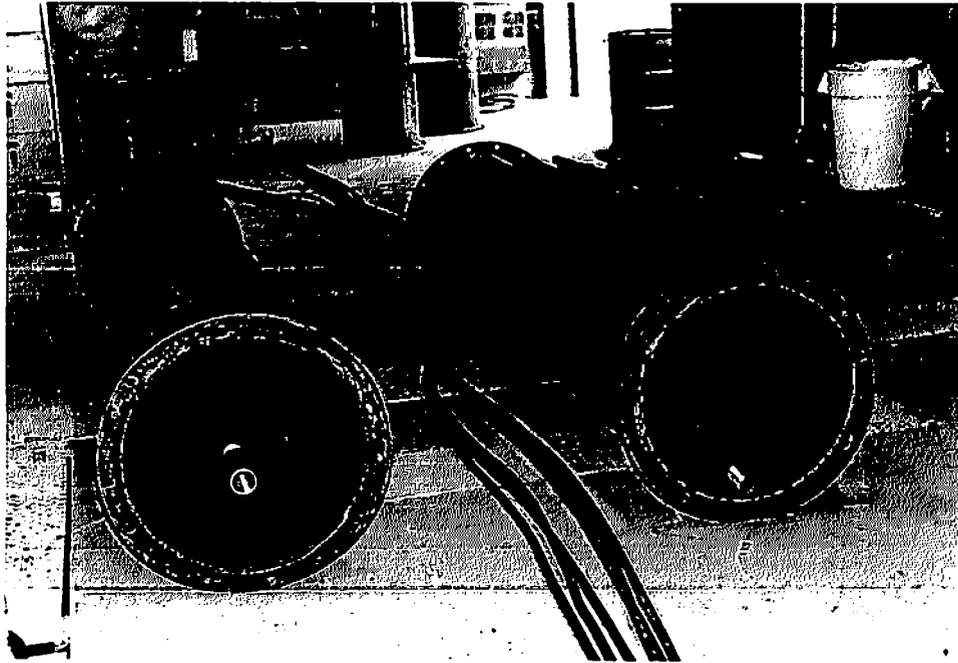
Station cart showing completion of overhaul and painting.



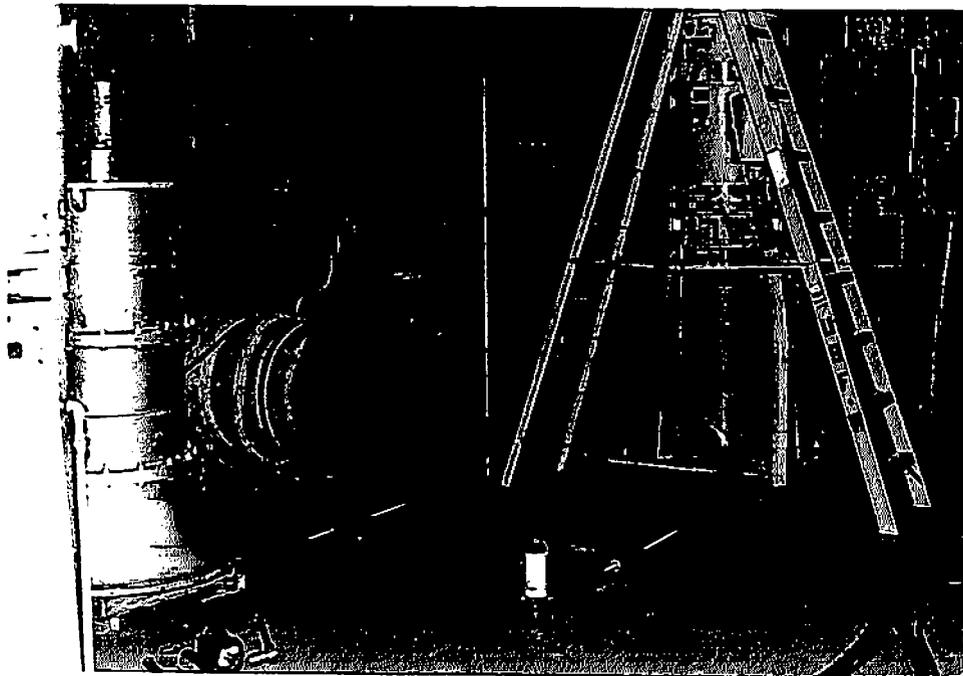
Maintenance worker Ray Rosales in the process of repainting the station electric work carts.



Raceway screen clamping device for securing screens in channel.

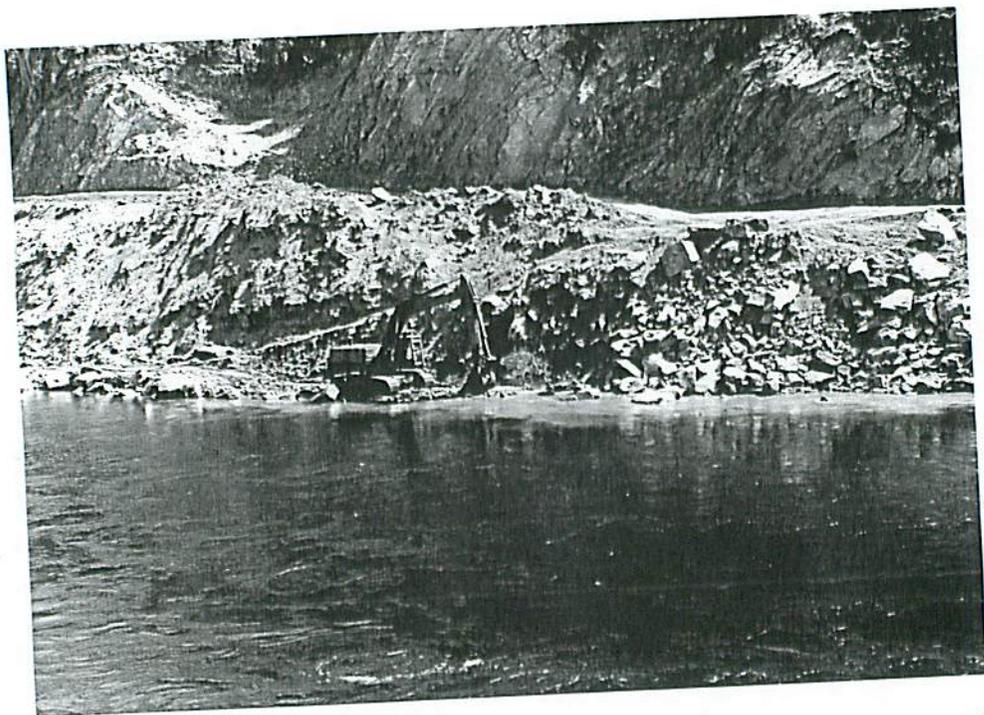


Installation of major pump assemblies No. 2 and No. 5 at river intake.

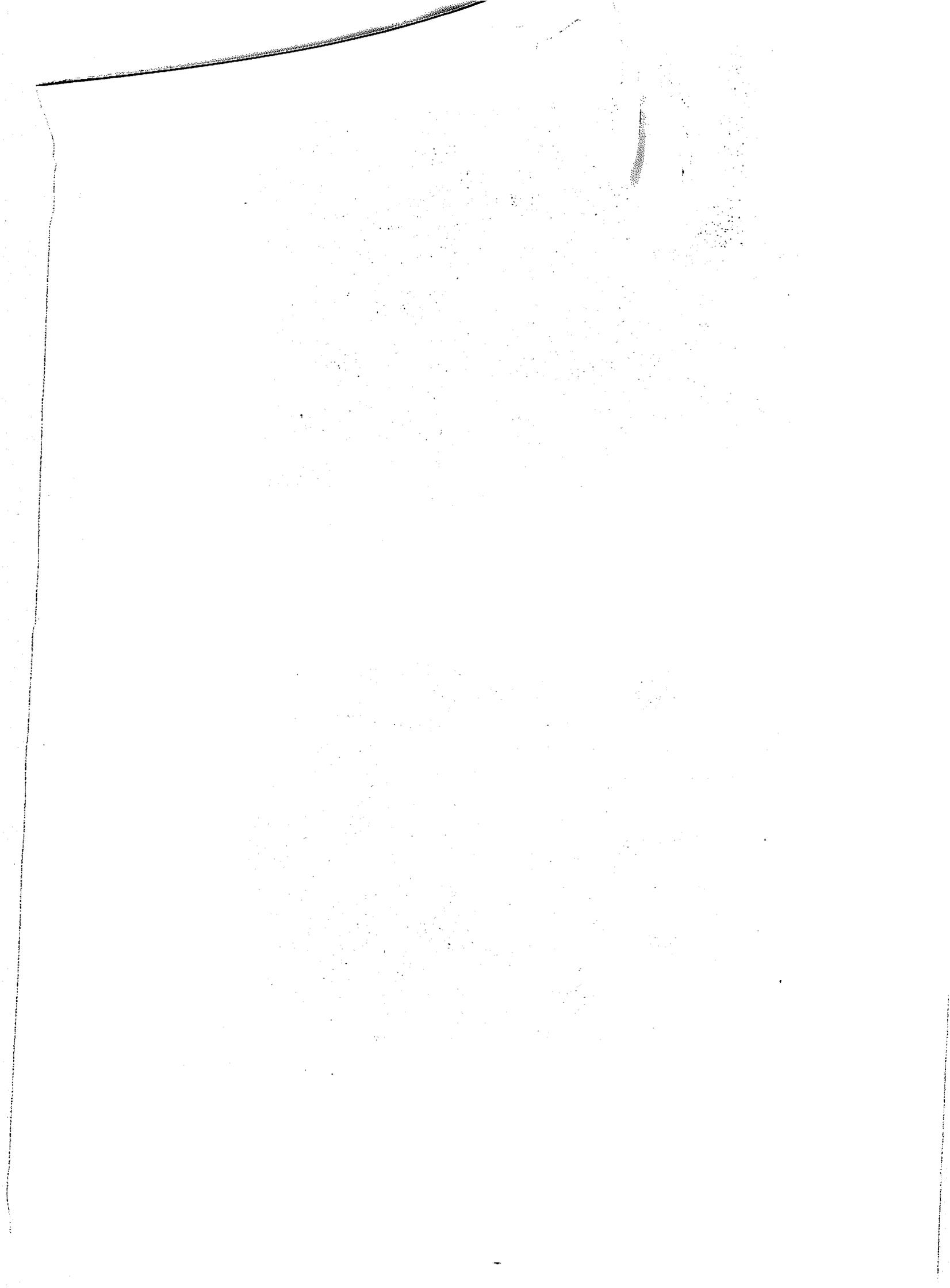




River crossing for new pipeline construction to Clearwater State Hatchery from Dworshak Reservoir.

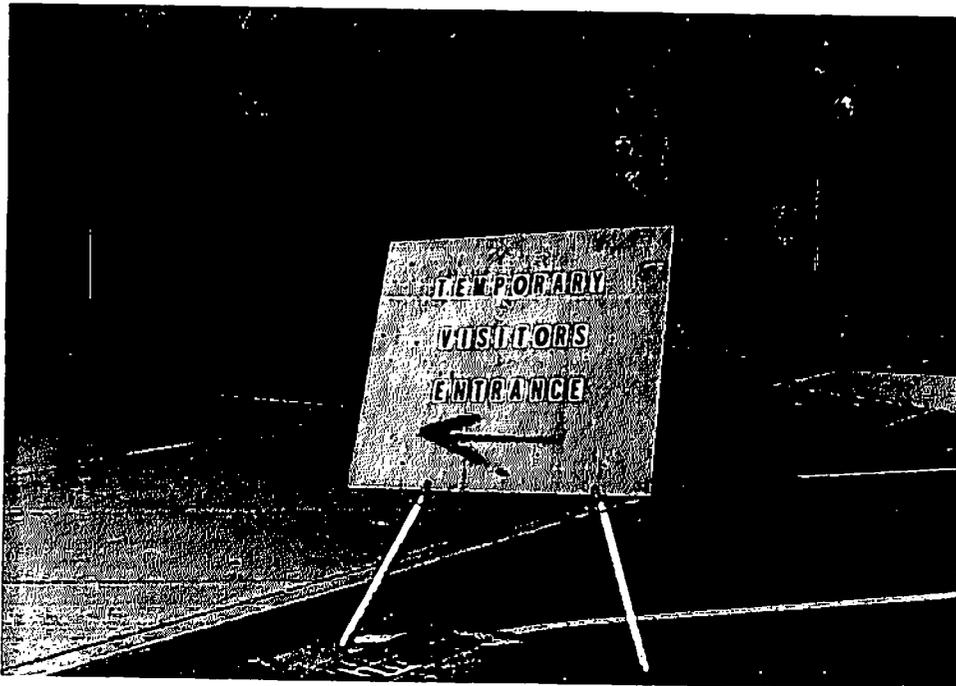


Turbid water conditions were often the result of pipeline construction work in the river supply above Dworshak's water intake.





Area near visitors' entrance to hatchery grounds under construction for new pipeline connection.



Visitors rerouted during pipeline construction work.

MEETINGS/TRAVEL/TRAINING

A meeting at Dworshak on October 11 with Corps of Engineers attendees Gary Willard, Joe Rasmussen, Bert Leonard, Marv Brammer, Paul Winborg, Rodger Colgan and Major Don Kurkjian was held to review the rehab/modernization work being proposed for the hatchery.

Dave Owsley, Engineer, travelled to Michigan, October 16-18, to meet with the Department of Natural Resources representatives regarding hatchery water supply treatment.

Several breakfast meetings were held during the year and attended by Manager Olson with representation from the Nez Perce Tribe, Clearwater National Forest, and FWS.

An upriver fisheries coordination meeting was held at Dworshak 10/31-11/01 with 23 Service people attending from hatcheries, fishery resource offices, fish health labs, Abernathy Development Center and Regional Office.

A Mora NFH (New Mexico) workshop was hosted by Dworshak hatchery on 10/31-11/01. Dave Owsley, staff engineer and member of the workshop team, participated along with other engineers, consultants, and FWS representatives.

Coordination meetings were held at Dworshak on November 8 and March 14 to review production programs, fish health and fishery management activities in the Clearwater Basin. Twenty-three participants attended representing FWS, COE, IDFG, Nez Perce Tribe and University of Idaho.

The Northwest Fish Culture Conference, in Boise on December 4-6, 1990 was attended by Olson, Owsley, Maskill, Streufert, and Berg.

John Parks, Fish Culturist, Dworshak, travelled with Ron Skates, FAO Kalispell, Montana, during the week of December 10. Mr. Parks was later hired for a career development position in Region 6 with schooling assistance provided.

Owsley travelled to Athens, Georgia to instruct "Water Quality and Treatment" at a March 11 Leetown training session.

Olson attended a public meeting at the Dworshak Dam visitor center, March 28, regarding forthcoming water flow plans for Dworshak Reservoir to assist downriver fish migration.

Olson and Owsley attended the North Central Aquaculture Conference in Kalamazoo, Michigan March 18-22. Papers were presented by the two participants.

Employees Maskill and Owsley participated in the Region's Vision Action Planning work groups held near Yamhill, OR during the week of April 29.

Several meetings were held with Clearwater Power Company regarding Dworshak's overuse of energy capacity allotted from the Ahsahka sub-station. Manager Olson travelled to Walla Walla and met with COE officials to review the issue.

Manager Olson accompanied a group of station employees to visit fish passage operations at Lower Granite Dam on May 21. A record number (676,000) of steelhead and spring chinook smolts had moved through the collecting system during the previous 24 hours ending that morning.

Dave Owsley travelled to Bozeman, Montana, June 4-6 to instruct at the Leetown Academy's course on hatchery water treatment.

Attending the Regional Fisheries Team meeting in Reno, NV during the week of June 24 were Olson, Owsley, Berg, Maskill, Bigelow and Streufert.

Manager Olson attended an ESA conferencing review at Kimberland Meadows July 9 and 10. The meeting was chaired by the Boise LSRCP office with personnel from IDFG, Nez Perce Tribe and FWS in attendance.

Engineer Owsley participated in the Western AFS meeting in Bozeman, Montana July 17-19 and as a team member to Boise on July 24 for review of a sockeye salmon rearing program in the Boise area. He also attended the National Livestock, Poultry & Aquaculture Waste Management workshop in Kansas City, Missouri July 28-31.

Dave Owsley, Engineer, attended an Isolation/Quarantine Task Group meeting in Denver, Colorado August 6-8.

Biologist Maskill, and Fish Culturists Greenland, Wright, Oatman and Weeks travelled during the week of August 5 to visit several lower Columbia River fish hatcheries.

Formal training was provided to the following station employees:

Mark Maskill - Introduction to Supervision, OPM, Seattle, WA (40 hrs) - 11/26-30/90.

Wayne Olson - The Advocacy Role of Managers, Leetown Academy, Corpus Christi, TX (24 hrs) - 2/5-7/91.

Pre-Retirement Counseling, OPM, Seattle, WA (24 hrs) - 4/16-18/91.

VISA training, Portland, OR (8 hrs) - 4/11/91.

Jerry Berg - Module I - Introduction to USFWS Fisheries Program (80 hrs) - 1/7-18/91.

Spring Creek NFH Spawning detail (80 hrs) - 9/16-27/91.

Dawna Newman - How to Handle Difficult People, National Career Workshops, Spokane, WA (8 hrs) - 2/26/91.

Small Purchases, Portland, OR (16 hrs) - 6/18-19/91.

WordPerfect I, Lewiston, ID (4 hrs) - 9/17/91.

Mary Lou Galloway - How to Handle Difficult People, National Career Workshops, Workshops, Spokane, WA (8 hrs) - 2/26/91.

VISA training, Portland, OR (8 hrs) - 4/11/91.

Cooperative Agreements, Portland, OR (8 hrs) - 6/20/91.

WordPerfect II, Lewiston, ID (4 hrs) - 9/26/91.

Administrative Workshop for Fisheries, Portland, OR (32 hrs) - 4/15-19/91.

Dave Clifford - How to Build a Better Team, Keye Productivity Center, Spokane WA, (8 hrs) - 3/07/91.

Small Purchases, Portland, OR (16 hrs) - 6/18-19/91.

Dave Owsley - Water Rights and Law Training, Portland, OR (16 hrs) - 5/29-30/91.

Creative Problem Solving, OPM, Portland, OR (24 hrs) - 2/13-15/91.

Hank Jenks - Pump Maintenance Seminar, Pasco, WA (16 hrs) - 4/30-5/01/91.

Ray Rosales - Pump Maintenance Seminar, Pasco, WA (16 hrs) - 4/30-5/01/91.

PUBLIC INFORMATION/VISITORS

Paul Koberstein, an Oregonian newspaper reporter, visited Dworshak in February, to do a feature article on the "salmon" issue including comments on hatchery operations.

Work was contracted to construct a new video cabinet for replacement in the downstairs area of Dworshak's visitor center. This work allowed for the present system to be removed from its close proximity to the conference room and also provide available access to the physical handicapped.

New lighting was added to Dworshak's fish spawning area and to the visitor balcony area overlooking the activities.

Numerous school groups visited the Dworshak hatchery in the spring to observe the steelhead spawning activities. Formal tours were given to over 1000 school students by station employees with assistance from the two senior volunteers.

KHQ-TV of Spokane, WA was at Dworshak on April 9 to film steelhead spawning operations.

Olson provided the program for a noon Orofino Kiwanis luncheon meeting on May 14. Also attended was the Orofino Chamber of Commerce meeting on May 15 to present the "Open House" festivities planned for Dworshak on June 15.

Olson gave a program on June 12 at the monthly task force meeting of the Clearwater Interagency Council on Youth. The theme of Dworshak's "Open House," "Hooked on Fish, Not on Drugs" was used for the presentation.

Several new life size fish mounts, both steelhead and spring chinook, were completed and delivered for displays at both hatcheries. New photos were added to Dworshak's inside displays to replace older and outdated 8"x10" transparencies. Dworshak's fish diorama was noticeably improved with the replacement of the 2-D metal displays with mounted fish of excellent taxidermy quality.

A contract was awarded for \$2200 to produce the camera-ready art for printing of Dworshak's new hatchery brochure replacing the 1981 leaflet. The text and color chromes were furnished by the hatchery. The station leaflet was completed in time for Dworshak's "Open House" on June 15.

The hatchery held their first "Open House" on June 15, 1991. With nearly 1500 people in attendance, an overflow parking lot throughout the day, beautiful weather, dedicated employees assisting, and 504 kids fishing--what more could one expect. Video and photos recorded the day--but one must have been there to actually "feel" the excitement and see the expressions on kid's faces after a most successful and positive fishing experience. The success of this year's "Open House and kids free fishing day" is assurance for similar activities of this type in future years. Dworshak is making plans for next year's fun filled activities to be held on June 13, 1992.

Forty-seven international students, attending a genetic workshop at the University of Idaho, toured the Dworshak hatchery on June 26.

Jay Bigelow, Fishery Biologist, gave an off-site presentation to a number of elementary school age children attending a Lewis-Clark State College summer sponsored program in Orofino.

Colonel Robert Volz, new District Engineer, Walla Walla, visited the Dworshak hatchery on December 6. Rodger Colgan, Project Engineer, Dworshak Dam and Paul Winborg, Operations Chief, Walla Walla, accompanied Colonel Volz on the tour.

Mike Taylor, Corps of Engineers (Operations - Budget), Walla Walla District, visited Dworshak on May 8 to review station funding requirements, and to discuss generally the hatchery's major rehab proposal and design.

Division (COE) Commander, General Ernest Harrell; District (COE) Engineer; Colonel Robert Volz; Paul Winborg, District Chief-Operations; and Gary Willard, District Chief-Construction, were at Dworshak on May 30 to tour the hatchery with Manager Olson.

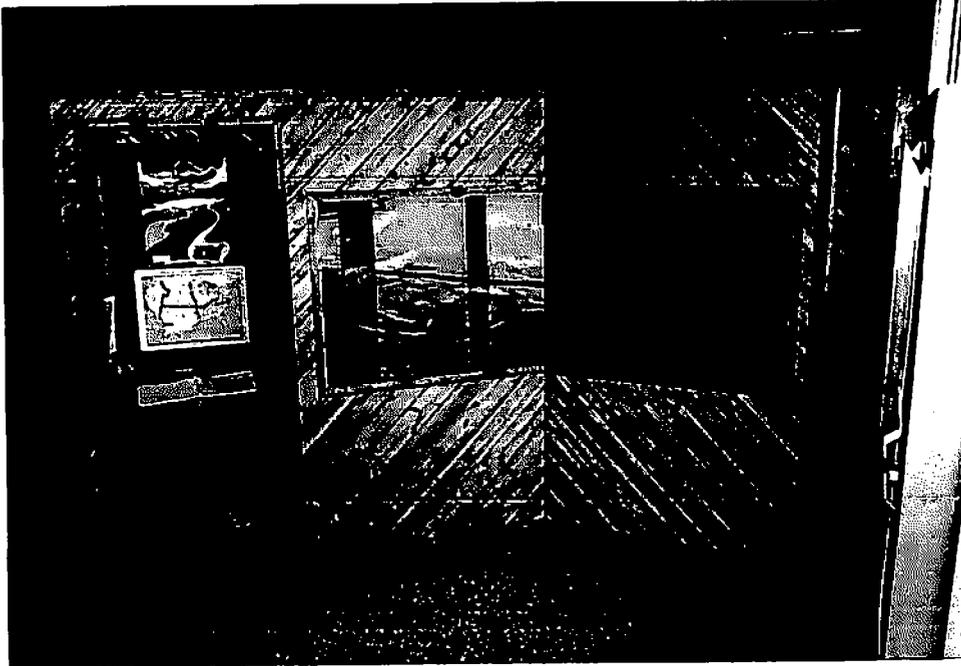
Allen Palisoul, Office of Legislative Services, and Jane Lyder, Office of Congressional and Legislative Affairs, from Washington D.C., accompanied by John Miller, Portland R.O., toured Dworshak hatchery on August 7.

Other official visitors during the year included several visits from Regional Office personnel representing fisheries and engineering.

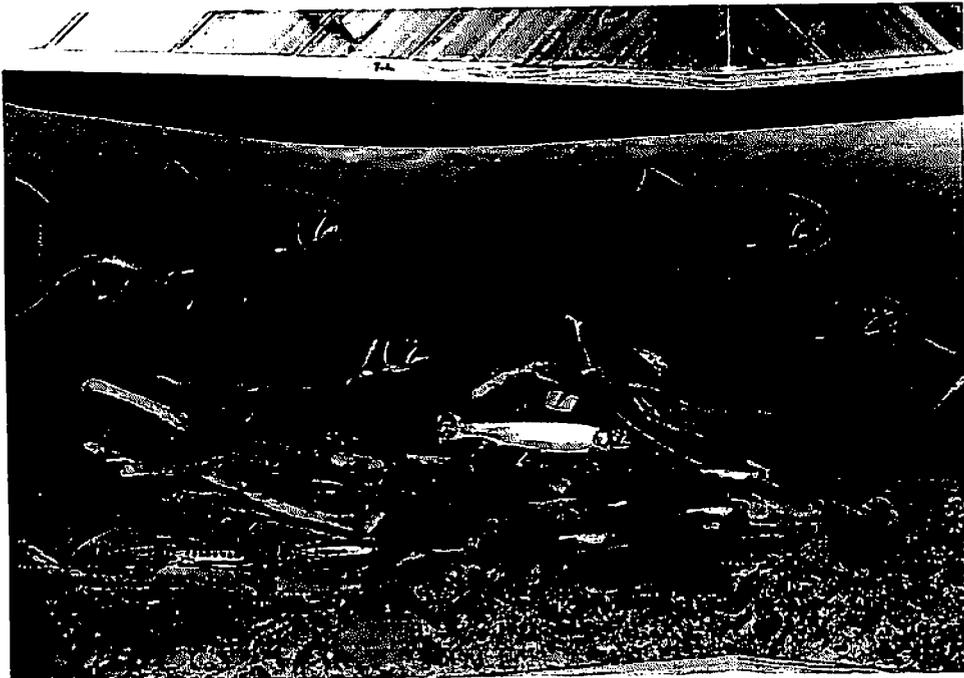
A noticeable increase in station visitors was seen during the summer months with interest in the adult chinook returns. Several groups were provided formal tours. Of special note were visitors representing public utilities on July 5, an "Outward Bound" group on July 27 of young high school students attending a summer program at the University of Idaho, and several Canadian visitors representing Rotary District 508 and many tourists in the area for the first time to tour the hatchery along with Dworshak Dam.

Number of visitors to the hatchery during this reporting period were estimated at 30,000.

PHOTOS



New fish diorama with visitor registration desk in main lobby of hatchery building.



Fish diorama showing adult and fingerling stages of steelhead trout and spring chinook salmon.



New video cabinet in downstairs visitor lobby of hatchery building for showing "Your National Fish Hatchery."



Upstairs lobby video cabinet redesigned with hatchery video removed and photos and displays added.



Senior volunteers Clayton Mc Gill (above) and Jesse Lyda (below) assist station visitors during steelhead spawning.





Corps of Engineers officials Rasmussen, Winborg, Major Kurkjian, Brammer and Willard being briefed by Dave Owsley, Engineer, of Dworshak's water aeration problems.

STAFFING

Participation in Region One's Employee Development Training program continued with Fishery Biologists John Rueth, Jerry Berg and Jay Bigelow enrolled. Biologist Rueth transferred to Arcata FRO, California in July 1991. Biologists Berg and Bigelow were hired in December 1990; Mr. Berg from the Peace Corps and Mr. Bigelow assigned from Willow Beach NFH, Arizona.

Dworshak's production assistant position was reclassified to a GS-11 grade and a vacancy announcement initiated in October 1991. Christine Hanson, presently in this position was selected with promotion to Assistant Manager, GS-11, Leadville NFH with an effective date of November 4, 1990. Mark Maskill was selected for the vacated position as a GS-7 with full performance potential to a GS-11.

A position through the Older Worker Program, administered by the Lewis-Clark State College, was established for Dworshak. Interviews were conducted and a worker hired to start in early June, 20 hours per week at minimum salary. This position, filled by Vern Holloway, effective June 30, replaced a high school student that normally had been used for weekend work.

Personnel actions resulted in promotion for the following employees:

John Rueth, Fishery Biologist, GS-5 to GS-7, effective 1/27/91.

Mark Maskill, Fishery Biologist, GS-7 to GS-9, effective 4/21/91.

Ron Oatman, Fish Culturist, WG-4 to WG-5, effective 12/02/90.

John Bigelow, Fishery Biologist, GS-7 to GS-9, effective 8/11/91.

Tom Taggart, Fish Culturist (Leader), WL-4 to WL-5, effective 12/30/91.

New permanent appointees were added to Dworshak's staffing through the Veteran's Readjustment Program (VRA):

Rocky Greenland, Fish Culturist, WG-4 from Laborer WG-2 (temporary).

Ben Wright, Fish Culturist, WG-4 from Laborer WG-2 (temporary).

Terry Weeks, Fish Culturist (recruitment), WG-4, effective 6/30/91.

Employee transfers included:

Richard Parks, Fish Culturist to Bozeman FRO, effective 2/24/91.

John Rueth, Fishery Biologist to Arcata FRO, effective 7/14/91.

Other personnel actions included:

Kathy Stamper, Student Aide, end-of-appointment, effective 12/15/90.

Alfred Jenks, Fish Culturist, WG-5, converted to Maintenance Mechanic Helper, WG-5, effective 2/24/91.

Pam Davis, Student Aide, temporary, part-time, effective 5/18/91.

Ben Greene, Title change from Electrical Equipment Operator to Electrician, effective 7/28/91.

Dworshak Employees
- FY 91 -

<u>Name</u>	<u>Position Title</u>	<u>Period of Employment</u>	<u>Status</u>
Barker, Rhett J.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Berg, Jerry D.	Fishery Biologist	12/02/90 - 9/30/91	Permanent
Bigelow, John P.	Fishery Biologist	12/16/90 - 9/30/91	Permanent
Cermak, Anne D.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Clifford, David E.	Work Supervisor (Maint.)	10/01/90 - 9/30/91	Permanent
Collins, Sheila K.	Clerk-Typist	10/01/90 - 9/30/91	Temporary
Davis, Pamela J.	Summer Aide	5/18/91 - 9/30/91	Temporary
Easterbrook, Chad L.	Social Services Asst.	6/10/91 - 8/02/91	YCC Program
Franklin, Spring J.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Fry, Scott T.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Galloway, Mary Lou	Fisheries Program Asst.	10/01/90 - 9/30/91	Permanent
Greene, Benny C.	Electrical Equipment Repairer	10/01/90 - 9/30/91	Permanent
Greene, Jennifer L.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Greenland, Rocky E.	Laborer	10/01/90 - 9/30/91	Permanent
Hanson, Christine L.	Fishery Biologist	10/01/90 - 11/03/90	Permanent
Holloway, Vernon C.	Older Worker Program	6/07/91 - 9/30/91	N/A
Jenks, Alfred H.	Animal Caretaker	10/01/90 - 9/30/91	Permanent
Lawson, Douglas L.	Fishery Biologist	10/01/90 - 9/30/91	Permanent
Maskill, Mark G.	Fishery Biologist	10/01/90 - 9/30/91	Permanent
Moffett, Clarence P.	Maintenance Worker	10/01/90 - 9/30/91	Permanent
Newman, Dawna M.	Clerk-Typist	10/01/90 - 9/30/91	Permanent
Oatman, Ronald W.	Animal Caretaker	10/01/90 - 9/30/91	Permanent
Olson, Wayne H.	Hatchery Manager	10/01/90 - 9/30/91	Permanent

<u>Name</u>	<u>Position Title</u>	<u>Period of Employment</u>	<u>Status</u>
Owsley, David E.	Environmental Engineer	10/01/90 - 9/30/91	Permanent
Parks, Richard J.	Animal Caretaker	10/01/90 - 2/23/91	Permanent
Praest, Diane E.	Secretary (Typing)	10/01/90 - 9/30/91	Permanent
Rosales, Raymundo A.	Maintenance Worker	10/01/90 - 9/30/91	Permanent
Ross, Robin F.	YCC Enrollee	6/10/91 - 8/02/91	YCC Program
Rueth, John C.	Fishery Biologist	10/01/90 - 7/14/91	Permanent
Schultz, Travis J.	Summer Aide	10/01/90 - 3/18/91	Temporary
Sims, Hubert M.	Maintenance Worker	10/01/90 - 9/30/91	Permanent
Stamper, Kathy L.	Student Aide	12/15/90 - 5/13/91	Temporary
Streufert, Jonathan M.	Assistant Manager	10/01/90 - 9/30/91	Permanent
Taggart, Thomas M.	Animal Caretaker Leader	10/01/90 - 9/30/91	Permanent
Vargas, John J.	Animal Caretaker	10/01/90 - 9/30/91	Permanent
Weeks, Terry C.	Animal Caretaker	6/30/91 - 9/30/91	Permanent
Wright, Benjamin A.	Laborer	10/01/90 - 9/30/91	Permanent

DWORSHAK-KOOSKIA NFH COMPLEX

September 30, 1991

Wayne H. Olson
Complex Manager

Richard A. Bottomley
Resident Manager
Kooskia

James A. Crawford
Maint Mechanic

Rodney Funderburg
Fish Culturist

Joyce E. Brimmer
Fishery Tech

Jonathan M. Streufert
Assistant Manager
Dworshak

Mark G. Maskill
Asst Prod Spvr

Douglas L. Lawson
Fishery Biologist

Jerry D. Berg
Fishery Biologist
(Trainee)

John P. Bigelow
Fishery Biologist
(Trainee)

Thomas M. Taggart
Lead Fish Culturist

Ronald W. Oatman
Fish Culturist

Rocky E. Greenland
Fish Culturist

John J. Vargas
Fish Culturist

Benjamin A. Wright
Fish Culturist

Vernon C. Holloway
Older Worker Program

Pamela J. Davis
Student Aide

David E. Owsley
Environmental
Engineer

Administrative Staff

Mary Lou Galloway
Fisheries Prg Asst

Diane E. Praest
Secretary
(FRO shared)

Dawna M. Newman
Office Clerk

Amy C. Kishpaugh
Office Clerk
(FRO shared)

David E. Clifford
Maint Work Spvr

Benny C. Greene
Electrician

Alfred H. Jenks
Maint Helper

Clarence Moffett
Maint Worker

Raymundo Rosales
Maint Worker

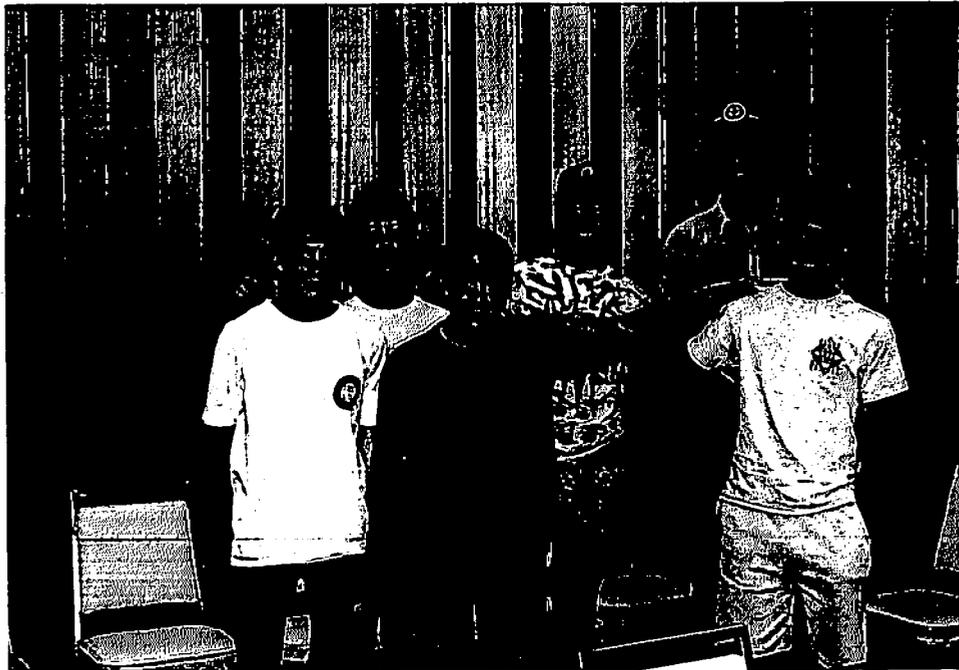
Hubert M. Sims
Maint Mechanic

Terry C. Weeks
Fish Culturist

PHOTOS



Senior volunteers Clayton McGill and Jesse Lyda contribute many hours in assisting the public on their visit to the hatchery.



Youth Conservation Corps (YCC) enrollees, Scott Fry, Spring Franklin, Jennifer Greene, Robin Ross, Crew Leader Chad Easterbrook, and Rhett Barker

COOPERATIVE PROGRAMS

The hatchery continued to work closely with the following agencies and groups in the accomplishment of various activities.

- Idaho Department of Fish and Game:
 - Boise Office
 - Lewiston Office
- Seattle National Fishery Research Center (SNFRC)
- Corps of Engineers
 - Walla Walla District
 - Dworshak Dam and Reservoir Project
- Cooperative Fishery Research Unit (CFRU) - University of Idaho
- Nez Perce Tribal Fisheries
- National Marine Fisheries Service (NMFS)
- University of Idaho
- Washington State University
- Clearwater National Forest
- Clearwater County Sheriff Office

Dworshak Fish Health Center and Idaho Fishery Resource Office shared facilities on the hatchery. The three Service groups are cooperatively involved in FWS activities on the Clearwater River.

Steelhead carcasses were, as in recent years, received by a local processor on spawning days to be processed, frozen, and made available to several commodity programs administered through the Idaho Department of Education. The hatchery provided cold storage space for the processed fish until distribution was made.

Eggs and small fish were again furnished other agencies and university groups for study purposes, i.e., environmental testing genetic experiments, and ongoing bacterial kidney disease monitoring.

Assistance in distribution of Dworshak's smolt production was provided by IDFG and COE with trucks and drivers as requested.

Two semi-annual coordination meetings were held at Dworshak with Idaho Department of Fish and Game, Nez Perce Tribe and COE to review hatchery production programs and to discuss Clearwater River fishery activities. A meeting in November 1990 was followed by another in March 1991.

Assistance was provided to the Nez Perce Fisheries with holding and marking a small group of spring chinook fingerlings and providing equipment to transfer the fish to a study site.

Two senior volunteers contributed 71 hours of service to assist visitors viewing Dworshak's steelhead spawning operations in the spring.

Provided instructors for Leetown Academy courses:

Dave Owsley - "H₂O Quality and Treatment," Athens, GA, 3/91
Dave Owsley - "H₂O Treatment Processes," Bozeman, MT, 6/91

Environmental Engineers Owsley continued to assist other agencies both federal and private on water treatment, holding design and other related faculty operations. Numerous information mailings, telephone calls and personal contacts were made throughout the year. Mr. Owsley participated on several task forces and was involved in formal presentations and work groups as shown:

Kalamazoo, MI - Wolf Lake State Hatchery, 10.90
Kalamazoo, MI - North Central Aquaculture Conference, 3/91
Yamhill, OR - Vision Action Planning Workshop, 4/91
Bozeman, MT - Western Division of AFS, 7/91
Boise, ID - Sockeye Salmon Culture, 7/91
Kansas City, MO - National Livestock, Poultry and Aquaculture Management Workshop, 7/91
Denver, CO - Isolation/Quarantine Task Group, 8/91
Baton Rouge, LA - Louisiana State University Workshop "Design of High Density Recirculating Aquaculture Systems," 9/91

Jim Congleton and student Yan Zhang of the University of Idaho were at the station in February to allow staffing to review their paper on "IHN Virus in the Water Supply and in Fish-Rearing Units at Dworshak NFH."

Ron Pascho and Diane Elliott, Seattle National Fisheries Research Center were at Dworshak in March to review program logistics to accommodate their ongoing BKD studies.

Jim Farneman, Consultant, Food Services, Idaho Department of Education, Boise was at Dworshak in March to view steelhead spawning operations and disposal of fish carcasses. Mr. Farneman has been an overseer of the distribution of fish to commodity programs, prisons, schools and others of which Dworshak has contributed to since 1983.

A Jennifer Junior High School student from Lewiston was provided the opportunity to acquire 10 hours of observation and work experience at Dworshak to satisfy a school project assignment.

Biologist trainees Jay Bigelow, Jerry Berg, and John Rueth acted as judges at the annual Orofino Elementary Science Fair in March.

The hatchery continued to have representation at the Steelhead Impact Committee meetings held in Orofino on a regular basis.

The hatchery assisted the LSRCP satellite facilities in advancing their SCS programs several years by providing a transfer of 850,000 fingerling fish in June and September 1991. The Complex total number of fish to the three satellite hatcheries was 1.5 million.