ANNUAL REPORT

FISCAL YEAR 1993

DWORSHAK NATIONAL FISH HATCHERY

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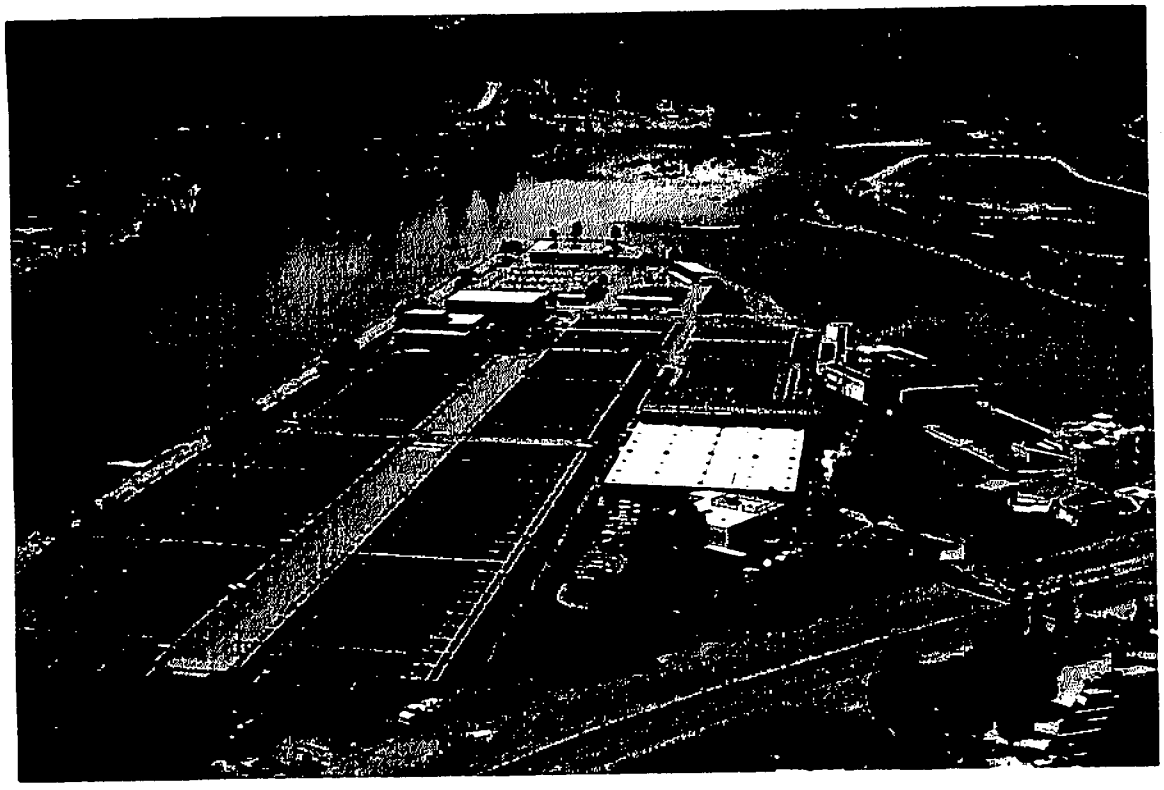
INTRODUCTION

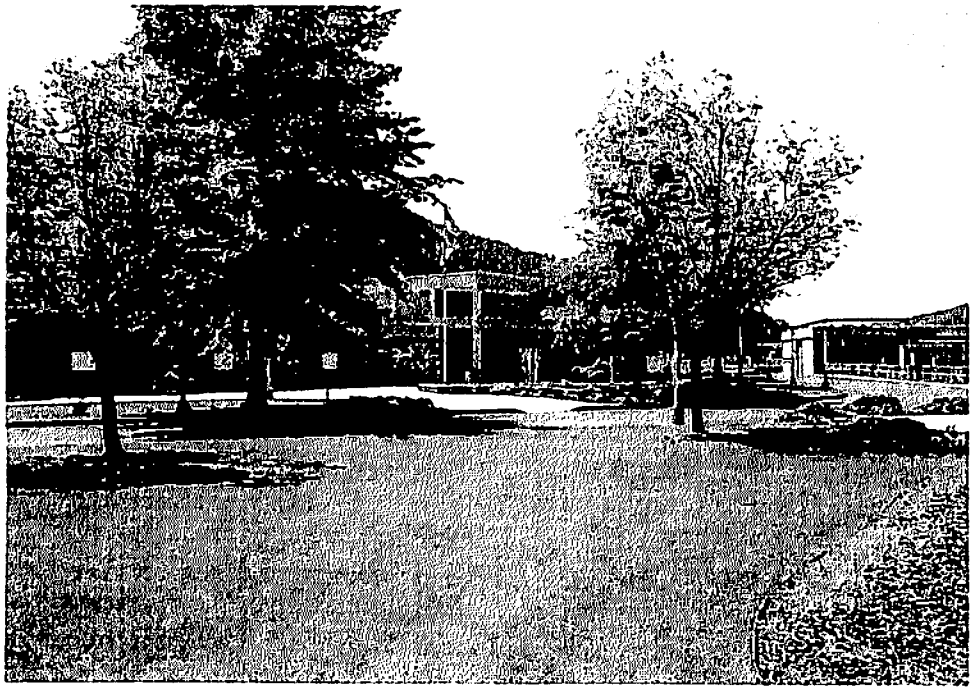
Dworshak National Fish Hatchery (DNFH) is located in north central Idaho downriver from Dworshak Dam, at the confluence of the North Fork and the main stem Clearwater River. Dworshak Dam was constructed by the Corps of Engineers (COE) in 1966-70. Operation of the hatchery by the Fish and Wildlife Service (FWS) was authorized by the COE in a Memorandum of Understanding of 1969. The hatchery has since served primarily as a mitigation hatchery for steelhead trout (*Oncorhynchus mykiss*); a unique run of the North Fork "B" strain threatened by the construction of Dworshak Dam. The FWS has endeavored over the past 20+ years to meet the "mitigation goal" of providing 20,000 adult steelhead to the Clearwater River and maintain the unique genetics of the stock.

DNFH consists of a complete up-to-date mechanical, electrical, water reuse and reconditioning system employing filtration, sterilization, biological nitrification, pollution control and monitoring facilities, alarm system, water chillers, heaters, and numerous pumps. Initial construction at DNFH included 84 Burrows ponds, 64 nursery tanks, and 9 adult holding ponds. Twenty-five Burrows ponds (System I) were operated on a heated recycled water flow, for rearing steelhead smolts to the required size of 180 mm in only one year. In 1973, System II (25 ponds) and System III (34 ponds) were converted from a single-pass of water, 2-year rearing cycle, to water reuse and heating for accelerated production growth. This second phase construction, with added mechanical systems (biological filters, electric grid, sand filters, U.V. lamps, chillers, and boilers), increased production capacity and allowed all three water systems to be environmentally controlled.

~~During the mid-1970's, with DNFH not meeting production goals nor meeting mitigation goals, major operational changes were made. Review and studies of~~



Dworshak NFH - Aerial View



Visitor entrance to administrative building.

During the mid-1970's, with DNFH not meeting production goals nor meeting mitigation goals, major operational changes were made. Review and studies of the reuse systems, water temperature regime, water quality, and fish culture techniques were done by hatchery staff and university scientists. Corrective measures followed which removed the computerized pneumatic feed system, eliminated the ultra violet treatment of water reuse, redesigned the water flows to maximize single-pass use and a return to a more hands on basic fish culture. Selecting cooler water temperatures from Dworshak Reservoir during the summer, adding minerals (sodium chloride and potassium chloride) to a soft water supply, removing supersaturated nitrogen gas, along with other designed mechanical changes, and more involvement of hatchery staff in monitoring fish culture, all contributed positively towards improving the hatchery's program.

Column degassers, using "Koch" rings as a diffuser, were designed and tested and placed in operation for aeration and for protection from high nitrogen gas. The Dworshak hatching jar was developed for the nursery tanks for incubating eggs and allowing fry to swim directly to the tanks. Excellent results on trials of demand feeders warranted placing all steelhead production ponds on these types of feeders. DNFH personnel developed the concept of using overhead wire to support a net enclosure of nearly 130,000 square feet of rearing area from bird predation.

Further construction in the 1980's added 18,000 square feet of nursery building, doubling the number of inside rearing tanks to 128. A new concept of biological filtration, known as a fluidized sand filter, replaced the oyster shell media in System I. An additional thirty 8' x 80' raceways were constructed under the Lower Snake River Compensation Plan (LSRCP) to provide production facilities for spring chinook salmon (*Oncorhynchus tshawytscha*).

The uniqueness of DNFH's water systems provides several options for egg incubation and rearing. Three temperature schematics are available for egg development through the incubators. Three different temperature regimes are also available to the nursery tanks with ozone treated water to 32 of the 128 inside tanks. The outside steelhead ponds are furnished single-pass river water from May through October when desired temperatures can be obtained through selector gates at Dworshak Dam. A pump station on the North Fork, one mile downriver from the Dam, is capable of providing 75,000 gpm of water. Water reuse, used extensively during the colder months of November until fish are released in the spring, is made up from 10 percent new water to allow heating for desired fish growth. Each of the three outside ponding systems is independent of each other for temperatures when on reuse and heated water. Beginning in 1992, the hatchery was supplied with an additional 6400 gpm of gravity flow Dworshak Reservoir water directly by pipeline. This "clean" water furnishing egg incubators and nursery rearing has afforded disease protection from Infectious Hematopoietic Necrosis (IHN) virus in the early production stages.

The Kooskia hatchery, 35 miles upriver from Dworshak on the Clearwater River, has operated as a Complex with Dworshak since 1978 to restore the spring chinook fishery in the Clearwater. In addition to spring chinook, the facility also serves as a temporary site for the rearing of rainbow trout for

stocking Dworshak Reservoir while Dworshak's IHN virus problem continues to exist. The administrative headquarters for the Dworshak-Kooskia Complex is located at the Dworshak hatchery. The Dworshak Fish Health Center and the Idaho Fishery Resource Office are co-located at the Dworshak station.

The Dworshak hatchery has capacity for producing 2.3 million steelhead smolts; 1.4 million yearling chinook salmon smolts; and 200,000 sub-catchable rainbow trout for stocking Dworshak Reservoir. The hatchery's annual production capacity exceeds 550,000 pounds. Mitigation adult fish goals to the Clearwater River are 20,000 returning steelhead and 9,000 spring chinook. Steelhead goals are being satisfied, however, spring chinook returns continue to remain well below mitigation levels.

This report covers the period of hatchery activities from October 1, 1992 to September 30, 1993.

STATION HIGHLIGHTS

A program document of goals and responsibilities for Fiscal Year 1993 was prepared for the hatchery complex. This document, prepared annually since 1988, outlined production planning, training, staffing, budgets and maintenance projects proposed for the coming year.

Operating funds (1935 account) transferred from the Corps of Engineers (COE) were $1,302,475. An amount of $13,475 (8610 account) was used from quarters rental reimbursements for a total of $1,315,950. Included was $48,000 budgeted to the Dworshak Fish Health Center (FHC) for their assistance and $43,000 to the Idaho Fishery Resource Office (FRO) for continuation of a broodstock and smolt monitoring evaluation.

A 3.3 percent funding cut by the Corps in January 1993 reduced the station's overall operating costs by $43,000. A request to restore these funds was denied resulting in several scheduled cyclical projects and equipment purchases to be deleted.

The hatchery transferred $10,000 to Kooskia National Fish Hatchery for the production of rainbow trout for stocking Dworshak Reservoir; a mitigation responsibility of Dworshak hatchery. This cost represents Dworshak's share of expenses to rear rainbow trout at another hatchery in an effort to manage around IHN virus disease.

The Lower Snake River Compensation Plan (LSRCP) funded $405,000 (4710 account) for production of spring chinook salmon. The Youth Conservation Corps (YCC), an 8-week summer work program, was also covered by the LSRCP.

Fish marking costs included $40,000 to ad-clip 2.4 million steelhead fingerlings and $5,300 for coded-wire tagging of contribution groups released. Marking of spring chinook cost $71,300 for coded-wire tagging and $52,000 for adipose fin clipping.

Major costs were also distributed between 13 cyclical projects ($82,200) and purchase of new or replacement equipment ($128,300).

Total hatchery operation and maintenance funding, excluding $91,000 for FHC and FRO assistance was $1,461,300. Salaries and benefits accounted for 54 percent of the total.

Full-time staff years employed were 21.2; permanent employees 20.3 and temporaries 0.9 years. Thirty-two (32) employees were represented in the staffing during the year. This number included YCC program participants and Older Worker Program employment.

Overall feed conversion was 1.56 (less than 2 pounds of food to produce 1 pound of fish gain); spring chinook 1.69 and steelhead 1.54. Total feed cost per pound of fish produced was $0.52; chinook $0.84 and steelhead $0.48. Costs in both programs increased substantially this year because of a significant increase in contract feed costs early in the fiscal year.

The hatchery's gain in steelhead production was 332,705 pounds for the year (10/01/92 - 9/30/93) compared to last year's production of 450,785 pounds. Health problems in the program mid-winter caused many ponds to go off feed and result in a drop in growth. Weight gain was primarily from Brood Year 1992's program released as smolts in spring 1993. Dworshak released 2,388,993 steelhead smolts, weighing 323,308 pounds (185 mm), both off-site and directly from the hatchery.

Spring chinook production gain of 40,162 pounds was significantly below the previous year's of 81,173 pounds as only 467,222 smolts were produced due to low egg numbers collected. These smolts weighing 27,384 pounds (147 mm) were from Brood Year 1991, released in April-May 1993.

Brood Year 1992's egg takes were again down due to fewer returning adults to Dworshak's fish ladder. However, over 900,000 eyed spring chinook eggs were received in October 1992 from Rapid River State Hatchery to fill-in Dworshak's deficit. This number in addition to eggs on station would assure meeting production capacity for a release of 1.3 million smolts in spring 1994.

Ending the reporting year of September 30, 1993, Dworshak had on station 1,319,872 spring chinook fingerlings (Brood Year 1992) for a planned yearling smolt release in spring 1994 of 1.27 million in spring 1994. Success to date of the steelhead program was attributed to the continued absence of IHN virus in Dworshak's nursery rearing.

Adipose fin clipping of Dworshak's steelhead production was begun on October 8, 1992. Clipping of these fish was completed November 16. CWT marking of the remaining STT took place from December 8 through December 16, for a total number marked of 2.66 million fish.

Dworshak's fish ladder was opened on October 29, 1992 to collect early returning steelhead and continued to operate intermittently through November 20. A total of 325 STT adults were collected during this period to be held for spawning in late January. The ladder was reopened in mid-February 1993 and closed on May 3.

Returning adult steelhead to Dworshak totaled 7,900 fish. Nearly 8 million green eggs were collected for the various STT programs. Excess adults were outplanted to the South Fork of the Clearwater River (2264) while 206 were shipped to the Boise River for release. Another 2445 fish were processed for food distribution by Idaho Department of Education.

Considerable effort was again devoted to the stock performance and productivity study being coordinated with the National Fisheries Research Center - Seattle (NFRC-S). Special handling procedures and three special spawning days for hatchery were necessary to ensure sufficient numbers of study fish would be produced. Additional spawning days for wild adults were conducted by NFRC-S personnel. Unfortunately, most of the wild offspring were lost after a power failure cut off the water supply to the incubator room. Survivors are being reared for release in spring 1994 along with four ponds of hatchery stock involved in this study.

Transportation arrangements were made with the Corps of Engineers to truck Dworshak's steelhead to off-site locations. Three trucks from the COE logged 30 trips and 2500 miles to plant the South Fork of the Clearwater River and Clear Creek with 1.17 million STT smolts. Dworshak's release of an additional 1.22 million steelhead directly from the hatchery occurred on May 3 and 4 for a final total of 323,000 pounds of steelhead smolts produced and distributed. Dworshak also direct released 467,000 spring chinook to the North Fork of the Clearwater River from April 8 through May 6.

Release of Dworshak's spring smolts from the hatchery was again coordinated with Reservoir Control Center in Portland to provide increase water from Dworshak Reservoir during time of release when river flows were minimal. An increase was requested from 1100 cfs to 5000 cfs only on April 8 during the time period of 1000 to 1600. Other smolt releases benefitted by high flows scheduled for downriver fish passage.

Final steelhead eyed egg shipments were made to Magic Valley and Clearwater state hatcheries in May. A total of 2.37 million eggs were transferred to these State and LSRCP facilities.

Fish tagging and clipping of spring chinook fingerlings were begun on June 15 by a crew contracted with and supervised by the Vancouver FRO. These activities, in which all 1.33 million fish were ad-clipped and most were CWT marked, were completed on June 16.

A power outage on June 26 caused by lightning resulted in a loss of 225,000 fingerling steelhead in Dworshak's nursery. Also affected by the water shut-off were several thousand steelhead fry located in incubators; this latter group a part of Reisenbichler's study. Adequate numbers remained, however, to salvage a major part of the study. Three standby generators did not respond automatically to the outage resulting in pumps being down from 20 to 35 minutes.

The hatchery reported another successful 1993 steelhead rearing program using reservoir water in the nursery tanks. No IHN virus was found in the nursery building for the 2nd year on the new water supply. Steelhead production continued to remain generally free of IHN virus through September in the outside rearing ponds. This year's success must be attributed to a change in ponding strategy which maximized use of "clean" reservoir water in the nursery for holding young steelhead longer and delaying ponding of the fingerlings until fish were larger than 100 per pound; a change from a smaller 200-250 fish per pound normally followed.

Monthly Hatchery Evaluation Team (HET) meetings continued during FY 1993 with Idaho FRO and Dworshak FHC participating with hatchery members. Major accomplishments for the team were: (1) the establishment of their role in the workings of the Complex, (2) aiding as a general communication and coordination forum, and (3) review of operations and prioritization of goals for the three projects.

The fish ladder was opened on May 21 for returning adult chinook. Spawning began on August 23 with completion on September 13. Adult returns to Dworshak

were 823 fish and Kooskia 1180. Green egg take from Dworshak fish was 1.48 million eggs, with 2.0 million from Kooskia adults. Dworshak retained 1.53 million eyed eggs (580,000 of Kooskia stock) anticipating 1.35 million smolts in 1995. Kooskia received 1.0 million eyed eggs from its stock for an 800,000 smolt release.

Planning and scheduling for Dworshak's major rehab work was turned back by the Corps of Engineers (COE) Washington Headquarters Office when submitted for approval from the District. As the result of this setback, several meetings were scheduled with District Engineers to address the urgency of particular sections of the rehab program being funded from other sources and to delete others that may be accomplished through direct O&M money. Immediate attention must be given to specific items, i.e., electrical and pumping, to assure operation of the hatchery continues without further unexpected breakdowns.

An Environmental Review Team (ERGO) from the Corps of Engineers (COE), Walla Walla District, was on station at Dworshak in May. Necessary action will be needed to assure several environmental concerns are addressed and future funding requests be earmarked for particular projects requiring attention.

Another highly successful 3rd annual Open House was held on June 19, 1993. The highlight of the event was a free fish pond attracting 528 children registering and catching two rainbow trout each. Another 594 adults attended the popular activities in conjunction with National Fishing Week.

July will go down as the wettest and coldest month in history. Temperatures were 15° below normal and precipitation was above 3 inches.

An 8-week Youth Conservation Corps (YCC) program ended on July 30. The program, staffed with six enrollees and one crew leader, was again highly successful. It is noted that participation in the YCC program dates back to 1983. Numerous work projects were performed with special attention given to buildings and grounds maintenance.

River flows were up during July from increased spilling at Dworshak Dam. Flows ranged form 10,000 to 25,000 cfs with reservoir drawdown reaching 1540 feet elevation; a 60 foot drop over a 4 week period ending August 13. Adjustments of water temperature via selector gates for both reservoir and river water supplies were limited during time of drawdown.

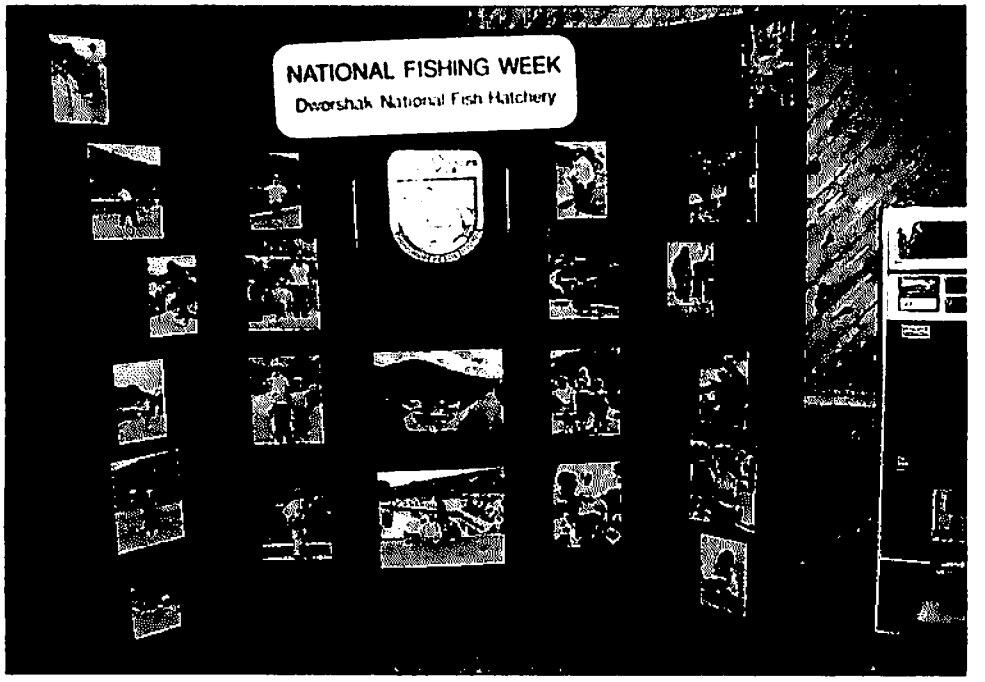
Considerable time and effort were involved in obtaining a dredging permit from the COE to work in the hatchery's main river intake. Efforts were begun early in the spring for permission to complete the removal of materials from the site. Application was stalled for no apparent reason considering the proper procedures taken. The permit was received on September 1 which allowed us to have completed the work by August 31. No work was to have begun before this date without all parties signing. Needless to say, a major undertaking was accomplished beginning on August 16 with final completion on August 31. Contract cost of $23,915 went to $48,000 when it was discovered that materials removed were over 3 times the estimate. Crane time to remove and again set the trash racks was $4000. Thanks to Dworshak's maintenance crew, Idaho FRO

divers and maintenance assistance, and Clearwater County diving assistance, this job could not have been completed without everyone's cooperative efforts.

Hatchery Manager Wayne Olson with IFRO Project Leader Bill Miller co-authored a paper, "Dworshak National Fish Hatchery - A Mitigation Hatchery That Works." The paper was displayed at a poster session of the 123rd American Fisheries Society meeting held in Portland August 29 to September 2.

Station safety continued to be emphasized through formal meetings and employees participation in committee activities. Few minor injuries were reported that required medical attention.

To accomplish Region One's "Vision Action Planning" - "Fisheries: A Future Legacy," an action team is represented with several station members assigned. Accomplishments included: (1) continuation of public outreach with a station "Open House" as a highlight, and identification of 0.3 FTE annual staff participation from Biologist David Weigand earmarked directly for "Outreach," (2) expanding training activities for all employees, (3) routine meetings of maintenance and production section, (4) employee representation on action planning teams, and (5) involvement in the hatchery evaluation team. Employees are also represented on the Region's market review team, budget action team, and water quality team.

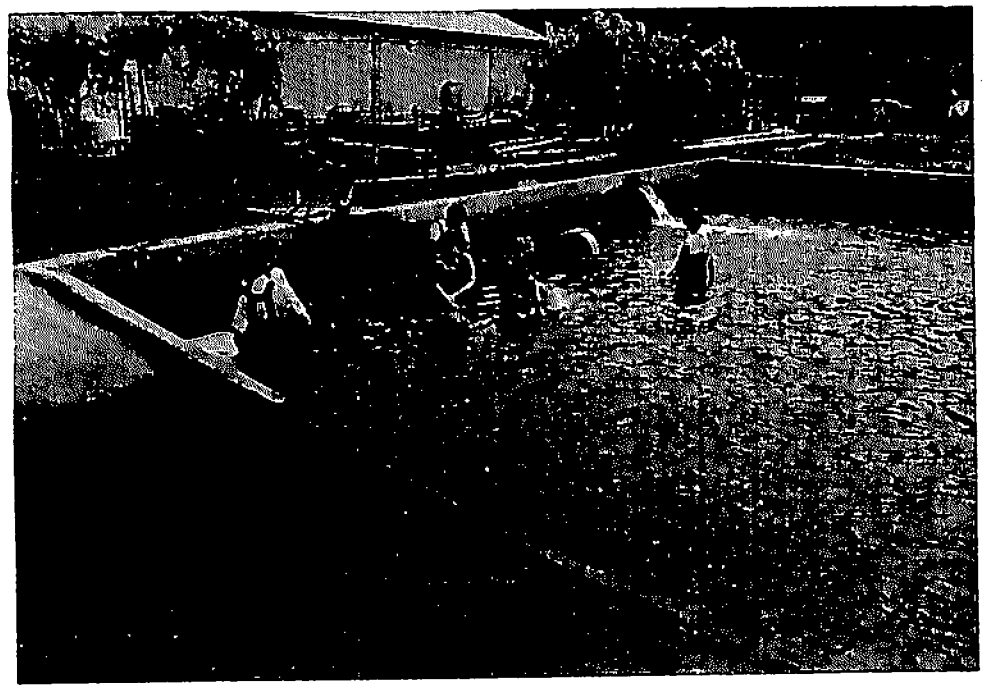


- June 19, 1993 -

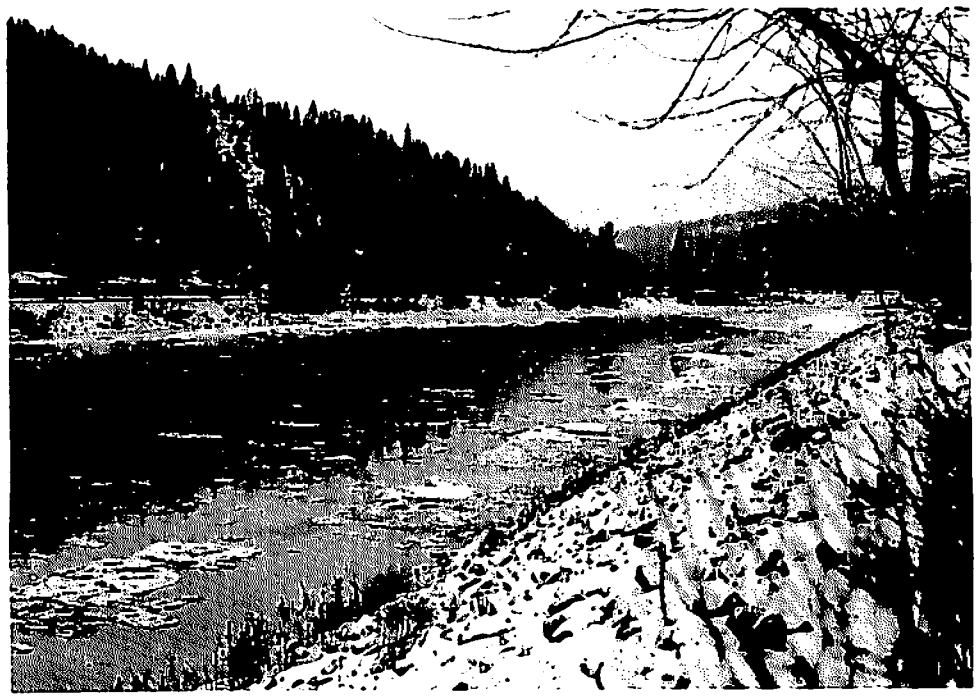
Station employees adding a finishing touch to the hatchery grounds with flowers as part of "Open House" June 19.

- Open House -
Kid's Fishing Pond

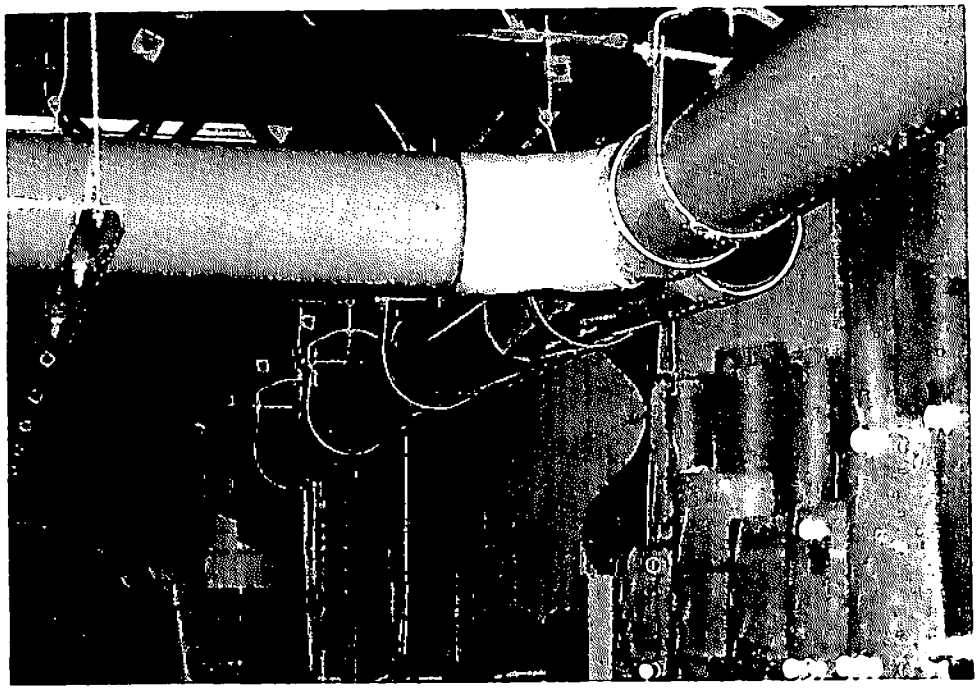
- Open House -
Kid's Fishing Pond
and lucky catches.



YCC enrollees seining and removing excess rainbow trout from "Open House" fishing pond. Fish were hauled to outlying planting sites at IDFG's request.

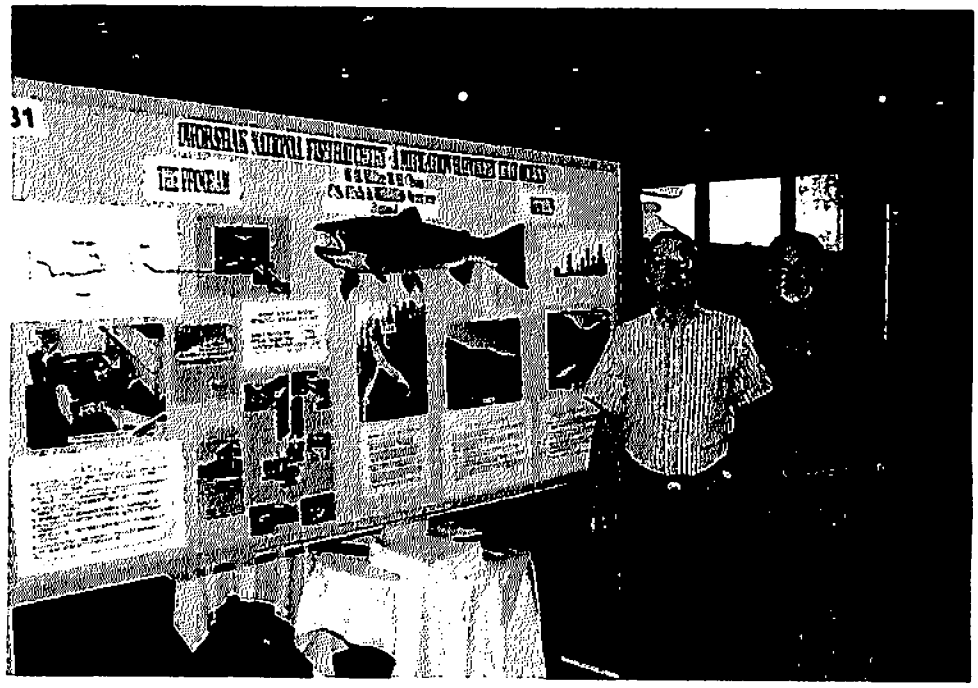


Clearwater River freeze-up in early December followed by an above normal snowfall.

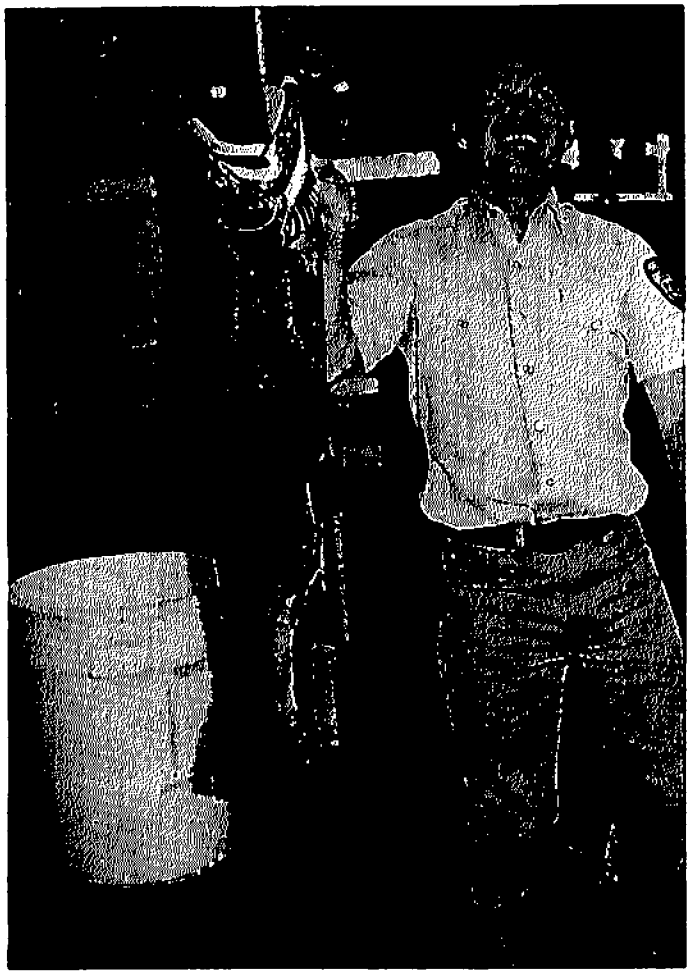


Major pipe damage in the nursery tanks area caused from a buildup of CO_2 gas in the reservoir supply line.

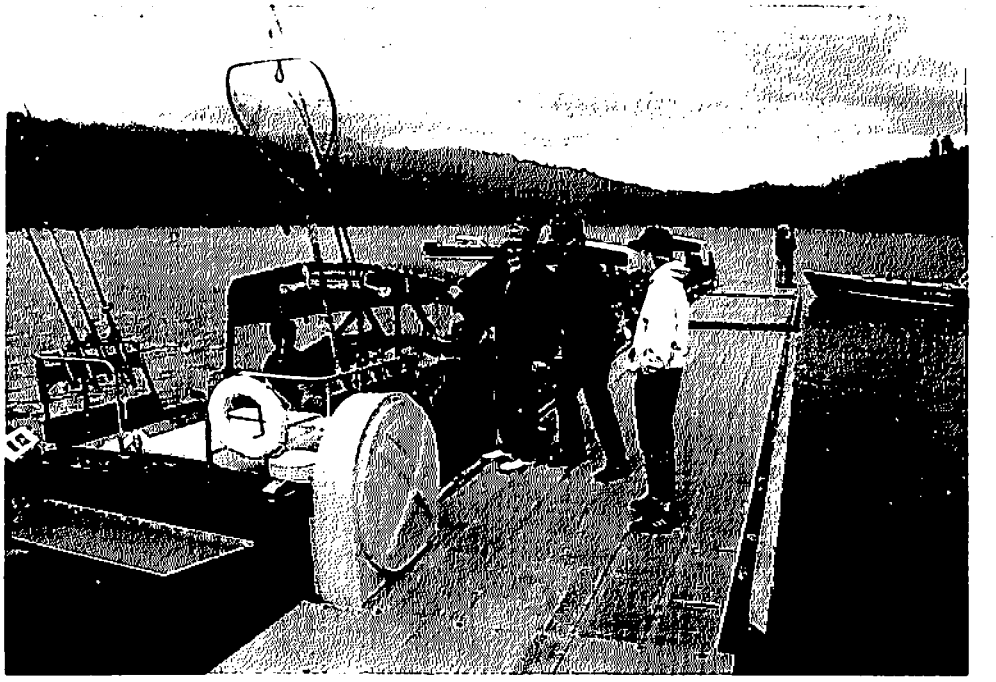
Pipe explosion of line furnishing reservoir water to a section of Dworshak's nursery tanks - damaged pipe replacement estimated at $3000.



Poster presentation by Hatchery Manager, Wayne Olson and Idaho FRO Project Leader Bill Miller, at the A.F.S. conference, in Portland - August 1993.



Nice Steelhead! Dave Owsley displaying a 42-inch, 21 pound male spawner.



Dworshak's annual kokanee fishing derby held on Dworshak Reservoir in May for all employees and guests.

FISH CULTURE OPERATIONS

Steelhead Trout Production

- Brood Year 1992 -

The hatchery's gain in steelhead production was 332,705 pounds for the year (10/01/92 - 9/30/93) compared to last year's production of 450,785 pounds. This decrease was due to BY 1992 STT averaging 185 mm (7.39 FPP) at release, compared to the 206 mm length (5.37 FPP) attained by BY 1991 fish. Dworshak released 2,388,993 steelhead smolts in Spring 1993, weighing 323,308 pounds, both off-site and directly from the hatchery. The mitigation goal for steelhead production was generally accomplished, with an average smolt length of 185 mm at time of release.

As shown in Table 1 below, BY 1992 steelhead had excellent survival from eyed eggs through smolt release, with a 60.7 percent survival, considerably above three of the four previous years. Tanking to smolt survival was the highest recently recorded at 66.7 percent. While early-ponded fish lost an average 30 percent to IHN, few fish ponded later succumbed to the disease. Overall, a loss of 18.8 percent were lost during ponding. While survival overall has increased considerably, enabling a gradual reduction in initial numbers, we are confident that cumulative survival from green egg to smolt can be increased from BY 1992's 49.1 percent to 60 percent. This will depend largely on determining the optimum size and date to pond these fish, and upon identifying cultural procedures and practices which can help increase ultimate smolt quality.

Table 1. Survival summary - steelhead trout, Dworshak NFH.

	Percent Surviving from Previous Stage				Cumul.	Cumul.	Cumul.
BY	EYDegg	TANKfry	PONDfing	RLSDsmlt	GRN>smlt Survival	EYD>smlt Survival	TANK>smlt Survival
1988	88.7	94.2	29.5	79.2	19.5	22.0	23.4
1989	86.7	97.9	21.9	92.3	17.2	19.8	20.2
1990	84.1	97.0	71.1	89.1	51.7	61.4	63.4
1991	80.3	87.5	58.5	92.0	37.8	47.1	53.8
1992	81.0	90.9	82.2	81.2	49.1	60.7	66.7
5YRavg	84.2	93.5	52.6	86.8	35.1	42.2	45.5
1993	90.6	92.6	87.2	0.0	0.0	na	na

Note: Data are only for STT reared entirely at Dworshak NFH.
* Data does not include eggs deliberately culled before eye-up.

Source: SRVSUMST.wk1 - RV 09/29/93

By system, the steelhead in System 1 had a ponding to release survival of 66.4 percent, after adjusting numbers for inventory gains. The loss in System 1 reflects the 30 percent average loss in most of these ponds to IHN. System 2 had a survival of 85.0 percent, with chronic losses to Ich. System 3's survival was 83.9 percent, with several ponds experiencing IHN.

System 1

Aside from IHNV, the fish in System 1 were in generally good health during the remainder of the rearing cycle. This, despite the fact that 22 of the 25 ponds were treated with 167 mg/l formalin treatment for one hour from January through early April for external parasites, mainly Trichodina spp. although some Gyrodactylus spp. was present and recommended for treatment by the Dworshak FHC. The single formalin treatments were very effective in reducing parasite numbers as well as mortalities, and seemed to help reduce gill swelling. Only BP 11 received two treatments for parasites. Historically, numerous and repeated treatments for external parasites have been given to the fish in this system, the only system on continuous raw river water.

Table 2 summarizes steelhead performance in System 1 during FY 1993. The elevated mortality in early winter of 1992 is due to lingering effects of the previous summer's IHN epidemic. One curiosity is the fact that higher mid-winter mortalities were exhibited by the five ponds which never experienced IHN losses.

Table 2. System 1 steelhead performance (1992-1993) - BY 1992.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	92	724,370	19.6	0.54	3.65	53.2
November	92	706,737	14.6	0.58	2.22	50.0
December	92	690,996	11.0	0.32	1.68	44.2
January	93	679,381	9.51	0.18	1.39	40.6
February	93	669,930	8.77	0.16	1.03	39.7
March	93	663,408	8.18	0.21	0.88	40.5
April	93	657,577	7.51	0.03	0.38	40.0
Release		655,775	7.05	-	-	-

The fish in System 1 averaged 188 mm in length (7.05 FPP) at time of release in Spring 1993, when 655,775 smolts were outplanted and directly released into tributaries of the Clearwater River or into the Clearwater River itself. A Length Deviation Index (LDI) of 7.2 was achieved for fish in the system, indicating the 25 ponds' size at release were fairly uniform. LDI, an index used at Dworshak for several years now, is simply the standard deviation of the 25 average FPPs at release divided by the overall average FPP at release times 100. The greater the LDI, the greater variation in average fish size from pond to pond.

According to Dworshak Fish Health Center, the smolts appeared to be in generally good health at release. Although high levels of Trichodina, Gyrodactylus, and Epistylis had caused a deterioration of fish health in some ponds, fish in this system had the best condition factor and fat content of fish in all three systems. This agrees with historical observations and with CWT mark contribution studies that generally show higher rates of return from System 1 STT. For a comparison and discussion of the relative health of the fish in Systems 1, 2, and 3 see the Smolt Quality Assessment Section below.

Steelhead trout in 15 of 17 rearing units in System 1 were ad-clipped by personnel from the Idaho Department of Fish and Game between October 8 and 28. The remaining fish were ad-clipped, CWT marked and some freeze branded in mid-December by IDFG marking crews. Two ponds contained fish marked for determining contribution of these fish to later adult returns, and one pond of fish was CWT for a sport harvest mark. PIT-tag marking of 500 fish from this system was accomplished during March 1993 by IDFRO personnel.

Once all fish had been inventoried by marking crews, it was determined that the 732,217 fish inventoried exceeded current book values by 20,157 fish, a surplus of only 2.8 percent. This is well below the 5 percent error value that is occasionally used as a rule-of-thumb for assessing how accurately production is keeping its books. This good agreement with actual inventory values (repeated in Systems 2 and 3) validates most of the accounting and cultural procedures currently practiced such as use of appropriate water adjustment factors when inventorying fish, accurate mortality picking and recording, and the use of individual rearing unit record sheets. For the last three brood years, this deviation from book value for System 1 has averaged a mere 1.0 percent.

System 2

System 2 was comprised of fish from Takes 9 through 15 this production program, along with a few thousand National Fisheries Research Center-Seattle (NFRC-S) study fish that came on feed a good two weeks after Take 15. These steelhead had their share of health problems, even though the IHN virus was not one of them. *Ichthyophthirius multifilis* (Ich) began retarding growth and causing mortality in January 1993, with 25 one-hour treatments of 220 mg/l formalin being given that month, several to the same ponds. Treatment effectiveness was debatable, with only some of the repeated treatments resulting in evident reduction in mortalities. For that reason, no further treatments were given for the parasite. In an attempt to reduce severity of the disease, water temperatures were dropped from the heated reuse temperature of 54°F to 50°F in mid-January. As shown in Table 3, System 2's temperature remained at this level for the remainder of the production program. Two ponds lost over 20 percent of their populations to the parasite.

Table 3. System 2 steelhead performance (1992-1993) - BY 1992.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	92	542,088	49.8	0.45	0.16	53.2
November	92	771,604	35.8	0.57	0.43	40.0
December	92	789,164	24.6	0.43	0.53	52.2
January	93	789,108	19.2	0.32	5.43	51.0
February	93	746,277	16.1	0.36	3.63	49.9
March	93	719,198	13.4	0.49	3.96	50.9
April	93	690,732	10.5	0.40	1.54	46.7
Release		679,949	8.97	-	-	-

The flare-up in Ich can be seen in monthly mortality that rose above five percent in January, and the long-term effect of the cooler water can be seen in the subdued growth from that point on. Although the system went to heated reuse on December 7, the limited winter growth caused by Ich and cool water resulted in these fish being released at an average length of only 172 mm (8.97 FPP) in April and May of 1993. This was considerably below the 200 mm target length planned for fish in this program.

It should be mentioned that approximately 43,000 fish were reared in two ponds in this system that were involved in evaluating the effects of genetic mark selection on the fish's on-station performance. This is part of a long-term, multiple-part study being conducted in cooperation with the NFRC-S. Another group of 2,900 fish possessing a homozygous mark were reared in BP 16 to compare on-station performance of these offspring of hatchery and wild adults. The most obvious result of the tests through release was that hatchery offspring survived considerably better than wild offspring. Future reports from NFRC-S will keep all involved parties current on the study findings.

Ad-clipping of the system's fish by IDFG marking crews took place from November 18 through 30. CWT marking and some freeze branding, as well as finishing up the ad-clipping, occurred from December 7 through 10. Late winter PIT tag marking occurred in mid-April, with IDFRO personnel implanting 750 fish with PIT tags, 250 from BP 8 and 500 from BP 16. Fish in BPs 8 and 44 were marked for contribution and outmigration studies, while the fish in BP 42 were marked for sport harvest purposes. NFRC-S study fish in BPs 20 and 22 also received left vent clips, CWT marks, and some received freeze brands, as well. Fish marking inventory numbers were only 3.0 percent above Production book values, 23,142 fish long. The previous two years' inventories were within 2.3 to 3.1 percent of book values.

As mentioned, these STT were released in April and May of 1993, with 679,949 fish being outplanted and directly released. An LDI of 5.41 indicated little variation from pond to pond in average fish lengths. All ponds were sample counted before release. Mortality had dropped to under two percent monthly by release time, although health problems were still present. Prior to release, the water was dropped to ambient temperatures on April 13 and 14, with the system going to raw water on April 21. The reuse system, incidentally, functioned well during this production cycle, with electrolyte levels being maintained appropriately for the most part.

Half the fish in this system were outplanted in the South Fork of the Clearwater River and in Clear Creek from April 22 to 26, 1993, with the remaining half directly released from the hatchery to the Main Stem of the Clearwater River on May 3.

System 3

Only three takes comprised System 3 this production cycle, both early and normal returns in Take 7, as well as fish from Takes 8 and 9. Total initial ponding, adjusted for marking inventory changes, was 1.26 million fish. This averaged 36,930 fish per pond for the system. While this is not too different

from some earlier years, it is still higher than is probably optimum for producing high quality steelhead smolts.

System 3 fish began pond rearing under fairly good conditions. Most of these fish had ponding delayed until August and September, due to IHN outbreaks in System 1 fish in June and July. A few of these ponds, with fish ponded at under 80 FPP, and so larger than System 1 fish, still broke with the virus. Losses were generally subdued, however, except for BP 61 which lost 37 percent of its population overall. At time of release 12 of the 34 ponds contained fish that had experienced IHNV.

These fish grew quite rapidly and, by December 1, just before going on reuse December 8, averaged 17 FPP, substantially larger than the 31 FPP target given in this system's standard growth projection. Growth and fish condition remained good through January (Table 4). In February, however, health problems began to occur and, from that point on, monthly growth of 0.35 inches and under was experienced. Mortality, while just above one percent monthly in early winter, also rose again in February, reaching 2.8 percent in March.

Table 4. System 3 steelhead performance (1992-1993) - BY 1992.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	92	818,244	30.3	0.64	0.96	53.2
November	92	1,120,766	23.1	0.53	1.02	50.0
December	92	1,121,498	17.1	0.70	1.08	54.4
January	93	1,112,246	11.9	0.53	0.43	53.5
February	93	1,107,514	9.31	0.31	0.84	53.8
March	93	1,098,177	8.15	0.35	2.78	51.1
April	93	1,067,590	7.05	0.08	-	46.6
Release		1,053,269	5.37	-	-	-

The fish health problems and losses were likely the result of several factors. First of all, the average loadings of 36,000 fish per rearing unit. A continued attempt to get good growth on this large number of fairly good sized fish probably led to reduced water quality in the reuse system. The reuse system evidently was not able to handle the job of fecal and feed matter removal adequately, because water pumped back into the ponds had a fair amount of suspended solids in it. Ammonia levels at 0.7 to 1.0 mg/L were also four to six times those in System 2. A series of extended salt pump malfunctions caused sodium ion levels to rise to 25 mg/L from the recommended 20 mg/L and potassium levels to drop below the recommended 8 mg/L. Combined, these conditions resulted in gill filament clubbing, gill swelling, depressed growth rates, and, ultimately, increased mortality in several ponds. Two ponds were diagnosed with bacterial kidney disease, although the actual problems were more widespread. What is surprising is that no formalin treatments were necessary for the parasite Trichodina.

With fish health and growth suffering, this group's target length was not reached and released as smolts at 190 mm, 6.82 FPP, under the 200 mm target.

Somewhat cooler water was employed during March and part of April to partially ameliorate the other rearing conditions. Temperature was dropped to ambient on April 13 and 14, with the system going off reuse on April 19. Half the 1,053,269 fish in the system were outplanted to the South Fork of the Clearwater River April 19 through 21, with the remainder directly released May 4, 1993. At time of release the Dworshak FHC rated the health of the fish in System 3 as generally good.

Fish in the system were ad-clipped by IDFG marking crews from 10/28/92 through 11/17/92, with a couple ponds left for CWT marking. These ponds of fish got CWT marked and left vent fin clipped from 12/14 through 12/16, two ponds receiving marks for contribution studies and one being marked for sport harvest. Any fish not receiving CWT marks in the three ponds were ad-clipped, and an additional 17,000 fish received freeze brands for out-migration information. PIT-tag marking of 500 STT in the system took place in March. Over 1.136 million steelhead were inventoried during marking, a 55,068 fish surplus which was 5.1 percent over book values. This represents fairly good agreement and confirms that proper inventory and accounting procedures are being used.

Distribution

Releases of steelhead smolts began April 19 and continued through April 26, 1993. In six days of outplanting 1.17 million smolts were successfully transported to the South Fork of the Clearwater River, the Main Stem of the Clearwater River at Kamiah, and Clear Creek (Table 5). These fish average 182 mm in length. The direct release of 1.22 million additional smolts, averaging 188 mm in length, a week later from the hatchery into the Main Stem of the Clearwater River also went smoothly. A total of just over 2.38 million STT smolts with an average length of 185 mm were released from this production program. Numberwise, this release mimics Release Year 1992 when 2.31 million smolts were released. Last year's average length, however, was considerably greater at 206 mm.

Table 5. Distribution summary by type release and by system - STT Brood Year 1992 (April 19- May 4, 1993).

	Number	Weight	No/lb	--Length-- in	mm
OUTPLANTS (4/19-26/93):					
System 1	328,603	40,564	8.10	7.07	180
System 2	339,869	37,205	9.14	6.79	172
System 3	502,531	73,833	6.81	7.49	190
Subtotal/average	1,171,003	151,602	7.72	7.18	182
DIRECT (5/3-4/93):					
System 1	327,172	52,454	6.24	7.71	196
System 2	340,080	38,572	8.82	6.87	174
System 3	550,738	80,680	6.83	7.48	190
Subtotal/average	1,217,990	171,706	7.09	7.39	188
Grand Total	2,388,993	323,308	7.39	7.28	185

Three U. S. Corps of Engineers drivers and distribution tractor-trailers accomplished the fish hauling with no major incidents over a period of six days.

Table 6. Release summary by water and site - STT BY 1992 (April 19 - May 4, 1993).

WATER	AT (Site)	Number	Weight	No/lb	--Length-- in	mm
Outplants: (4/19-26/93)						
MAIN S. CLEARWTR. R.	KAMIAH BDG.	88,500	10,746	8.24	7.03	179
S.F. CLEARWTR. R.	MILL CR. BDG.	178,894	22,878	7.82	7.15	182
S.F. CLEARWTR. R.	COTTONWOOD CR.	320,943	41,094	7.81	7.15	182
S.F. CLEARWTR. R.	RIVER MILE 8.7	239,792	29,862	8.03	7.09	180
CLEAR CR.		342,874	47,023	7.29	7.32	186
Subtotal/average		1,171,003	151,602	7.72	7.18	182
Direct: (5/3-4/93)						
M.S. CLEARWTR. R.		1,217,990	171,706	7.09	7.39	188
Grand Total		2,388,993	323,308	7.39	7.28	185

As Table 7 indicates, there was considerable variation in final release sizes at release time between fish in the three systems. System 2, at 173 mm, was substantially below Systems 1 and 3. Again, this was due in large part to Ich problems and the cooler reuse temperatures used in an attempt to control this parasite. System 3 average was smaller than target because of earlier mentioned fish health problems. System 1 experienced three weeks of cold

water the previous summer, which subdued growth enough so these fish did not make target size. For System 1 fish, on ambient temperatures the entire rearing cycle, making target size is not possible every year even with good water temperatures and using early egg groups.

Table 7. Distribution summary by system - STT
Brood Year 1992 (April 19 - May 4, 1993).

	Number	Weight	No/lb	--Length-- in	mm
System 1	655,775	93,018	7.05	7.40	188
System 2	679,949	75,777	8.97	6.83	173
System 3	1,053,269	154,513	6.82	7.48	190
Grand Total	2,388,993	323,308	7.39	7.28	185

Smolt Quality Assessment

While the fish in all three systems were released in at least generally good condition, System 2 and 3 fish had experienced significant fish health problems detailed above. A comparison of smolt quality between fish in the three systems, using four of the more important smolt assessment criteria, is presented in Table 8. This comparison shows the quantitative difference in fish quality between different groups of STT smolts.

Table 8. Smolt assessment comparisons between systems just prior to release - Steelhead BY 1993.

System	No. Fish Sampled	Condition Factor	Hematocrit (35+=good)	Gill Condition (Normal/Swelled)		Mesenteric Fat (Scale 0 to 4)
System 1	34	3.79	55.6	88%	9%*	2.1
System 2	40	3.22	51.5	57%	33%	0.9
System 3	53	3.56	44.6	38%	58%	1.3

* Does not add to 100% because additional gill conditions are rated (not shown).

Source: Summaries of Fish Autopsy - DFHC 3/18/93-4/26/93

System 1 fish were in better shape than fish in the other two systems based on all four criteria. They had the highest condition factor, indicating good body condition, a fact corroborated by an average mesenteric fat index of 2.1. This index rates the relative level of body cavity fat, with a 0 level indicating essentially none and a 4 indicating abundant fat. While fish can probably have too much fat, some is usually desirable, so that an average of 2 to 3 might be recommended for smolts just before release. At present, it is not known what the best range is for this index for Dworshak steelhead. Hopefully, in the near future, both literature reviews and an analysis of historical data will provide justification for a recommendation.

Condition factors and fat indices for System 3 fish were second best, at 3.56 and 1.3, respectively. The fat index being almost one half that of System 1 fish indicates System 3 fish probably had problems earlier, a fact discussed in previous section. System 2 steelhead, with a condition factor of only 3.22 and fat index of only 0.9 very clearly had problems. The Ich and cold water in this system produced minimal growth in these fish, and substandard fish quality resulted.

Hematocrits were all well above the recommended minimum of 35, but here System 2 fish hematocrits were significantly above those of fish in System 3. This more than likely reflects the deteriorated water conditions that prevailed in System 3 in February and March 1993. Gill condition ratings also demonstrate the good rearing conditions in System 1 on raw water, with 88 percent of gills showing normal gill development, and only 9 percent exhibiting swelling. System 2 fish, with a 57/33 ratio of normal to swelled gills were in clearly better condition than those in System 3, which had a 38/58 ratio.

The lower gill and other criteria indices in reuse system steelhead simply confirm that a compromise in fish health generally occurs in the use of reuse rearing systems. The extent and magnitude of that compromise is somewhat open to both debate and to experimental or analytical demonstration. In any case, the current rearing strategy, while possessing weak points, remains a reasonable means of maintaining this strain of steelhead, given the current facilities and administrative, biological, and environmental constraints.

- Brood Year 1993 -

A summary of Brood Year 1993's spawning season is referred to in "Spawning Report - Steelhead Trout, Brood Year 1993", dated July 29, 1993.

Summary of Run

Adult steelhead were collected as in recent years, with early-returning STT being collected as well as the normal spectrum of the run. The ladder operated 16 days of the period October 29 through November 20, 1992, during which time 325 early-returning STT were collected.* The ladder reopened February 16, 1993, remaining open until May 3, 1993.

During the collection period 7,900 adult STT returned to Dworshak, more than enough to allow sufficient eggs to be taken for the various programs involved. A total of 5,432 females returned along with 2,468 males, producing a 68.8 percent female to 31.2 percent male ratio (Table 9). As in the past, the run was dominated by II-ocean fish, which constituted 93.0 percent of all returning adults.

*The ladder was closed when fish movement into the hatchery had stopped. River flows during the fall were extremely low with only 1100 cfs in the North Fork. Normally, flows from Dworshak Dam during this same period would range from 4000 to 5000 cfs providing improved conditions to move fish upriver.

Table 9. Age and sex structure summary - STT adults Brood Year 1993.

	Male No.	(%)	Female No.	(%)	Total No.	(%)
I-ocean	348	(4.4)	41	(0.5)	389	(4.9)
II-ocean	1,993	(25.2)	5,356	(67.8)	7,349	(93.0)
III-ocean	127	(1.6)	35	(0.5)	162	(2.1)
	2,468	(31.2)	5,432	(68.8)	7,900	(100.0)

source: IFRO 92/93 Final Weekly Dw STT Count

Early-returning adult STT were treated with a one-hour formalin treatment (167 mg/l) three times each week from 11/25/92 through 1/27/93. Pre-spawning mortality totaled 14 fish out of 325, or 4.3 percent of the fish on hand during the first day of spawning.

Spawning Summary

Over 7.8 million green eggs were taken in 15 egg takes from 1,153 females and 768 males (Table 10). This total was enough to cover mitigation needs and other program requirements, and included 136 females specially spawned for a productivity/stock performance study conducted with NFRC-S personnel.

Table 10. Spawning and egg enumeration summary - BY 1993 Steelhead.

Takes	NOspawned Mls.	Fmls	Actual GRNeggs	Actual EYDeggs	EYup Enum egg%	EYup Total egg%	Actual Eggs/ Female	====CULLED===== GRNeggs	EYDeggs
1-15	768	1,153	7,811,988	6,941,410	90.6	88.9	6,775	152,730	1,150,300

Source: EGUP93ST.wkl - RV 06/05/93

Fecundity for this brood year averaged 6,775 eggs per female and eye-up for eggs actually enumerated was 90.6 percent, which produced 6.94 million eyed eggs. The 90.6 percent eye-up is well above the previous five-year average of 84.2 percent, and was likely due to the use of a one percent saline solution during egg fertilization. Total eye-up was 88.9 percent, indicating very few trays of completely dead eggs were experienced. These eggs are discarded and not enumerated. However, the total eye-up value includes them as this value is the effective eye-up for all eggs taken.

A total of 1.53 million green eggs were culled due to IHNV status or to IHN concerns which prevented shipment outside the Clearwater drainage or to other hatcheries, or they were culled as being surplus to planned programs. The overall male to female spawning ratio was 1.0:1.5.

Spawning Procedures

Procedures were basically the same as in previous years. Adults were crowded from holding ponds into the channel, then into the channel basket and dumped into anesthetic bins. The fish were anesthetized with a 200 to 300 mg/l carbon dioxide solution (buffered with sodium bicarbonate), then lifted to the sorting table.

Ripe adults were sent to the spawning table with the females killed by a pneumatic knife at the sorting table. Green and excess ripe adults were returned to holding ponds. Sperm was kept in a cooler until needed. Eggs from one or two females were fertilized with sperm from one male, rinsed, and then placed in Heath incubator trays. Aseptic procedures were employed throughout spawning operations. Iodophor solutions of 500 mg/l and 250 mg/l were used to disinfect equipment and workers' hands, respectively.

Eggs were water hardened in a buffered 75 mg/l iodophor solution for 30 minutes. After eye-up, the eggs were shocked, passed through an egg picker, and then counted. They were then disinfected for 10 minutes in a buffered 100 mg/L iodophor solution. Most eggs were then placed into hatching jars (33,000 per jar) over nursery tanks for hatching, although some were hatched in incubator trays (11,000 per tray).

DFHC sampled selected spawned adults for IHNV (Table 11). As in previous brood years, IHN levels were fairly high early and late in the run.

Table 11. IHN Incidence in Sampled STT Adults - Brood Year 1993.

	No. Sampled		IHNV Positive					
			Male		Female		Totals	
Take Date	Male	Female	No.	%	No.	%	No.	%
TOTALS	133	467	7	5.3	12	2.6	19	3.2

* Table includes fish sampled for NFRC-S's spawns.
Note that fish sampled are occasionally from adults not spawned.

Source: Sampling Results - Dworshak FHC, IDFG Eagle Lab, NFRC-S.

In addition to testing spawned adults for IHNV, fish health samples were taken for several other diseases (Table 12).

Table 12. Disease sampling summary - STT Brood Year 1993.

Disease	==Adults Sampled== Number	Percent	Number Positive	Percent Positive
1. BKD	270	47.8*	2	0.7
2. Ceratomyxa	150	26.5	105	70.0
3. EIBS	150	26.5	6	4.0
4. ERM	150	26.5	17	11.3
5. Furunculosis	150	26.5	0	0.0
6. IPN	150	26.5	0	0.0
7. Myxosoma	100	26.5	0	0.0
8. PKD	150	26.5	0	0.0
9. IHN	600	100.0	19	3.4

* Percent indicates proportion of sampled adults tested for this disease.

Source: Dworshak FHC - May 1993

Sperm and unfertilized eggs were also provided to several research projects during the spawning season.

Special spawning procedures and special spawning days were conducted for a study being run in cooperation with Reg Reisenbichler et al. of the NFRC-S. These took place on 4/06/93 and 4/13/93. The study is fairly complex, with a general objective of comparing on- and off-station performance of steelhead from natural and hatchery stocks. Additional spawns were made by NFRC-S using wild adults that had been held in Raceway C 3 during April and May.

Egg Disposition

This year just over 3.2 million eyed eggs were retained at Dworshak (Table 13), only the second time in more than 10 years that the hatchery would attempt to keep its entire rearing program on station. Just over 869,000 eyed eggs were shipped to the Clearwater Fish Hatchery (CFH). Another 1.5 million eggs were shipped to Magic Valley (MV) FH in southern Idaho in a continuation of support for its B-run program on the East Fork of the Salmon River. Only eggs from IHN-negative parents were shipped out of the Clearwater drainage.

Table 13. Egg disposition - STT Brood Year 1993.

Takes	No. Eyed Eggs	Dw	CFH	MV	NFpalouse	Discarded
1-15	6,941,410	3,279,638	869,900	1,500,000	141,572	1,150,300

Of the eggs from the NFRC-S study, 141,572 were outplanted as unfed fry in the North Fork of the Palouse River, while others were retained at Dworshak. The Department of Environmental Quality distributed 700 eyed-eggs (Take 13) to Big Elk Creek and 1300 to the South Fork Clearwater River at Mill Creek bridge as

part of an environmental study. A total of 1,150,300 eyed eggs were culled, due to IHN concerns or not needed in planned programs.

Adult Disposition

From 7,900 returning adult STT, 1,921 fish were spawned between January and May 1993. Enhancement of the local sport fishery was achieved as Idaho Fish and Game assisted in the outplanting of 2,470 adults to various sites on the South Fork of the Clearwater River (Table 14). Latham's Meats of Orofino processed 2,445 adult steelhead for distribution by the Idaho Department of Education. Washington State University received 480 steelhead carcasses for use in feeding captive bears. Idaho Department of Fish and Game received 300 adult mortalities to be used in a nuisance bear trapping operation. The remaining adult steelhead were disposed of at the local landfill only when all other options of utilization were exhausted.

Table 14. Adult STT outplant summary - BY 1993.

Date	Water Body	Site	No. Outplanted Males	Females	Total
03/24/93	S.F. CLEARWATER R.	Stites Area	251	529	780
03/25/93	S.F. CLEARWATER R.	Stites Area	212	547	759
03/26/93	BOISE RIVER		49	157	206
04/01/93	S.F. CLEARWATER R.	Stites Area	166	559	725
TOTALS			678	1792	2470

Production Methods

Most of the 3.28 million eyed STT eggs retained at Dworshak for its production program were hatched in egg jars over nursery tanks, although some had to be hatched and buttoned-up in incubator trays. Most tanks received 33,000 eyed eggs or the button-up fry from that number of eggs. Survival to feeding fry was 92.6 percent, which produced 3.04 million fry. A tanking and ponding strategy was constructed which detailed the initial tanking and ponding dates and fish sizes for the entire steelhead production program this year (copy attached following page). This was necessitated by the need to pond fish as large and as late as possible. With only a few exceptions, every tank was split about two months after initial tanking, when the fish had reached approximately 200 FPP. The only way to ensure tank capacity limits were not exceeded was to project growth and splitting and ponding dates for every tank of fish.

(pdpl93st) 08/03/93

9.033	9.033	9.033	10.033	10.033	10.033	11.033	11.033	91.033	12.033	12.033	13.033	13.033	14.020	14.020	82.025
07/12	07/12	07/12	07/22	07/22	07/22	07/26	07/26	08/26	08/02	08/02	08/12	08/12	08/19	08/19	08/26
D 801.160	802.160	803.160	804.150	805.150	806.150	807.160	808.160	809.150	810.160	811.160	812.150	813.150	814.150	815.150	816.150
9.033	9.033	9.033	10.033	10.033	10.033	11.033	11.033	91.033	12.033	12.033	13.033	13.033	14.020	15.020	82.025
07/12	07/12	07/12	07/22	07/22	07/22	07/26	07/26	08/26	08/02	08/02	08/12	08/12	08/19	08/26	08/26
D 701.160	702.160	703.160	704.150	705.150	706.150	707.160	708.160	709.150	710.160	711.160	712.150	713.150	714.150	715.150	716.150
8.027	9.033	9.033	10.033	10.033	10.033	11.033	11.033	92.033	12.033	12.033	13.033	13.033	14.020	15.020	99.000
07/08	07/12	07/12	07/22	07/22	07/22	07/26	07/26	08/26	08/02	08/02	08/12	08/12	08/19	08/26	
C 601.150	602.160	603.160	604.150	605.150	606.150	607.160	608.160	609.150	610.160	611.160	612.150	613.150	614.150	615.150	616.150
8.027	9.033	9.033	9.033	10.033	10.033	11.033	11.033	92.033	12.033	12.033	13.033	13.033	13.033	15.020	99.000
07/08	07/12	07/12	07/12	07/22	07/22	07/26	07/26	08/26	08/02	08/02	08/12	08/12	08/12	08/26	
C 501.150	502.160	503.160	504.160	505.150	506.150	507.160	508.160	509.150	510.160	511.160	512.150	513.150	514.150	515.150	516.150
1.000	1.000	3.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	8.033	8.033	8.033	8.033	8.033	7.033
06/18	06/18	07/02	07/03	07/05	07/05	07/05	07/05	07/12	07/12	07/08	07/08	07/08	07/08	07/08	07/01
B 401.080	402.080	403.080	404.090	405.100	406.100	407.100	408.100	409.100	410.100	411.150	412.150	413.150	414.150	415.150	416.150
1.000	1.000	3.000	4.000	5.000	5.000	5.000	5.000	6.000	8.033	8.033	8.033	8.033	8.033	7.033	7.033
06/18	06/18	07/02	07/03	07/05	07/05	07/05	07/05	07/12	07/08	07/08	07/08	07/08	07/08	07/01	07/01
B 301.080	302.080	303.080	304.090	305.100	306.100	307.100	308.100	309.100	310.150	311.150	312.150	313.150	314.150	315.150	316.150
1.032	1.032	2.018	3.030	4.034	5.030	5.030	5.030	5.030	6.014	6.025	6.024	7.032	7.032	7.032	7.032
06/18	06/18	06/25	07/02	07/03	07/05	07/05	07/05	07/05	07/12	07/12	07/12	07/01	07/01	07/01	07/01
A 201.080	202.080	203.080	204.080	205.090	206.100	207.100	208.100	209.100	210.100	211.100	212.100	213.150	214.150	215.150	216.150
1.032	1.032	2.018	3.030	3.020	4.034	5.030	5.030	5.030	5.030	6.033	6.025	6.018	7.032	7.032	7.032
06/18	06/18	06/25	07/02	07/02	07/03	07/05	07/05	07/05	07/05	07/12	07/12	07/12	07/01	07/01	07/01
\ 101.080	102.080	103.080	104.080	105.080	106.080	107.100	108.100	109.100	110.100	111.100	112.100	113.100	114.150	115.150	116.150

	TGno	GNeg	EYeg	TNfs	PDfs	RLfs			
								14	10
5yr AVG			83.6	92.8	82.2	88.2			
%survival=			80	94	85	90	0.57528		
smolt no.=	2.3	4.0	3.2	3.0	2.6	2.3		3070143	
TOdate no.=				3070143	2809622	2348660			

	EYeg NO/tank	FPPatMOVE to BPs	EYdate	TANKfry	SPLdate 200fpp	NOeyEGs	Initial NOtanks	1st SPLIT NO tanks	NO BPs
1	32	80	02/12	03/06	05/09	124070	4	8	0
2	18	80	02/19	03/13	05/16	35625	2	2	0
3	27	80	02/26	03/20	05/23	80971	3	4	0
4	34	90	03/05	03/27	05/30	68400	2	4	0
5	32	100	03/12	04/03	06/06	240000	8	12	0
6	33	100	03/19	04/10	06/13	198000	6	20	0
7	33	150	03/26	04/17	06/20	316000	10	10	5
8	33	150	04/02	04/24	06/27	383000	12	10	5
9	32	160	04/09	05/01	07/04	363000	11	24	0
10	33	150	04/16	05/08	07/11	363000	11	10	5
11	33	160	04/23	05/15	07/18	331732	10	20	0
12	33	160	04/30	05/22	07/25	264000	8	20	0
13	33	150	05/07	05/29	08/01	297000	9	11	3
14	20	150	05/14	06/05	08/08	60000	3	0	0
15	20	150	05/21	06/12	08/15	50000	3	0	0
						3175798	102	155	18

1. Only 8 tanks (264K) from TK11 + 2 tan

2. Only 8 tanks (264K) from TK 12+ 2 tan

3. Clarification of diagram:

Take — Thousands of fish (here

7.032
07/15 — Date to BP at F
116.150

Tank No. — FPP (here 150)

Nursery steelhead rearing went very well, without a single case of IHN virus. A-, C-, and D-bank tanks received raw reservoir water, while B-bank was on ozonated reservoir water. A- and B-bank water supplies were both heated to 54°F, while C- and D-banks received water at ambient (reservoir) temperatures - from 42°F to 54°F. On June 26 there was an evening power outage at the hatchery that caused the main pumps to shut down for 20 to 25 minutes. This power outage caused low oxygen problems to develop in the nursery and resulted in the loss of approximately 235,000 STT fingerlings from Takes 1, 3, 5, 7, and 8. Sufficient fry remained for hatchery program obligations, however. Unfortunately, the majority of homozygote eggs and fry in the Reisenbichler et al. study were lost, due to failure of the water supply to the incubator stacks. Some were saved and were subsequently either outplanted as button-up fry or were reared further in Dworshak's production program.

A ponding strategy experiment was devised that involved the eggs from Takes 8, 10, and 13. When the eggs from each take became eyed, they were thoroughly mixed with each other, and then machine counted into appropriate replicates. Three replicates of approximately 30,000 fish each from each take were ponded at 150 FPP and another three replicates at 80 FPP. In addition, three replicates from Take 13 were ponded at just under 300 FPP. By the end of the fiscal year, September 30, 1993, none of the 20 ponds involved in the experiment had been confirmed with the virus, although several Take 10 ponds were exhibiting telltale signs of the disease. Through September 30, 1993, no other steelhead pond had broken with or was showing signs of the virus.

First ponding of BY 93 steelhead did not occur this year until June 29 and 30. This allowed river water to be kept at 45°F for the benefit of the spring chinook salmon program, minimizing growth. Subsequent rearing of steelhead through the end of the fiscal year went quite well, with good growth and minimal cultural problems.

As of September 30, 1993, over 2.5 million steelhead remained in Dworshak rearing units (Table 15). With subdued IHN losses, a STT smolt release of 2.3 to 2.4 million steelhead is anticipated in spring 1994.

Table 16. Inventory summary - STT Brood Year 1993 (9/30/93).

Location	Number	Weight (Lb)	No/Lb	Length (in/mm)
System 1	787,864	61,703	12.8	6.08/154
System 2	826,394	22,196	37.2	4.25/108
System 3	980,782	42,819	22.9	5.00/127
Totals/Avg	2,595,040	126,718	20.5	5.18/132

Rainbow Trout Production

Rainbow trout (RBT) for Dworshak Reservoir have been supplied from another hatchery since 1985 because of Dworshak's IHNV disease status. In 1993

Kooskia reared and released 94,420 at 21.1 FPP into Dworshak Reservoir in April 1993 and another 101,337 at 19.3 FPP into the reservoir in May. Refer also to Kooskia NFH's Annual Report of FY 1993 for further details on rainbow trout rearing.

Spring Chinook Salmon Production

- Brood Year 1991 -

This brood year entered Fiscal Year 1993 on October 1, 1992, with 818,244 fish averaging 30.3 FPP, slightly larger than targeted. While they had been grown up to that point on a 16.5 FPP smolt size projection plan, target size was altered at this time back to the historical 18 to 20 FPP. This required reducing growth rates, so they began a 7-days on feed/5-days off feed. Fish health was monitored and, judging by a monthly mortality of about 0.1 percent, remained at a generally satisfactory level. The only caveat regarding fish health might be the abnormally low pyloric caeca fat which was minimal at time of release. Aside from the two 21-day medicated feed treatments given this lot of fish, no treatments were necessary for this lot of fish during pond rearing.

Table 17 presents BY 1991 performance during this period, with monthly growth rates ranging from 0.26 inches per month down to 0.7 to 0.8 inches per month. This indicated that growth was indeed reduced, with the fish being released at 17.1 FPP, slightly larger than targeted.

Table 17. 1992-93 spring chinook salmon performance - Brood Year 1991.

Month		--1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
October	92	818,244*	30.3	0.26	0.19	51.2
November	92	470,868	25.9	0.23	0.09	50.0
December	92	470,456	22.7	0.13	0.07	41.7
January	93	470,133	21.1	0.16	0.08	40.6
February	93	469,773	19.3	0.09	0.10	39.7
March	93	469,294	18.4	0.09	0.19	40.5
Release		467,222	17.1	-	-	-

*The Kooskia strain chinook being reared at Dworshak were transferred to Kooskia in mid-October, 346,354 SCS weighing 12,602 pounds (27.5 FPP).

In an effort to better understand BKD, its incidence and progression in production facilities, and its measurability, Dworshak FHC selected six raceways of SCS to sample for the disease from September 1992 through March 1993 (just prior to release). Approximately 30 fish were sampled from each raceway monthly and tested for BKD levels using ELISA. Table 18 below presents a condensed summary of the ELISA readings that resulted.

Table 18. BKD ELISA levels in six raceways from September 1992 through March 1993 - BY 1991 SCS.

RW	No.Sampled	Neg	Low	Med	High	Avg.	RELgrp	PARENTbkd	Release FPP
RW A3:	199	139	55	3	2	0.11	1	Low	18.9
RW A7:	196	132	55	3	6	0.12	3	Low	22.1
RW A11:	194	154	39	0	1	0.09	2	Low	18.5
RW A14:	206	156	49	0	1	0.10	4	Low	10.1
RW B28:	204	145	55	2	2	0.10	4	Med	15.8
RW B29:	197	138	53	3	3	0.13	4	High	16.6

Examination of the ELISA data reveals no clear pattern, either over time within any particular raceway, or from raceway to raceway by BKD parentage. Table 18 presents only total numbers of fish that tested positive in each group over the entire testing period and the average BKD level. The fish in all six raceways averaged quite low this year, about 0.10 optical density units (ODUs). Individual test date BKD ELISA levels were all negative (<0.10 ODUs) or low (<0.249 ODUs) with one 0.33 ODU reading in Raceway 29 (high-BKD offspring) in late September. The six subsequent readings from this unit were all low or negative, however, a further indication of subdued BKD levels.

It might also be noted that the fish in one raceway (A-14) were released at 10.1 FPP because they were being held at a very low density and were occasionally fed more than planned. Despite reaching this large size, however, these fish had very low BKD levels. This contrasts with earlier experiences at Dworshak when fish fed to this size normally exhibited high levels of BKD. Improved diets can probably take credit.

Overall, this lot of fish performed quite well during this production cycle, as demonstrated by a cumulative green egg to smolt survival of 82.3 percent, eight percent above the five-year running average (Table 19). Only slightly over three percent total were lost from first tanking to final release. While improved accuracy in eyed egg counting is partially responsible for this, continued improvements in fish culture can also be credited. Sand filter flushing during egg incubation, increased attention to incubating eggs and fry, minimizing tank and raceway densities, feeding medicated feed, and segregation by BKD parentage levels are the major changes. Other cultural considerations continue to be considered in efforts to increase the quality of spring salmon chinook smolts produced by the hatchery.

Table 19. Survival summary - spring chinook salmon, Brood Year 1991 comparison with previous 5-year average, Dworshak NFH.

	----Percent Surviving from Previous Stage----				Cumulative
Brood Year	EYEDeggs	TANKEDfry	PONDEDfing.	RLSDsmolts	Survival
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	97.2	86.0
Average	93.9	93.1	89.7	95.1	74.5
1991	89.0	96.1	99.3	96.9	82.3

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

Source: SRVSUMSC.wk1 - 06/03/93

Marking and Sampling

Fish tagging and clipping operations were completed in spring 1992 and included all fish being CWT marked and ad-clipped.

A total of 823,977 fish were marked and inventoried, 22,166 fish above the 803,770 carried on the books. This 2.8 percent gain over book value is comparable with recent years' loss/gain values, and reflects considerable accuracy and consistency in tracking chinook numbers. The absolute value of the average raceway's deviation from book was 4.2 percent.

Fish in 18 of the 29 raceways received PIT-tags during the first week of March.

Distribution

In October 1992, 346,354 Clear Creek stock chinook were returned to Kooskia for further rearing as had been previously planned. These fish weighed a total of 12,602 pounds and, at 27.5 FPP, were 4.95 inches in length.

The release of BY 1991 spring chinook smolts took place from April 8 through May 6, 1993. Most of the SCS were involved in a serial release study, in which some fish were released early on April 8, some on April 22, and the last group late on May 6. Each release group consisted of eight raceways of fish which had been differentially grown so that release sizes were similar. Approximately 130,000 fish were in each release group, as shown in Table 20, which left just under 82,000 chinook in to be released at the normal release date of April 15. No supplemental flows were obtained for the serial releases with exception of the April 8 release when an increase of 5000 cfs was requested from Dworshak Dam. All other releases benefitted through high flows from Dworshak spills and an upriver spring thaw that helped flush fish downriver.

Table 20. Distribution summary - SCS Brood Year 1991 (April 8-May 6, 1993).

Date	Water	Group	Number	Weight	FPP	--Length-- in	mm
04/08/93	N.F. CLEARWTR. R.	Release Grp. 1	129,366	7,569	17.1	5.80	147
04/15/93	N.F. CLEARWTR. R.	Genl. Release	81,915	5,343	15.3	6.02	153
04/22/93	N.F. CLEARWTR. R.	Release Grp. 2	129,330	7,424	17.4	5.76	146
05/06/93	N.F. CLEARWTR. R.	Release Grp. 3	126,611	7,048	18.0	5.70	145
Grand Total/Averages			467,222	27,384	17.1	5.80	147

Source: DIST-DWO.dbf - 06/07/93

Smolt Quality Assessment

As mentioned earlier and according to DFHC, the chinook in general were in good shape at time of release. While EIBS was present, it was not causing and had not caused any problems at time of release. Fish health assessments regarding four criteria are presented in Table 21. It shows condition factor to be fairly high, hematocrits to be quite acceptable, and gill condition to be good. The only index demanding attention is the 0.8 average mesenteric fat level. Cursory examination of historical fat indices show recent indices of 1.4 to 2.7, considerably above brood year 1993 at release. Fish quality, and fat level in particular, will be a central issue in the immediate years ahead as Dworshak feeding rates for spring chinook are examined.

Table 21. Smolt assessment indices - spring chinook salmon Brood Year 1993.

System	No. Fish Sampled	Condition Factor	Hematocrit (35+=good)	Gill Condition (Normal/Swelled)		Mesenteric Fat (Scale 0 to 4)
B-bank	30	4.26	43.2	100%	0%	0.8

Source: Summary of Fish Autopsy - DFHC 3/10/93

Incubation

As Fiscal Year 1993 began on October 1, 1992, approximately 882,000 eyed chinook eggs were developing in incubators. Of these, about 518,000 were from Dworshak returning adults and 364,480 were from Kooskia stock. The Dworshak stock spawns had been allowed to eye-up individually in colanders for a NFRC-S study, so were not individually enumerated. A fecundity of 3,750 green eggs per female was assumed for this group of fish.

In early October, another 928,000 eyed eggs were received in four shipments from Rapid River Fish Hatchery to enable Dworshak to fulfill its spring chinook production commitment (Table 22). These eggs were placed into incubator stacks for hatching and swim-up. While initially kept as a separate lot, these fish were merged with Dworshak chinook at ponding. The fact that 61 percent were from high- and presumed high-BKD adults required that mortality in this group would be scrutinized over the rearing period, with extraordinary mortality calling for the consideration of discarding the fish.

Table 22. Egg shipments from Rapid River Fish Hatchery.

Shipment Number	Date	====Egg Numbers by Parental BKD Level===== Low	Medium	High	PresumedHI	Total
1	10/2/92	101,500	69,500	205,000	0	376,000
2	10/6/92	0	0	0	198,605	198,605
3	10/7/92	67,676	77,264	83,587	0	228,527
4	10/8/92	0	41,466	49,290	34,461	125,217
		---	---	---	---	---
		169,176	146,764	337,877	233,066	928,349

It should be mentioned that the large numbers of high and presumed-high eggs resulted because of many adults not actually having been tested for BKD, and because of multiple-spawn incubation.

These eggs hatched in mid- to late October, and were put into tanks once 75 percent had reached the swim-up stage. At swim-up the fish were started on feed, with an average date on feed of November 12, 1992.

Early rearing

Great care was devoted to maintaining the segregation of fry according to the various criteria: Kooskia stock, Dworshak stock (production or NFRC-S groups), Rapid River stock, BKD level (low, medium, high, presumed high). This time-consuming process involved tanking a total of 1.67 million SCS in 63 nursery tanks, with an average of 26,556 feeding fry per tank.

The fry went on feed well and performed quite well in nursery rearing. They maintained a good feed conversion, grew well, and required no treatments. Survival through ponding was also excellent - 93.4 percent, almost two percent

above the five-year running average although this was somewhat lower than that of the last two years.

Table 23. Survival summary - spring chinook salmon, Dworshak NFH.

	Percent Surviving from Previous Stage				Cumul.	Cumul.	Cumul.
BY	EYDegg	TANKfry	PONDfing	RLSDsmlt	GRN>smlt Survival	EYD>smlt Survival	TANK>smlt Survival
1987	92.5	86.2	97.4	93.8	72.8	78.8	91.4
1988	96.0	93.9	76.5	93.0	64.1	66.8	71.1
1989	92.8	94.2	89.2	96.5	75.2	81.1	86.1
1990	94.2	98.2	95.6	97.2	86.0	91.3	92.9
1991	89.0	96.1	99.3	96.9	82.3	92.5	96.2
AVG.	92.9	93.7	91.6	95.5	76.1	82.1	87.5
1992	96.4	96.3	93.4	0.0	na	na	na

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

Source: SRVSUMSC.wk1 RV 09/23/93

The monthly mortalities of the Dworshak production lot and of the NFRC-S fish needs to be pointed out. Both of these groups of fish experienced losses of over 2.6 percent in December, while the Kooskia lot mortalities were considerably less at only 0.77 percent. All Dworshak and NFRC-S fish were eyed-up in colanders, suspected for some time of providing poorer water circulation than the incubator trays. All Kooskia fish were eyed in trays. Higher losses in Dworshak and NFRC-S fish may have been due simply to the chronic effects of an earlier, but unapparent, oxygen deprivation during colander incubation. This differential mortality persisted into January, with the 0.58 and 0.36 percent mortality rates for fish eyed-up in colanders higher than for the 0.28 percent rate of the Kooskia fish. Colander incubation may not be providing the best conditions for developing eggs.

From April 7 to 9, 1993, a total of 304,861 Clear Creek stock chinook fingerlings were transferred from Dworshak's nursery to Kooskia NFH. The total weight of transferred fish was 1,379 pounds (244.6 FPP) and mean length was 2.39 inches.

Pond Rearing

In the latter half of April 1993 the nursery tanks of chinook began to near their upper carrying capacities of 180 to 200 pounds apiece. With most BY 1991 chinook released from outside raceways in mid-April, BY 1992 fingerlings began to be moved out to raceways shortly thereafter. Pressure-spray cleaning and sun drying had been accomplished first. BY 1993 steelhead continued to demand more and more nursery space, and by early May all SCS had been moved outside.

Moving and inventorying these fish outdoors, as in past years, required careful planning and execution. Two erythromycin studies, to be discussed later on, were initiated which necessitated the pooling and subsequent

splitting of two 260,000 fish groups. The nine NFRC-S study groups of fish had to be moved out to specific locations. High-, medium-, and low-BKD groups were inventoried out and kept separate, as much as was possible. The Rapid River and Dworshak production fish were merged to some extent, keeping BKD parentage in mind. And guiding all initial ponding was a strategy that allowed for CWT marking to take place that would result in every group of fish winding up in its proper place at its final loading number.

The first 21-day erythromycin feeding at 100 mg/kg/day was begun April 27. For most fish the last day of medication was May 18, although a few fish were fed a while longer because of experiments or due to a minor surplus. Ad-clipping, CWT marking, and some freeze-branding took place from 6/15-7/12/93. This year, for the first time at Dworshak, chinook were ad-clipped to mark them as hatchery stock, while only some of these received CWT marks. Fish marking inventory numbers came to 1,329,500 fish or 3,460 fish (0.3 percent) below book inventory numbers. The average pond was 2.6 percent off of book. This good agreement again verifies that proper inventory and record keeping procedures are being followed.

Through the remainder of the fiscal year, to September 30, these fish performed quite well. Feed conversion increased somewhat to 1.76, probably due to erythromycin feedings, while monthly mortalities remained subdued at 0.10 to 0.26 percent (Table 24). The second erythromycin feedings began 9/21/93 and 9/28/93, with 21-day and 28-day treatments being compared. Second medicated feedings ended 10/19/93 for most fish, with some being fed to month's end to use up surplus feed.

These fish were somewhat ahead of target size by mid-summer, so were put on a five-day on/two-day (weekend) off feeding schedule. The reduced monthly growth rates of 0.30 inches are seen in Table 24. Fortunately, the first STT ponding was not planned until early July, so that 46°F temperature could be maintained in the North Fork Clearwater River water supply until late June.

Table 24. Fiscal year 1993 SCS performance - Brood Year 1992.

Month		---1st of Month-- Number	No/Lb	Growth (in.)	Mortality (%)	Temperature (°F)
November	92	Not on the books until month's end				
December	92	1,673,071	1502	0.21	1.85	44.3
January	93	1,656,813	970	0.23	0.59	41.5
February	93	1,647,082	627	0.26	0.41	41.5
March	93	1,640,471	410	0.24	0.86	40.8
April	93	1,884,914	336	0.49	1.04	43.0
May	93	1,330,942	215	0.51	0.81	44.3
June	93	1,298,042	113	0.21	0.07	46.0
July	93	1,329,763	92.2	0.31	0.10	51.8
August	93	1,324,860	70.7	0.36	0.12	52.3
September	93	1,323,286	53.1	0.10	0.26	53.7

Despite the cold June water, however, the reduced rations had an effect on one aspect of fish condition. A mid-September look at fish from the group revealed mesenteric fat levels of 58 percent were level 0 (no or little fat), 34 percent were level 1, and 8 percent were level 2. These abnormally low fat levels caused considerable concern, prompting a memo from Production addressing the sub-optimal feeding levels needed to keep Dworshak chinook at just 18 to 20 FPP at time of release. Dworshak's average 80 percent of manufacturers recommended feeding rates may have other impacts on smolt quality. The short-term solution to the reduced fat levels was to raise feeding rates to 90 percent of recommended.

At fiscal year's end, September 30, 1993, there were 1,319,872 SCS on station averaging 49.3 FPP.

Special Studies

Several studies were being conducted with this brood year of chinook salmon. The following sections provide some detail as to the purpose and the present state of each experiment.

Serial Release

Nine raceways contain chinook that are the offspring of low- and negative-BKD parentage SCS. These fish will be used in a serial release study involving three different release dates. The effects of varying the release date on fish health, smolt development, and smolt migration will be measured. This experiment is being conducted in cooperation with Ron Pascho and Diane Elliott of the NFRC-S. To date all fish have been treated as similarly as possible, and no differences between the groups are noted. They will go out at progressively slightly larger sizes with no differential growth planned as in the BY 1991 serial release study. About 230,000 chinook are included in this experiment.

Erythromycin - Comparison of Drug Carriers

The purpose of this study is "to compare the efficacy and palatability of the existing drug carrier, Gallimycin - 50-P, with a new formulation, 22 percent Erythromycin in a whole germ carrier." In order to get the new carrier approved, it must be shown that on-station performance is comparable to that obtained when the old carrier is used. Outmigration and return data will also be examined once this experiment is completed. This is being done under Investigational New Animal Drug application (INAD 4333), coordinating with the University of Idaho, which is serving as sponsor and regional coordinator.

By fiscal year's end the first 21-day feeding of the two carriers and drug had been given and the second feeding started on 9/28/93. Getting full 100 mg/kg/day doses into the fish for each treatment was accomplished. There were eight raceways of chinook involved in this study, four raceways in each treatment. Each treatment was comprised of two replicates of two 30-31,000 fish raceways each. Each 60,000+ fish replicate was CWT marked with a number unique to that coded wire tag. There were approximately 250,000 fish total in

this experiment, and by fiscal year's end there were no appreciable performance differences between the two groups.

Erythromycin - 21-day vs. 28-day Treatment

The purpose of this experiment "is to compare the efficacy of a 21-day treatment duration with a 28-day treatment duration. The extended treatment may provide a higher level or longer period of protection." Outmigration and return data will be examined upon the study's completion. This experiment is also being conducted in cooperation with the University of Idaho.

The first feeding of these fish was completed in May and a second feeding was begun in late September 1993. Full 100 mg/kg/day dose treatments were achieved. The experimental design is identical to the carrier comparison just discussed above: eight raceways of fish, with four in each treatment. Each treatment has two replicates, each replicate is contained in two separate raceways. The four replicates total about 240,000 fish, with just under 30,000 in each of the eight raceways. At fiscal year's end there were subtle, but no statistically proven, differences between the two treatments.

Ladder Operation

Dworshak's ladder was opened to collect returning spring chinook salmon from May 21 until August 24, 1993, while Kooskia kept its trap functional from May 28 through August 5. A total of 2,003 adult SCS returned to the complex this year, with 1,180 back to Kooskia and 823 to Dworshak. A total of 110 adults were placed above the trap at Kooskia and the remaining 1,070 chinook returned to Dworshak in 18 separate trips from May 28 through August 5.

Table 25. Age Structure Summary - SCS Adults Brood Year 1993.

	Kooskia NFH	Dworshak NFH	Totals	(Percent)
I-ocean	11	9	20	(1.0 %)
II-ocean	749	452	1,201	(60.0 %)
III-ocean	409	359	768	(38.3 %)
Unmeasured	11	3	14	(0.7 %)
	---	---	---	
Totals	1,180 (58.9 %)	823 (41.1 %)	2,003	

Source: DW/KK Adult SCS Summary, IDFRO - 12/09/93

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) before being sent to a holding pond. Kooskia adults were periodically brought to Dworshak for holding until ready for spawning. All Kooskia fish were tagged with spaghetti tags cinched up through opercle punched holes to distinguish these fish from Dworshak adults. Some Kooskia adults were inoculated with erythromycin a second time on August 3 and 4. Kooskia adults brought down on August 5 only received one injection. Dworshak adults received only one injection, as well, with those returning after August 19 not being injected at all.

Formalin Treatment for Adults

Adult salmon were treated with formalin in an effort to control external fungus and reduce pre-spawning mortality. Beginning on June 6, 1993, adults were treated three times a week with formalin at 167 mg/l for one hour, using a revised treatment application that maintained higher formalin levels. On 19 July, formalin treatments were expanded to 5 days per week (Monday - Friday).

Pre-spawning mortality of adult spring chinook was slightly over seven percent for Dworshak and Kooskia stocks combined (Table 26). Pre-spawning and total mortality were considerably lower than that of recent years. While other factors can affect survival rates during the pre-spawn holding period, the new formalin treatment regime may have helped reduce losses this year.

Table 27. Adult SCS mortality - Brood Year 1993 SCS.

	Dworshak	Kooskia	Average
Pre-spawning* (% mortality)	9.2	5.7	7.4
During spawning (% mortality)	5.8	6.4	6.1
	---	---	---
Total	14.5	11.8	13.2

* Mortality picked from holding ponds from ladder opening on 5/21/93 through first spawn on 8/23/93).

Pre-spawning losses totaled 132 fish of the 1,892 fish on station by 8/23/93 (Dworshak - 822 returnees, Kooskia - 1,070). This 7.4 percent loss is a significant drop from the 19.4 percent mortality experienced by Brood Year 1992 adults, and is considerably below the five year average (Table 28). Mortality during spawning of 6.1 percent is comparable to the five-year average, while total mortality of 18.7 is somewhat below the 23.3 percent five-year average.

Table 28. Comparison of BY 1993 prespawning and total holding mortality with previous five brood years.

Brood Year	Pre-spawn Mort.	During spawn Mort.	Total Mortality
5 YR Avg	**13.3**	**6.6**	**18.7**
1993	7.4	6.1	13.2

Spawning Summary

Eleven egg takes were accomplished for this brood year, starting August 23 and ending September 13 (Table 29). Spawned were 817 females including 343 from Dworshak returns and 474 from Kooskia. A total of 3.49 million eggs were taken. Fecundity for the 1993 spawn was 4,270 eggs per female, which was slightly higher than the five-year average. This was due to the abnormally high 43.6 percent of III-salt fish.

Table 29. Spawning summary - SCS Brood Year 1993.

	--Spawned-- Fmls.	Mls.	Green Eggs	Eyed Eggs	Eggs/ Female	Enmrt EYup%	Total EYup%
KK	474	442	2,007,270	1,583,240	4,235	87.0	78.9
DW	343	323	1,482,121	1,233,960	4,321	87.5	83.3
	===	===	=========	=========			
	817	765	3,489,391	2,817,200	4,270	87.2	80.1

Eyed egg disposition: 1.0 M KK; 1.53 M DW; 114.9 K Nez Perce; 171 K discarded.

Eye-up for enumerated eggs averaged 87.2 percent (Table 29), 87.0 percent for Kooskia eggs and 87.5 percent for Dworshak eggs. When spawns that were

discarded because of being totally dead are considered, eye-up overall was just 80.1 percent. The problem with comparing any of these eye-ups with historical eye-up data is that it is only within the last two years that Dworshak has begun distinguishing between the two types of eye-up, i.e. total egg eye-up or enumerated egg eye-up. It should be mentioned that despite the historical lack of clarity in what constitutes eye-up, eye-up this year was definitely below historical averages. While nothing particular stands out as a possible cause, a couple egg handling procedures (saline use and rinsing procedures) may be investigated during the next brood year to help prevent a recurrence of reduced eye-up.

Table 30. Comparison of BY 1993 spring chinook salmon spawning with 5-year average.

Brood Year	Adult Returns	% Fmls.	Green Eggs	Eggs /Fml.	% Eye-up
5 YR average	1,947	52.3	3,023,640	4,014	93.0
1993	2,003	51.7	3,489,391	4,270	87.2

During spawning several cooperating agencies had personnel in the spawning area collecting tissue, sperm, or egg samples.

Spawning Procedures

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. Spawned adults received numbered, stainless steel pins for later culling and segregation due to disease status. Sperm was collected in reusable 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, and a small amount of one percent saline solution was added.

Fertilized eggs were thoroughly rinsed before the eggs were put into incubation trays. The eggs then water hardened for 30 minutes in iodophor (75 mg/l) buffered with sodium bicarbonate. Crosses were made between one male and one female, with occasional exception when males were running low. This resulted in a male to female spawning ratio of 1.0 to 1.1.

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 because of concerns over the iodophor dripping into the sperm. Iodophor solutions of 500 mg/l and 250 mg/l were used to disinfect equipment and workers' hands.

It should be mentioned that Kooskia stock adults were spawned exclusively with other Kooskia adults, while Dworshak adults were spawned only with other Dworshak adults.

Adult Disease Sampling

Table 31 outlines the disease sampling regimen generally followed this year.

Table 31. Fish health sampling proposal - SCS Brood Year 1993.

	=====Dworshak=====		=====Kooskia=====	
Disease	Males	Females	Males	Females
BKD	none	100%	none	100%
IHNV	none	subsample	none	subsample
Other	subsample		subsample	

Source: Pre-spawning conference summary - 08/12/93

BKD segregation was based on ranges given in Table 32, using ELISA values only from female parents. This 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.

Table 32. Optical density units associated with BKD levels in Dworshak/Kooskia SCS.

BKD Level	Optical Density Units Range
Negative	0.000 - 0.099
Low	0.100 - 0.249
Medium	0.200 - 0.449
High	0.45 and above

Source: Monthly Activity Report, Dworshak FHC - 3/29/93.

Segregation of Dworshak's BY 1993 eggs was based on ovarian samples from female adults, with the NFRC-S providing the ELISA analyses and results. They were not able to provide kidney/spleen sample results on time. Of the 10 females testing high on the basis of kidney/spleen samples, two were classified as low and two as medium on the basis of ovarian samples. Dworshak FHC recommends using only kidney/spleen samples as the bases of egg classification and segregation. Eggs sent to Kooskia were segregated based on ELISA values from kidney/spleen samples. The Dworshak FHC ran ELISAs on all Kooskia fish and on Takes 9, 10, and 11, while NFRC-S conducted ELISAs on Dworshak Takes 2, 4, 6, and 8.

Table 33 summarizes the BKD levels prevalent in the 766 adult chinook sampled this brood year from the two fish stocks. Actually, proportions of fish in the various BKD levels were remarkably similar, with over 94 percent classified as lows and negatives, about one percent being moderates, and three to five percent exhibiting high BKD levels. These values are well in line with historical averages.

Table 33. BKD ELISA levels in Kooskia and Dworshak BY 1993 adult SCS.

BKD Level	Kooskia		Dworshak	
BKD Level	No. Fish	Percent	No. Fish	Percent
Negative	358	76.8	216	72.0
Low	90	19.3	67	22.3
Moderate	5	1.1	3	1.0
High	13	2.8	14	4.7
	---		---	
Totals	466		300	

Source: DFHC 1993 SCS Adult Sampling Summary - 09/17/93

All spawns from high-BKD female parentage were discarded at the green egg stage this year. This included 15 Kooskia spawns and 12 Dworshak spawns. The three medium-BKD spawns, one from Kooskia fish and two from Dworshak fish, were discarded after enumeration at the eyed egg stage. Due to the strategic difficulty of dealing with chinook groups by take, by BKD level, by test group, etc., negative- and low-BKD parentage eggs are simply grouped into the single category of low-BKD.

Dead chinook pulled from holding ponds were also tested for BKD levels, with a surprising number testing high. 38 (37.2 percent) of the 102 tested proved to have high-BKD levels, 4 (3.9 percent) tested moderate, 23 (22.5 percent) tested low, and 37 (36.2 percent) proved negative. The 37.2 percent highs is in marked contrast to the three to five percent of adults tested later that prove to be high-BKD.

Sub-sampling of females for IHN virus indicated that 36 (33.6 percent) of the 107 Kooskia females sampled tested positive for the virus. Just 7 (19.4 percent) of the 36 Dworshak females tested positive for the virus.

Subsampling by Dworshak FHC for other diseases proved negative for IPN, VHS, furunculosis, and Myxobolus spp. Testing for ERM showed 2 of 110 positive, while 55 percent were positive for Ceratomyxa shasta.

Incubation

All spawns were incubated individually in Heath trays. Incubation temperatures were kept at 52°F or below. After eye-up all eggs were shocked, picked, counted, and returned at 5,000 eggs per tray. While eye-up and hatching temperatures averaged about 52°F, on November 5 the incubation temperature was dropped to about 41°F. This was done to delay button-up by about two weeks, a minor attempt to address the long-term historical problem with Dworshak's spring chinook program of sub-optimal feeding.

Incubating eggs were given 15-minute 1,667 mg/l formalin treatments three times each week. Once the eggs were sufficiently eyed, dead eggs or eggs showing signs of fungus were regularly picked. Egg shells were also consistently removed from trays to ensure proper water flow. Formalin treatment was discontinued once 75 percent of the eggs had hatched.

Due to a malfunction in the formalin treatment system, 15 trays of eggs (an entire stack) were accidentally killed by overtreatment with formalin. This unfortunate accident caused the loss of approximately 65,000 eggs from Kooskia adults. Modifications to the system were made and proper protocol for egg treatment was implemented to prevent this in the future.

Disposition

A total of 187,831 green eggs from Kooskia adults were discarded, with the spawns of 29 females culled due to low fertility (less than 20 percent) and the spawns of 15 females culled due to high-BKD female parentage. Another 72,025 green eggs from Dworshak stock were culled, five spawns because of low fertility, and 12 because of medium high-BKD female parentage. Spawns culled were not enumerated, but were assumed to have the same number of eggs as the average enumerated spawn in that take.

Following enumeration, 1.0 million eyed eggs from Kooskia adults were shipped to Kooskia NFH for further incubation and rearing. The remaining 580,900 eggs from Kooskia adults were kept at Dworshak. Together with the 950,000 eyed eggs kept from Dworshak adults, a total of 1.53 million eyed eggs resulted to constitute the start of Dworshak's chinook rearing program. Approximately 115,000 surplus eyed eggs and newly hatched fry were transferred to the Nez Perce Sweetwater Rearing Facility at their request. Dworshak sac fry (165,100) were discarded for being surplus to program needs, while 2,340 Kooskia eyed eggs and 3,960 Dworshak eyed eggs were discarded because of medium-BKD female parentage. All eggs retained for Kooskia and Dworshak programs were from low-BKD female parentage.

Program Objectives

Distribution of fingerling and smolts from the present brood year should proceed according to the following proposed schedule:

Table 34. Program proposal - Spring Chinook Salmon Brood Year 1993.

Program (Egg Source)	Release No.	Release Type	Release FPP	Release Date
Dworshak (Dworshak) (950,000 eyed)	836,000	Smolt	18.0	Apr 95
Dworshak (Kooskia) (580,900 eyed)	511,000	Smolt	18.0	Apr 95
	1,347,000			
Kooskia (Kooskia) (1,000,000 eyed)	880,000	Smolt	18.0	Apr 95
Total Smolts	2,227,000	Objectives based on 3-year average of 88 percent eyed egg to smolt survival.		

File: ANRP93FY - RV 12/16/93

Division of Fish Hatcheries

HPDW9309.WK1
12-Oct-93
10:01 AM

HATCHERY PRODUCTION SUMMARY

Station:
DWORSHAK NFH
Period covered:
10/1/92 through 09/30/93

Density Index: 0.13

Flow Index: 0.57

Total Flow 51786 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.		Conver-sion	UNIT FEED COST	T.U. per Inch	T.U. to Date	LENGTH INCREASE 30 DAY MONTH
	Number	Weight	Length	Number	Weight	Pounds	Cost		Per Lb.			Inches
1	2	3	4	5	6	7	8	9	10	12	13	14
STT-NFW-92-DWO-0	0	0		0	1,277	1,352	462.44	1.06	0.36	0.0	0.0	0.00
STT-NFW-92-DWO-1	0	0		655,775	55,990	88,407	24,014.08	1.58	0.43	0.0	0.0	0.00
STT-NFW-92-DWO-2	0	0		679,949	60,718	87,201	24,673.34	1.44	0.41	0.0	0.0	0.00
STT-NFW-92-DWO-3	0	0		1,053,269	123,445	198,990	55,029.45	1.61	0.45	0.0	0.0	0.00
STT-NFW-93-DWO-0	90,281	1,223	3.38	0	31,507	42,207	23,982.81	1.34	0.76	65.1	151.6	0.35
STT-NFW-93-DWO-1	872,955	43,644	5.23	0	34,498	47,251	14,451.56	1.37	0.42	34.2	62.7	0.83
STT-NFW-93-DWO-2	668,069	9,965	3.49	0	2,470	9,494	4,039.57	3.84	1.64	40.1	32.1	0.33
STT-NFW-93-DWO-3	1,011,331	32,771	4.52	0	22,800	38,100	14,308.38	1.67	0.63	28.8	62.8	0.83
SCS-CRW-91-DWO-0	0	0		813,576	14,175	24,300	8,845.63	1.71	0.62	0.0	0.0	0.00
SCS-CRW-92-DWO-0	1,319,872	26,773	4.07	304,861	21,607	38,036	20,819.74	1.76	0.96	55.7	158.1	0.10
SCS-RRW-92-ID	0	0		0	4,380	5,383	4,024.32	1.23	0.92	0.0	0.0	0.00
Subtotal STT	2,642,636	87,603	3.83	2,388,993	332,705	513,002	160,961.63	1.54	0.48	42.1	77.3	0.59
Subtotal SCS	1,319,872	26,773	4.07	1,118,437	40,162	67,719	33,689.69	1.69	0.84	55.7	158.1	0.10
TOTALS	3,962,508	114,376		3,507,430	372,867	580,721	194,651.32					
AVERAGES			3.91					1.56	0.52	44.8	93.5	0.49

Form 3-229
(Sept.1971)
DWRV.2/21/91

FISH AND FISH EGG FISCAL YEAR 1993 DISTRIBUTION SUMMARY

Fiscal Year: 1993

Delivering Hatchery: Dworshak NFH

Check One: ✓ Initial Report
__ Nothing to Report
__ Amended Report

Line 1	Program 2	Agency 3	State 4	WType 5	Management Area 6	Water Name 7	Acres/ Miles 8	Species 9	Strain 10	Fish & Fish Egg Numbers 11	Fish Length 12	Total Weight 13	Trips	Mi's
1	RE	FWS	ID	SR	IDAHO	BIG ELK CR.		STT	NFW	700	0	0		
2	RM	FWS	ID	SR	IDAHO	BOISE R.		STT	NFW	206	32.5	2472		
3	RM	FWS	ID	SR	IDAHO	CLEAR CR.		STT	NFW	342874	7.32	47022		
4	BS	STG	ID	HO	CLEARWATER AFH	CLEARWATER AFH		STT	NFW	869900	0	0		
5	BS	STG	ID	HO	MAGIC VALLEY SFH	MAGIC VALLEY SFH		STT	NFW	1500000	0	0		
6	RM	FWS	ID	SR	MAIN S. CLEARWTR. R.	MAIN S. CLEARWTR. R.		STT	NFW	1274981	7.36	178443		
7	RM	FWS	ID	SR	IDAHO	S.F. CLEARWTR. R.		STT	NFW	772438	7.13	97843		
8	RE	FWS	ID	SR	IDAHO	N.F. PALOUSE R.		STT	NFW	137393	1.05	55		
9	RE	NMF	WA	SR	WASHINGTON	NMFS		STT	NFW	10100	7.16	1298		
10	RM	FWS	ID	SR	IDAHO	S.F. CLEARWTR. R.		STT	NFW	2264	32.5	27168		
11	RM	FWS	ID	SR	IDAHO	N.F. CLEARWTR. R.		SCS	CRW	467222	5.8	27384		
12	BS	FWS	ID	HF	KOOSKIA NFH	KOOSKIA NFH		SCS	CRW	840000	0	0		
13	RM	FWS	ID	HF	KOOSKIA NFH	KOOSKIA NFH		SCS	CRW	651215	4.15	13981		

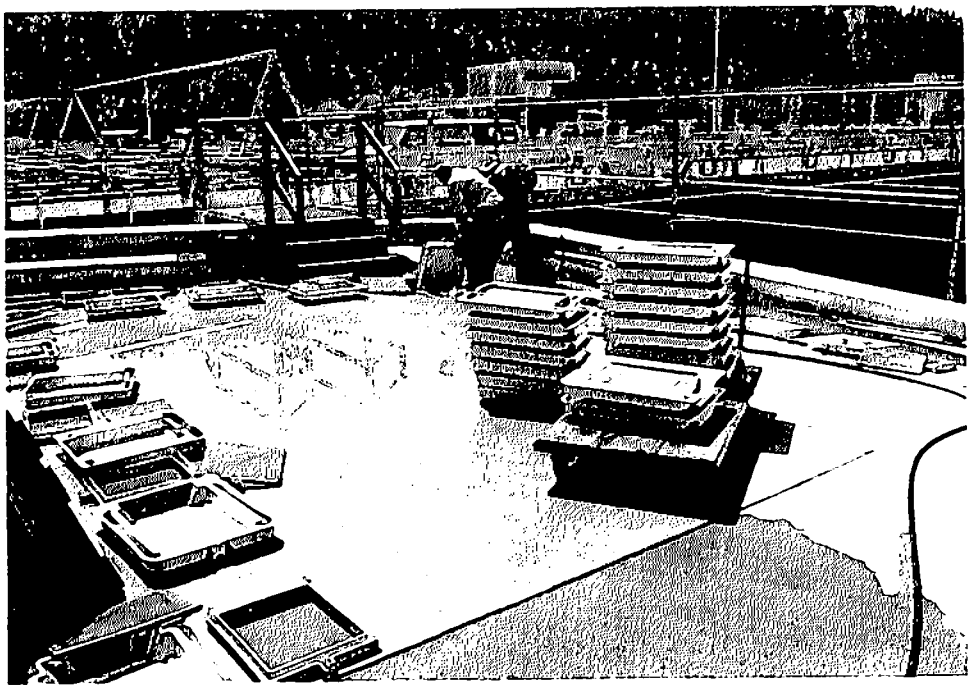
Form 3-2026 (Rev. 12/91)
Source: (fy93dsum.wk1) RV 12/9/93

FISH AND FISH EGG FISCAL YEAR 1993 DISTRIBUTION SUMMARY

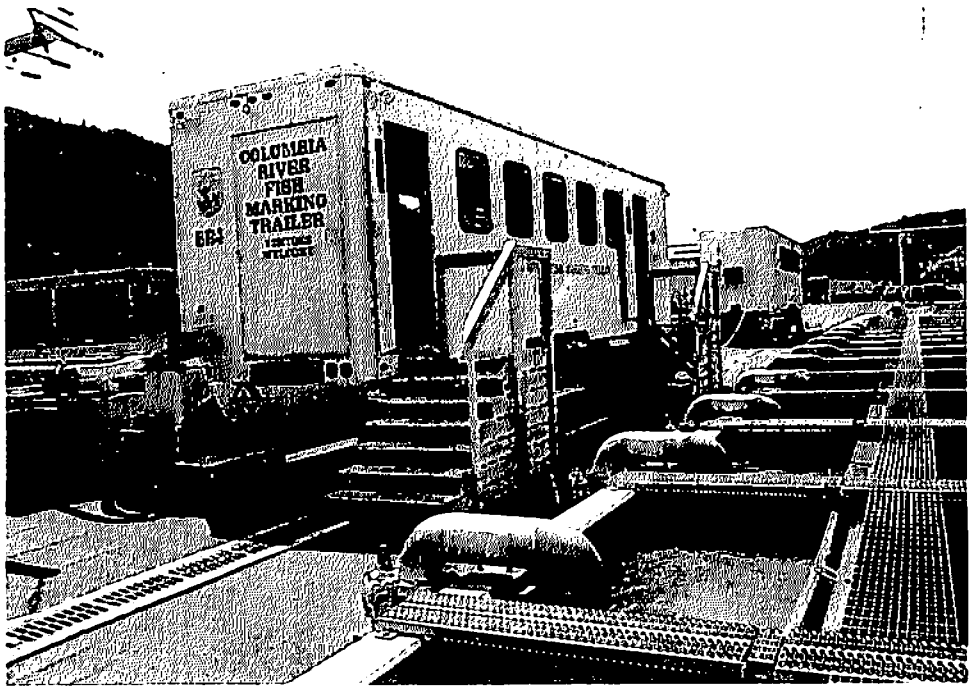
Fiscal Year: 1993

Delivering Hatchery: Dworshak NFH

	SPECIES	STAGE	NUMBER	WEIGHT
SUMMARY:	STT	EGGS	2371900	0
		FRY	137393	55
		SMOLT	2399093	324606
		ADULT	2470	29640
	SCS	EGGS	840000	0
		FINGERLINGS	651215	13981
		SMOLT	467222	27384
	FY 1993 DISTRIBUTION TOTALS		6869293	395666

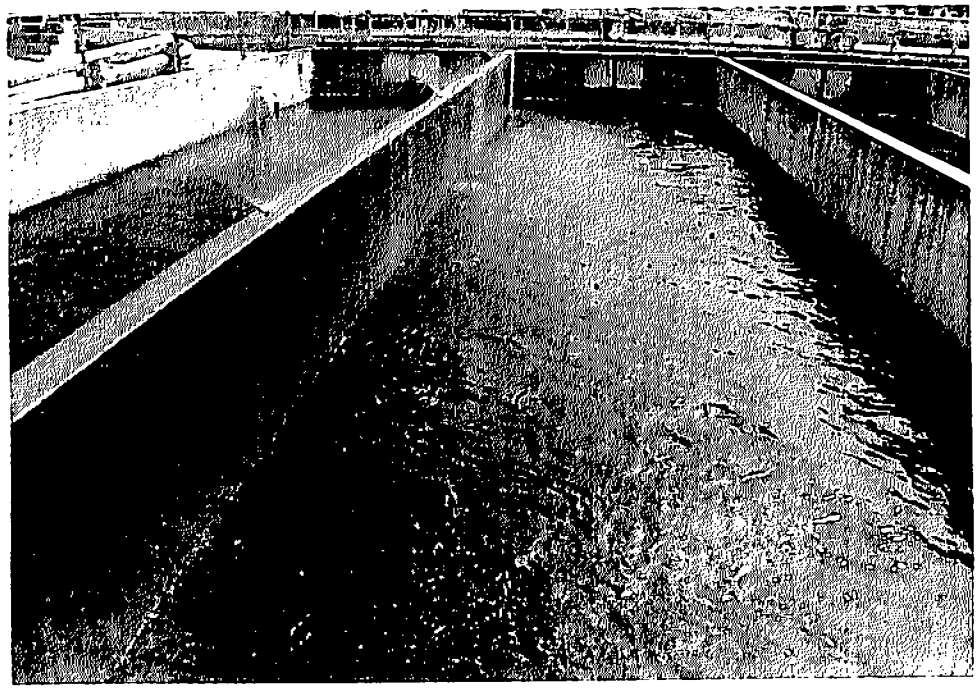


Workers cleaning incubator trays with power washer preparing for spring chinook eggs.



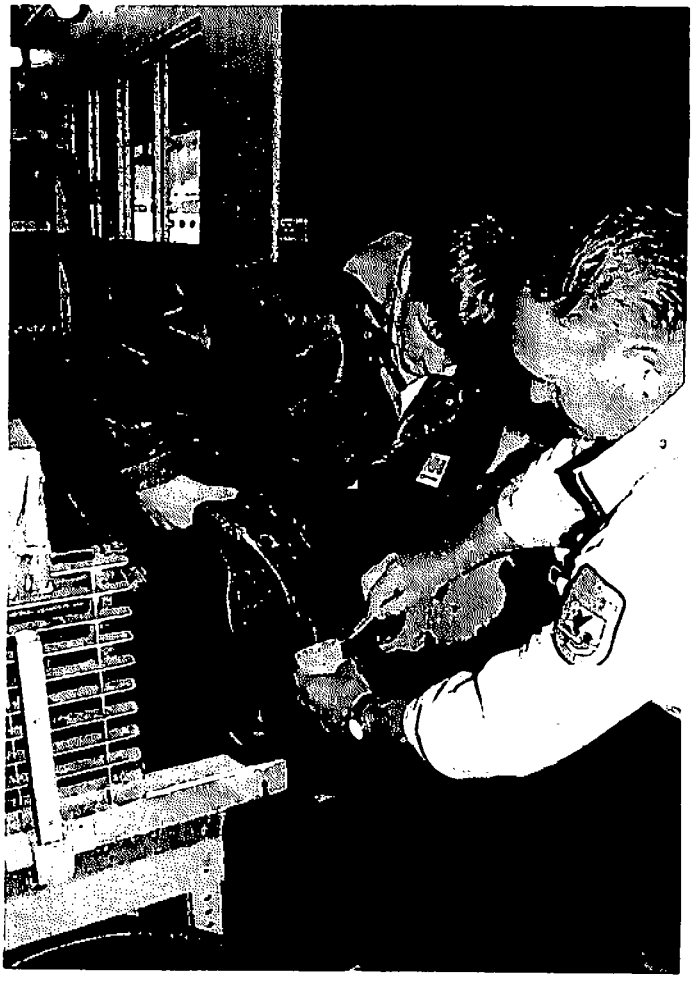
Marking trailer in place to ad-clip and coded-wire tag chinook production.

Fish Culturist, John Vargas, preparing formalin treatment of the chinook holding ponds.

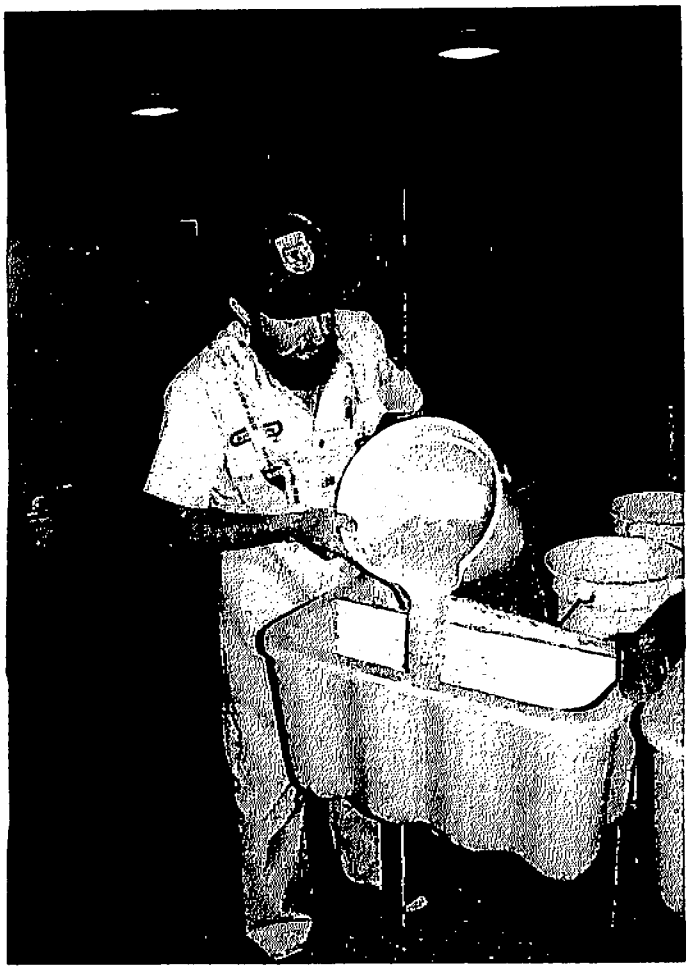


Spring chinook adults in summer holding prior to spawning.

Fish Culturist, Ben Wright collecting spring chinook eggs.



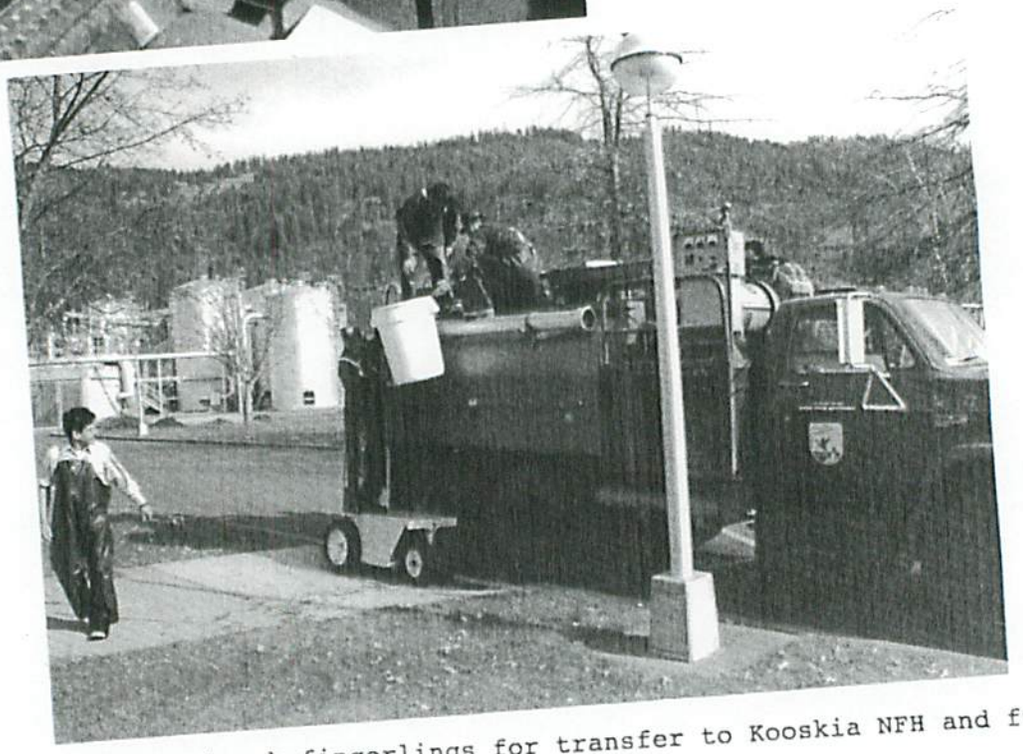
Chinook spawning with Biologist Ken Peters and hatchery worker, Vern Holloway assisting.



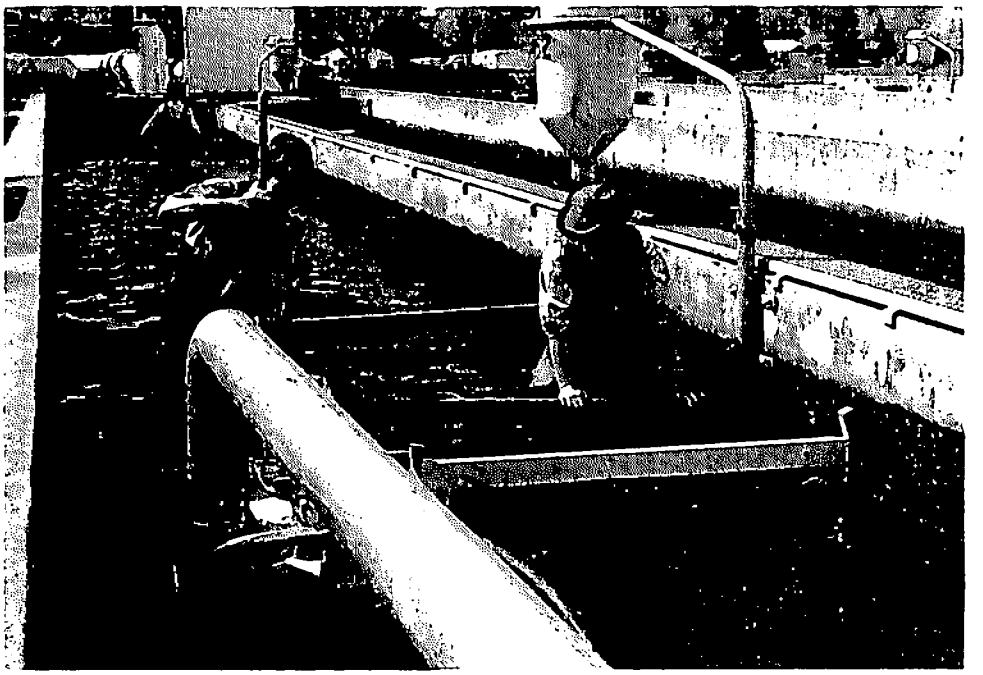
Rodney Funderburg, Kooskia NFH, assisting in washing chinook eggs.

FRO employees Doug Burum and Ray Jones assisting in sampling and recording data on chinook adults.

Biologist Kevin Sloan adding sodium bicarbonate as a buffering agent to the iodophore treatment of chinook eggs.



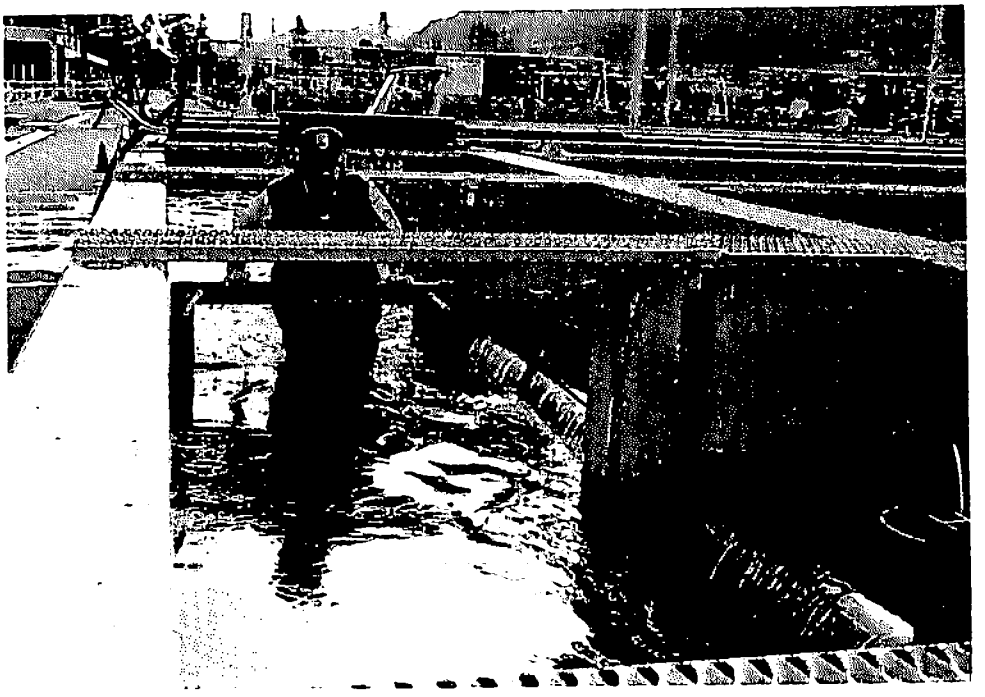
Employees loading chinook fingerlings for transfer to Kooskia NFH and further rearing.



Crowding steelhead for pumping to distribution trucks.

Steelhead smolt transfer using COE trucks to haul fish to off-site locations.

Biologist Peter Long and Fish Culturist Rocky Greenland loading spring chinook fingerlings for transfer to Kooskia NFH.



Final release of spring chinook smolts - Biologist Long crowding fish to discharge point.

Fish Culturist John Vargas and Biologist Ken Peters weighing chinook fingerlings for transfer to Kooskia NFH.

REPAIRS/IMPROVEMENTS/NEW EQUIPMENT

Special Projects:

Preliminary radon testing in four (4) residences was issued by the COE. Further testing is anticipated to further monitor the facilities.

Domestic water treatment system changed from an iodine system to treatment with ozone (O_3 primary) and chlorine (secondary) - $2200.

Fabricating a bird exclosure of the chinook raceways to enclose 23,000 square feet of rearing area. Supports for the overhead enclosure are in place from original construction, side panels and gates with wire mesh to be completed - $27,000.

(Cost break out: $5000 (FY 1992); $12,700 materials, $9000 labor)

Assistance to IFRO in providing services for electrical, water and sewer along with site preparation for temporary modular office building located near west area of hatchery.

Major work was completed in installing new piping, valving and pumps to allow use of reservoir water to supply the ozone generators. Previously the ozone system was supplied with water directly from the river. Costs ($17,000) for this project were recovered from the Walla Walla COE District; hatchery personnel performed the work.

Temporary modifications were made to the existing fish counting weir located adjacent to Holding Pond 9. Changes allowed steelhead returning via the fish ladder to access and be counted into Pond 9. Further improvements were made prior to spring chinook collection incorporating a COE engineering design.

Main river water intake area was dredged for removal of silt and debris accumulated over 25 years of operation. Contract cost of $24,000 was increased to $48,000 when work was extended to assure completion of job. In addition, $4000 was required for rental and operation of crane to remove and reset intake trash racks. A number of hours were logged by station personnel assisting on this project.

Main aeration chamber - partial replacement of the support beams holding column degassers and new media added (COE special transfer funds) - $22,700.

Adding relief valves to five existing 12-inch water supply pipes at the main aeration chamber to reduce flow velocity through column degassers and eliminating destruction of the column media - $2600.

Repairs/Improvements:

Netting repairs were made to enclose the spring chinook raceways from birds. Side curtains were replaced with smaller mesh in an effort to make the area more secure.

Column degassers installed on 64 nursery tanks and new plumbing added. Materials on hand from FY 1992 purchase.

Install incubator pump sump clay valve - COE purchased in FY 1992, installed January 1993.

Electric grids removed from Mechanical I and II in January 1993 as obsolete equipment

Installed expanded metal panels on safety guard rail along head channel of adult holding ponds. Material purchased in FY 1992, completed May 1993.

Fire and Maintenance pump installation and new control system purchased FY 1992, operating August 1993.

Repair and assemble main pump No. 6. Materials purchased FY 1992, completed October 1992.

Completed conversion of adult Holding Pond 3 from two raceways with major work and materials occurring in FY 1992.

Residence improvements included venetian blinds in four houses - $1900; new linoleum in kitchen and bathroom of quarters 3 and 4 - $4000; and asphalt paving of drive at quarters 1 - $1600.

Asphalt paving of west storage area - $2800.

Replaced smaller pond screens with larger 3/32 size openings. Screens purchased FY 1992 and completed in all ponds, May 1993.

Purchased and installed new window blinds in crew's room and production office - $900.

Cable on main pump house overhead crane and Mechanical II crane replaced and safety tested.

Installed crossover line to connect gravity flow reservoir water to egg incubator supply to assure continued operation during time of power failure, completed August 1993 - $700.

New screen covers were constructed and installed on 128 nursery tanks - $2200.

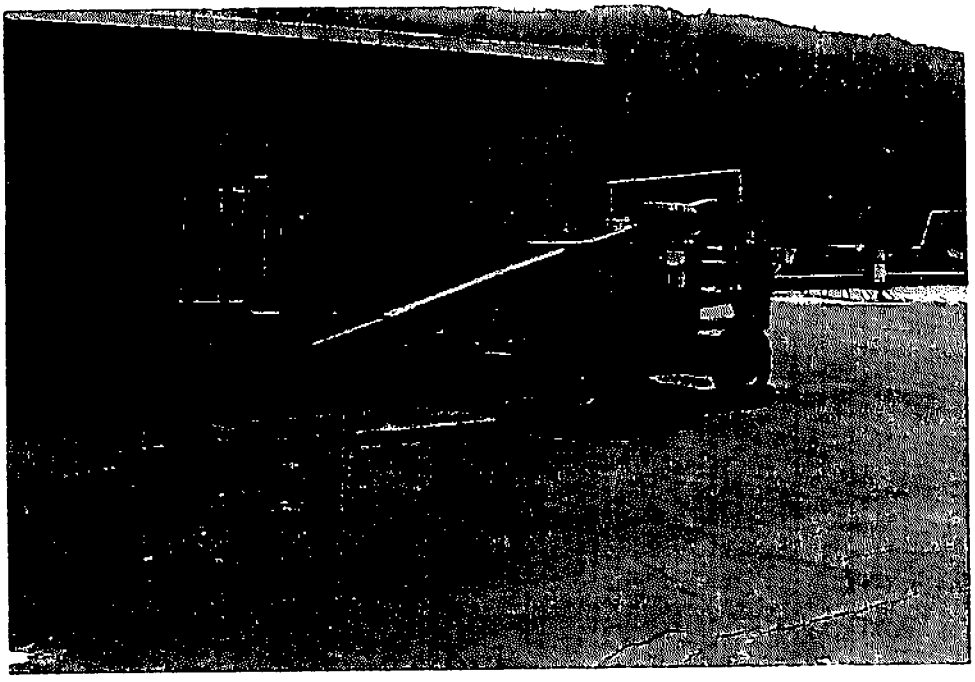
Up-graded chemical feed system for formalin treatment of Holding Ponds 1 and 2 - $800.

A main water supply line, furnishing a segment of the nursery tanks, exploded on August 3. Approximately 135 feet of pipeline varying in diameter from 12 inches to 4 inches along with all fitting connections and pipe headers to each tank were destroyed. CO_2 gas appeared to cause the explosion. Material costs were assessed at $3000 to complete the repairs. Work is anticipated early next year prior to using this section of the nursery building.

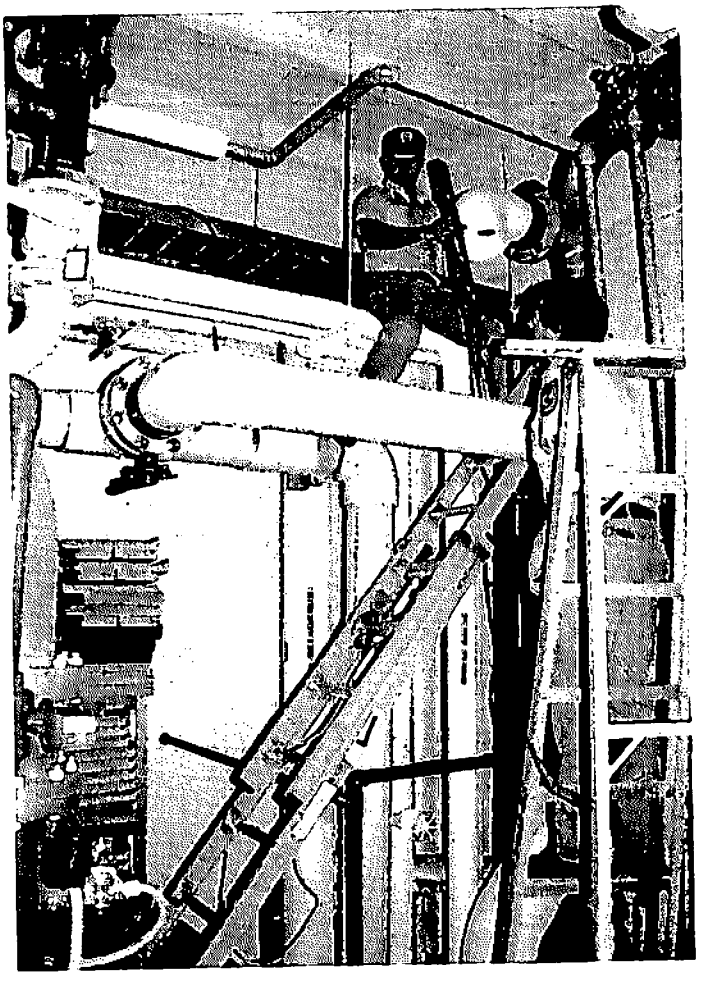
Equipment Purchases:

Annunciator alarm system	$43,000
Pond aerators (2) for sludge basin	9,600
Sump pumps (2) for SCS raceway effluent	10,800
Computer, production office	2,600
Hydraulic man lift	42,000
Storage cabinets, shop	1,000
Tamper, shop	2,300
**Distribution tank (add-on costs)	*16,500
*$66,300 previously available from FY 1991	
Television set (Zenith) purchased (replacement for a Mitsubishi TV) and installed in the public video display	500

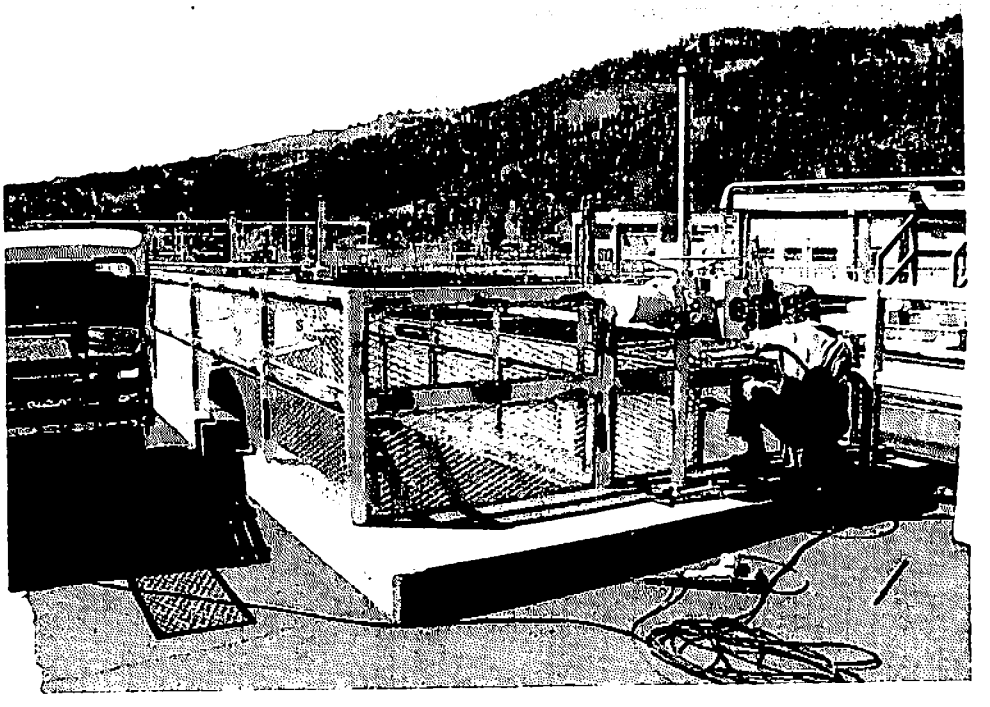
A Ford truck (cab and chassis) ordered on November 27, 1990 was delivered to the hatchery on February 13, 1991. This unit remained at the hatchery until award of a fish distribution tank (2500 gallon capacity) was issued to Interpipe, Phoenix, Arizona in April 1992 at a cost of $66,300. The vehicle was picked up on June 3, 1992 for mounting of a new fish tank anticipated to be completed by September 1992. Unanticipated delays by the contractor continued to postpone the tank fabrication resulting in a proposed default of the contract initiated in April 1993. The contract was readvertised and awarded to Nebraska Welding, Omaha at a cost of $82,800 or $16,500 increase; work to be completed in December 1993 with delivery to follow. The above scenario describes the problems and delays resulting in a new truck delivered 3 years later with "zero" miles registered.



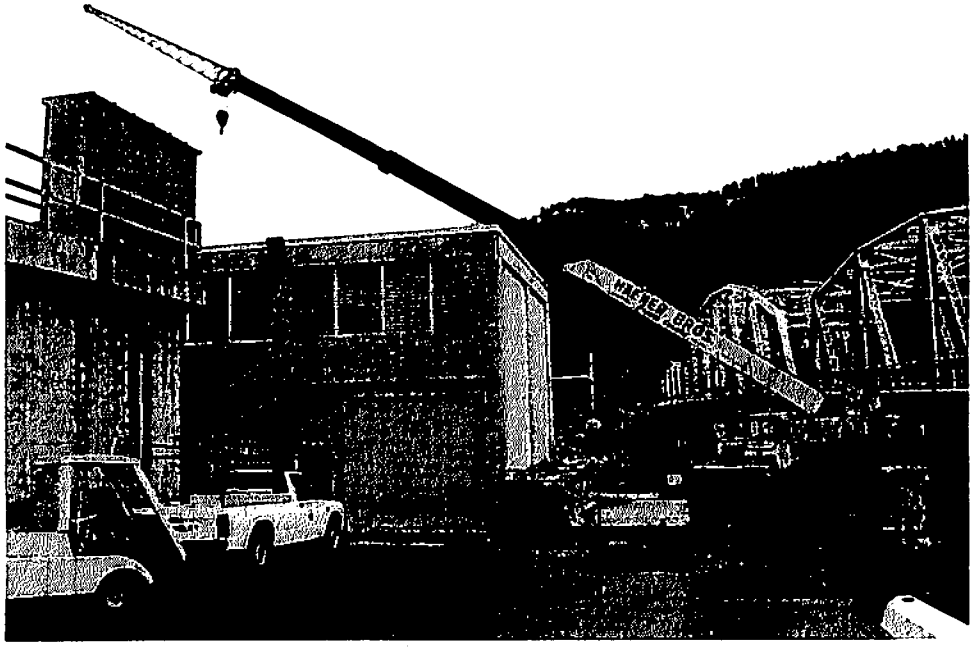
Hydraulic man-lift delivered in July 1993 - cost $42,000.



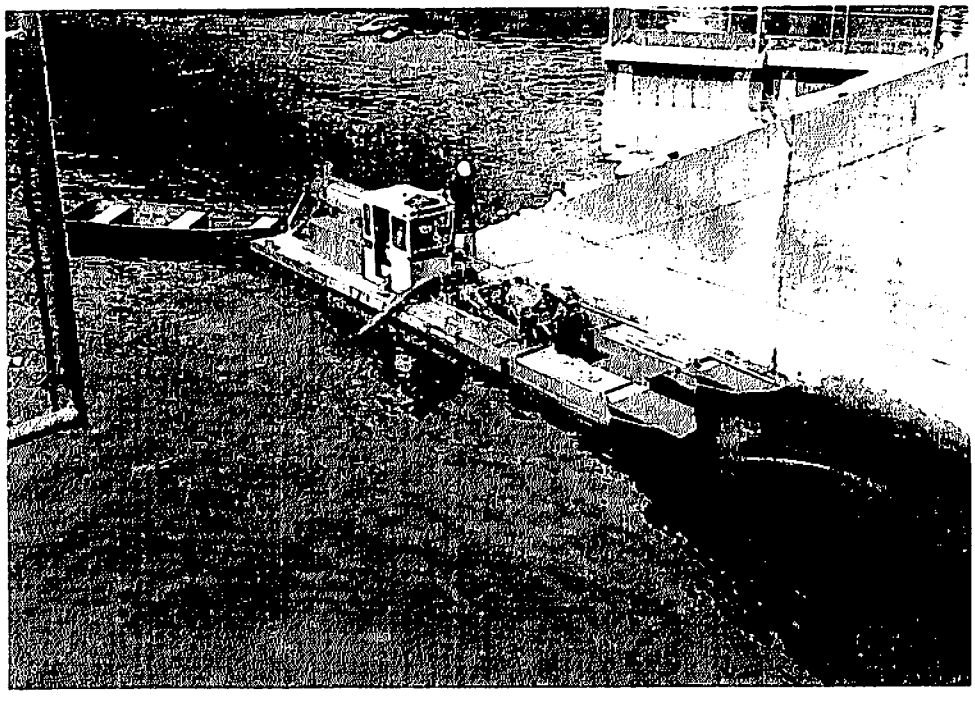
New crossover line installed allowing gravity flow reservoir water to the egg incubators.



Maintenance Mechanic Hugh Sims installing safety barrier along a deep water channel.

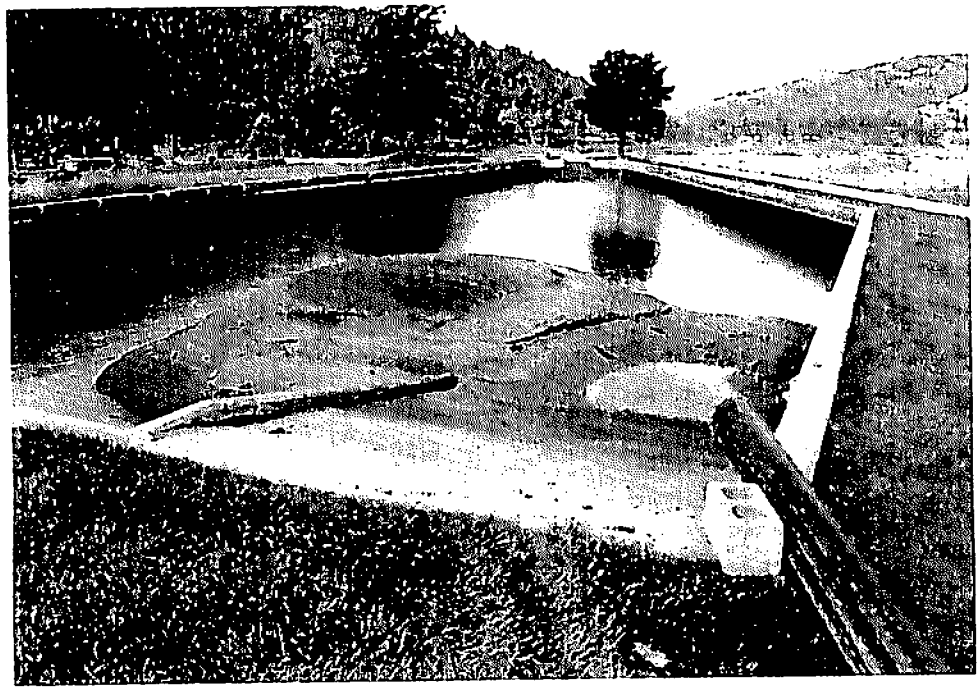


Crane in place to remove trash grates from in front of main river intake structure.

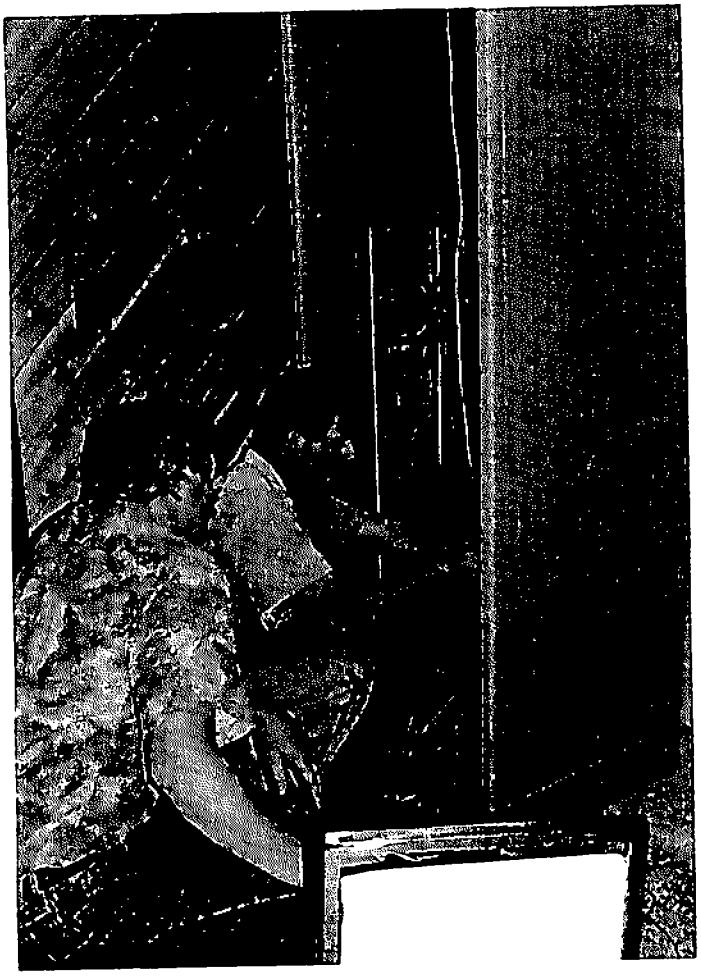


Dredging at main water intake to remove 25 years of river silt accumulation.

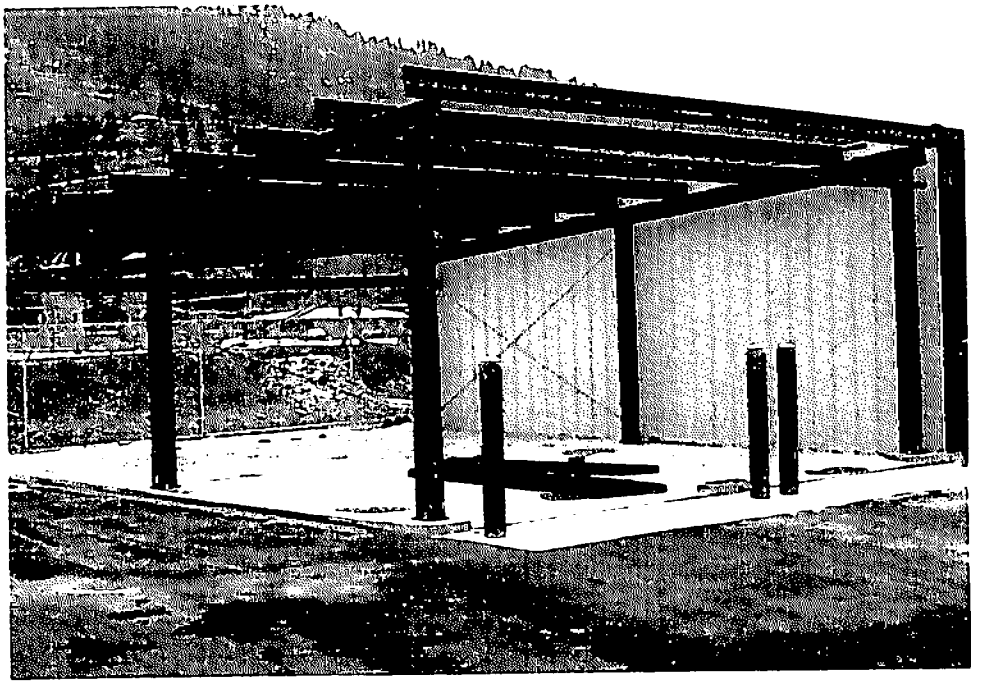
Dredging and removing logs from the main water intake structure. Accumulation had occurred over a 25 year period causing serious pumping problems.



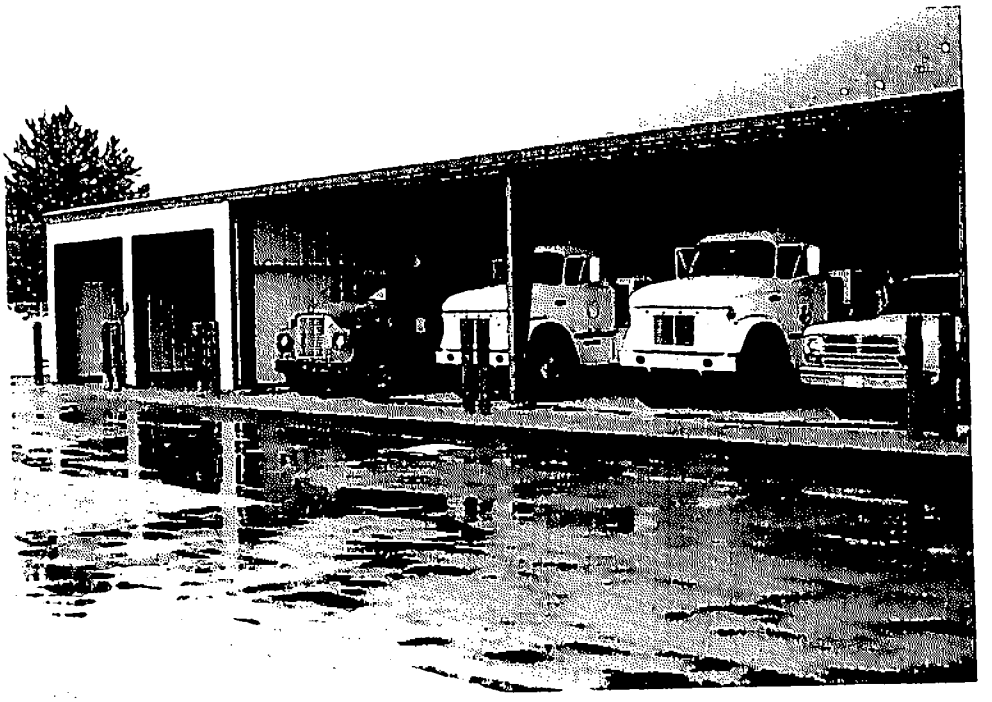
Sand accumulation from dredging pumped to west point of hatchery grounds for removal.

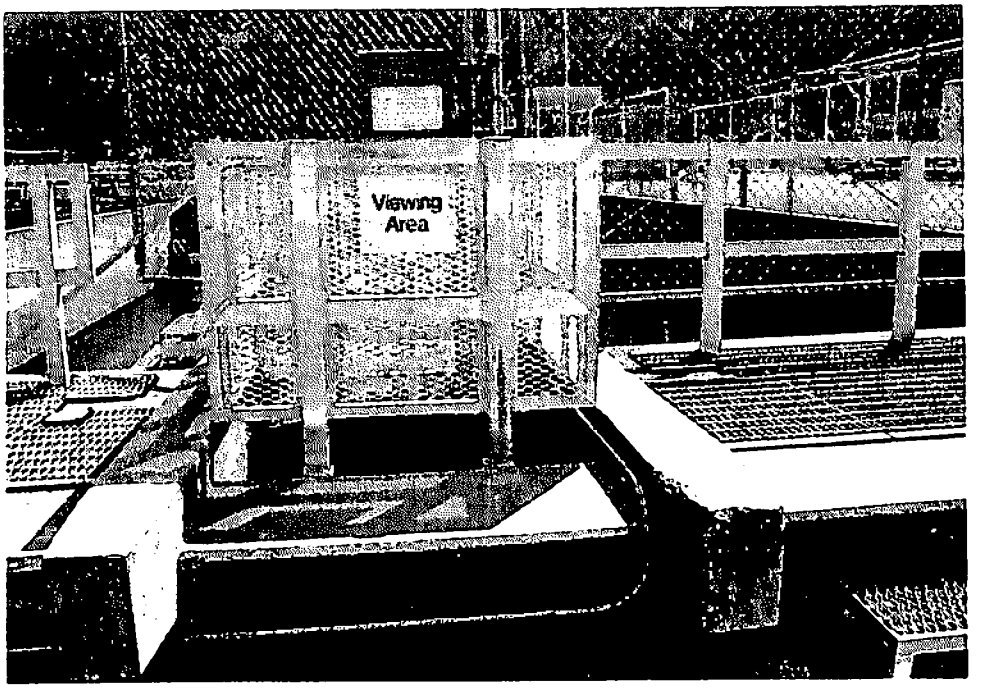


A new alarm annunciator installed by Aqua Technologies - cost $42,900.

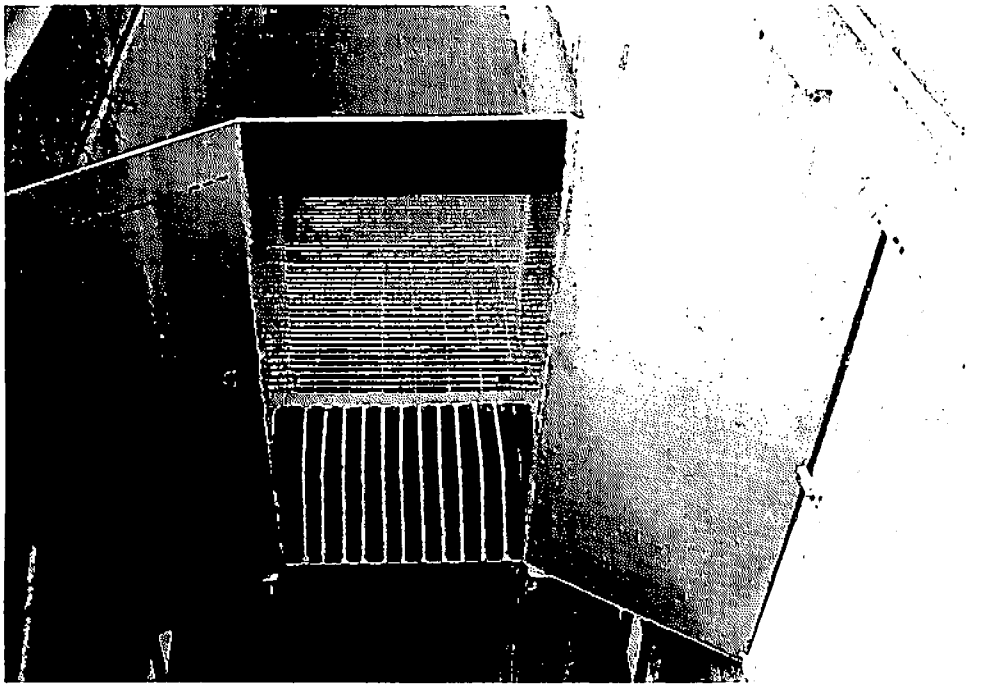


Construction of a two-stall storage addition to the existing equipment building.

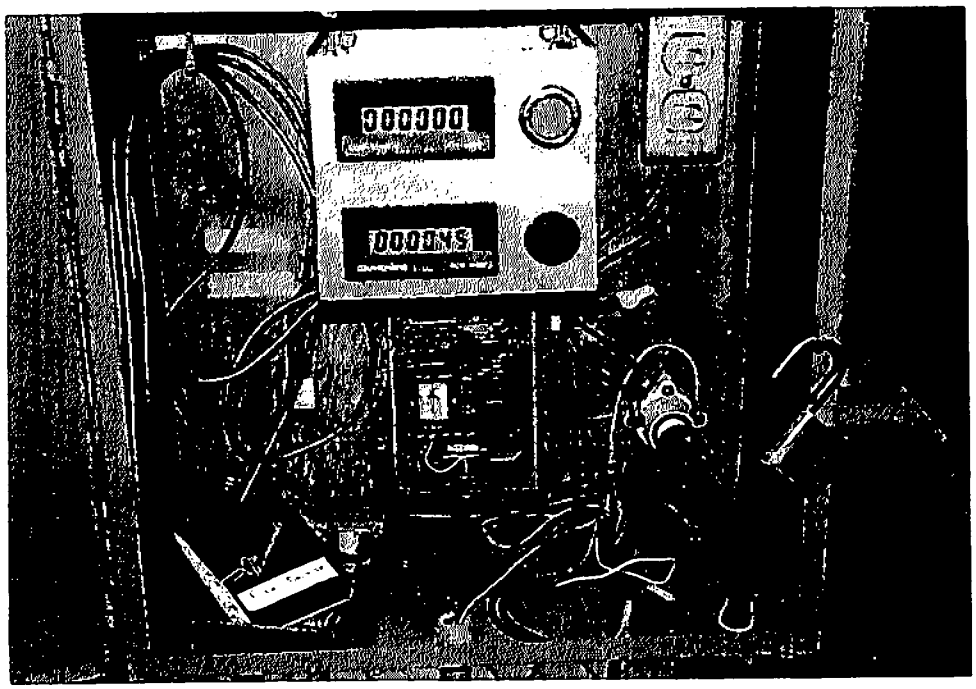




Viewing area to observe adult fish being counted over a weir into a holding pond.



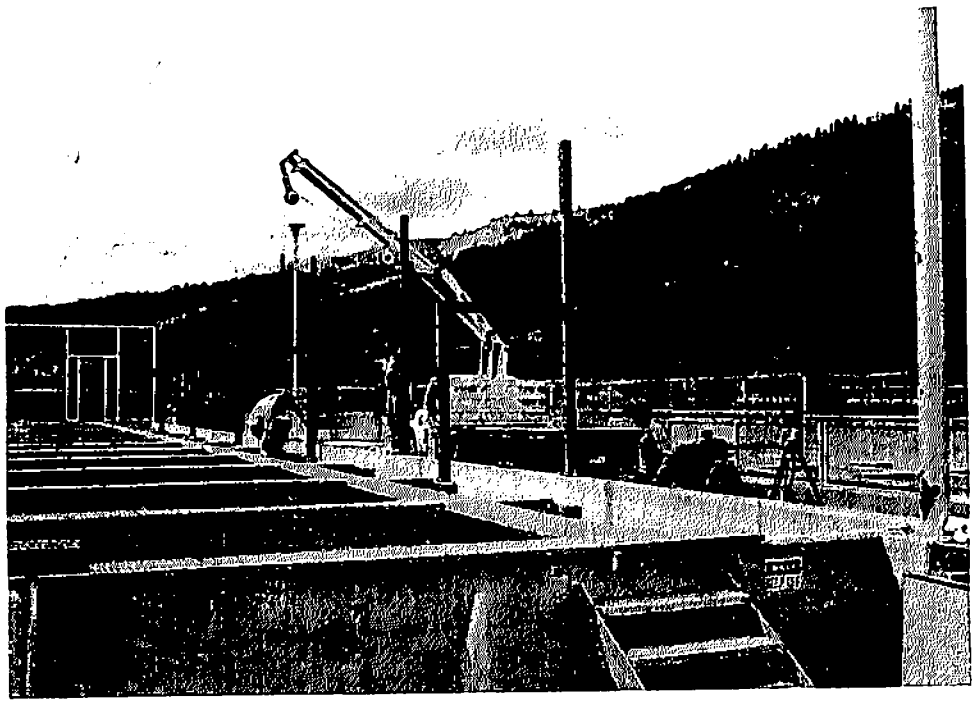
Dworshak's newly modified fish weir for collecting and counting adult chinook steelhead.

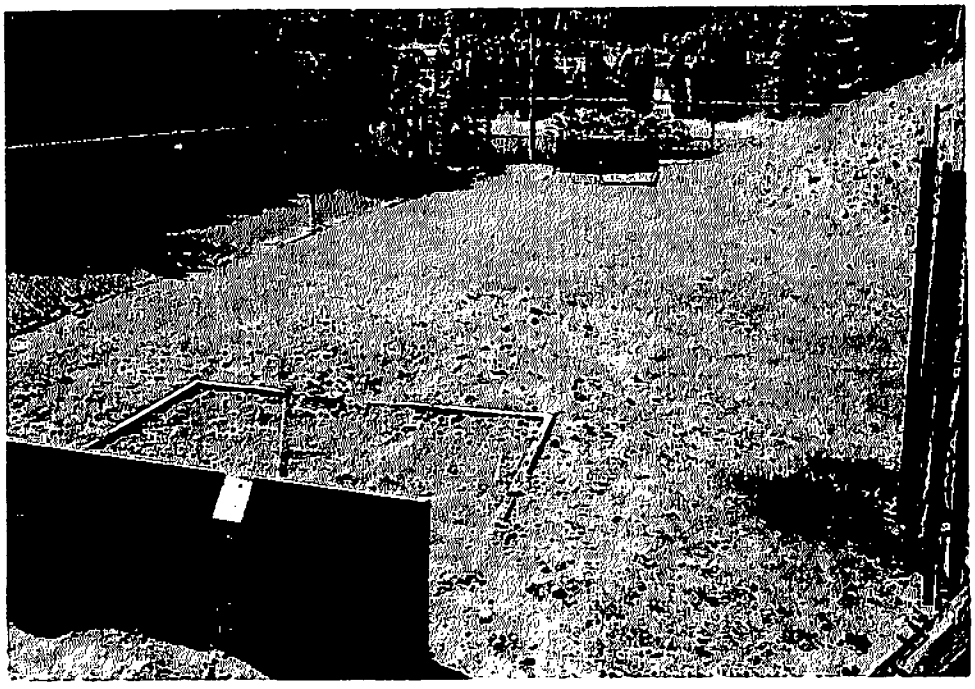


Adult fish counter showing wiring and special electronic equipment to enumerate numbers collected via the fish ladder.

YCC enrollees assisting Ray Rosales in the chinook raceway enclosure project.

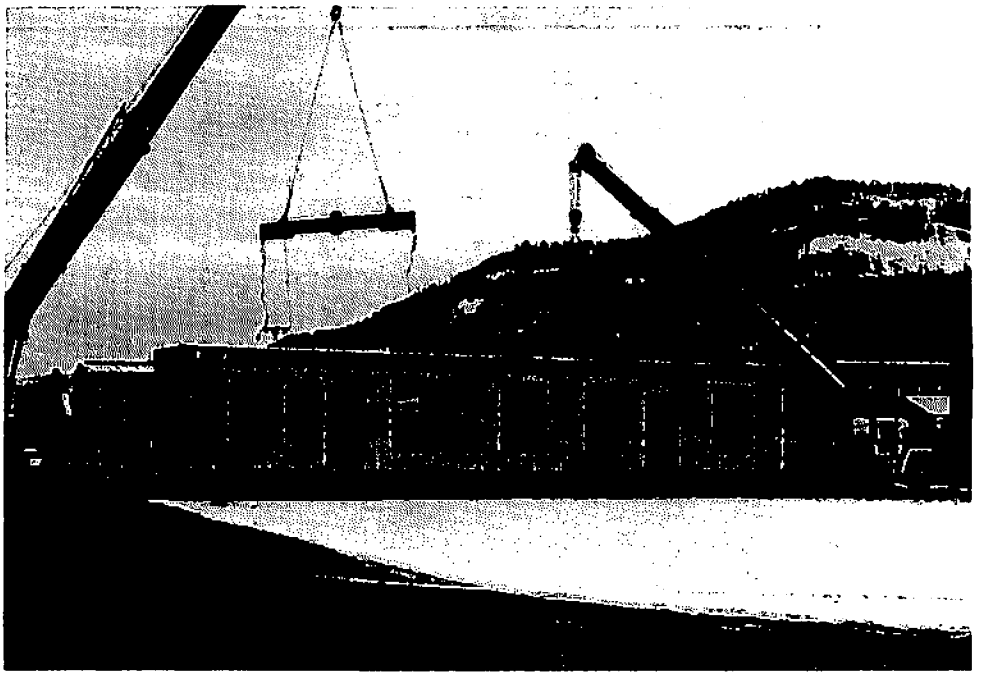
Construction of a bird exclosure at the chinook raceways to include a complete closure with gates and removable side frames for workability.



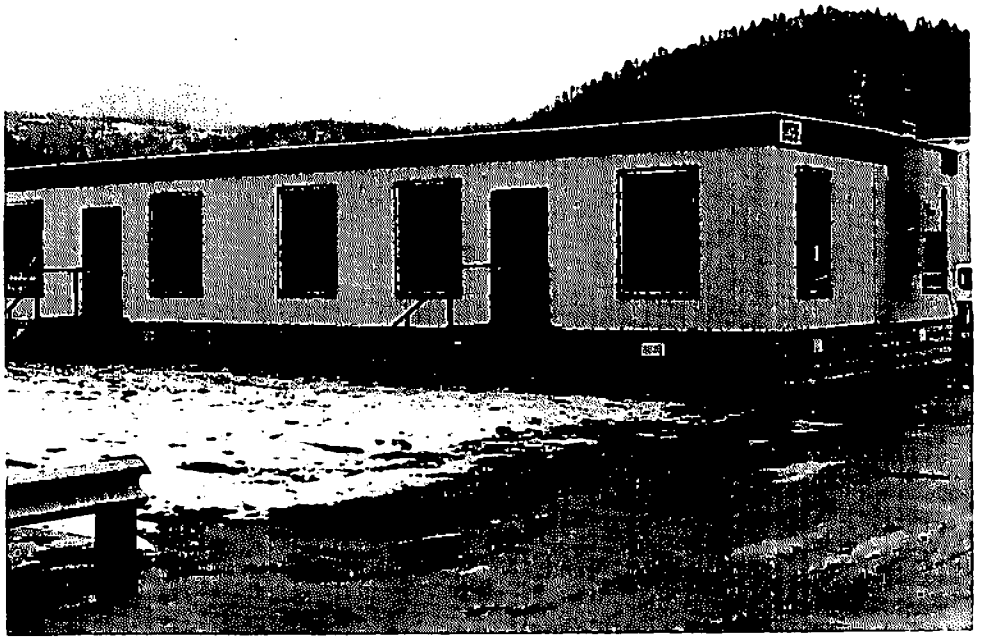


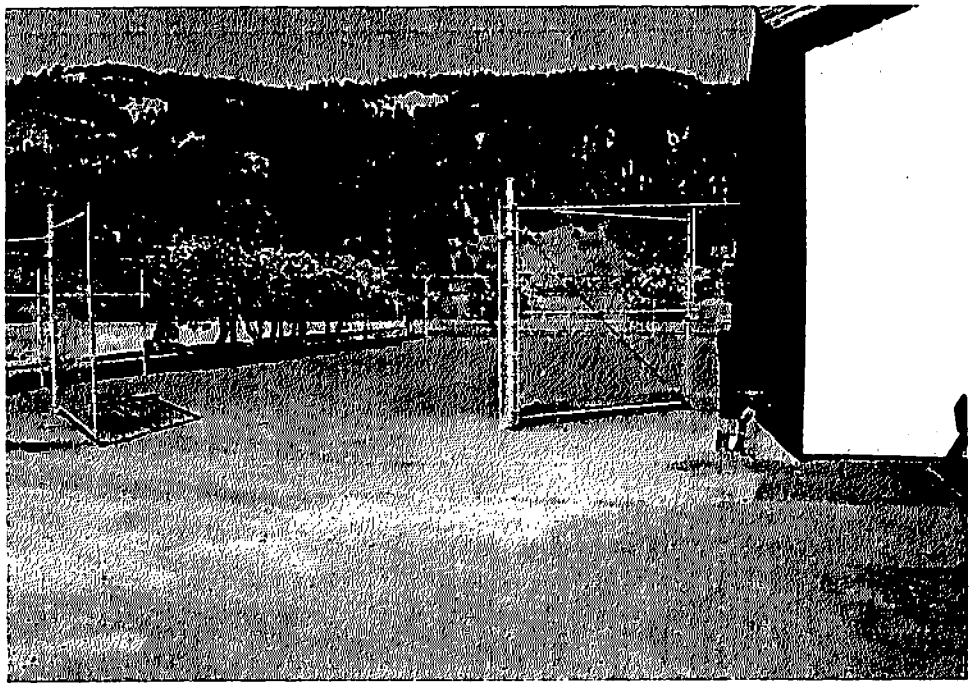
Horseshoe pits constructed by the YCC program for use by station employees.

Site of FRO's office building prior to installing a double-wide modular trailer.

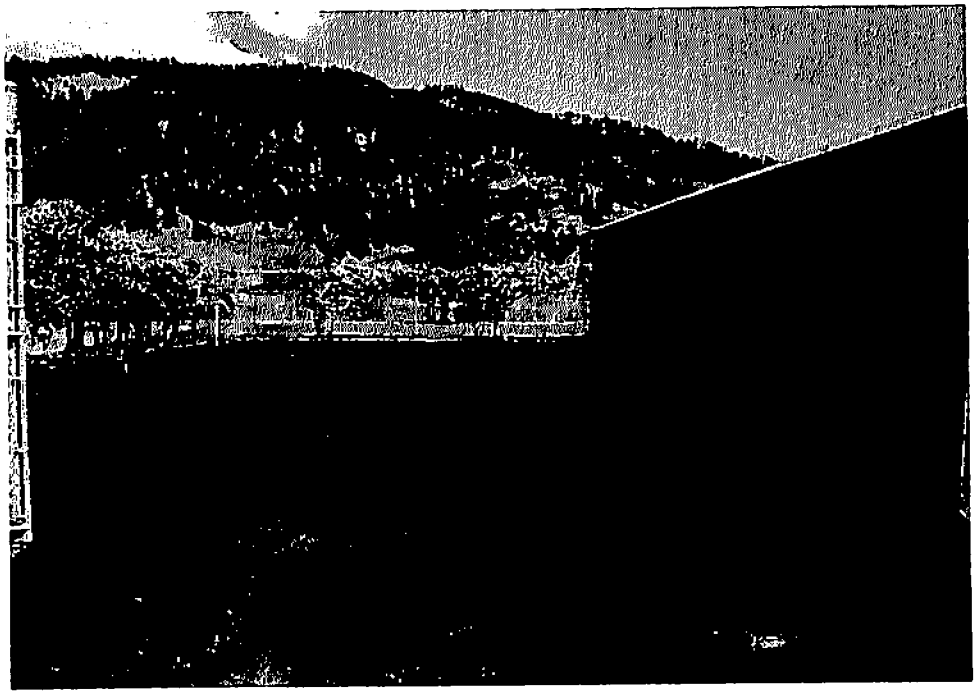


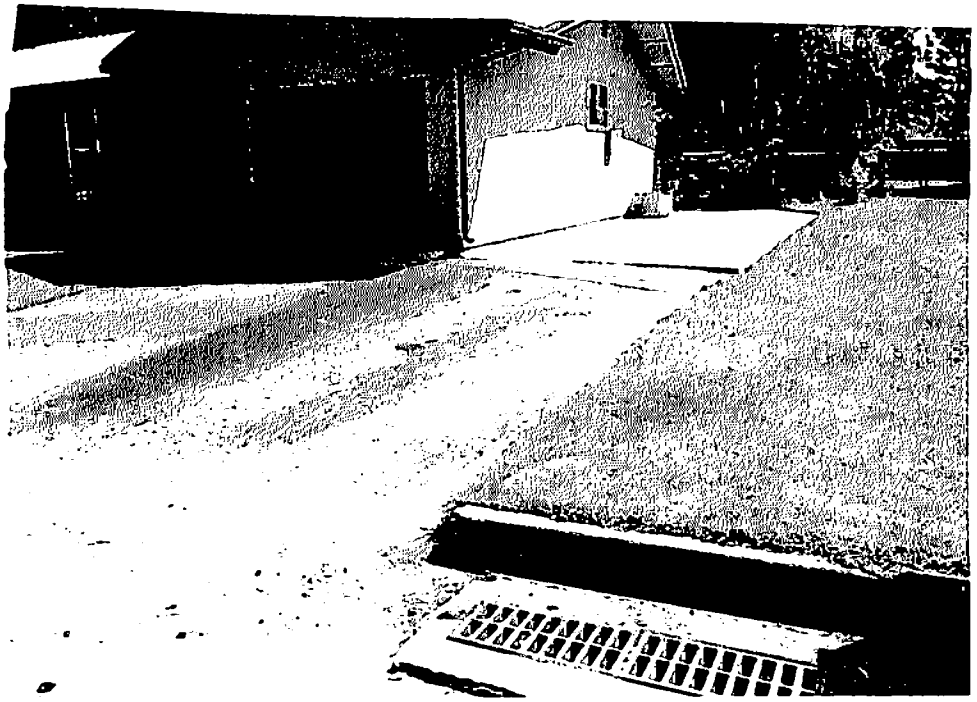
Installing FRO's project headquarters in vicinity of Dworshak's west point. Hatchery employees assisted in site preparation and with utility services.



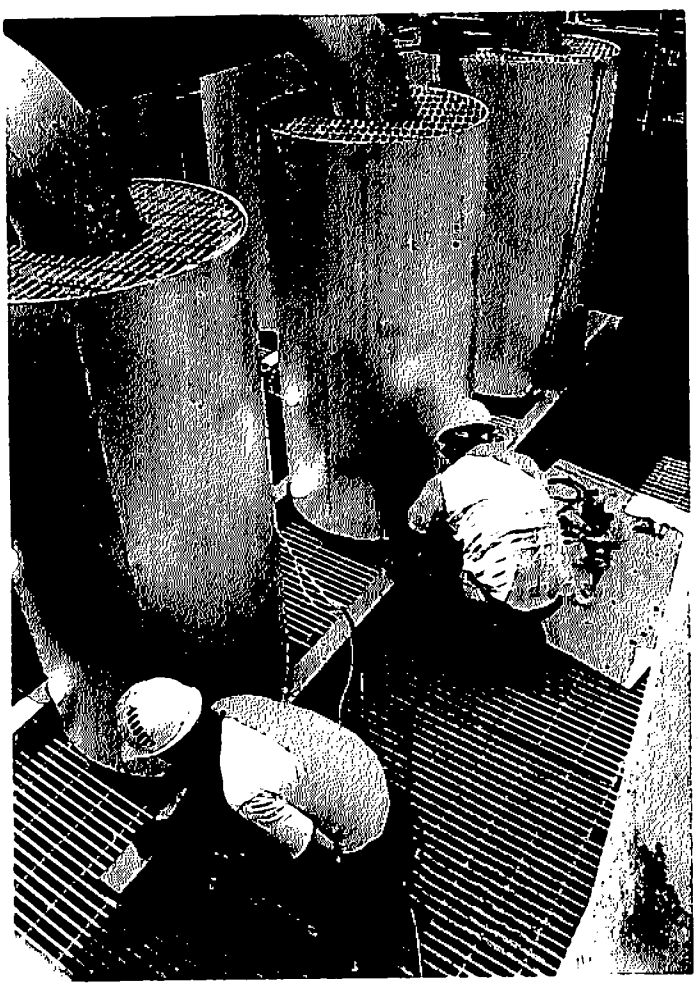


Site preparation of west storage area for asphalt overlay.





New asphalt/concrete apron near Residence No. 1.



COE contract issued to repair structural damage of the main aeration chamber including reinstalling columns and supports.

YCC project involving clean-up and planting of area adjacent to hatchery property for an added buffer zone.

MEETINGS/TRAVEL/TRAINING

Dworshak's coordination meeting was held on November 19. There were 28 in attendance representing Idaho FRO, Dworshak FHC, Corps of Engineers, LSRCP, and Idaho Department of Fish and Game. The resident mitigation fishery was a topic of concern by IDFG needing further review to resolve. The issue was over a 100,000 pound annual rainbow production commitment that the Corps has for the Dworshak Reservoir area.

A Columbia River project leaders meeting was held in Richland, Washington, November 2-5 with Manager Olson attending.

Wayne Olson and Dave Owsley were represented at a steering committee meeting in Portland November 12-13, to begin planning the 44th Annual Northwest Fish Culture Conference. The Service hosts the event in December 1993.

The Northwest Fish Culture Conference, held in Wenatchee, Washington December 1-3, was attended by Jon Streufert, Dave Owsley, John Vargas and Kevin Sloan. A paper was presented by Streufert "Effects of Using Two Different Water Sources on the Incidence of IHN Virus at Dworshak NFH."

Olson participated in an AFF (Fisheries) Retreat in Portland, Oregon on December 4.

Environmental Engineer Owsley attended and presented a paper, "Biofiltration," at the Western Regional Aquaculture Expo, in Reno, Nevada, February 17-19.

Biologists Peters, Long, and Wolfe attended the Idaho AFS Chapter meeting in McCall, Idaho on February 25-27.

Dworshak's semi-annual coordination meeting was held on March 18. Service representatives included Idaho FRO, Dworshak FHC, Kooskia NFH, University of Idaho Coop Unit and Seattle NFRC. Other attendees were from IDFG, COE and NMFS. A full day was allotted to hatchery production activities, research studies, and fishery issues in general.

A meeting was held on March 23 with COE representatives from the Walla Walla District to inspect Dworshak's overpass bridge. A cost analysis will be made to determine the best approach in resolving a concern over safety of the 1968 constructed wooden trestle. Two approaches being considered are to replace the bridge with new construction or make an at-grade railroad crossing.

Manager Olson travelled to Phoenix on March 25 to inspect the construction of Dworshak's new fish distribution truck expected to have been completed on March 25. It was discovered that no progress had been made on the two tanks; Little White NFH also receiving a unit. Contracting and General Services (CGS) in Portland was notified resulting in a default of contract with Interpipe, Inc.

Dave Owsley represented the hatchery at a project staff meeting regarding the Dworshak Small Hydroelectric Project. The meeting with Service reviewers was hosted by Idaho Department of Water Resources in Dworshak's conference room on

April 14. Further follow-up became necessary concerning the hatchery's additional water need from the reservoir and the sizing of the project.

Olson travelled to Hagerman NFH on April 22 to view their latest bird exclosure work. The visit was an opportunity to say "farewell" to Manager Dave Bruhn who retired on April 30.

Jon Streufert attended a Quality Control Improvement meeting in Portland, Oregon on May 17-18.

Owsley and Clifford travelled to Coeur d'Alene on May 25 to meet with a dredging contractor regarding upcoming work at Dworshak's river water intake. The hatchery will pump and remove the silt accumulation from in front of the intake and dispose of the solids on site. A permit to discharge in the river was denied.

Engineer Dave Owsley attended the '93 Aquaculture Engineering Conference held in Spokane, Washington, June 21-23. Mr. Owsley presented a paper, "Status of FWS Hatcheries With Reuse Systems in Region 1."

Wayne Olson and Dave Owsley travelled to Spokane on July 13 to meet with the committee members on planning the 44th N.W. Fish Culture Conference.

Olson and Owsley attended and participated with presentations at the 123rd annual meeting of the American Fisheries Society (AFS) held in Portland, August 29-September 2. Owsley was also actively involved in the AFS Bioengineering Section.

Dave Owsley updated the PNWFHPC Twin Falls, Idaho September 28-29 on water quality and water treatment systems with emphasis on ozone.

Training, representing 1160 hours, was provided the following station employees:

Dave Clifford	Site visits to Eagle Creek, Spring Creek, Carson and Little White NFHs, February 10-12
	EEO refresher training, USFWS, Nampa, Idaho, 16 hrs, October 20-21
Mary Lou Galloway	EEO refresher training, USFWS, Nampa, Idaho, 16 hrs, October 20-21
	Mentor training, USFWS, Portland, Oregon, 16 hrs, October 26-27
	Basic Supervision I, OPM, Seattle, Washington, 40 hrs, November 16-20
	Secretary workshop, LCSC, Lewiston, Idaho, 8 hrs, April 21

Rocky Greenland	Cold Water Fish Culture, USFWS, Bozeman, Montana, 80 hrs, March 1-12
Hank Jenks	Clay-Valve Operation and Maintenance, Idaho Rural Water Association, Lewiston, Idaho, 8 hrs, April 8
Peter Long	Module I, USFWS, Leetown, West Virginia, 80 hrs, October 26-November 6
Dawna Nichols	Getting Started with DOS, correspondence, OPM, National Independent Study Center, 24 hrs, November 13
	Managing Multiple Projects, Spokane, Washington, 8 hrs, November 30
	Secretary workshop, LCSC, Lewiston, Idaho, 8 hrs, April 21
	VISA training, USFWS, Portland, Oregon, 8 hrs, May 19
Wayne Olson	Word Processing I, Lewiston, Idaho, 4 hrs, October 7
	EEO refresher training, USFWS, Nampa, Idaho, 16 hrs, October 20-21
	Mentor training, USFWS, Portland, Oregon, 16 hrs, October 26-27
Dave Owsley	Word Processing I, Lewiston, Idaho, 4 hrs, October 7
	Mentor training, USFWS, Portland, Oregon, 16 hrs, October 26-27
	Applied Supervision, correspondence, OPM, National Independent Study Center, 40 hrs, December 20
	N.W. Fish Culture Conference, Wenatchee, Washington, December 8-10
Ken Peters	N.W. Fish Culture Conference, Wenatchee, Washington, December 8-10
Ray Rosales	Clay-Valve Operation and Maintenance, Idaho Rural Water Association, Lewiston, Idaho, 8 hrs, December 8
	Site visits to Eagle Creek, Spring Creek, Carson and Little White NFHs, February 10-12
Hubert Sims	Clay-Valve Operation and Maintenance, Idaho Rural Water Association, Lewiston, Idaho, 8 hrs, December 8
	Pump Maintenance Seminar, Kennewick, Washington, 16 hrs, March 23-24

Kevin Sloan	N.W. Fish Culture Conference, Wenatchee, Washington, December 8-10
	Introduction to Supervision I, OPM, Seattle, Washington, 40 hrs, March 1-5
	Water Treatment Processes for Hatcheries, USFWS, Lewiston, Idaho, 32 hrs, May 10-13
	Managing Personal Growth, USFWS, Boise, Idaho, 16 hrs, June 29-30
Jon Streufert	EEO refresher training, USFWS, Nampa, Idaho, 16 hrs, October 20-21
	N.W. Fish Culture Conference, Wenatchee, Washington, December 8-10
John Vargas	N.W. Fish Culture Conference, Wenatchee, Washington, December 8-10
David Weigand	Pacific Salmon Culture, USFWS, Vancouver, Washington, 80 hrs, July 12-23
Cyndie Wolfe	Module I, USFWS, Leetown, West Virginia, 80 hrs, October 26-November 6
	AFS Chapter meeting, McCall, Idaho, February 25-27
	Lahontan NFH (Marble Bluff), Nevada, Cui-ui passage activities - 11 day detail, May 26-June 4
	Module II, USFWS, Leetown, West Virginia, 80 hrs, August 16-26
Ben Wright	Basic Fish Health, USFWS, Olympia, Washington, 40 hrs, June 21-25

STAFFING

Dan Diggs, Regional Office, presented awards on October 5 to Dave Clifford for Fishery Specialist of the Year and Mary Lou Galloway Administrative Assistant of the Year.

A 10-year length of government Service award was presented to Ben Greene, Electrician, on November 25.

Richard Rountree ended his Older Worker Program (OWP) appointment with a resignation effective March 14. Carol Davis was hired on May 28 to continue in a similar position. OWP, administered through Lewis-Clark State College, has used the Complex as a work site since 1989. Ms. Davis will be employed for one year working 20 hours each week.

Senior volunteers Lyda, McGill, and Thiessen provided nearly 100 hours of service assisting the public in viewing steelhead spawning activities during February thru April.

Manager Olson attended a noon luncheon in Orofino on April 26 recognizing senior volunteer workers of the local area. Dworshak's three volunteers were presented certificates in recognition of their excellent services to the hatchery.

A farewell get together was held on April 30 to send Clarence "Perry" Moffett into retirement. Perry's retirement was effective April 30 after working 20 years at Dworshak. Prior to this time, Mr. Moffett had spent 20 years with the military.

New employee, Ken Peters, was presented with the "Outstanding Graduate Student" award for 1992 from the College of Forestry, Wildlife, and Range Science, University of Idaho. The award was given at a banquet held in Moscow on April 23. Ken began his employment at Dworshak in November 1992 upon graduation from the university.

Special monetary awards were presented by Idaho FRO Project Leader Bill Miller to Dave Clifford, Mary Lou Galloway and David Owsley for their assistance in providing office and equipment storage spaces for the FRO project.

Six enrollees and one crew leader were hired for the 8-week YCC program. The program began on June 7, ending July 30.

Engineer Dave Owsley was presented a Distinguished Service Award at the 123rd annual meeting of the American Fisheries Society, in Portland, on August 30, in recognition of his many outstanding contributions to the Bioengineering Section.

Personnel Actions:

Kenneth Peters, Fishery Biologist, GS-482-7, VRA program, employment effective November 1.

Rocky Greenland, Fish Culturist, promotion from WG-5048-4 to a WG-5048-5, effective May 2.

Terry Weeks, Fish Culturist, promotion from WG-5048-4 to a WG-5048-5, effective May 2.

David Trainor, Welder, temporary appointment, WG-3703-10, effective July 6.

Robert G. Arnold, YCC Crew Leader, GS-186-5, effective June 6, ending July 30.

Alfred Jenks, Maintenance Worker, promotion from WG-4749-5 to WG-4749-7, effective August 8.

Cynthia Wolfe, Fishery Biologist, promotion from GS-482-7 to GS-482-9, effective August 22.

Peter Long, Fishery Biologist, promotion from GS-482-7 to GS-482-9, effective August 22.

Recruitment to fill two fishery biologists positions closed August 30. Selections of Glenn Green, GS-7, and Jay Ahn, GS-5, were made with appointments anticipated in October.

Dworshak Employees
- FY 93 -

Name	Position Title	Period of Employment		Status
Anderson, Natalie R.	YCC Enrollee	6/21/93 7/30/93	-	YCC Program
Arnold, Robert G.	YCC Crew Leader	6/07/93 7/30/93	-	YCC Program
Blanchfield, Jetta B.	YCC Enrollee	6/07/93 7/30/93	-	YCC Program
Claffey, Angelia S.	YCC Enrollee	6/07/93 6/11/93	-	YCC Program
Clifford, David E.	Work Supervisor (Maint.)	10/01/92 9/30/93	-	Permanent
Davis, Carol J.	Older Worker Program	5/28/93 9/30/93	-	Temporary
Galloway, Mary Lou	Program Assistant	10/01/92 9/30/93	-	Permanent
Greene, Benny C.	Electrician	10/01/92 9/30/93	-	Permanent
Greenland, Rocky E.	Fish Culturist	10/01/92 9/30/93	-	Permanent
Hill, Heidi J.	YCC Enrollee	6/07/93 7/30/93	-	YCC Program
Holloway, Vernon C.	Laborer	7/01/92 9/30/93	-	Temporary
Jenks, Alfred H.	Maintenance Worker	10/01/92 9/30/93	-	Permanent
Jenks, Emery A.	YCC Enrollee	6/07/93 7/30/93	-	YCC Program
Kessinger, Randon P.	YCC Enrollee	6/07/93 7/23/93	-	YCC Program
Long, Peter A.	Fishery Biologist	8/09/92 9/30/93	-	Permanent
Moffett, Clarence P.	Maintenance Worker	10/01/92 4/30/93	-	Permanent
Newman, Dawna M.	Office Automation Clerk	10/01/92 9/30/93	-	Permanent
Oatman, Ronald W.	Fish Culturist	10/01/92 9/30/93	-	Permanent
Olson, Wayne H.	Hatchery Manager	10/01/92 9/30/93	-	Permanent
Owsley, David E.	Environmental Engineer	10/01/92 9/30/93	-	Permanent
Peters, Kenneth K.	Fishery Biologist	11/01/92 9/30/93	-	Permanent
Peterson, Justin K.	YCC Enrollee	6/07/93 7/30/93	-	YCC Program
Rosales, Raymundo A.	Maintenance Worker	10/01/92 9/30/93	-	Permanent

Rountree, Richard D.	Older Worker Program	9/18/92 3/14/93	-	Temporary
Sims, Hubert M.	Maintenance Mechanic	10/01/92 9/30/93	-	Permanent
Sloan, Kevin N.	Fishery Biologist	10/04/92 9/30/93	-	Permanent
Streufert, Jonathan M.	Assistant Manager	10/01/92 9/30/93	-	Permanent
Trainor, David A.	Welder	7/06/93 11/10/93	-	Temporary
Vargas, John J.	Fish Culturist	10/01/92 9/30/93	-	Permanent
Weeks, Terry C.	Fish Culturist	10/01/92 9/30/93	-	Permanent
Weigand, David C.	Fishery Biologist	9/20/92 9/30/93	-	Permanent
Wolfe, Cynthia A.	Fishery Biologist	8/09/92 9/30/93	-	Permanent
Wright, Benjamin A.	Fish Culturist	10/01/92 9/30/93	-	Permanent

DWORSHAK-KOOSKIA NFH COMPLEX

October 1, 1992

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 (P/T)
- **Jonathan M. Streufert, Assistant Manager, Dworshak**
  - Kevin N. Sloan, Asst Prod Spvr
  - Peter A. Long, Fishery Biologist
  - David C. Weigand, Fishery Biologist
  - Cyndie A. Wolfe, Fishery Biologist
  - Ken Peters, Fishery Biologist
  - Ronald W. Oatman, Fish Culturist
  - Rocky E. Greenland, Fish Culturist
  - John J. Vargas, Fish Culturist
  - Benjamin A. Wright, Fish Culturist
  - Vernon C. Holloway, Laborer (P/T)
  - Richard D. Rountree, Older Worker Program
- **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 Worker
  - Clarence Moffett, Maint Worker
  - Raymundo Rosales, Maint Worker
  - Hubert M. Sims, Maint Mechanic
  - Terry C. Weeks, Fish Culturist

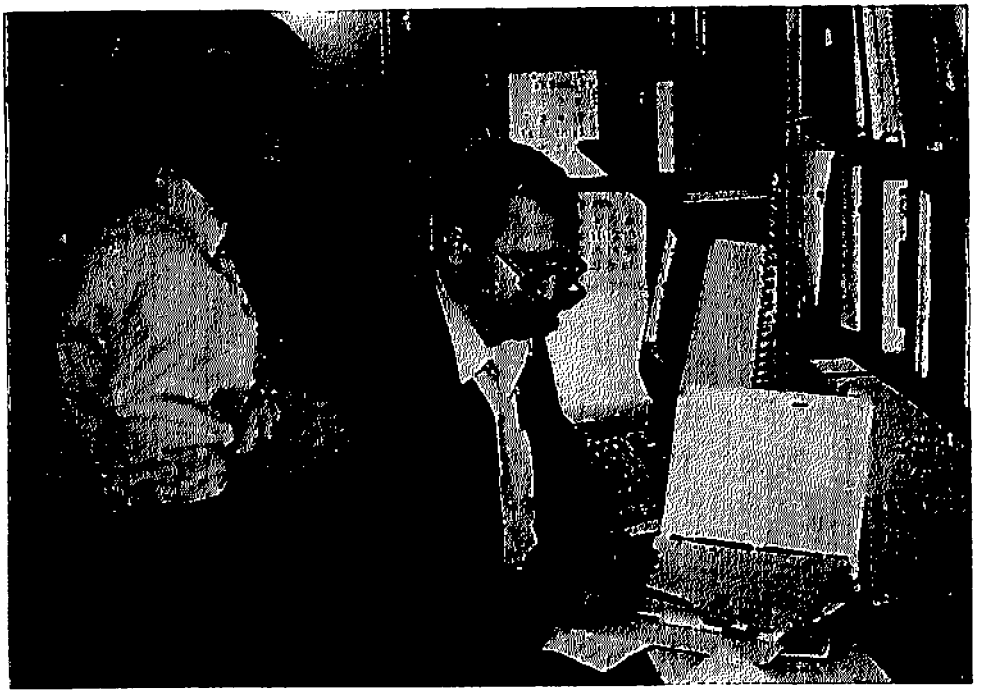
STAFFING PHOTOS

Dworshak NFH staff (left to right, back row): Dave Clifford, Maintenance Supervisor; Terry Weeks, Fish Culturist; Ron Oatman, Fish Culturist; Jon Streufert, Assistant Project Leader; Peter Long, Fishery Biologist; Ken Peters, Fishery Biologist; and Dave Weigand, Fishery Biologist; (left to right, middle row) - Wayne Olson, Hatchery Manager; Hubert Sims, Maintenance Mechanic; Ray Rosales, Maintenance Worker; Dave Owsley, Environmental Engineer; Kevin Sloan, Fishery Biologist; Hank Jenks, Maintenance Worker; Rocky Greenland, Fish Culturist; and Perry Moffett, Maintenance Worker; (left to right, front row) - Ben Wright, Fish Culturist; Mary Lou Galloway, Fisheries Program Assistant; Dawna Nichols, Office Automation Clerk; Amy Kishpaugh, Office Automation Clerk; Cyndie Wolfe, Fishery Biologist; Diane Praest, Secretary; and Jon Vargas, Fish Culturist. Not pictured is Ben Greene, Electrician.

Associate Fishery Manager, Dan Diggs, presenting the Region's Administrative Assistant Award to employee Mary Lou Galloway.

Dan Diggs, Regional Office, with a Fish Culturist of the Year Award for Dave Clifford, Maintenance Supervisor.

Manager Olson presenting a FWS recognition award to Perry Moffett upon retirement from 22 years of employment, April 1992.



Biologist Cyndie Wolfe receiving training on production programming from Assistant Manager Jon Streufert.

YCC crew (left to right): Emery Jenks, Heidi Hill, Justin Peterson, Jetta Blanchfield, Crew Leader, Bob Arnold, and Natalie Anderson. Absent was Randon Kessinger.

Employees Kishpaugh, Praest, Long and Wolfe on a trip to Lower Granite Dam to view fish barging operations.

PUBLIC OUTREACH/VISITORS

Benny Perry, Hatchery Manager, Norfork, Arkansas (Region 4) toured the Complex on October 9. Mr. Perry was especially interested in designs for enclosing ponds from birds.

Two articles were prepared and submitted for publication in the Region's "Fish Tales."

Bill Shake, ARD, from Portland, visited the station and met with the crew on November 12.

Dave Owsley presented a program to the Orofino High School consumer class on November 17. Mr. Owsley was also a guest speaker at two high school resources classes to speak on water quality.

Joe McMichael, LSRCP Project Engineer, COE, was at the on December 23 with his replacement, Joe Murar. McMichael's retirement was effective on December 31.

An Executive Seminar Program sponsored by Lewis-Clark College in Lewiston, held a one-day session in Dworshak's conference room. The group, representing several different agencies, was given a brief tour of the hatchery.

A DEQ Drinking Water workshop was hosted in the conference rom on January 20.

Orofino City Police Officer, Homer Ferguson, presented a program on seat belt safety to station employees on February 8.

Sandra Ristow, professor at Washington State University, along with several students from a course, "Intro to Aquaculture," visited Dworshak on February 23. A general tour of the facilities, viewing steelhead spawning activities and an informative meeting with staff employees, completed their visit.

Dan Diggs visited the stations on March 16-19 attending the coordination meeting and taking time to visit with staff.

The U.S. Forest Service Supervisor's office of the Clearwater National Forest in Orofino, displayed Dworshak's "Open House" fishing photos in their public information center. The folding panel display (10' x 8" high) was on loan during April and May.

Carol Rike, Program Assistant, Carson NFH, was at Dworshak during the week of April 26 to familiarize herself with Dworshak's office procedures. This on-site visit appeared to be highly beneficial.

Pat Masterson, Regional Office, CGS Purchasing Agent, performed an acquisition management review on April 8-9. Purchasing records were reviewed for fiscal years 1991, 1992, and 1993 to date and recommendations submitted as to the findings.

The annual Rotary District 508 Conference was hosted by the local Orofino club and included a tour of the hatchery on May 13.

Three senior volunteer workers from the local community donated over 100 hours of service to the hatchery during the period of February thru April assisting visitors viewing the weekly steelhead spawning activities. The volunteers provided information, answered questions and coordinated tours.

Malka Pattison, Policy Analyst, Washington Interior Office; Bill Maxon, Regional Office; and Fred Olney, Columbia River Coordinator visited Dworshak on June 8. Purpose of Ms. Pattison's trip was to gain an overview of the Western Region's fishing resource activities.

Biologist David Weigand presented an evening program on June 11 to campers at Dent Acres campground.

An increase in visitors was noticed in June with several tours provided to larger groups. A number of visitors toured after attending the Aquaculture Conference in Spokane. Included in this group were several members of the Prince Edward Island Trout Farmers of Canada, on June 21.

Open House activities were held at Dworshak on June 19. A free fishing pond was the highlight with 528 kids registering to fish. Numerous events filled the day adding to a most successful activity. This was Dworshak's 3rd annual.

The hatchery participated in "Wildlife Week" sponsored by Lewis-Clark State College and hosted by Orofino "kids" college. A one-hour presentation in July with a tour of the hatchery grounds was given to 12 elementary age students. Several other groups were given formal tours of the hatchery with special emphasis on spring chinook adult collection.

Corps visitors to Dworshak on August 5 included Colonel Jim Weller, District Engineer (replaced Col Voltz); Paul Winborg, District Chief-Operations; and Rodger Colgan, Project Engineer, Dworshak Dam. Purpose of the visit was to acquaint the new District Engineer with the hatchery's programs.

Gary Wilson, Regional Safety Officer, visited the station on August 10-11.

Lori Arden, Lower Snake Comp Plan Office, in Boise, was in the area September 24 taking inventory at the Clearwater Hatchery. She gave us a hand at picking chinook eggs for part of the day.

Biologist David Weigand's formal training position ended in September. Mr. Weigand was retained on station to continue in his present position with the production activities, however, with more emphasis on public outreach. An Outreach Team was established with representation from all projects which include the Complex of Dworshak and Kooskia, IFRO and FHC. This team will place emphasis on a more active program with schools and local communities.

An estimated 28,000 visitors toured the facility with the greatest increase seen in June through September. Steelhead spawning accounted for numerous students from surrounding area schools to view activities and tour the hatchery operations. Overall the number of public visitors were down from previous years. The proximity of the hatchery to Dworshak Reservoir relates to visitor activity. This year's low reservoir level in the summer May have had some effect on the reduced number of visitors.

VISITORS PHOTOS

Visitors in balcony viewing area observing steelhead spawning operations.

COOPERATIVE PROGRAMS

The hatchery worked closely with the following agencies and groups to accomplish 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
- -Older Worker Program
- -Senior Citizen Volunteer Program

Dworshak Fish Health Center and Idaho Fishery Resource Office shared facilities on the hatchery. The three Service groups are cooperatively involved in Service 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 provides cold storage space for the processed fish until distribution.

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

Two semi-annual coordination meetings were held at Dworshak with Idaho Department of Fish and Game, Nez Perce Tribe, COE and other Service groups to review hatchery production programs and to discuss Clearwater River fishery activities. A meeting in November 1992 was followed by another in March 1993.

Three senior volunteers contributed 100 hours of service to assist visitors viewing Dworshak's steelhead spawning operations in the spring.

Environmental Engineer Owsley continued to assist other agencies both federal and private on water treatment, holding design and other related facility 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 requested. To be specific, Dave instructed at the Leetown Academy course "Water Treatment Processes" held in Lewiston, Idaho, 5/93 and "Pacific Salmon," Vancouver, Washington, 7/93; assisted Creston NFH, Montana at Region 6's request to review the hatchery's effluent control needs; assisted

Marrowstone Research Station (Seattle NFRC) on a nitrogen gas problem, 4/93; and represented the Service at a "Park Partners" meeting in 4/93 at the Nez Perce National Historical Park. Mr. Owsley was actively involved for the 14th year as principle instructor in the local Idaho Hunter Education program providing two sessions annually.

The hatchery's fish distribution unit was on loan again for two weeks to the University of Idaho's fisheries program for transferring adult chinook from Cowlitz (Washington) hatchery.

The hatchery participates in the Older Worker Program administered by Lewis-Clark State College. This program has been used actively by the Complex since initiated on March 23, 1989; Kooskia having one senior worker in the program until June 1991 and Dworshak assuming the position since 1991.

Assistance was given by station staffing to help Idaho FRO relocate their offices to a new modular building located on the hatchery. Work included site preparation and connection of services. Employees Dave Clifford, Dave Owsley and Mary Lou Galloway were recognized by FRO Project Leader Bill Miller with monetary awards for their help.

Excellent communication was established with IDFG Clearwater Hatchery in the operation of the reservoir pipelines furnishing water to the two hatcheries. Temperature monitoring and valve operations were closely communicated to assure both parties were understanding of each other's needs.

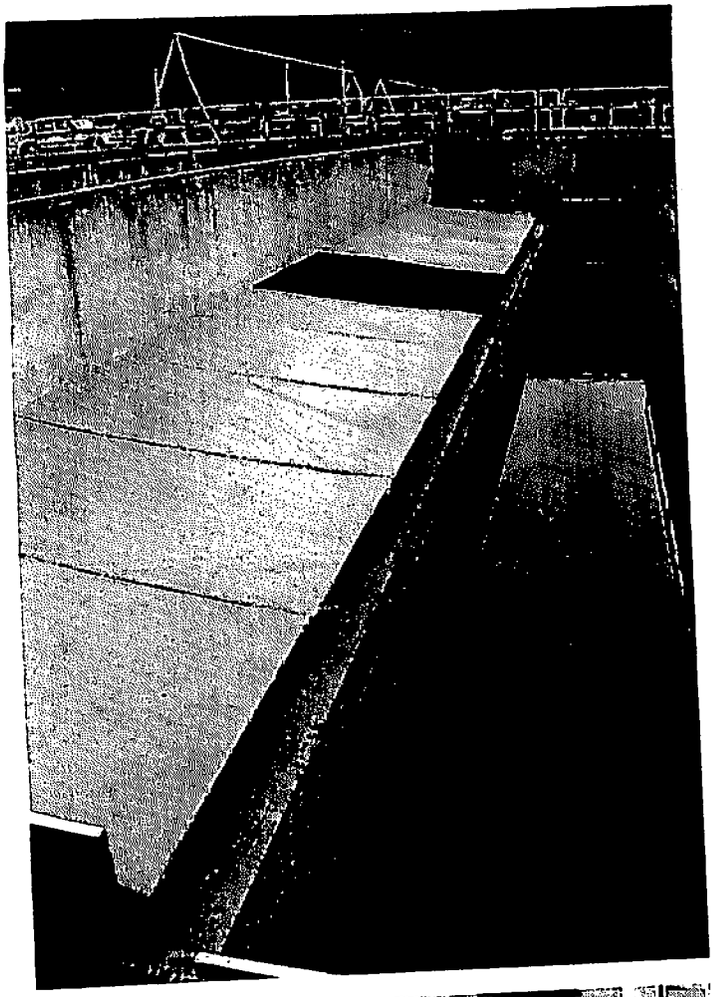
David Weigand, Fishery Biologist, assisted as an instructor at Leetown's training course "Orientation for Technicians" held in Marquette, Michigan, March 1-2.

Dave Clifford was in Portland on April 28 to assist on a rating panel for a maintenance position to be filled at Little White NFH.

Biologist Weigand assisted Idaho FRO on June 24 with fish sampling on the Lochsa River.

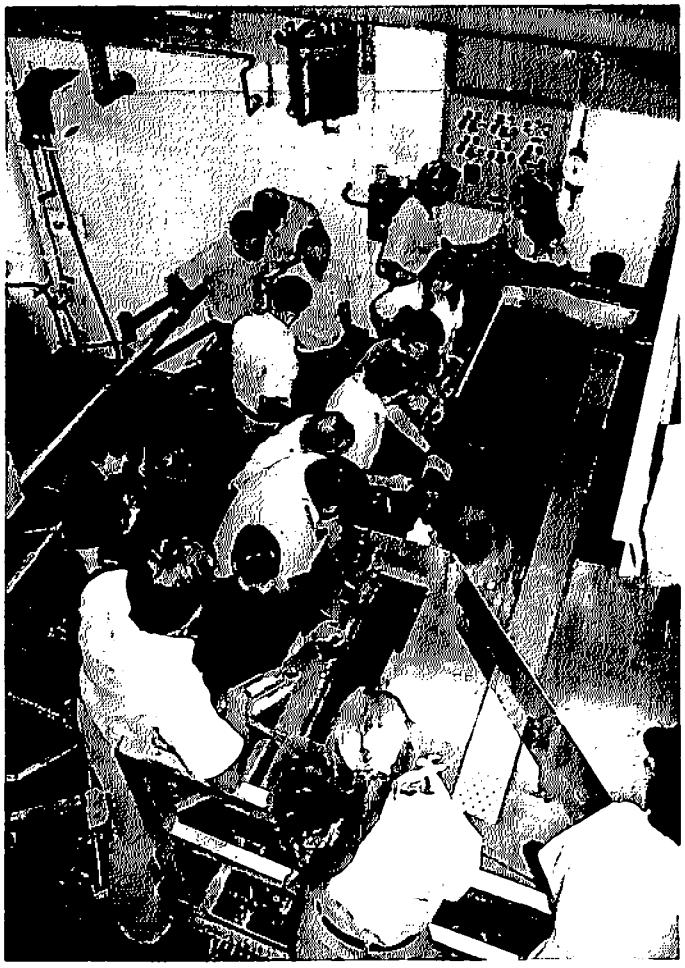
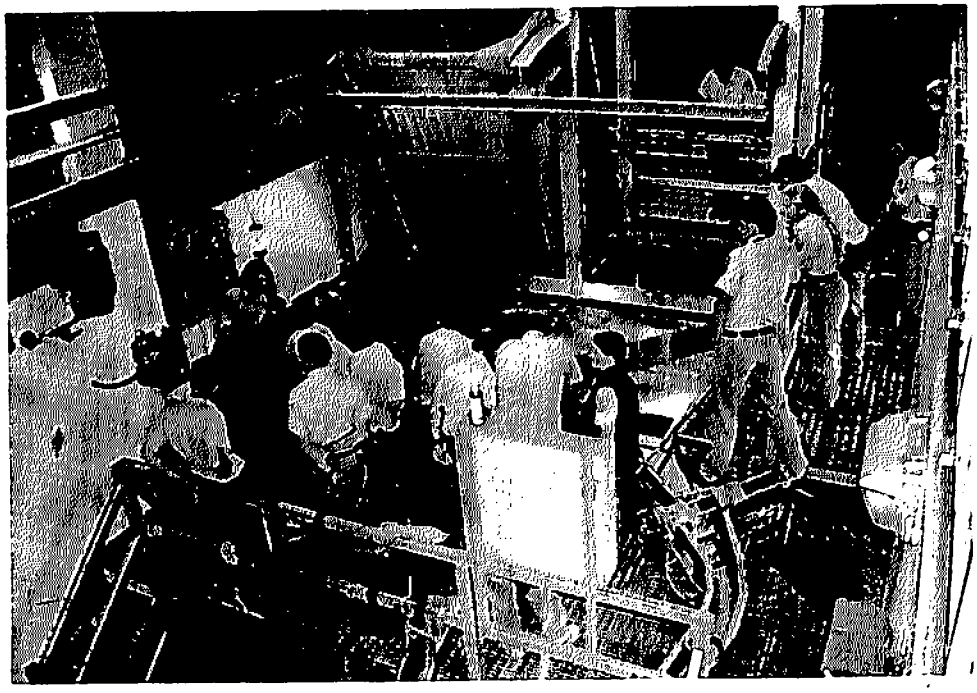
Biologist Peter Long was detailed to Idaho FRO, June 15-17, to participate in their fall chinook study on the Snake River.

Biologist Cyndie Wolfe returned on June 4 from an 11-day detail to assist in cui-ui fish passage at the Marble Bluff facility, Nevada.



Special holding pond area constructed with cover to retain wild steelhead collection - SNFRC study.

FRO Technician, Jill Olson, transferring a wild steelhead to a holding pond as part of SNFRC's "wild vs. hatchery" study.



Service employees viewing use of visual implant tags on chinook adults.