Annual Report

FISCAL YEAR 1977

DWORSHAK NATIONAL FISH HATCHERY
(Hatchery)

Submitted By: Wayne H. Olson Title Hatchery Manager Date 12-1-77

Date Received Regional Office _____ Reviewed By: _____ Date _____

Date original forwarded to Washington Office: _____

Date Received Washington Office _____ Reviewed By: _____ Date _____

DIVISION OF FISH HATCHERIES

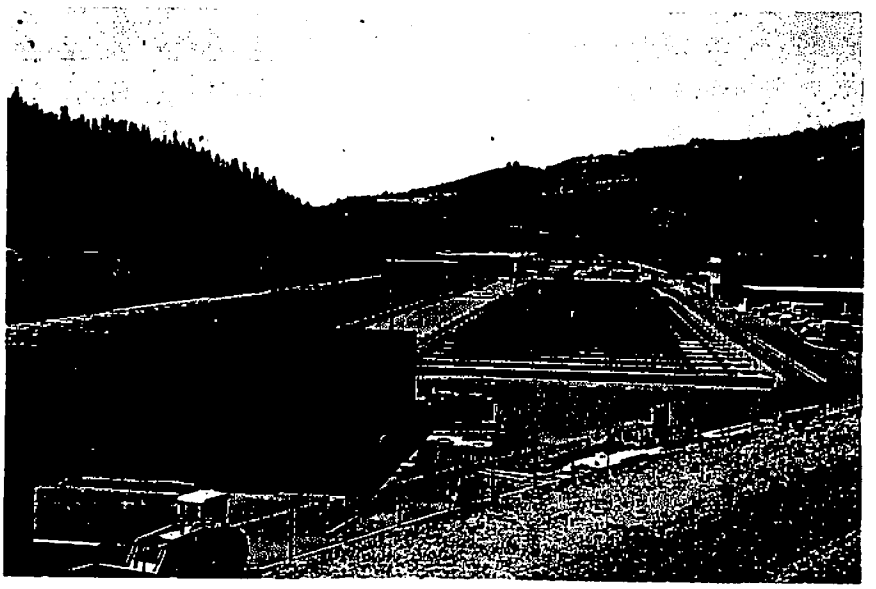
Form 3-100

INDEX

I N T R O D U C T I O N

The Dworshak National Fish Hatchery, located at the confluence of the Clearwater River and North Fork of the Clearwater, near Orofino, Idaho, was designed and constructed by the Army Corps of Engineers in 1968 and is operated by U. S. Fish and Wildlife Service. The purpose of the hatchery is (1) to mitigate for spawning losses of the North Fork steelhead trout created by construction of Dworshak Dam and (2) to provide a resident species of trout for planting Dworshak Reservoir.

The Fiscal Year 1977 Annual Report summarizes activities of the hatchery from October 1, 1976 through September 30, 1977.



View of hatchery from overpass

GENERAL

Continued monitoring of water quality through Systems II and III biofilters, along with monitoring fish health, identified certain problems affecting fish quality. These problems were: (1) ineffective biofilters for removal of metabolites, (2) a water quality having low pH and lacking in hardness, and (3) a pond design that allows for inefficient draining; all contributed towards poor health and high mortality in the steelhead. The problems became even more apparent in the reuse systems at time of presmolting in February and March. Fish held for 2-year rearing in raw water appeared, in general, to be in good condition at time of release and losses remained low during the year.

A number of meetings and workshops were held at the hatchery to find solutions to the rearing problems that could assure the production and release of a quality steelhead smolt. A Water Reuse Workshop was hosted March 1 in which 30 interested persons, all concerned with recycled water flows, were in attendance. Proceedings of this meeting were recorded and wide distribution made of the report.

Studies and investigations during the year by the Corps of Engineers, together with work carried out by the Dworshak staff, led to immediate planning for replacing filter media in System II with a smaller, more efficient material in time for FY 1978 production. Design changes for the coming year also incorporated equipment and a building to add chemicals to Systems II and III reuse for improving water quality. Plans will proceed with replacing filter media in System III after evaluating System II performance.

Bird predation on the smaller steelhead appeared to be a more serious problem than in past years as inventory shortages were especially evident in ponds where sea gulls and mallard ducks were noticed. Work was begun during the latter part of the year to erect wires over System II and to install a sprinkler system on one-half of the ponds in System III. Both methods of bird deterrents will be evaluated in FY 78 for their effectiveness in reducing losses.

There continues to be evidence of inefficient pond draining which allows for solids from the fish to accumulate. Modifications to several "Burrow" ponds were made to determine if these changes correct the problem.

Cooler water through the summer months benefited the young steelhead production. Temperatures in the low 50's were made available from Dworshak Reservoir. These temperatures reduced the incidence of "Ich" and other parasite diseases and allowed for a healthier fish.

Broodyear 1977 production was programmed on the basis of lighter loading throughout all three systems. These lighter loads are expected to produce a better quality steelhead as it realistically reflects current hatchery limitations pending improvements to be made to water chemistry and filter systems. Rainbow production was removed from the station and assigned to Hagerman NFH. Dworshak Reservoir, beginning in FY 1978, will be stocked with fish from Hagerman. All costs for this program will be borne by the Dworshak Hatchery. The removal of the rainbow program allows the hatchery to place more emphasis on steelhead production during the interim period of development and construction.

A proposed construction schedule has been prepared by the Corps of Engineers which outlines completion by FY 1980. This construction is part of the Fish and Wildlife request for improvement items considered necessary to meet mitigation requirements of the hatchery. Project estimate for this work is $4.3 million. Included in this total is a contract awarded to Washington Mechanical Contractors of Seattle for $405,000 to finish Phase II construction. Nearly all of this work was completed during the year which included, among others, the installation of sump pumps in the return channels of Systems II and III for better cleaning, and the added isolation valves between raw water and reuse in Systems II and III. Also included in the total estimated construction costs is some $250,000 awarded in FY 1977 for the filter bed media change in System II and the added mineral-addition facilities for Systems II and III.

Isolation valves - Systems II and III

DEVELOPMENTAL INVESTIGATIONS

Chemical Addition

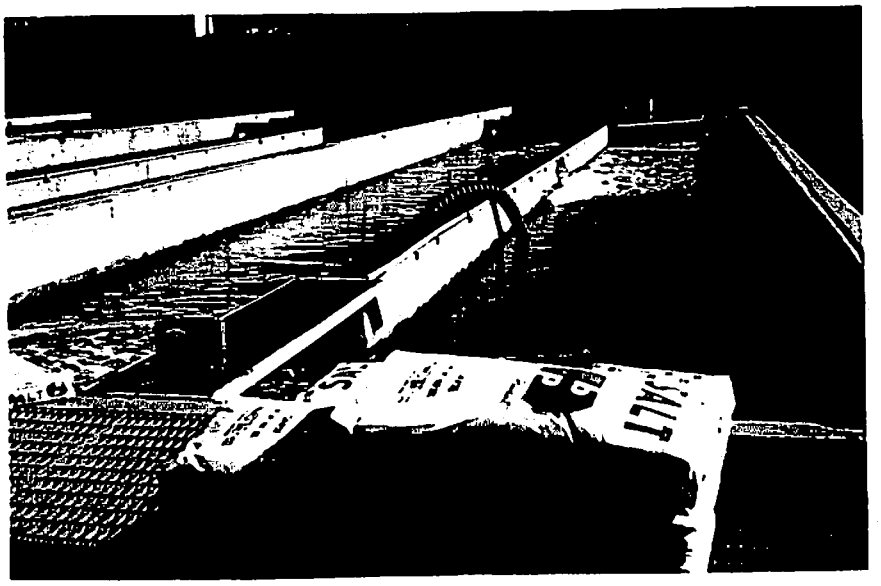
Mineral salts were added to the makeup water in Reuse System II from the start of Broodyear 76-77. Sodium chloride and calcium chloride were added to increase the water hardness and the chloride ion level in the system. System III was operated on reuse without chemical addition as a control.

During the smolting period, additional minerals in the form of magnesium sulfate and potassium chloride were added to Reuse System II for the osmoregulation of the fish.

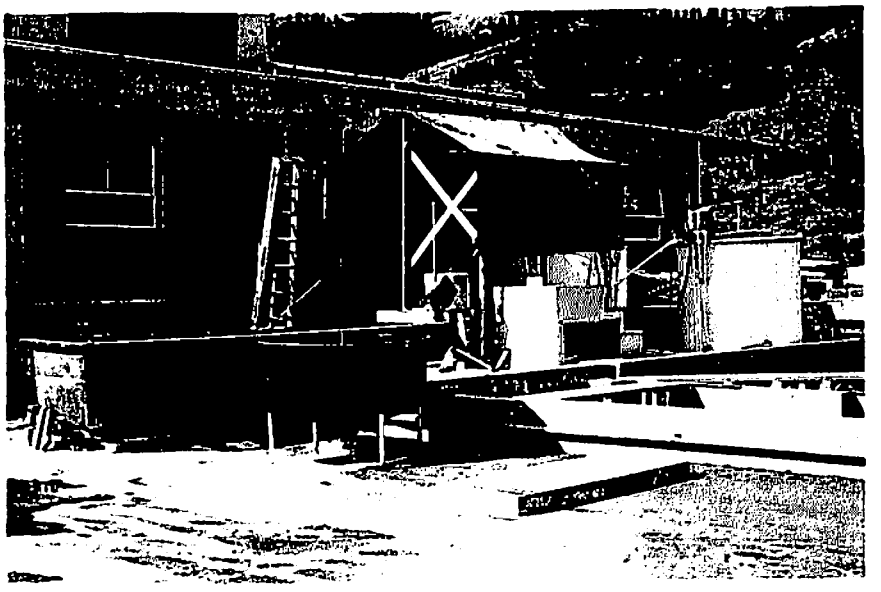
Sodium chloride was added to System III several times during the production season to alleviate nitrite toxicity. The chloride ion has proven effective against nitrite toxicity. In System II, the salt addition allowed the nitrite levels to increase about two and a half times the level of the previous year without exhibiting nitrite toxicity.

Starting with the egg production of Broodyear 77-78, calcium chloride was added to the incubator water to increase the hardness from 12 ppm to 150 ppm. It was used in an attempt to reduce the white spot incidence.

For Broodyear 77-78, System II is being operated on 5+ percent makeup water with mineral addition. Calcium chloride is being added to increase the hardness, sodium carbonate to increase the alkalinity, and lime to increase the pH. The calcium chloride will also furnish the needed chloride ions to protect the fish against nitrite toxicity.



NaCl addition



Chemical feed addition to System III

Nitrogen Gas

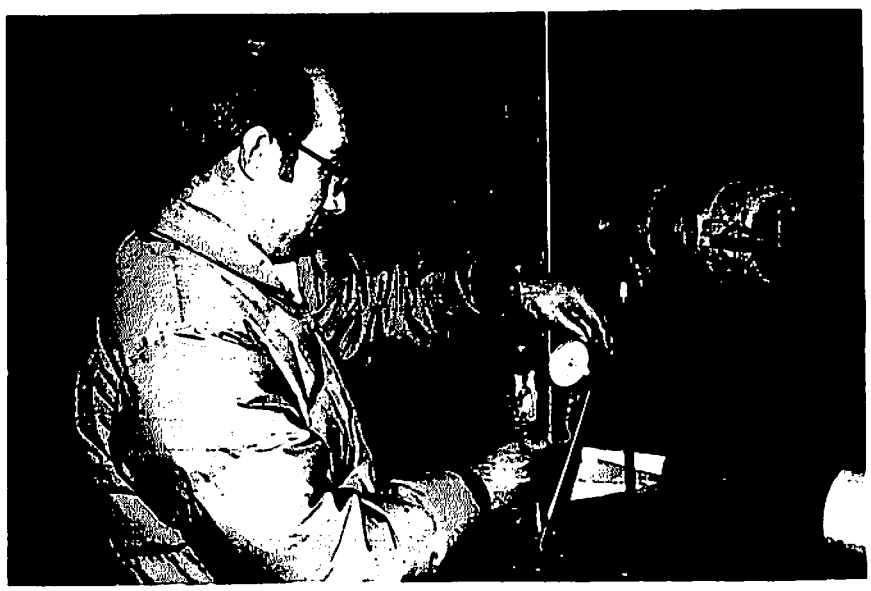
A pilot Swedish degasser was set up in an attempt to increase the performance of this type of degasser. Different perforated plates, various baffle arrangements and outlet structures were tested. Plastic 1½-inch media rings were also tested.

A degasser shaped similar to a Chinese "pagoda" was tested extensively with excellent results. After some modifications to the original design, nitrogen gas was removed from over 120 percent down to 100 percent. This unit is designed to handle approximately 1,000 gpm and removes nitrogen gas under gravity flow conditions.

Nitrogen gas removal using different lengths and diameters of clear PVC pipe was tested. These "packed column" degassers removed nitrogen gas from over 116 percent down to 100 percent under gravity flow conditions. The best design appears to be a 10-inch diameter column, 5 feet in length with 4½ feet of 1½-inch plastic ring media.

The Swedish degasser in the incubator room is still being operated during the incubation period with favorable results. The main drawbacks to this type of degasser is the power requirements, noise, and the cost.

Monitoring of nitrogen gas continues in every water source used for rearing fish. The use of the Weiss "saturometer" has made monitoring a fairly easy task with reliable data to analyze.



N_2 readings - Owsley

It was detected through monitoring that dams do not have to spill water to create supersaturation problems. During low power demands, air is introduced into the turbines to prevent cavitation. This can cause nitrogen gas supersaturation levels over 100 percent.

Pilot Tests

A diurnal test was run on both Reuse Systems II and III. The parameters monitored were ammonia, nitrite, nitrate, oxygen and pH. Interesting changes were noted on the parameters over a 24-hour period. The importance of a continuous water quality monitoring system becomes necessary if we are to better understand the biological functions and changes within a reuse system.

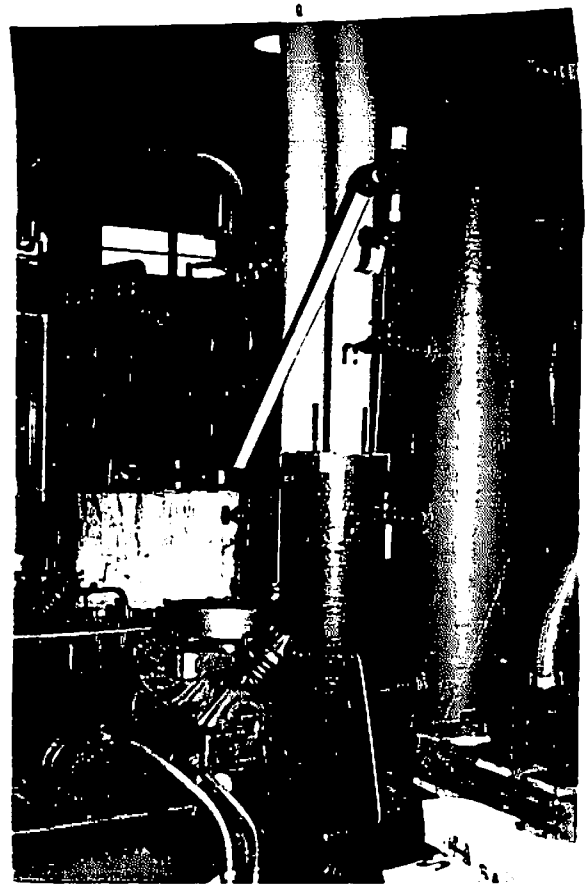
A diurnal CO_2 test was run on Reuse System III and single-pass raw water System I. Parameters monitored were dissolved oxygen, carbon dioxide and pH. Over a 24-hour period the CO_2 levels in the rearing ponds showed a marked increase at various times. Gill changes and respiratory problems observed in the reuse systems may be partly caused by elevated CO_2 levels.

For a 3-week period, lime was added to System III to increase the pH from 6.7 to 8.0. The objectives were to stimulate nitrifying bacteria populations within the filter beds and to eliminate the elevated CO_2 levels. A marked reduction in the CO_2 levels as well as an increase in filter bed efficiency was observed.

Calcium chloride was added to two rearing ponds in System III in an attempt to improve fish health. The addition was short-termed and showed no apparent beneficial effects.

Two pilot columns were added to System II to see if additional media could improve the filter performance. A tall column with 3½-inch plastic rings showed that additional rings did not increase filter performance. A short column with small plastic beads demonstrated a remarkable reduction of the metabolites. This test indicates that the filters need more surface area but not in the form of plastic rings.

Testing of a bacterial enumeration procedure for the population of nitrifiers continues. Although the procedure is not ready for field use, it can serve as a useful tool to better understand our reuse systems.



Column test filter media

Bacteria enumeration - Client

Pilot Tests (continued)

Three ponds in System II containing marked fish were treated with salt (sodium chloride) at 5,000 ppm over an 8-hour period prior to release. A downriver study will be followed through by the University of Idaho.

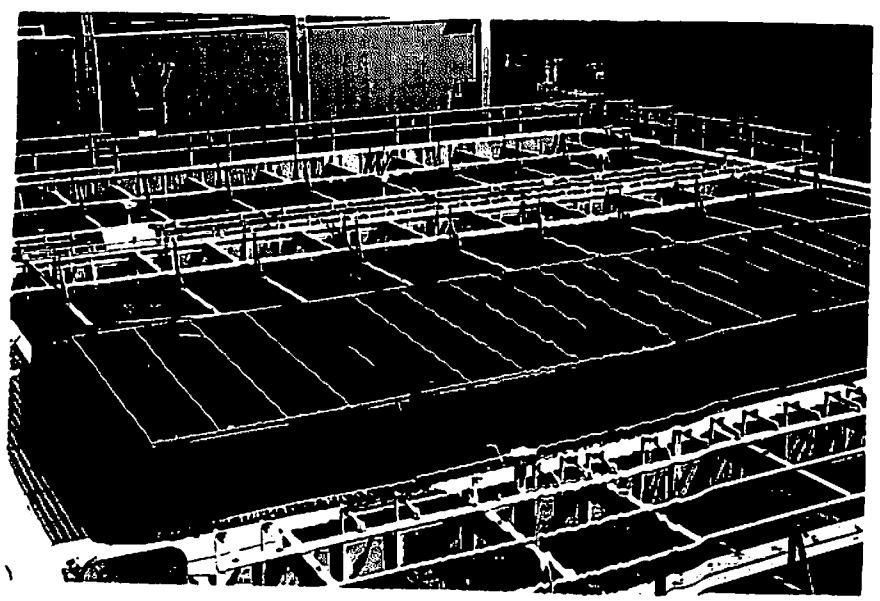
A pilot plant is being tested using the plastic bead material under actual hatchery operations. The study is being conducted by the University of Idaho and Corps of Engineers. Although only a model, the results from this experiment should give a good indication as to what will happen when this new media is applied to a large system.

Filter Beds

Prior to startup of Broodyear 76-77, both Systems II and III filter beds were preactivated by adding ammonium hydroxide, increasing temperature and recirculating water to replenish the oxygen supply. This process takes approximately 2 weeks but can cut down filter startup by almost 4 weeks.

The new air-backwash system for Reuse Systems II and III is being used. Several schedules are being tried to determine what type of cleaning schedule is best applicable to a filter bed. It appears at this time that a less frequent, less vigorous cleaning is more beneficial to the nitrifying bacteria in the filters.

The Number 3 filter bed in System II was uncovered. Although an improvement in the nitrification performance was not noted, good algae control was achieved by covering this filter.



Covering filter bed

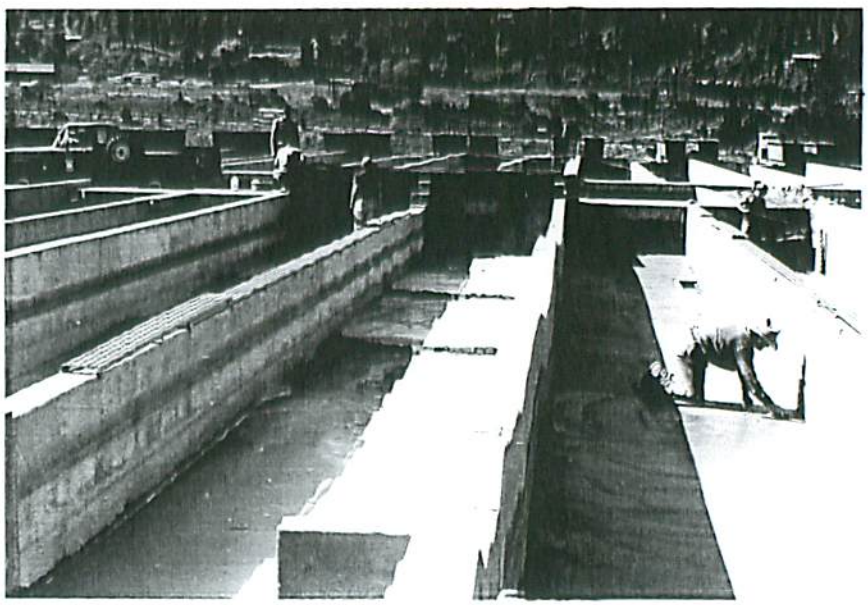
Filter Beds (continued)

Preactivation of biological filters was tested using various bacteria seeds. The seeds tested were "Salmo" liquid bacteria, river sand, sludge, and dirt. Results indicate that river sand is the best source of seed for nitrifying bacteria. Dry river sand should be used to prevent introducing any harmful bacteria to the fish.

All three filter systems are being operated at Dworshak for Broodyear 77-78. System I consists of the downflow rock oyster-shell. System III will have the upflow 3½-inch plastic ring media. System II will have the new plastic bead media in an upflow pattern. The three filter systems will be compared for efficiency of the filter media.

Pond Modifications

Six ponds in Systems II and III were altered by changing the outlet screen configruation. Screens with larger perforations were placed in each pond with partial covering of some of the screen area. The larger holes in the screens have more potential for pond cleaning but have several disadvantages.



Pond modifications

Pond Modifications (continued)

Three Burrows ponds in System I have been altered for Brood-year 77-78. One of the ponds was converted to a raceway design. The other two ponds have been converted to a "BOWL" design. The "BOWL" design closely resembles a raceway with a different outlet configuration.

CONTRACT STUDIES

A contract for $18,000 was awarded to Dr. Tom Meade, University of Rhode Island, to study "The Environmental and Physiological Parameters Associated with Nitrite Toxicity with Particular Emphasis on Steelhead Trout Production in Hatcheries Employing a Water Reuse System." This contract was extended in September for 1 year at a cost of $18,000 to continue studies on water quality and fish health associated with water reuse.

The University of Idaho was awarded a contract for $42,000 to continue marking studies on steelhead smolt releases from Dworshak. Dr. Ted Bjornn, Unit Leader, Cooperative Fishery Research Unit, is principal investigator. Title of study is "Parr-Smolt Transformation of Steelhead Trout--Evaluation of Various Hatchery Rearing Conditions on the Seaward Migration of Steelhead Trout."

The Corps of Engineers has contracts in effect with Dr. Klontz, "Laboratory Evaluation of Selected Dworshak NFH Biofilter Operating Factors" and Dr. Wallace, "Pilot Test Using Granular Filter Media"; both studies are funded to the University of Idaho.

STATION IMPROVEMENTS

Incubator water supply pressure and volume losses during sand filter backwash cycles were predominate with the original installed pumping equipment. A reduced quantity of water resulted to both eggs and fry. The problem was satisfactorily solved by removal of the three 25-horsepower pumps and replacing them with 40-horsepower assemblies. New wiring and magnetic starters were also necessary. Addition of a flow control valve and relief by-pass system returned part of the water to the pumping sump during normal operation. This addition provided for the necessary safeguard of the increased pressure. The Corps of Engineers purchased the bulk of the materials while hatchery personnel provided manpower.

New lighting was installed in the spawning room at a cost of $2800. It is controlled by a rheostat and positioned on a track for more effective lighting.

The 64 fiberglass nursery tanks, purchased in the previous year, were installed on a temporary basis for use in the Broodyear '77 program. These tanks will later be moved to the nursery tank building upon construction of the new facility.

Modification of four adult holding ponds into units that will hold smaller steelhead was completed in September in time for rearing fish in single-pass raw water. These modified facilities will give added flexibility to a production program that allows for carrying over fish an additional year to meet size requirements.

Purchases of $12,400 were made on materials for control measures to reduce fish losses from birds. Work will be completed in time for FY 1978's winter rearing program. Sixteen ponds of System III will have sprinklers installed, operated intermittently by a timer. System II rearing ponds will be covered by overhead wires.

Minerals were added to the water supply of the incubators and System II in efforts to improve water quality. Costs for this program, beginning in March and ending at the close of FY 1977, were $16,475. A total of 246,800 pounds of calcium chloride was used during the year. Expenditures were $15,848 in purchasing the bulk from Defense General Supply Center, an optional mandatory supply source. If purchased from the Federal Supply Service, the prime mandatory source, cost would have been $58,615. A savings of $42,767 on this one item alone was realized by using this valuable DLA Supply Source.

PERSONNEL

Personnel actions were completed on 15 permanent employees and 43 temporaries. The number of permanent employees at the end of the year was 22. Temporary workers counted 6 man-years.

Jeanette Herbert, Administrative Clerk, was awarded a Quality Increase Award and George Williams, Assistant Manager, a Special Achievement Award.

Wayne Olson attended a 2-week training session in Olympia on "Personnel Management for Executives"; Tom Taggart, 2-weeks in Spearfish on "Fish Cultural Techniques"; and Gene Forest, 1 week in Portland on "Simplified Procurement." Rick Nelson returned in January from 5 months disease training held at Leetown, West Virginia.

PUBLIC RELATIONS

Three tour guides were employed during the summer season to assist public visitors. Informal tours by the guides were extended to some 10,000 visitors. Approximately 17,000 visitors toured the hatchery unassisted. Work was nearly completed on the mural display depicting the route of Dworshak's migrating steelhead. A descriptive narrative is to be added. Numerous school groups toured the hatchery and viewed the spawning operation. The public was kept informed on the hatchery program and the steelhead adult returns through the news media. A number of interviews were given to the local radio station and carried also in Lewiston and Grangeville. News releases were reported by the Lewiston Tribune and Clearwater Tribune. Associated Press also carried stories pertaining to hatchery activities.

Information packets were prepared together with Dworshak Dam and distributed to all schools in the immediate area. These packets describe briefly what visitors may expect to see in their visit to the hatchery and dam.

Mural display -
Route of the migrating steelhead

Steelhead (Continued)

System II -- The 25 ponds in System II were set up in October 1976 with 900,000 steelhead on reuse at 56°F with NaCl and CaCl added to the water. The mortality rate increased in January and more salts were added for nitrite protection. The temperature was lowered to 52°F in February. In early April the system was changed to raw water and fish were released later in the month.

Fifty fiberglass rearing tanks were set up over the ponds and stocked in August with steelhead from the incubators. System II is to be operated on 5 percent makeup water with chemical enrichment through the 1977-78 rearing season.

System III -- System III was on raw water at the end of fiscal year 1976. The system was changed back to reuse at 57°F in mid-October and NaCl added to reduce the effects of nitrite toxicity. Mortality was 103,000 (7.8%) in November with 75 percent coming from Take 11 which comprised only one-half of the fish in the system. Very few steelhead from this same group in System II were lost. Fish that incurred the greatest mortality in System III had a history of disease problems beginning with Myxobacteria in the rearing tanks followed by "Ich" in the ponds. Mortality remained high into January and February and many mallard ducks and sea gulls were noticed in the ponds during this time. The system was put on raw water in mid-March in preparation for release.

The system was started for Broodyear 1977 in August. It is to be operated with a light load (620,000 at release time) and 10 percent makeup water. There will not be any chemical enrichment unless needed for a specific problem.

Rainbow

Two million eyed rainbow eggs were received in October from Hot Creek, California for release as fingerlings in spring 1977. There was a shipment of 92,000 from Hagerman NFH for release in fall 1977. In January, 100,000 eyed rainbow eggs were received from Erwin NFH. They were scheduled for release as catchables

Rainbow (Continued)

in fall 1978 but were planted in spring 1977 as small fingerlings when it was determined that Hagerman NFH would begin rearing rainbow trout for Dworshak Reservoir. A total of 23,000 catchable rainbow were planted in the Reservoir in August and another 20,000 were held for release in fall 1977. This completes the rainbow production from Dworshak.

Kokanee

The late spawning kokanee in previous years were planted in Elk Creek, a tributary to Dworshak Reservoir. Elk Creek was checked in fall 1976 but no spawning kokanee were found. A shipment of 2½ million eyed eggs was received from Bellingham, Washington. They grew well with little mortality and were planted in Elk Creek in April.

DISTRIBUTION

The following information summarizes the 1977 distribution:

Steelhead

Smolts -- ~~1,577,000~~ 1,613,667 -- Clearwater River
171,109 ~~171,000~~ -- Barge to Bonneville Dam
34,320 ~~34,000~~ -- Truck to Bonneville Dam
27,763 ~~28,000~~ -- Lochsa River
~~1,810,000~~
1,846,859

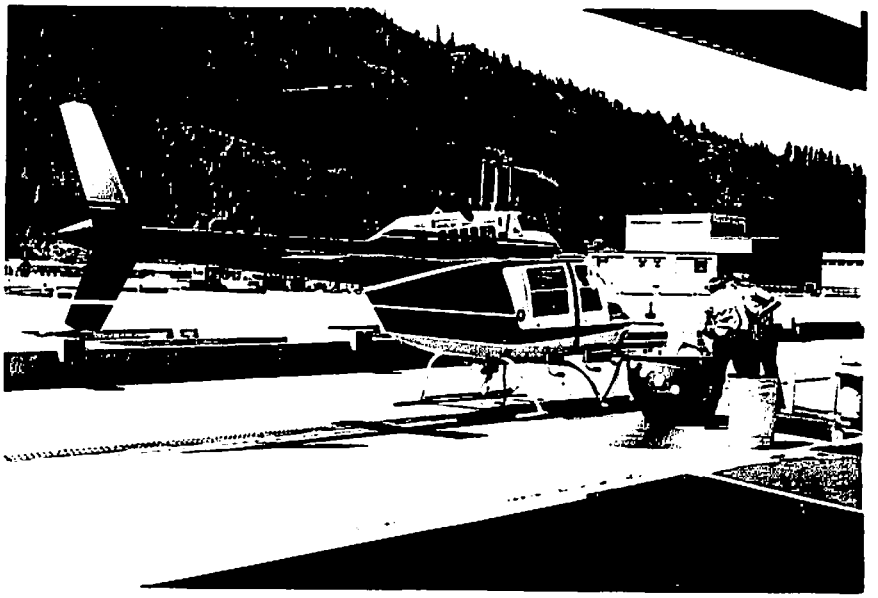
Eggs and Fry -- 3,147,000 Fry -- Idaho Fish and Game
570,000 Fry -- University of Idaho
400,000 Eggs -- Idaho Fish and Game
10,000 Eggs -- University of Rhode Island
4,127,000

Rainbow

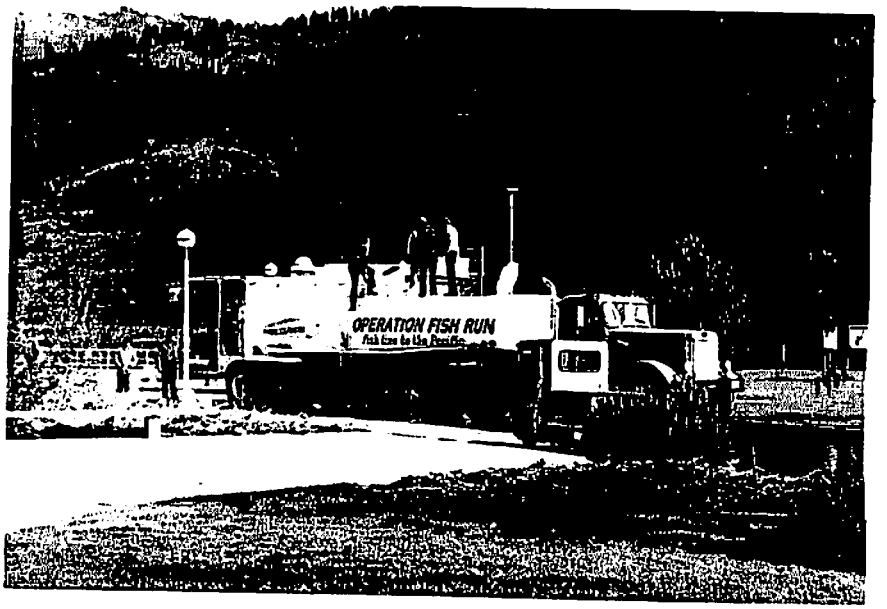
Fingerling -- 1,014,000 -- Dworshak Reservoir
59,000 -- Dworshak Reservoir

Catchables -- 66,620 -- Dworshak Reservoir
750 -- Quarry Pond, Colville Indian Reservation
1,800 -- Talmacs Lake, Nez Perce Indian Reservation

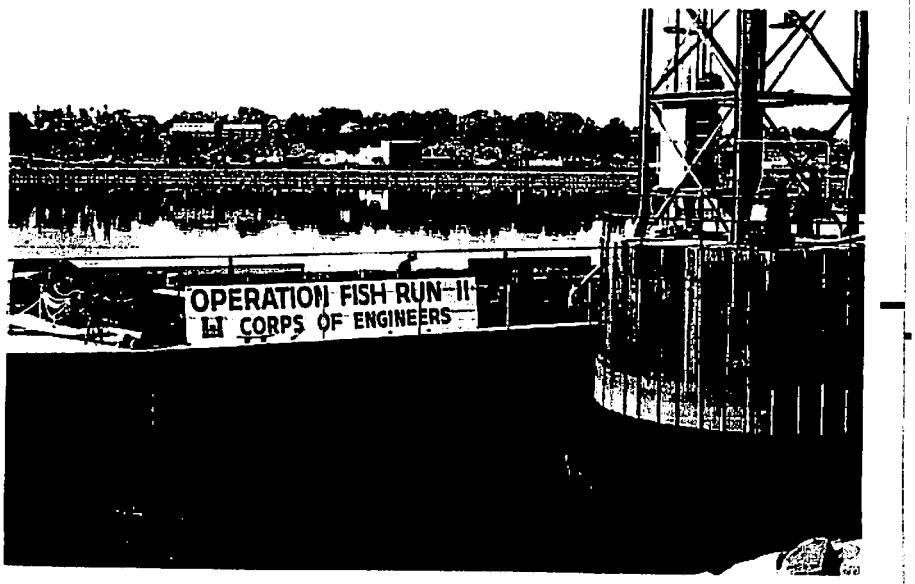
Kokanee -------- 1,000,000 -- Dworshak Reservoir



Helicopter planting of kokanee to Reservoir



Operation fish run - trucks



Operation fish run - barge

STEELHEAD SPAWNING

The trap at Dworshak Dam operated 2 days every other week during December and January. The trap was activated in February full time along with the ladder at the hatchery. Spawning season was February 22 to May 20. A total of 113 small adult males was planted in the Reservoir. The spawned steelhead were used as bear bait for Idaho's bear predation studies.

Summary of Spawning

Adult return	3,100
Eggs taken	8,491,225
Percent eye	87.1
Fry	7,356,000
Excess fry	4,127,000
Fish on hand October 1, 1977	2,050,000

Marking fish (inside)

Diet Trial

A diet trial was started early in the year to compare EWOS feed with OMP. There was 9 to 12 percent dust in the EWOS granules and indications of poor mixing. A higher disease incidence was also recorded. The trial was discontinued in December.

Vanes

A study was initiated to determine the effectiveness of the hydraulic turning vanes installed in the recirculating ponds. Fish growth and health showed no difference in comparison between vanes and no vanes and the ponds with vanes were continually dirtier. The vanes were difficult to work around and needed to be removed to handle the fish. They also presented a safety hazard. The vanes were removed from all ponds in March.

Computerized Feed System

Eighteen ponds in System III were placed on the feed system in February. The system was monitored closely and proved acceptable in feeding. The following modifications are necessary to make it operate more efficiently: (1) a method to prevent the feed from bridging in the hoppers, (2) more sensitive tier valve sensors in the basement, and (3) a method to prevent feed from building up in the delivery tubes.

Hatching Jars

Eleven plexiglass hatching jars were constructed and tested for use in eying and hatching steelhead eggs. Indications showed that jars could be used with success and eventually replace the Heath incubators.

Egg hatching jars

SAFETY

The safety committee consisted of members from within various sections of the hatchery:

James Billi (Chairman), Production
Susan Espinosa, Laboratory
Gene Forest, Maintenance
Jeanette Herbert, Office

Monthly safety meetings were held, and safety suggestions were solicited and implemented. Safety during construction was especially emphasized. John Walker, Safety Inspector for the State of Idaho, Northern Region, made a courtesy inspection of the station and offered some helpful suggestions. Members of the Emergency Medical Team of Clearwater County presented training to all employees on cardiopulmonary resuscitation (CPR). Two employees sustained injuries during the year. As of September 24, 1977, the station reported 4,264 man-days without a lost-time accident.

MAINTENANCE AND REPAIR

Ten high school students worked jointly with permanent and temporary personnel this summer on routine maintenance as well as short-term objective projects. Emphasis was placed on cyclical maintenance where changes could be made to lengthen the period between support actions. One of these changes was re-striping roadways and parking areas with a polymer film in lieu of the customary yearly spray coating. Other similar projects included storm drain repairs and outside painting. Improvements to the existing chemical enrichment facilities and irrigation systems were continued. Routine summer activities included custodial maintenance to buildings and grounds beautification.

Annual maintenance of the ultraviolet treatment system included replacing all germicidal lamps at a cost of $12,360.

HATCHERY BIOLOGIST ACTIVITIES

Diet Development Control

Two diet trials were initiated this fiscal year:

1. Basic Abernathy formulation with chelated minerals and dicalcium phosphate added.

2. Basic Oregon Moist Pellet (OMP) formulation with (a) chelated minerals added, (b) calcium-phosphorus added and (c) double vitamin C added.

The two diet trials will be continued until the 1978 release time.

Equipment Testing

Hatching jars were used for hatching steelhead eggs. The benefits of using jars appear to outweigh the weak points. Visual control of eggs as well as the limited space needed for jars vs. trays warrants future use and testing.

A bioassay rearing unit was purchased for the wet lab. Small fry can be reared under controlled temperatures. This is a 12-unit model operating on 1 gpm flow per unit. Smaller numbers of fish can be used in toxicity testing.

Fish Culture

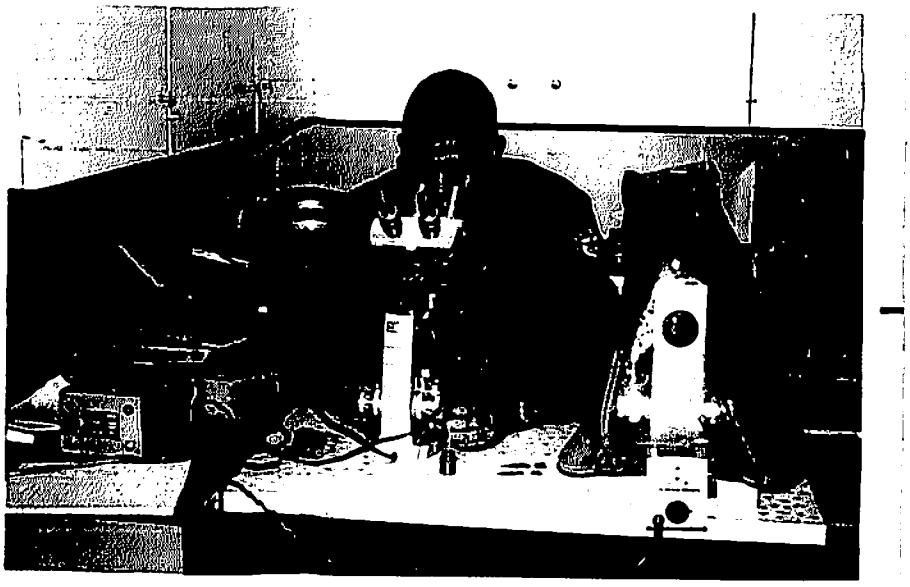
Marking of steelhead at Dworshak began on December 13, 1976. This is the second year of study conducted by Dr. Ted Bjornn of the University of Idaho. The study, entitled "Evaluation of Various Hatchery Rearing Conditions on the Seaward Migration of Steelhead Trout," is a cooperative study involving the U. S. Fish and Wildlife Service, University of Idaho, National Marine Fisheries Service and the State of Idaho.

The use of cool water releases from the Dworshak Dam during the summer rearing season for steelhead trout proved to be a favorable management tool. Parasite numbers were reduced and a healthier fry was evident.

Fish Physiology and Health

Two new pieces of laboratory equipment were purchased this year: a Corning chloridometer for serum chloride determinations, and a Wescor osmometer for blood osmolality determinations. The use of these two instruments should help us to better understand changes in fish health as well as detection of problems within the reuse systems.

Considerable time was spent in monitoring fish health. Several hematological parameters were run; of particular help were the methemoglobin determinations to detect nitrite toxicity problems.



Nelson at microscope

Sodium chloride was added to System III several times during the production year to alleviate nitrite toxicity. The chloride ion has proven effective against nitrite toxicity. System I experienced an elevated nitrite period this year. By adding sodium chloride, a ten-fold increase in nitrites did not cause a toxicity problem.

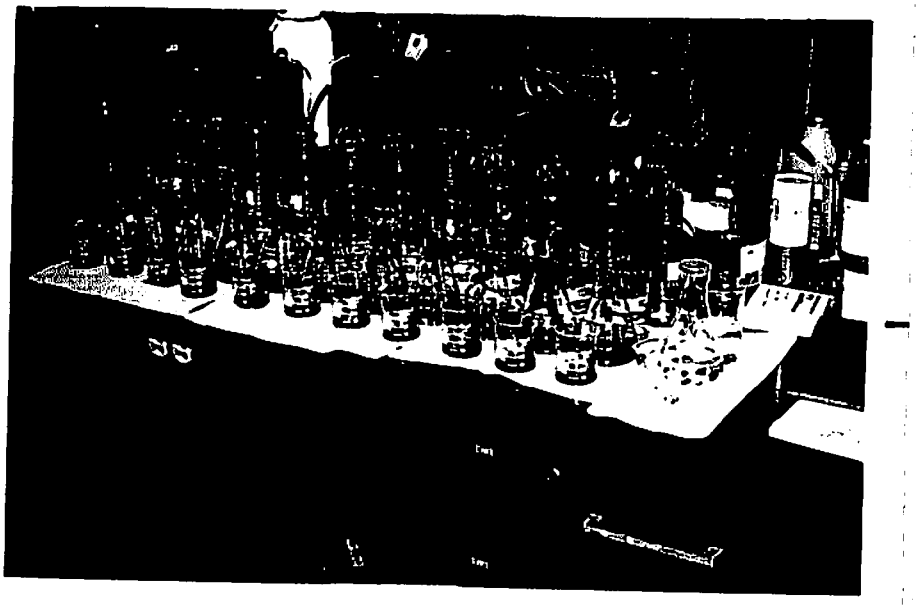
Saltwater-tolerance tests were conducted at Dworshak NFH prior to smolt release. The tests indicated that smolt size does play an important part in osmoregulation but is not the only contributing factor.

Dr. Tom Meade, University of Rhode Island, continued the study to determine the "Interrelationship Between Environmental and Physiological Parameters and Accelerated Smoltification in Steelhead Trout."

Dr. Gary Wedemeyer, National Fisheries Research Center, Seattle, Washington, conducted a fish health assessment at Dworshak in March. Monthly samples of water and fish were sent to Dr. Wedemeyer for heavy metals analysis.

Water Quality Monitoring

Water quality monitoring is a major responsibility of the laboratory. Standardization of reagents and methods is important to maintain continuity of data.



Standardizing H_2O quality tests

Cooperation and Communications were maintained with the following:

University of Idaho

Dr. Klontz -- Initiated tests for water-hardening steelhead eggs using 2 ppm Erythromycin and Spectam.

Dr. Knowles -- Conducted analysis on minerals, water and some fish tissue for heavy metals.

Dr. Bjornn -- Lab assisted in marking program by recommendations of treatment and fish health.

Washington State University

Dr. Hindin -- A graduate student under Dr. Hindin conducted tests on malachite green in soft water using steelhead. The use of specific ion probes for water quality monitoring at Dworshak was examined and tested.

Idaho Fish and Game Department

Cooperation with personnel on spawning, mark recovery, disease problems and fish health problems.

U. S. Fish and Wildlife Service

Dr. Wedemeyer -- Cooperation on fish health problems, reuse problems and establishing a monitoring and fish health assessment plan for Dworshak NFH.

Bozeman FCDC -- Discussed loading and density potential for Dworshak. Support services for Dworshak through histological examinations.

Abernathy FCDC -- Establish diet trials and special diets for Dworshak steelhead.

Dr. Zaugg -- ATP-ase studies on smolts.

National Marine Fisheries Service -- Discussed mark recovery, migration, marking studies, examinations and fish health.

Fort Morgan Fish Disease Control Center -- Continued cooperative agreement for implementing the National Fish Disease Inspection policy.

U. S. Army Corps of Engineers -- Worked closely on fish health problems and how they relate to production of steelhead trout in reuse systems.

Extension Service -- Several meetings were held with State, Federal and University representatives to discuss reuse and fish health. Seminars were given at WSU and for groups of University of Idaho students. Presentations were made at the Northwest Fish Cultural Conference in Twin Falls, Idaho and the AFS meeting in Vancouver, B. C.

Diagnostic Services

Fish health exams and inspections were conducted at six federal hatcheries. Two checks for the State of Washington, two commercial hatcheries in Idaho, disease checks were made for NMFS at the Little Goose Dam, and an inspection was completed at Summit Lake in Nevada on the Summit Lake Cutthroat.

Use of Lab Facilities

Laboratory facilities were available to the Army Corps of Engineers, U. S. Forest Service, University of Idaho and Washington State University graduate students, and Kooskia National Fish Hatchery personnel.

Meetings

Laboratory personnel participated in seminars, workshops, task force meetings, coordination meetings, training sessions and group discussions.

Major Contributions

1. Hagerman NFH disinfection completed.
2. Assisted Kooskia NFH in water quality monitoring and standardizations.
3. Tested chemical treatments for steelhead.
4. Established information leaflets on tests conducted at Dworshak NFH.
5. Established fish health monitoring system for Dworshak steelhead.

Bureau of Sport Fisheries and Wildlife

BROODSTOCK AND SPAWNING OPERATIONS

(See Fish Hatchery Manual Section 4438a for Instructions)

No.	ITEM	ANADROMOUS OR WILD TROUT - Indicate Species			DOMESTICATED TROUT - Indicate Species		
		Steelhead					
1.	NUMBER OF FEMALES STRIPPED	1,395					
2.	TOTAL WEIGHT OF FEMALES						
3.	NUMBER OF MALES STRIPPED	1,597					
4.	TOTAL WEIGHT OF MALES						
5.	NUMBER OF GREEN EGGS TAKEN	8,356,182					
6.	EGGS TAKEN PER POUND OF FEMALES						
7.	EGGS TAKEN PER FEMALE	5,990					
8.	NUMBER OF EYED EGGS PRODUCED	7,399,405					
9.	EGG SURVIVAL: PERCENT TO EYED STAGE	88.6 %	%	%	%	%	%
	PERCENT TO HATCHING	88.0 %	%	%	%	%	%
	PERCENT TO FEEDING	84.6 %	%	%	%	%	%
10.	LABOR COST	12,550					
11.	NON-LABOR COST	9,389					
12.	TOTAL COST	21,939					
13.	CREDIT CURRENT YEAR WEIGHT GAIN OF LOT (lbs. @ $)						
14.	ADJUSTED TOTAL COST (Item 12 minus Item 13)						
15.	DEBIT CURRENT YEAR WEIGHT LOSS OF LOT (lbs. @ $)						
16.	ADJUSTED TOTAL COST (Item 12 plus Item 15)						
17.	COST PER THOUSAND EYED EGGS	2.97					

Form 3-101
(Revised June 1968)

Form 3-102
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

DISTRIBUTION DATA AND COSTS

See Fish Hatchery Manual Section 4438b for Instructions)

PART 1 - COSTS

SPECIES	DISTRIBUTION COSTS			FISH DISTRIBUTED		AVERAGE COSTS
	Labor (1)	Non-Labor (2)	Total (3)	Pounds (4)	Number (5)	(6)
PONDFISH	--	--	--	15	50,000	Per M. --
TROUT	1,815	3,889	5,704	26,164	3,592,263	Per lb. .22
ANADROMOUS	2,585	2,555	5,140	203,667	1,641,430	Per lb. .025
TOTALS	4,400	6,444	10,844	229,846	5,283,693	

PART 2 - DISTRIBUTIONS

SPECIES	TRANSFERS TO OTHER NFH's		TRANSFERS TO STATES		OTHER DISTRIBUTION	
	Pounds (1)	Number (2)	Pounds (3)	Number (4)	Pounds (5)	Number (6)
PONDFISH	--	--	--	--	15	50,000
TROUT	--	--	--	--	26,164	3,592,263
ANADROMOUS	--	--	--	--	203,667	1,641,430
TOTALS	--	--	--	--	229,846	5,283,693

PART 3 - TRIP DATA

SPECIES	NUMBER OF TRIPS			POUNDS PER TRIP			NUMBER PER TRIP		
	Transfers (1)	Other (2)	Total (3)	Transfers (4)	Other (5)	Total (6)	Transfers (7)	Other (8)	Total (9)
PONDFISH	--	1	1	--	15	15	--	50,000	50,000
TROUT	--	24	24	--	1,044	1,044	--	47,594	47,594
ANADROMOUS	--	2	2	--	1,725	1,725	--	13,881	13,881
TOTALS	--	27	27						
AVERAGE				--	1,056	1,056	--	45,186	45,186

PART 4 - MILEAGE AND SPECIES DELIVERIES

ITEM	PONDFISH	TROUT	ANADROMOUS	TOTAL
MILES TRAVELED	116	745	279	1,140
AVERAGE NUMBER OF MILES PER TRIP				42.2
NUMBER APPLICATIONS (species delivered) THIS YEAR				
NUMBER FARM POND DELIVERIES				
NUMBER INDIVIDUAL FARM PONDS INVOLVED				

PONDFISH DISTRIBUTED, 6" and larger: _____ POUNDS _____ NUMBER

PART 5 - FISH DISTRIBUTED BY OTHER HATCHERIES OR AGENCIES

SPECIES	FISH DISTRIBUTED		NAME OF DISTRIBUTING AGENCY
	Pounds	Number	
Rbt	10	150	University of Idaho
Stt	300	570,000	University of Idaho
Stt	1,662	3,147,050	Idaho Fish and Game Department
Stt	30,009	205,429	NMFS
TOTAL	31,981	3,922,629	

Bureau of Sport Fisheries and Wildlife

SALMONIDAE PRODUCTION

(Fish and Eggs)

(See Fish Hatchery Manual Section 4438c for Instructions)

(1) Species	(2) ON HAND October 1, 1976		(3) Received During Year		(4) Total Distribution		(5) ON HAND September 30, 1977		(6) Total Production in Pounds
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	
STT (CA)									
5-DsX-51X	409,000	39,000	--	--	286,913	44,456	--	--	5,456
6-DsX-61X	2,280,000	23,761	--	--	1,559,946	189,220	59,500	9,386	174,845
7-DsX-71X	--	--	8,356,182	Eggs	4,127,050	2,148	2,078,700	17,902	20,050
Sub-Total	2,689,000	62,761	8,356,182	--	5,973,909	235,824	2,138,200	27,288	200,351
RBT (IF)									
6-EwX-618	106,828	4,069	--	--	69,325	18,522	29,600	12,584	27,037
7-EwX-707	--	--	92,000	20	59,094	411	--	--	391
6-U MtX-608	--	--	1,100,000	244	966,281	4,960	--	--	4,716
6-Hg-1-609	--	--	75,000	16	47,600	244	--	--	228
Sub-Total	106,828	4,069	1,267,000	280	1,142,300	24,137	29,600	12,584	32,372
KOE (IF)									
7-UWa-1-705	--	--	2,450,000	400	2,450,000	1,113	--	--	713
Sub-Total	--	--	2,450,000	400	2,450,000	1,113	--	--	713
TOTALS	2,795,828	66,830	12,073,182	680	9,566,209	261,074	2,167,800	39,872	233,436

Form 3-103
(Jan. 1966)

Bureau of Sport Fisheries and Wildlife

ANADROMOUS DISTRIBUTION

Species: Steelhead Trout

Source (parent waters): North Fork of Clearwater River

(See Fish Hatchery Manual Section 4438d for Instructions)

BROOD YEAR	NUMBER OF EGGS		EGGS AND FISH SHIPPED to another Hatchery			FISH PLANTED				
	Collected	Received	Number	Number per pound	Weight	Date Mo./Yr.	Number	Number per pound	Weight	Waters
1975						3/77	18,442	7.05	2,615	N. Fork Clearwater River
						4/77	82,379	6.12	13,461	N. Fork Clearwater River
						5/77	171,109	6.61	25,858	NMFS Trucks for Barge (Clearwater River)
						6/77	14,983	5.94	2,522	Middle Fork Clearwater River
1976						3/77	34,863	7.69	4,532	N. Fork Clearwater River
						4/77	1,339,222	8.23	162,796	N. Fork Clearwater River
						4/77	27,763	8.05	3,449	Lochsa River
						5/77	106,330	8.27	12,860	N. Fork Clearwater River
						5/77	34,320	8.27	4,151	NMFS Trucks for Barge (Clearwater River)
						6/77	17,448	12.18	1,432	N. Fork Clearwater River
1977	8,356,182		10,000	eggs	14	5/77	186,900	1,731	108	Potlatch Cr. (Clearwater River)
			100,000	eggs	43	6/77	1,042,150	1,934	539	S. Fork Clearwater River
			300,000	eggs	129	6/77	1,290,000	1,892	682	Clearwater River
						6/77	1,198,000	1,893	633	Salmon River

Form 3-104
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

EGG SHIPMENTS - SALMONIDAE

(See Fish Hatchery Manual Section 4438e for Instructions)

SPECIES	NAME AND ADDRESS OF APPLICANT	EGGS SHIPPED NUMBER	EGGS SHIPPED WEIGHT	DATE SHIPPED
Steelhead Trout Lot Designation 71 X	Dr. Tom Meade University of Rhode Island Kingston, RI 02881	10,000	14	4-18-77
71 X	Hayden Creek Hatchery Idaho Fish & Game Lemhi, ID 83465	300,000	129	5-4-77
71 X	Niagara Springs Hatchery Idaho Fish & Game Wendell, ID 83355	100,000	43	6-2-77
	TOTAL NUMBER SHIPPED	410,000	186	

Form 3-105 (Revised, Division of Fish Hatcheries
Region I, Portland, Oregon)

Bureau of Sport Fisheries and Wildlife

FISH FOOD

SPECIES
[X] Trout [ ] Anadromous [ ] Salmon [ ] Other

(See Fish Hatchery Manual Section 4438f for Instructions)

No	ITEM		POUNDS (a)	TOTAL COST or VALUE (b)
1.	FISH FOOD ON HAND October 1, 1976		21,564	$ 5,595.03
2.	FISH FOOD RECEIVED BY DONATION		---	---
3.	FISH FOOD RECEIVED BY TRANSFER		---	---
4.	SUB-TOTAL RECEIVED AND ON HAND		21,564	$ 5,595.03
5.	LIST TYPE PURCHASED DURING YEAR	Cost Per Pound		
6.	SUB-TOTAL PURCHASED	Average: .247	50,989	$12,607.15
7.	TOTAL RECEIVED AND PURCHASED (Item 4 + 6)		72,553	$18,202.18
8.	LESS FISH FOOD TRANSFERRED TO OTHER HATCHERIES		---	---
9.	LESS FISH FOOD ON HAND September 30, 1977		8,913	$ 2,554.82
10.	**TOTAL FISH FOOD EXPENDED**		63,640	$15,647.36
11.	COST PER POUND OF FISH FOOD EXPENDED (Line 10, col. (b) ÷ col. (a)			.246
12.	GAIN IN WEIGHT OF FEEDING FISH PRODUCED DURING YEAR			33,075
13.	FOOD CONVERSION (Line 10, col. (a) ÷ line 12)			1.92
14.	FOOD COST PER POUND OF FISH PRODUCED (Line 10, col. (b) ÷ line 12)			.47
15.	GIVE DETAILS ON REVERSE SIDE FOR ENTRIES ON LINES 2, 3, and 8			

Form 3-106
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

FISH FOOD

SPECIES
☐ Trout ☒ Anadromous ☐ Salmon ☒ Other

(See Fish Hatchery Manual Section 4438f for Instructions)

No	ITEM		POUNDS (a)	TOTAL COST or VALUE (b)
1.	FISH FOOD ON HAND October 1, 1976		70,986	$ 18,417.97
2.	FISH FOOD RECEIVED BY DONATION		---	---
3.	FISH FOOD RECEIVED BY TRANSFER		---	---
4.	SUB-TOTAL RECEIVED AND ON HAND		70,986	$ 18,417.97
5.	PURCHASED DURING YEAR	Cost Per Pound		
6.	SUB-TOTAL PURCHASED	Average: .247	458,901	$ 113,464.39
7.	TOTAL RECEIVED AND PURCHASED (Item 4 + 6)		529,887	$ 131,882.36
8.	LESS FISH FOOD TRANSFERRED TO OTHER HATCHERIES		490	$ 113.90
9.	LESS FISH FOOD ON HAND September 30, 1977		80,217	$ 22,993.44
10.	**TOTAL FISH FOOD EXPENDED**		449,180	$ 108,775.02
11.	COST PER POUND OF FISH FOOD EXPENDED (Line 10, col.(b) ÷ col.(a)			.242
12.	GAIN IN WEIGHT OF FEEDING FISH PRODUCED DURING YEAR			187,791
13.	FOOD CONVERSION (Line 10, col.(a) ÷ line 12)			2.39
14.	FOOD COST PER POUND OF FISH PRODUCED (Line 10, col.(b) ÷ line 12)			.58
15.	GIVE DETAILS ON REVERSE SIDE FOR ENTRIES ON LINES 2, 3, and 8		See reverse	

Form 3-106
(Revised June 1968)

Item #8 Transfer to Garrison Dam National Fish Hatchery January 1977

Bu of S Ishe nd W e
Divisio Fish Hatcheries

OPERATIO S COST SUMMARY

(See Fish Hatchery Manual Section 4438j for instructions.)

	ITEM	Work Element	LABOR EXPENDITURES * 8610 (a)	8620 (b)	8650 (c)	Total (d)	NON-LABOR EXPENDITURES * 8610 (e)	8620 (f)	8650 (g)	Total (h)	Total Expenditures (i)
1	Broodstock and spawning	350	12,550	935	--	13,485	9,389	721	--	10,110	23,595
2	Rearing	380 360	133,084	17,985	--	151,069	230,223	7,776	--	237,999	389,068
3	Distribution	400	2,585	1,815	--	4,400	2,555	3,889	--	6,444	10,844
4	PRODUCTION Sub-total		148,219	20,735	--	168,954	242,167	12,386	--	254,553	423,507
5	Maintenance of facilities	140	124,357	29,535	--	153,892	134,690	26,129	--	160,819	314,711
6			--	--	--	--	--	--	--	--	--
7			--	--	--	--	--	--	--	--	--
8	MAINTENANCE Sub-total		124,357	29,535	--	153,892	134,690	26,129	--	160,819	314,711
9	Public use	000	--	--	19,140	19,140	--	--	4,912	4,912	24,052
10	Training	130	1,265	275	--	1,540	3,206	737	--	3,943	5,483
11	Development Investigations	250	64,401	880	--	65,281	63,377	1,328	--	64,705	129,986
12	OPERATIONS & MAINTENANCE TOTAL		338,242	51,425	19,140	408,807	443,440	40,580	4,912	488,932	897,739
13	Fish production facilities										
14	Buildings										
15	Other physical facilities										
16	Public use facilities										
17	REHABILITATION TOTAL										
18	GRAND TOTALS		338,242	51,425	19,140	408,807	443,440	40,580	4,912	488,932	897,739
19	O & M Expenditures - Percent for Fish Production		Column (d): Line 4 ÷ Line 12			41	Column (i): Line 4 ÷ Line 12				47
20	TOTAL EXPENDITURES - Percent for Fish Production		Column (d): Line 4 ÷ Line 18			41	Column (i): Line 4 ÷ Line 18				47

Form 3-110
(Revised August 1967)

*If any totals include contributed funds, show source and breakdown on reverse!

PRODUCTION COSTS

(See Fish Hatchery Manual Section 4438k for Instructions)

PART 1 - PRODUCTION and EXPENDITURES

No.	ITEM	PONDFISH	TROUT	ANADROMOUS	TOTAL
1	Number Produced	---			9,156,209
2	Pounds Produced	---	33,085	200,351	233,436
3	Labor Expenditures	---	20,735	148,219	168,954
4	Non-Labor Expenditures	---	12,386	242,167	254,553
5	TOTAL EXPENDITURES	---	33,121	390,386	423,507

PART 2 - ANALYSIS OF PRODUCTION COST

ITEM	COST	PERCENTAGE
PONDFISH		
PRODUCTION COST PER POUND	---	
LABOR COST PER POUND	---	
LABOR COST PERCENT OF PRODUCTION COST		---
PRODUCTION COST PER THOUSAND FISH	---	
LABOR COST PER THOUSAND FISH	---	
TROUT		
PRODUCTION COST PER POUND	$ 1.00	
LABOR COST PER POUND	.63	
LABOR COST PERCENT OF PRODUCTION COST		63
ANADROMOUS		
PRODUCTION COST PER POUND	$1.95	
LABOR COST PER POUND	.74	
LABOR COST PERCENT OF PRODUCTION COST		38
AVERAGE PRODUCTION COST PER POUND OF ALL FISH PRODUCED	$ 1.81	

Form 3-111
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

REARING FACILITIES AND WATER SUPPLY

(See Fish Hatchery Manual Section 4438m for Instructions)

PART 1 REARING FACILITIES

1. TYPES OF FACILITIES IN USE	NUMBER IN USE	CAPACITY (Calculate at normal water level)	MONTHS IN USE	TOTAL (Months x Cu.Ft.)
TROUGHS		Cu.Ft.		
TANKS		Cu.Ft.		78,000
RACEWAYS		Cu.Ft.		
OTHER POOLS AND PONDS - Concrete		Cu.Ft.		1,826,603
OTHER POOLS AND PONDS - Earthen		Cu.Ft.		
		TOTAL		1,904,603
TOTAL CUBIC FEET IN USE ON YEARLY BASIS (Divide Total by 12)				158,717

PART 2 - WATER SUPPLY

2. SOURCE OF SUPPLY	Check appropriate source for each supply: SPRING	WELL	LAKE	STREAM	OTHER (Explain on reverse)
Supply No. 1				X	
Supply No. 2					
Supply No. 3					

3. AVERAGE VOLUME OF WATER-g.p.m. (Give total flow in parenthesis, if not all used)	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	ANNUAL AVERAGE
Supply No. 1					33,530
Supply No. 2					
Supply No. 3					

4. AVERAGE WATER TEMPERATURE-F°	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	ANNUAL AVERAGE
Supply No. 1 River					46
Supply No. 1 Incubator					47
Supply No. 2 System I					46
Supply No. 2 System II					53
Supply No. 3 System III					53

5. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED: 233,436 lbs

6. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED per g.p.m. AVERAGE FLOW USED: 7.0

7. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED per Cu. Ft. (annual) FLOW: 1.47

IS ANY WATER PUMPED FOR FISH PRODUCTION? YES [X] NO [ ] HEATED? YES [X] NO [ ]

(If YES in either case, give details as to flow involved, estimated cost, etc, on reverse.)

Form 3-112
(Revised June 1968)

Estimated cost involved to pump, cool and heat water:

Electrical for pumping, cooling and heating:	$ 28,095
Fuel Oil for heating	13,659
Total =	$ 41,754

SUMMARY OF LABOR EXPENDED AND UTILIZATION

(See Fish Hatchery Manual Section 4438n for Instructions)

PART 1 - STATION LABOR ANALYSIS

No.	ITEM	Man-Years of Labor
1	PERMANENT PERSONNEL (Includes PCS and PFT)	22
2	ALL OTHER LABOR	6
3	OVERTIME FOR WORK PERFORMED AT STATION BY ABOVE EMPLOYEES	--
4	DETAIL OF PERSONNEL TO STATION	--
5	OVERTIME OF DETAILED PERSONNEL AT STATION	--
6	TOTAL LABOR - ALL PERSONNEL	28

PART 2 - LABOR UTILIZATION

No.	ITEM	Permanent	Other
7	PRODUCTION	11.4	2.1
	TROUT	(1.6)	--
	SALMON	(9.8)	(2.1)
8	DISTRIBUTION ~~(Cost Codes 13, 16, 17)~~	0.3	--
9	MAINTENANCE	9.8	3.0
10	PUBLIC USE	0.4	0.9
11	TRAINING	0.1	--
12	SUB TOTAL	22	6
13	TOTAL PERMANENT AND OTHER (Equals Item 6)	28	

Form 3-113
(Revised June 1968)