Annual Report

FISCAL YEAR 1976

Dworshak National Fish Hatchery
(Hatchery)

Submitted by: [signature] Title Hatchery Manager Date 11/16/76

Date Received Regional Office NOV 17 1976 Reviewed By: [signature] Date [illegible], 1976

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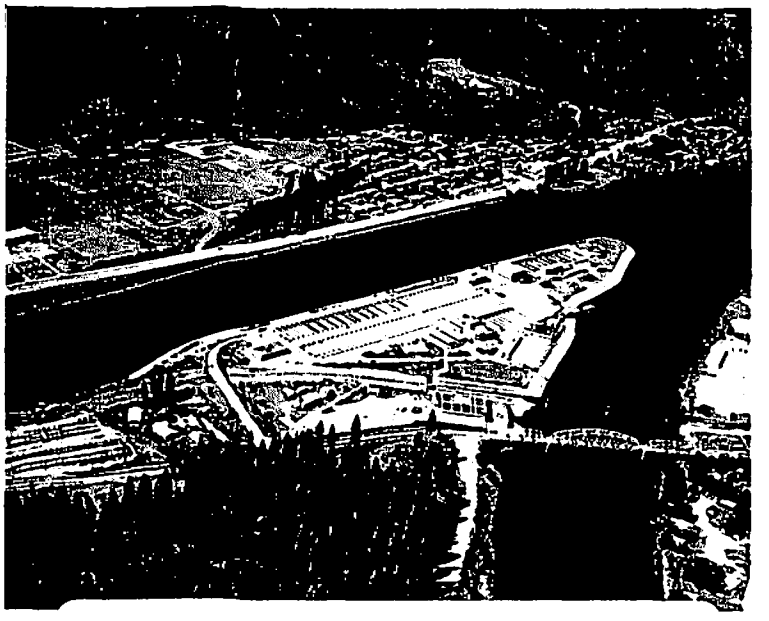
DIVISION OF FISH HATCHERIES

Form 3-100
(Jan. 1964)

INDEX

INTRODUCTION

The Dworshak National Fish Hatchery is located at Ahsahka, Idaho near the confluence of the Clearwater River and North Fork of Clearwater. The hatchery was completed in 1968 by the Corps of Engineers to compensate for loss of the steelhead spawning grounds blocked by construction of Dworshak Dam. Facilities are designed for the release of 400,000 pounds of steelhead smolts each spring and an annual production of 100,000 pounds of resident species (rainbow, kokanee and cutthroat) for planting into Dworshak Reservoir.



View of hatchery

The Annual Report covers a 15-month period to include Fiscal Year 1976, ending June 30, 1976 and 3 months for changeover to a new period of fiscal year reporting. Hereafter, reports will follow the fiscal year beginning October 1 and ending September 30. Accomplishments and highlights during this time are reported along with any problems that may have occurred.

General

Steelhead production for the hatchery was revised during the year to increase size of smolt at release to average 8 inches (200 mm) from 7 inches (180 mm). Numbers of fish scheduled for release were reduced from 3.3 to 2.4 million to adjust for the size increase while weight at release remained the same at approximately 400,000 pounds. Recent research on other summer steelhead stocks has indicated that steelhead released at the larger size have better survival. Studies will continue under contract with the University of Idaho to determine optimum size of smolt to release from this hatchery.

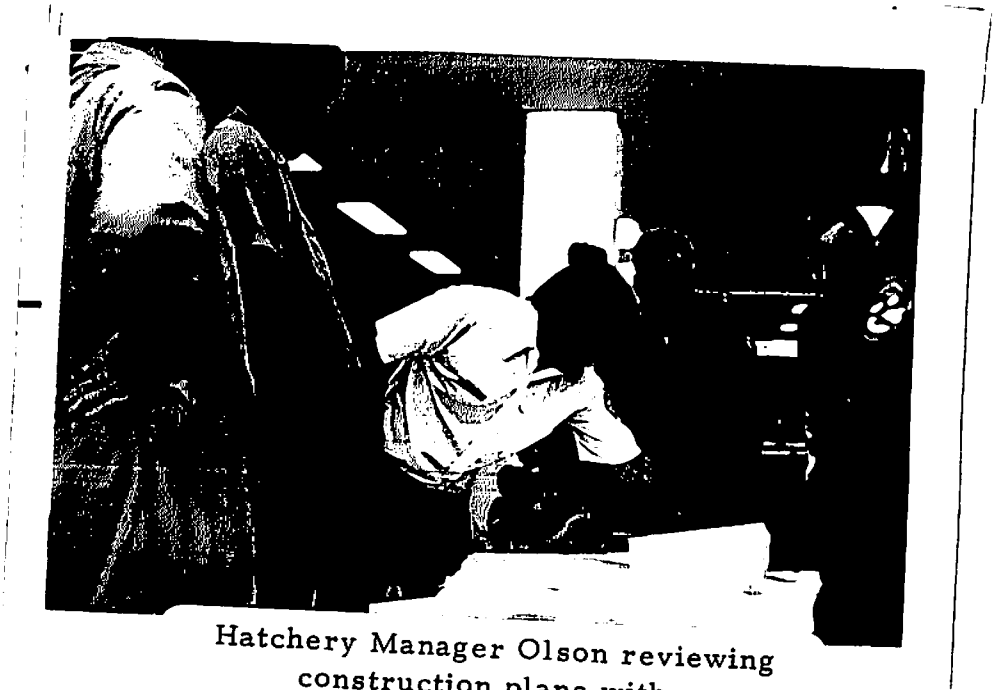
Problems in production were experienced at different times of the year. Water temperatures were lowered, flows adjusted between reuse and raw water, and various treatments applied to reduce fish mortalities during these times; all of which worked against meeting anticipated sizes by having to feed at lower levels than desired. As a result, fish programmed for 200 mm had to be released at 180 mm.

Over 400,000 Broodyear 1975 steelhead were held over for second year rearing after it was determined that projected size at release would be too small for downriver survival. These fish have been reared entirely on raw water and will be released in spring 1977 as 2-year-olds.

Fish from Broodyear 1975 released in spring 1976 were not of comparable quality. System II fish, in general, were hurt by exposures to nitrite levels that continued to increase from mid-December to late January 1976. A parr/smolt study under contract with Dr. T. C. Bjornn, University of Idaho, was begun in February with 180,000 steelhead marked. Moving and handling of fish to accommodate the study resulted in increased mortality and contributed to additional fungusing. There were some indications of increased mortality at the same time in System III; however, fish were smaller and adjustments could be made to the water supply to avoid major loss and alleviate the problem. Fish in System III appeared to be in very good condition at time of release, whereas System II fish may have suffered from earlier exposure to high ammonia, high nitrite, increased solids in the ponds and additional stress conditions brought on by excess handling.

The Study Team was established at the beginning of the year with two initial objectives in mind: (1) follow-up on the Dworshak Task Force report with a specific program of studies to be conducted; (2) provide continuity in the evaluations. The Team, responsible to Regional Director, Kahler Martinson, and Idaho Fish and Game Director, Joe Greenley, has as their leader Ted Bjornn, University of Idaho, Cooperative Fisheries Research Unit Leader; Jerry Burton, Columbia River Fishery Services Field Biologist; and Dave Ortmann, Idaho Fish and Game Coastal Anadramous Supervisor. The Study Team met a number of times throughout the year, individually or as a group, with the hatchery staff.

The need for review and planning for modification of some existing facilities and construction of new ones became even more evident during the year when problems occurred from disease, inadequate nursery tank space, shortage of pond rearing capacity, inefficient operation of System I reuse, and poorly designed "Burrows" rearing ponds that defied cleaning. Proposals have been discussed with the Corps of Engineers that would alleviate some of the operational problems. Plans have been prepared by the Corps for our review. These plans provide for additional rearing tank space, construction of new raceways and earthen ponds, and modification of System I reuse into two separate systems. Money for all or some of these changes is pending approval.



Hatchery Manager Olson reviewing construction plans with station personnel

Developmental Investigations

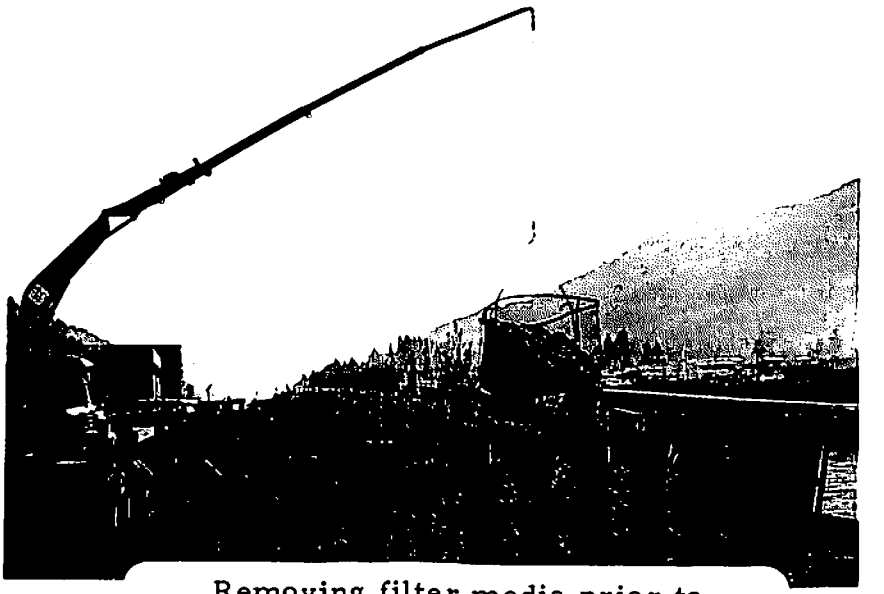
Studies were initiated in hopes of finding answers that could resolve some of the operating problems. Briefly described are these studies, all to be continued into FY-1977.

1. Air Backwash System for Cleaning Filter Beds

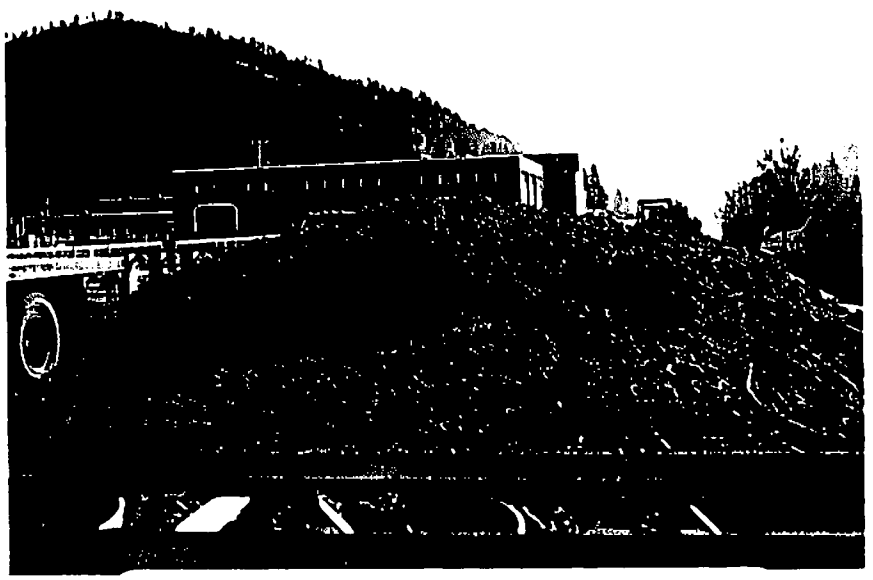
After three seasons of operating the biofilters of System II and III it was apparent that a way had to be designed to clean the filter media. The filters were initially designed as an upflow system in which sludge deposits would settle beneath the beds and be removed from the system by a series of scrapers. We assumed this to be the case until it was discovered in March 1976, after digging through 6 feet of media, sludge was accumulating in areas as deep as 3 feet.

After the fish were released and the system shut down, work was begun to install a series of lateral pipes beneath the filter media. These pipes, plumbed into an air blower, were installed in the 10 filter beds of System II and III. Work was completed during the summer of 1976 in time for the startup of the reuse systems. Testing will be done through the rearing season to determine a schedule of operation for best removing any accumulation of sludge and to provide us with the assurance that short-circuiting of water through the beds, due to a sludge buildup, is not possible.

Filter media in Systems II and III showing accumulation of sludge on the plastic rings



Removing filter media prior to installing air backwash cleaning system



Media removed from
Systems II and III biofilters

2. Mineral Enrichment of Water Supply

The water supply furnished the hatchery is low in minerals and has been compared to distilled water. Efforts were made to increase hardness and to provide similar water conditions as found in southern Idaho.

Procedures were established and dosages calculated for using sodium chloride (NaCl), potassium chloride (KCl), magnesium sulphate ($MgSO_4$), and calcium chloride (CaCl). These salts were added to the incubator water during time of hatching and early feeding stage. No positive results for fish health were obtained, although further testing is planned to establish this fact.

Later discussion with Dr. Tom Meade, University of Rhode Island, suggested that the chloride ion added to water low in chloride can produce positive results in alleviating nitrite toxicity. Studies will be carried out in FY-1977 to establish this fact by the addition of NaCl and CaCl to System II makeup water and using System III without mineral addition as the control. If chloride added to water can alleviate problems with high nitrite experienced during heavy fish loading, we will have discovered a major breakthrough in operating the Dworshak biofilters.

3. Pond Modifications

A number of tests were made to determine the best procedure for cleaning the Burrows ponds. The ponds, designed with turning vanes and floor drains, do not perform at Dworshak as they were designed. Problems have been experienced over the years of operation and these same problems continue to plague the hatchery and cause untold losses in fish production.

The self-cleaning pond does not work, and because of the inefficiency of this design, suspended material remains in the water and there is no provision for its removal.

Among some of the tests being carried out at present are: (1) removal of turning vanes, (2) converting a pond to raceway design, (3) repositioning water intakes, and (4) partial covering of drains for more efficient action.

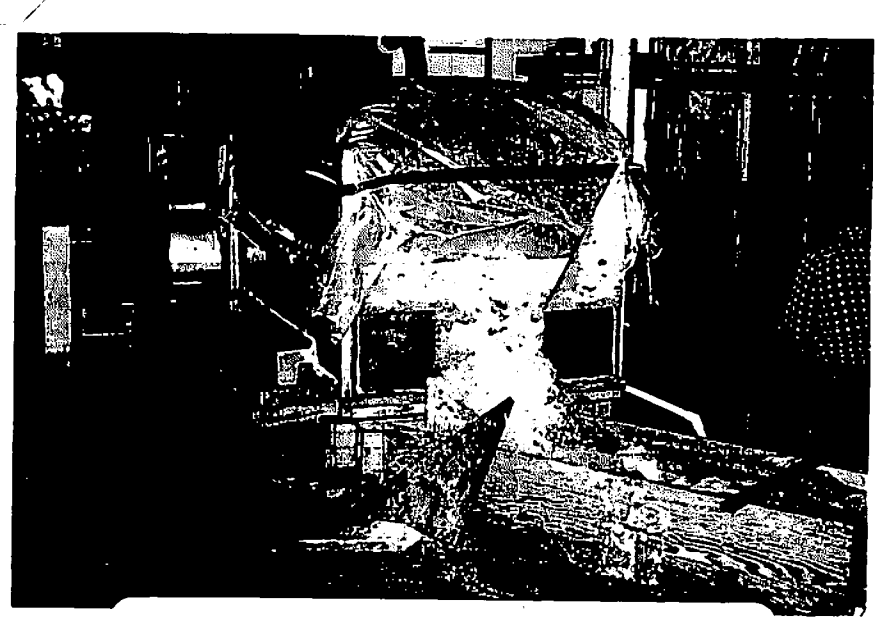
4. Degasser for Removal of Supersaturated Nitrogen

Losses in smaller fish to high nitrogen levels may be higher than first believed. Many of these losses could be due to high nitrogen levels; however, losses may also have been masked by other causes.

A degasser, patterned after a system developed and used in Sweden for removal of supersaturated nitrogen (N_2), was designed, constructed by station personnel, and operated on the incubator water supply. An earlier model was built and tested prior to designing the larger system.

Numerous nitrogen readings were made during the year with a "Saturometer" providing us data to base results upon. Results were encouraging as average N_2 readings were reduced from 105 percent to below 102 percent.

Further testing will continue and N_2 readings recorded. A small degasser is planned for the wet lab to provide protection against high N_2 levels on test fish. Possible use of a degasser on the reuse systems will need further study.



Model degasser designed for incubator water supply

5. Preactivation of Filter Beds

For the first time, System II and III biofilters were activated by "seeding" to establish the nitrifying bacteria. This differs from other startups where fish loading activated the filters. Procedures recommended by Dr. Tom Meade, University of Rhode Island, include circulating water through the filter beds, heating to 80°, and adding ammonium hydroxide.

Results of the preactivation will not be known until end of the steelhead rearing season. It is anticipated that the autotroph bacteria will dominate to allow for a more efficient biofilter operation. Heterotrophs have dominated operation in the past and may be a cause for having to carry lighter fish loads than the system was designed for.

6. Two-Year Rearing Program for Steelhead

Fiscal Year 1976 found a change in program direction when size of fish released was increased from 180 to 200 mm. To assure that fish from the late take of eggs would attain the larger size, it would become necessary to hold them for another year of rearing.

Some changes need to be made to accommodate a second year of rearing. There are 400,000 yearling steelhead remaining to be released. These fish will have to be moved to the filter beds of System I and held through the winter months to make room for the first-year steelhead.

Studies will continue with Dr. Ted Bjornn, University of Idaho, to further justify an additional year of rearing.

7. Spawning and Incubation

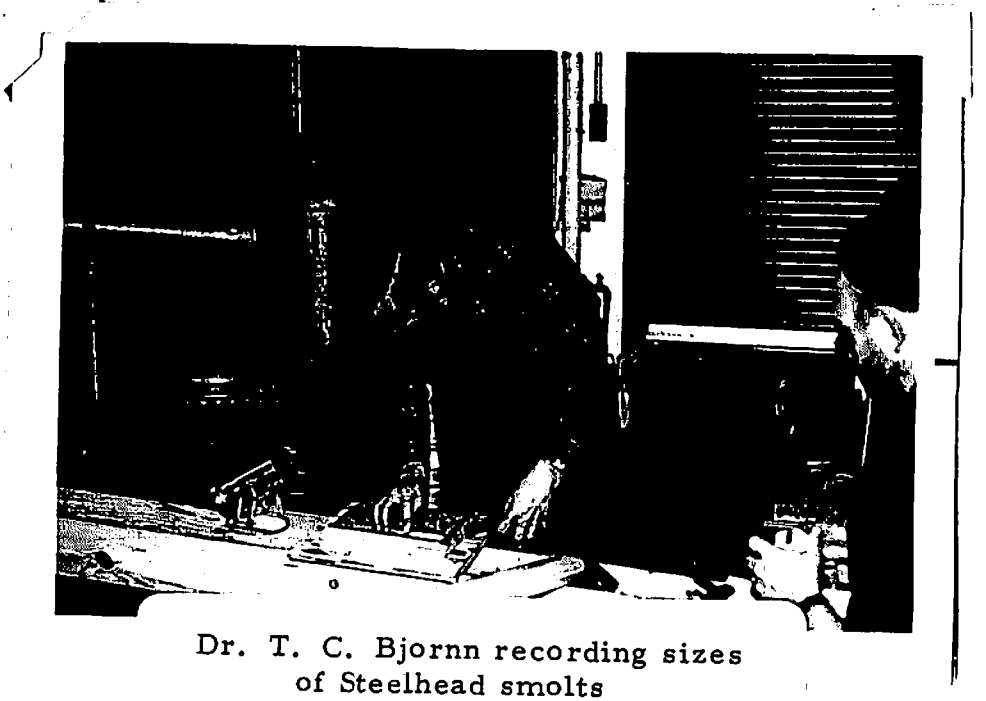
Studies were made to find cause(s) of poor egg eye-up and reasons for high incidence of white spot. Changing spawning procedures and methods of incubation, adding minerals to water supply, and reducing nitrogen levels did not appear to provide definite answers to our problems. However, some of the tests may have indicated an improvement that is worthy of further investigation in FY-77.

Use of jars for egg incubation in lieu of stacked trays is highly encouraging, and their use needs to be studied further in next year's program. Pooling of sperm and spawning in buckets in place of colanders, indicated some success. Average egg eye-up again was 75 percent and work continues to improve upon this.

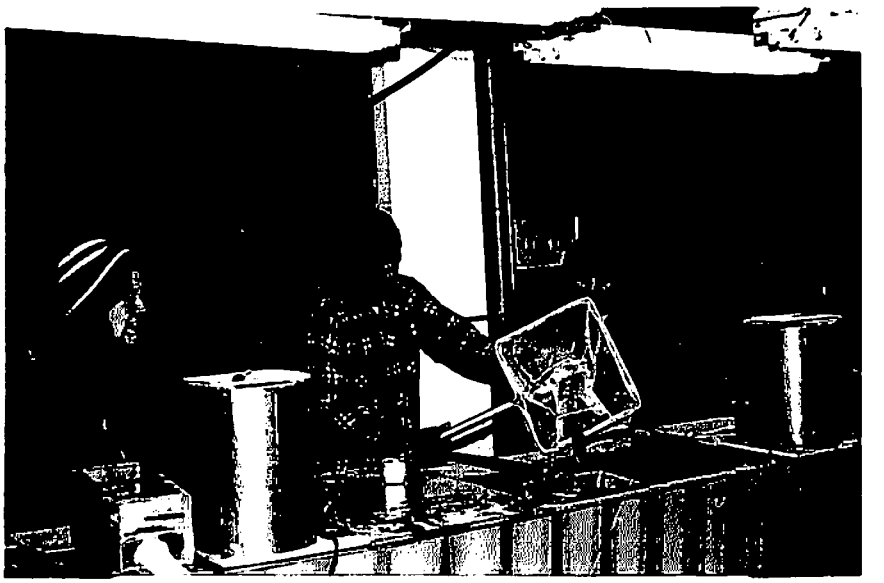
Contract Studies

Surplus funds were made possible to continue funding a study for 1 year to Idaho Fish and Game. Previous studies of this type were funded by the Corps of Engineers; however, money had not been budgeted to continue. The total cost of $60,600 continues the Dworshak Dam Fisheries Studies from March 1, 1976 to February 28, 1977.

Two contracts were made during the year with the University of Idaho and Dr. T. C. Bjornn, Cooperative Fisheries Unit Leader, as principal investigator. A study, "Parr/Smolt Transformation of Steelhead Trout," covers a period from January 15, 1976 to June 30, 1977 at a cost of $22,000 and includes the following investigations: To determine size of fish, time of release, and pre-release conditioning needed to facilitate the parr/smolt transformation and migration to the ocean of steelhead reared at Dworshak.



Dr. T. C. Bjornn recording sizes of Steelhead smolts



Fish marking crew

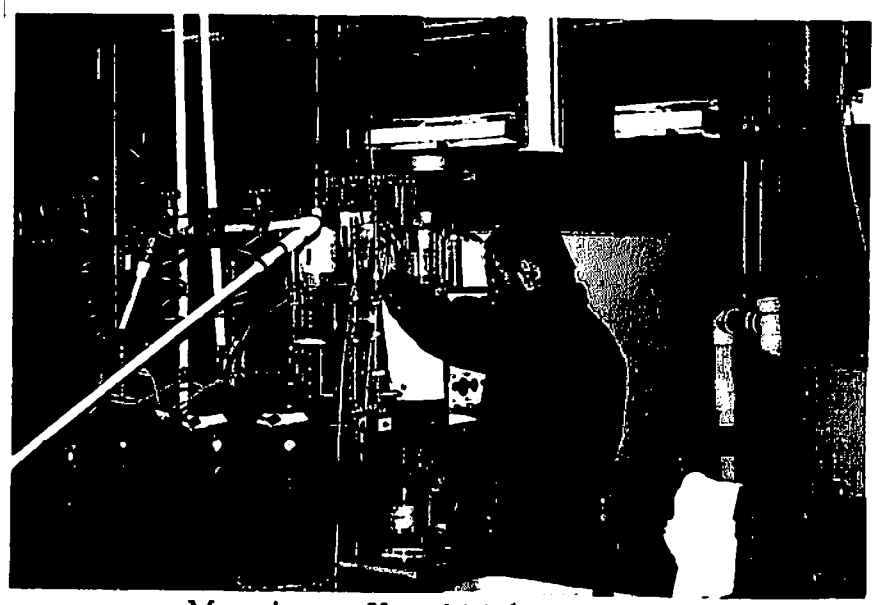
The second study, "Evaluation of various Hatchery Rearing Conditions on the Seaward Migration of Steelhead Trout," was contracted for $41,700 and initiated September 1, 1976 to end on June 30, 1978. The objectives of this study are to provide sufficient information on diet, length of rearing, length of conditioning, size of smolt, location and method of release, and date of release to maximize the yield of adult steelhead from Dworshak.

At a cost of $2,000, a study was initiated and completed with Dr. W. S. Zaugg, Western Fish Disease Laboratory, Cook, Washington Field Station, to determine "Temperature and Advanced Photoperiod Effects on Migration and Gill ATPase Activity in Juvenile Steelhead Trout from Dworshak National Fish Hatchery."

Dr. Thomas Meade, University of Rhode Island, was contracted for $18,000 to complete a study titled, "Investigation of Environmental and Physiological Parameters Associated with Nitrite Toxicity with Particular Emphasis on Steelhead Trout Production in Hatcheries Employing Water Reuse Systems." Beginning date was September 15, 1976 to end on September 14, 1977.

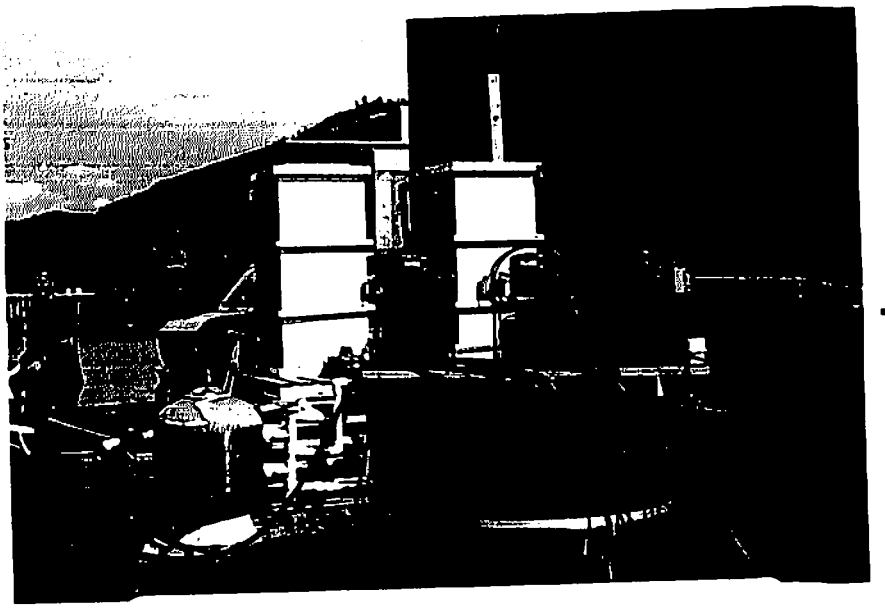
Funds were provided at a cost of $56,000 to the Corps of Engineers to continue operation improvement studies and to provide the hatchery engineering assistance. Some studies continued to be carried on contract with the University of Idaho on designing and testing biofilters at the hatchery. Among those pilot plant studies were:

1. Clarification ahead of nitrification
2. BOD removal prior to nitrification
3. Seeding of biofilters
4. Ozonation versus ultraviolet lighting in treatment of makeup water
    a. efficiency
    b. effects on fish toxicity
    c. costs



Morrison, U. of Idaho graduate student, monitoring use of ozone in a water treatment system

Kramer, Chin & Mayo, Inc. performed a pilot study on "Ion Exchange Bed Investigation" using clinoptilolite as the filter media. This study, costing $13,500, was funded on a 50/50 basis between USCE and USFWS.



K. C. M. pilot study

Station Improvements

Briefly stated are some of the improvements made during the year to the station:

1. Metal storage sheds installed at residence #1 and #4.

2. Conference room added to second floor of hatchery building by dividing visitor area, carpeting, and installing table and seating arrangement for 25 to 30 people.

3. Spray nozzles were added to one pump in each of the aeration towers of System I and System II, replacing the aspirators and providing for greater removal of supersaturated nitrogen levels.

4. The entrance to the feed building at the basement storage level was enlarged to accommodate a fork lift making possible use of this room for additional feed and storage space and allowing former use of the "west" storage building to be used by maintenance.

5. Incubator degasser described previously in "Developmental Investigations."

6. Filter bed modifications described previously under "Developmental Investigations."

7. Pond walkways were constructed for those rearing ponds previously having turning vanes as walkways and now removed.

8. A large storage area was constructed by paving an area in the west end of the hatchery and surrounding it with chain link fencing.

9. Two ponds were constructed for collection and drying sludge removed from filter Systems II and III.

10. Sixty-four (64) fiberglass fish tanks were purchased at a cost of $38,000. These tanks will later be set up to double the nursery rearing capacity.

Procurement

The addition of Defense Supply Agency's "Logistics & Management Data System" during the past 13 months has generated three primary benefits:

1. Savings between 20 to 75 percent over wholesale and jobber prices.
2. Savings in supply research and office procedure time.
3. Expedient delivery of urgently needed items.

Currently, 30 to 35 percent of our purchases are made through "milstrip." More savings will result in the future as our knowledge and publications increase. Meanwhile, the use of authorized purchases from the Department of Defense is considered a definite asset.

FISH CULTURAL OPERATIONS

Broodyear 1975 Steelhead

There were 5, 561, 988 green eggs taken in the spring of 1975. From this total, 73, 000 were transferred for lab experiments and 3, 868, 000 started to feed.

In August 1975, 989, 000 fish were moved out of the tank area at 300 per pound and set up in 12 ponds in System III for the diet trials. There were six tests:

1. OMP Control, fed the regular production diet.
2. OMP without medicated starter.
3. Silver Cup Salmon Feed.
4. Abernathy A-11.
5. Abernathy with double vitamin pack.
6. Alternating between OMP and Silver Cup after every 1-inch of growth.

The final analysis of the diet trials indicates that OMP, without medicated starter, was a better diet. Abernathy and Silver Cup diets showed suspended solids in ponds while OMP-fed ponds were somewhat cleaner.

In late August, System I was taken off reuse and put on raw river water because of the high incidence of "Ich" in the system and high mortality. In October, the condition of the steelhead in Systems I and II appeared good. System II water temperature was raised from 55° to 58° F. By November, System I was back on reuse, although mortality was still high. At that time it was necessary to change back because the hatchery was still programmed for 1-year rearing. Warmer water had to be used to enable attaining a migratory size of 180 mm in lieu of using raw water at 43° through the winter months for rearing.

A change in program direction was made in December 1975. Fish from the late take of eggs could not make the new 200-mm size recommended for release. Therefore, System I, holding the smaller fish, was changed back again to raw water and has remained on this supply to accommodate a 2-year rearing program. System II and III would continue on reuse.

The computer system was again turned on in late December to feed steelhead in System I. Soon the ponds were noticeable dirtier and the system was shut down again. The air entrainment system breaks down the pellets, creating a dust which recirculates, causes gill problems and makes the ponds dirtier. Also, the computer is not programmed for variations in fish appetite that occur often. The computer is still used for record keeping and alarm monitoring, while feeding of the ponds continues to be done by hand.

Problems in System II and III began to appear in December and reached a high level of high mortality in late January. Fish were affected by an imbalance in the biofilter system which caused an increase in toxic nitrite levels. System II fish were hit harder than System III possibly because of the larger fish, heavier loading and dirtier ponds. Adjustments were made to System III which improved conditions and offset further losses. However, System II continued to be plagued with problems until the fish were released.

There were a number of fish that died in the months following marking and handling. There was also a noticeable increase in fungus appearing on fish in System II after having been marked and/or handled. A tabulation of the marking program:

Fish Marked: 180, 807
Total Number Handled: 215, 977
Mortality: 10, 191
Percent Mortality: 6. 3

Releases from Systems I and II were begun on April 12 by pumping the fish into the North Fork. The majority of System II was released in late April. There were several ponds of marked fish that were released at predetermined intervals. Two ponds were held with traps to allow fish to escape when desired. The remaining fish in those ponds were pumped out on May 20. Table I shows what happened with the marked experimental fish after they were released.

TABLE I

ESTIMATED PERCENTAGE OF DWORSHAK NATIONAL FISH HATCHERY STEELHEAD SMOLTS MIGRATING PAST LOWER GRANITE DAM--1976

	Number Released	Number Recovered	Percent	
Released April 14, 15				
Large				
0 weeks	10,864	6,204	57.1	
3 weeks	12,955	7,991	61.7	--60.2
6 weeks	10,989	6,760	61.3	
				--54.0
Small				
0 weeks	13,149	7,926	60.3	
3 weeks	14,227	5,846	41.1	--48.3
6 weeks	10,055	4,297	42.7	
Released May 4, 5				
Large				
0 weeks	10,164	4,378	43.1	
3 weeks	12,685	5,792	45.7	--40.5
6 weeks	8,880	2,689	30.3	
				--38.1
Small				
0 weeks	15,636	5,935	38.0	
3 weeks	12,214	3,880	31.8	--36.2
6 weeks	10,948	4,210	38.5	
Released May 24				
Large				
13 weeks	6,004	3,670	61.1	--61.1

We released 1,751,805 yearling steelhead in spring 1976, weighing 210,442 pounds. Fish averaged 8.32 per pound and 180 mm in size.

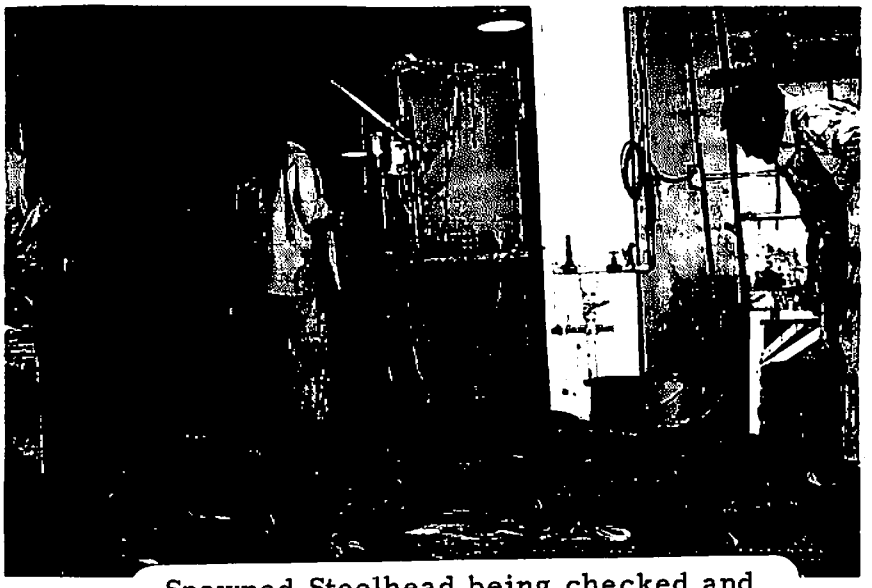
Broodyear 1976 Steelhead

Spawning was average for the year. There were numerous tests having some definite and beneficial results. Eggs spawned into a bucket in which ovarian fluid was saved showed better percent fertility than eggs spawned into a colander where ovarian fluid drained off. Eggs fertilized immediately after spawning showed better percent fertility than those with a delay of 5 and 10 minutes. Table II is a summary of spawning statistics.

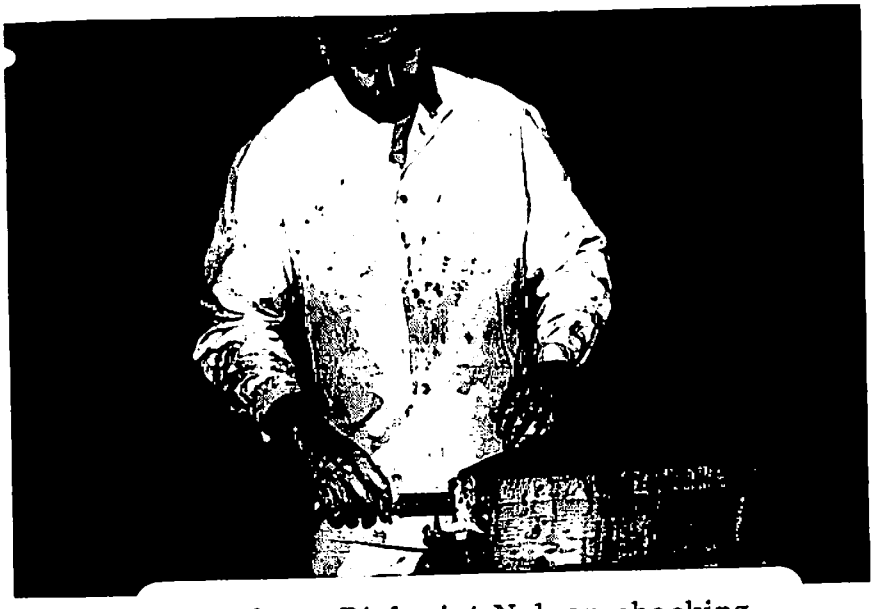
TABLE II.--Summary of Spawning Activities From February 13, 1976 to June 4, 1976

Females spawned	1,053
Males spawned	635
Mortality, loss, released	170
Total Run	1,858
Green eggs taken	7,519,247
Green eggs kept	7,434,247
Eggs eyed-up	5,588,627
Eyed eggs kept	5,582,851
Green eggs per female	7,141
Percent eye-up	75.2

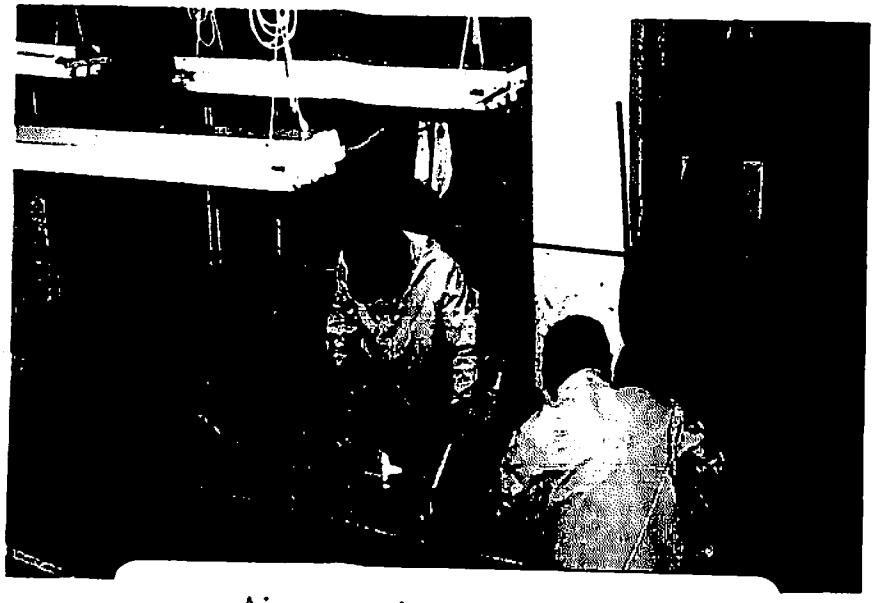
Checking Steelhead for ripeness



Spawned Steelhead being checked and sampled for laboratory information

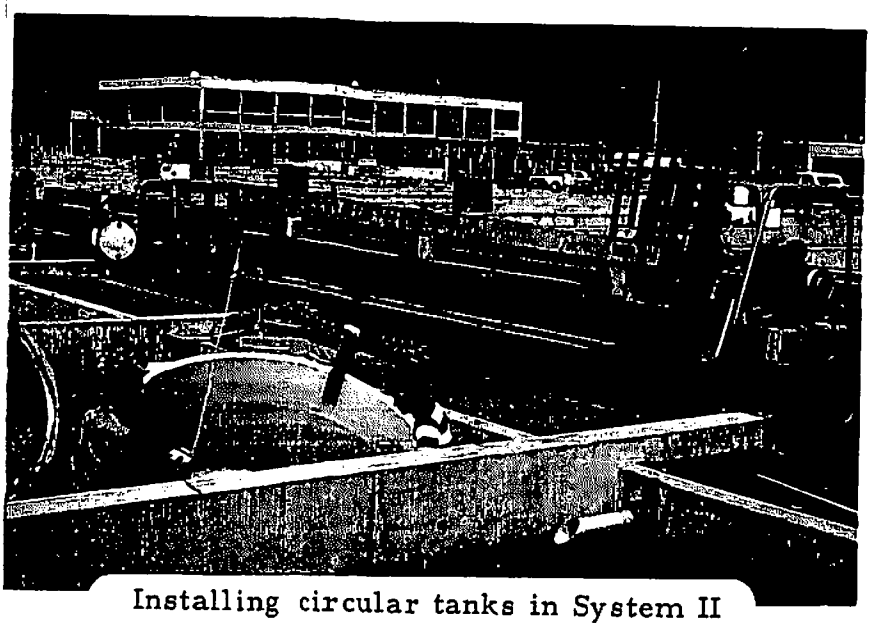


Hatchery Biologist Nelson checking adult Steelhead for nose tags



Air spawning of Steelhead

The new fiberglass rearing tanks did not arrive in time for the 1976 season, and 40 round tanks were again loaned from Kooskia National Fish Hatchery and installed in System II rearing ponds.



Installing circular tanks in System II ponds for temporary rearing of small Steelhead

One million fry were transferred to Idaho Fish and Game in June to relieve crowding of the smaller fish resulting from inadequate rearing facilities.

Idaho Fish and Game receiving
1-million Steelhead fry

Problems were evident from the beginning in using the temporary circular tanks. Poor circulation and low water flows caused stress conditions in fish from the later take of eggs. These same fish became highly susceptible to an "Ich" infection which later spread throughout System II reuse and infected all ponds. Though "Ich" had been discovered in the system in past years, there was never an indication that the disease would become full blown because of the filter system design. Losses seriously affected the possible transfer of fingerling fish to the State for further rearing. No excess production was later identified for transfer.

There were 4,100,000 fry to feed. As of September 30, 1976 there remained 2,280,000 fish on hand plus 400,000 yearlings from Broodyear 1975 to meet a 2.4 million release in Spring 1977. Losses in fry and early feeding fish through the summer of 1976 were as follows:

1. "Ich"	1,000,000
2. White Spot	400,000
3. Unaccountable (inventory shortage)	420,000

Resident Species Program

Rainbow

The rainbow program for Dworshak Reservoir continued with fish of many sizes and from varied sources being planted. The subcatchables were planted in the lower tributaries by loading the distribution trucks on a barge. The catchables were trucked to the more accessible boat ramps. The following is a brief summary of the eggs received during the year and subsequent distribution:

Source	Number Eggs Rec'd	Fish Planted			On Hand 9/30
		Number	Weight	No. /lb	
Ennis, MT	Rec'd FY 75	36,000	34,170	1.06	--
Ennis, MT	Rec'd FY 75	118,000	57,478	2.05	--
White Sulphur Springs, WV	83,694	30,000	219	137	--
Arlee, MT	500,262	300,000	1,277	235	--
Beulah, WY	150,000	20,000	12	1,667	--
Erwin, TN	800,000	285,000	650	438	107,000 @ 26/lb
		789,000	93,806		

A total of 2,600 rainbow were planted in Talmacs Lake, on the Nez Perce Indian Reservation, in exchange for a planting by Hagerman National Fish Hatchery to Dworshak Reservoir and thus relieving a logistics problem for the Hagerman hatchery.

Kokanee

The site on Elk Creek, a tributary to the Dworshak Reservoir, was selected and a cabin to house the spawning crew was constructed. Periodic checks in October and November did not show any kokanee, and the trap was not installed. There were 1,104,000 eyed eggs received from Whatcom Falls, near Bellingham, Washington, and 750,000 green eggs from

Granby Lake, Colorado. The Colorado eggs were partially frozen during water hardening and percent hatch was low. There were 1, 326, 000 fry planted by helicopter in Elk Creek in spring 1976 in addition to 186, 000 planted at 3-4" size in fall 1975.

Transferring kokanee fry to helicopter for planting in Dworshak Reservoir

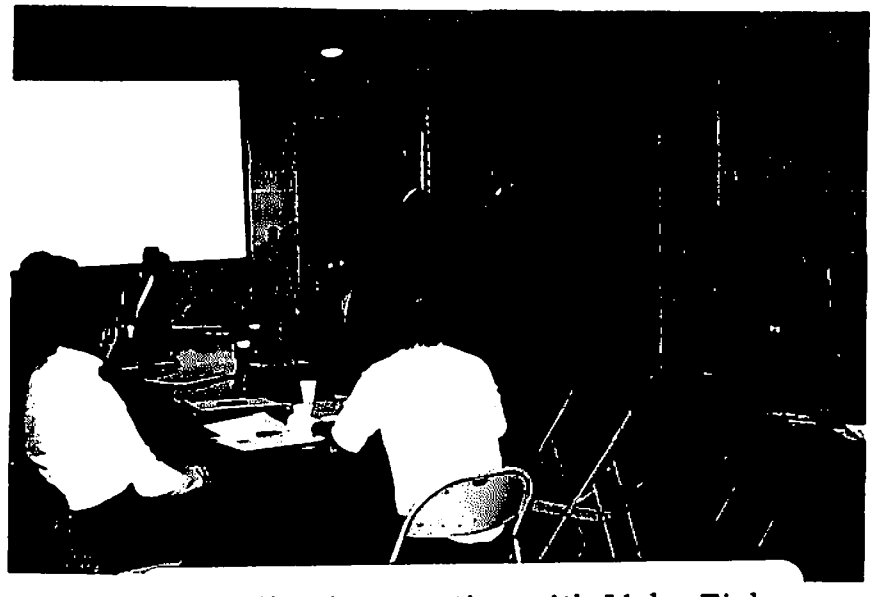
Cutthroat

It was determined during the year that the cutthroat brood stock program at Dworshak should be terminated. There were 111, 000 cutthroat on the station, which were planted in Elk Creek. An area was chosen above the kokanee spawning site in the event a trapping operation became necessary in the future.

A shipment of 125, 000 eyed eggs was received from Kings Lake, Washington. The resulting fry were picked up by Idaho Fish and Game personnel for rearing at their Sandpoint Hatchery.

Smallmouth Bass

A shipment of 50, 000 smallmouth bass fry was received from New London National Fish Hatchery, Minnesota, and planted into the reservoir.



Coordination meeting with Idaho Fish and Game in Lewiston--January 1976

The hatchery again provided use of the laboratory to the Corps of Engineers, U. S. Forest Service and University of Idaho for studies of interest to the agencies involving water quality, limnology and sedimentation.

SAFETY

Seventeen formal staff safety meetings were held during this reporting period. Safety meetings averaged about 30 minutes in length. Subjects covered during the year were: auto safety, boat handling, lifting, choking, heart attack, hunter safety, heavy equipment operation, and safety in general.

CPR Training (Cardiopulmonary Resuscitation) was offered to the employees. Leonard Eckman, a local instructor, came to the hatchery and taught an 8-hour course to 19 personnel.

A Multimedia First Aid Training Course was offered by the Clearwater National Forest Service and 13 employees took part in the session.

Eight DI-134s were filed during the year. These accidents were: cut finger, bruised elbow, cut leg, neck muscle strain, bruised heel, debris in eye, steel in eye, and cut finger.

The safety committee held numerous discussions with employees about accidents and how they happened. The station safety manual was revised and updated.

There have been 778 man days of lost time accident-free operation through September 30, 1976.

MAINTENANCE AND REPAIRS

Considerable time and money was placed on routine maintenance. Pump replacement and repairs continued to run high. However, after eight years of operation, expenditures for maintenance are being reduced and appear to be leveling towards a more realistic figure for budget planning.

Painting of resident interiors and exteriors in addition to some outside painting of other buildings was completed by station personnel and contract. Some inside painting was begun in Mechanical Building #1 to color code the piping system.

An annual replacement of ultraviolet lights in all systems for treatment of incoming water was done at a cost of $11,000.

Modifications were made to the chemical feed system in Systems I, II and III. These modifications involved some pumping changes and new piping for use in adding minerals to the water supply.

Four electric ranges were replaced in the residences.

The USCE issued contracts for purchase and installation of four aerators in the main water treatment facility. These aerators were installed and operating by August 1976.

All door locks were changed over for better security and one master key issued to personnel on a sign-out agreement.

HATCHERY BIOLOGIST ACTIVITIES

Diet Development Control

During the 1975-76 production season, monitoring of fish health, hematological parameters and growth was conducted on the OMP production diet, two Abernathy diets and alternating diets.

During the 1976 season, diet tests were conducted using EWOS diets and OMP diets.

Equipment Testing

Tests were conducted in an attempt to reduce stress conditions on smolting steelhead and pond efficiency by removing vanes in the Burrows ponds which cause abrasion. Attempts to find methods for improving pond cleaning and circulation by reversing flow directions were also tested. Fish health was monitored.

Montana hatching boxes were tested as a means to increase the steelhead egg eye-up.

Fish Cultural Techniques

Testing was conducted on spawning techniques and percent eye-up. A test was designed in an attempt to reduce the incidence of white spot by utilizing degassed water and mineral enriched water. The University of Idaho, two Idaho State Fish Hatcheries and Kooskia National Fish Hatchery have participated in this experiment.

During the past year, the Dworshak laboratory has had a unique opportunity to accept help and suggestions from many sources and to extend help and suggestions to others.

Those agencies and individuals offering help and information were as follows:

University of Idaho

Dr. Klontz helped to initiate an inoculation program for kidney disease at Kooskia National Fish Hatchery. He also offered help concerning disease problems encountered.

Dr. Falter and Dr. Lingg cooperated in identifying algae growths found in the reuse systems and water supplies at Dworshak.

Dr. Wallace offered assistance in testing the use of alum for flocculation and pilot studies on reuse systems.

Dr. Watts offered suggestions for conducting studies on possible pond modifications for the Burrows ponds.

Dr. Knowles conducted analyses for heavy metals during the entire year at Dworshak and Kooskia in the raw systems and water supplies.

Dr. Bjornn helped in the experimental design of many tests at Dworshak and conducted marking studies and parr-smolt transformation studies.

Washington State University

Dr. Hindin, an environmental chemist, cooperated in testing blood from adult steelhead at Dworshak for lead concentrations. He also offered suggestions as to monitoring methods and ran heavy metals tests on systems waters.

Roger Dirkes, a graduate student at W. S. U., studied the accumulation of the aluminum ion in the reuse systems and the raw water supply.

Ron Sims offered help to the lab in setting up a means to enumerate the number of nitrifying bacteria in a filter system.

Idaho Fish and Game Department

Considerable time was spent discussing the Dworshak program and working with personnel of the Idaho Fish and Game. Spawning techniques, the mark-recovery program, disease problems and fish health problems were discussed.

U. S. Fish and Wildlife Service

Dr. Wedemeyer of the Western Fish Disease Lab at Seattle, was in continual contact with the Dworshak lab and offered help in many physiological areas.

Charlie Smith and Bob Piper of the Bozeman FCDC extended histological monitoring to all reuse hatcheries in Region I and offered suggestions in establishing loading factors and density information where applicable.

The Abernathy FCDC visited Dworshak and offered diet information and extended help in setting up the white spot trials.

Dr. Wally Zaugg conducted studies on ATPase levels at Dworshak through Dr. Bjornn's marking studies.

The National Marine Fisheries Service spent time throughout the year discussing migration problems, nitrogen gas problems and mark-recovery data.

Army Corps of Engineers representatives Morris Croker, John Hess, Gene Buglewicz, Ray Oligher were in continual contact with the hatchery on water quality, design criteria and EPA permit information.

Ivan McElwain visited the Dworshak hatchery. A cooperative agreement was established with the Fish Disease Control Center to run the required annual disease inspection samples in their laboratory at Fort Morgan, Colorado. This has been a beneficial arrangement for both laboratories. The Fort Morgan lab has the quality control for interstate shipments and the Dworshak lab can spend more time on specific hatchery problems.

Other Sources

Wayne Brunson, fish disease biologist from the Washington Department of Game, spent time at Dworshak discussing common goals and problems.

Jack Donahue, from the Illinois Conservation Department, helped set up pond testing experiments based on work being done with Burrows ponds in Pennsylvania, Michigan and Illinois.

Drs. Thurston and Russo from Montana State University in Bozeman spent two days at Dworshak discussing and setting up bioassays for nitrite and ammonia toxicity on steelhead.

Dr. Wagner of Oregon State University contributed considerable information on steelhead.

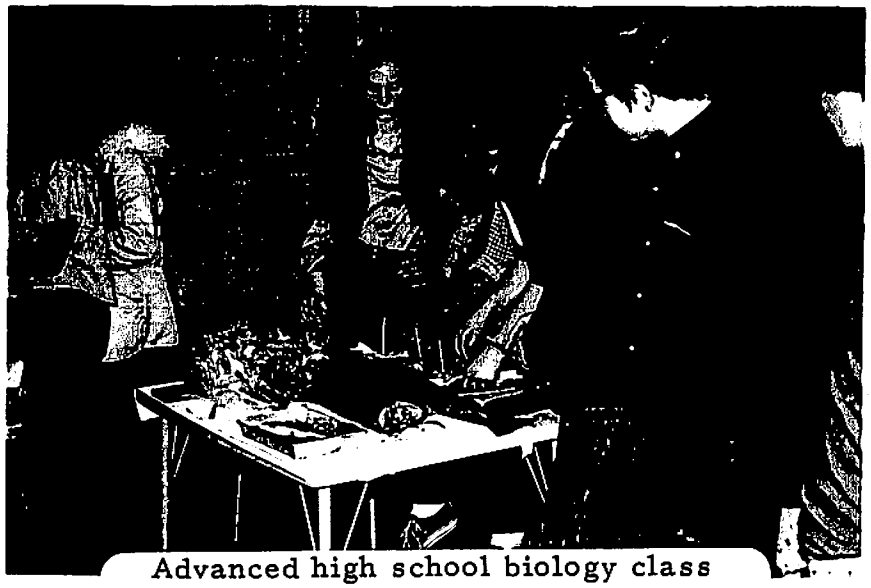
Dr. Meade, from the University of Rhode Island, discussed reuse problems and toxicity problems associated with reuse systems and their possible controls.

Dr. Robbins, a biochemist from Montana State University, discussed ammonia testing methods and methylene blue treatments for nitrite toxicity.

Extension Service

Four college groups visited and participated in seminars concerning the Dworshak National Fish Hatchery this year.

Eleven students and their instructor from the Orofino High School advanced biology class were guests of the hatchery for a three-hour laboratory class. The laboratory staff conducted sessions on laboratory equipment and techniques, diagnostic checks on fish and water analysis.



Advanced high school biology class attending a laboratory session at hatchery

Several sessions with National Marine Fisheries Services were held to prepare for diagnostic tests and mark-recovery of downstream migrants.

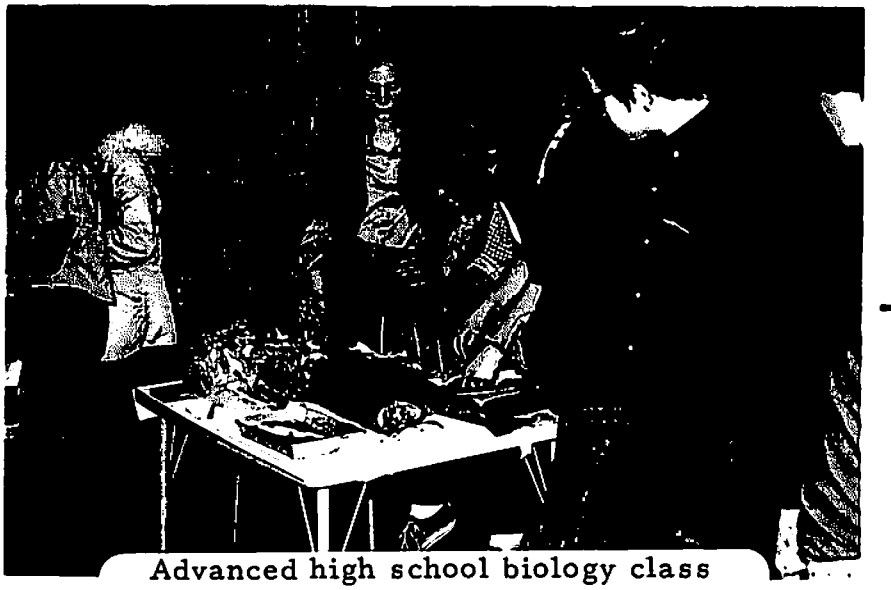
Milt from Dworshak steelhead was collected to be used with females from the Hayden Lake stock of cutthroat in eastern Idaho. This was a cooperative effort.

Cooperative meetings were held with Idaho Fish and Game throughout the year to discuss mark-return information, fish health, marking programs and release of smolts.

Considerable time was spent explaining the role of the Dworshak hatchery and lab to representatives of all disciplines interested in fish culture.

Diagnostic Services

Fish health checks and inspections were conducted for six federal hatcheries. Two checks for the State of Washington, two commercial hatcheries in Idaho and a Title 50 exam in Canada were also conducted. An inspection was completed at Summit Lake in Nevada on the Summit Lake Cutthroat.



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Diagnostic Services

Fish health checks and inspections were conducted for six federal hatcheries. Two checks for the State of Washington, two commercial hatcheries in Idaho and a Title 50 exam in Canada were also conducted. An inspection was completed at Summit Lake in Nevada on the Summit Lake Cutthroat.

The lab has cooperated with the Dworshak Reservoir resources crew in checking fish for parasites and pathogens.

Use of Laboratory Facilities

Throughout the year the Army Corps of Engineers, U.S. Forest Service, University of Idaho graduate students, Kooskia National Fish Hatchery personnel and interested college students used the lab facilities for specific projects or to participate in laboratory functions.

Meetings

The laboratory participated in numerous seminars, workshops, task force meetings, coordination meetings, training sessions and group discussions, all related to reuse systems of steelhead production.

Major Contributions

During the past year the laboratory staff has helped to set up the following:

1. Methemoglobin determinations.
2. Enumeration of nitrifying bacteria in reuse systems.
3. Standardized water quality monitoring methods and reagents.
4. Exchange of literature and information related to reuse systems.
5. Treatments used in reuse systems.
6. A station library is being set up to be used by any interested agencies involved in fisheries in the Dworshak area.

Personnel Changes

Mr. Richard Nelson transferred from Coleman National Fish Hatchery to Dworshak as a biologist trainee. Mr. Nelson is attending the Eastern Fish Disease Laboratory pathology course from September 1976 through January 1977.

Mr. David Owsley came on the staff as a sanitary engineer.

Mr. Gene McPherson is employed as a biological technician in Mr. Nelson's absence.

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	--	--	---	Fry	50,000	Per M. --
TROUT	1,840	557	2,397	96,816	2,531,437	Per lb. .025
ANADROMOUS	3,230	3,159	6,389	211,736	2,776,778	Per lb. .030
TOTALS	5,070	3,716	8,786	308,552	5,358,215	

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	--	--	--	--	Fry	50,000
TROUT	--	--	59	118,236	96,757	2,413,201
ANADROMOUS	--	--	607	1,023,500	211,129	1,753,278
TOTALS	--	--	666	1,141,736	307,886	4,216,479

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	--	Fry	--	--	50,000	50,000
TROUT	--	43	43	--	2,235	2,235	--	24,819	24,819
ANADROMOUS	1	--	1	165	--	165	1,500	--	1,500
TOTALS	1	44	45						
AVERAGE				165	2,235	2,188*	1,500	25,391	24,860*

PART 4 - MILEAGE AND SPECIES DELIVERIES

ITEM	PONDFISH	TROUT	ANADROMOUS	TOTAL
MILES TRAVELED	5	1,014	720	1,739
AVERAGE NUMBER OF MILES PER TRIP				39
NUMBER APPLICATIONS (species delivered) THIS YEAR	1	3	1	5
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	
* Anadramous planted	at Hatchery, except one trip to Willard, Washington Lab.		
Resident:	50,000 Small Mouth		
	1,067,201 Trout	96,105 lbs. by Truck	
	1,346,000 Trout	652 lbs. by Helicopter	
	118,236 Trout	59 lbs. Transferred to Idaho Fish & Game	
TOTAL			

SALMONIDAE PRODUCTION
(Fish and Eggs)

(See Fish Hatchery Manual Section 4436c for Instructions)

(1) Species	(2) ON HAND JULY 1		(3) Received During Year		(4) Total Distribution		(5) ON HAND ~~JUNE 30~~ Sept 30		(6) Total Production in Pounds
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	
STT - (CA)									
4-D-41	76,000	5,700	--	--	2,983	852	--	--	4,848
5-D-51	5,561,988	eggs	--	--	1,751,795	210,442	409,000	39,000	249,442
6-D-61	--	--	7,519,247	eggs	1,022,000	442	2,280,000	23,761	24,203
	5,637,988	5,700	7,519,247	--	2,776,778	211,736	2,689,000	62,761	268,797
RBT - (IF)									
4-E-472	36,000	16,800	--	--	36,113	34,170	--	--	17,370
5-F-517	195,000	1,853	--	--	117,925	57,478	--	--	55,625
5-Wss-581	--	--	83,694	19	30,000	219	--	--	200
5-U Mt-571	--	--	500,262	116	300,697	1,277	--	--	1,161
6-Bh-1 618	--	--	150,000	20	20,000	12	--	--	8
6-EW-~~660~~	--	--	800,000	135	285,000	650	106,828	4,069	4,584
	231,000	18,653	1,533,956	290	789,735	93,806	106,828	4,069	78,932
CTT - (IF)									
4-UWa-461	6,270	214	--	--	4,110	403	--	--	189
5-UWa-561	--	--	142,000	94	106,900	394	--	--	300
6-UWa-661	--	--	125,000	40	118,236	59	--	---	19
	6,270	214	267,000	134	229,246	850	--	--	508
~~-~~ - (IF)									
10E 5-UWa-505	73,000	102	--	--	74,828	545	--	--	443
5-UCO-515	124,200	225	--	--	111,628	969	--	--	744
6-UWa-605	--	--	1,104,000	140	976,000	470	--	--	330
6-UCO-615	--	--	750,000	67	350,000	170	--	--	103
	197,200	327	1,854,000	207	1,512,456	2,154	--	--	1,620
TOTALS	6,072,458	24,894	11,174,203	631	5,308,215	308,552	2,795,828	66,830	349,857

Form 3-103
(Jan. 1964)

Bureau of Sport Fisheries and Wil[illegible]

ANADROMOUS DISTRIBUT[illegible]

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
1969	11,472,500	--	1,200,000		eggs	7/69	1,583,066	2,500	633	North Fork, Clearwate
						4/70	1,248,227	7.10	175,766	River
						5/70	123,316	9.15	13,472	
						4/71	1,341,366	5.63	238,209	
1970	11,627,946	--	2,795,500	--	eggs	4/71	1,802,205	10.19	176,837	
						10/71	1,500	7.5	200	NMFS, Little Goose
						10/71	50	7.5	7	University of Idaho
						4/72	17,669	5.7	3,117	NMFS, Columbia River
						4/72	943,659	5.8	162,319	Clearwater River
						4/72	500	5.9	85	Station
						5/72	15,226	4.9	3,088	NMFS, Columbia River
1971	6,448,600	--	401,159	--	eggs	7/72	460	46	10	University of Idaho
						9/72	200	25	8	University of Idaho
						10/72	500	20	25	NMFS, Little Goose
						1/73	6,000	20	300	Willard Nutrition Lab.
						4/73	1,270,197	14.2	89,373	North Fork, Clearwate
										Rive
1972	5,244,698	--	10,000		eggs	8/72	15,000	2,500	6	University of Idaho
						3/33	77,903	13.0	6,077	N-Fork Clearwater
						4/73	1,280,619	15.0	85,162	" "
						4/73	841,377	54.7	15,383	S-Fork Clearwater
						5/73	200,880	62.0	3,240	" "
1973	26,561,861	--	12,951,000		eggs	6/73	748,300	2,144	349	S-Fork Clearwater
			2,000	eggs	1.	10/73	1,800	225	8	University of Idaho
			42,000	eggs	17	12/73	230,335	76	3,012	Lolo Creek
			2,020,200	1,400	1,443	3/74	492,827	9.7	50,627	N-Fork Clearwater
						2/74	2,781	9.3	300	University of Idaho
			2,221,936	158	14,047	4/74	2,907,031	8.1	357,378	N-Fork Clearwater
						4/74	400	8.5	47	Oregon Game Commissio
						5/74	287,53[illegible]	10.2	28,129	U.S.F.S.
						5/74	101,995	8.1	12,594	Lolo Creek
						5/74	72,318	8.[illegible]	7,866	Clearwater River

39

Form 3-104 [illegible]

Form 3-102
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

DISTRIBUTION DATA AND COSTS

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	--	--	---	Fry	50,000	Per M. --
TROUT	1,840	557	2,397	96,816	2,531,437	Per lb. .025
ANADROMOUS	3,230	3,159	6,389	211,736	2,776,778	Per lb. .030
TOTALS	5,070	3,716	8,786	308,552	5,358,215	

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	--	--	--	--	Fry	50,000
TROUT	--	--	59	118,236	96,757	2,413,201
ANADROMOUS	--	--	607	1,023,500	211,129	1,753,278
TOTALS	--	--	666	1,141,736	307,886	4,216,479

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	--	Fry	--	--	50,000	50,000
TROUT	--	43	43	--	2,235	2,235	--	24,819	24,819
ANADROMOUS	1	--	1	165	--	165	1,500	--	1,500
TOTALS	1	44	45						
AVERAGE				165	2,235	2,188*	1,500	25,391	24,860*

PART 4 - MILEAGE AND SPECIES DELIVERIES

ITEM	PONDFISH	TROUT	ANADROMOUS	TOTAL
MILES TRAVELED	5	1,014	720	1,739
AVERAGE NUMBER OF MILES PER TRIP				
NUMBER APPLICATIONS (species delivered) THIS YEAR	1	3	1	39
NUMBER FARM POND DELIVERIES				5
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	
* Anadramous planted	at Hatchery, except one trip to Willard, Washington Lab.		
Resident:	50,000 Small Mouth		
	1,067,201 Trout	96,105 lbs. by Truck	
	1,346,000 Trout	652 lbs. by Helicopter	
	118,236 Trout	59 lbs. Transferred to Idaho Fish & Game	
TOTAL			

Bureau of Sport Fisheries and Wildlife

SALMONIDAE PRODUCTION

(Fish and Eggs)

(Fish Hatchery Manual Section 4438c for Instructions)

(1) Species	(2) ON HAND JULY 1		(3) Received During Year		(4) Total Distribution		(5) ON HAND JUNE 30		(6) Total Production in Pounds
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	
STT - (CA)									
4-D-41	76,000	5,700	--	--	2,983	852	--	--	4,848
5-D-51	5,561,988	eggs	--	--	1,751,795	210,442	409,000	39,000	249,442
6-D-61	--	--	7,519,247	eggs	1,022,000	442	2,280,000	23,761	24,203
	5,637,988	5,700	7,519,247	--	2,776,778	211,736	2,689,000	62,761	268,797
RBT - (IF)									
4-E-472	36,000	16,800	--	--	36,113	34,170	--	--	17,370
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	231,000	18,653	1,533,956	290	789,735	93,806	106,828	4,069	78,932
CTT - (IF)									
4-UWa-461	6,270	214	--	--	4,110	403	--	--	189
5-UWa-561	--	--	142,000	94	106,900	394	--	--	300
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	6,270	214	267,000	134	229,246	856	--	--	508
KOE - (IF)									
5-UWa-505	73,000	102	--	--	74,828	545	--	--	443
5-UCO-515	124,200	225	--	--	111,628	969	--	--	744
6-UWa-605	--	--	1,104,000	140	976,000	470	--	--	330
6-UCO-615	--	--	750,000	67	350,000	170	--	--	103
	197,200	327	1,854,000	207	1,512,456	2,154	--	--	1,620
TOTALS	6,072,458	24,894	11,174,203	631	5,308,215	308,552	2,795,828	66,830	349,857

Form 3-103
(Jan. 1964)

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				
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						5/70	123,316	9.15	13,472	
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						10/71	1,500	7.5	200	NMFS, Little Goose
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						4/72	17,669	5.7	3,117	NMFS, Columbia River
						4/72	943,659	5.8	162,319	Clearwater River
						4/72	500	5.9	85	Station
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1972	5,244,698	--	10,000		eggs	8/72	15,000	2,500	6	University of Idaho
						3/33	77,903	13.0	6,077	N-Fork Clearwater
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			2,000	eggs	1.	10/73	1,800	225	8	University of Idaho
			42,000	eggs	17	12/73	230,335	76	3,012	Lolo Creek
			2,020,200	1,400	1,443	3/74	492,827	9.7	50,627	N-Fork Clearwater
						2/74	2,781	9.3	300	University of Idaho
			2,221,936	158	14,047	4/74	2,907,031	8.1	357,378	N-Fork Clearwater
						4/74	400	8.5	47	Oregon Game Commission
						5/74	287,530	10.2	28,129	N.M.F.S.
						5/74	101,995	8.1	12,594	Lolo Creek
						5/74	72,318	8.8	7,866	Clearwater River

Form 3-104 (over)

ANADROMOUS DISTRIBU

Species: Steelhead Trout

Source (parent waters): North Fork 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
1974	26,047,748		2,000	eggs	1	7/74	1,000	500	2	University of Idaho
			5,342,000	eggs	2058	9/74	1,000	167	6	University of Idaho
			1,350,000	eggs	551	3/75	31,565	5.10	6,189	Clearwater River
			550,000	eggs	225	4/75	544,008	5.91	92,126	Clearwater River
			210,000	eggs	86	4/75	1,186,305	6.14	193,353	North Fork Clearwat
			300,000	fry	123					Rive
1975	5,561,988		*73,800	eggs		1/76	1,500	9.09	165	Willard Lab
						4/76	1,539,964	8.41	183,078	North Fork Clearwat
						5/76	210,331	7.73	27,199	" " " Riv
										"
1976	7,519,247		*70,000	eggs		8/76	22,000	880	25	University of Idaho
			1,000,000	fry	417					

* Transferred to Hatchery Biologist for research uses.

Form 3-104
(Revised June 1968)

Bureau of Sport Fisheries and Wildlife

EGG SHIPMENTS - SALMONIDAE

e Fish Hatchery Manual Section 4438e for Instructions)

SPECIES	NAME AND ADDRESS OF APPLICANT	EGGS SHIPPED		DATE SHIPPED
		NUMBER	WEIGHT	
None				
	TOTAL NUMBER SHIPPED			

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

(Fish Hatchery Manual Section 4438f for Instructions)

No.	ITEM		POUNDS (a)	TOTAL COST or VALUE (b)
1.	FISH FOOD ON HAND JULY 1		97,100	26,032.85
2.	FISH FOOD RECEIVED BY DONATION		--	--
3.	FISH FOOD RECEIVED BY TRANSFER		--	--
4.	SUB-TOTAL RECEIVED AND ON HAND		97,100	26,032.85
5.	LIST TYPE PURCHASED DURING YEAR	Cost Per Pound		
	OMP	.223	41,442	9,224.98
	ABERNATHY	.157	20,000	3,149.01
	SILVER CUP	.177	32,969	5,819.94
	EWOS	.354	80	28.32
6.	SUB-TOTAL PURCHASED	Average: .193	94,491	18,222.25
7.	TOTAL RECEIVED AND PURCHASED (Item 4 + 6)		191,591	44,255.10
8.	LESS FISH FOOD TRANSFERRED TO OTHER HATCHERIES		--	--
9.	LESS FISH FOOD ON HAND JUNE 30		21,564	5,595.03
10.	TOTAL FISH FOOD EXPENDED		170,027	38,660.07
11.	COST PER POUND OF FISH FOOD EXPENDED (Line 10, col.(b) ÷ col.(a)			.227
12.	GAIN IN WEIGHT OF FEEDING FISH PRODUCED DURING YEAR			82,387
13.	FOOD CONVERSION (Line 10, col.(a) ÷ line 12)			2.06
	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 1965)

Bureau of Sport Fisheries and Wildlife

FISH FOOD

SPECIES
☐ Trout
☒ Anadromous Salmon
☒ Other

(Fish Hatchery Manual Section 4438f for Instructions)

No.	ITEM		POUNDS (a)	TOTAL COST or VALUE (b)
1.	FISH FOOD ON HAND JULY 1		121,420	21,238.39
2.	FISH FOOD RECEIVED BY DONATION		--	--
3.	FISH FOOD RECEIVED BY TRANSFER		--	--
4.	SUB-TOTAL RECEIVED AND ON HAND		121,420	21,238.39
5.	LIST TYPE PURCHASED DURING YEAR	Cost Per Pound		
	OMP	.223	328,578	73,140.86
	ABERNATHY	.157	20,000	3,149.00
	SILVER CUP	.177	54,481	9,617.56
	EWOS	.354	39,920	14,129.68
6.	SUB-TOTAL PURCHASED	Average: .226	442,979	100,037.10
7.	TOTAL RECEIVED AND PURCHASED (Item 4 + 6)		564,399	121,275.49
8.	LESS FISH FOOD TRANSFERRED TO OTHER HATCHERIES		--	--
9.	LESS FISH FOOD ON HAND JUNE 30		70,986	18,417.97
10.	TOTAL FISH FOOD EXPENDED		493,413	102,857.52
11.	COST PER POUND OF FISH FOOD EXPENDED (Line 10, col.(b) ÷ col.(a)			.208
12.	GAIN IN WEIGHT OF FEEDING FISH PRODUCED DURING YEAR			269,432
13.	FOOD CONVERSION (Line 10, col.(a) ÷ line 12)			1.83
	FOOD COST PER POUND OF FISH PRODUCED (Line 10, col.(b) ÷ line 12)			.38
15.	GIVE DETAILS ON REVERSE SIDE FOR ENTRIES ON LINES 2, 3, and 8			

Form 3-106
(Revised June 1968)

CHEMICAL CONTROL PROGRAM

(See Fish Hatchery Manual Section 4438I for Instructions)

CONTROL CHEMICAL USED	ORGANISM TREATED	AMOUNT USED		No. Acres Treated (Indicate Land or Water)	TOTAL PURCHASE PRICE
		Lbs.	Gals.		
FORMALIN	FUNGUS, PROTOZOA		200	L W X	Carried Over From Previous Years
MALACHITE GREEN	FUNGUS	20		L W X	"
WESCODYNE	BACTERIA, FUNGUS		1	L W X	"
ROCCAL	BACTERIA		25	L W X	"
CALCIUM HYPOCHLORITE	DISINFECTANT	700		L W X	"
				L W	
				L W	
				L W	
				L W	
				L W	
				L W	
				L W	
				L W	
				L W	
				L W	
TOTAL		720	226	L W	

Form 3-109
(Jan. 1964)

Bureau of Sport Fisheries and Wildlife
Divisi[illegible] Fish Hatcheries

OPERAT[illegible] 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	12,918	4,906	--	17,824	23,650	4,174	--	27,824	45,648
2	Rearing	380 360	158,250	26,982	--	185,232	338,854	56,304	---	395,158	580,390
3	Distribution	400	3,230	1,840	--	5,070	3,159	557	--	3,716	8,786
4	PRODUCTION Sub-total		174,398	33,728	--	208,126	365,663	61,035	--	426,698	634,824
5	Maintenance of Facilities	140	100,118	25,754	--	125,872	255,466	42,001	--	297,467	423,339
6			--	--	--	--	--	--	--	--	--
7			---	--	--	--	--	--	--	--	--
8	MAINTENANCE Sub-total		100,118	25,754	--	125,872	255,466	42,001	--	297,467	423,339
9	Public use	000	--	--	24,529	24,529	--	--	5,301	5,301	29,830
10	Training	130	3,231	--	--	3,231	704	--	--	704	3,935
11	Development Investigations	250	45,214	1,840	--	47,054	37,558	6,628	--	44,186	91,240
12	OPERATIONS & MAINTENANCE TOTAL		322,961	61,322	24,529	408,812	659,391	109,664	5,301	774,356	1,183,168
13	Fish production facilities	51 52									
14	Buildings	53 54									
15	Other physical facilities	55 56									
16	Public use facilities	57 58									
17	REHABILITATION TOTAL										
18	GRAND TOTALS		322,961	61,322	24,529	408,812	659,391	109,664	5,301	774,356	1,183,168
19	O & M Expenditures - Percent for Fish Production		Column (d): Line 4 ÷ Line 12			51	Column (i): Line 4 ÷ Line 12				54
20	TOTAL EXPENDITURES - Percent for Fish Production		Column (d): Line 4 ÷ Line 18			51	Column (i): Line 4 ÷ Line 18				54

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	--			--
2	Pounds Produced	--	81,060	268,797	349,857
3	Labor Expenditures	--	33,728	174,398	208,126
4	Non-Labor Expenditures	--	61,035	365,663	426,698
5	TOTAL EXPENDITURES	--	94,763	540,061	634,824

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	1.17	
LABOR COST PER POUND	.42	
LABOR COST PERCENT OF PRODUCTION COST		35.6
ANADROMOUS		
PRODUCTION COST PER POUND	2.01	
LABOR COST PER POUND	.65	
LABOR COST PERCENT OF PRODUCTION COST		32.3
AVERAGE PRODUCTION COST PER POUND OF ALL FISH PRODUCED	1.81	

Form 3-111
(Revised June 1968)

REARING FACILITIES AND WATER SUPPLY

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	10	116	Cu.Ft.	10	1,160
TANKS	64	6,144	Cu.Ft.	10	61,440
RACEWAYS	--	--	Cu.Ft.	--	--
OTHER POOLS AND PONDS - Concrete	84	222,180	Cu.Ft.	11	2,443,980
OTHER POOLS AND PONDS - Earthen	--	--	Cu.Ft.	--	--
			TOTAL		2,506,580
TOTAL CUBIC FEET IN USE ON YEARLY BASIS (Divide Total by ~~12~~ 15)					167,105

PART 2 - WATER SUPPLY

2. SOURCE OF SUPPLY	Check appropriate source for each supply				OTHER (Explain on reverse)
	SPRING	WELL	LAKE	STREAM	
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	45,000	30,000	30,000	15,000	30,000
Supply No. 2					
Supply No. 3					

4. AVERAGE WATER TEMPERATURE-F°	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	ANNUAL AVERAGE
River	58	55	39	45	49.3
Incubator	48	48	48	48	48
System I	58	55	39	45	49.3
System II	57	57	55	45	53.5
System III	57	58	55	42	53.0

5. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED: 349,857

6. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED per g.p.m. AVERAGE FLOW USED: 11.66

7. TOTAL POUNDS OF TROUT OR ANADROMOUS SPECIES PRODUCED per Cu. Ft. (annual) FLOW: 2.09

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 1958)

Estimated cost involved to pump, cool and heat water:

Electrical for pumping, cooling and heating:	35,119.00
# 5 Fuel Oil for heating (Husky):	16,634.37
TOTAL =	$51,753.37

Bureau of Sport Fisheries and Wildlife

REPORT OF PERMANENT PERSONNEL

(See Fish Hatchery Manual Section 4438o for Instructions)

PART 1 - STATION PERSONNEL

NAME OF EMPLOYEE	Age	Grade	Marital Status	Children Under 18	Period Worked	COMPENSATION PAID			Total Compensation
						Total Regular Salary	Uniform Allowance	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BILLI, JAMES L.	37	GS-11	M	2	7/1/75 - 9/30/76	22,457	156.25		22,613.25
CARLSON, DWAIN A.	41	GS-06	M	5	7/1/75 - 9/30/76	15,130	156.25	68.88	15,355.13
ESPINOSA, SUSAN D.	27	GS-05	M	1	7/1/75 - 9/30/76	11,637	156.25		11,793.25
FOREST, GENE A.	37	GS-09	M	3	7/4/76 - 9/30/76	3,430	156.25		3,586.25
GRIFFITH, JIMMY R.	31	GS-05	M	3	7/1/75 - 9/27/75	2,509	102.49	88.20	2,699.69
HARRIS, WALTER G.	42	GS-09	M	3	7/1/75 - 9/30/76	21,863	156.25		22,019.25
HAYES, CHARLES H.	39	GS-06	S	0	7/1/75 - 12/19/75	4,330	54.00	31.88	4,415.88
1. TOTAL - STATION PERSONNEL									

PART 2 - PERSONNEL DETAILED TO STATION

NAME OF EMPLOYEE	From Station	Period of Detail	COMPENSATION PAID			Total Compensation
			Regular Salary Costs	Per Diem and Expenses	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)
2. TOTAL - DETAILED TO STATION						
3. TOTAL COMPENSATION PAID TO PERMANENT PERSONNEL ON DUTY AT STATION						

Form 3-114
(Jan. 1964)

GENE A. FOREST - Full time appointment effective 07/04/76

JIMMY R. GRIFFITH - Transferred to Abernathy Salmon Cultural Development Center, effective 09/28/75

CHARLES H. HAYES - Resignation effective 12/19/75

Bureau of Sport Fisheries and Wildlife

REPORT OF PERMANENT PERSONNEL

(See Fish Hatchery Manual Section 4438o for Instructions)

PART 1 - STATION PERSONNEL

NAME OF EMPLOYEE	Age	Grade	Marital Status	Children Under 18	Period Worked	COMPENSATION PAID			Total Compensation
						Total Regular Salary	Uniform Allowance	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HEATHCO, MERLE S.	52	GS-06	M	0	7/1/75 - 9/30/76	15,787	156.25	90.90	16,034.15
LIENTZ, JOSEPH C.	36	GS-11	M	2	7/1/75 - 9/30/76	19,843	156.25		19,999.25
MOFFETT, CLARENCE P.	44	WG-05	S	0	7/1/75 - 9/30/76	14,194	156.25	20.55	14,370.80
NELSON, RICHARD C.	34	GS-07	M	2	12/7/75 - 8/28/76	8,071	113.05		8,184.05
OLSON, WAYNE H.	41	GS-13	M	4	9/14/75 - 9/30/76	24,900	156.25		25,056.25
PARVIN, JOHN R.	61	GS-13	M	0	7/1/75 - 7/31/75	12,020			12,020.00
REYNOLDS, LAVERNE W.	41	GS-05	S	0	7/1/75 - 9/30/76	13,694	156.25	46.38	13,896.63
1. TOTAL - STATION PERSONNEL									

PART 2 - PERSONNEL DETAILED TO STATION

NAME OF EMPLOYEE	From Station	Period of Detail	COMPENSATION PAID			Total Compensation
			Regular Salary Costs	Per Diem and Expenses	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)
2. TOTAL - DETAILED TO STATION						
3. TOTAL COMPENSATION PAID TO PERMANENT PERSONNEL ON DUTY AT STATION						

Form 3-114
(Jan. 1964)

RICHARD C. NELSON - Reassignment effective 12/07/75
Detailed to attend "Leetown" Fish Disease Departmental Training, In-Service Course conducted at Eastern Fish Disease Lab, with salary paid by WO Account No. 93140-1340-990, effective 8/29/76.

WAYNE H. OLSON - Reassignment effective 9/14/75

JOHN R. PARVIN - Retirement effective 7/31/75

Bureau of Sport Fisheries and Wildlife

REPORT OF PERMANENT PERSONNEL

(See Fish Hatchery Manual Section 4438o for Instructions)

PART 1 - STATION PERSONNEL

NAME OF EMPLOYEE	Age	Grade	Marital Status	Children Under 18	Period Worked	COMPENSATION PAID			Total Compensation
						Total Regular Salary	Uniform Allowance	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SANDERS, BOYCE O.	60	GS-09	M	0	7/1/75 - 5/7/76	15,605	125.00		15,730.00
SIMONSEN, ROLF W.	54	GS-07	M	0	7/1/75 - 9/30/76	17,404	156.25		17,560.25
TAGGART, THOMAS M.	43	GS-07	M	0	7/1/75 - 9/30/76	15,115	156.25	124.94	15,396.19
THORNTON, WARREN L.	47	WG-12	M	0	7/1/75 - 9/30/76	20,453	156.25	93.78	20,703.03
WILLIAMS, GEORGE L.	47	GS-11	M	3	7/1/75 - 9/30/76	23,670	156.25		23,826.25
WURTH, RICHARD L.	44	WG-10	M	2	7/1/75 - 9/30/76	18,892	156.25	27.93	19,076.18
1. TOTAL - STATION PERSONNEL						301,004	2,738.29	593.44	304,335.73

PART 2 - PERSONNEL DETAILED TO STATION

NAME OF EMPLOYEE	From Station	Period of Detail	COMPENSATION PAID			Total Compensation
			Regular Salary Costs	Per Diem and Expenses	Paid Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)
[illegible] DETAILED TO STATION						
TOTAL COMPENSATION PAID TO PERMANENT PERSONNEL ON DUTY AT STATION						30

Form 3-114
(Jan. 1964)

BOYCE O. SANDERS - Retirement effective 05/07/76

Standby Pay for FY-76:

James L. Billi.....	$4,623
Gene A. Forest.....	855
Merle S. Heathco.....	3,616
John R. Parvin.....	1,697
Boyce O. Sanders.....	3,484
George L. Williams.....	4,623
TOTAL.....	$18,898

Bureau of Sport Fisheries and Wildlife

FIVE YEAR PRODUCTION AND DISTRIBUTION SUMMARY

...h Hatchery Manual Section 4438p for Instructions)

PART 1 - PRODUCTION

YEAR	TOTAL POUNDS (All Species)	NUMBER of PONDFISH	PER TOTAL MAN YEARS		PER PRODUCTION MAN YEARS	
			Pounds (All Species)	Number (Pondfish)	Pounds (All Species)	Number (Pondfish)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1972	260,625		13,863		30,305	
1973	284,807		13,340		27,922	
1974	495,073		23,243		51,091	
1975	384,342		16,014		34,845	
1976	349,857		10,290		25,537	

PART 2 - COST ANALYSIS

YEAR	Percent Production Cost of Total	Percent Labor Cost of Total	Production Cost per Pound of Fish	Labor Cost per Pound of Fish	Food Cost per Pound of Fish	Food Conversion
	(2)	(3)	(4)	(5)	(6)	(7)
...72	57	47	1.05	.42	.32	2.73
1973	63	38	1.43	.48	.28	2.47
1974	64	38	.97	.29	.39	1.82
1975	60	38	1.23	.39	.42	1.88
1976	54	34	1.81	.59	.40	1.89

PART 3 - DISTRIBUTION

YEAR	TOTAL DISTRIBUTION		Number of Truck Trips	Miles Traveled in Fish Distribution	Average Miles per Trip	AVERAGE DISTRIBUTION PER TRIP		Average Cost per Trip	Dist. Cost per Pound of Fish
	Pounds	Number				Pounds	Number		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1972	278,933	3,035,149	73	3,602	49	1,509	28,172	109.79	.032
1973	338,635	20,544,274	80	4,847	61	1,910	61,722	653.15	.1543
1974	503,705	5,247,859	76	3,950	52	1,148	21,985	147.87	.022
...5	374,995	5,809,580	59	1,165	20	1,439	39,216	282.32	.044
1976	308,552	5,358,215	45	1,739	39	2,188	24,860	195.24	.028

Form 3-115
(Jan. 1964)

[illegible]

SENIOR

[illegible]

PUBLIC RELATIONS

(See Fish Hatchery Manual section 4438q for instructions)

TOTAL PUBLIC VISITORS[1/]: 30,000

A - INTERPRETATIVE PRESENTATIONS

TYPE OF GROUPS	ON HATCHERY		OFF HATCHERY	
	Number of Groups	Number in Group	Number of Groups	Number in Group
Sportsman Clubs				
Schools	32	1,950	3	125
Service Clubs			3	65
Professional-Scientific	7	85	5	40
Religious Groups	4	45		
Camp Groups	2	60		
Youth Groups	3	65		
State or Federal Government	4	37		
Other	1	13		
TOTALS	53	2,255	11	230

B - OTHER PUBLIC RELATIONS ACTIVITIES

TYPE OF ACTIVITY	NUMBER	TYPE OF ACTIVITY	NUMBER
Press Releases (field level)	14	Hatchery Exhibits	1
Number of newspapers (receiving releases)	many	Off Hatchery Exhibits	
TV Presentations		Estimate number of exhibit viewers	30,000
Radio Presentations	1	Other (Explain in remarks - i.e., open house, participation in local events, etc.)	

REMARKS

Form 3-172
(May 1965)

1/ will not agree with totals below