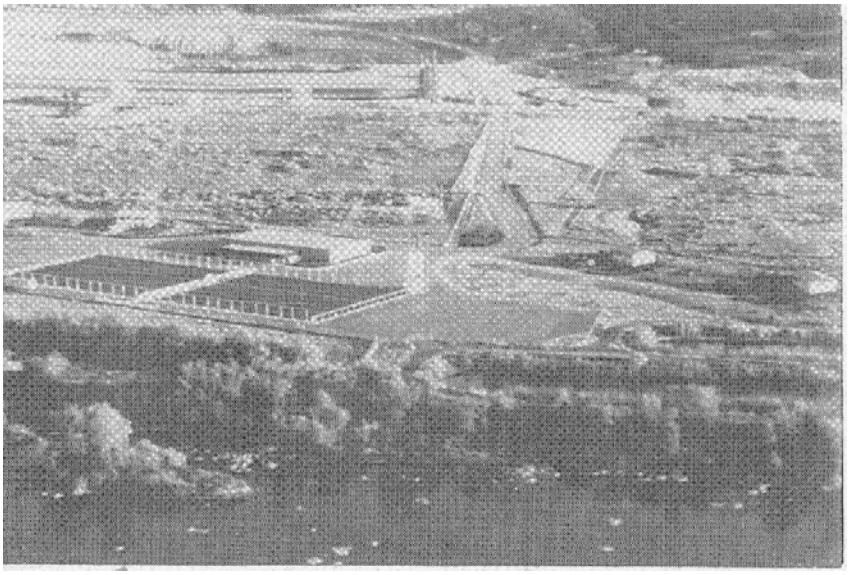
MAGIC VALLEY HATCHERY

1995 Brood Year Report



by

Bob Moore
Fish Hatchery Manager II

Dave May
Assistant Fish Hatchery Manager

Kent Hills
Fish Pathologists

Mark Olson
Fish Pathologists

IDFG 98-12
May 1998

TABLE OF CONTENTS

List of Tables and Figures

TABLE OF CONTENTS (Cont.)

ABSTRACT

The ninth year (May l, l995 to May 7, l996) of steelhead *Oncorhynchus mykiss* production at Magic Valley Hatchery was completed with a total of 1,868,085 "A" and "B" steelhead smolts stocked weighing 402,926 pounds. These fish were fed 453,662 pounds of feed for a conversion of 1.13 pounds of feed per pound of gain.

Three different stocks of steelhead were received as eyed eggs including: 803,000 "A" strain (Pahsimeroi stock) steelhead eggs yielding a total of 738,133 smolts. A total of 40,000 "B" strain eggs (East Fork Salmon River stock) were received and returned 33,890 smolts to the East Fork Salmon River. In addition 1,502,200 eggs (Dworshak, Clearwater "B" stock) were received, contributing a total of 1,096,062 smolts back to the Salmon River and its tributaries. Of these, the East Fork Salmon River received 456,484 Dworshak "B" smolts, 403,281 went to Hazard Creek on the Little Salmon River, and Slate Creek received 236,297 Dworshak fish. Further stocking information is located in Table 3.

Authors:

Bob Moore
Fish Hatchery Manager II

Dave May
Fish Hatchery Assistant Manager

Kent Hills
Fish Culturist

Mark Olson
Fish Culturist

INTRODUCTION

Magic Valley Hatchery is part of the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP), compensating for losses of steelhead caused by the Lower Snake River Dams. The hatchery, constructed by the Army Corps of Engineers, is administered and funded by the U.S. Fish and Wildlife Service (USFWS), and operated by the Idaho Department of Fish and Game (Department).

The hatchery is located in Twin Falls County, seven miles northwest of Filer in the Snake River Canyon. The hatchery uses a maximum 125 cubic feet per second of 59^{o}F water from Crystal Springs located on the north shore of the Snake River.

All smolts were transported by truck to the Salmon River and tributaries. The brood sources were Dworshak "B" stock, East Fork Salmon River "B" stock, and Pahsimeroi "A" stock.

Fish health was good this year. We had none of the problems with Furunculosis that occurred the previous year.

OBJECTIVES

1. To hatch and rear 1.78 million "A" and "B" strain steelhead smolts for stocking in the Salmon River and its tributaries to achieve the mitigation goal of 11,660 adult steelhead back to Idaho waters.

2. Provide smolts and consequently returning adults that could be utilized for harvest, broodstock supplementation, reintroduction, and research purposes.

3. Mark hatchery smolts prior to release to avoid mixed stock harvest and to maximize harvest and natural production management options.

FACILITIES

The hatchery building houses the incubation and early rearing room with 40 upwelling incubators (12 gallon). Each is capable of accommodating 50,000-75,000 eyed eggs. Two incubators are placed over each raceway. There are 20 concrete tanks (4 feet x 3 feet x 40 feet, 418 cubic feet of rearing space) with a capacity of 115,000-125,000 steelhead to 200 per pound size. The early rearing room also houses two fiberglass troughs (2 feet x 1 foot x 12 feet), and 60 automatic fry feeders. The building also contains an office, laboratory, wet laboratory, shop, dormitory, enclosed storage room, covered vehicle storage area, feed storage room, walk-in freezer, and mechanical room for water pumps, water chiller, and domestic water supply systems.

There are 32 outside rearing raceways (10 feet x 3 feet x 200 feet, with 6,153 cubic feet of rearing space). These raceways are divided in the middle by the headrace resulting in 16 "East" raceways and 16 "West" raceways. Each raceway has the capacity to raise 60,000-70,000 smolt size steelhead. The raceways may be further divided to result in a total of 64 individual rearing subunits. A moveable bridge equipped with 16 automatic Neilsen fish feeders spans the outdoor

raceways. Two 30,000 pound bulk feed bins equipped with fish feed fines shakers and a feed conveyor complete the outside feeding system.

There are two tailraces outside located on opposite ends of the facility. Each flows to the north where they join in a common pipe before entering the flow-through settling pond. The hatchery effluent water is treated by opening valves in the bottom of "quiescent zones" and sweeping wastes into a cleaning waste water pond (approximately 2.5 surface acres). A hatchery flow-through wastewater pond (about 1.5 surface acres in size) cleans the non-cleaning wastewater. All cleaning effluent must pass through both ponds.

The limiting factors in producing more smolts are space and water flows. Our production is about 20% less than for which the facility was designed. This is primarily due to production restrictions placed upon us by the National Marine Fisheries Service (NMFS) in an attempt to protect endangered salmon. Density and flow indices may exceed the maximum desired levels of .30 pounds of fish per cubic foot of rearing space per inch of fish length, and 1.25 pounds per gallon per minute per inch of fish length at the end of the rearing cycle. Water flows have not reached the 125 cubic feet per second (cfs) maximum water right in several years due at least in part to the drought. Decreases in numbers of fish requested from this facility have improved loading levels even with lower water flows.

WATER SUPPLY

The Magic Valley Hatchery water supply collection facility is located on the north wall of the Snake River canyon. It collects the 59^{o}F spring water from Crystal Springs in a covered concrete channel system, which consolidates the flow in a metal building. A 42-inch pipeline delivers the 125.47 cfs of water via gravity flow to a control tank that degasses and distributes the water to the outside raceways through a 42-inch pipeline which supplies the headrace and auxiliary supply waterlines. The auxiliary supply line allows us to add water between raceway sections to improve water quality in the lower sections and to clean upper quiescent zones without dewatering the bottom section. This line had apparently never been used until this year.

The hatchery building receives water through a 14-inch pipeline which branches off prior to going through the outside degassing tower. Water going to the hatchery building is degassed in packed columns above each individual raceway.

STAFFING

Magic Valley Hatchery is staffed with four permanent employees: Bob Moore, Fish Hatchery Manager II; Dave May, Assistant Hatchery Manager; Kent Hills, and Mark Olson both Fish Culturists. In addition we hire temporary Bio-aides or Laborers to assist with fish culture duties during peak production, smolt transportation, and adipose fin-clipping. Michael Reed was our Bio-aide again this year. There was no money for the Youth Conservation Corp (YCC) program in the Summer of 1995. Personnel from this hatchery continue to oversee adipose marking operations at the three-steelhead hatcheries located in southern Idaho.

FISH PRODUCTION

Egg shipments and early rearing

The hatchery received 1,502,200 "B" strain (Dworshak Stock) eyed eggs; 40,000 "B" strain eyed eggs (East Fork Salmon River Stock); and 803,000 "A" strain eyed eggs (Pahsimeroi Stock). All eggs were received in April, May, and June 1994. The survival of eyed eggs to smolts is found in Table 1.

All eggs received were treated with Argentyne at 100-ppm for ten minutes, enumerated by displacement, and put into the upwelling incubators (50,000-75,000 eggs per incubator, 15 gallons per minute). The eggs hatched within five days and emerged from the incubators into the hatchery tanks twelve days after hatching. Each of the 20 hatchery tanks (with a flow of 100-250 gallons per minute) averaged 120,000 feeding fry until they reached 300 per pound or almost two inches long. At that time fish were moved to the larger outside raceways. The highest mortality rate was during the hatching, swim-up, and early rearing stages. This year as is traditional survival was lower in the Dworshak stock of eggs and fish than in the Pahsimeroi and East Fork stocks.

All of the feeding fry were started on Biodiet soft-moist feed until moved from the hatchery building tanks to the larger outside raceways.

Final production rearing

Fish in the outdoor raceways were then fed Rangen 470 extruded salmon diet using Haskell's (1967) feeding rate formula. The feeding rate was calculated using a projected growth of .027 inches per day, starting with one-inch fish (swim-up fry) and ending with an 8.4-inch smolt.

The steelhead maintained an average .65 to .71 inch per month growth. The fish had a conversion of 1.13 lbs of feed to produce a pound of fish. All of the fish were growing faster than desired and were put on an intermittent schedule of five days on and five days off feed. When the East side was on the West was off and vice versa in hopes of decreasing our daily phosphorus discharge. We began this system the first of October through the middle of March at which time all fish were put on full ration. Our changes in feeding methods produced a considerable improvement in feed conversion, which in turn saved nearly $30,000 in feed costs. The switch to extruded feed probably accounted for most of this improvement. Our intermittent feed schedule may have made the fish more efficient in assimilating the feed. Also, dividing the raceways into 64 individual rearing units allowed us to more accurately deliver feed to the fish. In the past, feed was calculated for 16 rearing units. To do this one had to assume that the fish were evenly divided on both sides of the headrace, and between upper and lower sections. This assumption was often erroneous. See Table 2 for feed and total costs.

Piper's (1970) formulas for density and flow indices were used to calculate the densities and flows for each tank or raceway. The desired density index of .30 or 1.25 flow index was not reached until the end of March in some raceways. The final pond inventories and indices for the individual raceway numbers, densities, and flows are found in Table 4.

Maximum flows for the year were around 120 cfs from October through March. The majority of the time our flows were around 100-110 cfs. Each of the outside 32 raceways had about 3.4 cfs prior to distribution in April.

Steelhead smolt distribution began on April 8, 1996 and continued six days a week through 1996. An average of five trucks per day was used for the transportation of 402,926 pounds of fish and involved 95 truckloads (Table 3). This year we again hauled only 5,000 pounds per load to meet IHOT (Integrated Hatcheries Operation Team) recommendations. In addition, highway load limits to the East Fork Salmon River held us to only 3,000 pounds per truck. On those loads we only filled three of the five compartments. So density levels were the same as the 5,000 pound loads due to using less water on those trips.

LENGTH FREQUENCY DATA

The NMFS may require us to produce smolts within a very narrow size range (170mm to 220mm). Length frequency data taken from eleven raceways (Table 7.) showed 34.4% of smolts planted were unacceptable under this plan. Only 3.7% were smaller than 170 mm. The other 30.7% were 225 mm or larger. See Table 8 for combined length frequency graphs of all three stocks. This year feeding methods, etc. were modified to see if smolts of a desired size could be produced without major changes in hatchery operation. It did not appear to have a major effect. Last year the average was 33% outside the acceptable range. We probably could have done better but did not want to starve the fish during the month prior to release. It was felt that it would be better to be slightly over the target size than under to maximize migration success.

FISH HEALTH

No acute or chronic diseases or mortalities were encountered in these fish. No prophylactic treatments were used.

Organosomatic index assessments conducted on March 28,1996 (Table 5) revealed robust fish with plenty of stored energy. Fat index was 3.95, hematocrit levels were 51.2, and serum protein 5.46. No noteworthy maladies were detected at Magic Valley this year. Furunculosis, coldwater disease, whirling disease, and IPNV (Infectious Pancreatic Necrosis Virus) were not isolated this year during routine and preliberation inspections.

Future plans include fencing and netting to ensure total enclosure from birds. This has become more important due to the continuation of the commercial Hagerman aquaculture industry too completely net off their hatcheries.

FISH MARKING

Adipose Fin Clipping

All of the "A" and "B" strain hatchery steelhead are required to have an adipose fin clip identifying them from wild steelhead. At Magic Valley Hatchery the fin-clipping crews (admark

and coded-wire taggers) combined to mark 1,904,647 fish during August and September. Fin-clipping mortality was negligible. No treatment was necessary after handling.

Coded-wire Tagging

Three groups of steelhead were coded-wire tagged this 1995 brood year. There were 485,739 fish marked with the coded-wire tag and 482,351 were stocked. Very little loss was encountered from handling and no treatment was necessary. See Table 6 for details on which raceways were tagged with CWT's.

PIT Tagging

All three stocks of steelhead had a total of 2,410 PIT (Passively Induced Transponder) tags inserted in them. We only found five morts so 2,405 were released.

PHOSPHORUS STUDY

This year we did several 24-hour phosphorus profiles to try and determine the best way to manage our settling ponds for phosphorus removal. As a result of the Mid-Snake River Nutrient Management Plan, the Idaho Department of Health and Welfare's Division of Environmental Quality (DEQ) will be setting maximum phosphorus emissions for each hatchery in the area. A total maximum daily load (TMDL) will be established.

The information we obtained from our 24-hour samples are graphed in Table 9. The influent is the hatchery inflow and the effluent is the hatchery outflow. The primary influent is the cleaning waste going in to the primary treatment pond and the primary effluent is the treated effluent going in to the secondary treatment pond. The data shows a fairly significant drop in phosphorus levels. Unfortunately, they do not appear to be significant enough. What we learned in our study may help us determine how best to run our waste ponds. However, we will probably be given fairly specific operational guidelines in our next NPDES (National Pollution Discharge Elimination) permit. These will be included under what are called "best management practices."

LITERATURE CITED

Haskell, D.C. 1967. Calculations of amounts to feed trout in hatcheries. Progressive Fish Culturist 19 (4) : 194 pp.

Piper, R.G. 1970a. Know the proper carrying capacities of your farm. American Fishes and U.S. Trout News 15(1) : 4 pp.

Sharpnack, R. 1996. Personal communication.

Table 1. Brood Year 1995 Steelhead Survival Rates

Eyed Egg Number	Percent Hatched	500/Pound Number	Percent Survival	Released Smolts-Fry	Percent Survival
Pahsimeroi 'A'					
803,000	98.0%	770,880	96.0%	738,133	91.9%
Dworshak (Clearwater) 'B'					
1,502,200	93.0%	1,276,927	85.0%	1,096,0627	2.9%
East Fork Salmon 'B'					
40,000	97.0%	38,352	95.8%	33,890	84.7%
2,345,200	94.8%	2,086,159	88.9%	1,868,085	79.7%

Table 2. Feed Cost and Utilization

Number of fish	1,868,085
Pounds of fish	402,114
Feed cost	$146,323.00
Pounds of feed	453,662
Conversion	1.13
Total cost	$488,327
Cost per 1000 fish	$261.42
Cost per pound fish	$1.21

Table 3. Steelhead Smolt Distribution in the Salmon River and Tributaries

Species	Numbers	Pounds	No./Lb	Receiving Waters	Dates Released
Dworshak "B"	456,484	98,597	4.4	East Fork	4/12; 4/24-5/4/96
East Fork "B"	33,890	7,702	5.0	East Fork	4/24
Dworshak "B"	236,297	54,200	4.4	Slate Creek	4/26-5/2/96
Dworshak "B"	403,281	85,642	4.5	Hazard Creek	4/8-12/96
Pahsimeroi "A"	201,212	44,590	4.1	Salmon R @ Lemhi	4/15-24/96
Pahsimeroi "A"	201,968	41,720	4.4	Salmon R @ McNabb Pt	4/15-17/96
Pahsimeroi "A"	127,708	28,825	4.2	Salmon R @ North Fork	4/15-16/96
Pahsimeroi "A"	207,245	41,700	4.9	Salmon R @ Bruno	4/17-19/96

Table 4. Final Raceway Inventory and Indices for Magic Valley Hatchery "A" and "B" Strain Steelhead Trout for 1994 Brood Year.

Raceway	Strain	Number	Weight	No/lb	Flow Index	Density Index
E1	B	55,168	11,259	4.9	0.92	0.26
E2	B	44,866	9,970	4.5	0.79	0.23
E3	B	51,405	11,175	4.6	0.89	0.26
E4	B	52,080	12,400	4.2	0.97	0.27
E5	B	48,653	12,475	3.9	0.95	0.27
E6	B	51,637	11,475	4.5	0.92	0.26
E7	B	57,640	13,100	4.4	1.03	0.29
E8	B	54,560	12,400	4.4	0.98	0.28
E9	B	64,190	13,100	4.9	1.07	0.30
E10	B	59,925	12,750	4.7	1.03	0.29
E11	B	62,920	14,300	4.4	1.12	0.32
E12	A	57,868	12,580	4.6	1.01	0.29
E13	A	55,264	12,560	4.4	0.99	0.28
E14	A	63,580	14,450	4.4	1.14	0.32
E15	A	77,740	14,950	5.2	1.25	0.36
E16	A	63,000	12,600	5.0	1.04	0.29
W1	B	46,985	10,441	4.5	0.83	0.24
W2	B	64,527	13,450	4.8	1.09	0.31
W3	B	57,960	12,700	4.6	1.02	0.29
W4	B	69,120	12,750	5.4	1.08	0.31
W5	B	58,538	12,200	4.6	0.99	0.28
W6	B	55,852	12,141	4.6	0.98	0.28
W7	B	55,845	11,881	4.7	0.96	0.27
W8	B	59,820	11,964	5.0	0.97	0.28
W9	B	58,261	14,210	4.1	1.10	0.31
W10	A	56,570	11,545	4.9	0.95	0.27
W11	A	56,373	13,110	4.3	1.04	0.29
W12	A	63,765	14,170	4.5	1.13	0.32
W13	A	56,203	11,470	4.9	0.94	0.27
W14	A	63,455	12,950	4.9	1.06	0.30
W15	A	59,690	12,700	4.7	1.03	0.29
W16	A	64,625	13,750	4.7	1.11	0.32
Total "A"s		738,133	156,835	4.7	0.98	0.28
Total "B"s		1,129,952	246,141	4.6	1.06	0.30
Grand Totals		1,868,085	402,976	4.6	1.01	0.29

Table 5. Organosomatic Index Expressed in Percent of Normals

Gills	Pseudo-branch	Thymus	Eyes	Mes. Fat	Spleen	Hind Gut	Kidney	Liver
100	100	100	100	100	100	100	100	100

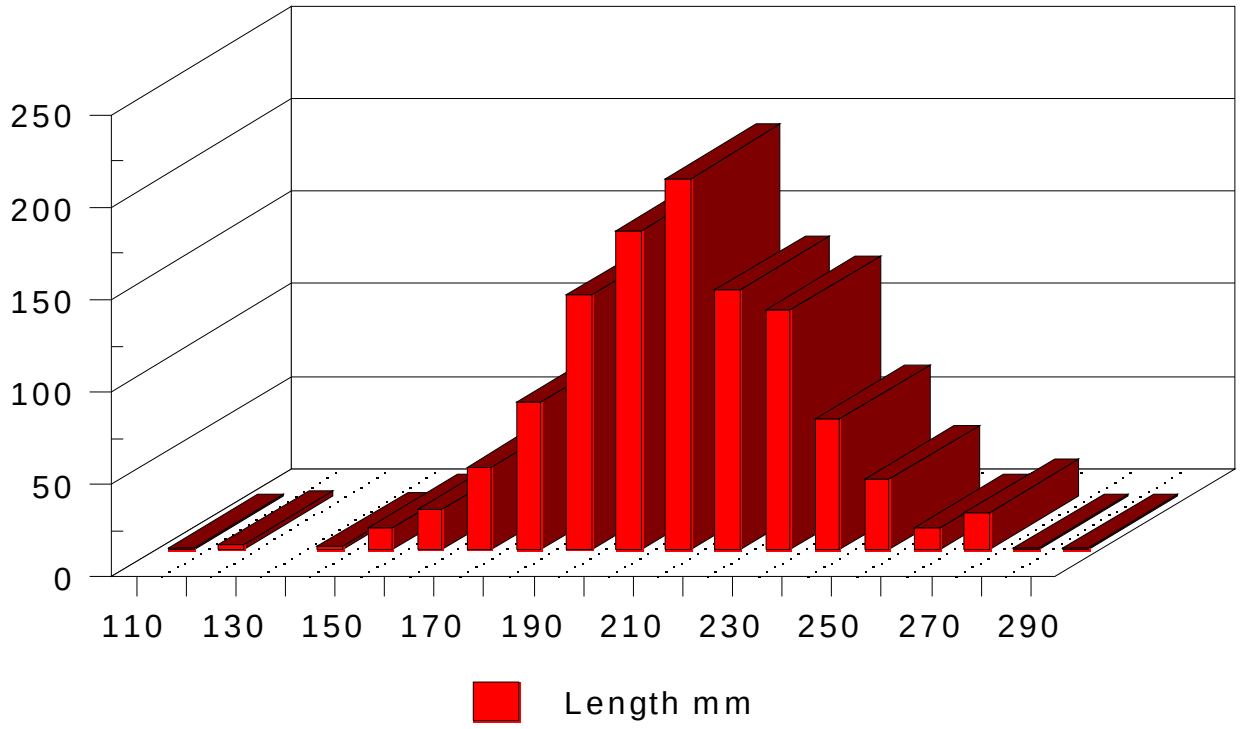
Table 6. Brood Year 1995 Coded-wire Releases

CWT Code	Stock	Number Tagged	Number Stocked	Pit Tag	Site and Purpose
10-35-07	Dwor B	63,878	63,603	306	Slate Cr.,contrib. Contrib. Cr. contribution
10-35-08	Dwor B	65,402	64,962	300	E FK Salmon, contrib.
10-35-09	Dwor B	64,558	64,152	304	Little Salmon,@ Hazard Cr.contr.
10-35-10	Pah A	64,346	63,561	300	N Fk Salmon, contrib.
10-35-11	Pah A	64,186	63,478	300	Salmon R @McNabb, contr.
10-35-12	Pah A	64,266	63,893	300	Lemhi R, contribution
10-35-13	Pah A	64,963	64,830	300	Salmon @ Bruno, distrib.
10-46-13	E Fk B	11,228	11,140	300	E Fk Salmon, contrib.
10-47-09	E Fk B	22,912	22,732		E Fk Salmon, contrib.
Subtotals	Dwor B	193,838			
	Pah A	257,761			
	E Fk B	34,140			
Totals		485,739	482,351	2,410	

Table 7. Length Frequency Analysis Brood Year 95.

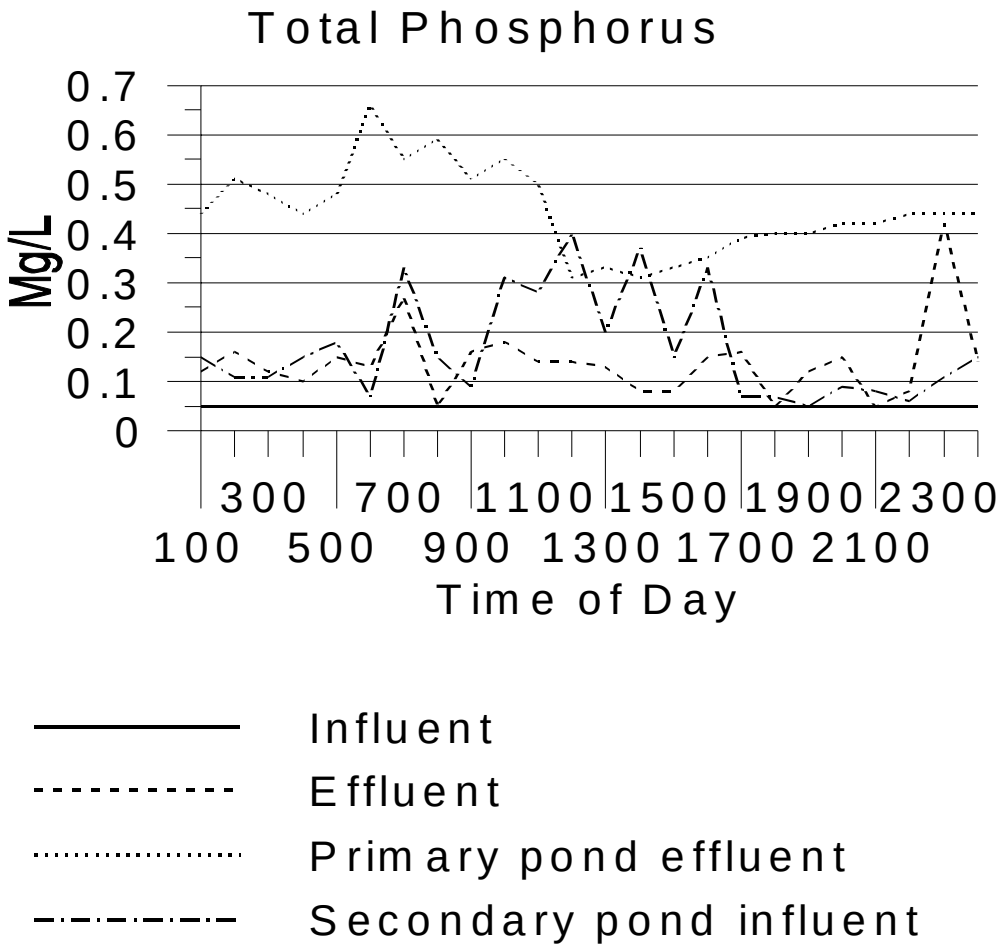
Pond	Size fish/lb	Total release	Percent <175mm	Percent >225mm	Percent outside desired range	Percent within desired range	Number outside range	Number within desired range
Pahsimeroi A's								
12W	5.05	63,765	11%	17%	28%	72%	17,854	45,911
14E	4.13	63,580	1%	29%	30%	70%	19,074	44,506
14W	4.84	63.455	1%	21%	22%	88%	13,960	55,840
16W	5.31	64,625	5%	11%	16%	84%	10,340	54,285
Avg	4.83		5%	20%	25%	75%		
Subtotal		738,133					184,533	553,600
Dworshak B's								
10E	4.44	59,925	4%	28%	32%	68%	19,176	40,749
3E	4.83	51,405	4%	19%	23%	77%	11,823	39,582
4E	4.50	52,080	1%	25%	26%	74%	13,541	38,539
5E	4.09	48,653	0%	50%	50%	50%	24,327	24,327
7W	4.72	55,845	2%	23%	25%	75%	13,961	41,884
8E	3.96	54,560	1%	42%	43%	57%	23,461	31,099
Avg	4.54		2%	31%	33%	67%		
Subtotal		1,096,062					361,700	734,362
East Fork B's								
11E	4.16	33,890	3%	37%	40%	60%	13,556	20,334
Grand Total		1,868,085			30%	70%	559,789	1,308,296

Table 8. Brood Year 1995 Length Frequency.



Minimum: 110 mm Maximum: 290 mm Mean: 211 mm
Standard Deviation: 24.5 Coefficient of Variance: 11.6

Table 9. Phosphorus Discharge Profile over 24 Hour Period.



Primary pond flows averaged 20-40 gallons/ minute while the hatchery influent flows were around 45,000-gallons/minute.

Submitted by:

Bob Moore
Fish Hatchery Manager II

Dave May
Assistant Fish Hatchery Manager

Kent Hills
Fish Pathologist

Mark Olson
Fish Pathologist

Approved by:

Virgil K. Moore, Chief
Bureau of Fisheries

Tom Rogers
Fish Hatcheries Supervisor