



**SAWTOOTH FISH HATCHERY
and
EAST FORK SATELLITE**

**1997 Spring Chinook Brood Year Report
1998 Steelhead Brood Year Report**



By

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TABLE OF CONTENTS

	<u>Page</u>
1997 SPRING CHINOOK SALMON	1
ABSTRACT	1
INTRODUCTION	2
Funding Source	2
Location	2
Species Reared.....	2
Broodstock History	2
OBJECTIVES.....	3
Mitigation Goals	3
Idaho Department of Fish and Game Objectives	3
FACILITY DESCRIPTION.....	3
Hatchery Description.....	3
Production Capabilities	4
RECOMMENDATIONS.....	4
WATER SUPPLY	4
Source.....	4
Quantity and Temperature	5
Water Quality	5
STAFFING	5
FISH HEALTH.....	5
Diseases Encountered and Treatment.....	5
FISH PRODUCTION.....	6
Spring Chinook Adult Collection	6
Adult Treatments.....	6
Prespawning Mortality.....	7
Spawning Operations.....	7
Incubation	7
Early Rearing	8
Final Rearing.....	8
Fish Marking	9

TABLE OF CONTENTS (CONT)

	<u>Page</u>
Fish Distribution	9
PAHSIMEROI CHINOOK.....	9
NEZ PERCE SALMON PROGRAM.....	10
SOCKEYE SALMON	10
1998 STEELHEAD.....	12
ABSTRACT	12
FISH PRODUCTION.....	14
Steelhead Adult Collection	14
Adult Treatments.....	14
Prespawning Mortality.....	15
Spawning Operations.....	15
Incubation.....	15
Release Acclimation of BY 97	16
Fish Marking.....	16
CONCLUSIONS/RECOMMENDATIONS	16
East Fork Trap	16
Sawtooth Fish Hatchery.....	16
Appendices	17

LIST OF APPENDICES

Appendix A. Sawtooth Fish Hatchery Chinook Smolt Releases and Returns (Marked and UnMarked)	18
Appendix A.1 Sawtooth Fish Hatchery Chinook Smolt Releases and Hatchery Returns (Marked)	19
Appendix B. Sawtooth Fish Hatchery Water Quality Analysis of the Salmon River	20
Appendix C. Sawtooth Fish Hatchery Results of Disease Sampling	21
Appendix D. Sawtooth Fish Hatchery Spring Chinook Run Timing.	22

TABLE OF CONTENTS (CONT)

	<u>Page</u>
Appendix E. Sawtooth Fish Hatchery Age-Class Totals from Trapped Chinook, Return Year 1997	22
Appendix E.1. Sawtooth Fish Hatchery Spring Chinook Salmon Length Frequency Distribution for 1997	23
Appendix F. Age-Class Breakdown of Released Chinook, Return Year 1997	24
Appendix G. Sawtooth Fish Hatchery Age Class Breakdown by CWT Recoveries, 1997	24
Appendix H. Breakdown by Fork Length (cm), for spring chinook at the East Fork Trap, 1997. (All Released)	24
Appendix I. Sawtooth Fish Hatchery Spawning Matrix 1997 Return Year	25
Appendix J. Survival Table for Chinook (BY97) and Steelhead (BY98) From Green Eggs to Released Smolts	26
Appendix J.1. Feed Schedule for Sawtooth/Pahsimeroi Chinook, BY97	26
Appendix K. Rearing Water Temperatures, BY97 Spring Chinook at Sawtooth Fish Hatchery	27
Appendix L. Summary of Marked Chinook Released, Return Year 1997	28
Appendix M. Summary of Sawtooth Fish Hatchery Spring Chinook Smolt Releases, Return Year 1997	28
Appendix N. Sawtooth Fish Hatchery Summary of Smolt Releases and Marks	29
Appendix N.1. Sawtooth Fish Hatchery Production Cost Table Including Chinook (BY97) and Steelhead (BY98)	30
Appendix N.2. Cost Table for BY97 Chinook Eggs from McCall (South Fork) and Rapid River Fish Hatcheries	30
Appendix N.3. Cost Table for Nez Perce Tribe Program at Sawtooth Fish Hatchery, 1997	31
Appendix O. Run Timing Graphs for 1998 Steelhead Trapped at Sawtooth and East Fork	32
Appendix P. Steelhead Returns by Year Class and Sex, Return Year 1998	33
Appendix P.1. Lengths of Released Steelhead, Return Year 1998, from Sawtooth Fish Hatchery and East Fork Traps	34

TABLE OF CONTENTS (CONT)

	<u>Page</u>
Appendix Q. Sawtooth Fish Hatchery Steelhead Length Frequency Distribution, Return Year 1998	35
Appendix R. East Fork Steelhead Length Frequency Distribution, Return Year 1998	36
Appendix S. Slate Creek Steelhead Length Frequency Distribution, Return Year 1998.....	37
Appendix T. Released Steelhead by Year Class and Sex, Return Year 1998	38
Appendix U. Sawtooth Fish Hatchery Criteria for Aging Steelhead Adults	38

1997 SPRING CHINOOK SALMON

ABSTRACT

The Sawtooth Fish Hatchery (SFH) trap and weir were put into operation on June 16, 1997 but was not fully functional until July 7, 1997 and operated through September 4, 1997. A total of 254 spring chinook salmon *Oncorhynchus tshawytscha* (144 males, 101 females, and 9 jacks) were trapped. Released above the weir were 112 fish, (60 unmarked and 4 marked males, 40 unmarked and 3 marked females, and 5 unmarked and 0 marked jacks) to spawn naturally. There were 4 prespawning mortalities.

Spawning began on August 7, 1997 and continued through September 8, 1997 with nine spawning days. We spawned 53 females, 63 males, and one jack that produced 260,840 green eggs (4,915 eggs per female), which yielded 231,827 eyed eggs for an eye-up rate of 89%. From these eyed eggs, 228,997 fry were ponded which resulted in a smolt release of 223,240 smolts.

The East Fork Satellite fish trap and velocity barrier were put into operation on July 8, 1997 and continued operating through September 8, 1997. A total of 7 spring chinook salmon (5 unmarked males, one marked female, and one unmarked female) were trapped. All seven fish were released above the weir to spawn naturally. No pre-release mortality occurred.

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INTRODUCTION

Funding Source

Sawtooth Fish Hatchery(SFH) is part of the Lower Snake River Compensation Plan (LSRCP) and has been in operation since 1985. The hatchery and satellite facility were built by the U.S. Army Corp of Engineers (USACE) and is funded through the U.S. Fish & Wildlife Service (USFWS).

Location

SFH is located five miles south of Stanley, Idaho. The facility's 71 acres border the Salmon River to the west, Highway 75 to the east and U.S. Forest Service ground to the south and north. The SFH weir is approximately 400 miles from Lower Granite Dam and 950 miles from the mouth of the Columbia River. Chinook salmon *Oncorhynchus tshawytscha* are released directly into the river at the hatchery and above the hatchery in the headwaters of the Salmon. The SFH steelhead are released at the hatchery, along the lower Salmon and various other drainages around the state.

The SFH has operated a satellite facility on the East Fork of the Salmon River since 1984. The facility is situated eighteen miles upstream on the East Fork Salmon River. The mouth of the East Fork Salmon River is located 42 miles downriver from SFH. The property was purchased from the Bureau of Land (BLM) and is surrounded by private land. An access road easement was purchased from a private landowner who has property surrounding the location. The east side of the property borders the East Fork of the Salmon River. Historically, all East Fork fish have been returned to the East Fork River.

Species Reared

SFH is involved in trapping, spawning, and rearing spring chinook salmon to the smolt stage for release. A-run steelhead trout are also trapped and spawned. The steelhead eggs are incubated to eye-up then transferred to other hatcheries for rearing.

The East Fork facility handles spring chinook salmon as well as B-run steelhead trout. The green eggs from fish spawned at the East Fork station are transferred to SFH for incubating. The chinook are reared at SFH with the steelhead being transferred as eyed eggs to other hatcheries for rearing.

Broodstock History

Historically, all of the SFH and the East Fork trap broodstock have come from the upper Salmon River and the East Fork River respectively. There was some introduction of Rapid River stock at the SFH site and in the headwaters of the Salmon River in the late 1970s and early 1980s as fry and smolt plants.

At both facilities, returning adult fish are released to spawn naturally. Numbers of fish released depends on marked and unmarked fish returns. The National Marine Fisheries Service (NMFS) under permits #919 and #920 prescribes fish handling for chinook salmon. All unmarked steelhead are released along with enough marked hatchery fish to ensure pairing of adults. At the East Fork, all salmon are released until a total of twenty pairs have been passed above the weir. All unmarked steelhead are released along with enough marked hatchery fish to ensure equal adult pairings. An historical synopsis of releases and returns is shown in Appendix A and Appendix A.1.

OBJECTIVES

Mitigation Goals

As part of the Lower Snake River Compensation Plan, SFH's mitigation goals are expressed in adult returns 19,000 adult salmon over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

Idaho Department of Fish and Game (Department) objectives are:

1. To produce 2.4 million smolts for release, of which up to one million of the East Fork-origin smolts will be returned to the East Fork of the Salmon River.
2. Produce quality fish for supplementation programs.
3. Implement research programs at the hatchery to improve returns to the hatchery.

FACILITY DESCRIPTION

Hatchery Description

The hatchery's main building is 134 ft by 166 ft and consists of an office, meeting room, lab, visitor/interpretive center, wood shop, welding/fabrication shop, intake collection box/chemical room, shop office, incubation and early rearing room, one inside storage room and two outside covered storage areas, generator room, furnace room and a feed freezer/chemical equipment room. The hatchery has four pump houses (each is 14 ft x 11 ft). One is for domestic water and three are production wells. An intake building (15 ft x 37 ft) is located one-half mile upstream from the hatchery and Salmon River water is collected for outside production rearing. The adult fish holding and spawning facility is located 300 yards north of the hatchery building. It includes an enclosed spawning shed (35 ft x 52 ft) and three adult holding ponds. Adjacent to the adult facility is the temporary employee dormitory (38 ft x 72 ft) which has three bedrooms with bath; attached public restroom; storage and laundry room; living and dining areas and an open kitchen. There are five resident houses at SFH, all about 1,360 square ft each with attached single car garages and separate woodsheds.

The East Fork has a roof structure over a 28-ft travel trailer that is used as a residence while the trap is in operation. The other building is a combination shop, storage and spawning shed (22 ft x 44 ft).

Production Capabilities

Production capacities at the East Fork trap consists of two 68-ft x 10-ft x 4.5-ft adult holding ponds (3,060 cubic ft) and a 10-ft x 17-ft fish trap. No fish are reared at this facility. All green eggs are shipped to SFH.

Production capacities for SFH include 100 stacks of Flex-a-lite Consolidated Inc. (FAL) incubators containing 800 trays with the potential to incubate five million chinook eggs or seven million steelhead eggs. Inside rearing consists of sixteen semi-square tanks with an individual volume of 17 cubic feet (cf) and a capacity of 15,000 swim up fry each, 14 inside rearing tanks with an individual volume of 50 cf and a capacity for 30,000 fry each, and 12 inside rearing vats with an individual volume of 391 cf and a capacity for 100,000 fry each. Outside rearing consists of 12 fry raceways each with 750 cf of rearing space and 28 production raceways each with 2,700 cf of rearing space. Each production raceway has a capacity to raise 100,000 chinook to smolt stage for a total capacity of 2.8 million fish. These production raceways are serial reuse that flow from an upper raceway to a lower one.

The adult facility has three concrete adult fish holding ponds with 4,500 cf of holding area. Each pond can hold approximately 1,300 adults.

RECOMMENDATIONS

Recommendations for SFH include developing additional wells for disease-free rearing water, modifying the river water intake to reduce winter icing problems, repairing gabions at the weir and intake, covering raceway tail-race openings with grating for added safety, installing fence around outside raceways for predator control, and seal coating hatchery roadways.

East Fork recommendations include developing separate holding ponds for smolt acclimation, modifying the intake screen to exclude fish fry, modifying the velocity barrier to prevent injury to migrating fish, and develop a removal system for debris that accumulates on the weir.

WATER SUPPLY

Source

SFH receives fish culture water from the Salmon River and two production wells. Rearing water from the river enters an intake structure located one-half mile upstream from the hatchery building, and flows through a 54-inch pipe to a control box located in the hatchery building for final screening. This water is then distributed to the indoor vats, outside raceways or adult fish facility. Incubation and early-rearing water is provided by two production wells. Excess well water is spilled into the control box for use in the outside raceways. A third well provides tempering water introduced at the river intake to reduce winter icing problems.

The East Fork trapping site receives water from the East Fork of the Salmon River via gravity-flow piping throughout the holding ponds. A well provides domestic water, and pathogen free water, for spawning and egg water-hardening. No fish are reared at the East Fork trap.

Quantity and Temperature

The SFH wells provide 3.1 cfs of pumped water and temperatures range from 39° F (4° C) in the winter to 52° F (11° C) in the summer. The Salmon River provides up to 55 cfs of gravity-flow water and ranges in temperature from 32° F (0° C) in the winter to 68° F (20° C) in the summer.

Water Quality

The most recent water quality analysis from the SFH collection box at the river was completed in September 1996. Results include: hardness at 80 mg/L; total alkalinity as CaCO₃ at 79; bicarbonate alkalinity as CaCO₃ at 79; sp.conductance at 167 (umhos/cm); total ammonia as N at 0.027 (mg/L); total NO₂ + NO₃ as N at 0.006; total Kjeldahl N as N at 0.20 (mg/L); total phosphorus as P at <0.05 (mg/L); and pH at 8.04. The most noticeable variances from the 1993 tests were; hardness, which was 68 mg/L in 1993 to 80 mg/L in 1996 and Kjeldahl N as N, which was <0.05 mg/L in 1993 to 0.20 mg/L in 1996. A new sample will be taken in September 1999. Additional information is shown in Appendix B.

STAFFING

Five permanent personnel are stationed at SFH: a Hatchery Manager II; an Assistant Hatchery Manager; a Utility Craftsman; and two Fish Culturists.

The temporary employee staffing includes; 8 months of Fishery Technician time, 42 months of Biological Aide time, and 27 months of Laborer time.

FISH HEALTH

Diseases Encountered and Treatment

No major disease outbreaks were encountered with any of the BY97 spring chinook salmon raised at SFH. Erythromycin was used as a prophylactic treatment as provided by Investigational New Animal Drug (INAD) #4333 for control of *Renibacterium*. All fish were given two separate prophylactic, 28-day erythromycin feed treatments. Whirling disease, caused by *Myxobolus cerebralis*, was found via digest methods, once the fish were moved onto river water and an appropriate amount of time was allowed for the parasite to move through the host. Acute losses were not experienced in any production fish at SFH. *Pseudomonas spp.* caused chronic mortalities at rates that warranted antibiotic treatment with OTC treated feed for ten days in February and July. The fish were also treated with formalin for ten days in August for environmental gill disease (Appendix C).

Both facilities have been relatively disease-free, although SFH and East Fork chinook have had incidences of Bacterial Kidney Disease (BKD) in the past. A BKD segregation program was implemented in 1989, with apparent success in limiting mortalities to high BKD raceways (91-153 & 91-154). In times of either warmwater temperatures or fish handling, some fish will show typical signs of this disease. The focus of the fish health program at SFH is to control BKD. This segregation starts at the eye-up stage and continues until the fish are released. Whirling disease exposure is reduced by keeping the fry on pathogen free well water for as long as possible before moving them outside on raw river water.

Several programs have been implemented at SFH to help raise a better quality smolt. Outside raceway baffles were tested with two raceways and shade-cover was installed on all the outside raceways. Baffles are used on all inside rearing vats, and light is controlled to mimic outside photoperiod. SFH has taken on the role of conservation hatchery. Stocks are so depressed that optimal rearing conditions are needed to reduce risk and provide every opportunity for survival. Fish health needs for SFH include increasing pathogen-free well water capacity and small rearing unit capability. This will provide the flexibility of providing well water to outside raceways, and to increase small family rearing ability. Both will limit horizontal infection of serious etiologic agents such as *Myxobolus* and *Renibacterium*.

FISH PRODUCTION

Spring Chinook Adult Collection

The SFH chinook-trapping season began on June 16, 1997, and continued through September 4, 1997. The peak of the run occurred July 20, 1997 (Appendix D). A total of 254 spring chinook salmon were trapped including 144 males, 101 females, and 9 jacks (Appendix E, Appendix E.1). Released above the weir were 112 salmon (including 60 unmarked and 4 marked males, 40 unmarked and 3 marked females, and 5 unmarked and 0 marked jacks) (Appendix F). There were no CWT fish recoveries (Appendix G). There was one PIT tagged adult chinook trapped. It was a 71 cm marked male (tag # 225A460F73). The SFH had a ratio of 60% male to 40% female.

The East Fork trap was in operation from July 8, 1997 through September 8, 1997. The peak of the run occurred September 8, 1997. A total of seven spring chinook salmon were trapped including 5 unmarked males, one marked female, and one unmarked female (Appendix H). All fish trapped were released above the weir to spawn naturally. The East Fork had a ratio of 71% male to 29% female. No CWT fish were recovered.

A total of 10 three-year old, 148 four-year old and 96 five-year old fish returned to SFH. The East Fork had seven four-year old fish return.

Adult Treatments

The SFH and East Fork adult chinook were injected with erythromycin phosphate at a rate of 20 mg active per kg. body weight. Injections were given posterior to the pelvic fins in the peritoneal cavity. The SFH ponded adults were treated three times per week in a one-hour 170 ppm formalin drip treatment. No adults were ponded at the East Fork.

Prespawning Mortality

The SFH had four female pre-spawning mortalities of ponded fish. The East Fork had no pre-release mortality.

Spawning Operations

Spawning activities at SFH began August 7 and concluded September 8, 1997. The nine egg takes during this period yielded 260,480 green eggs from 53 females for an average fecundity of 4,915 eggs per female. There were 63 male and one jack salmon used for fertilization. Each female's eggs were separated into four groups. Each group was fertilized by sperm from one male (Appendix I). The four groups were then recombined and water hardened for one hour in a 100 ppm titrate-able iodine solution. The eggs were then put into FAL incubator trays, with one female per tray for BKD segregation.

All adults trapped at the East Fork Facility were released. No spawning occurred.

Incubation

Each eight-tray FAL stack had flows set at 5 gpm of well water. Eggs were put away at one female per tray for BKD segregation. This averaged 4,915 eggs per tray. All incubated green eggs were treated with a 1,667 ppm formalin bath for 15 minutes starting three days after fertilization at five times per week for fungal control.

Well temperatures ranged from 50° F to 43° F during the incubation period. The eggs eyed-up at 500 Fahrenheit thermal units (FTU). At eye-up the eggs were shocked by dropping them from one container to another. They were then picked and enumerated by hand count. The eggs are shocked at 530 FTU and hatch at 1,300 FTU.

During the 1997 chinook incubating season, SFH managed five stocks of eyed eggs. These eggs came from chinook salmon from Rapid River/Lookingglass, Rapid River Fish Hatchery, McCall Fish Hatchery, Pahsimeroi Fish Hatchery, and SFH. These eyed eggs were either distributed to other locations for continued incubation or remained at SFH for rearing.

The chinook salmon eggs remaining at SFH for rearing included the Sawtooth and Pahsimeroi stocks. The 231,827 eyed eggs of SFH stock included reserve and supplementation groups as well as low and high ELISA BKD groups. The 107,700 eyed eggs of Pahsimeroi stock were designated low ELISA BKD.

In addition to the BY97 SFH eggs, other eggs were incubated at the SFH and were sent out as eyed eggs. Two shipments of green eggs were received from spawning activity at McCall Hatchery, South Fork Salmon River trapping station. The first group of eggs arrived on August 29 and the second group on September 2, 1997. There were four females' eggs in each group that were culled because of high ELISA values. Percent eye up for these eggs was not obtained. Chinook salmon eggs were also distributed to other locations for continued incubation. These included the Rapid River/Lookingglass, Rapid River, and South Fork Salmon River stocks. A total of 57,830 eyed eggs of Rapid River Fish Hatchery stock were shipped to Clearwater Fish Hatchery. McCall Fish Hatchery received 25,781 supplementation eyed eggs

from South Fork stock. The Shoshone-Bannock egg box program received 91,980 reserve group eyed eggs and 158,156 supplementation eyed eggs of South Fork stock. The Nez Perce Tribe received 25,865 eyed eggs and unfertilized eggs from 115 females of Rapid River/Lookingglass stock. (Detailed egg information and distribution can be found in Appendices N.1, N.2, N.3).

The SFH green eggs eyed up at a 89% rate, yielding 231,827 eyed eggs (Appendix J).

Early Rearing

The SFH stock swim-up fry were transferred from the FAL trays to semi-square tanks measuring 42-inches x 42-inches x 17-inches which were plumbed into existing vat well water supply. The swim-up fry were kept at a high density during feed training (1.2 lb/cf) until all the fish were on feed. After all the fish were eating well, they were combined and transferred to an inside vat. The vat contained PVC baffles every four feet. Starting flows for the swim-up fry were set at 3 gpm in each semi square tank and then 20 gpm per vat. As the fish grew, the flows were increased to a maximum of 110 gpm. Early rearing well water varied in temperature from 46° F to 40° F (Appendix K).

All fry were started on Bio-Oregon BioDiet Starter #2 and #3, and initially fed by hand. Feed amounts and sizes varied according to manufacturer recommendations as the fish grew. Automatic belt feeders were used once the fry exhibited a good feed response. All fish were fed a 28-day prophylactic treatment of erythromycin medicated feed during May, at a rate of 4.5 grams active/100 lbs. of fish. The fish were transferred outside for final rearing in June and July 1998.

Final Rearing

The SFH spring chinook were placed into the upper sections of six large raceways. Initial densities were 0.03 lbs/cf and water flows were 660 gpm. Three raceways were set up as NATURES Raceways for a natural rearing experiment. The raceways contained camouflage netting to simulate under-cut banks, bottoms painted with six colors to simulate the natural stream bottoms, and suspended trees used to simulate cover. Scientific research done in the past indicates that hatchery smolts may perform better if exposed to some type of natural rearing.

All outside fish were fed Bioproducts grower feed. A second 28-day prophylactic erythromycin medicated feed treatment was fed after the fish were moved outside. It was administered at a rate of 4.5 grams active per 100 pounds of fish, to prevent the onset of BKD. In late October 1998, all outside fish were administered a three-day formalin drip treatment at 170ppm per hour for a myotic outbreak.

The finish weight of the BY97 SFH chinook smolts was 10,006 pounds. The fish were fed 11,984 pounds of feed for a conversion rate of 1.2. A synopsis of feeding regimes can be found in Appendix J.1.

Fish Marking

Fish marking occurred May 19, 20, and 21, 1998. A total of 119,442 reserve SFH stock fish were marked with an ad-clip. The fish marking crew returned September 14-18, 1998 and CWT-tagged all 225,268 BY97 SFH chinook. In addition, 3,000 fish were Passive Integrated Transponder (PIT)-tagged in March. The PIT tags were used to evaluate downriver migration (Appendix L, Appendix M).

Fish Distribution

Fish release for SFH stock BY97 smolts occurred on April 21, 1998. A total of 223,240 smolts were released into the Salmon River at the SFH weir (Appendix N). The fish were released in the evening through the outside raceway tailrace pipe. Production costs for BY 97 smolts can be found in Appendix N.1.

PAHSIMEROI CHINOOK

The SFH reared a portion of Pahsimeroi Hatchery's summer chinook due to a lack of space and pathogen free water at Pahsimeroi. Seven lots of fertilized eggs were brought to SFH between September 23, 1997 and October 14, 1997. A total of 107,707 eggs were incubated. After dead egg pick off, the number at ponding was 105, 042 for a 97.5% survival from green eggs to ponding. Lot #1 was ponded on December 17, 1997 and the last lot ponded on January 20, 1998.

All fish fed and grew as expected during the winter and early spring time period. On April 29 and 30, 1998, Pahsimeroi Hatchery delivered and additional 33,155 fish that were 65 fpp to SFH. These fish were put into the "A" section of a large raceway fed by river water.

On May 14, 1998, the entire Pahsimeroi group being reared on well water was moved outside into a large raceway and placed on river water. The fish averaged 150 fpp and 2.8 inches in length. They were moved because they were about to exceed density index of 0.3 and the lack of available water for steelhead egg incubation.

A slight increase in mortality resulted in all Pahsimeroi fish receiving a 10-day OTC medicated feed treatment in February and early March for a pseudomonas infection. On April 8, 1998, the motor on well number one burned up and the fish were exposed to river water for six hours until the motor was replaced. Another 10-day OTC medicated feed treatment was administered on July 15 for a chronic pseudomonas infection. All Pahsimeroi fish received a 28-day prophylactic erythromycin medicated feed treatment beginning on May 22 and ending on June 18, 1998. On August 7, a 10-day formalin bath treatment was administered as fish were noticeably flashing.

On September 14, 1998, all fish were adipose clipped. The resulting inventory number was a total of 135,845 fish. On September 23 and 24, all Pahsimeroi fish were returned to Pahsimeroi in three shipments. Total pounds of fish shipped were 5,550 for an average fpp of 24.4.

NEZ PERCE SALMON PROGRAM

A program to hold adult spring chinook salmon for spawning purposes with the resulting fertilized eggs or gametes being given to the Nez Perce tribe was conducted at SFH in 1997. The adult salmon were Rapid River/Lookingglass, Oregon stock fish that were trapped at Lower Granite Dam and transported by truck to SFH.

The first shipment arrived on May 30, 1997 and consisted of 50 fish. The second shipment arrived on June 2, 1997, with 72 adults. Three more shipments on June 9, 1997, June 17, 1997 and 24, 1997, with 57, 61, and 42 fish respectively, completed the delivery of 282 adults.

It was noticed a fair number of these fish arrived in a state of poor health. Most noticeable was nitrogen burn with a resultant fungus infection. There were a number of fish that had a deep slash or a slash with a deep hole on top of the head. In all, 43 fish became pre-spawning mortalities and another 11 died after the first spawn day. Formalin treatments for fungus control began on June 2 with treatments administered every Monday, Wednesday, and Friday. Poor water quality associated with the spring runoff would have reduced the effectiveness of five day a week treatments. However, this was changed to Monday through Friday treatments on July 7 due to the poor condition of the fish and improved water quality. The last treatment was on August 29, 1997.

August 11, 1997 was the first spawn day, however only one female was ripe. August 21 was the second spawn day with 10 females being spawned. The fertilized eggs from these two spawn takes were held at SFH. Disease sampling results indicated a high ELISA value for the first female spawned and for two females from the second spawn day. These eggs were culled. On September 23, the remaining eggs were shocked, and machine-picked on September 25. A total of 25,865 eyed eggs and 2,405 dead eggs produced a 91% eyeup. These eggs were picked up by the Nez Perce tribe on September 30 (Appendix N.3).

After the second spawn day, it was decided to take unfertilized gametes from the fish, ship or fly them to the Sweetwater Fish Hatchery, and initiate fertilization there. On August 28, September 2, and September 8, 1997, a total of 32, 50, and 33 males and females gametes were obtained, respectively. A total of 21 fish were spawned and 115 sets of gametes taken (Appendix N.3). Other information gathered by and available from tribal personnel were scale samples, lengths and weights, CWT, PIT, and snout collection. Unfortunately, when the carcasses were disposed of the snouts were lost.

SOCKEYE SALMON

The SFH received 110,983 eyed Redfish Lake sockeye eggs from Big Beef (NMFS) and Eagle Fish Hatcheries in two shipments between December 8, 1997 and December 12, 1997. The eggs arrived with approximately 530 Celsius temperature units (CTUs). At 1,922 CTUs fry were ponded into twelve semi-square rearing tanks. Initial water flows were set at three gpm.

Eyed egg to ponding survival was 87%, yielding 97,058 fry. All fry were started on Bio-Oregon BioDiet Starter #1. Feed size was increased in accordance to manufacturer's recommendation with the exception that 20% of the feed was one size smaller to assure smaller

fish would get adequate amounts of feed. As densities reached 4 pounds/gpm, fish were transferred to larger rearing containers. The first transfer was to 50 cuft. semi-square tanks with water flows at 8- gpm, then to inside vats with water flows at 100 gpm.

The majority of the BY97 Redfish Lake sockeye being reared were released in October 1998 as pre-smolts. Redfish Lake received 39,418 fish (1,212 PIT) at 49 fpp on October 14, 1998. Alturas Lake received 39,377 fish (1,247 PIT) at 51 fpp on October 14, 1998. Total release was 78,795 fish. The remaining 10,056 sockeye continued to be reared on well water over winter. On May 4 and 5, 1999, 4,859 sockeye were released into the Salmon River below the SFH weir. An additional 4,859 sockeye were released into Redfish Lake Creek. All fish averaged 25.4 g/fish and 200 for each release were carrying PIT. An additional 310 smolts were transferred to the NMFS Manchester Facility for the captive broodstock program. Total spring release was 10,028 smolts.

1998 STEELHEAD TROUT

ABSTRACT

The Sawtooth Fish Hatchery (SFH) trap and weir were put into operation on March 23, 1998 and closed May 8, 1998. A total of 768 adult steelhead *Oncorhynchus mykiss* (506 males and 262 females) were trapped at the SFH weir. A total of 153 steelhead were released. This included 140 males (3 natural), and 13 females (3 natural). Of these released fish, 10 hatchery males and 10 hatchery females were released into a weired-off section of Beaver Creek for a natural-spawning study, conducted by Alan Byrne, Department Research Biologist. Seventy-five males were opercle punched and released at Torrey's Boat Ramp, and 50 hatchery males were released into Kids Creek Pond for additional angling opportunities. There was no prespawning mortality at SFH.

Spawning operations began at SFH on March 30, 1998 and continued through May 4, 1998 with 11 spawning days. A total of 246 females were spawned with 246 males, yielding 1,116,350 green eggs for an average fecundity of 4,538 eggs per female. These green eggs yielded 984,600 eyed eggs for an eye-up percentage of 88.2%. The eggs were shipped as follows: Hagerman National Fish Hatchery received 726,300 and the Shoshone-Bannock Tribes received 247,600.

The East Fork velocity barrier and trap were put into operation April 6, 1998 and ran through May 11, 1998. A total of 27 adult B-run steelhead were trapped. This included 12 males and 15 females. Fish released above the weir to spawn naturally included 5 males (2 natural), and 12 females (all natural). There was no prespawning mortality.

An adult steelhead trap was installed on Slate Creek, a tributary of the Salmon River on March 31, 1998, and operated through May 5, 1998. A total of five adult steelhead were trapped. This includes 4 males and one female. All of the fish trapped were A-run steelhead. No unmarked fish were trapped. No fish were released above the weir.

East Fork spawning operations began on April 24, 1998, and continued through May 4, 1998 with 2 spawning days. A total of 3 females were spawned with 3 males, yielding 11,550 green eggs, for an average fecundity of 3,850 eggs per female. These green eggs yielded 7,700 eyed eggs for a 67% eye-up rate. These eggs were shipped to Magic Valley Hatchery for rearing. An additional 6,100 A-run eggs from Slate Creek were shipped to the Shoshone-Bannock Tribes.

There were 4,002,500 green eggs from Pahsimeroi Hatchery incubated at SFH. These eggs eyed up at an 82.6% rate, yielding 3,308,200 eyed eggs. Survival of eyed eggs to swim-up was 96.5%. The eggs or fry were shipped to the following hatcheries: Magic Valley received 597,000 as eyed eggs, Niagara Springs received 1,416,800 as eyed eggs, and the Shoshone-Bannock Tribes received 596,400 eyed eggs for their streamside incubator program.

The SFH and East Fork stock eyed eggs were released as smolts during the spring of 1999. A total of 723,108 BY98 SFH stock smolts were released. The SFH released 457,084 acclimation smolts at the SFH weir. Hagerman National Fish Hatchery stocked 226,364 direct release smolts and Magic Valley Fish Hatchery stocked 39,660 direct release smolts at the SFH weir. East Fork stock smolts numbering 7,700 were mixed with Dworshak smolts and released below Squaw Creek Pond.

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FISH PRODUCTION

Steelhead Adult Collection

The SFH weir and trap was put into operation on March 23, 1998 and closed May 8, 1998. The East Fork trap was put into operation April 6, 1998 and ran through May 11, 1998. The Slate Creek trap was put into operation on March 31, 1998 and ran through May 5, 1998. The peak of the SFH steelhead *Oncorhynchus mykiss* run occurred during the first week of April, the peak of the East Fork run occurred during the third week of April, and the Slate Creek run peaked during the second week of April (Appendix O).

The SFH trapped a total of 768 adult fish, which included 506 males and 262 females (Appendix P). All fish were scanned for Coded Wire Tags (CWT). Information on the CWT fish was not available. There was one PIT tagged adult steelhead trapped at SFH. It was a 56-cm marked male (tag # 222C324B21). A total of 153 steelhead, 140 males (3 natural) and 13 females (3 natural) were released (Appendix P.1). Of the released fish, 5 males (3 natural), and 3 females (all natural) were released immediately above the weir. Fifty hatchery males were released into Kids Creek Pond near Salmon Idaho and 75 hatchery males were opercle punched and released at Torrey's boat ramp to provide additional angling opportunities. The other adult fish were released as part of supplementation studies conducted by Alan Byrne, Department Research Biologist. These hatchery fish (10 males and 10 females) were placed into a weired-off section of Beaver Creek.

The East Fork facility trapped 27 B-run adult fish, of which 12 were males and 15 were females (Appendix P). A total of 5 males (2 natural) and 12 females (all natural) were released above the velocity barrier to spawn naturally (Appendix P.1). All fish were scanned for CWT. Information regarding the CWT fish was not available.

The trap at Slate Creek collected a total of 5 adult steelhead, of which 4 were males, and one was female (Appendix P). All fish were marked A-run fish and no fish were released above the weir. Information on the CWT fish recovered at Slate Creek was not available. The length frequency distribution of steelhead from SFH, East Fork and Slate Creek is shown in Appendix Q, R, and S.

The SFH had a percent male to female ratio of 66% males and 34% females. The East Fork's percent male to female ratio was 44% male and 56% female. Slate Creek had a percent male to female ratio of 80% male and 20% female.

Using Kent Ball's (Department Anadromous Researcher) lengths for one- and two-ocean fish, steelhead returns by year class and sex are shown in Appendix U.

Specific information obtained from CWT fish at both SFH and the East Fork facility was not available. However, released steelhead by adult year class and sex are shown in Appendix T.

Adult Treatments

The returning adults at SFH, the East Fork Satellite, and Slate Creek, are not treated or injected with any type of drug or chemicals prior to spawning.

Prespawning Mortality

The SFH, the East Fork facility, and Slate Creek had no pre-spawning mortality.

Spawning Operations

The SFH spawned steelhead on 11 days from March 30 through May 4. Spawning took place at the East Fork on two days from April 24 through May 24. The lone female trapped at Slate Creek was spawned out and as a result, was not spawned. However, two females that were captured from a hook and line effort were spawned.

At SFH, 492 fish were spawned, of which 246 were females. The East Fork facility spawned 6 fish, of which 3 were females. Using the Von Bayer egg-enumeration method, 1,116,350 green eggs were collected from SFH fish (4,538 per female) and 11,550 green eggs were taken from East Fork fish (3,850 per female).

After fertilization, the eggs were rinsed of blood and sperm with well water. The eggs were then water hardened in a minimum 100 ppm solution of Argentine (10% iodine) solution for one hour before being put into FAL trays for incubation. All eggs tested negative for virus.

Incubation

After hardening in the Argentine solution, the green eggs were put away at one females eggs per FAL incubator tray.

There were 4,002,500 green eggs received from Pahsimeroi Hatchery that were incubated at SFH. These eggs were incubated at two females per FAL tray.

All incubated eggs were treated with a 1,667 ppm 15-minute formalin flow-through treatment five times per week for fungal and bacterial control. Sawtooth's eggs eyed up at an 88.2% rate, yielding 984,600 eyed eggs. East Fork eggs eyed up at a 67% rate, yielding 7,700 eyed eggs. Pahsimeroi eggs incubated at SFH eyed up at a 82.6% rate, resulting in 3,308,200 eyed eggs.

Well temperatures varied from 40°F at the beginning of incubation to 47°F when the last fry were shipped. Ten temperature units (TUs) per day was the average during the incubation period. Eye-up occurred at 360 TUs and the eggs were shocked at 380 TUs.

The eggs were shocked by putting them in a half-full three-gallon bucket of water, then pouring them into a quarter-full bucket of water from about three feet high. One day after shocking, the eggs were machine-picked, using a Jenn-Sorter model JH machine, which picks and enumerates eggs. A day or two after picking, the eyed eggs are handpicked before transfer to the rearing hatcheries. The eggs were loaded at 50,000 to 100,000 eggs per 48-quart cooler of well water. Then the cooler was strapped shut and shipped.

We shipped the SFH eggs as follows: 726,300 as eyed eggs to Hagerman National Hatchery, 247,600 eyed eggs to the Shoshone-Bannock Tribes. Magic Valley received 7,700 East Fork eyed eggs.

The Pahsimeroi eggs were shipped as follows: 597,000 as eyed eggs to Magic Valley Hatchery; 1,416,800 as eyed eggs to Niagara Springs Hatchery, 596,400 as eyed eggs to the Shoshone-Bannock Tribes.

The Shoshone-Bannock Tribes received an additional 6,100 eyed eggs from A-run females that were caught by hook and line at Slate Creek, and spawned separately.

Release Acclimation of BY 98

For the eighth year in a row, steelhead smolts were held and acclimated at SFH before final release. A total of 488,464 smolts were hauled from Hagerman National Hatchery and held in eight separate raceways, starting April 1, 1999 and continuing until April 13, 1999. They were held from 10 to 22 days. All of the fish were fed a maintenance diet of Rengen Dry Extruded 3.0mm totaling 2,600 lbs. The screens were removed on April 23, 1999. The smolts were forced out of the raceways the same day. A total of 457,084 BY98 acclimated smolts were released. An additional 226,364 BY98 smolts were hauled from Hagerman National Fish Hatchery (HNFH) and 39,660 Sawtooth smolts from Magic Valley were direct released below the Sawtooth weir concurrent to the acclimated smolts, bringing the total BY98 smolt release near SFH to 723,108. No fish were released at Torrey's Hole this year.

Fish Marking

Fish marking was completed in the rearing hatcheries and is shown in Appendix N.

CONCLUSIONS/RECOMMENDATIONS

East Fork Trap

As stated in last year's brood year report, the East Fork's adult returns are insufficient to meet egg needs or escapement goals. With the involved agency approvals, a lower weir and trap would boost our facility's adult numbers by capturing all the fish that drop out before reaching the trap. Another option would be not to clip the adipose fin off East Fork stock fish. A ventral fin could be clipped to identify these fish as East Fork stock. With the adipose fin attached, the East Fork stock would not be fished upon, giving us more brood stock potential. This would allow us to plant less Dworshak stock smolts, which appear to be returning at a lower rate than East Fork stock fish.

Sawtooth Fish Hatchery

If the returning number of adults show that acclimation is a viable program, then we should plan on implementing the program every spring. But if the numbers of adults show there is no difference or less returning "acclimated" adults, then we need to stop the program. Acclimation requires the hatchery to draw large amounts of water from the river, which also draws in emerging endangered natural chinook fry.

APPENDICES

Appendix A. Sawtooth Fish Hatchery Chinook Smolt Releases and Returns (marked and unmarked).

Brood Year	Release Year	Number Released	Adult Returns ^a			Returns	Total %
			3-year	4-year	5-year		
1979	1981	None	-	-	-	291	inc
1980	1982	None	17	66	165	248	inc
1981	1983	185,375	49	1,182	796	2,027	1.08
1982	1984	230,550	292	922	875	2,086	.91
1983	1985	420,060	51	452	1,318	1,821	.43
1984	1986	347,484	17	86	190	293	.08
1985	1987	1,185,06	80	286	164	530	.05
1986	87-88	1,705,500	412	1,212	297	1,921	.11
1987	88-89	2,092,000	112	201	63	376	.02
1988	89-90	1,895,60	68	496	480	1,044	.055
1989	90-91	652,600	45	78	27	150	.023
1990	91-92	1,273,400	29	63	6	98	.008
1991	92-93	774,583	6	15	28	49	.006
1992	93-94	213,830	16	101	96	213	.099
1993	94-95	334,313	27	148	133	308	.092
1994	1996	25,006	10	33	(1999)	-	inc
1995	1997	4,756	4	(1999)	(2000)	-	inc
1996	1998	43,161	(1999)	(2000)	(2001)	-	inc
1997	1999	223,240	(2000)	(2001)	(2002)	-	inc

East Fork Chinook Smolt Releases and Returns (marked and unmarked).

Brood Year	Release Year	Number Released	Adult Returns ^a			Returns	Total %
			3-year	4-year	5-year		
1979	1981	-	-	-	69	69	inc
1980	1982	-	-	26	59	85	inc
1981	1983	-	-	193	102	317	inc
1982	1984	-	-	87	181	268	inc
1983	1985	-	22	90	519	631	inc
1984	1986	108,700	1	23	51	75	.06
1985	1987	195,100	6	55	27	88	.045
1986	1988	249,200	22	106	32	160	.064
1987	1989	305,300	12	23	23	58	.019
1988	1990	514,600	7	27	65	99	.019
1989	1991	98,300	15	18	13	46	.046
1990	1992	79,300	6	2	0	8	.010
1991	1993	35,172	0	0	0	0	.000
1992	1994	12,368	0	7	0	7	.056
1993	1995	48,845	3	7	ND	10	.020
1994	1996	-	0	ND	ND	-	inc
1995	1997	-	ND	ND	(2000)	-	inc
1996	1998	-	ND	(2000)	(2001)	-	inc
1997	1999	-	(2000)	(2001)	(2002)	-	inc

a Age classes based upon the following lengths: 3-yr. old: ≤ 64 cm, 4-yr. old: 64 to 82 cm 5-yr. old: >82 cm. ND means no data, trap not operated.

Appendix A.1 Sawtooth Fish Hatchery Chinook Smolt Releases and Hatchery Returns (marked fish).
Beginning with BY91, all hatchery chinook smolts released were marked.

Hatchery Adult Returns

Brood Year	Release Year	Number Released	Adult Returns ^a			Returns	Total %
			3-year	4-year	5-year		
1991	92-93	774,583	2	11	7	20	.002
1992	93-94	213,830	8	23	26	57	.026
1993	94-95	334,313	21	72	23	116	.035
1994	1996	25,006	1	3	(1999)	-	inc
1995	1997	4,756	0	(1999)	(2000)	-	inc
1996	1998	43,161	(1999)	(2000)	(2001)	-	inc
1997	1999	119,442	(2000)	(2001)	(2002)	-	

East Fork Chinook Smolt Releases and Hatchery Returns (marked Fish).

Hatchery Adult Returns

Brood Year	Release Year	Number Released	Adult Returns ^a			Returns	Total %
			3-year	4-year	5-year		
1991	1993	35,172	0	0	0	0	.000
1992	1994	12,368	0	0	0	0	.000
1993	1995	48,845	1	1	ND	2	.004
1994	1996	-	0	ND	ND	-	inc
1995	1997	-	ND	ND	(2000)	-	inc
1996	1998	-	ND	(2000)	(2001)	-	inc
1997	1999	-	(2000)	(2001)	(2002)	-	

^a Age classes based upon the following lengths: 3-yr. old: ≤ 64 cm, 4-yr. old: 64 to 82 cm 5-yr. old: >82 cm.
ND means no data, trap not operated.

Appendix B. Sawtooth Fish Hatchery Water Quality Analysis of the Salmon River.

	1996	1993	1985
<u>Nutrients (mg/L)</u>			
T. Ammonia as N	0.027	0.043	0.045
T. NO ₂ + NO ₃ as N	0.006	0.073	0.088
T. Kjeldahl Nitrogen as N	0.20	<.05	0.26
T. Phosphorus as P	<.05	<.05	0.02
Ortho Phosphate as P	NR	0.019	<.003
<u>Minerals (mg/L)</u>			
Sp. Conductance (umhos/cm)	167	157	135
Hardness as CaCO ₃	80	68	62
T. Alkalinity as CaCO ₃	79	74	63
Bicarbonate Alk. as CaCO ₃	79	74	63
Calcium	27.4	24	20.8
Magnesium	2.9	1.9	1.8
Sodium	5.5	7.0	3.8
Potassium	0.7	0.7	<1
Fluoride	0.29	0.85	0.58
Sulphate as SO ₄	12	5	<6
<u>Total Metals (ug/L)</u>			
Arsenic, Total	<10	<10	<10
Boron, Total	<10	<80	1
Cadmium, Total	<1	<1	<1
Chromium, +6	NR	<10	<50
Chromium, Total	<2	<10	<50
Copper, Total	<10	<10	<10
Iron, Total	20	20	120
Lead, Total	<5	<5	<50
Manganese, Total	1	<10	10
Mercury, Total	<.5	<.5	<.5
Nickel, Total	<5	<10	<50
Silver, Total	<1	<1	<1
Zinc, Total	3	<2	<1
<u>Miscellaneous</u>			
Turbidity (NTU)	0.45	<1	1.8
pH (SU)	8.04	8.0	8.1
Total Cyanide (mg/L)	<.005	<.005	<.005
Total Residue	NR	NR	97

Appendix C. Sawtooth Fish Hatchery Results of Disease Sampling.

BY97 Juvenile Chinook

Case #	Stock	Date	Data
98-013	Saw	01/22/98	IHN, IPN, 0/5; FUR, ERM, CWD 0/4; Pseudomonas 4/4
98-149	Saw	05/05/98	BKD, FUR, ERM, CWD 0/2; VIRO 0/2, FAT 0/2, BACTE-NSG
99-054	Saw	03/17/99	IHN, IPN, BKD 0/20; FUR, VIRO 0/20; WHD 1/4 x5, digest only

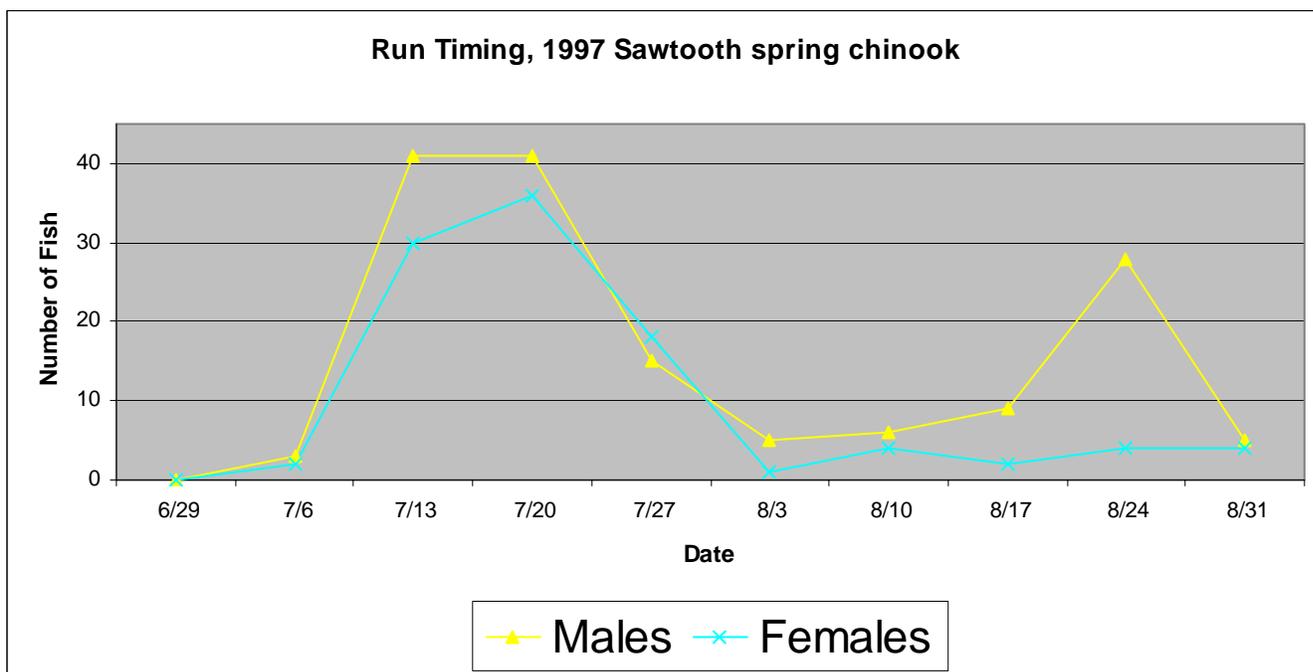
Return Year 1997 Chinook Broodstock

Case #	Stock	Date	Data
97-234	Saw	08/07/97	BKD 7/7 4 low, 3 high; VIRO 0/7
97-235	Saw	08/11/97	BKD 2/2 low; VIRO 0/7
97-238	Saw	08/13/97	BKD (ELISA) 5/6 low; VIRO 0/6
97-244	Saw	08/18/97	ELISA 15/15 all low; VIRO 0/15
97-255	Saw	08/21/97	ELISA 4/5 3 low, 1 high; VIRO 0/5
97-264	Saw	08/25/97	ELISA 10/10 8 low, 2 high; VIRO 0/10
97-282	Saw	08/28/97	ELISA 4/4 all low; VIRO 0/4
97-283	Saw	08/11/97	WHD 2/6
97-289	Saw	09/02/97	ELISA 3/4 all low; VIRO 0/4
97-302	Saw	09/08/97	ELISA 1/1 high; VIRO 0/1

Return year 1998 Steelhead Broodstock

Case #	Stock	Date	Data
98-089	Saw	03/30/98	VIRO 0/15
98-092	Saw	04/02/98	VIRO 0/11
98-104	Saw	04/06/98	VIRO 0/26
98-118	Saw	04/13/98	VIRO 0/34
98-131	EF	04/24/98	VIRO 0/1
98-148	EF	05/01/98	VIRO 0/1
98-166	EF	05/14/98	FAT 0/10, WHD 0/8
98-167	Saw	05/14/98	WHD 0/20

Appendix D. Sawtooth Fish Hatchery Spring Chinook Run Timing.



Appendix E. Sawtooth Fish Hatchery age-class totals from all trapped chinook, return year 1997.

Sawtooth	Length (Fk)	Year class	Number
Males	≤ 64 cm	3-year old	9
	64-82 cm	4-year old	88
	> 82 cm	5-year old	56
Subtotal			153
Females	≤ 64 cm	3-year old	1
	64-82 cm	4-year old	60
	> 82 cm	5-year old	40
Subtotal			101
Total			254

Appendix E.1. Sawtooth Fish Hatchery spring chinook salmon length frequency distribution for 1997.

FORK LENGTH (CM)	MALES					FEMALES					TOTAL FISH
	HAT. PONDED	HAT. REL.	NAT. PONDED	NAT. REL.	TOTAL MALES	HAT. PONDED	HAT. REL.	NAT. PONDED	NAT. REL.	TOTAL FEMALES	
44			1		1					0	1
48				1	1					0	1
51				1	1					0	1
52			1		1					0	1
54				1	1					0	1
55			1		1					0	1
58				1	1					0	1
62			1		1					0	1
63				1	1	1				1	2
66				1	1					0	1
67			1	1	2					0	2
68			1	1	2					0	2
69	1		1	1	3					0	3
70	2		2	1	5					0	5
71	2		6	2	10	1		2		3	13
72	2		2	1	5			1		1	6
73	1		2	4	7	3		1	2	6	13
74	2		1	6	9	2			1	3	12
75	5			3	8	1			1	2	10
76	2		3	3	8	1			1	2	10
77	2			1	3	2			2	4	7
78	1			3	4	8	1		2	11	15
79	4		1	1	6	3			1	4	10
80	2		1	1	4	12			2	14	18
81	2	1		3	6	2	1		3	6	12
82	3	1	1		5	2			2	4	9
83	5		1	1	7	3				3	10
84	1		2		3			1		1	4
85	2	1		1	4	1				1	5
86	1				1					0	1
87	1			2	3				1	1	4
88				1	1	1			2	3	4
89					0			1	1	2	2
90				1	1	1			2	3	4
91	1	1			2	1	1	1	3	6	8
92			1	2	3			1	2	3	6
93					0				4	4	4
94					0			1	1	2	2
95	1			1	2	2				2	4
96				3	3				3	3	6
97			1		1				2	2	3
98	1		1	2	4			1	2	3	7
99				1	1					0	1
100			2		2					0	2
101				1	1			1		1	2
102	1		1	1	3					0	3
103			1	5	6					0	6
104				2	2					0	2
105			2	1	3					0	3
106				1	1					0	1
107			1		1					0	1
108				1	1					0	1
Totals	45	4	39	65	153	47	3	11	40	101	254

HAT. = Hatchery; NAT. = Natural; REL. = Released

Appendix F. Sawtooth Fish Hatchery age class breakdown by released chinook, return year 1997

Sawtooth	Length (Fk)	Age Class	Number
Males	< 64 cm	3-year old	5
	64-82 cm	4-year old	35
	> 82 cm	5-year old	29
Total Males			69
Females	< 82 cm	4-year old	19
	> 82 cm	5-year old	24
Total Females			43
Total released			112

Appendix G. Sawtooth Fish Hatchery Chinook Age Class Breakdown by CWT Recoveries 1997.

Sex	Length (cm)	Code	Purpose
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Data unavailable for 1997

Appendix H. Breakdown by Fork Length (cm), for spring chinook at the East Fork Trap, 1997
(All Released)

Sex	Length	Age	Total Number	Marked Number	Unmarked Number
M	<64cm	3	0	0	0
M	>64-≤82cm	4	5	0	5
F	>64-≤82cm	4	2	1	1
M	>82cm	5	0	0	0
F	>82cm	5	0	0	0
	Totals		7	1	6

Appendix I. Sawtooth Fish Hatchery spring chinook spawning matrix, 1997 return year.

Date Spawned	Female		Males		Males	
	Length	Mark	Length	Mark	Length	Mark
8-7-97	73	ADLV	107		76	
	78	AD	?	-	83	-
	79	ADLV	83	AD	85	AD
	76	ADLV	87	ADLV	70	AD
	77	AD	79	AD	69	RV
	78	AD	73			
	80	ADLV	81	AD	69	RV
	8-11-97	73	AD	83	AD	95
8-14-97	95	AD	83	AD	79	AD
	80	AD	83	AD	82	AD
8-18-97	90	AD	81 *	AD	79 *	AD
	78	AD	79	AD	71	AD
	77	AD	85 *	AD	77	AD
	80	ADLV	74	AD	71	AD
	81	ADLV	75	AD	77	AD
	80	AD	82	AD	75 *	AD
	78	AD	80	AD	74	AD
	80	AD	77 *	AD	71 *	AD
	91	AD	76	AD	82 *	AD
	80	AD	74 *	AD	82 *	AD
	79	AD	73 *	AD	83 *	AD
	74	AD	71 *	AD	76	AD
	82	AD	79 *	AD	75 *	AD
	71	-	83 *	AD	105	-
	89	-	76 *	-	84	-
74	AD	79	ADLV	81	ADLV	
77	AD	86	RV	83	-	
78	ADLV	NT		69	-	
77	AD	71	-	67	-	
98	-	84	-	76	-	
8-21-97	82	AD	76 *	AD	71	-
	92	-	75	AD	85	AD
	78	AD	72	AD	75	AD
	101	-	107 *	-	79 *	ADLV
8-25-97	78	ADLV	103	-	74	-
8-25-97	80	AD	83	AD	72 *	AD
	80	AD	98	AD	80 *	AD
	88	AD	74 *	AD	78	AD
	80	AD	75 *	AD	76 *	AD
	73	AD	70 *	AD	75 *	AD
	91	-	75	AD	72 *	AD
	71	-	80	AD	84 *	RV
	73	-	102	-	84 *	-
	75	AD	50	-		
	79	AD	80	-		
8-28-97	63	AD	80 *	AD	83 *	AD
	80	ADRV	75 *	AD	98 *	AD
	81	AD	80 *	-	71	-
	78	AD	74 *	-	71	-
9-2-97	85	AD	102	AD	70	AD
	80	AD	85 *	AD	NT	AD
	83	AD	72 *	-	71	-
	94	-	102 *	-		
9-8-97	72	-	79	-	NT	-

denotes using a male a 2nd time,
 - denotes an unmarked fish
 NT denotes tag missing

Appendix J. Survival Table for chinook (BY97) and steelhead (BY98) from green eggs to released smolts, at Sawtooth Fish Hatchery and East Fork Sites.

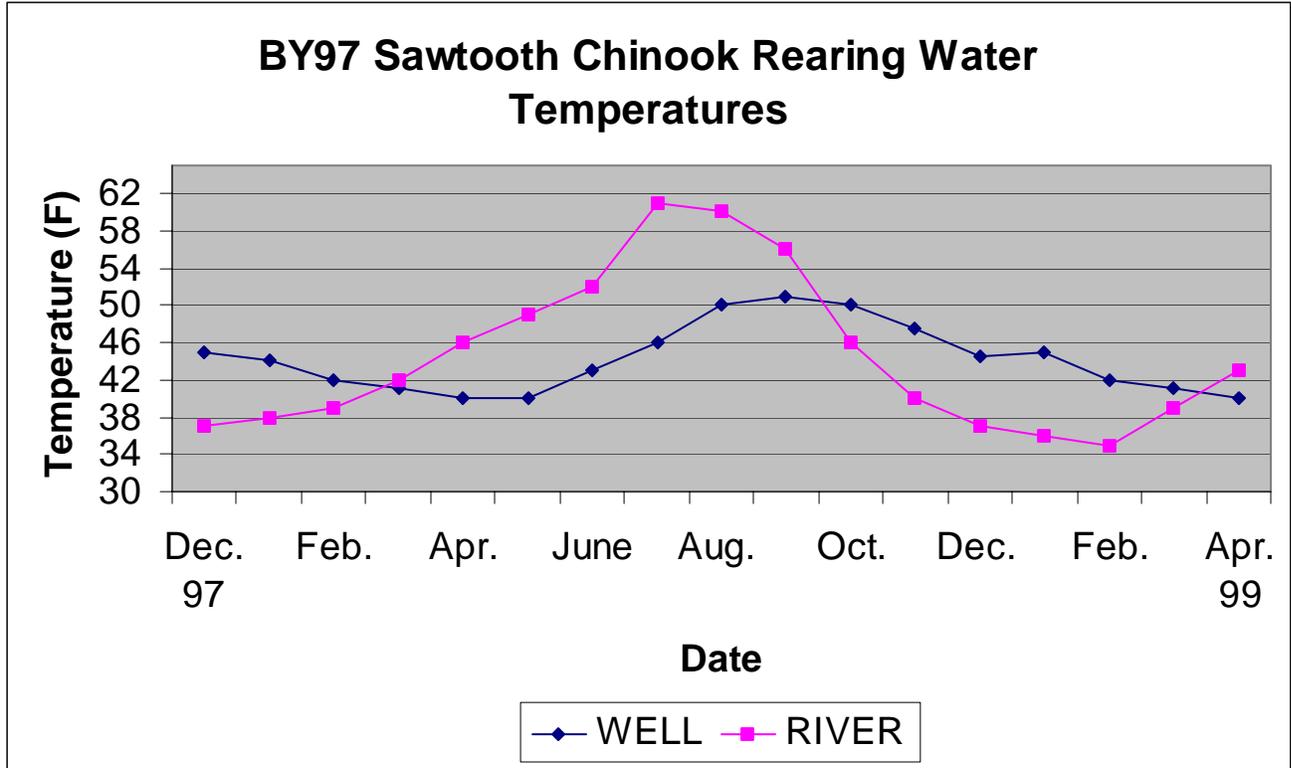
CHINOOK				
Green egg Number	Eyed egg Number	Percent Survival	Released Smolts	Percent Survival From green
<u>Sawtooth Fish Hatchery Fish</u>				
260,480	231,827	89	223,240	86
STEELHEAD				
Green egg Number	Eyed egg Number	Percent Survival	Released Smolts	Percent Survival From green
<u>Sawtooth Fish Hatchery Fish</u>				
1,116,350	984,600*	88.2	distributed as follows	
	726,300 for smolt production		683,448	83
	247,600 for egg boxes		N/A	N/A
<u>East Fork/Slate Creek Fish</u>				
11,550	7,700	67	±	

* = 10,700 surplus destroyed due to WHD exposure.
 N/A = Fish numbers resulting from these eyed eggs is unknown.
 ± = Fish were combined with Dworshak stock fish at release.
 All steelhead raised at other hatcheries.

Appendix J.1. Feed Schedule for Sawtooth/Pahsimeroi Spring Chinook, BY97.

Fpp	% BW Fed	Feed Size	Timing
su-----800	.035	#2/#3 str	11/97 - 01/16/97
800---500	.033	#3 str	01/98 - 02/98
500---400	.025	1.0 mm	02/98 - 03/98
400---350	.025	1.0/1.3 mm	03/98 - 04/98
350---300	.023	1.3 mm	04/98 - 04/98
300---250	.022	1.3 mm	05/98 - 06/98
250---150	.024	1.5 mm	06/98 - 06/98
150---110	.024	1.5 mm	06/98 - 07/98
110---90	.025	1.5 mm	07/98 - 08/98
90-----50	.022	2.5 mm	08/98 - 09/98
50-----17	.020	2.5 mm	09/98 - 10/98
≤ -----17	Maintenance	3.0 mm	10/98 - release 4/16/99

Appendix K. rearing water temperatures, BY97 spring chinook at Sawtooth Fish Hatchery.



Appendix L. Summary of marked spring chinook released, return year 1997.

Sawtooth Fish Hatchery Stock		
Mark	Number Released	Location
Adipose Clip & CWT	117,442	Sawtooth Fish Hatchery Weir, 04/16/99 (reserve)
CWT only	105,951	Sawtooth Fish Hatchery Weir, 04/16/99 (supplementation)
Total Release (PIT)	223,240 (2.975)	
Pahsimeroi Stock		
Adipose Clip	135,845	Transferred to Pahsimeroi FH 7/23/98, 7/24/98

Appendix M. Summary of Sawtooth Fish Hatchery spring chinook smolt releases, return year 1997.

Raceway	Number	Fish per Pound	Pounds	Designation
1	45,466	20.2	2,250	Reserve
2	39,746	23.6	1,684	Supplementation *
3	37,040	23.5	1,576	Supplementation
4	40,674	23.1	1,760	Reserve *
5	31,149	22.2	1,403	Reserve (High BKD)
6	29,165	21.9	1,333	Supplementation (High BKD) *
Total	223,240		10,006	

* = NATURES raceway

Appendix N. Sawtooth Fish Hatchery Summary of Smolt Releases and Marks.

Steelhead Sawtooth Fish Hatchery Stock BY98					
Mark Type	CWT Code	#PIT	# Fish Released	Date	Release Purpose
AD	none	none	338,669	04/23/99	Acclimated, contribution
AD	10-52-57,58,59, 60,61,63	**	118,415	04/23/99	Acclimated, contribution
AD	none	none	62,425	04/23/99	Direct Release at SFH weir, contribution
AD	10-46-43,44,45,46, 10-51-09, 10-53-01,02	**	163,939	04/23 & 26/99	Direct Release at SFH weir, contribution
AD	none	none	*39,660	04/23/99	Direct Release at SFH weir, contribution
TOTAL			723,108		

** number PIT tagged available from IDFG, marking supervisor

* sawtooth stock from Magic Valley Fish Hatchery

Steelhead East Fork Stock BY98					
Mark Type	CWT Code	#PIT	# Fish Released	Date	Release Purpose
AD	none	none	7,000	April 99	contribution

Chinook Sawtooth Fish Hatchery BY97					
Mark Type	CWT Code	#PIT	# Fish Released	Date	Release Purpose
AD	N/A	1,482	117,289	04/16/99	Reserve, NATURES rearing eval.
None	N/A	1,493	105,951	04/16/99	Supplementation, NATURES rearing eval.
					All released at Sawtooth FH Weir
Total		2,975	223,240		

N/A = cwt codes are available at IDFG Nampa Fish Research, Natures Study.

Appendix N.1. Sawtooth Fish Hatchery production cost table (includes chinook BY97 and steelhead BY98).

Smolt Number	Lbs. Feed	Cost Feed	Chinook		Total Cost	Cost per 1,000	Cost per lb.
			Lbs of Smolts	C			
Sawtooth							
223,240	13,160	13,890.24	10,006	1.20	\$195,414	\$875.35	\$19.53
Pahsimeroi							
135,845	5,937	6,233.85	5,550	1.06	\$65,139	\$479.51	\$11.74

East Fork

No BY97 East Fork spring chinook salmon were reared. Costs were incurred operating the trap.

Stock	Green Eggs	Eyed Eggs	Steelhead Total Cost	Cost per 1,000 eyed eggs
Sawtooth	1,116,350	984,600	\$56,996	\$57.89
East Fork	11,550	7,700	\$28,498	\$ 3,701.04
Pahsimeroi	4,002,500	3,308,200	\$61,068	\$18.46
Totals	5,130,400	4,300,500	\$146,562	\$34.08

Note: Total costs less capital outlay. Costs include operating East Fork fish trap and running wells for entire rearing period.

Appendix N.2. Cost table for BY97 chinook eggs from McCall (South Fork) and Rapid River Fish Hatcheries.

Stock	Green Eggs	Eyed Eggs	Total Cost	Cost per 1,000 eyed eggs	Status
South Fork*	328,339	250,136	\$3,908	\$15.62	Shipped to McCall FH & SBT
Rapid River**	105,973	57,830	\$1,302	\$22.52	Shipped to Clearwater FH

* = four females were culled (34,756 eggs)

** = 13 females were culled (45,241 eggs)

Appendix N.3. Cost Table for Nez Perce Tribe Program at Sawtooth Fish Hatchery, 1997.

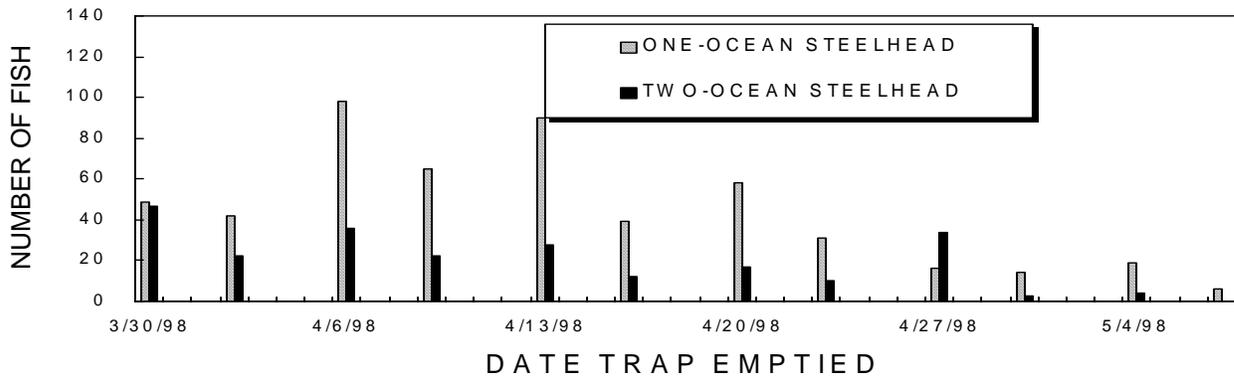
Number Of Adults Handled	Duration
282	Received 5/30, 6/9, 6/17, and 6/24/1997. Spawned on 8/11, 8/21, 8/28, 9/2, and 9/8/1997.

Date	Green Eggs	Eyed Eggs	Adults used for Gamete Collection	Cost/Cost per 1000
8/11/97	Culled			-
8/21/97	* 28,270	25,865		\$ 390/15.08
8/28 9/2 9/8			32 male & female 50 male & female 33 male & female	
TOTALS	28,270	25,865	115 male & female (Approximately 517,500 unfertilized eggs)	\$ 7,429/14.35 \$ 7,820

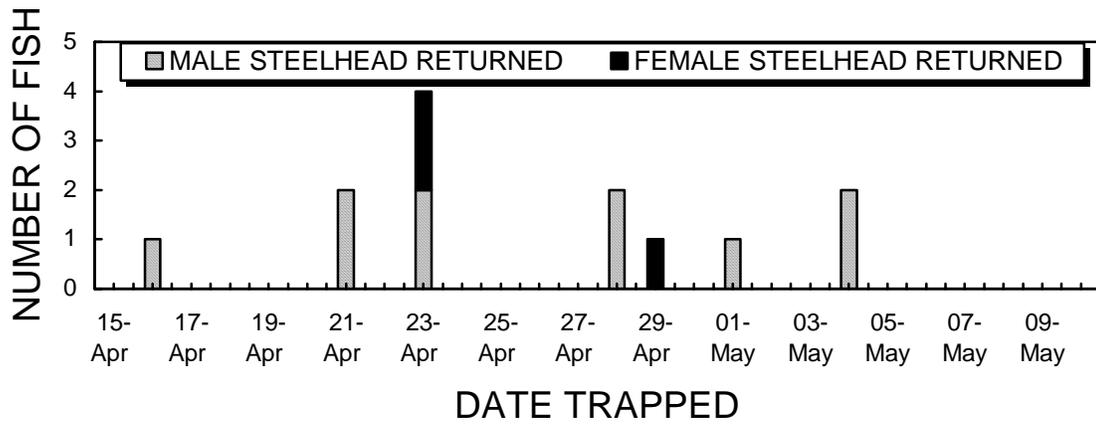
* = Eggs from two females were culled due to high BKD designation. No enumeration was done. On 8/11/97, two females were spawned. Their eggs were culled due to high BKD designation. No enumeration was done.

Appendix 0. Run timing for steelhead, return year 1998, Sawtooth and East Fork traps.

**1998 SAW TOOTH HATCHERY
STEELHEAD RUN TIMING
HATCHERY ORIGIN STEELHEAD**



**1998 EAST FORK STEELHEAD RUN TIMING
HATCHERY ORIGIN STEELHEAD**



Appendix P. Steelhead returns by year-class¹ and sex, return year 1998.

<u>Sawtooth Fish Hatchery (768)</u>	
2-year old males -----	412 (3 natural)
3 or 4-year old males -----	<u>115 (0 natural)</u>
males	527 (3 natural)
2-year old females -----	119 (1 natural)
3 or 4-year old females -----	<u>122 (2 natural)</u>
females	241 (3 natural)
<u>East Fork (27)</u>	
2-year old males -----	5 (0 natural)
3 or 4-year old males -----	<u>7 (2 natural)</u>
males	12 (2 natural)
2-year old females -----	3 (3 natural)
3 or 4-year old females -----	<u>12 (9 natural)</u>
females	15 (12 natural)
<u>Slate Creek (5)</u>	
2-year old males -----	4
3 or 4-year old males -----	<u>0</u>
males	4 (0 natural)
2-year old females -----	1
3 or 4-year old females -----	<u>0</u>
females	1 (0 natural)

¹These figures are based on Kent Ball's criteria for aging steelhead, as described in Appendix U.

Appendix P.1. Lengths of released steelhead, return year 1998, from Sawtooth Fish Hatchery, and East Fork Traps.

Sawtooth:				East Fork:			
Fork Len. (cm)	Male	Female	Total	Fork Len. (cm)	Male	Female	Total
52	1		1	63		2(2)	2
54	2		2	64		1(1)	1
55	4	3(1)	7	71	1	1(1)	2
56	7		7	72		1(1)	1
57	7	1	8	73		1(1)	1
58	13	2	15	74		2(2)	2
59	13	1	14	75			
60	16	1	17	76	1	1(1)	2
61	16	1	17	77		1(1)	1
62	15(1)		15	78	1		1
63	13		13	80		1(1)	1
64	6(1)		6	84	1(1)	1(1)	2
65	2		2	87	1(1)		1
67	1		1				
68	1	1(1)	2	Totals:	5(2)	12(12)	17
69	2		2				
70							
71	1	2	3				
72	2		2				
73	7		7				
74	1		1				
75	3	1(1)	4				
76	4		4				
77	1		1				
79	2		2				
Totals:	140(2)	13(3)	153				

Note: Figures in () indicate number of unmarked fish in each length group.

Appendix Q. Sawtooth Fish Hatchery steelhead length frequency distribution, return year 1998.

cms	HATCHERY		NATURAL		TOTAL TRAPPED		
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	TOTAL
50	0	0	0	0	0	0	0
51	2	2	0	0	2	2	4
52	0	0	0	0	0	0	0
53	0	2	0	0	0	2	2
54	10	2	0	0	10	2	12
55	10	7	0	1	10	8	18
56	20	13	0	0	20	13	33
57	29	10	0	0	29	10	39
58	44	25	0	0	44	25	69
59	50	23	0	0	50	23	73
60	63	19	0	0	63	19	82
61	61	14	0	0	61	14	75
62	43	7	1	0	44	7	51
63	32	6	0	0	32	6	38
64	28	8	2	0	30	8	38
65	14	5	0	0	14	5	19
66	0	10	0	0	0	10	10
67	3	12	0	0	3	12	15
68	7	15	0	1	7	16	23
69	4	12	0	0	4	12	16
70	8	23	0	0	8	23	31
71	5	11	0	0	5	11	16
72	11	15	0	0	11	15	26
73	20	8	0	0	20	8	28
74	17	3	0	0	17	3	20
75	9	1	0	1	9	2	11
76	5	4	0	0	5	4	9
77	3	2	0	0	3	2	5
78	1	0	0	0	1	0	1
79	1	0	0	0	1	0	1
80	2	0	0	0	2	0	2
81	1	0	0	0	1	0	1
82	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0
TOTALS	503	259	3	3	506	262	768

Appendix R. East Fork steelhead length frequency distribution, return year 1998.

cms	HATCHERY		NATURAL		TOTAL TRAPPED		
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	TOTAL
50	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0
59	1	0	0	0	1	0	1
60	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0
62	1	0	0	0	1	0	1
63	2	0	0	2	2	2	4
64	0	0	0	1	0	1	1
65	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0
71	1	0	0	1	1	1	2
72	0	0	0	1	0	1	1
73	0	0	0	1	0	1	1
74	0	0	0	2	0	2	2
75	1	0	0	0	1	0	1
76	2	0	0	1	2	1	3
77	0	0	0	1	0	1	1
78	1	2	0	1	1	3	4
79	0	0	0	0	0	0	0
80	1	1	0	1	1	2	3
81	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0
84	0	0	2	0	2	0	2
TOTALS	10	3	2	12	12	15	27

Appendix S. Slate Creek steelhead length frequency distribution, return year 1998.
 (All fish trapped were A – run adults).

cms	HATCHERY		NATURAL		TOTAL TRAPPED		
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	TOTAL
50	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0
55	0	1	0	0	0	1	1
56	1	0	0	0	1	0	1
57	1	0	0	0	1	0	1
58	0	0	0	0	0	0	0
59	1	0	0	0	1	0	1
60	1	0	0	0	1	0	1
61	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0
TOTALS	4	1	0	0	4	1	5

Appendix T. Released steelhead by year class and sex, return year 1998.

Sawtooth Fish Hatchery (153; (5n))

Males -	2-year old -	117 (3n)	Females -	2-year old -	9 (1n)
	3 or 4-year old	23 (0n)		3 or 4-year old -	4 (2n)
	Total -	140 (3n)		Total -	13 (3n)

East Fork (20; (12n))

Males -	2-year old -	1 (0n)	Females -	2-year old -	3 (3n)
	3 or 4-year old -	4 (2n)		3 or 4-year old -	9 (9n)
	Total -	5 (2n)		Total -	12 (12n)

n = natural fish

No fish were released at the Slate Creek trap.

Appendix U. Sawtooth Fish Hatchery criteria for aging steelhead, from Kent Ball, The Department.

"A-run" male -	≤ 68 cm - 2-year old
	> 68 cm - 3 or 4-year old
"A-run" female -	≤ 65 cm - 2-year old
	> 65 cm - 3 or 4-year old
"B-run" male -	< 73 cm - 2-year old
	> 73 cm - 3 or 4-year old
"B-run" female -	< 68 cm - 2-year old
	> 68 cm - 3 or 4-year old

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