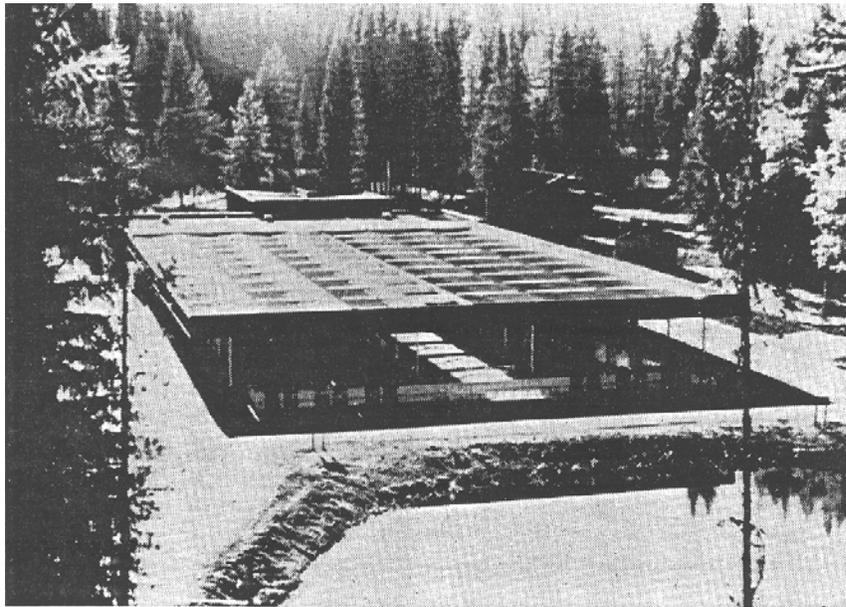




McCALL FISH HATCHERY

1996 Summer Chinook Salmon Brood Year Report



by

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ABSTRACT

The South Fork Salmon River weir and trap were installed on July 10, 1996 and removed at the conclusion of trapping on September 6, 1996.

Chinook salmon *Oncorhynchus tshawytscha* spawning at the trap commenced on August 9 and concluded on September 6, 1996. A total of 1,199 returning chinook salmon were trapped, measured, and recorded during this period. The overall average eye-up from eggs taken was 89.6%, with a total survival to release of 86.0%.

Of the 1,199 fish trapped: 181 were females, of which 130 were ponded; 32 were trucked to the Stolle Meadows area; 19 were released at the weir; and 19 died in the pond for a pre-spawn mortality rate of 14.6%. There were 280 adult males trapped of which 191 were ponded, 30 transported to the Stolle Meadows area, 59 released at the weir, and 6 died in the pond for a pre-spawn mortality of 3%. There were 738 jacks trapped (according to length frequency criteria), 703 were ponded, 430 were given to the Nez Perce Tribe, Shoshone-Bannock Tribes, and charity organizations. Ten were transported to Stolle Meadows, and 25 released at the weir.

From the 130 females ponded, 111 were spawned with an average fecundity rate of 4,384 eggs per female, resulting in 486,644 green eggs taken.

During March 1998, there were 393,872 brood year 1996 smolts weighing 22,507 pounds transported and released at Knox Bridge on the South Fork Salmon River. In July of 1997, there were 24,990 supplementation parr, weighing 129 pounds, released in a supplementation acclimation pond near Stolle Meadows.

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INTRODUCTION

McCall Fish Hatchery (MCFH) was built in 1979 as a result of the Water Resources Development Act enacted by Congress in 1976. A portion of this Act is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for fish and wildlife losses caused by the Lower Snake River Projects (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams). The MCFH was the first hatchery built as a partial fulfillment of the LSRCP. Funding for LSRCP is administered to the Idaho Department of Fish and Game (IDFG) by the U.S. Fish and Wildlife Service.

The MCFH is located within the city limits of McCall, Idaho along the North Fork of the Payette River, approximately 0.16 km (1/4 mile) downstream from Payette Lake.

A satellite facility for trapping and spawning adult chinook salmon *Oncorhynchus tshawytscha* is located on the South Fork Salmon River near Warm Lake, approximately 26 miles east of Cascade, Idaho.

The main production for MCFH is summer chinook reared to smolt size. There is also a resident trout program funded solely by IDFG.

The first salmon reared at the MCFH were transferred in from the Mackay Fish Hatchery and the Dworshak/Kooskia National Fish Hatchery complex. These eggs were the products of adult summer chinook trapped at Little Goose and Lower Granite dams. The first eggs from the South Fork of the Salmon River were received in August 1980.

OBJECTIVES

The mitigation goal is to return 8,000 adult summer chinook salmon above Lower Granite Dam. The objectives of the MCFH are:

1. Restore summer chinook salmon to the South Fork Salmon River; historically a major summer chinook stream in Idaho.
2. Trap and spawn adult salmon returning to the South Fork Salmon River.
3. Raise 1,000,000 summer chinook smolts for release into the South Fork Salmon River.
4. Work with management and research to identify optimum operating procedures for the MCFH.

FISH REARING FACILITIES

The hatchery facility consists of six buildings on approximately 15 acres. The largest building consists of a shop, parking garage, incubation and early rearing area, generator room, and feed/freezer room. The office and a three-bedroom dormitory are contained in one building. There is a visitor center with restrooms, a flow chart for a self-guided tour, and historical information signs. There are three residences for permanent personnel also located on the site.

The fish production facilities include:

1. Twenty-six eight-tray stacks of FAL (Flex-A-Lite, Consolidated) vertical flow (Heath type) incubators.
2. Fourteen concrete vats 4-ft x 40-ft x 2-ft (water depth); 320 cubic feet of rearing area per vat.
3. Two concrete rearing ponds 196-ft x 40.5-ft x 4-ft (water depth); 23,814 cubic feet of rearing space per pond.
4. One concrete collection basin 101-ft x 15-ft x 4-ft (water depth). The hatchery is designed to raise a maximum capacity of 1,000,000 smolts, averaging 17 fish per pound.

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Warm Lake. This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds (10-ft x 90-ft), and a covered spawning area. Water is supplied from the South Fork Salmon River through a 33-inch underground pipeline. Holding capacity for the facility is approximately 1,000 adult salmon. Some adults are passed above the weir to spawn naturally, with an additional group transported to Stolle Meadows for Idaho Supplementation research. Eggs collected at the facility are transported "green" to MCFH for incubation and rearing.

WATER SUPPLY

Hatchery water is obtained by gravity flow from Payette Lake through a 36 inch underground pipeline. Water may be taken from the surface or up to a depth of 50 ft, thus providing the capability of obtaining optimum rearing water temperatures.

Through an agreement with the Payette Lake Reservoir company, 20 cubic feet per second (cfs) of water flow is available for hatchery use. Design criteria and production goals were established using this constraint, ensuring the hatchery has enough water to meet its production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish (Appendix 12). The pH stays about 6.8. There is no indication of problems with heavy metals and temperature is maintained at 52°F to 56°F, with a low of 37°F.

STAFFING

The hatchery is staffed with three permanent employees: a Hatchery Manager II, an Assistant Hatchery Manager, and a Fish Culturist. In addition, there are four temporary employees to assist during the busy field season.

TRAPPING AND SPAWNING

The weir and trap on the South Fork Salmon River were installed on July 10. Trapping continued through September 6, 1996 with the first fish trapped on July 11. Normal trap installation is usually around June 20 with the fish arriving shortly thereafter. The peak of the run for 1996 was July 25.

There were 1,199 fish trapped; 181 (15.1%) were females, and 1,018 (84.9%) were males. A total of 737 male fish (72%) were jacks (three-year-old-fish) according to length frequency criteria. There were 51 females, 89 adult males, and 35 jacks released upstream of the weir. Of the released fish, there were 32 females, 30 adult males, and 10 jacks that were transported to the Stolle Meadows area and released. There were 19 unmarked females, 59 adult males, and 19 unmarked jacks released directly to the river above the weir. All of the ponded fish received a numbered tag, attached to the opercle with stainless steel staples; the released fish were assigned a number and tagged prior to release.

From the 1,199 fish trapped, there were 610 snouts removed from adipose fin-clipped (AD) fish indicating coded-wire tags (CWT). These were sent to the lab in Lewiston, Idaho for tag removal.

The age-class determination by length frequency was used at the trap site during initial trapping. The CWT recovery data and scale analysis show an overlap of age-classes originally determined using length frequency (Appendix 1).

Fork lengths were taken on all of the fish trapped, and all of the adult fish were injected with Erythromycin (Erythro 200) at a rate of 10 mg/kg.

There was a surplus of jacks available near the end of spawning; 37 were given to the Shoshone-Bannock Tribes, 49 were given to the Nez Perce Tribe, 344 were given to health and welfare organizations. There were four jacks used for spawning. Of the 738 jacks trapped, 695 were marked.

Pre-spawn mortality for the females was 14.6%, with 3% for the males. Spawn-taking activities started on August 9 and finished on September 6, 1996. There were nine spawning days during this period. A total of 486,644 green eggs were taken from 111 females for an average fecundity rate of 4,384 eggs per female. There were 10 unmarked females and 5 ventral clipped fish spawned for supplementation research, 96 for reserve or production fish. The average eye-up rate was 89.7%. A total of 123 adult males and 4 jacks were used in the spawning operation. All eggs taken were water-hardened for one hour in a 200 ppm titrateable iodine solution prior to being transported to the hatchery. The fecundity rate is estimated at 4,500 eggs per female until the eye-up stage is reached and the eggs are enumerated. At eye-up, the eggs are shocked by siphon,

picked with an electronic picker, and enumerated by displacement and an electronic counter. The overall eye-up totaled 436,509 eggs.

All of the spawned females were disease sampled by the pathologists from the Eagle Lab. There were three females testing high positive for bacterial kidney disease (BKD). Due to the low numbers of eggs available, there would be no culling of BKD positive eggs. These eggs and resulting fish will be kept isolated through out the rearing cycle.

Incubator flows were set at a five gallon per minute rate, and incubators were loaded at 2,000 cc, or approximately 8,000 eggs per tray. If space allowed, 1,500 to 1,800 cc of eggs per tray were utilized. The eggs were treated with 1,667 ppm of formalin for 15 minutes starting three days after fertilization and continuing on a daily basis until the eggs started to hatch.

Eggs eyed-up at approximately 600 thermal units (TU) and were then shocked, picked, and enumerated. Hatching began at approximately 925 TU.

FISH PRODUCTION

Early Rearing

Fry were sent out to the concrete vats approximately three days prior to initial feeding. Initial feeding begins between 1,750 and 1,775 TU. Flows for the vats are set at 80 gallons per minute and are loaded at 30,000 to 55,000 fish per vat, depending on the number of fish on hand. The vats start at half length and are extended to full length when the density index (DI) reaches 0.30 to 0.35, usually around mid-February.

Beginning growth rates are slow, only 0.003-inch to 0.004-inch per day, due to cold water temperatures of only 37°F to 39°F. The fry are started on BioDiet #2 and #3 feed and remain on #3 until they reach 700 fish per pound. BioDiet feed has been used successfully at MCFH, using modified feed rates. The conversion rates average 1.1:1 to 1.5:1 during the fry- rearing stage.

Fish are moved to the outside rearing ponds the last week of June. They are AD, CWT, and enumerated as they are moved to the ponds. Elastomer tagging was performed on the remaining supplementation fish in October. The BKD groups testing high-positive were isolated inside the hatchery building for the entire rearing cycle. All of the reserve and supplementation fish were placed in pond one. There were 394,882 fish ponded outside and 7,110 left inside for disease isolation. There were a total of 421,325 marks applied to fish. (Appendix 14).

The fish were fed two medicated feed treatments of Aquamycin, at 2.25 grams of active erythromycin phosphate per 100 pounds of fish at 1% body weight.

FISH HEALTH

Diseases Encountered and Treatment

Due to enzyme-linked immunosorbent assay (ELISA) based BKD segregation and prophylactic erythromycin medicated feed treatments, clinical BKD was not found until the final weeks of rearing. The fluorescent antibody test (FAT) positive fish were found (15/20) in the production group of fish, but clinical BKD was not observed. ELISA values in the production fish ranged from 0.224 to 0.505 optical densities in pooled samples. The BKD segregation group experienced clinical BKD despite three medicated feed treatments of erythromycin. Otherwise these fish experienced an uneventful disease history while at MCFH.

Organosomatic Index

Summary of Fish Autopsy (Appendix 14).

Acute Losses

Acute losses were not experienced in production or high BKD segregation groups. Chronic mortality was experienced in high BKD groups due to *Renibacterium* infection and in production fish due to *Pseudomonas fluorescens* infection.

Other Assessments

Even though *Renibacterium* was prominent in this year's production of fish, all other parameters suggest quality production. Only the future returns will suggest the impact of *Renibacterium* on these fish.

FISH MARKING

The fish marking crew was here in June and October and marked 421,325 fish. These marks include CWT/AD-clips, Elastomer tags, Ventral clips, and AD clips.

The marking crew returned in March and Passive Integrated Transponder (PIT) tagged 47,521 fish. The breakdown of tagged released fish appears in Appendix 14.

FISH DISTRIBUTION

The brood year 1996 smolt hauling operation began on March 29, 1998 with the release of the reserve and supplementation fish, and concluded on the morning of the April 6. There were approximately eighteen loads of fish hauled in three days. The river conditions were excellent for the release; the water was coming up and slightly off color. All together there were 393,872 brood year 1996 smolts at 17.5 fish per pound totaling 22,507 pounds released (Appendix 10).

EXPERIMENTS

The supplementation research carried over to the brood year 1996 chinook. This project is designed in an attempt to generate more returning adults to natural spawning grounds. Supplementation smolts are the prodigy of unmarked adults. These fish were isolated within the hatchery until they could be differentially marked to ensure that genetic crossover with hatchery production fish would not occur. When these fish return as adults, a portion will be kept for spawning purposes to continue this program. There were 22,982 smolts released in the supplementation group that received an elastomer tag. These fish were released at the same time as the normal production group. The elastomer tag is a silicon type material that is inserted under the skin behind the eye. It is colored material that is highly visible under a black light. It remains flexible to allow for growth. It was used as a test to try to eliminate a ventral fin clip for the supplementation fish. In July 1997, there were 24,990 right ventral (RV) clipped parr released into an acclimation pond that was renovated near Stolle Meadows. These fish were part of the supplementation research program. A structural failure in the floor of the pond resulted in most of these fish escaping into the river within a few days of stocking.

Low phosphate feed with a higher vitamin pack was utilized on the brood year 1996 fish with no adverse effects noted. This resulted in a reduction of total phosphorous in the hatchery effluent water to the minimum detectable amount (Appendix 12).

CONCLUSIONS

The brood year 1996 summer chinook released from MCFH were in excellent condition at release time. The overall survival rate to Lower Granite Dam was estimated at 50.3% based on PIT tag recoveries at the dam. The isolation program utilized on the BKD high-positive eggs had a positive effect on the over-all health and condition of the fish. The release pipe and tempering pump were utilized again this year. The fish transport and stocking went smoothly with fewer numbers being stocked.

RECOMMENDATIONS

Low phosphate feed with a higher vitamin pack was utilized during the peak rearing cycle with no adverse effects noted. It is recommended to continue to utilizing low phosphate feed. All of the chinook eggs that tested high-positive for BKD were isolated this year and should be continued. It is recommended that culling should be implemented if sufficient eggs are available. The Gabion baskets need to be replaced to make a stable footing for the weir as the existing ones have rotted out over time.

APPENDICES

Appendix 1. Age distribution of 1996 summer chinook returns to McCall Fish Hatchery, South Fork Salmon River, based on CWT data and length frequency data.

Age	Males		Females	
	CWT* Estimate	Length/frequency Estimate	CWT Estimate	Length/frequency Estimate
3	738	737	0	0
4	259	266	165	160
5	21	18	16	18
Totals	1,018	1,021	181	178

* CWT data based on 267 tags recovered from 610 snouts and expanded for the entire run. Length data is taken at trapping prior to first sort.

Age-class breakdown

66 cm = three-year-olds, jacks
 67-89 cm = four-year-olds
 90 cm = five-year-olds

Appendix 2. Lengths of brood year 1996 fish trapped at McCall Fish Hatchery.

Fork Length (cm)	Males	Females
42	0	0
43	2	0
44	4	0
45	8	0
46	5	0
47	18	0
48	12	0
49	23	0
50	41	0
51	45	0
52	46	0
53	52	0
54	56	0
55	60	0
56	62	0
57	67	0
58	46	0
59	49	0
60	52	0
61	27	0
62	23	0
63	16	0
64	8	0
65	8	0
66	7	0
67	1	0
68	2	3
69	5	2
70	1	2
71	5	2
72	9	2
73	12	5
74	19	7
75	16	8
76	27	9
77	23	8
78	19	16
79	23	20

Appendix 2. Lengths of brood year 1996 fish trapped at McCall Fish Hatchery (Continued).

Fork Length (cm)	Males	Females
80	25	17
81	14	9
82	16	16
83	20	9
84	7	9
85	9	8
86	3	2
87	5	6
88	1	2
89	2	0
90	3	2
91	1	2
92	2	3
93	0	3
94	2	2
95	1	3
96	0	2
97	1	1
98	1	0
99	0	0
100	0	0
101	1	0
102	1	0
103	0	0
104	1	0
105	0	0
106	2	0
107	0	0
108	0	0
109	0	0
110	1	0
111	0	0
112	0	0
113	1	0
Total	1018	181

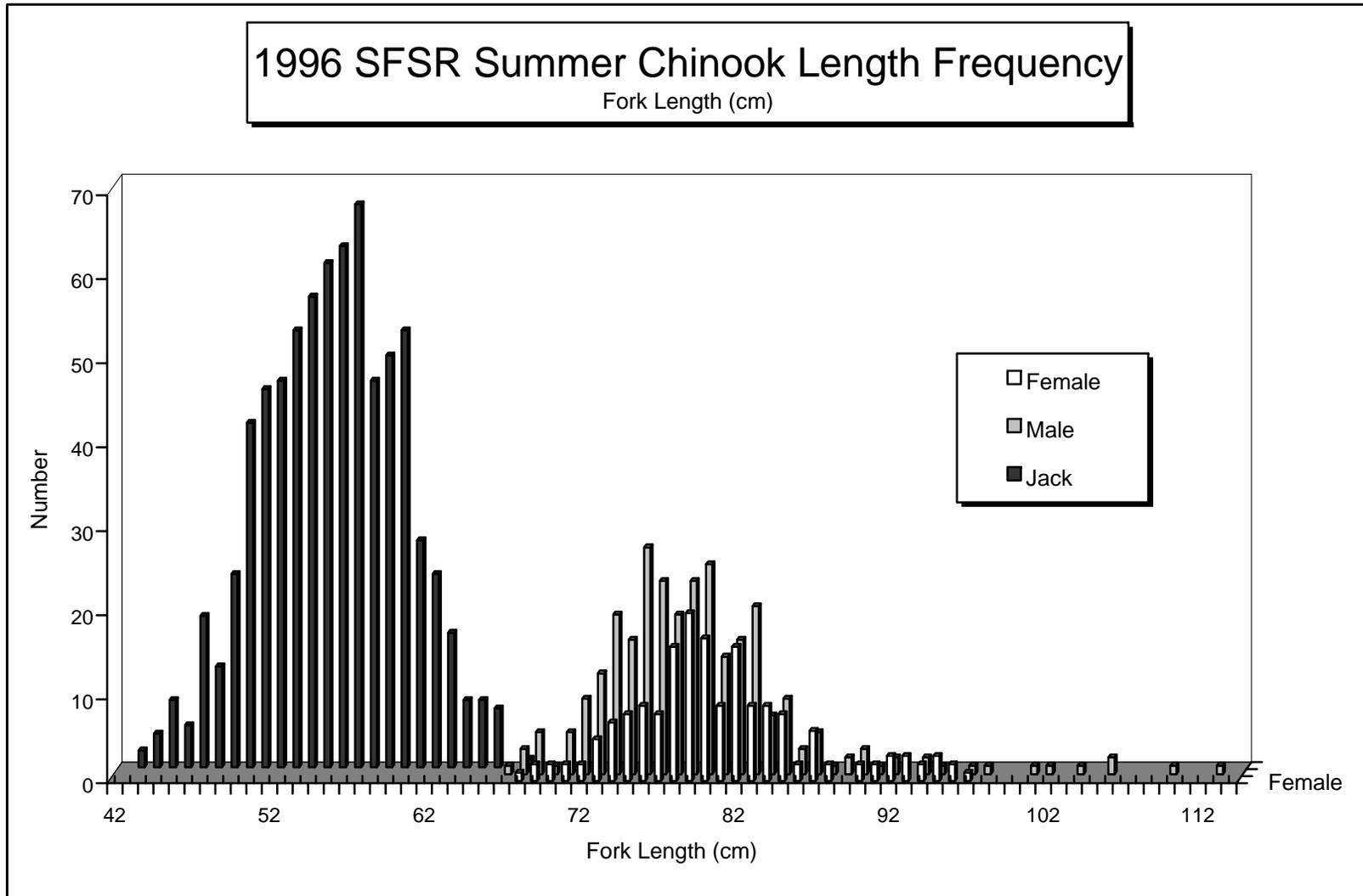
Appendix 3. Length frequency for brood year 1996 summer chinook broodstock at the South Fork of the Salmon River trap, according to Mark type recorded at McCall Fish Hatchery.

Fork Length (cm)	No. Mark	LV	RV	AD
42	0	0	0	0
43	0	0	1	1
44	0	0	3	1
45	1	0	3	4
46	0	0	1	4
47	0	0	9	9
48	1	0	3	8
49	2	0	6	15
50	3	0	7	31
51	3	0	10	32
52	0	0	11	35
53	7	0	14	31
54	0	0	9	47
55	2	0	15	43
56	2	0	11	49
57	3	0	9	55
58	1	0	13	32
59	4	0	9	36
60	2	0	13	37
61	2	0	4	21
62	1	0	10	12
63	1	0	3	12
64	2	0	2	4
65	3	0	2	3
66	3	0	0	4
67	0	0	0	1
68	0	1	1	3
69	2	2	0	7
70	3	0	0	0
71	2	3	0	2
72	7	0	0	4
73	6	3	0	8
74	9	6	0	11
75	11	2	0	11
76	9	8	0	19
77	4	5	0	22
78	8	5	0	22
79	11	11	0	21
80	11	9	0	22
81	4	4	0	15
82	6	7	0	19

Appendix 3. Length frequency for brood year 1996 summer chinook broodstock at the South Fork of the Salmon River trap, according to Mark type recorded at McCall Fish Hatchery (Continued).

Fork Length (cm)	No. Mark	LV	RV	AD
83	4	6	0	19
84	4	3	1	8
85	4	1	0	12
86	2	1	0	2
87	3	1	0	7
88	1	0	0	2
89	1	0	0	1
90	1	0	1	3
91	0	0	0	3
92	0	0	1	4
93	0	0	0	3
94	0	0	2	2
95	1	0	0	3
96	0	0	0	2
97	0	0	0	2
98	0	0	0	1
99	0	0	0	0
100	0	0	0	0
101	0	0	0	1
102	0	0	0	1
103	0	0	0	0
104	0	0	0	1
105	0	0	0	0
106	0	0	0	2
107	0	0	0	0
108	0	0	0	0
109	0	0	0	0
110	0	0	0	1
111	0	0	0	0
112	0	0	0	0
113	0	0	1	0
114	0	0	0	0
TOTAL	157	175	78	789

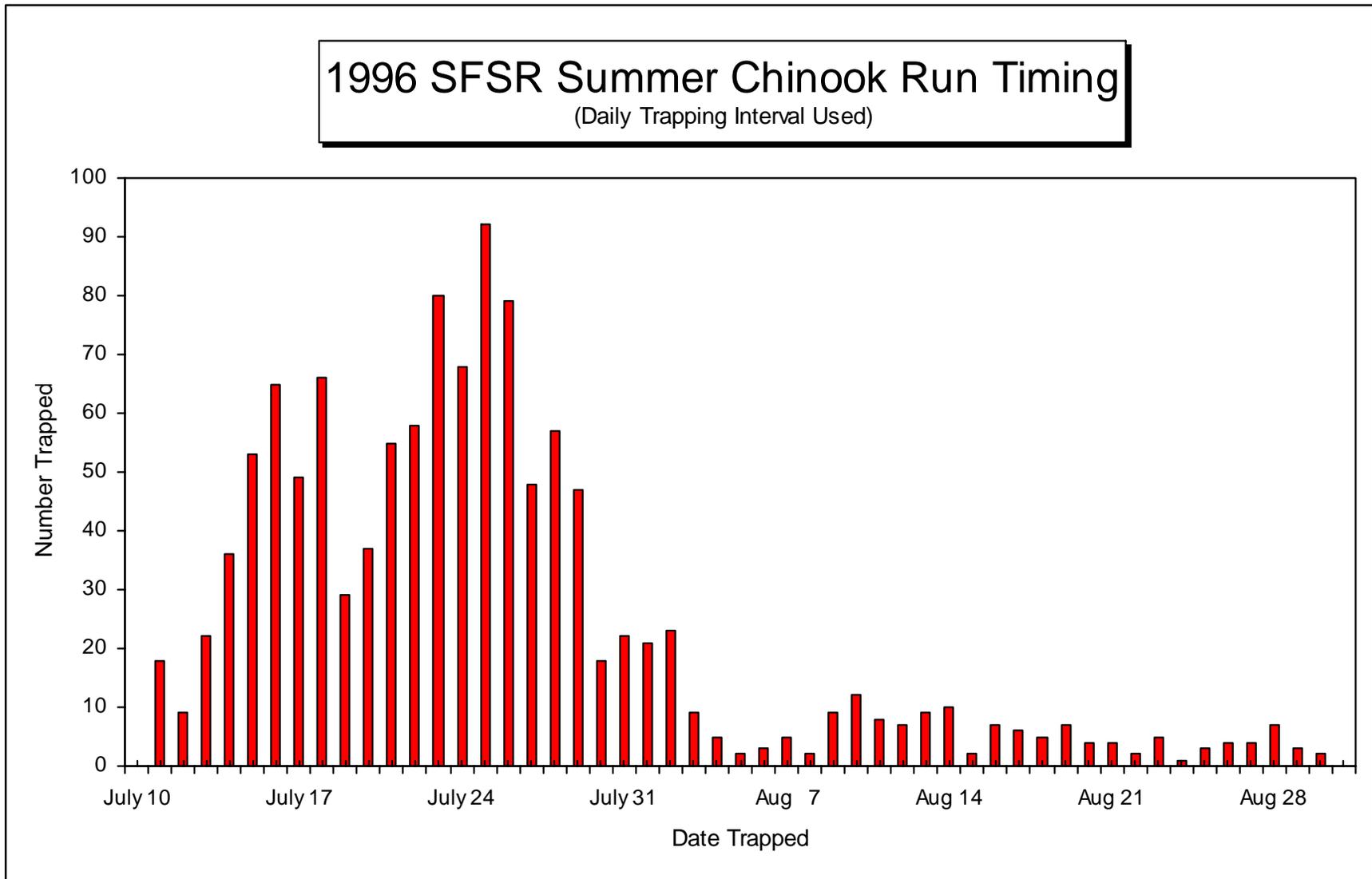
Appendix 4. South Fork Salmon River summer chinook length frequency graph BY96.



Appendix 5. McCall Fish Hatchery 1996 summer chinook run timing, South Fork Salmon River.

Date	Number Trapped	Date	Number Trapped
7/10	0	8/9	9
7/11	18	8/10	12
7/12	9	8/11	8
7/13	22	8/12	7
7/14	36	8/13	9
7/15	53	8/14	10
7/16	65	8/15	2
7/17	49	8/16	7
7/18	66	8/17	6
7/19	29	8/18	5
7/20	37	8/19	7
7/21	55	8/20	4
7/22	58	8/21	4
7/23	80	8/22	2
7/24	68	8/23	5
7/25	92	8/24	1
7/26	79	8/25	3
7/27	48	8/26	4
7/28	57	8/27	4
7/29	47	8/28	7
7/30	18	8/29	3
7/31	22	8/30	2
8/1	21	8/31	0
8/2	23	9/1	0
8/3	9	9/2	0
8/4	5	9/3	0
8/5	2	9/4	0
8/6	3	9/5	0
8/7	5	9/6	0
8/8	2		
		Total	1199

Appendix 6. McCall Fish Hatchery South Fork Salmon River chinook run timing graph BY96.



Appendix 7. Historic hatchery releases and returns logged at McCall Fish Hatchery.

Brood Year	Release Year	Number of Fish	3-year-olds	Year Returned	4-year-olds	Year Returned	5-year-olds	Year Returned	Percent Returned
1978	1980	124,800	124	1981	462	1982	161	1983	0.598
1979	1981	248,926	48	1982	272	1983	221	1984	0.217
1980	1982	122,247	504	1983	713	1984	151	1985	1.119
1981	1983	183,896	595	1984	1,259	1985	203	1986	1.119
1982	1984	269,880	828	1985	1,265	1986	202	1987	0.850
1983	1985	564,405	1,222	1986	2,117	1987	893	1988	0.674
1984	1986	970,348	386	1987	1,392	1988	191	1989	0.255
1985	1987	958,300	50	1988	252	1989	30	1990	0.035
1986	1988	1,060,400	495	1989	911	1990	154	1991	0.147
1987	1989	975,000	28	1990	237	1991	25	1992	0.029
1988	1990	1,032,500	821	1991	2,617	1992	1,311	1993	0.030
1989	1991	708,600	206	1992	1,364	1993	299	1994	0.263
1990	1992	901,500	28	1993	158	1994	5	1995	0.021
1991	1993	607,298	70	1994	201	1995	37	1996	0.050
1992	1994	1,060,163	101	1995	424	1996	166	1997	0.065
1993	1995	1,074,598	738	1996	3,448	1997	0	1998	---
1994	1996	585,654	45	1997	0	1998	0	1999	---
1995	1997	238,367	0	1998	0	1999	0	2000	---
1996	1998	393,872	0	1999	0	2000	0	2001	---

Appendix 8. Summer chinook distribution in the South Fork of the Salmon River logged at McCall Fish Hatchery.

Destination	Weight	Number/pound	Number released
Stolle Pond	128.8	193.9	**24,990
Knox Bridge	8,200	17.5	143,500
Knox Bridge	8,600	17.5	150,500
Knox Bridge	5,311	17.5	92,942
Knox Bridge*	396	17.5	6,390
Total Released	22,507		393,872

*These fish were the high BKD groups and were released last.

** These fish were released in July 1997 into Stolle Pond as parr and are not included in total .

Appendix 9. Brood year 1996 chinook survival from green eggs to released smolts.

Number of Green Eggs	Number of Eyed Eggs	Percent Survival	Ponded	Percent Survival	Released Smolts	Percent Survival
486,644	436,509	89.6	*402,235	87.8	393,872	85.50%

* 24,990 parr release to Stolle Pond not included.

Appendix 10. Temperature range from August 1996 to April 1998 at McCall Fish Hatchery.

Date	Temperature
Aug-96	53.5
Sep-96	49.5
Oct-96	44.5
Nov-96	42.5
Dec-96	39.5
Jan-97	38.5
Feb-97	37.5
Mar-97	37.5
Apr-97	38.0
May-97	41.3
Jun-97	47.3
Jul-97	55.1
Aug-97	51.8
Sep-97	47.9
Oct-97	45.6
Nov-97	44.6
Dec-97	39.9
Jan-98	37.5
Feb-98	37.0
Mar-98	37.5
Apr-98	38.0

Appendix 11. Water analysis at McCall Fish Hatchery.

Date	pH	Ammonia	Nitrate	Nitrite	Total Phosphate	Total Nitrogen	KJEL Hardness	CaCO₂ Saturation	Oxygen ppm
1988	6.8	-	-	-	-	-	<10	97/103	7/10
1991		<0.05	<0.1	<0.1	<0.05	<0.10			
1993	6.9	<0.05	<0.1	<0.01	<0.05	<0.10			
1994	6.9	<0.05	<0.1	<0.01	0.01	<0.10			

Appendix 12. Brood year 1996 production cost table.

Number of Fish	Pounds of Feed	Cost of Feed	Pounds of Fish	Conversion	Total Cost	Cost/1,000	Cost/Pound
418,862	30,619.50	\$32,457	23,636	1.37	\$249,992	\$596.92	\$10.57

Appendix 13. Brood year 1996 marked fish that were released.

Date	Number of Fish Marked	Mark	Purpose	Number Marked Fish Released	Site/group Released
06/24-07/01	231,166	AD	Identification	229,826	393,872
06/24-07/01	134,946	AD/CWT	US-Canada	134,134	393,872
10/01/97	23,050	LEAST	Supplementation	22,982	393,872
06/26-06/27	25,000	RV	Supplementation	24,990	24,990
07/01/98	7,163	AD	Identification	6,930	393,872
02/01/98	47,521	PIT	Migration Study	47,400	393,897
Total	421,325			418,862	418,862

* High BCD groups.

Appendix 14. Summary of fish autopsy.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 98-70 LOCATION: McCall
 SPECIES: Chinook Spring AUTOPSY DATE: 3/19/98
 STRAIN: South Fork Summer AGE: juv
 UNIT: Pond SAMPLE SIZE: 20
 RIVER FOR AUTOPSY: preliberation
 INVESTIGATOR(S): Munson
 REMARKS: Blood parameters not assayed, centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	0.00	0.00	0.00
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		FAT		MESEN. SPLEEN		GUT		HIND KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	18	1	0
B2	0	C	0	L	0	2	0	2	8	G	0	2	0	M	0	C	2	2	0
E1	0	M	0	S&L	0			3	12	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	0	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0		Mean=0.00
H2	0			O	0			Mean=2.60								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

	20	20	20	20	20	20	20	20	17	20	0
SEX		M: 0			F: 0				U: 0		

GENERAL REMARKS:

FINS: GONADS:
 SKIN: OTHER:

Submitted by:

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