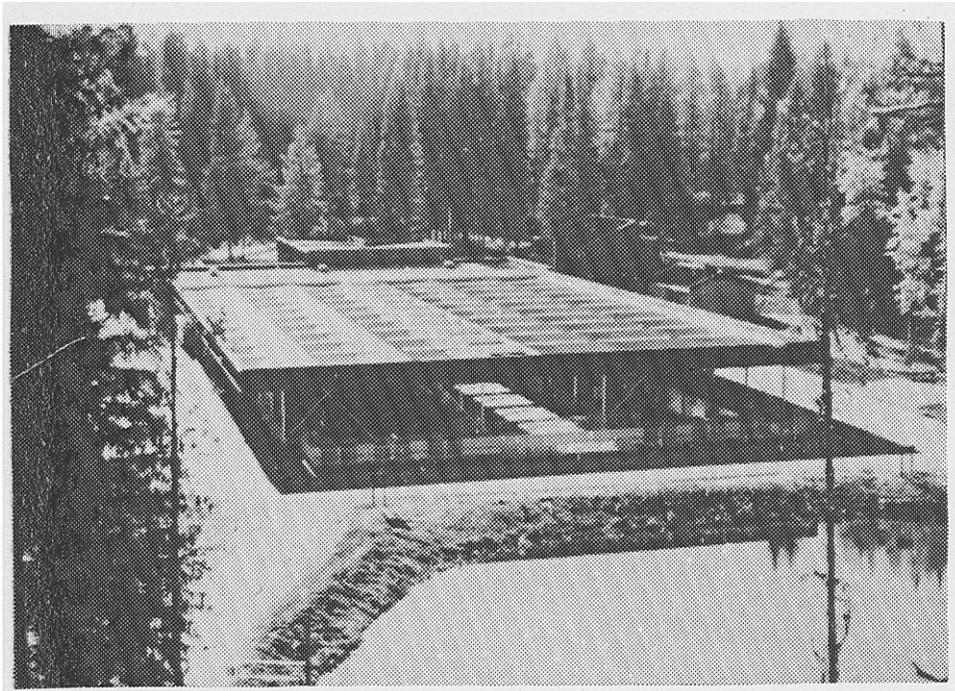


LOWER SNAKE RIVER
COMPENSATION PLAN
Hatchery Program

MCCALL FISH HATCHERY

1994 Summer Chinook Salmon Brood Year Report



by

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ABSTRACT

The South Fork Salmon River weir and trap were installed on June 7, 1994, and removed at the conclusion of trapping on September 17, 1994.

Chinook salmon *Oncorhynchus tshawytscha* spawning at the trap commenced on August 13 and concluded on September 13, 1994. A total of 527 returning chinook salmon were trapped, measured, and recorded during this period. The overall average eye-up from eggs taken was 88.2%, with a total survival to release of 85%.

Of the 527 fish trapped: 266 were females of which 162 were ponded, 104 were released upstream of the weir, 27 were trucked to the Stolle Meadows area, 23 died in the pond for a pre-spawn mortality rate of 14%. There were 191 adult males trapped of which 93 were ponded, 74 were released upstream of the weir, 24 transported to the Stolle Meadows area, 13 died in the pond for a pre-spawn mortality rate of 14%. There were 70 jacks trapped (according to length frequency criteria), 67 were ponded, one was released upstream, and two were transported to Stolle Meadows. Of the 67 ponded jacks, 41 were given to the Shoshone-Bannock Tribes.

From the 162 females ponded, 139 were spawned with an average fecundity rate of 4,958 eggs per female, resulting in 689,203 green eggs taken.

During April 1996, there were 585,654 brood year 1994 smolts weighing 32,772 pounds transported and released at Knox Bridge on the South Fork Salmon River.

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INTRODUCTION

McCall Fish Hatchery 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 McCall Hatchery 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 McCall Hatchery 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 McCall Fish Hatchery is summer chinook reared to smolt size. There is also a resident trout program funded solely by IDFG.

The first salmon reared at the McCall Fish Hatchery were transferred in from the Mackay Fish Hatchery and the Dworshak/Kooskia National Fish Hatchery complex. These eggs were the product 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 of 1980.

OBJECTIVES

The mitigation goal is to return 8,000 adult summer chinook salmon above Lower Granite Dam. The objectives of the McCall Fish Hatchery 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; and
4. Work with management and research to identify optimum operating procedures for the McCall Hatchery.

FISH REARING FACILITIES

The McCall 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; and
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. An additional group is transported to Stolle Meadows for Idaho Supplementation research. Eggs collected at the facility are transported "green" to McCall for incubation and rearing.

WATER SUPPLY

The McCall 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 feet, 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 H). Total hardness ranges from 6.3 to 7.06 mg CaCO₃/l, while 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 McCall 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 was installed and operational on June 7, 1994, and trapping continued through September 16, 1993. The first fish were trapped on June 13. Normal trap installation is usually around June 20 with the fish arriving shortly thereafter. The peak of the run for 1993 was June 30.

There were 527 fish trapped; 266 (50.5%) were females, and 261 (49.5%) were males. A total of 70 male fish (13%) were jacks (three-year-old-fish) according to length frequency criteria. There were 77 females, 74 adult males, and one jack released upstream of the weir. There was an additional 27 adult females, 24 adult males, and 2 jacks transported to the Stolle Meadows area and released. These fish were tagged with Peterson disc tags for observation and spawning distribution information.

From the 527 fish trapped, there were 213 snouts removed from adipose-clipped 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). There were two different dosages tested; half of the fish received a 0.4 cc injection and half received a 0.67 cc injection. Fish were monitored for drug toxicity and increased mortality, but no abnormal behavior was noted. The released adults received a 0.4 cc dosage of Erythromycin.

The early arriving jacks were injected with Erythromycin but died, so the jack injections were discontinued. There was a surplus of jacks available near the end of spawning and 41 uninjected jacks were given to the Shoshone-Bannock Tribes. There were eight jacks used for spawning. Of the 70 jacks trapped, 67 were marked.

Pre-spawn mortality for the females was 14.0%, with 14.0% for the males. Spawntaking activities started on August 13 and finished on September 13, 1994. There were eight spawn days during this period. A total of 689,203 green eggs were taken from 139 females for an average fecundity rate of 4,958 eggs per female. There were 54 unmarked females spawned for supplementation research, 859 for reserve or production fish. There were 413,461 reserve and 275,742 supplementation eggs taken. The fecundity rate for the unmarked females was 5,106 and 4,864 for the marked females. The eye-up rate was originally reported at 82.5% but a more accurate inventory at marking resulted in an average eye-up of 88.2%. A total of 80 adult males and 8 jacks

were used in the spawning operation. All eggs taken were water-hardened for one hour in a minimum 100 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 percentage was 88.2%, or 607,733 eyed eggs.

All of the spawned females were disease sampled by the pathologists from the Eagle lab. There were three reserve females and two supplementation females testing positive for Bacterial Kidney Disease (BKD). Due to the low numbers of eggs available, there was no culling of BKD positive eggs, but eggs were reared in isolation.

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 Bio-Diet #2 and #3 feed and remain on #3 until they reach 700 fish per pound. Bio-Diet feed has been used successfully at McCall Hatchery 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 first week of June. They are adipose clipped, LV clipped, and enumerated as they are moved out. The ponds are loaded at 344,431 into pond #1 and 226,660 into pond #2. Pond #2 received LV clipped fish. The LV clipped fish are for supplementation research. (Appendix 13). The high positive BKD groups were kept in vats 1 and 2 for the entire rearing cycle.

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

Despite two prophylactic treatments (28 day treatments) of Erythromycin medicated feed (provided by INAD 4333), the high BKD segregation groups developed clinical signs of BKD (*Renibacterium salmoninarum*). A third treatment was applied to these fish (28 treatment days, alternate medicated feed and off feed the following day). The epizootic appeared to diminish as the treatment was completed.

Acute Losses

Losses from *Renibacterium* in the high BKD group should be described as chronic. All other fish seemed relatively disease free.

Other Assessments

This was the first year of BKD segregation at McCall Hatchery. The value of a segregation program at this facility was apparent. The high segregation group broke with clinical BKD, while the lows and negatives (main rearing group) were disease free. McCall Hatchery needs to continue with the BKD segregation program unless there are enough returning fish to allow a culling program. In the future, Oxytetracycline can be used for BKD control under the Oxytetracycline INAD. Years in which a BKD segregation program is utilized at McCall Hatchery, a high BKD rearing strategy of three Erythromycin prophylactic treatments and one Oxytetracycline treatment should be investigated as a means of not only controlling BKD while on the hatchery, but increase contributions to the fishery as returning spawning adults.

FISH MARKING

The fish marking crew was here in July and marked 594,114 fish with 659,818 marks. These marks include CWT/Ad-clips, LV (left ventral) clips, and AD (adipose) clips.

The marking crew returned in March and PIT tagged 29,623 fish. The breakdown of tagged released fish appears in Appendix 13.

FISH DISTRIBUTION

The brood year 1994 smolt hauling operation began on April 11, 1996 with the release of the supplementation fish and concluded on the afternoon of the April 14. There were approximately 13 loads of fish hauled in four days. The river conditions were excellent for the release, the water was coming up and slightly off color. All together there were 585,654 brood year 1994 smolts at 17.87 fish per pound totaling 32,772.9 pounds released (Appendix 8).

EXPERIMENTS

The supplementation research carried over to the brood year 1994 chinook. This project is designed in an attempt to generate more returning adults to natural spawning grounds. Supplementation smolts are the progeny 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 234,566 smolts released in the supplementation group that received a left ventral (LV) clip. These fish were released at the same time as the normal production group.

Low phosphate feed with a higher vitamin pack was utilized on the brood year 1994 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 11)

CONCLUSIONS

The brood year 1994 summer chinook released from McCall Hatchery were in excellent condition at release time. The overall survival rate to Lower Granite Dam was estimated at 34.9% based on PIT tag recoveries at the dam. The dams were spilling during the period and survival rates could be higher than estimated. The fish were larger, 17.87 fish per pound as opposed to 21.8 fish per pound last year. 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. 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 1994 summer chinook returns to McCall Fish Hatchery, South Fork Salmon River, based on CWT data and length frequency data.

Age	CWT* Estimate	<u>Males</u> Length/ frequency Estimate	CWT Estimate	<u>Females</u> Length/ frequency Estimate
3	60	70	0	0
4	7	43	8	115
5	207	161	245	138
Totals	274	274	253	253

* CWT data based on 196 tags recovered from 213 snouts and expanded for the entire run. Length data is taken at trapping prior to first sort.

Age class breakdown

66 cm< = 3-year-olds, jacks
 67 cm - 89 cm = 4-year-olds
 90 cm> = 5-year-olds

Appendix 2. Lengths of brood year 1994 fish trapped at McCall Fish Hatchery.

Fork Length (cm)	Males	Females
40	1	0
41	0	0
42	0	0
43	0	0
44	1	0
45	1	0
46	1	0
47	5	0
46	5	0
49	3	0
50	1	0
51	4	0
52	2	0
53	8	0
54	11	0
55	5	0
56	5	0
57	2	0
58	2	0
59	5	0
60	2	0
61	1	0
62	1	0
63	2	0
64	0	0
65	0	0
66	2	0
67	0	0
68	0	0
69	3	0
70	2	0
71	1	0
72	3	0
73	1	1
74	3	0
75	1	0
76	2	0
77	2	0
78	1	0
79	1	1
80	3	4
81	1	5
82	3	3
83	1	4

70*

Appendix 2. Continued.

Fork Length (cm)	Males	Females
84	2	5
85	2	9
86	2	14
87	1	20
88	5	20
89	3	29
90	4	23
91	17	14
92	4	20
93	11	20
94	10	18
95	5	11
96	12	11
97	12	9
98	10	5
99	10	5
100	18	1
101	6	1
102	14	0
103	8	0
104	5	0
105	4	0
106	1	0
107	2	0
108	3	0
109	2	0
110	1	0
111	1	0
112	1	0
113	0	0
114	0	0
115	0	0
Totals** 204***	274	253

* Total jacks.

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix 3. Lengths of brood year 1994 fish ponded at McCall Hatchery.

Fork Length (cm)	Males	Females
40	1	0
41	0	0
42	0	0
43	0	0
44	1	0
45	1	0
46	1	0
47	5	0
48	4	0
49	3	0
50	1	0
51	4	0
52	2	0
53	8	0
54	11	0
55	5	0
56	4	0
57	1	0
58	2	0
59	5	0
60	2	0
61	1	0
62	1	0
63	2	0
64	0	0
65	0	0
66	2	0
67	0	0
68	0	0
69	2	0
70	2	0
71	1	0
72	2	0
73	1	1
74	0	0
75	0	0
76	1	0
77	0	0
78	0	0
79	1	1
80	2	1
81	0	2
82	2	3
83	1	2

67*

Appendix 3. Continued.

Fork Length (cm)	Males	Females
84	0	5
85	2	9
86	0	7
87	1	12
88	2	14
89	2	13
90	2	11
91	8	8
92	1	8
93	5	13
94	6	14
95	2	5
96	4	8
97	10	4
98	7	2
99	4	5
100	9	0
101	1	1
102	9	0
103	4	0
104	3	0
105	3	0
106	1	0
107	1	0
108	1	0
109	1	0
110	1	0
111	1	0
112	0	0
113	0	0
114	0	0
115	0	0
Totals**	106***	173
		149

* Total jacks.

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix 4. Lengths of brood year 1994 fish released at McCall Fish Hatchery.

Fork Length (cm)	Males	Females
40	0	0
41	0	0
42	0	0
43	0	0
44	0	0
45	0	0
46	0	0
47	0	0
48	1	0
49	0	0
50	0	0
51	0	0
52	0	0
53	0	0
54	0	0
55	0	0
56	1	0
57	1	0
58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	0	0
64	0	0
65	0	0
66	3*	0
67	0	0
68	0	0
69	1	0
70	0	0
71	0	0
72	1	0
73	0	0
74	3	0
75	1	0
76	1	0
77	2	0
78	1	0
79	0	0
80	1	3
81	1	3
82	1	0
83	0	2

Appendix 4. Continued.

Fork Length (cm)	Males	Females
84	2	0
85	0	0
86	2	7
87	0	8
88	3	6
89	1	16
90	2	12
91	9	6
92	3	12
93	6	7
94	4	4
95	3	6
96	8	3
97	2	5
98	3	3
99	6	0
100	9	1
101	5	0
102	5	0
103	4	0
104	2	0
105	1	0
106	0	0
107	1	0
108	2	0
109	1	0
110	0	0
111	0	0
112	1	0
113	0	0
114	0	0
115	0	0
Totals**	98***	104

* Total Jacks

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix 5. 1994 summer chinook run timing South Fork Salmon River

Date	Total Run	Males	Females
6/7	0	0	0
6/8	0	0	0
6/9	0	0	0
6/10	0	0	0
6/11	0	0	0
6/12	0	0	0
6/13	2	0	2
6/14	1	0	1
6/15	1	0	1
6/16	0	0	0
6/17	2	2	0
6/18	1	0	1
6/19	2	1	1
6/20	7	4	3
6/21	14	4	10
6/22	18	9	9
6/23	16	7	9
6/24	19	9	10
6/25	18	11	7
6/26	13	4	9
6/27	23	11	12
6/28	9	2	7
6/29	11	4	7
6/30	40	17	23
7/1	28	20	8
7/2	26	18	8
7/3	12	6	6
7/4	13	9	4
7/5	16	5	11
7/6	10	6	4
7/7	7	0	7
7/8	13	8	5
7/9	11	7	4
7/10	12	8	4
7/11	5	2	3
7/12	10	4	6
7/13	7	3	4
7/14	7	4	3
7/15	6	2	4
7/16	1	1	0
7/17	11	5	6
7/18	9	6	3
7/19	5	3	2
7/20	4	4	0
7/21	10	7	3

Appendix 5. Continued.

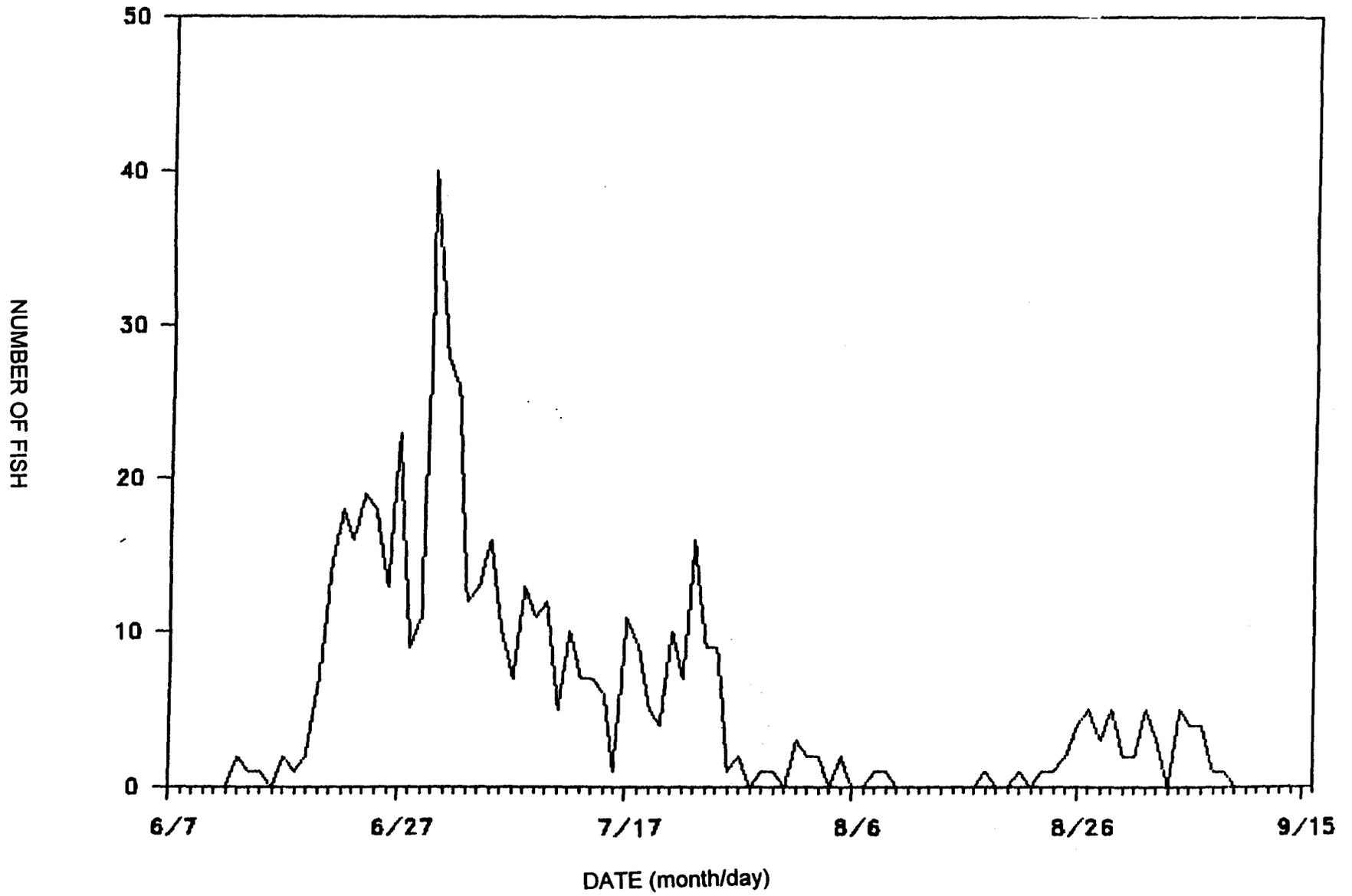
Date	Total Run	Males	Females
7/22	7	4	3
7/23	16	9	7
7/24	9	5	4
7/25	9	4	5
7/26	1	0	1
7/27	2	1	1
7/28	0	0	0
7/29	1	1	0
7/30	1	1	0
7/31	0	0	0
8/1	3	2	1
8/2	2	1	1
8/3	2	2	0
8/4	0	0	0
8/5	2	1	1
8/6	0	0	0
8/7	0	0	0
8/8	1	1	0
8/9	1	1	0
8/10	0	0	0
8/11	0	0	0
8/12	0	0	0
8/13	0	0	0
8/14	0	0	0
8/15	0	0	0
8/16	0	0	0
8/17	0	0	0
8/18	1	1	0
8/19	0	0	0
8/20	0	0	0
8/21	1	0	1
8/22	0	0	0
8/23	1	1	0
8/24	1	1	0
8/25	2	1	1
8/26	4	3	1
8/27	5	4	1
8/28	3	3	0
8/29	5	2	3
8/30	2	1	1
8/31	2	1	1
9/1	5	2	3
9/2	3	2	1
9/3	0	0	0
9/4	5	2	3

Appendix 5. Continued.

Date	Total Run	Males	Females
9/5	4	2	2
9/6	4	1	3
9/7	1	1	0
9/8	1	0	1
9/9	0	0	0
9/10	0	0	0
9/11	0	0	0
9/12	0	0	0
9/13	0	0	0
9/14	0	0	0
9/15	0	0	0
9/16	0	0	0
TOTALS	527	274	253

Totals Represent Initial Trap Numbers Prior to First Sort.

Appendix 6. South Fork summer chinook run, 1994



Appendix 7. Historic Hatchery releases and returns 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	1259	1985	203	1986	1.119
1982	1984	269,880	828	1985	1265	1986	202	1987	0.850
1983	1985	564,405	1222	1986	2117	1987	893	1988	0.674
1984	1986	970,348	386	1987	1392	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	2617	1992	1311	1993	0.030
1989	1991	708,600	206	1992	1364	1993	299	1994	0.263
1990	1992	901,500	28	1993	158	1994	17	1995	0.022
1991	1993	607,298	70	1994	189	1995	0	---	---
1992	1994	1,060,163	101	1995	0	0	0	---	---
1993	1995	1,074,598	0	1996	---	---	---	---	---

Appendix 8. Summer chinook distribution in the South Fork of the Salmon River.

Destination	Weight	Number/pound	Number released
Knox Bridge	19,108.6	17.87	341,171
Knox Bridge	12,588.6	17.87	224,958
Knox Bridge*	552.2	17.87	9,869
Knox Bridge*	523.5	17.87	9,356
Total Released	32,772.9		585,654

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

Appendix 9. Brood year 1994 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
689,203	607,733	88%	594,114	86.2	585,654	85%

Appendix 10. Temperature range from August 1994 through April 1996.

Date	Temperature
08/94	50.0
09/94	50.1
10/94	48.7
11/94	43.5
12/94	38.8
01/95	38.0
02/95	38.0
03/95	38.0
04/95	38.9
05/95	41.0
06/95	44.3
07/95	53.2
08/95	52.1
09/95	51.0
10/95	46.7
11/95	43.9
12/95	40.3
01/96	38.8
02/96	39.0
03/96	39.0
04/96	39.5

Appendix 11. Water analysis at McCall Fish Hatchery.

Date	pH	Ammonia	Nitrate	Nitrite	Total phosphate	Total nitrogen	KJEL hardness	CaCO ₂ 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			

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Appendix 12. Brood year 1994 production cost table.

Number of fish	Pounds of feed	Cost of feed	Pounds of fish	Conversion	Total cost	Cost/1.000	Cost/pound
585,654	43,030	\$36,576	32,772	1.31	\$202,958	\$346.93	\$6.19

Appendix 13. Brood year 1994 marked fish that were released.

Date	Number of fish marked	Mark	Purpose	Number marked fish released	Site/group release
07/5-7/10	280,307	AD	Identification	276,188	585,654
07/5-7/7	65,704	AD/CWT	US-Canada	65,283	585,654
07/10-7/13	227,466	LV	Supplementation	224,958	585,654
07/12-7/13	9,639	LV	Supplementation*	9,356	585,654
07/12-7/13	10,998	AD	Identification	9,869	585,654
Total	594,114			585,654	585,654

*High BKD groups.

Appendix 14. Summary of fish autopsies.

ACCESSION NO: 96-98

SPECIES: su

STRAIN: sf

UNIT:

REASON FOR AUTOPSY: preliberation

INVESTIGATOR(S): Munson, Frogf

REMARKS: general population nice; HBKD group rough looking

LOCATION: mc

AUTOPSY DATE: 03/20/96

AGE: juv

SAMPLE SIZE: 20

	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	45.05	4.35	0.09
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	9.22	0.96	0.10

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

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

VALUES AS PERCENTS OF TOTAL SAMPLE

ES	GILLS	PSEUDO-BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	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 20	1 0
B2 0	C 0	L 0	2 0	2 0	G 0	2 0	M 0	C 0	2 0
E1 0	M 0	S&L 0		3 4	NO 0		G 0	D 0	3 0
E2 0	P 0	I 0		4 16	E 0		U 0	E 0	
H1 0	OT 0	OT 0	$\bar{X} = 0.00$	OT 0		$\bar{X} = 0.00$	T 0	F 0	
H2 0		O 0	$\bar{X} = 3.80$				OT 0		$\bar{X} = 0.00$
MI 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

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

GENERAL REMARKS

FINS: good

GONADS:

SKIN: descaling

OTHER:

Submitted by:

Donald E. McPherson
Fish Hatchery Manager III

Douglas Munson
Fish Pathologist

Approved by:



Al Van Vooren, Acting Chief
Bureau of Fisheries



Tom Rogers
Fish Hatcheries Supervisor