

D R A F T

STATE OF IDAHO
Fish and Game Department
John R. Woodworth, Director

Annual Project Report
U. S. BUREAU OF COMMERCIAL FISHERIES
DOWNSTREAM MIGRANT MARKING PROGRAM
SALMON RIVER DRAINAGE
January 1, 1966 to December 31, 1966

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INTRODUCTION

During 1966, the Idaho Fish & Game Department conducted a downstream migrant marking program under contract to the U.S. Bureau of Commercial Fisheries.

Juvenile chinook salmon and steelhead trout were collected in traps during their downstream migrations and marked with a thermal brand. Marked fish were returned to the streams above the traps for mark and recovery population estimates.

Fish were collected on the Lemhi River, the main Salmon River near the town of Salmon, the Pahsimeroi River, the East Fork of the Salmon River, and Marsh Creek, a tributary of the Middle Fork of the Salmon River (Figure 1).

Marked salmonids smolts recaptured by the B.C.F. at Ice Harbor Dam, McNary Dam, the Dalles Dam, and Bonneville Dam are being used in evaluation studies of migration timing, behavior, survival, and population estimates and B.C.F. will prepare reports on this phase of the study.

MARKING PROCEDURE

Both chinook salmon and steelhead smolts were marked with a thermal brand. The fish were first anesthetised in an MS222 solution to facilitate handling and prevent injury.

The thermal marking tool is a miniature branding iron. The applicator end of the tool is made of silver to facilitate heat transmission from the tool to the epidermis of the fish. The handle of the tool is a copper rod enclosed in protective plastic tubing. The tool is immersed in actively boiling water and allowed to heat up for a few seconds then excess water is shaken from the tip to prevent smearing of the mark. The end of the branding tool is then applied evenly for approximately one-and-one half seconds with gentle pressure, to the desired location on the side of the fish, above the lateral line.

The mark, when first applied, is not distinct and appears as a shiny figure. After a few hours the mark will darken and in a day or so becomes very discernable. Almost any design, letter, or numeral can be used as a mark. However, it has been observed that on small closed figures such as a small "e" the smaller openings tend to darken and fill in and become less easily recognized. A small "e" for example

t fill in to appear as a small "o". More success has been realized by using er
open letters or figures such as "T", "F", etc.

TRAPPING METHODS

Downstream migrants were collected in five locations in the Salmon River
basin. The traps on the main Salmon River (S-14 trap), the Pahsimeroi River (3
trap), and the East Fork of the Salmon River (E.Fk.#2 trap), consist of a
cylindrical perforated metal box with a removable lid placed at the end of a
fish screen bypass pipe. Downstream migrants entering the screened ditch are
driven into the bypass pipe and into the trap box. The boxes average approxi-
mately 2 feet wide by 4 feet long. The bypass pipe extends into the box approxi-
mately its length to provide the captured fish a resting area away from high water cities.

On Marsh Creek, a weir and series of inclined screen traps capture 99 to 100 percent
of all downstream migrants during low flows. An upstream fish ladder allows
returning migrant adult salmon and steelhead to negotiate the weir. The ladder is
designed to allow upstream movement but prevent downstream chinook and steelhead
entering.

On the Lemhi River two types of trapping systems were used. Smolts were
collected in a bypass pipe box as described above. Smolts were also collected in
a louver facility located approximately 33 miles upstream from the mouth of the
river. Estimates of downstream migrant chinook and steelhead populations were made
at this louver facility. Earlier intensive studies have indicated that the louver
consistently captures 3.3% of the chinook smolts and 20.0% of the steelhead
is moving past it.

ESTIMATION OF MIGRANTS

Lemhi River

From January through December 1966, 6,120 chinook salmon and 1,391 steelhead

smolts were marked at L-43 screen trap and the louver trap on days the traps operated (Table 1). If the trap had been operated every day an estimated 9,397 chinook and 1,885 steelhead would have been collected. Using a proportion extension formula for recaptures, an estimated 284,800 chinook juveniles and 9,400 steelhead juveniles migrated downstream past the louver facilities during the year.

Brood-year 1964 chinook salmon were collected at the trapping systems from January 1966 to the middle of June. Brood-year 1965 chinook smolts were collected from early February through December, 1966. During this period size range of the 1965 brood-year chinook ranged from 30 millimeters fork length in February to 105 millimeters in December (Table 6).

Salmon River (S-14)

From February 16 to December 15, 1966, 5,089 chinook salmon smolts and 74 steelhead smolts were marked at S-14 trap during the period the trap was operated (Table 2). If the trap had been operated every day an estimated 11,016 chinook and 141 steelhead smolts would have been collected. Using a proportion extension formula for recaptures, an estimated 1,572,000 chinook salmon juveniles migrated down the Salmon River past S-14 trap during the year.

No steelhead were recaptured at S-14 trap so no estimates can be made on total steelhead out-migrants. It appears that steelhead migrants avoid the slower water in the wing dam channels and do not readily enter the channels and trapping facilities.

Pahsimeroi River (P2&3)

From January through December 15, 1966, 3,441 chinook salmon and 473 steelhead smolts were marked at P2&3 trap on the Pahsimeroi River on the days the trap operated. If the trap had been operated every day an estimated 3,963 chinook salmon smolts and 544 steelhead smolts would have been collected. Using a proportion extension formula for recaptures, an estimated 150,000 chinook salmon juveniles and 20,500 steelhead smolts migrated down the Pahsimeroi River past P2&3 trap during the year.

Brood-year 1964 chinook salmon were collected at the trapping system from January 1966 to the middle of June. Brood-year 1965 chinook smolts were collected

from early February through December, 1966. During this period size range of 1965 brood-year chinook ranged from 30 millimeters fork length in February to 105 millimeters in December (Table 6).

East Fork of the Salmon River (E,Fk.#2)

From March through November, 1966, 15,440 chinook and 311 steelhead smolts were marked at E.Fk.#2 trap (Table 4). Had the trap been operated every day an estimated 20,034 chinook salmon smolts and 358 steelhead smolts would have been collected. Using a proportion extension formula for recaptures, an estimated 396,000 chinook salmon and 11,100 steelhead juveniles migrated down the East Fork of the Salmon River during the year.

Brood-year 1965 chinook salmon were collected at the East Fork trap from mid-April through December, 1966 (Table 6). Emergence of chinook fry occurs later on the East Fork of the Salmon River than on the Lemhi and Pahsimeroi Rivers because of the difference in water temperatures of these streams. The spring-fed Lemhi and Pahsimeroi Rivers are warmer during the winter months than the snow-fed East Fork of the Salmon.

Marsh Creek Weir

In July, 1966, a wooden weir structure was installed across Marsh Creek, just above its confluence with Cape Horn Creek. Dam boards and five inclined screen traps were fitted into the weir structure. An upstream migrant ladder was incorporated into the weir. The ladder was screened to prevent downstream migrants from passing through the ladder but allow upstream fish to pass over the weir structure. This trapping system collects 99 to 100 percent of all downstream migrants moving past the weir.

The Marsh Creek trapping system was put into operation July 26, 1966. From that date to November 9, 1966, the traps collected 25,573 chinook salmon and 642 steelhead trout juveniles. Converting to catch-per-day and expanding the number of captured fish to include missed days of operation indicates that 40,519 chinook and 742 steelhead passed the weir system between the above dates_

All the chinook salmon observed were young-of-the-year, 1965 brood-year fish. No 1+ salmon smolts were observed. The size of these fish ranged from 55 millimeters fork length in July to 85 millimeters in November (Table 6). Plans are to operate the Marsh Creek trapping facilities in the spring of 1967[^] To collectg 1965 brood-year salmon that may migrate at that time.

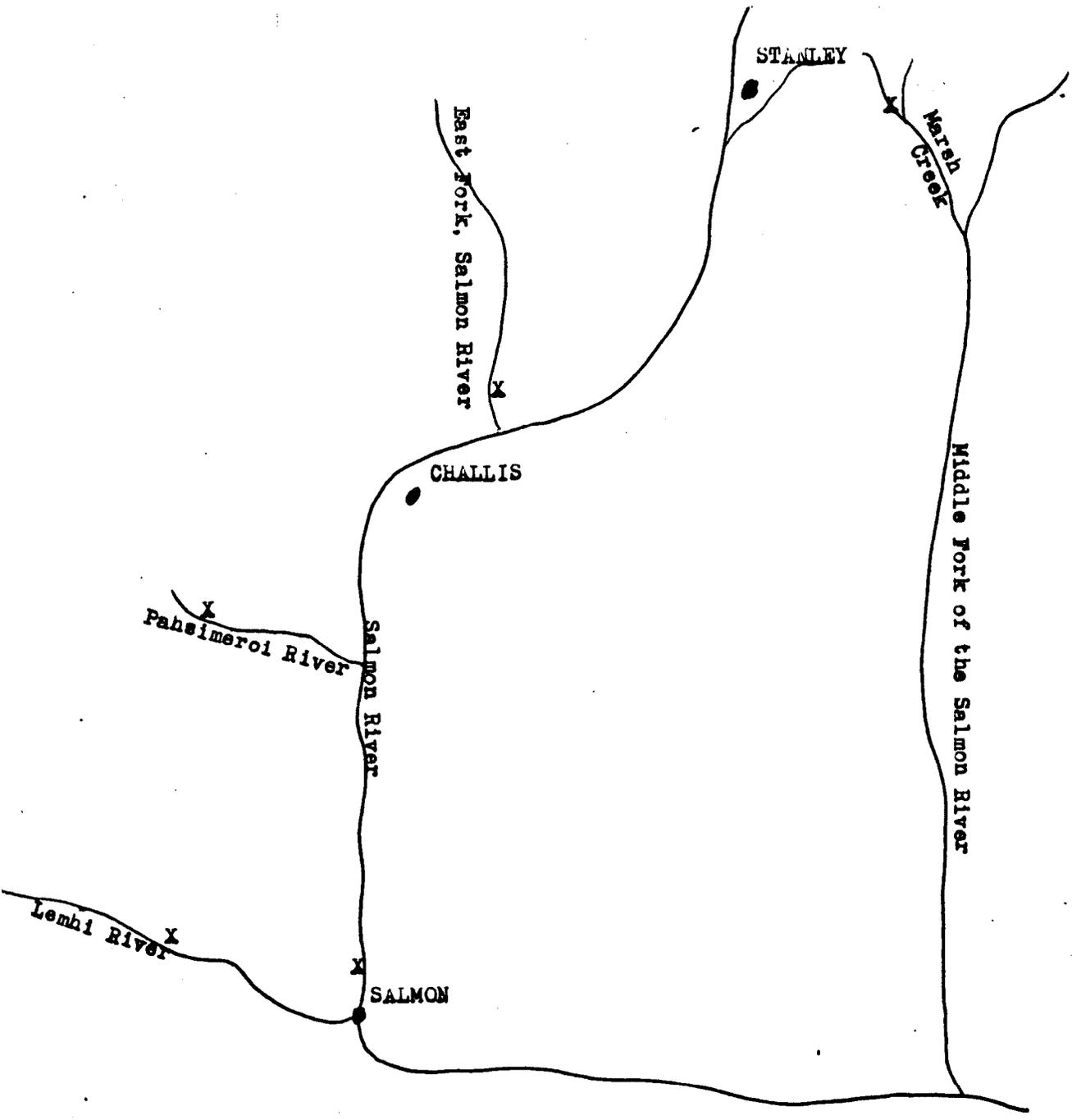


Figure 1 . Relative locations of downstream migrant trapping facilities in the Salmon River drainage. The "X" marks the general position of each trapping system. Bureau of Commercial Fisheries downstream migrant marking program, 1966.

Table 1. . Numbers of juvenile chinook salmon and steelhead collected and marked at the louver trapping facilities and L-43 trap on the Lemhi River and estimates of downstream migrants passing the louver facilities based on these 1 data. January through December, 1966.

MONTH	SAMPLE DAYS	CHINOOK MARKED	STEELHEAD MARKED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATED STEELHEAD MIGRANTS
JAN.	14	259	0	572	0	17,30 ^{1/2}	0 ^{1/2}
FEB	14	437	2	874	4	26,500	20
MAR.	20	1,414	39	2,192	60	66,400	300
APR.	22	613	116	834	158	25,300	600
MAY	22	759	511	1,070	721	32,400	3,600
JUNE	28	53	134	57	143	1,700	700
JULY	31	56	30	56	30	1,700	150
AUG.	31	273	117	273	117	8,300	580
SEPT.	22	512	209	696	284	21,100	1,400
Dec	21	740	134	1,095	198	33,200	1,000
NOV.	19	816	72	1,289	114	39,100	570
DEC.	15	188	27	389	56	11,800	280
TOTALS	259	6,120	1,391	9,397	1,885	284,800	9,400

^{1/2}Recapture rates for estimating chinook and steelhead migrants were established from previous intensive studies as 3.3% for chinook migrants and 20.0% for steelhead migrants.

Table 2 . Numbers of juvenile chinook salmon and steelhead collected and marked at S-14 trap-on the main Salmon River and estimates based on these data. February 16, through December 15, 1966.

MONTH	SAMPLE DAYS	MARK	CHINOOK MARKED	STEELHEAD MARKED	CHINOOK RECAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATED STEELHEAD MIGRANTS
FEB. (16-28)	6	LA S	779	0	12	0	1,690	0	240,000	
MAR.	15%	LA S	1,073	0	21	0	2,232	0	319,000	
APR.	11	LP S	747	5	4	0	2,040	13	291,000	
MAY	17	LP O	306	51	4	0	558	93	80,000	
SEPT.	16	RA S	23	0	0	0	42	0	6,000	
	16	RP S	227	11	0	0	434	21	62,000	
NOV.	15	RA ^(/)	1,098	6	0	0	2,190	12	313,000	
DEC. (1-15)	7	RP (/)	834	1	0	0	1,830	2	261,000	
	103		5,089	74	41	0	11,016	141	1,572,000	

Table 3 . Numbers of juvenile chinook salmon and steelhead collected and marked at P2&3 trap on the Pahsimeroi River and estimates based on these data. January 1, through December 6, 1966.

MONTH	SAMPLE DAYS	MARK	CHINOOK MARKED	STEELHEAD MARKED	CHINOOK A CAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL-	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMAT STEELHEAD MIGRANTS
JANUARY	17	LA =	104	30	2	o	186	55	7,000	2,000
FEBRUARY	27	LA=	131	4	5	0	149	4	6,000	200
MARCH	30	LA “	248	4	3	0	254	4	10,000	200
AP11HL	25	LP “	325	133	6	5	1+03	159	15,000	6,000
MAY	31	LP =	172	162	6	4	219	162	8,000	6,000
JUNI	27	LD “	599	<i>j8</i>	<i>jj</i>	2	682	42	26,000	1,600
JULY	31	LD =	109	5	0	0	109	5	4,000	200
AUGUST	31	RD “	91	18	0	0	91	18	3,000	700
SEPTEMBER	28	RA=	157	41	0	1	174	45	7,000	1,700
OCTOBER	j0	HP=	515	1.0	12	0	527	10	20,000	400
093BE11	30	RA “	869	9	20	0	869	9	33,000	400
DECEMBER (1-15)	6	MP“	121	19	3	0	300	31	11,000	1,100
TOTALS	313		3441	473	90	12	39963	544	150,00	20,500

Table 4 . Numbers of juvenile chinook salmon and steelhead collected and marked at \$.Fk.#2 trap on the East Fork of the Salmon River and estimates based gn these data. March 1, through November 26, 19660

MONTH	SAMPLE DAYS	MARK	CHINOOK` MARKED	STEELHEAD MARKED	CHINOOK RECAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATO STEELHE; MIGRANT6
MAR.	15	LA F	1,171	4	55	0	2,418	8	48,300	250
APR:	30	LP F	4,035	61	171	3	4,035	61	80,100	2,000
MAY	28	LA “	933	100	13	2	1,023	111	20,400	3,500
JUNE	30	LP “	150	5	4	0	150	5	3,000	150
JULY	29	RD F	177	19	2	0	186	20	3,700	600
AUG:	31	RD-“	331	50	13	4	331	50	6,600	1,500
SEPT.	17	RA F	380	32	9	1	660	56	13,200	1,700
OCT.	28	RP F	5,353	31	326	0	5,921	34	118,400	1,000
NOV. (1-26)	23	RA “	4,081	9	190	0	5,310	12	106,200	400
TOTALS	231		15,440	311	783	10	20,034	358	396,800	11,100

Table 5 . Numbers of juvenile chinook salmon and steelhead collected and marked at the Marsh Creek weir and trap. July 24, through November 9, 1966.

MONTH	SAMPLE DAYS	MARK	MARKED CHINOOK	UNMARKED CHINOOK	TOTAL CHINOOK	MARKED STEELHEAD	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL
JULY (16-31)	8		0	4,330	4,330	17	16,771	36
AUGUST	25		0	8,968	8,968	172	11,129	211
SEPTEMBER	24	RA	890	56	946	66	1,170	108
OCTOBER	31	RP	9,952	2,202	11,254	387	11,254	387
NOVEMBER (1-15)	6	RA	75	0	75	0	195	0
TOTALS	94		10,017	15,556	25,573	642	40,519	742

Table 6. Brood-years and length frequencies of juvenile chinook salmon collected at downstream migrant traps located in the Salmon River drainage during 1966.

MONTH	5-14 TRAP BROOD-YEAR	P2&3 TRAP BROOD-YEAR	E.Fk.#2 TRAP BROOD-YEAR	MARSH CR. BROOD-YEAR	LEMHI BROOD-YEAR
JAN.		85-95mm. 1964			90-100 1964
FEB.	80=90mm. 1964	30 ⁸⁵⁻ - ⁹⁵ 40 1964			30-40 1964
MAR.	85-95 1964	90-100 1964			95-105 1964
APR.	90-100 1964	35-45 1965	75-85mm. 1964		35-45 1965
MAY	95-105 1964	95-105 1964	80-90 1964		100- 1964
JUNE		45-55 1965	30-40 1965		35-45 1965
JULY		105-115 1964	100-110 1964		105- 1964
AUG.		55-65 1965	35-45 1965		115 1965
SEPT.	85-95 1965	105-115 1964	90-100 1964		110- 1964
OCT.	90-100 1965	70-80 1965	40-50 1965		55-65 1965
NOV.	90-100 1965	75-85 1965	70-80 1964		70-80 1965
DEC.	95-105 1965	80-90 1965	45-55 1965	55-65mm. 1965	80-90 1965
		90-100 1965	60-70 1965	65-75 1965	90-100 1965
		95-105 1965	70-80 1965	75-85 1965	90-100 1965
		95-105 1965	75-85 1965	75-85 1965	95-105 1965
					95-105 1965

S-14 TRAP - approximately five miles upstream from the town of Salmon, Idaho, on the main Salmon River.

P2&3 TRAP - on the Pahsimeroi River near Burstedt Lane, approximately two miles above the river mouth.

E.Fk.#2 TRAP - on the East Fork of the Salmon River, approximately three miles above the river mouth.

MARSR CREEK - weir and trap system located on Marsh Creek 1/8 mile above its confluence with Capehorn Creek. %_W.A.'L

LEMHI RIVER - weir and louver trap system on the Lemhi River, approximately 33 miles above the river mouth.

Table . Numbers of juvenile chinook salmon and steelhead collected and marked at P2&3 trap on the Pahsimeroi River and estimates based on these data. March through June, 1967.

CNTH	SAMPLE DAYS	MARK	CHINOOK MARKED	STEELHEAD MARKED	CHINOOK RECAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATED STEELHEAD MIGRANTS
MARCH	23	LA 11	175	40	3	0	235	53	11,200	2,100
APRIL	29	LA U	173	73	3	0	179	76	8,500	3,000
MAY	29	LA =	134	36	2	0	143	38	6,800	1,500
JUNE	30	LA = [478	10	12	0	178	10	22,700	400
TOTALS	111		960	159	20	0	1,035	177	49,200	7,800

Table . Numbers of juvenile chinook salmon and steelhead collected and marked at S-11i trap on the main Salmon River and estimates based on these data. February 15, through May 8, 1967.

MONTH	SAMPLE DAYS	MARK	CHINOOK MARKED	STEELHEAD MARKED	CHINOOK RECAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATED STEELHEAD MIGRANTS
FEB. (15-28)	7	LA S	87	1	0	0	150	2	60,000	-
MARCH	22	LA S	254	0	1	0	358	0	143,000	-
APRIL	28	LP S	542	5	1	0	580	5	232,000	-
MAY (1-8)	4	LA	315	0	1	0	730	0	292,000	-
TOTALS	61		1,198	6	3	0	1,818	7	727,000	-

.25%

Table . Numbers of juvenile chinook salmon and steelhead collected and marked at E.Fk.#2 trap on the East Fork of the Salmon River and estimates based on these data. March 22, through May 16, 1967.

MONTH	SAMPLE DAYS	MARK	CHINOOK MARKED	STEELHEAD MARKED	CHINOOK RECAPTURED	STEELHEAD RECAPTURED	EXPANDED CHINOOK TOTAL	EXPANDED STEELHEAD TOTAL	ESTIMATED CHINOOK MIGRANTS	ESTIMATED STEELHEAD MIGRANTS
MAR. (22-31)	10	LA ^W	822	9	17	0	857	9	13,200	280
APRIL	22	LP F	2,943	12	250	0	4,011	18	61,700	570
MAY (1-16)	16	LA F	2,738	146	195	0	2,763	146	42,500	4,600
TOTALS	48		6,503	167	462	0	7,631	173	117,400	5,450

7.1