MONITORING THE MIGRATIONS OF WILD SNAKE RIVER SPRING/SUMMER CHINOOK SALMON SMOLTS

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EXECUTIVE SUMMARY

We PIT tagged wild spring/summer chinook salmon parr in the Snake River Basin in 1993, and subsequently monitored these fish during their smolt migration through Lower Granite, Little Goose, Lower Monumental, and McNary Dams during spring, summer, and fall 1994. This report details our findings, which are summarized below.

1) We PIT tagged and released 8,065 wild chinook salmon parr in 15 streams in Idaho in July and August 1993.
2) The average overall observed mortality from collection, tagging, and 24-hour delayed mortality was 2.2%. No PIT tags were lost during the 24-hour delayed mortality tests.
3) In 1994, the overall adjusted percentage of released PIT-tagged fish subsequently detected at the four dams averaged 13.8% (range 6.6 to 28.5%, depending on stream of origin).
4) Fish that were larger at release were detected at a significantly higher rate the following spring and summer than their smaller cohorts ($P < 0.001$).
5) Wild fish outmigrating in April and May were significantly larger at release than fish outmigrating after May ($P < 0.0001$).
6) At Lower Monumental Dam in 1994, the 17 wild chinook salmon smolts weighed and measured grew an average of 37.6 mm in length and gained an average of 8.5 g in weight, over an average of 268.5 days.

7) In 1994, outmigration timing of wild spring/summer chinook salmon smolts at Lower Granite Dam was similar to 1992 and 1990, with peak passage in all 3 years in April; however, peak detections of fish from individual streams in 1994 occurred from late April to late May. In 1994, as well as in the previous 5 years, passage of wild fish at this dam was highly variable and generally independent of river flows before mid-May. In contrast, peak passage of wild fish after about mid-May tended to coincide well with periods of peak river flow in all years at this dam.

8) We have consistently observed a 2-week shift in timing of wild fish at Lower Granite Dam between relatively warm and relatively cold years. In the colder-than-normal years of 1989, 1991, and 1993, 50% of all wild fish passed the dam by mid-May, 'while 90% passed by mid-June (except 1993 when high flows moved 90% through the dam by the end of May). In the warmer-than-normal years of 1990, 1992, and 1994, 50% of all wild fish passed this dam from 29 April to 4 May, and 90% passed by the end of May.

9) Diel timing patterns of wild chinook salmon smolts exiting from the fish and debris separators varied among the dams. At Lower Granite and Lower Monumental Dams, significantly more wild fish exited the separators during nighttime hours (1800-0600 h), than exited during the day (0600-1800 h). At both Little Goose and McNary Dams, significantly more wild fish exited the separators during daytime hours than exited at night.

INTRODUCTION

Project Goals

The goals of this study are to 1) characterize the outmigration timing of different wild stocks of spring/summer chinook salmon smolts at dams on the Snake and Columbia Rivers, 2) determine if consistent patterns are apparent, and 3) determine what environmental factors influence outmigration timing.

Background

The National Marine Fisheries Service (NMFS) began a cooperative study with the U.S. Army Corps of Engineers (COE) in 1988 to Passive Integrated Transponder (PIT) tag wild Snake River spring and summer chinook salmon parr for transportation research. This project continued through mid-1991, with outmigrating smolts monitored during spring and summer 1989-1991 as they passed Lower Granite, Little Goose, and McNary Dams (Matthews et al. 1990, 1992; Achord et al. 1992). Information from this study demonstrated that the timing of various wild stocks through Lower Granite Dam differed among streams of origin and also differed from patterns for hatchery-reared fish. Generally, the outmigrations of wild spring chinook salmon were later and more protracted than those of their hatchery-reared counterparts, and they also exhibited variable timing patterns over the 3 years. Conve-rsely, the outmigrations of wild summer chinook salmon were earlier and more protracted than those of their hatchery counterparts.

The present study began with the 1992 outmigration of wild chinook salmon smolts (Achord et al. 1994). Warmer-than-normal weather and higher-than-normal water temperatures in late winter and spring appeared to elicit an early outmigration timing for all wild smolts in 1992. The outmigration timing of wild spring chinook salmon smolts was earlier than for the previous 3 years. Also, most wild summer chinook salmon smolts outmigrated earlier than wild spring chinook salmon smolts. 'However, as was observed during previous years, all wild stocks exhibited protracted and variable outmigration timing at Lower Granite Dam.

In 1993, cooler-than-normal weather and low water temperatures from late winter to early summer appeared to elicit a late outmigration timing; however, high flows during the third week of May moved a large portion of wild spring/summer chinook salmon through the dams (Achord et al. 1995). As observed in previous years, wild stocks also exhibited variable outmigration timing at Lower Granite Dam; however, the middle 80% passage time of wild fish at the dam was compressed compared with earlier years.

Prior to 1992, decisions on dam operations and use of stored water relied on recoveries of branded hatchery fish, index counts at traps and dams, and flow patterns at the dams. In 1992, a more complete approach integrated PIT-tag detections of several wild spring and summer chinook salmon stocks at Lower Granite Dam. Our research on wild fish has initiated a data base which addresses several goals of the Columbia River Basin Fish and

Wildlife Program of the Pacific Northwest Electric Power Planning Council and Conservation Act (1980). Section 304(d) of the program states: "The monitoring program will provide information on the migrational characteristics of the various stocks of salmon and steelhead within the Columbia Basin." Further, Section 201(b) urges conservation of genetic diversity. This will only be possible if wild stocks are preserved. The advent of PIT-tag technology has provided the opportunity to precisely track the smolt migrations of many stocks as they pass through the hydroelectric complex on their way to the ocean.

This report provides information on PIT tagging of wild chinook salmon parr in 1993, and the subsequent monitoring of these fish as they migrated as smolts through Lower Granite, Little Goose, Lower Monumental, and McNary Dams during 1994.

FISH COLLECTION AND TAGGING

In 1992, Oregon Department of Fish and Wildlife (ODFW) began PIT tagging wild chinook salmon parr in the Grande Ronde and Imnaha River drainages in northeast Oregon. All tagging, detection, and timing information for fish from these streams in 1993-1994 will be reported by ODFW. However, with ODFW's concurrence, NMFS will continue to report the timing at Lower Granite Dam of fish from those streams in Oregon where we PIT tagged wild chinook salmon from 1988-1991.

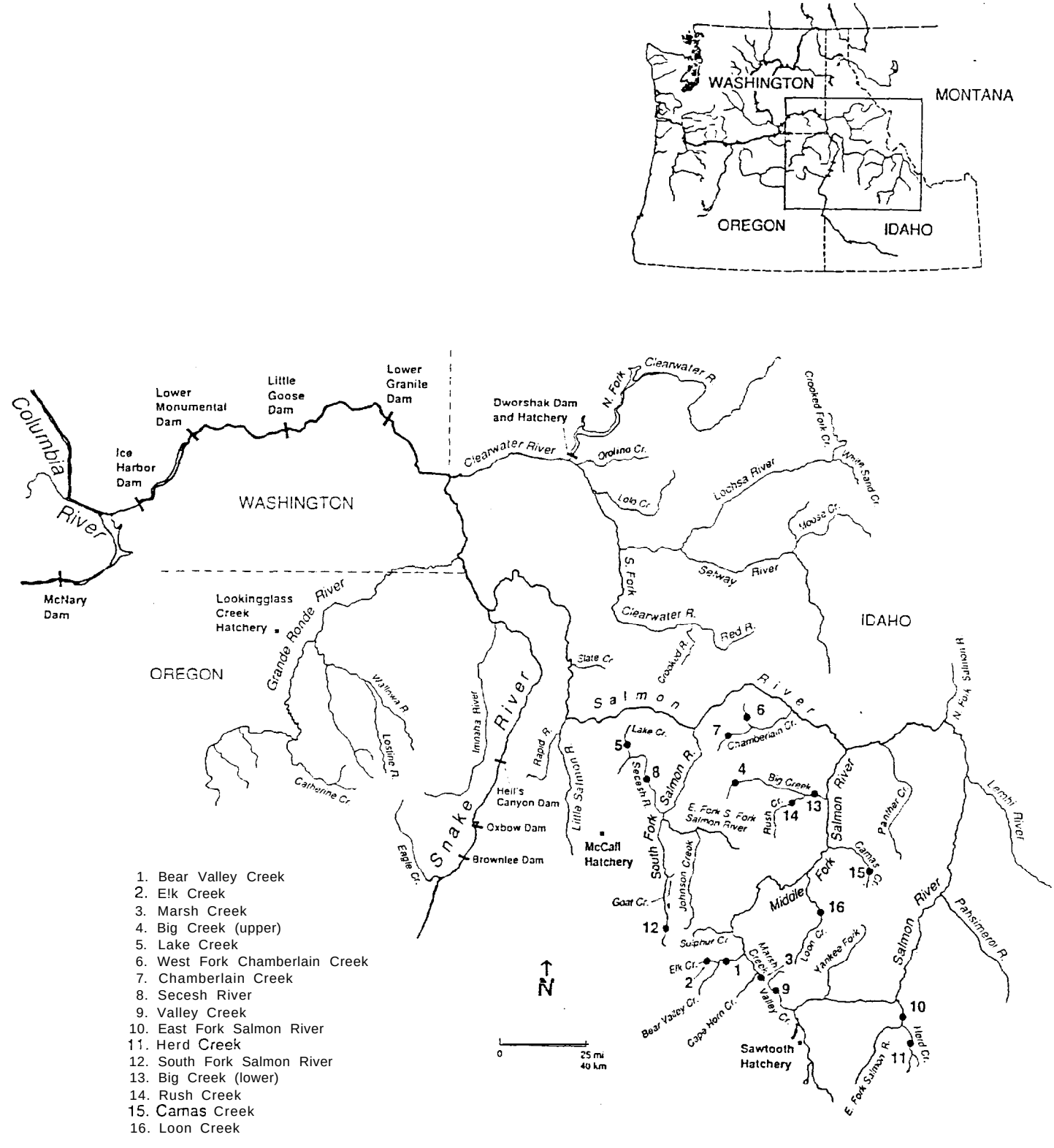
We collected and PIT tagged wild chinook salmon parr from various reaches of each target stream during July and August 1993

(Fig. 1). Our primary objective was to collect parr in these streams quickly and with minimal impact to the fish. Areas of high parr concentrations were located by snorkeling in advance of collection. Thus, we concentrated our collection and marking efforts in areas within each stream where parr abundance was highest. During summer 1993, no fish were tagged in Cape Horn and Sulphur Creeks because chinook salmon parr were not observed in these streams during snorkeling.

Collection and PIT-tagging procedures described by Matthews et al. (1990) and Achord et al. (1994, 1995) were used for our field work in 1993, with the exception that tagged fish were held in live cages overnight if the daytime water temperatures reached 16°C at tagging.

From 28 July to 25 August 1993, we collected 9,503 wild chinook salmon parr in Idaho over a distance of about 71 stream kilometers (Table 1 and Appendix Table 1). Of these, 8,065 fish were PIT tagged and released back into the streams. Numbers tagged and released per stream ranged from 10 in Rush Creek to 998 in Elk Creek. Fork lengths of tagged and released wild fish ranged from 47 to 132 mm (mean 66 mm). Weights ranged from 1.2 to 22.2 g (mean 3.9 g).

Table 2 provides a summary of species other than chinook salmon observed during electrofishing or seining operations. The most abundant of these was steelhead parr of various age classes. We caution that the numbers of fish in Table 2 do not represent abundance of all other fish in the areas of collection.



1. Bear Valley Creek
2. Elk Creek
3. Marsh Creek
4. Big Creek (upper)
5. Lake Creek
6. West Fork Chamberlain Creek
7. Chamberlain Creek
8. Secesh River
9. Valley Creek
10. East Fork Salmon River
11. Herd Creek
12. South Fork Salmon River
13. Big Creek (lower)
14. Rush Creek
15. Camas Creek
16. Loon Creek

Figure 1. Study area where wild spring/summer chinook salmon parr were PIT tagged during summer 1993.

Table 1. Summary of wild chinook salmon parr collected, PIT tagged and released; average fork lengths and weights; and approximate distances covered in streams of Idaho, summer 1993.

Tagging location	Number collected	Number tagged and released	Average length of tagged fish (mm)	Average weight of tagged fish (g)	Kilometers covered in streams
Bear Valley Creek	a75	856	63	3.7	9
Elk Creek	1,019	998	64	4.5	8
Marsh Creek	990	960	69	4.6	3
Valley Creek	892	855	67	4.2	8
E. Fork Salmon River	928	883	72	5.3	7
Herd Creek	124	119	74	5.6	5
S. Fork Salmon River	1,919	806	59	2.9	4
Big Creek (upper)	559	535	64	3.4	5
W. Fork Chamberlain Creek	518	496	68	---	1
Chamberlain Creek	76	76	64	---	1
Camas Creek	233	215	64	---	4
Loon Creek	438	396	64	3.6	3
Big Creek (lower)	193	186	70	4.3	4
Rush Creek	11	10	68	4.2	2
Lake Creek	265	252	62	3.1	3
Secesh River	463	422	60	2.8	4
Totals or averages	9,503	8,065	66	3.9	71

Table 2. Summary of species other than chinook salmon observed during collection operations in various Idaho streams, July and August 1993.

Stream	Steel-head	Brook trout	White-fish	Cut-throat trout	Bull trout	Sculpin	Dace	Sucker
Bear Valley Creek	497	276	38	0	5	299	23	0
Elk Creek	372	564	144	0	1	300	14	0
Marsh Creek	223	273	0	0	0	522	0	0
Valley Creek	383	246	61	0	0	1,091	364	0
Camas Creek	1,068	4	7	0	0	0	0	0
Loon Creek	546	0	1	0	3	391	0	0
Herd Creek	276	0	5	0	0	194	0	0
E. Fork Salmon River	1,131	0	23	0	0	598	0	0
S. Fork Salmon River	730	4	7	0	1	409	81	0
Big Creek (upper)	503	364	1	0	1	952	1	0
Big Creek (lower)	663	0	2	7	0	184	75	25
Rush Creek	177	0	0	0	0	84	6	0
W. Fork Chamberlain Creek	383	0	14	0	10	28	0	0
Chamberlain Creek	356	0	1	0	4	266	0	0
Secesh River	377	44	5	0	1	551	156	0
Lake Creek	64	68	3	0	0	142	10	0
Totals	7,749	1,843	312	7	26	6,011	730	25

Mortality associated with collection and tagging procedures was low, and 24-hour tag loss was 0% (Table 3 and Appendix Table 2). Average collection mortality was 2.0%, average tagging mortality was 0.1%, and average 24-hour delayed mortality was 0.3%. The average overall observed mortality was 2.2%.

DETECTIONS AT DAMS

During spring, summer, and fall 1994, surviving chinook salmon PIT tagged for this study migrated volitionally downstream through the hydroelectric complex on the Snake and Columbia Rivers. Of the eight dams the smolts passed, four were equipped with complete smolt collection and PIT-tag monitoring systems: Lower Granite, Little Goose, and Lower Monumental Dams on the Snake River, and McNary Dam on the Columbia River (Fig. 1).

At the collection dams, all smdlts guided away from the turbine intakes and into the juvenile bypass systems were electronically interrogated for PIT tags as they passed through the distribution flumes downstream from the outlet orifices of the fish and debris separators. The PIT-tag monitor systems were the same as those described by Prentice et al. (1990). Dates and times to the nearest second were recorded on a computer as PIT-tagged fish passed through the numbered detector coils in the fish distribution flumes. All detection data were transferred once each day to the mainframe computer operated by the Pacific States Marine Fisheries Commission in Portland, Oregon.

Table 3. Mortality and tag loss for wild chinook salmon parr collected and PIT tagged in Idaho, summer 1993.

Tagging location	Mortality (%)				24-hour tag loss (%)
	Collection	Tagging	24-hour	Overall	
Bear Valley Creek	0.8	0.2	0.6	1.3	0.0
Elk Creek	1.8	0.1	0.0	1.9	0.0
Marsh Creek	1.0	0.2	0.6	1.8	0.0
Valley Creek	3.5	0.0	0.0	3.5	0.0
E. Fork Salmon River	4.0	0.2	0.0	4.2	0.0
Herd Creek	4.0	0.0	---	4.0	
S. Fork Salmon River	1.0	0.4	0.0	1.1	0.0
Big Creek (upper)	1.6	0.0	0.0	1.6	0.0
W. Fork Chamberlain Creek	0.0	0.0	4.0	0.8	0.0
Chamberlain Creek	0.0	0.0	---	0.0	
Camas Creek	3.0	0.0	---	3.0	---
Loon Creek	6.2	0.0	0.0	6.2	0.0
Big Creek (lower)	3.1	0.5	0.0	3.6	0.0
Rush Creek	9.1	0.0	---	9.1	---
Lake Creek	0.4	0.0	---	0.4	
Secesh River	1.3	0.0	0.0	1.3	0.0
Averages	2.0	0.1	0.3	2.2	0.0

Since the PIT-tag detection/diversion systems were operational at Lower Granite, Little Goose, and Lower Monumental Dams throughout the outmigration season, most PIT-tagged fish were diverted back to the river below these dams. Therefore, to accurately portray timing at the dams for the various wild stocks of fish, we used first-time detections at each dam and adjusted these daily detections for spill. The equation used to adjust the daily detections for individual streams and combined populations at each dam was:

$$\frac{\text{number detected}}{\text{average daily powerhouse flow}} = \frac{x}{\text{average daily flow spilled}}$$

with x rounded to the nearest whole number and added to the number detected to produce an adjusted number of PIT-tagged fish passing each dam daily for individual or combined populations[1].

From 16 April to 1 October 1994, a total of 1,117 (adjusted) fish PIT tagged in Idaho were detected at the 4 dams (Table 4 and Appendix Tables 3-18). The overall percentage of first-time detections at the four collector dams was 13.8%, with averages of 7.7, 3.3, 1.5, and 1.2% detected at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. The proportions of total fish detected at the four dams were 55.9, 24.1, 11.2, and 8.8% for Lower Granite, Little Goose, Lower Monumental, and

[1] Due to rounding, total adjusted numbers for daily detections of fish from combined streams in Appendix Tables 20-23 will not add up to the total adjusted detections for individual streams in Table 4.

Table 4. Summary of first-time detections and detections adjusted for spill of PIT-tagged wild spring/summer chinook salmon smolts from Idaho at four dams in spring, summer, and fall 1994. See Table 1 for numbers released.

Stream	Detections											
	Lower Granite Dam			Little Goose Dam			Lower Monumental Dam			McNary Dam		
	Unadjusted	Adjusted N	Adjusted %	Unadjusted	Adjusted N	Adjusted %	Unadjusted	Adjusted N	Adjusted %	Unadjusted	Adjusted N	Adjusted %
Bear Valley Creek	84	95	11.1	42	52	6.1	13	13	1.5	11	11	1.3
Elk Creek	74	84	8.4	29	37	3.7	12	12	1.2	9	9	0.9
Marsh Creek	75	83	8.6	25	31	3.2	14	15	1.6	22	25	2.6
Valley Creek	45	51	6.0	15	18	2.1	18	19	2.2	8	8	0.9
E. Fork Salmon River	45	47	5.3	20	25	2.8	18	18	2.0	5	5	0.6
Herd Creek	4	4	3.4	0	0	0.0	3	3	2.5	1	1	0.8
S. Fork Salmon River	40	48	6.0	22	28	3.5	11	12	1.5	5	5	0.6
Big Creek (upper)	21	24	4.5	12	14	2.6	7	7	1.3	2	2	0.4
W. Fork Chamberlain Creek	31	32	6.5	5	7	1.4	6	6	1.2	3	3	0.6
Chamberlain Creek	1	1	1.3	1	1	1.3	0	0	0.0	3	3	3.9
Camas Creek	20	25	11.6	6	7	3.3	6	6	2.8	6	6	2.8
Loon Creek	37	45	11.4	24	28	7.1	6	6	1.5	11	11	2.8
Big Creek (lower)	33	34	18.3	6	7	3.8	7	7	3.8	5	5	2.7
Rush Creek	1	1	10.0	1	1	10.0	0	0	0.0	0	0	0.0
Lake Creek	17	19	7.5	3	3	1.2	0	0	0.0	2	2	0.8
Secesh River	32	32	7.6	8	10	2.4	1	1	0.2	2	2	0.5
Totals or averages	560	625	7.7	219	269	3.3	122	125	1.5	95	98	1.2

McNary Dams, respectively. The overall detection rates at the four dams varied by stream of origin (Figure 2 and Table 4), ranging from 6.6% of the Chamberlain Creek fish to 28.5% of the Big Creek (lower) fish.

To ascertain how water temperature may have affected study fish during tagging, we examined the differences in combined detection rates at dams the following spring for various groups (Appendix Table 19). The detection rate (unadjusted) of groups from all streams when tagging began with water temperatures 13°C or greater was 17.2%. When tagging began at temperatures less than 13°C, the detection rate was 11.4%. A two-sample Z-test showed a significant difference between these percentages ($P < 0.0001$).

We also analyzed the detection rates on fish from groups released at different water temperatures. The detection rate of groups released when water temperatures were 13°C or greater was 13.6%. When water temperatures were less than 13°C, the detection rate was significantly lower at 11.7% ($P < 0.0001$).

When we added tagging and release water temperatures, we found the detection rate for groups tagged and released with additive water temperatures of 25°C or greater was 14.3%. With additive water temperatures less than 25°C, the detection rate was 11.3%. This difference was statistically significant ($P < 0.0001$).

Data from 1992 and 1993 indicated that fish released when water temperatures were 16°C or greater were detected the next

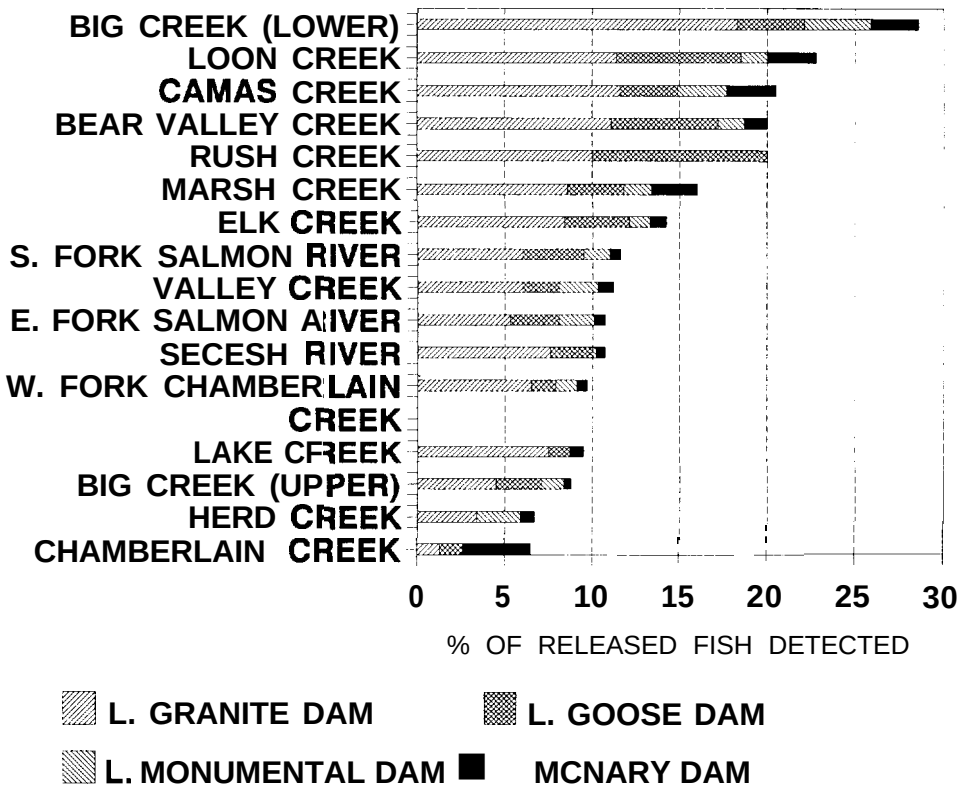


Figure 2. Percentage (adjusted for spill) of PIT-tagged wild spring/summer chinook salmon smolts detected at Lower Granite, Little Goose, Lower Monumental, and McNary Dams in 1994.

year at lower rates than when released at lower temperatures. In 1993, we held the fish overnight in live cages in the stream if the daytime water temperature reached 16°C at tagging. In 1994, we found that these fish were detected at a higher rate (13.3%) at the dams than fish that were not held overnight (12.0%), but the difference was not statistically significant.

At release, the average fork length for all fish was 66 mm. However, for fish detected the following spring at the dams, the average fork length at release was 67 mm. A chi-square comparison of the length distributions showed these lengths were significantly different ($P < 0.0004$). Figure 3 shows the relationship between length at release and eventual detection at the dams. Fish 59 mm or smaller were detected at a significantly lower rate than expected ($P < 0.0002$), whereas fish 65-69 mm were detected at a significantly higher rate than expected ($P < 0.005$).

We also found a significant difference in fork lengths at time of release between fish that migrated through the dams in April and May and fish that migrated after May ($P < 0.0001$). Fish migrating after May were on average 4 mm smaller when released than fish migrating before this time. These data suggest that fish size may be an important factor influencing outmigration timing or location where the fish overwinters with respect to proximity to the first dam.

During a portion of the migration season at Lower Monumental Dam, we tested the PIT-tag detection/diversion system. The

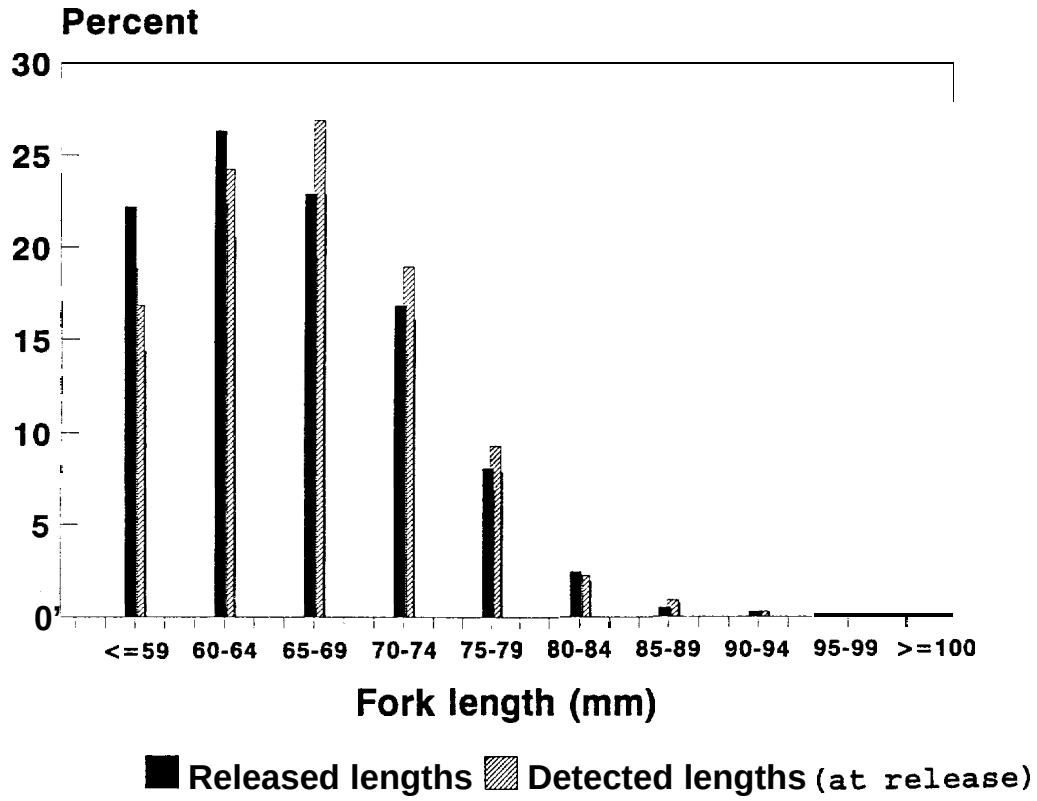


Figure 3. Percent, by fork length increments, of PIT-tagged wild spring/summer chinook salmon parr released in Idaho streams in 1993 and percent of fish detected for these length increments at Lower Granite, Little Goose, Lower Monumental, and McNary Dams in spring and summer 1994.

diverted fish were scanned for PIT tags, weighed, and measured. This allowed us to collect information on fork length and weight gains for wild fish from time of tagging and release until recovery at the dam (Table 5). The average gains in fork length and weight were 37.6 mm and 8.5 g, respectively, over an average of 268.5 days.

OUTMIGRATION TIMING AT DAMS

Migration timing at dams was calculated by totaling the adjusted number of detections in 3-day intervals and dividing by the total adjusted detections during the season. This method was applied to detection data for fish from individual and combined streams. Timing of smolt outmigrations from individual streams was calculated at Lower Granite Dam (Fig. 4), while outmigration timing for smolts from all Idaho streams combined was calculated at all four dams (Fig. 5).

Fish from lower Big/Rush Creeks in the Middle Fork of the Salmon River drainage, Secesh River and Lake Creek in the South Fork of the Salmon River drainage, East Fork Salmon River/Herd Creek in the upper Salmon River, West Fork Chamberlain/Chamberlain Creeks in the main Salmon River, and the Lostine River in Oregon had the earliest timings at Lower Granite Dam (Fig. 4 and Table 6). Over 50% of the fish from these streams passed the dam by 1 May. Peak passage dates for fish from these streams all occurred in late April (Appendix Tables 9-10, 13-18, and Fig. 4). Fish from lower Big/Rush Creeks had the

Table 5. Increases in length (mm) and weight (g) for wild spring/summer chinook salmon tagged in summer 1993 and recovered at Lower Monumental Dam in spring 1994.

Stream	Length increase			Weight increase			Average days
	N	Average	Range	N	Average	Range	
Big Creek (upper)	2	38.0	38.0-38.0		----	---------	268.5
Big Creek (lower)	1	52.0		1	13.1	---------	249.0
Bear Valley Creek	1	38.0			----	---------	285.0
Camas Creek	1	43.0	---------				270.0
Elk Creek	2	30.0	23.0-37.0				295.0
E. Fork Salmon River	2	39.0	33.0-45.0		----	---------	266.5
Lake Creek	2	43.5	37.0-50.0	2	7.9	7.0-8.8	249.5
Secesh River	2	43.5	40.0-47.0	1	9.4	---------	253.5
S. Fork Salmon River	1	26.0	---------	1	4.4	---------	280.0
Valley Creek	2	40.0	29.0-51.0	2	8.3	4.4-12.1	276.0
W. Fork Chamberlain Creek	1	51.0	---------		----	---------	262.0
Totals or averages	17	37.6	23.0-52.0	7	8.5	4.4-13.1	268.5

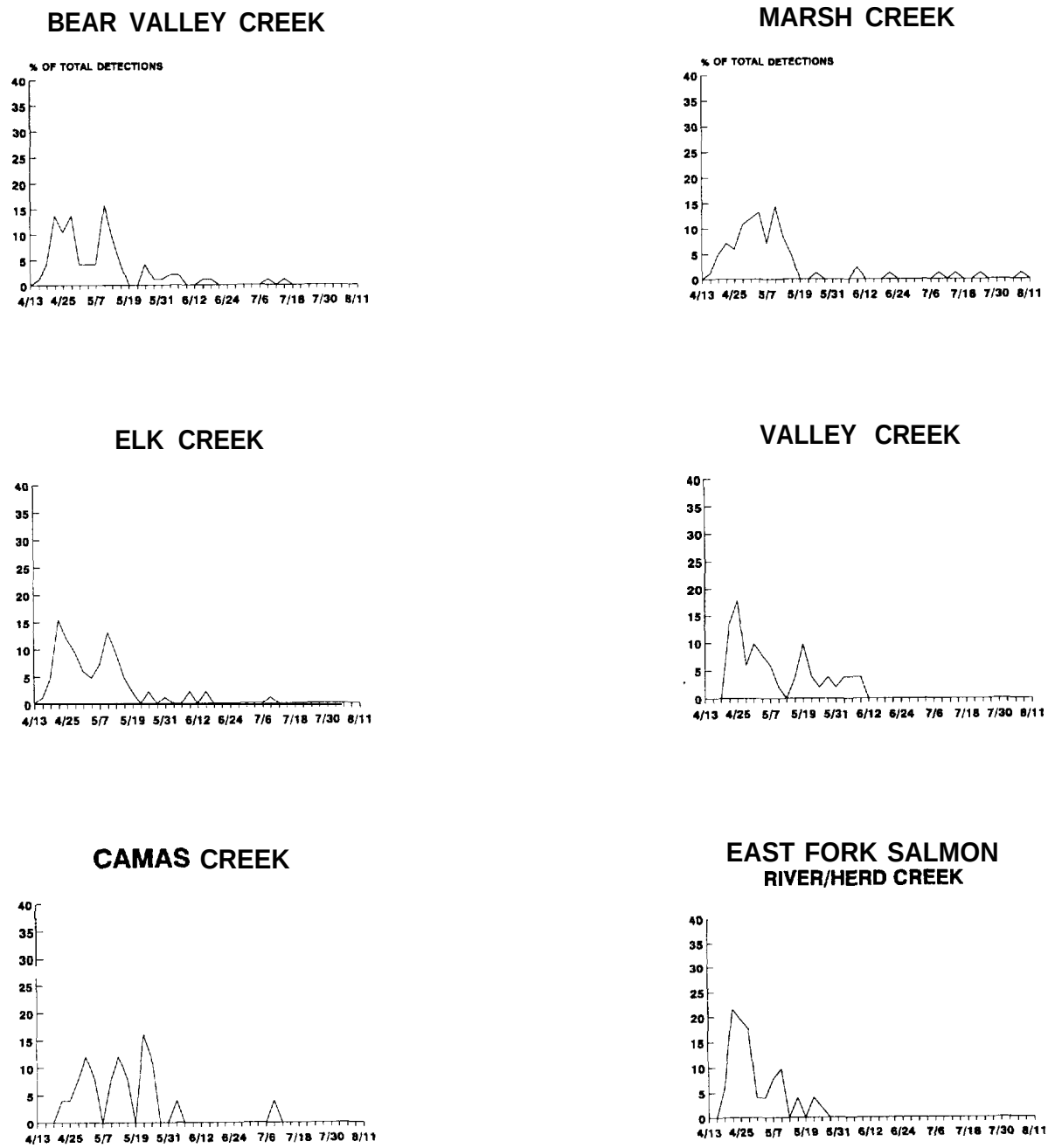
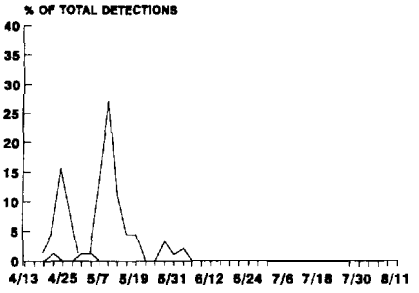


Figure 4. The outmigration timing (adjusted for spill) at Lower Granite Dam in 1994 of PIT-tagged wild spring/summer chinook salmon smolts from individual or combined streams in Idaho and Oregon.

CATHERINE CREEK



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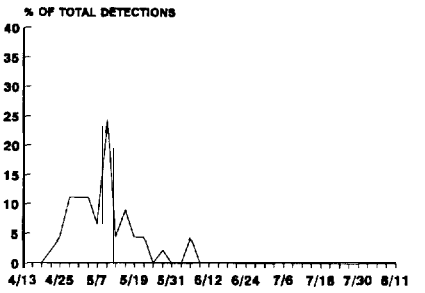
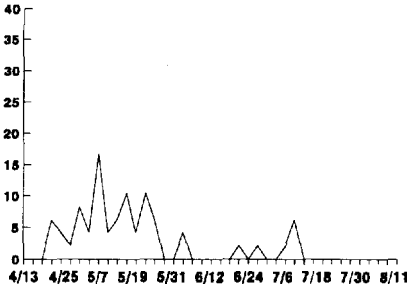
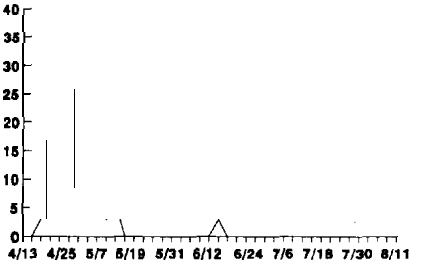


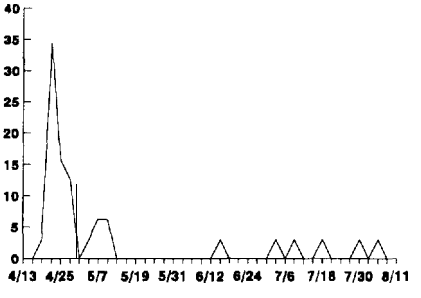
SOUTH FORK SALMON RIVER



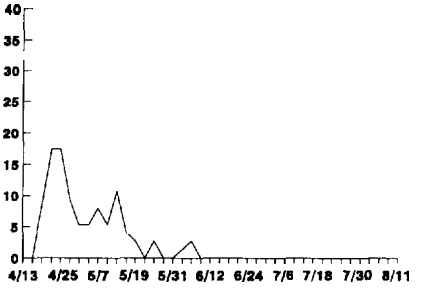
BIG CREEK (LOWER)/
RUSH CREEK



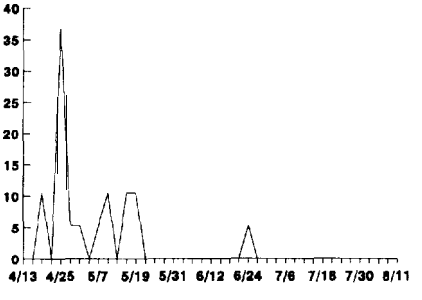
SECESH RIVER



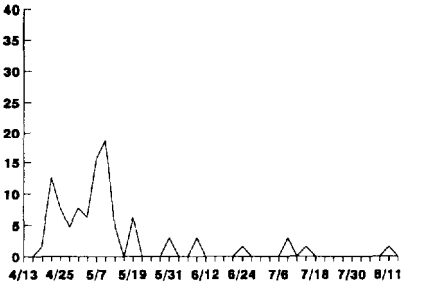
LOSTINE RIVER



LAKE CREEK



IMNAHA RIVER (UPPER)



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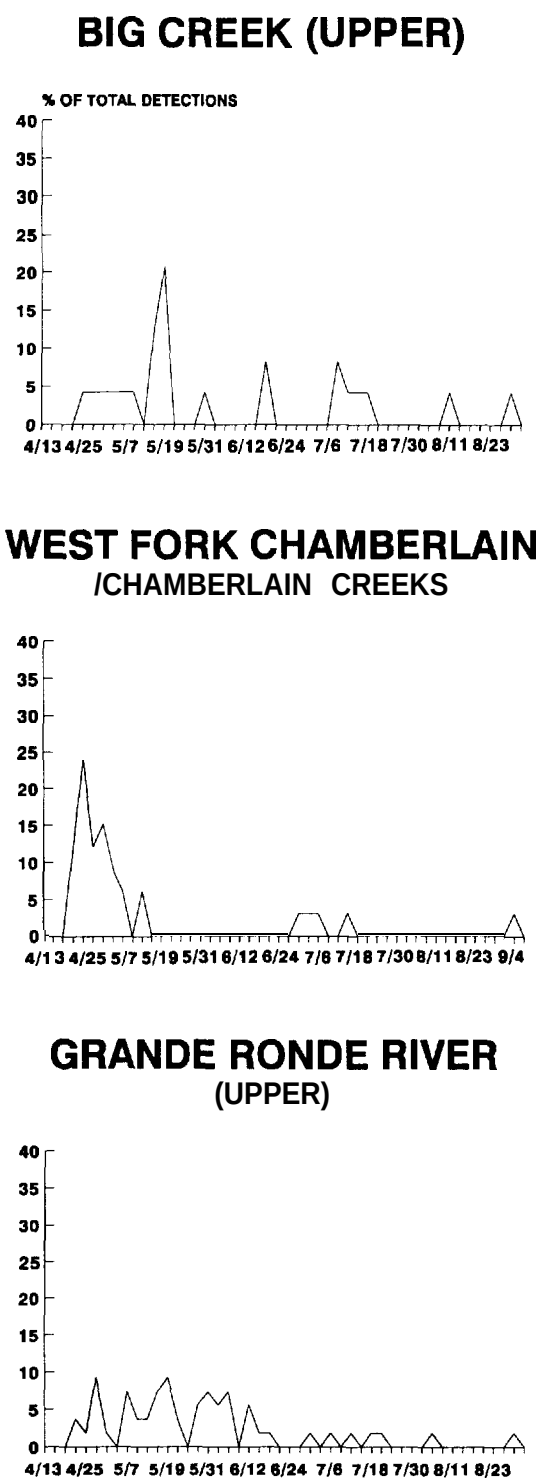

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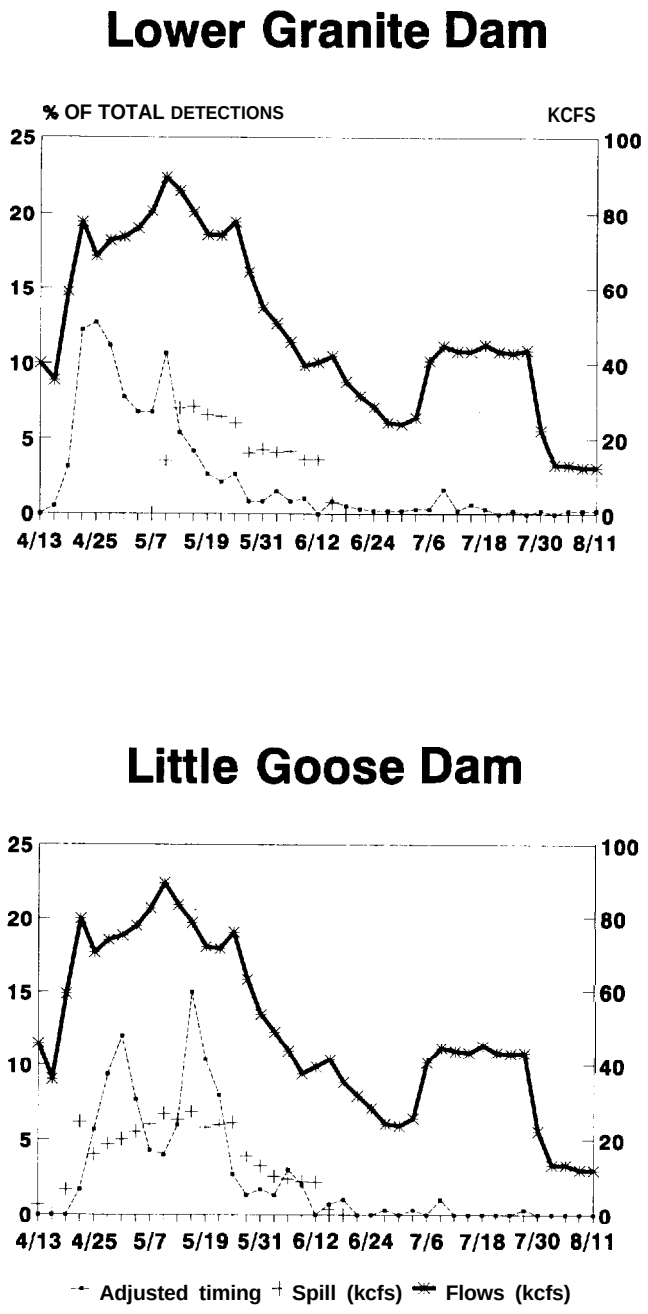

Figure 5. The overall outmigration timing of PIT-tagged wild spring/summer chinook salmon smolts at Lower Granite, Little Goose, Lower Monumental, and McNary Dams in 1994, with associated river spill and flows at these dams. Data represent detections from all Idaho streams combined by 3-day intervals and average river spill and flows at the dams over the same time periods.

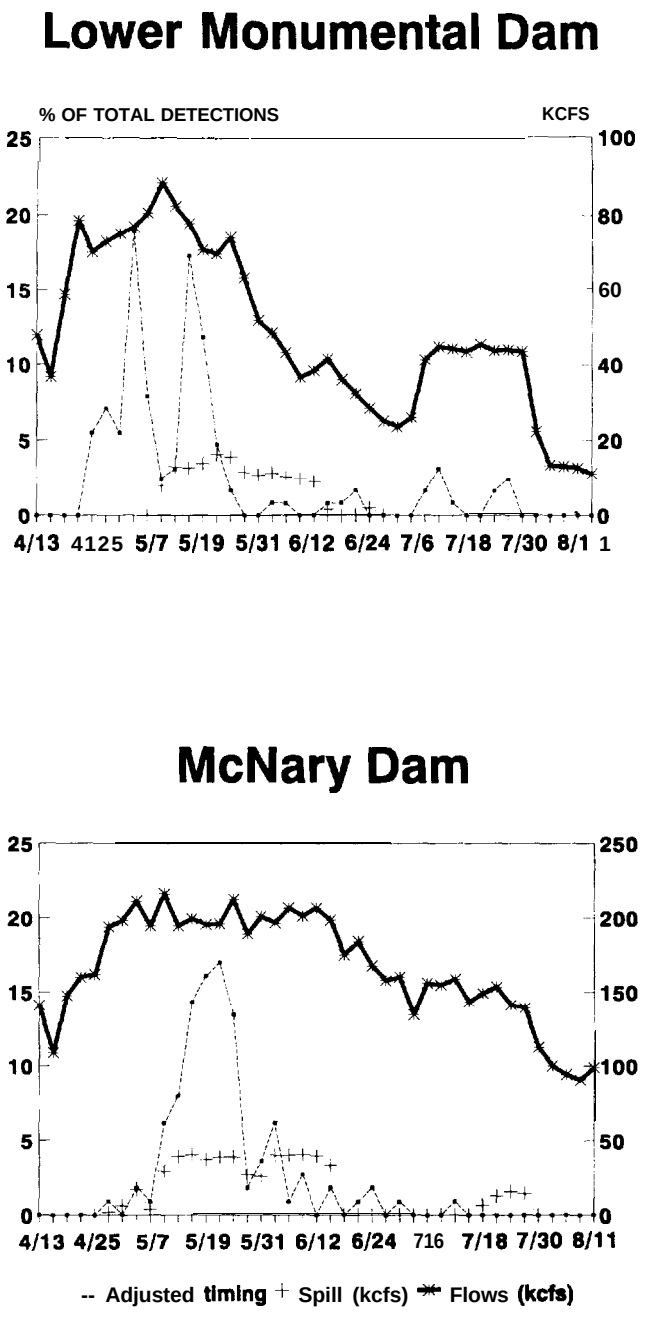

Figure 5. Continued.

Table 6. Historical and 1994 passage dates at Lower Granite Dam for PIT-tagged wild spring/summer chinook salmon smolts from streams in Idaho and Oregon.

Year	Passage dates at Lower Granite Dam 10%	50%	90%	Range
		Bear Valley Creek		
1990	19 April	5 May	31 May	11 April-18 July
1991	3 May	20 May	12 June	18 April-23 June
1992	15 April	2 May	24 May	7 April-28 June
1993	29 April	16 May	22 June	22 April-27 July
1994	**22 April**	**6 May**	**29 May**	**16 April-15 July**
		Elk Creek		
1990	a			
1991	3 May	20 May	16 June	25 April-24 June
1992	11 April	30 April	28 May	5 April-17 July
1993	2 May	16 May	11 June	21 April-26 June
1994	**23 April**	**4 May**	**21 May**	**18 April- 9 July**
		Sulphur Creek		
1990	18 April	30 April	31 May	11 April-27 June
1991	b			
1992	16 April	3 May	23 May	10 April- 1 June
1993	28 April	16 May	12 June	24 April-28 June
1994	**b**			
		Cape Horn Creek		
1990	b			
1991	24 April	16 May	28 May	19 April- 6 June
1992	12 April	28 April	30 May	10 April- 1 June
1993	8 May	19 May	26 June	5 May- 1 July
1994	**b**			
		Marsh Creek		
1990	17 April	29 April	31 May	9 April- 1 July
1991	26 April	20 May	9 June	17 April-18 June
1992	17 April	7 May	2 June	10 April-13 July
1993	29 April	15 May	27 May	24 April-10 August
1994	**23 April**	**4 May**	**18 May**	**16 April- 8 August**

Table 6. Continued.

Year	Passage dates at Lower Granite Dam 10%	50%	90%	Range
		Valley Creek		
1989	24 April	14 May	12 June	9 April-17 June
1990	16 April	8 May	5 June	12 April-29 June
1991	11 May	20 May	20 June	21 April-13 July
1992	15 April	30 April	27 May	13 April- 4 June
1993	30 April	16 May	2 June	24 April- 6 June
1994	**24 April**	**4 May**	**3 June**	**22 April- 9 June**
		Camas Creek		
1993	3 May	16 May	27 May	24 April-24 June
1994	**30 April**	**15 May**	**26 May**	**24 April-11 July**
		Loon Creek		
1993	5 May	12 May	17 May	3 May-25 June
1994	**29 April**	**10 May**	**24 May**	**22 April- 7 June**
		East Fork Salmon River		
1989	22 April	3 May	18 May	7 April- 8 June
1990	b			
1991	22 April	9 May	26 May	16 April-20 June
1992	13 April	21 April	16 May	10 April- 3 June
1993	25 April	6 May	18 May	22 April- 1 June
1994	**22 April**	**28 April**	**17 May**	**20 April-25 May**
		Herd Creek		
1992	14 April	20 April	10 May	13 April-18 May
1993	26 April	30 April	18 May	26 April-31 May
1994	**a**			
		South Fork Salmon River		
1989	25 April	13 May	14 June	16 April-20 June
1990	b			
1991	20 April	16 May	10 June	17 April-13 July
1992	14 April	29 April	27 May	7 April-27 July
1993	29 April	16 May	2 June	26 April-28 June
1994	**27 April**	**15 May**	**28 June**	**22 April- 9 July**

Table 6. Continued.

Year	Passage dates at Lower Granite Dam 10%	50%	90%	Range
		Big Creek (upper)		
1990	27 April	**30 May**	22 June	17 April-18 July
1991	18 May	10 June	26 June	26 April- 1 July
1992	22 April	**8 May**	3 June	15 April-26 June
1993	**8 May**	18 May	**26 May**	26 April-15 June
1994	**3 May**	**19 May**	**19 July**	**25 April-30 August**
		Big (lower)/Rush Creeks		
1993	24 April	29 April	**13** May	21 April-16 May
1994	**23 April**	**29 April**	**11 May**	**21 April-15 June**
		West Fork Chamberlain Creek		
1992c	15 April	26 April	3 June	12 April-24 June
1993	28 April	**15 May**	23 June	23 April-22 July
1994c	**24 April**	**1 May**	**5 July**	**24 April- 4 September**
		Secesh River		
1989	20 April	27 April	**9 June**	9 April-19 July
1990	14 April	22 April	7 June	10 April-13 July
1991	20 April	27 April	14 June	13 April-20 July
1992	13 April	29 April	4 June	5 April- 3 July
1993	26 April	16 May	16 June	22 April-15 July
1994	**22 April**	**26 April**	**11 July**	**21 April- 7 August**
		Lake Creek		
1989	23 April	**2 May**	16 June	12 April- 1 July
1990	b			
1991	b			
1992	b			
1993	23 April	**9 May**	**22 June**	22 April-25 June
1994	**21 April**	**28 April**	**19 May**	**20 April-24 June**
		Catherine Creek		
1991	1 May	14 May	8 June	17 April-23 June
1992	16 April	1 **May**	**21 May**	9 April-29 June
1993	**6 May**	**18 May**	5 June	29 April-26 June
1994	**25 April**	**11 May**	**20 May**	**13 April-26 July**

Table 6. Continued.

Year	Passage dates at Lower Granite Dam 10%	50%	90%	Range
		Grande Ronde River (upper)		
1989	12 May	6 June	19 June	27 April-22 July
1990	b			
1991	b			
1992	b			
1993	5 May	16 May	25 May	23 April-20 June
1994	**28 April**	**23 May**	**7 July**	**23 April-29 August**
		Imnaha River (lower)		
1989	11 April	30 April	11 May	4 April- 5 June
1990	10 April	18 April	9 May	5 April-27 May
1991	20 April	1 May	13 May	14 April-15 May
1992	10 April	21 April	3 May	6 April-21 May
1993	b			
1994	**b**			
		Imnaha River (upper)		
1993	24 April	14 May	28 **May**	15 April-23 June
1994	**24 April**	**8 May**	**9 June**	**20 April-11 August**
		Lostine River		
1990	a			
1991	29 April	14 May	26 May	20 April- 9 July
1992	16 April	30 April	11 May	12 April- 2 June
1993	23 April	3 May	17 May	17 April- 1 June
1994	**22 April**	**30 April**	**16 May**	**19 April- 7 June**

a insufficient numbers detected to estimate timing.
b no fish tagged for this outmigration year.
c includes fish from Chamberlain Creek.

earliest and most compressed passage period of all streams, while fish from the Secesh River had early, but the most protracted passage period at the dam.

Fish from Bear Valley Creek, Elk Creek, Marsh Creek, and Loon Creek in the Middle Fork of the Salmon River drainage, Valley Creek in the upper Salmon River, the Imnaha River (upper), and Catherine Creek in Oregon showed a later passage period at Lower Granite Dam (Fig. 4 and Table 6). The 50% passage dates for fish from these streams ranged from 4 to 11 May. Peak passage dates for fish from these streams were distributed between late April and mid-May (Appendix Tables 3-6, 8, and Fig. 4).

Fish from Big Creek (upper) and Camas Creek in the Middle Fork of the Salmon River, the South Fork of the Salmon River, and the Grande Ronde River (upper) had the latest passage periods at Lower Granite Dam (Fig. 4 and Table 6). Both the 50% passage and peak passage dates for fish from these streams all occurred during the last 2 weeks of May (Appendix Tables 7, 11-12, and Fig. 4).

Passage distributions for wild chinook salmon smolts from Idaho streams were quite variable at Lower Granite Dam in 1994. The following analysis of passage distributions should be viewed with caution as statistics were potentially biased due to low numbers and the spill program although detection numbers were adjusted for spill. Oregon streams were not included in this analysis. For the 10th percentile passage dates at the dam, Big

Creek (upper) fish were significantly later than all other groups ($P < 0.05$). Loon Creek and Camas Creek fish passed significantly later than fish from all other Idaho streams except the South Fork of the Salmon River ($P < 0.05$). The South Fork of the Salmon River fish passed the dam significantly later than all others except for those from West Fork Chamberlain Creek and Valley Creek ($P < 0.05$). For median passage dates at the dam, fish from Big Creek (upper) passed significantly later than all groups except Loon Creek, Camas Creek, and the South Fork of the Salmon River ($P < 0.05$). Camas Creek and the South Fork of the Salmon River fish were later than the rest except Bear Valley Creek, Elk Creek, Valley Creek, and Marsh Creek fish ($P < 0.05$). For the 90th percentile passage dates at the dam, fish from Big Creek (upper) passed significantly later than all others except the Secesh River, the South Fork of the Salmon River, Valley Creek, and the West Fork Chamberlain Creek fish (P c 0.05). Secesh River fish passed the dam later than lower Big/Rush Creeks and the East Fork Salmon River/Herd Creek fish (P c 0.05).

Timing of smolts from individual streams in Idaho is not presented here for Little Goose, Lower Monumental, or McNary Dams due to low numbers detected at these dams. See Appendix Tables 3-18 for this information.

We combined all detections of wild fish from Idaho streams at each of the four dams and compared the timing at each dam with associated river flows during the same time periods (Fig. 5). Overall passage occurred between mid-April and early-September at

Lower Granite Dam, with the middle 80% passing from late-April to early June (Table 7). The peak passage date was 30 April, which did not coincide with peak flow at the dam (Appendix Table 20).

The middle 80% passage of wild fish occurred between the end of April and the first week of June for Little Goose and Lower Monumental Dams, and between mid-May and the first week of June for McNary Dam (Table 7). Peak passage periods for these fish also did not coincide with peak flow periods at these three dams (Fig. 5 and Appendix Tables 21-23).

DIEL TIMING AT JUVENILE FISH FACILITIES

Diel timings at dams were based on detections of fish exiting the fish and debris separators at the juvenile fish facilities. Timing was calculated by totaling detections of combined populations of wild fish for each of the 24 daily hours through the migration and dividing by the total detected for the migration (Fig 6).

At Lower Granite Dam, significantly more wild smolts exited the separator from 1800 to 0600 h (mostly nighttime hours, 55.6%) than exited from 0600 to 1800 h (daytime hours, 44.4%) ($P < 0.007$). When we examined passage in 6-hour periods, the lowest numbers of fish exited the separator from 0600 to 1200 h, and the highest numbers exited from 1800 to 0000 h. Using chi-square tests, we found that only the percent passage from 0600 to 1200 h was significantly different from the other three periods

Table 7. Passage dates at Lower Granite, Little Goose, Lower Monumental, and McNary Dams for combined populations of PIT-tagged wild spring/summer chinook salmon smolts from Idaho in 1994.

Site	Passage periods at dams			
	10%	50%	90%	Range
Lower Granite Dam	23 April	4 May	2 June	16 April- 4 September
Little Goose Dam	28 April	15 May	4 June	23 April- 1 October
Lower Monumental Dam	29 April	16 May	6 July	26 April-19 September
McNary Dam	13 May	22 May	5 June	29 April-13 July

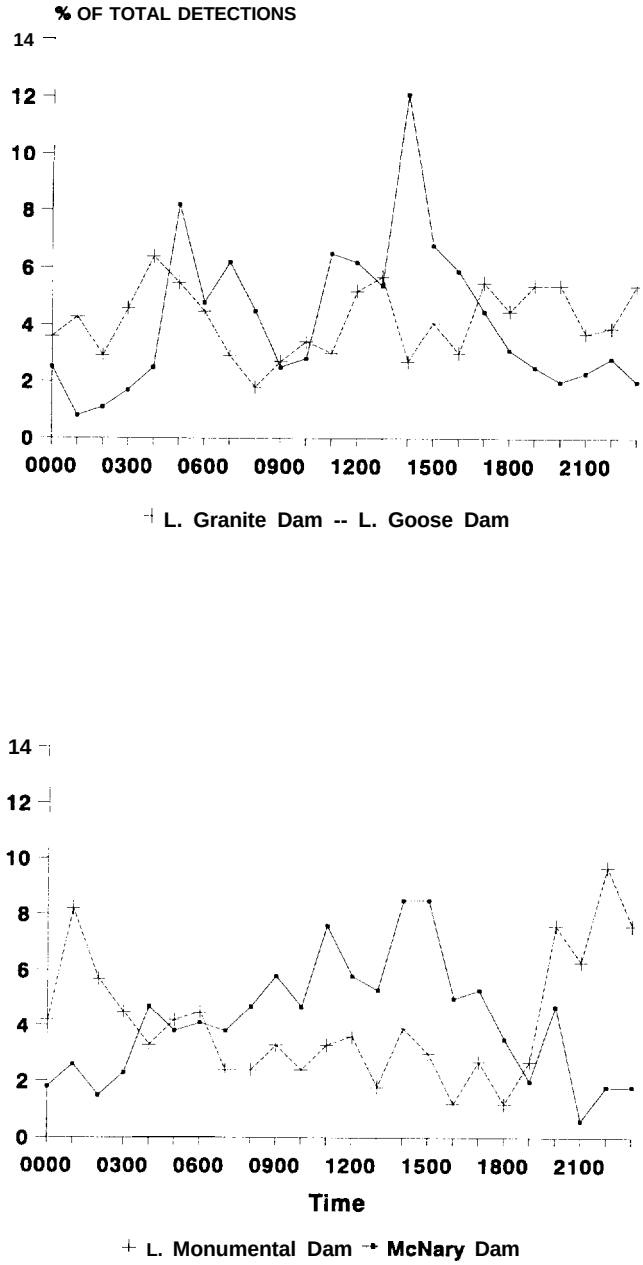

Figure 6. Diel passage timing of all PIT-tagged wild chinook salmon smolts from Idaho at Lower Granite, Little Goose, Lower Monumental, and McNary Dams in 1994. Diel timing was calculated on an hourly basis for fish exiting the fish and debris separators at the dams during the outmigration.

($P < 0.003$). Peak passage from the separator occurred at midday and the two crepuscular times (morning and evening).

At Little Goose Dam, significantly more wild smolts exited the fish and debris separator from 0600 to 1800 h (68.4%) than exited from 1800 to 0600 h (31.6%) ($P < 0.0001$). The lowest numbers of fish exited the separator from 1800 to 0000 h, and the highest numbers exited from 1200 to 1800 h. Greater differences in percent passage during the four 6-hour periods were found than at Lower Granite Dam, and both daytime periods were significantly different from the other three ($P < 0.0001$). The major peak passage time was from 1400 to 1500 h, with a lesser peak in early morning.

At Lower Monumental Dam, significantly more wild smolts exited the fish and debris separator from 1800 to 0600 h (65.3%) than exited from 0600 to 1800 h (34.7%) ($P < 0.0001$). The lowest numbers of fish exited from 1200 to 1800 h and the highest numbers exited from 1800 to 0000 h. Significantly fewer wild fish exited during both daytime periods than the two nighttime periods ($P < 0.0001$). The major peak passage period was from 2200 to 0200 h.

At McNary Dam, significantly more wild smolts exited the fish and debris separator from 0600 to 1800 h (69%) than exited from 1800 to 0600 h (31%) ($P < O\text{-}0001$). As at Little Goose Dam, the lowest numbers of fish exited from 1800 to 0000 h and the highest numbers exited from 1200 to 1800 h. Unlike the diel timing at Lower Monumental Dam, significantly more wild fish

exited during both daytime periods than the two nighttime periods ($P < 0.0001$). The major peak passage period was from 1400 to 1600 h.

ENVIRONMENTAL INFORMATION

One goal of this study is to identify relationships between environmental factors where wild parr reside and subsequent outmigration timing of smolts the following spring at downstream traps and dams. Since 1993, NMFS has worked with Pacific Northwest Laboratories (PNL) through Bonneville Power Administration funding to obtain environmental data.

In 1993, PNL personnel conducted an extensive review of historical and current environmental information collected in Idaho study streams. In November and December 1993, they installed environmental monitoring systems in the Middle Fork of the Salmon River near Thomas Creek, Marsh Creek, Valley Creek, the upper Salmon River near Sawtooth Hatchery, and the Salmon River below its confluence with the Yankee Fork. Monitors will be installed in other study streams on a priority basis in the next few years.

The stream monitors are YSI Water Quality Systems (Y-6000 Environmental Monitoring Systems). They were anchored to the streams' substrates by various means. The monitors automatically take hourly measurements of dissolved oxygen, temperature, specific conductance, pH, and depth. Although not included in this report, flow data at these sites will be documented.

Turbidity probes will be installed on the monitors in the future. Appendix Tables 24-28 provide a summary of environmental information collected at these 5 sites from December 1993 to July 1994.

DISCUSSION

Mortalities associated with collection and tagging in 1993 were comparable to earlier years (Matthews et al. 1990, 1992; Achord et al. 1992, 1994, 1995).

The average length of tagged and released fish in 1993 was 1 to 6 mm less than any of the previous 5 years (Matthews et al. 1990, 1992; Achord et al. 1992, 1994, 1995). The much colder-than-normal weather and water temperatures in spring and early summer 1993 probably reduced the growth rate of the salmon fry and parr during this time, ultimately resulting in smaller fish during late summer. We have observed the same trend in previous years, with larger fish in warm years and smaller fish in cold years.

For data collected over the last 6 years, length-distribution curves show that, generally, wild fish released and subsequently detected at dams are slightly larger than fish that are released but not detected. The reason for this slight difference, in size is unknown. However, it appears that larger fish, tagged and released the previous summers, survived better and/or were guided better into the collection systems at the dams than smaller fish. Nevertheless, although a much larger

proportion of the released fish were of a smaller size in 1993, the overall detection rate (adjusted) at the dams in 1994 was only 0.9 percentage points lower than the detection rate (adjusted) at the dams in 1993.

Another consistent trend we have observed over the years is the difference in migration timing at dams with respect to size at tagging. Wild fish migrating in April and May were significantly larger at release than fish migrating after May. This trend suggests that wild fish size is an important factor related to either the initiation of smoltification or other life-history dynamics that affect outmigration timing.

In 1994, the overall detection rate (adjusted) of wild fish at the four dams was slightly lower than for 1993 (Achord et al. 1995). The winter of 1993-1994 was milder and drier than the previous winter, and river flows were much lower in spring and summer 1994 than in 1993. As was also observed in 1993, fish from lower Big/Rush Creeks had the highest detection rate at the dams in 1994.

Average gains in fork length and weight observed for wild chinook salmon from time of release to recovery at Lower Monumental Dam, were similar to those observed at Little Goose and Lower Granite Dams during previous studies (Matthews et al. 1992; Achord et al. 1992, 1995). Average gains in fork length and weight for wild spring/summer chinook salmon in the Snake River drainage from late-summer to spring were similar to those observed for wild coho salmon from fall to spring in Big Beef

Creek in Washington (Peterson et al. 1994). The slightly higher average length and weight gains of 0.029 mm/day and 0.009 g/day that we observed over 4 years for chinook salmon, compared to the 2-year coho salmon study (Peterson et al. 1994), can be accounted for by the additional growth period of 27-64 days in late-summer and early-fall in our study.

As in 1992 and 1993, protracted passage distributions and small sample sizes made it difficult to statistically quantify small differences in arrival timing among fish from different streams at Lower Granite Dam in 1994. Since the timing of fish from all Idaho streams (excluding Oregon streams) tended to be early and very protracted at the dam in 1992, there were no statistically significant timing differences among streams for that year. Since the timing of fish from most Idaho streams was late in 1993, with more fish passing the dam during a shorter period, it was possible to detect some significant timing differences among fish from different streams in that year. In 1994, the middle 80% arrival timing distributions of fish from Idaho streams were quite variable, ranging from 18 to 80 days; therefore, some significant timing differences were detected. Table 6 reveals the variability in passage dates at Lower Granite Dam for individual streams in Idaho and Oregon over the years.

In 1994, peak detections of wild fish occurred at the end of April, and did not coincide with peak river flows at Lower Granite Dam. Over the past 6 years, passage timing of wild smolts at this dam has been highly variable and generally

independent of river flows before mid-May (Fig. 7). In contrast, peak passage of wild fish after mid-May has coincided well with periods of peak river flow at this dam. Raymond (1979) showed that the peaks of migration for the composite population of spring and summer chinook salmon smolts (mostly wild) passing Ice Harbor Dam from 1964-1969 preceded the periods of maximum river discharge in most years. During these years fish peaked between 26 April and 13 May. His observation agrees with what we found for wild fish migration before mid-May with respect to river flow.

Annual climatic conditions are emerging as important factors controlling overall timing of wild spring/summer chinook salmon smolts at Lower Granite Dam. Figure 7 gives a perspective on timing of combined populations of wild spring/summer chinook salmon smolts from 1989 through 1994. In the colder-than-normal years of 1989, 1991, and 1993, 50% of all wild fish had passed the dam by mid-May, while 90% passed by mid-June (except 1993 when high flows moved 90% through the dam by the end of May). In the warmer-than-normal years of 1990, 1992, and 1994, 50% of all wild fish passed this dam from 29 April to 4 May, and 90% passed by the end of May. We see a consistent 2-week shift in timing of wild fish at this dam between relatively warm and relatively cold years. Raymond (1979) cited water temperature as one of the most important factors involved in triggering the downstream movements of hatchery-reared and wild chinook salmon smolts in spring and

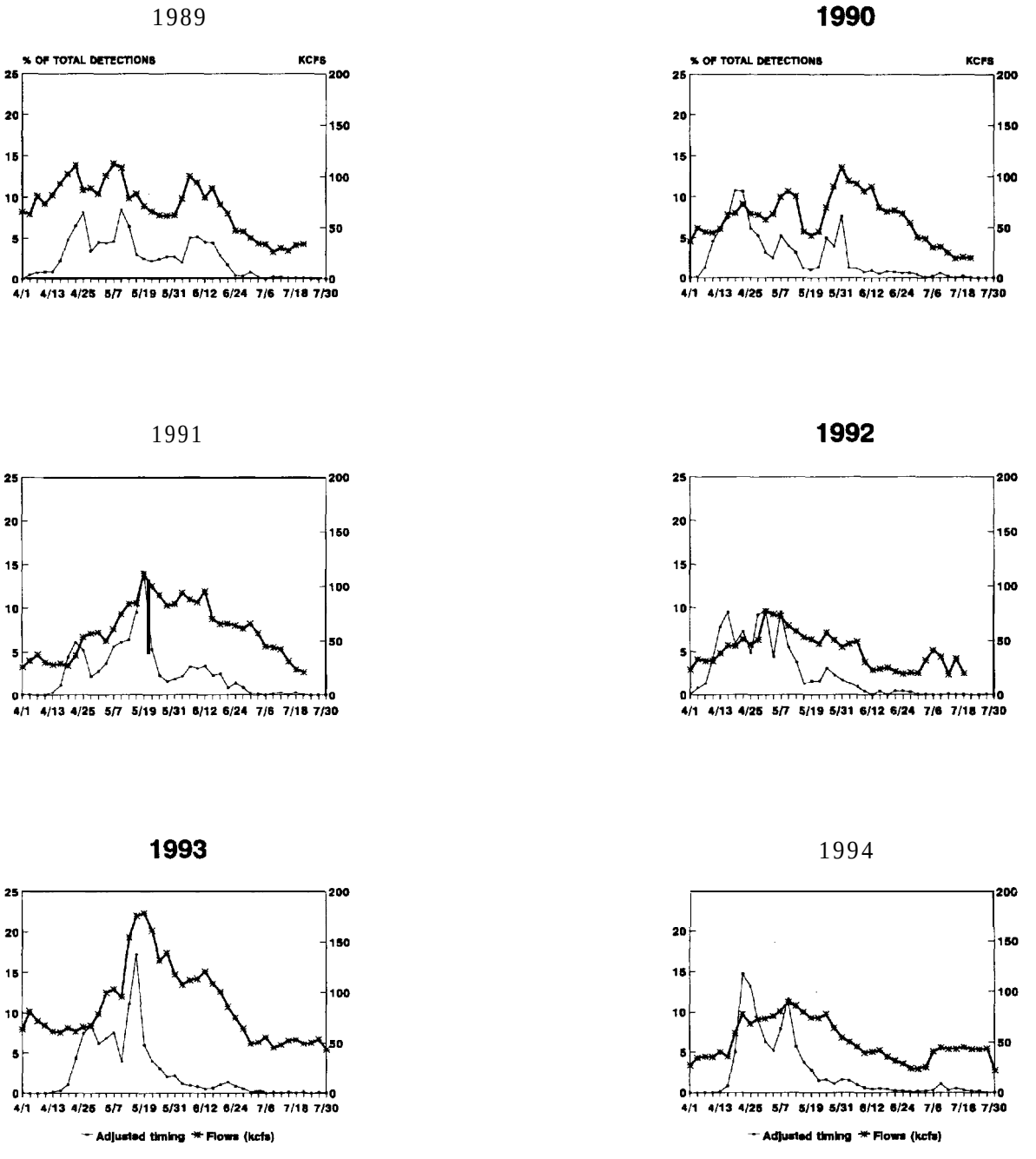

Figure 7. The historical perspective on outmigration timing (adjusted in spill years) of wild spring/summer chinook salmon smolts at Lower Granite Dam, with associated river flows at the dam. Data represent PIT-tag detections from Idaho and Oregon streams combined by 3-day intervals and average river flows at the dam over the same time periods.

also noted that the latest migrations occurred in years when runoff was delayed by cold weather.

In 1992 and 1993, peak detections of wild fish at the collector dams below Lower Granite Dam coincided well with peak river flows. We were not able to determine whether the increased river flow moved these groups of fish through the reservoirs or were simply coincidental with their arrival at the dams. Since peak detections at these dams have consistently occurred nearly simultaneously with increased flow, it seems likely that the fish were near the dams and were moved through them rapidly by the increased flow. However, in 1994 this did not appear to be the case. Peak detections at these dams did not coincide well with peak flows. In fact, peak flows at these dams coincided with significant decreases in wild fish detections, even though detections were adjusted for spill. We have no explanation for this difference.

It has become clear, after examining chinook salmon smolt passage timing at the dams over the last 6 years, that flow is only one of several factors affecting passage timing. Other factors such as water temperature, water turbidity, physiological development, variability in stock behavior, fish size, and other yet unknown conditions may equally affect wild smolt passage timing at dams.

As was observed in 1992 and 1993, diel timings of wild fish exiting the fish and debris separators during the migration season varied among the dams in 1994. In 1992, slightly more

wild fish exited the separator at Lower Granite Dam during daytime hours, but in 1993 and 1994, significantly more wild fish exited the separator during mostly nighttime hours. At Little Goose Dam, the diel timing was almost identical in 1992 and 1993, with more wild fish exiting the separator during daytime hours. We also observed more wild fish exiting the separator during daytime hours in 1994, but the proportion was larger than in the previous 2 years. At Lower Monumental Dam, significantly more wild fish exited the separator during mostly nighttime hours. At McNary Dam, more wild fish exited the separator during daytime hours in all 3 years; however, in 1992 and 1994, a larger proportion exited the separator during daytime hours.

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APPENDIX TABLES

Appendix Table l--Summary of tagging dates, numbers of fish collected, tagged, and released, and maximum, minimum, and average lengths (mm) and weights (g) of wild chinook salmon parr, PIT tagged in various Idaho streams during July and August 1993.

STREAM	BEAR VALLEY CREEK	ELK CREEK	MARSH CREEK	VALLEY CREEK	CAMAS CREEK	LOON CREEK	HERD CREEK	EAST FORK SALMON R.	SOUTH FORK SALMON R.	BIG CREEK (upper)	BIG CREEK (lower)	RUSH CREEK	SECESH RIVER	LAKE CREEK	WEST FORK CHAMBERLAIN CREEK	CHAMBERLAIN CREEK	TOTALS AVERAGES
TAGGING DATES	7/28 TO 7/30	7/30 TO 8/2	8/3	8/4 TO 8/6	8/9	8/9	8/11 TO 8/12	8/11 TO 8/13	8/16 TO 8/17	8/19 TO 8/20	8/23 TO 8/24	8/24	8/23 TO 8/24	8/25	8/19	8/20	7/28 TO 8/25
TOTAL NUMBER COLLECTED	875	1,019	990	892	233	438	124	928	1,919	558	193	11	463	265	503	76	9,503
TOTAL NUMBER TAGGED	860	999	963	855	215	396	119	885	809	535	187	10	422	253	500	76	8,083
TOTAL NUMBER TAGGED FISH RELEASED	856	998	960	855	215	396	119	883	806	535	186	10	422	252	496	76	8,065
MINIMUM LENGTH OF TAGGED FISH	50	50	51	50	50	51	58	56	47	52	52	61	49	50	52	53	47
MAXIMUM LENGTH OF TAGGED FISH	81	85	132	114	83	79	90	129	90	82	95	80	82	83	84	77	132
AVERAGE LENGTH OF TAGGED FISH	63	64	69	67	64	64	74	72	59	64	70	68	60	62	68	64	66
MINIMUM WEIGHT OF TAGGED FISH	1.9	2.6	2.7	1.5	--	1.2	2.6	2.3	1.4	--	2.0	3.3	1.2	1.3	--	--	1.2
MAXIMUM WEIGHT OF TAGGED FISH	8.1	7.9	11.6	22.2	--	7.5	9.3	10.5	7.3	--	7.3	6.8	6.7	8.0	--	--	22.2
AVERAGE WEIGHT OF TAGGED FISH	3.7	4.5	4.6	4.2	--	3.6	5.6	5.3	2.9	--	4.3	4.2	2.8	3.1	--	--	3.9

Appendix Table 2.--Summary of collecting and mortality data associated with the PIT tagging of wild chinook salmon parr from various streams in Idaho, July and August 1993.

STREAM	BEAR VALLEY CREEK	ELK CREEK	MARSH CREEK	VALLEY CREEK	CAMAS CREEK	LOON CREEK	HERD CREEK	EAST FORK SALMON R.	SOUTH FORK SALMON R.	UPPER BIG CREEK	LOWER BIG CREEK	KUSH CREEK	SECESH RIVER	LAKE CREEK	WEST FORK CHAMBERLAIN CREEK	CHAMBERLAIN CREEK	TOTALS AVERAGES
COLLECTING METHOD	SHOCK MTRAP	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SHOCK	SEINE	SHOCK	
NUMBER REJECTED	8	2	12	6	11	15	0	6	1,091	14	0	0	35	12	3	0	1,215
PERCENT REJECTED	0.9	0.2	1.2	0.7	4.7	3.4	0	0.6	56.9	2.5	0	0	7.6	4.5	0.6	0	12.8
NUMBER COLLECTION MORTALITY	7	18	15	31	7	27	5	37	19	9	6	1	6	1	0	0	189
PERCENT COLLECTION MORTALITY	0.8	1.8	1.5	3.5	3.0	6.2	4.0	4.0	1.0	1.6	3.1	3.1	1.3	0.4	0	0	2.0
NUMBER (1/2-3 H) POST-TAGGING MORTALITY	2	1	2	0	0	0	0	2	3	0	1	0	0	0	0	0	11
PERCENT (1/2-3 H) POST-TAGGING MORTALITY	0.2	0.1	0.2	0	0	0	0	0.2	0.4	0	0.5	0	0	0	0	0	0.1
NUMBER HELD 24 H POST-TAGGING MORTALITY	354	503	160	176	0	96	0	129	120	191	83	0	100	0	101	0	2,017
NUMBER 24 H POSTTAGGING MORTALITY	2	0	1	0	0	0	0	0	0	0	0	0	0	0	4	0	7
PERCENT 24 H POST-TAGGING MORTALITY	0.6	0	0.6	0	0	0	0	0	0	0	0	0	0	0	4.0	0	0.3
NUMBER LOST TAGS FROM 24 H HOLD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERCENT LOST TAGS FROM 24 H HOLD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MINIMUM LENGTH OF POST-TAGGING MORTALITIES	55	64	64	--	--	--	--	69	53	--	--	--	--	--	52	--	52
MAXIMUM LENGTH OF POST-TAGGING MORTALITIES	61	64	69	--	--	--	--	71	54	--	--	--	--	--	58	--	71
AVERAGE LENGTH OF POST-TAGGING MORTALITIES	58	64	66	--	--	--	--	70	54	--	--	--	--	--	56	--	60
MINIMUM WEIGHT OF POST-TAGGING MORTALITIES	2.3	--	--	--	--	--	--	4.3	2.2	--	--	--	--	--	--	--	2.2
MAXIMUM WEIGHT OF POST-TAGGING MORTALITIES	2.7	--	--	--	--	--	--	5.6	2.2	--	--	--	--	--	--	--	5.6
AVERAGE WEIGHT OF POST-TAGGING MORTALITIES	2.5	--	--	--	--	--	--	5.0	2.2	--	--	--	--	--	--	--	3.2

Appendix Table 3. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Bear Valley Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Bear Valley Creek
Release Site: Bear Valley Creek

Release Date: 7/28/93 to 7/30/93
Number Released: 856

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/16/94	1									
4/21/94	4									
4/22/94	6									
4/23/94	7		1							
4/25/94	5	1	1							
4/26/94	2	3 (4)	2	2						
4/27/94	3	2								
4/28/94	2	2	2	1						
4/29/94	6	3 (4)	1		1					1
4/30/94	5	1	1		1					
5/01/94		1						1		
5/02/94	3	1	1		2					
5/03/94	1	2 (3)			1	1				
5/04/94			1	3	1			1		
5/05/94	2	1	3	1	2		1		1	
5/06/94	2	3 (4)			3			1		
5/07/94			1					1		
5/08/94	1	1						1	1	
5/09/94	3		2		1	1		4	1	
5/10/94	1				2	2				
5/11/94	3 (4)	1							1	
5/12/94	7 (10)	1		1		1			2	
5/13/94	3 (4)						1			
5/14/94	2 (3)	1 (2)			1		1			1
5/15/94	1 (2)	1	1				1			
5/16/94	1 (2)	1 (2)		2			1	1		2
5/17/94		3 (5)			2			1		
5/18/94	1 (2)	2 (3)	1		1	1				
5/19/94		1	1							

Appendix Table 3. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/20/94				1	1					
5/21/94					3			1	1	
5/22/94		3 (4)					1		1	1
5/23/94					1	1	2	1	1	
5/24/94					1		1		2	
5/25/94	1									
5/26/94	1 (2)									1
5/27/94	1	1						1	1	
5/28/94		1								
5/29/94	1									
5/31/94	1	1								
6/01/94							1			
6/03/94				1						
6/04/94					1				1	
6/05/94	1									
6/06/94	1 (2)									
6/07/94		1								
6/08/94					1					
6/09/94		1								
6/10/94									1	
6/11/94							1			
6/14/94										
6/15/94										
6/16/94		1								
6/17/94		1		1						
6/18/94					1					
6/19/94										
6/20/94									1	
6/21/94					1					
6/23/94						1				
7/01/94					1					
7/02/94										
7/05/94										
7/09/94										
7/10/94									1	

Appendix Table 3. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
7/11/94	1							1		
7/15/94	1	—	—	—	—	—	—	—	—	—
TOTALS	84(95)	42(52)	22	13	29	9	11	18	17	7

Appendix Table 4. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Elk Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Elk Creek
Release Site: Elk Creek

Release Date: 7/30/93 to 8/2/93
Number Released: 998

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/18/94	1									
4/19/94	3									
4/20/94	1									
4/22/94	3									
4/23/94	3		1							
4/24/94	7	1								
4/25/94	2		1			1				
4/26/94	5		2			1				
4/27/94	3			1						
4/28/94	3	1								
4/29/94	2	2 (3)	1		1					
4/30/94	3	1								
5/01/94	3									
5/02/94	1	3 (4)	2		1					
5/03/94	1	1	1							
5/04/94	1		1	1	1	1				
5/05/94	3		4	1	1					
5/06/94		1		2	1	1				
5/07/94			1			3				
5/08/94	1	1			2					
5/09/94	5					1				
5/10/94	3	2 (3)			1	1				
5/11/94	4 (5)		1							
5/12/94	2 (3)				1					
5/13/94	2 (3)			1					1	
5/14/94	1 (2)		1		1	1				
5/15/94	2 (3)	1								
5/16/94	1 (2)	2 (3)	1	2	1				1	
5/17/94		1 (2)	1						2	1

Appendix Table 4. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/18/94	1 (2)	1 (2)		1			1	2		2
5/19/94					1	1		1		
5/20/94		1	2				1	2		
5/21/94	1 (2)	2 (3)	2				1	1		
5/22/94		1								
5/23/94		2 (3)	1		1	1				
5/24/94							1			
5/25/94						1	1	1		
5/26/94	1 (2)									
5/27/94		1								
5/28/94										1
5/31/94	1	1			1					
6/02/94							1			
6/03/94							1			
6/08/94		1								
6/10/94								1		
6/11/94	1 (2)									
6/15/94	1									
6/16/94							1			
6/17/94	1							1		
6/18/94				1						
6/23/94								1		
7/05/94		1								
7/09/94	1									
7/11/94		1		1						
TOTALS	74(84)	29(37)	23	12	14	13	9	18	8	5

Appendix Table 5. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Marsh Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Marsh Creek Release Date: 8/3/93
Release Site: Marsh Creek Number Released: 960

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/16/94	1									
4/19/94	1									
4/20/94	1									
4/21/94	2									
4/22/94	1									
4/23/94	4									
4/24/94	1									
4/25/94	1		1		1					
4/26/94	3									
4/27/94	1	1		1						
4/28/94	1	2	1							
4/29/94	3		1		1					
4/30/94	5		1		1				1	
5/01/94	4	1		1	1					
5/02/94	2	1							1	
5/03/94	4	1			1					
5/04/94	8			1	1				1	
5/05/94	2	1		2						
5/06/94	1		1		1					
5/07/94	3	1	1	1	1				1	
5/08/94	1	1			2			1		
5/09/94	2		1		1		1		2	
5/10/94	4	1					1	1		
5/11/94	3 (4)	1			3	1			1	
5/12/94	3 (4)						3 (4)			
5/13/94	2 (3)	1	1				1		1	
5/14/94	1 (2)	2 (3)	2		1					
5/15/94	1 (2)						1	1		
5/16/94	1 (2)	1 (2)					2 (3)	2		

Appendix Table 5. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/17/94		3 (5)					1			
5/18/94	1 (2)	1 (2)		1	1		1	2	2	
5/19/94				1				3		
5/20/94		3 (4)		2	3			2		
5/21/94		1	1	2 (3)						
5/22/94			1				3 (4)			
5/23/94		1								
5/24/94					1		2		1	
5/25/94							2	4		
5/26/94								1	1	
5/27/94	1						2	2		
5/28/94						1				
5/31/94								1		
6/01/94							1	1		1
6/05/94							1	1		
6/10/94	1 (2)	1								
6/22/94	1			1						
7/10/94	1									
7/16/94	1									
7/26/94	1									
8/08/94	1									
9/16/94				1						
TOTALS	75(83)	25(31)	12	14(15)	20	2	22(25)	22	12	1

Appendix Table 6. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Valley Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Valley Creek
Release Site: Valley Creek

Release Date: 8/4/93 to 8/6/93
Number Released: 855

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/22/94	2									
4/23/94	3									
4/24/94	2									
4/25/94	2	1								
4/26/94	4									
4/27/94	3			1						
4/28/94		1								
4/29/94	2		1	1						
4/30/94	1		1							
5/01/94	1		1							
5/02/94	1	1	1							
5/03/94	3									
5/04/94	3	2 (3)			1					
5/05/94					3					
5/06/94	1			1						
5/07/94	3			1	1					
5/08/94				1	1					
5/09/94				2	1					
5/10/94					1	1		1	1	
5/11/94									1	
5/12/94	1		1		1			1		
5/13/94				1						
5/15/94						1	1	2		
5/16/94				1	1		1	2		
5/17/94	1 (2)	2 (3)		1	1				1	
5/18/94				3 (4)				1		
5/19/94	1 (2)						1			
5/20/94							1			
5/21/94	2 (3)	1					1		1	

Appendix Table 6. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/22/94							1	1		
5/23/94	1 (2)							2		
5/24/94		1 (2)	1							
5/26/94		1								
5/27/94	1	1						1		
5/28/94	1									
5/29/94	1									
6/01/94	1									
6/03/94	1									
6/04/94		1								
6/05/94	1									
6/06/94	1 (2)	1					1			
6/09/94	1 (2)									
6/17/94								1		
6/18/94					1					
6/21/94				1						
6/29/94		1								
7/01/94										
7/06/94								1		
7/07/94					1					
7/09/94				1						
7/10/94				1						
7/11/94								1		
7/12/94				1						
7/15/94								1		
8/30/94		1								
TOTALS	45(51)	15(18)	6	18(19)	14	2	8	15	5	1

Appendix Table 7. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Camas Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Camas Creek Release Date: 8/09/93
Release Site: Camas Creek Number Released: 215

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/24/94	1									
4/27/94	1									
4/30/94	2									
5/01/94	2	1	1							
5/02/94	1									
5/04/94	1									
5/06/94	1			1						
5/07/94				1						
5/10/94	1									
5/11/94	1									
5/12/94			2							
5/13/94	1			1						
5/15/94	1 (2)		1							
5/16/94	1 (2)		1							
5/17/94				1			1		1	
5/18/94								3	1	
5/19/94		1	1	1			1		1	
5/20/94				1						
5/22/94								1		
5/23/94	1 (2)	2 (3)						1		
5/24/94	1 (2)					1				
5/25/94								1		
5/26/94	2 (3)									
5/27/94		1					1			
5/29/94		1								
5/31/94										
6/03/94	1									
6/04/94										
6/05/94							1			

Appendix Table 7. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
6/09/94							1			
6/22/94							1			
7/11/94	1	—	—	—	—	—	—	—	—	—
TOTALS	20(25)	6(7)	6	6	3	2	6	7	3	0

Appendix Table 8. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Loon Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Loon Creek Release Date: 8/9/93
Release Site: Loon Creek Number Released: 396

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/22/94	1									
4/27/94	2									
4/28/94		1			1					
4/29/94	2									
4/30/94	3	1			1					
5/01/94	2	1								
5/02/94	2									
5/03/94	1	1			1				1	
5/04/94	4	1		1					1	
5/05/94		1								
5/06/94	1	1								
5/07/94	2	1			2					
5/08/94					3					
5/09/94	1	1								
5/10/94	3	1								
5/11/94	4 (5)				2					
5/12/94	2 (3)		1							
5/13/94									1	
5/14/94		2 (3)	1			1			1	
5/15/94	1 (2)			1						
5/16/94	1 (2)	2 (3)			1					
5/17/94		3 (5)		1			1		1	
5/18/94	1 (2)			1			1			
5/19/94	1 (2)				1		1			
5/20/94					1					
5/21/94							2	2		
5/22/94		1		1				2	1	
5/23/94		1							1	
5/24/94	1 (2)						1	1		

Appendix Table 8. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/26/94							1			
5/27/94		1					2			
5/28/94							1			
5/29/94	1									
5/31/94								1		
6/03/94								1		
6/04/94		1	1							
6/06/94		1								
6/07/94	1 (2)				1					
6/09/94										
6/10/94		1								
6/18/94					1					
6/24/94									1	
7/10/94				1						
7/11/94										
10/1/94		1								
TOTALS	37(45)	24(28)	6	6	16	1	11	7	a	1

Appendix Table 9. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from East Fork Salmon River Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: East Fork Salmon River
Release Site: East Fork Salmon River

Release Date: 8/11/93 to 8/13/93
Number Released: 883

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/20/94	1									
4/21/94	1									
4/22/94	5									
4/23/94	4									
4/24/94	2									
4/25/94	4		2							
4/26/94	2		1	2						
4/27/94	3		1							
4/28/94	3	2	1	1		1				
4/29/94	2	1		2						
4/30/94	4	1			1					
5/01/94	1	3 (4)	2	1						
5/02/94		3 (4)		2	2					
5/03/94		1	2							
5/04/94	1			3	1	1				
5/05/94	1	1	1		2	1		1		
5/06/94		1			2					
5/07/94				1						
5/08/94	3	1			1				1	
5/09/94	1		2	2	1	1			1	1
5/10/94	1	2 (3)	1		1		2	1	1	1
5/11/94	2				1			1		
5/12/94	1			1				1		
5/14/94		1 (2)				1			1	
5/15/94		1				1		1		
5/16/94									1	
5/17/94	1 (2)								1	
5/18/94				1	1					1

Appendix Table 9. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/19/94							2	2		
5/21/94		2 (3)	1					3		
5/22/94									1	
5/23/94	1 (2)						1	1		
5/24/94				1	1					
5/25/94	1									
6/04/94					1					
6/06/94				1						
6/13/94								1		
6/14/94									1	
TOTALS	45(47)	20(25)	14	18	15	6	5	12	9	3

Appendix Table 10. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Herd Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Herd Creek
Release Site: Herd Creek

Release Date: 8/11/93 to 8/12/93
Number Released: 119

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/19/94	1									
4/25/94	1									
4/28/94				1						
4/29/94				1						
5/01/94	1		1							
5/03/94										
5/04/94				1						
5/05/94								1		
5/07/94								1		
5/08/94										1
5/10/94										
5/14/94					1					
5/15/94					1					
5/17/94							1			
5/18/94	—	—	—	—	—	—	—	—	1	—
TOTALS	4	0	1	3	2	1	1	2	1	1

Appendix Table 11. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from South Fork Salmon River Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: South Fork Salmon River
Release Site: south Fork Salmon River

Release Date: 8/16/93 to 8/17/93
Number Released: 806

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/22/94	1									
4/24/94	2									
4/25/94		1								
4/27/94	2		1		1					
4/29/94	1									
4/30/94				1						
5/01/94	1			1						
5/02/94	3									
5/03/94					1					
5/04/94	1									
5/05/94				1						
5/06/94	1									
5/07/94	4									
5/08/94	4				1					
5/09/94		1	1							
5/10/94	1									
5/12/94	1									
5/13/94			1		1					
5/15/94	2 (3)	3 (4)	1							
5/16/94	3 (5)	1 (2)			1					
5/17/94		1 (2)								
5/18/94		1(2)						1		
5/19/94	1 (2)			1	1			1		
5/20/94		2 (3)		2				1	1	
5/21/94		1						1		
5/22/94		1					1	1	1	
5/23/94		1								
5/24/94	3 (5)	1 (2)		2 (3)				1		

Appendix Table 11. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/25/94								1		
5/26/94	2 (3)							1		
5/27/94										
5/29/94										
5/31/94										
6/02/94							1	2		
6/03/94							1			
6/04/94	1 (2)									
6/07/94										
6/11/94								1		
6/18/94										
6/19/94					1					
6/22/94	1				1					
6/28/94	1									
7/01/94							1			
7/06/94										
7/08/94	1									
7/09/94	3	1								
7/13/94							1	1		
7/15/94			1							
7/24/94						1				
7/25/94				1						
9/09/94		1								
9/19/94					1					
9/26/94					1					
TOTALS	40(48)	22(28)	5	11(12)	10	1	5	13	2	0

Appendix Table 12. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Big Creek (upper), 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Big Creek (upper) Release Date: 8/19/93 to 8/20/93
Release Site: Big Creek (upper) Number Released: 535

	Lower Granite	Little Goose		Lower Monumental			McNary			
Detection Date	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/25/94	1									
4/30/94	1									
5/03/94	1									
5/04/94	1			1						
5/05/94										
5/06/94				1				1		
5/08/94	1									
5/09/94								1		
5/11/94										
5/12/94	1									
5/13/94						1				
5/15/94								1		
5/16/94	2 (3)			1						
5/18/94		1 (2)								
5/19/94	3 (5)			1						
5/20/94			1							
5/21/94		3 (4)						1		
5/22/94		1	1							
5/24/94			1							
5/25/94							1			
6/02/94	1	1								
6/03/94							1	1		
6/05/94		1								
6/08/94		1								
6/09/94		1								
6/15/94								1		
6/18/94	1	1						1		
6/19/94	1									
6/30/94										

Appendix Table 12. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
7/09/94	1									
7/10/94	1	1								
7/13/94	1									
7/16/94	1									
7/19/94	1									
7/22/94				1						
7/26/94				2						
7/28/94		1								
8/11/94	1									
8/30/94	1									
TOTALS	21(24)	12(14)	4	7	5	1	2	7	0	1

Appendix Table 13. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Big Creek (lower), 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Big Creek (lower) Release Date: 8/23/93 to 8/24/93
Release Site: Big Creek (lower) Number Released: 186

	Lower Granite	Little Goose		Lower Monumental			McNary			
Detection Date	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/21/94	1									
4/23/94	3									
4/24/94	1									
4/25/94	4									
4/26/94	1	1								
4/27/94	3				1					
4/28/94	2				1					
4/29/94	4									
4/30/94	3			1	1					
5/01/94	3					1				
5/02/94		2(3)			1				1	
5/03/94				2	1					
5/04/94	2	1		1						
5/05/94						1				
5/06/94	1	1		1		1				1
5/07/94	1									
5/08/94									1	
5/09/94	1									
5/11/94	1				3	1			1	
5/12/94				1						
5/13/94					1		1			
5/14/94	1 (2)				1					
s/15/94										
5/16/94									1	
s/17/94										
5/18/94										1
5/19/94							1			
5/20/94							1			

Appendix Table 13. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/25/94							2			
5/28/94									1	
6/15/94	1									
9/13/94			—	1	—			—	—	
TOTALS	33(34)	6(7)	14	7	10	4	5	5	5	2

Appendix Table 14. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Rush Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Rush Creek Release Date: 8/24/93
Release Site: Rush Creek Number Released: 10

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/22/94	1									
5/01/94		1								
5/06/94					1					
5/14/94	—	—	—	—	—	—	—	—	1	—
TOTALS	1	1	0	0	1	0	0	0	1	0

Appendix Table 15. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Secesh River, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Secesh River
Release Site: Secesh River

Release Date: 8/23/93 to 8/24/93
Number Released: 422

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/21/94	1									
4/22/94	3									
4/23/94	5	1 (2)								
4/24/94	3									
4/25/94	3	1								
4/26/94	1		1							
4/27/94	1	1	3							
4/28/94			1							
4/29/94	1	1	1		1					
4/30/94	3				2					
5/01/94			1		2					
5/02/94		1								
5/04/94					1				1	
5/05/94								1		
5/06/94	1		1						1	
5/07/94	1							1		
5/08/94					1				2	
5/09/94	1									
5/10/94	1				1					
5/11/94										1
5/12/94	1				1					1
5/13/94										1
5/14/94									1	
5/15/94										
5/16/94									1	
5/18/94		1 (2)								
5/20/94										
5/21/94		1								
5/22/94										

Appendix Table 15. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
5/23/94		1								
5/24/94				1						
5/27/94								1		
6/11/94								1		
6/15/94							1			
6/17/94	1									
7/03/94	1									
7/10/94										
7/11/94	1									
7/14/94						1				
7/18/94	1									
7/30/94	1									
8/07/94	1									
TOTALS	32	8(10)	10	1	10	4	2	5	6	3

Appendix Table 16. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Lake Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Lake Creek
Release Site: Lake Creek

Release Date: 8/25/93
Number Released: 252

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/20/94	1									
4/21/94	1									
4/25/94	3									
4/26/94	1									
4/27/94	3									
4/28/94	1									
4/30/94										
5/01/94	1									
5/02/94										
5/04/94		1								
5/05/94					2					
5/07/94	1									
5/09/94		1								
5/10/94	2									
5/13/94										
5/15/94					1					
5/16/94	1 (2)									
5/17/94										1
5/19/94	1 (2)									
5/21/94		1								
5/22/94								1	1	
5/23/94							1			
6/02/94								1		
6/04/94								1		
6/24/94	1						1			
TOTALS	17(19)	3	5	0	3	3	2	3	1	1

Appendix Table 17. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from West Fork Chamberlain Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: West Fork Chamberlain Creek Release Date: 8/19/93
Release Site: West Fork Chamberlain Creek Number Released: 496

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/24/94	4	1								
4/25/94	3	1								
4/26/94	1									
4/27/94	3									
4/28/94	1		1							
4/29/94	2				1					
4/30/94	1									
5/01/94	3		1							
5/02/94	1		1							
5/03/94	1									
5/04/94	1		3		1	1				
5/05/94	1				1					
5/06/94	1					2				
5/07/94			1		1					
5/08/94	1									
5/09/94	1									
5/11/94									1	
5/12/94								1		
5/14/94	1 (2)									
5/16/94								1		
5/17/94		1(2)		1				1		
5/18/94		1(2)		1					1	
5/20/94										
5/21/94										
5/22/94								2		
5/23/94								1		
6/30/94	1									
7/05/94	1									

Appendix Table 17. (continued)

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
7/08/94	1									
7/17/94	1									
7/23/94				1						
9/04/94	1									
9/19/94				1						
TOTALS	31(32)	5(7)	7	6	4	3	3	6	2	0

Appendix Table 18. Detections of PIT-tagged smolts by date at four dams for wild yearling chinook salmon from Chamberlain Creek, 1994. Numbers in parentheses are first detections at the dams that have been adjusted for spill.

Tagging Site: Chamberlain Creek
Release Site: Chamberlain Creek

Release Date: 8/20/93
Number Released: 76

Detection Date	Lower Granite	Little Goose		Lower Monumental			McNary			
	First Detect.	First Detect.	Prev. Detect. 1 Dam	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	First Detect.	Prev. Detect. 1 Dam	Prev. Detect. 2 Dams	Prev. Detect. 3 Dams
4/25/94	1									
5/05/94					1					
5/14/94									1	
5/19/94		1								
5/27/94							1			
5/28/94							1			
6/24/94	—	—	—	—	—	—	1	—	—	—
TOTALS	1	1	0	0	1	0	3	0	1	0

Appendix Table 19. A summary of the tagging dates, start tagging times and temperatures (°C), release dates, release times and temperatures, methods of capture, distance (in kilometers) from the stream's mouth to the release point, number released, unadjusted number detected, and unadjusted percent detected for each tag group at the four collector dams during 1993.

STREAM NAME	TAG GROUP	TAG DATE	START TAG TIME	RELEASE DATE	REL. TIME	START TAG TEMP (°C)	REL. TEMP (°C)	CAPTURE METHODS	DISTANCE RELEASED FROM MOUTH (KM)	NO. REL.	NO. DET.	% DET
BIG CREEK (upper)	SA93231.BC1	08/19/93	14:58	08/20/93	08:30	13.5	8.0	SHOCK	51	56	4	6.3
	SA93232.BC1	08/20/93	10:03	08/20/93	10:45	8.5	9.0	SHOCK	53	206	20	7.1
	SA93232.BC2	08/20/93	11:48	08/20/93	15:00	9.0	12.0	SHOCK	54			9.7
	SA93232.BC3	08/20/93	14:47	08/20/93	15:15	12.0	12.0	SHOCK		82	6	7.3
BIG CREEK (lower)	SA93235.BC1	08/23/93	13:22	08/24/93	08:45	14.0	11.0	SHOCK	10	73	22	26.5
	SA93235.BC2	08/23/93	14:24	08/23/93	15:15	15.0	14.5	SHOCK	12	30	22	30.1
	SA93236.BC1	08/24/93	15:25	08/24/93	15:30	15.0	15.0	SHOCK			7	23.3
BEAR VALLEY CREEK	SA93209.BV1	07/28/93	10:15	07/29/93	06:30	11.0	12.5	SHOCK	11	93	12	12.9
	SA93209.BV2	07/28/93	12:05	07/29/93	07:00	12.5	12.5	SHOCK	14	193	28	14.5
	SA93210.BV1	07/29/93	09:10	07/29/93	10:45	13.0	13.5	MTRAP		41	7	17.1
	SA93210.BV2	07/29/93	09:30	07/29/93	10:45	13.0	13.5	SHOCK	13	218	44	20.2
	SA93210.BV3	07/29/93	10:59	07/30/93	08:00	13.5	12.0	SHOCK	15	66	19	28.8
	SA93211.BV1	07/30/93	07:24	07/30/93	08:45	12.0	12.0	SHOCK	17	44	7	15.9
	SA93211.BV2	07/30/93	09:02	07/30/93	11:00	12.0	13.5	SHOCK	18	143	24	16.8
	SA93211.BV3	07/30/93	11:32	07/30/93	12:20	13.5	14.5	SHOCK		58	9	15.5
CAMAS CREEK	DJK93221.CA1	08/09/93	07:22	08/09/93	12:00	9.0	14.0	SHOCK	19	138	26	18.8
	DJK93221.CA2	08/09/93	09:19	08/09/93	12:15	11.0	14.0	SHOCK	23	77	12	15.6
CHAMBERLAIN CREEK	KMC93232.CB1	08/20/93	12:56	08/20/93	----	12.5	12.5	SHOCK	26	76	5	6.6

Appendix Table 19. (continued)

STREAM NAME	TAG GROUP	TAG DATE	START TAG TIME	RELEASE DATE	REL. TIME	START TAG TEMP (°C)	REL. TEMP (°C)	CAPTURE METHODS	DISTANCE RELEASED FROM MOUTH (KM)	NO. REL.	NO. DET.	% DET
ELK CREEK	SA93212.EC1	07/31/93	05:53	08/01/93	07:40	12.0	11.5	SHOCK	1 2 3	34 75 43	8 9 12	23.5 12.0 27.9
	SA93213.EC1	08/01/93	06:57	08/01/93	11:40	10.0	13.0	SHOCK	6	128	14	10.9
	SA93213.EC2	08/01/93	07:40	08/02/93	12:10	10.3	12.5	SHOCK	10	91	9	9.9
	SA93213.EC4	08/01/93	11:15	08/02/93	12:20	14.0	13.5	SHOCK	8 18	136 171	4 22	13.4 11.1
	SA93214.EC1	08/02/93	06:38	08/02/93	10:45	11.0	11.5	SHOCK	9			12.9
	SA93214.EC2	08/02/93	08:37	08/02/93	12:15	11.5	12.5	SHOCK		106	11	10.4
	SA93214.EC3	08/02/93	09:29	08/02/93	12:40	12.5	13.0	SHOCK	10	90	5	5.6
SALMON RIVER EAST FORK	SA93223.EF1	08/11/93	09:29	08/11/93	11:45	10.0	12.0	SHOCK	12 13	129	12	9.3
	SA93223.EF2	08/11/93	12:18	08/11/93	13:15	12.0	13.5	SHOCK	15	68	9	13.2
	SA93224.EF1	08/12/93	09:47	08/12/93	10:20	11.0	10.0	SHOCK	16	54	19	7.4
	SA93224.EF2	08/12/93	11:18	08/13/93	13:00	10.5	13.0	SHOCK		129	14	14.7
	SA93225.EF1	08/13/93	09:31	08/13/93	10:30	9.0	10.0	SHOCK	17	266		5.3
	SA93225.EF2	08/13/93	11:31	08/13/93	12:30	10.5	12.0	SHOCK	19	237	30	12.7
HERD CREEK	SA93223.HC1	08/11/93	13:23	08/11/93	13:45	13.5	13.5	SHOCK	1	51	0	0.0
	SA93224.HC1	08/12/93	10:14	08/12/93	11:00	10.0	10.5	SHOCK	5	68	8	11.8
LAKE CREEK	KMC93237.LC1	08/25/93	06:27	08/25/93	----	5.0	8.0	SHOCK	3	252	22	8.7
LOON CREEK	SA93221.LN1	08/09/93	08:37	08/09/93	10:00	7.5	8.0	SHOCK	33	168	41	24.4
	SA93221.LN2	08/09/93	14:38	08/09/93	15:45	13.5	15.0	SHOCK	34	132	27	20.5
	SA93221.LN3	08/09/93	15:26	08/10/93	09:00	14.0	8.0	SHOCK	35	96	10	10.4

Appendix Table 19. (continued)

STREAM NAME	TAG GROUP	TAG DATE	START TAG TIME	RELEASE DATE	REL. TIME	START TAG TEMP	REL. TEMP	CAPTURE METHODS	DISTANCE RELEASED FROM MOUTH (KM)	NO. REL.	NO. DET.	% DET
MARSH CREEK	SA93215.MC1	08/03/93	05:44	08/03/93	11:50	8.0	14.0	SHOCK	1 4	387	75 37	19.4
	SA93215.MC2	08/03/93	08 44	08/03/93	12:50	11.0	8.0	SHOCK		414		8.9
	SA93215.MC3	08/03/93	10:31	08/04/93	07:00	14.0		SHOCK	2	159	24	15.1
RUSH CREEK	SA93236.RC1	08/24/93	13:54	08/24/93	14:oo	13.0	11.0	SHOCK	1	10	2	20.0
SECESH RIVER	RLH93235.SE1	08/23/93	10:18	08/24/93	----	11.0	9.5	SHOCK	26 27	100	12 11	12.0
	RLH93235.SE2	08/23/93	10:57	08/23/93	----	11.0	12.0	SHOCK		101		10.9
	RLH93236.SE1	08/24/93	09 : 45	08/24/93	----	11.0	11.0	SHOCK	29	221	20	9.0
SALMON RIVER SOUTH FORK	SA93228.SF1	08/16/93	08:49	08/17/93	08:45	9.0	9.0	SHOCK	111	120	9 34	7.5
	SA93228.SF2	08/16/93	11:13	08/16/93	12:30	9.5	10.5	SHOCK	112	56	3	10.9
	SA93229.SF1	08/17/93	10:26	08/17/93	15:oo	9.0	11.5	SHOCK	117	156	15	5.4
	SA93229.SF2	08/17/93	10:58	08/17/93	13:oo	9.0	10.0	SHOCK	113			9.6
	SA93229.SF3	08/17/93	12:56	08/17/93	15:oo	9.5	11.5	SHOCK	118	36	1	2.8
	SA93229.SF4	08/17/93	14:29	08/17/93	15:30	11.0	11.5	SHOCK	116	127	16	12.6
VALLEY CREEK	SA93216.VC1	08/04/93	06:22	08/05/93	07:30	11.0	10.5	SHOCK	1	90	9	10.0
	SA93216.VC2	08/04/93	07:35	08/05/93	07:35	12.0	10.5	SHOCK	3	95	11	8.1
	SA93217.VC1	08/05/93	06:50	08/05/93	11:30	11.0	13.5	SHOCK	5	206	25	11.6
	SA93217.VC2	08/05/93		08/05/93	12:30	11.0	14.0	SHOCK				12.1
	SA93217.VC3	08/05/93	07:54	08/05/93	13:45	15.0	16.5	SHOCK	6	119	15	12.6
	SA93218.VC1	08/06/93	10:20	08/06/93	10:30	10.0	11.5	SHOCK	11	131	14	10.7
	SA93218.VC2	08/06/93	11:41	08/06/93	14:oo	12.5	16.5	SHOCK	13	128	5	3.9
CHAMBERLAIN CREEK WEST FORK	DJK93231.WC1	08/19/93	08:57	08/19/93	----	8.0	12.5	SEINE	1	400	33	8.2
	DJK93231.WC2	08/19/93	10:47	08/20/93	----	12.5	8.0	SHOCK	2	96	12	12.5

Appendix Table 20. Daily detections of PIT-tagged wild spring/summer chinook salmon smolts from Idaho at Lower Granite Dam during 1994, with associated river flows (kcfs), spill (kcfs), and water temperatures (°F) at the dam. Adjusted numbers detected are calculated during spill.

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
4/13/94	43.4	0.0	50	0	0
4/14/94	41.2	0.0	51	0	0
4/15/94	35.8	0.0	53	0	0
4/16/94	33.5	0.0	54	2	2
4/17/94	33.5	0.0	53	0	0
4/18/94	39.8	0.0	54	1	1
4/19/94	52.8	0.0	53	5	5
4/20/94	57.6	0.0	57	4	4
4/21/94	66.5	0.0	56	10	10
4/22/94	72.2	0.0	56	23	23
4/23/94	79.8	0.0	55	29	29
4/24/94	81.0	0.0	53	23	23
4/25/94	72.8	0.0	51	30	30
4/26/94	68.1	0.0	51	20	20
4/27/94	65.0	0.0	52	28	28
4/28/94	64.8	0.0	52	13	13
4/29/94	74.3	0.0	53	25	25
4/30/94	79.2	0.0	52	31	31
5/01/94	75.8	0.0	53	22	22
5/02/94	74.6	0.0	52	14	14
5/03/94	70.6	0.0	53	12	12
5/04/94	72.5	0.0	54	23	23
5/05/94	76.1	0.0	54	9	9
5/06/94	79.3	0.0	54	10	10
5/07/94	73.8	0.0	57	15	15
5/08/94	79.1	0.0	56	12	12
5/09/94	89.1	0.0	58	15	15
5/10/94	86.1	0.1	58	18	18
5/11/94	93.4	17.1	59	18	22
5/12/94	89.0	24.5	59	19	26
5/13/94	92.1	26.0	59	8	11
5/14/94	85.9	29.6	58	6	9
5/15/94	80.0	29.0	57	8	13
5/16/94	85.4	29.8	56	11	17
5/17/94	78.0	26.4	55	2	3

Appendix Table 20. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
5/18/94	77.9	29.7	54	4	6
5/19/94	74.5	27.7	54	7	11
5/20/94	75.5	25.8	54	0	0
5/21/94	72.9	25.6	54	3	5
5/22/94	75.9	25.9	55	0	0
5/23/94	72.7	26.1	56	3	5
5/24/94	73.8	25.9	57	5	8
5/25/94	79.4	25.6	59	2	3
5/26/94	76.3	25.7	58	6	9
5/27/94	77.3	21.4	59	3	4
5/28/94	68.7	14.3	59	1	1
5/29/94	64.3	17.2	59	3	4
5/30/94	59.8	17.5	59	0	0
5/31/94	58.0	17.0	59	2	3
6/01/94	54.0	17.4	59	1	1
6/02/94	52.1	17.3	60	1	1
6/03/94	52.4	17.3	61	3	4
6/04/94	49.7	16.9	62	1	2
6/05/94	49.5	15.0	62	2	3
6/06/94	46.0	16.8	62	2	3
6/07/94	45.9	16.7	63	1	2
6/08/94	45.3	17.0	64	0	0
6/09/94	41.4	14.5	63	1	2
6/10/94	40.3	15.7	65	1	2
6/11/94	36.5	12.4	64	1	2
6/12/94	37.3	14.0	63	0	0
6/13/94	34.4	13.2	63	0	0
6/14/94	49.3	15.6	64	0	0
6/15/94	45.7	8.6	64	2	2
6/16/94	39.7	0.0	65	1	1
6/17/94	40.5	0.0	66	2	2
6/18/94	37.8	0.0	63	1	1
6/19/94	34.0	0.0	64	2	2
6/20/94	33.9	0.0	62	0	0
6/21/94	32.3	0.0	63	0	0
6/22/94	31.1	0.0	70	2	2
6/23/94	30.9	0.0	66	0	0
6/24/94	31.5	0.0	68	1	1
6/25/94	27.9	0.0	68	0	0
6/26/94	26.2	0.0	68	0	0
6/27/94	25.1	0.0	71	0	0
6/28/94	24.5	0.0	71	1	1
6/29/94	23.2	0.0	70	0	0

Appendix Table 20. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
6/30/94	22.9	0.0	70	1	1
7/01/94	22.4	0.0	69	0	0
7/02/94	26.0	0.0	70	0	0
7/03/94	26.1	0.0	70	1	1
7/04/94	24.7	0.0	71	0	0
7/05/94	26.1	0.0	70	1	1
7/06/94	32.7	0.0	72	0	0
7/07/94	43.3	0.0	73	0	0
7/08/94	46.1	0.0	71	2	2
7/09/94	43.5	0.0	70	5	5
7/10/94	44.8	0.0	69	2	2
7/11/94	45.9	0.0	70	3	3
7/12/94	44.6	0.0	68	0	0
7/13/94	43.1	0.0	67	1	1
7/14/94	42.1	0.0	65	0	0
7/15/94	42.9	0.0	66	1	1
7/16/94	44.3	0.0	74	2	2
7/17/94	42.4	0.0	68	1	1
7/18/94	44.3	0.0	67	1	1
7/19/94	45.9	0.0	67	1	1
7/20/94	44.7	0.0	72	0	0
7/21/94	42.8	0.0	70	0	0
7/22/94	42.1	0.0	73	0	0
7/23/94	44.6	0.0	--	0	0
7/24/94	43.9	0.0	63	0	0
7/25/94	43.2	0.0	65	0	0
7/26/94	41.4	0.0	65	1	1
7/27/94	41.9	0.0	67	0	0
7/28/94	44.2	0.0	67	0	0
7/29/94	44.7	0.0	67	0	0
7/30/94	32.8	0.0	66	1	1
7/31/94	18.5	0.0	70	0	0
8/01/94	15.4	0.0	69	0	0
8/02/94	13.4	0.0	69	0	0
8/03/94	12.3	0.0	77	0	0
8/04/94	12.6	0.0	72	0	0
8/05/94	12.5	0.0	69	0	0
8/06/94	13.2	0.0	72	0	0
8/07/94	12.4	0.0	73	1	1
8/08/94	12.6	0.0	73	1	1
8/09/94	11.7	0.0	74	0	0
8/10/94	12.0	0.0	76	0	0
8/11/94	11.9	0.0	76	1	1

Appendix Table 20. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
8/12/94	12.4	0.0	76	0	0
8/13/94	12.0	0.0	76	0	0
8/14/94	11.1	0.0	75	0	0
8/15/94	11.3	0.0	74	0	0
8/16/94	13.3	0.0	75	0	0
8/17/94	14.9	0.0	--	0	0
8/18/94	13.0	0.0	76	0	0
8/19/94	13.0	0.0	76	0	0
8/20/94	13.1	0.0	75	0	0
8/21/94	12.7	0.0	75	0	0
8/22/94	10.8	0.0	75	0	0
8/23/94	11.6	0.0	75	0	0
8/24/94	12.6	0.0	75	0	0
8/25/94	18.4	0.0	75	0	0
8/26/94	14.2	0.0	74	0	0
8/27/94	13.9	0.0	74	0	0
8/28/94	11.5	0.0	74	0	0
8/29/94	12.5	0.0	74	0	0
8/30/94	14.7	0.0	74	1	1
8/31/94	13.3	0.0	74	0	0
9/01/94	12.5	0.0	74	0	0
9/02/94	13.1	0.0	73	0	0
9/03/94	13.9	0.0	73	0	0
9/04/94	12.6	0.0	73	1	1
9/05/94	11.7	0.0	74	0	0

Appendix Table 21. Daily detections of PIT-tagged wild spring/summer chinook salmon smolts from Idaho at Little Goose Dam during 1994, with associated river flows (kcfs), spill (kcfs), and water temperatures (°F) at the dam. Numbers detected represent fish not detected at a previous dam. Adjusted numbers detected are calculated during spill.

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
4/13/94	51.6	5.4	51	0	0
4/14/94	48.8	2.7	51	0	0
4/15/94	37.7	0.0	56	0	0
4/16/94	34.2	0.0	53	0	0
4/17/94	34.5	0.0	54	0	0
4/18/94	40.0	0.0	55	0	0
4/19/94	50.7	0.0	53	0	0
4/20/94	58.7	4.8	60	0	0
4/21/94	69.1	15.2	54	0	0
4/22/94	74.7	21.0	54	0	0
4/23/94	83.8	30.0	56	1	2
4/24/94	81.4	23.4	56	2	3
4/25/94	77.1	21.6	55	5	7
4/26/94	67.8	13.8	54	4	5
4/27/94	67.6	12.8	56	4	5
4/28/94	64.9	9.4	54	9	11
4/29/94	75.9	21.6	55	8	11
4/30/94	81.8	25.3	52	4	6
5/01/94	78.0	22.4	52	8	11
5/02/94	75.6	19.6	52	12	16
5/03/94	72.6	18.2	53	7	9
5/04/94	76.4	21.6	54	6	8
5/05/94	76.4	20.3	56	4	5
5/06/94	81.1	24.8	55	7	10
5/07/94	77.0	23.4	55	2	3
5/08/94	80.5	24.0	55	4	6
5/09/94	90.8	25.3	56	3	4
5/10/94	86.7	23.6	56	6	8
5/11/94	94.0	29.5	57	2	3
5/12/94	88.2	27.9	58	1	1
5/13/94	91.2	25.2	58	1	1
5/14/94	84.2	28.7	60	6	9
5/15/94	75.8	22.2	59	6	8
5/16/94	85.6	29.4	59	7	11

Appendix Table 21. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
5/17/94	74.8	26.4	58	14	22
5/18/94	76.3	26.7	60	8	12
5/19/94	72.1	23.4	56	3	4
5/20/94	74.0	23.0	56	6	9
5/21/94	70.9	23.4	57	12	18
5/22/94	71.8	22.8	59	7	10
5/23/94	71.9	21.5	60	8	11
5/24/94	71.6	27.9	59	2	3
5/25/94	77.3	29.5	56	0	0
5/26/94	74.9	24.3	56	1	1
5/27/94	76.7	20.0	57	5	7
5/28/94	68.4	17.7	57	1	1
5/29/94	63.3	16.7	57	2	3
5/30/94	58.6	12.8	60	0	0
5/31/94	57.2	19.0	59	3	4
6/01/94	53.1	10.3	60	0	0
6/02/94	51.2	9.9	61	1	1
6/03/94	51.1	11.0	59	0	0
6/04/94	47.5	10.0	60	2	3
6/05/94	48.7	9.8	60	1	1
6/06/94	43.4	9.6	60	2	3
6/07/94	45.0	9.7	60	2	3
6/08/94	43.0	9.5	60	2	3
6/09/94	39.9	9.1	60	2	3
6/10/94	39.2	9.5	64	2	3
6/11/94	34.1	7.8	65	0	0
6/12/94	37.0	8.7	63	0	0
6/13/94	32.6	8.2	61	0	0
6/14/94	48.8	9.2	62	0	0
6/15/94	44.3	4.4	62	0	0
6/16/94	40.6	0.0	62	1	1
6/17/94	39.5	0.0	69	1	1
6/18/94	38.5	0.0	63	3	3
6/19/94	32.9	0.0	67	0	0
6/20/94	35.0	0.0	65	0	0
6/21/94	32.5	0.0	67	0	0
6/22/94	31.5	0.0	69	0	0
6/23/94	31.4	0.0	62	0	0
6/24/94	31.4	0.0	65	0	0
6/25/94	26.8	0.0	64	0	0
6/26/94	27.0	0.0	63	0	0
6/27/94	25.1	0.0	69	0	0
6/28/94	25.9	0.0	66	0	0

Appendix Table 21. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
6/29/94	21.8	0.0	64	1	1
6/30/94	24.5	0.0	65	0	0
7/01/94	20.5	0.0	65	0	0
7/02/94	26.0	0.0	66	0	0
7/03/94	25.9	0.0	67	0	0
7/04/94	25.4	0.0	67	0	0
7/05/94	25.9	0.0	67	1	1
7/06/94	33.6	0.0	69	0	0
7/07/94	42.1	0.0	72	0	0
7/08/94	46.3	0.0	71	0	0
7/09/94	43.8	0.0	69	1	1
7/10/94	44.7	0.0	70	1	1
7/11/94	45.7	0.0	71	1	1
7/12/94	45.3	0.0	71	0	0
7/13/94	42.7	0.0	71	0	0
7/14/94	43.5	0.0	70	0	0
7/15/94	41.7	0.0	72	0	0
7/16/94	45.7	0.0	73	0	0
7/17/94	42.6	0.0	67	0	0
7/18/94	43.9	0.0	68	0	0
7/19/94	46.7	0.0	71	0	0
7/20/94	45.2	0.0	73	0	0
7/21/94	43.6	0.0	74	0	0
7/22/94	42.0	0.0	75	0	0
7/23/94	44.2	0.0	70	0	0
7/24/94	44.0	0.0	74	0	0
7/25/94	43.6	0.0	69	0	0
7/26/94	41.5	0.0	70	0	0
7/27/94	41.6	0.0	73	0	0
7/28/94	43.7	0.0	74	1	1
7/29/94	44.4	0.0	68	0	0
7/30/94	33.2	0.0	65	0	0
7/31/94	19.4	0.0	69	0	0
8/01/94	14.1	0.0	67	0	0
8/02/94	13.5	0.0	68	0	0
8/03/94	12.7	0.0	65	0	0
8/04/94	13.4	0.0	64	0	0
8/05/94	13.6	0.0	62	0	0
8/06/94	13.3	0.0	64	0	0
8/07/94	12.6	0.0	67	0	0
8/08/94	11.6	0.0	65	0	0
8/09/94	12.0	0.0	67	0	0
8/10/94	12.1	0.0	67	0	0

Appendix Table 21. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
8/11/94	11.9	0.0	68	0	0
8/12/94	11.3	0.0	68	0	0
8/13/94	12.3	0.0	68	0	0
8/14/94	11.2	0.0	68	0	0
8/15/94	11.7	0.0	66	0	0
8/16/94	12.2	0.0	67	0	0
8/17/94	14.2	0.0	69	0	0
8/18/94	13.0	0.0	71	0	0
8/19/94	12.9	0.0	70	0	0
8/20/94	14.1	0.0	70	0	0
8/21/94	13.1	0.0	69	0	0
8/22/94	10.9	0.0	70	0	0
8/23/94	12.9	0.0	70	0	0
8/24/94	11.0	0.0	71	0	0
8/25/94	16.7	0.0	72	0	0
8/26/94	15.0	0.0	72	0	0
8/27/94	14.1	0.0	74	0	0
8/28/94	12.0	0.0	72	0	0
8/29/94	11.9	0.0	72	0	0
8/30/94	12.7	0.0	72	1	1
8/31/94	11.3	0.0	72	0	0
9/01/94	12.5	0.0	72	0	0
9/02/94	12.2	0.0	72	0	0
9/03/94	13.5	0.0	71	0	0
9/04/94	13.0	0.0	72	0	0
9/05/94	11.8	0.0	72	0	0
9/06/94	12.6	0.0	72	0	0
9/07/94	14.1	0.0		0	0
9/08/94	18.0	0.0		0	0
9/09/94	13.0	0.0		1	1
10/01/94	----	0.0	--	1	1

Appendix Table 22. Daily detections of PIT-tagged wild spring/summer chinook salmon smolts from Idaho at Lower Monumental Dam during 1994, with associated river flows (kcfs), spill (kcfs), and water temperatures (°F) at the dam. Numbers detected represent fish not detected at a previous dam(s). Adjusted numbers detected are calculated during spill.

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
4/13/94	52.5	0.0	49	0	0
4/14/94	50.9	0.0	50	0	0
4/15/94	39.9	0.0	54	0	0
4/16/94	34.0	0.0	52	0	0
4/17/94	34.5	0.0	53	0	0
4/18/94	41.5	0.0	55	0	0
4/19/94	51.7	0.0	53	0	0
4/20/94	56.4	0.0	--	0	0
4/21/94	68.2	0.0	53	0	0
4/22/94	72.2	0.0	53	0	0
4/23/94	83.7	0.0	54	0	0
4/24/94	79.7	0.0	54	0	0
4/25/94	77.1	0.0	54	0	0
4/26/94	67.0	0.0	56	4	4
4/27/94	66.2	0.0	56	3	3
4/28/94	65.3	0.0	56	3	3
4/29/94	72.4	0.0	55	4	4
4/30/94	81.1	0.0	53	2	2
5/01/94	78.8	0.0	53	3	3
5/02/94	74.7	0.0	53	2	2
5/03/94	71.6	0.0	54	2	2
5/04/94	74.6	0.0	55	12	12
5/05/94	75.6	0.0	55	5	5
5/06/94	80.2	0.0	55	7	7
5/07/94	74.9	0.0	54	4	4
5/08/94	79.0	0.0	56	2	2
5/09/94	87.8	0.0	54	4	4
5/10/94	85.8	0.0	56	0	0
5/11/94	93.1	12.3	56	0	0
5/12/94	86.4	10.8	56	3	3
5/13/94	89.9	11.2	57	3	3
5/14/94	83.7	15.1	59	0	0
5/15/94	73.4	12.4	58	1	1
5/16/94	84.9	14.9	59	6	7

Appendix Table 22. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
5/17/94	72.2	9.5	59	4	5
5/18/94	76.0	13.0	60	8	10
5/19/94	69.6	11.5	58	4	5
5/20/94	72.6	13.8	58	6	7
5/21/94	70.0	15.7	57	2	3
5/22/94	69.8	16.1	57	1	1
5/23/94	70.8	16.0	57	0	0
5/24/94	68.5	16.2	59	4	5
5/25/94	76.7	15.7	56	0	0
5/26/94	73.8	17.2	57	1	1
5/27/94	71.4	12.9	57	1	1
5/28/94	71.2	11.6	56	0	0
5/29/94	60.6	11.1	56	0	0
5/30/94	57.7	11.2	58	0	0
5/31/94	54.9	11.1	58	0	0
6/01/94	51.3	10.3	58	0	0
6/02/94	49.0	10.5	60	0	0
6/03/94	50.3	11.6	60	1	1
6/04/94	46.3	10.5	60	0	0
6/05/94	48.2	11.2	61	0	0
6/06/94	42.3	9.7	61	1	1
6/07/94	44.3	10.9	60	0	0
6/08/94	42.6	9.9	60	0	0
6/09/94	38.0	9.5	60	0	0
6/10/94	37.6	9.9	62	0	0
6/11/94	34.0	9.5	62	0	0
6/12/94	34.4	8.1	61	0	0
6/13/94	31.9	8.8	62	0	0
6/14/94	48.3	9.5	62	0	0
6/15/94	42.5	4.7	63	0	0
6/16/94	42.9	0.0	62	0	0
6/17/94	39.1	0.0	68	1	1
6/18/94	39.1	0.0	64	1	1
6/19/94	33.2	0.0	--	0	0
6/20/94	35.4	0.0	64	0	0
6/21/94	32.6	0.0	65	1	1
6/22/94	32.4	0.0	66	1	1
6/23/94	31.5	0.0	66	0	0
6/24/94	30.9	5.7	67	0	0
6/25/94	26.9	0.4	66	0	0
6/26/94	27.4	0.0	66	0	0
6/27/94	24.9	0.0	66	0	0
6/28/94	27.7	0.0	66	0	0

Appendix Table 22. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
6/29/94	22.0	0.0	65	0	0
6/30/94	24.9	0.0	66	0	0
7/01/94	19.3	0.0	67	0	0
7/02/94	26.4	0.0	67	0	0
7/03/94	25.3	0.0	67	0	0
7/04/94	25.0	0.0	67	0	0
7/05/94	27.4	0.0	66	0	0
7/06/94	34.9	0.0	--	2	2
7/07/94	41.7	0.0	69	0	0
7/08/94	46.9	0.0	68	0	0
7/09/94	44.7	0.0	70	1	1
7/10/94	44.7	0.0	70	2	2
7/11/94	44.6	0.0	71	1	1
7/12/94	45.7	0.0	72	1	1
7/13/94	42.4	0.0	71	0	0
7/14/94	44.3	0.0	71	0	0
7/15/94	41.4	0.0	74	0	0
7/16/94	46.1	0.0	73	0	0
7/17/94	42.3	0.0	70	0	0
7/18/94	43.9	0.0	72	0	0
7/19/94	46.3	0.0	72	0	0
7/20/94	45.6	0.0	73	0	0
7/21/94	44.5	0.0	71	0	0
7/22/94	42.4	0.0	71	1	1
7/23/94	44.0	0.0	72	1	1
7/24/94	45.0	0.0	--	0	0
7/25/94	44.7	0.0		1	1
7/26/94	41.6	0.0	70	2	2
7/27/94	41.3	0.0	71	0	0
7/28/94	43.8	0.0	71	0	0
7/29/94	45.2	0.0	71	0	0
7/30/94	33.4	0.0	69	0	0
7/31/94	20.1	0.0	70	0	0
8/01/94	13.2	0.0	69	0	0
8/02/94	13.0	0.0	69	0	0
8/03/94	13.1	0.0	68	0	0
8/04/94	13.6	0.0	68	0	0
8/05/94	13.2	0.0	67	0	0
8/06/94	13.3	0.0	68	0	0
8/07/94	12.2	0.0	71	0	0
8/08/94	13.2	0.0	67	0	0
8/09/94	12.0	0.0	68	0	0
8/10/94	12.0	3.1	70	0	0

Appendix Table 22. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
8/11/94	10.3	4.3	69	0	0
8/12/94	11.1	0.0	69	0	0
8/13/94	11.5	0.0	69	0	0
8/14/94	11.7	0.0	69	0	0
8/15/94	11.9	0.0	68	0	0
8/16/94	12.3	0.0	69	0	0
8/17/94	13.1	0.0	70	0	0
8/18/94	13.2	0.0	71	0	0
8/19/94	12.8	0.0	69	0	0
8/20/94	14.5	0.0	69	0	0
8/21/94	13.2	0.0	69	0	0
8/22/94	11.2	0.0	69	0	0
8/23/94	13.0	0.0	70	0	0
8/24/94	12.2	0.0	70	0	0
8/25/94	15.7	0.0	70	0	0
8/26/94	14.9	0.0	70	0	0
8/27/94	14.5	0.0	71	0	0
8/28/94	12.2	0.0	71	0	0
8/29/94	11.9	0.0	70	0	0
8/30/94	13.0	0.0	72	0	0
8/31/94	11.8	0.0	72	0	0
9/01/94	11.4	0.0	72	0	0
9/02/94	12.7	0.0	71	0	0
9/03/94	11.3	0.0	70	0	0
9/04/94	11.0	0.0	71	0	0
9/05/94	12.8	0.0	72	0	0
9/06/94	12.8	0.0	71	0	0
9/07/94	13.1	0.0	72	0	0
9/08/94	14.8	0.0	71	0	0
9/09/94	12.9	0.0	70	0	0
9/10/94	12.9	0.0	70	0	0
9/11/94	11.3	0.0	71	0	0
9/12/94	12.4	0.0	70	0	0
9/13/94	11.5	0.0	71	1	1
9/14/94	13.2	0.0	70	0	0
9/15/94	12.6	0.0	70	0	0
9/16/94	11.8	0.0	71	1	1
9/17/94	13.0	0.0	71	0	0
9/18/94	12.9	0.0	71	0	0
9/19/94	13.0	0.0	71	1	1
9/20/94	12.3	0.8	71	0	0

Appendix Table 23. Daily detections of PIT-tagged wild spring/summer chinook salmon smolts from Idaho at McNary Dam during 1994, with associated river flows (kcfs), spill (kcfs), and water temperatures (°F) at the dam. Numbers detected represent fish not detected at a previous dam(s). Adjusted numbers detected are calulated during spill.

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
4/13/94	146.4	0.0	48	0	0
4/14/94	136.5	0.0	50	0	0
4/15/94	139.6	0.0	50	0	0
4/16/94	96.4	0.0	50	0	0
4/17/94	99.3	0.0	50	0	0
4/18/94	130.4	0.0	50	0	0
4/19/94	141.5	0.0	52	0	0
4/20/94	147.1	0.0	52	0	0
4/21/94	153.6	0.0	53	0	0
4/22/94	167.4	0.0	53	0	0
4/23/94	160.9	0.0	53	0	0
4/24/94	151.2	0.0	53	0	0
4/25/94	155.0	0.0	53	0	0
4/26/94	163.8	0.0	53	0	0
4/27/94	166.6	0.0	53	0	0
4/28/94	187.2	0.0	53	0	0
4/29/94	192.0	0.0	53	1	1
4/30/94	202.3	4.8	53	0	0
5/01/94	193.1	0.0	53	0	0
5/02/94	202.2	9.9	53	0	0
5/03/94	198.2	8.2	53	0	0
5/04/94	204.4	9.0	53	0	0
5/05/94	210.0	16.5	53	1	1
5/06/94	219.1	25.9	53	1	1
5/07/94	191.5	0.0	53	0	0
5/08/94	190.5	0.0	53	0	0
5/09/94	201.3	11.0	53	1	1
5/10/94	209.6	20.1	54	3	3
5/11/94	215.7	28.8	54	0	0
5/12/94	221.7	39.0	55	3	4
5/13/94	211.0	33.2	55	3	4
5/14/94	203.0	40.3	55	1	1
5/15/94	169.5	44.0	55	3	4
5/16/94	198.3	42.9	55	4	5
5/17/94	204.9	42.6	55	4	5

Appendix Table 23. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
5/18/94	194.5	35.7	55	5	6
5/19/94	200.8	39.4	55	6	7
5/20/94	199.7	39.3	56	5	6
5/21/94	186.0	33.1	56	4	5
5/22/94	181.0	41.8	56	6	8
5/23/94	197.7	34.8	57	4	5
5/24/94	208.7	39.6	57	5	6
5/25/94	207.1	34.2	57	6	7
5/26/94	219.4	45.8	57	1	1
5/27/94	209.9	36.7	57	6	7
5/28/94	192.6	26.7	57	2	2
5/29/94	183.8	26.7	57	0	0
5/30/94	191.2	26.7	57	0	0
5/31/94	193.3	23.3	57	0	0
6/01/94	210.1	23.3	57	2	2
6/02/94	199.3	30.0	58	2	2
6/03/94	199.5	40.2	58	3	4
6/04/94	201.2	40.4	58	0	0
6/05/94	188.7	39.8	58	2	3
6/06/94	211.0	40.4	59	1	1
6/07/94	201.2	40.1	59	0	0
6/08/94	207.7	40.1	59	0	0
6/09/94	203.9	40.4	59	2	2
6/10/94	204.3	40.4	59	0	0
6/11/94	195.3	40.2	59	1	1
6/12/94	190.4	38.3	61	0	0
6/13/94	210.9	40.3	60	0	0
6/14/94	217.8	40.1	59	0	0
6/15/94	211.4	40.2	59	1	1
6/16/94	195.8	40.0	59	1	1
6/17/94	188.4	20.0	59	0	0
6/18/94	184.3	0.0	60	0	0
6/19/94	165.4	0.0	60	0	0
6/20/94	175.1	0.0	62	0	0
6/21/94	190.9	0.0	62	0	0
6/22/94	174.9	0.0	65	1	1
6/23/94	186.6	0.0	64	0	0
6/24/94	181.6	0.0	63	2	2
6/25/94	167.0	0.0	63	0	0
6/26/94	154.4	0.0	63	0	0
6/27/94	164.6	0.0	64	0	0
6/28/94	158.8	0.0	64	0	0
6/29/94	149.8	0.0	64	0	0
6/30/94	176.1	0.0	65	0	0

Appendix Table 23. (continued)

Date	Daily average flow (kcfs)	Daily average spill (kcfs)	Scroll-case water temperature (°F)	Numbers detected	Adjusted numbers detected
7/01/94	162.5	0.0	65	1	1
7/02/94	141.9	0.0	65	0	0
7/03/94	132.1	0.0	65	0	0
7/04/94	130.9	0.0	65	0	0
7/05/94	139.8	0.0	65	0	0
7/06/94	150.4	0.0	64	0	0
7/07/94	158.1	0.0	64	0	0
7/08/94	159.5	0.0	64	0	0
7/09/94	162.6	0.0	64	0	0
7/10/94	138.9	0.0	64	0	0
7/11/94	162.5	0.0	67	0	0
7/12/94	164.1	0.0	67	0	0
7/13/94	155.5	0.0	--	1	1
7/14/94	156.3	0.0	--	0	0
7/15/94	153.2	0.0	67	0	0
7/16/94	149.6	0.0	70	0	0
7/17/94	127.1	0.0	70	0	0
7/18/94	149.6	2.5	70	0	0
7/19/94	152.8	6.7	70	0	0
7/20/94	145.0	10.4	71	0	0
7/21/94	155.0	10.7	73	0	0
7/22/94	162.2	12.0	73	0	0
7/23/94	142.6	15.7	73	0	0
7/24/94	128.0	15.7	73	0	0
7/25/94	148.1	15.7	73	0	0
7/26/94	147.2	15.4	73	0	0
7/27/94	143.3	15.4	73	0	0
7/28/94	132.9	15.7	73	0	0
7/29/94	141.1	11.5	72	0	0
7/30/94	134.6	0.0	71	0	0
7/31/94	106.1	0.0	71	0	0

Appendix Table 24. Monthly depth (in feet) information at five monitoring sites in the Salmon River drainage from December 1993 to July 1994. These data were provided by Pacific Northwest Laboratories.

Marsh Creek

	December	January	February	March	April	May	June	July
Average Depth	1.3	1.2	0.9	0.6	1.2	1.9	1.6	1.1
Maximum Depth	1.8	2.3	2.2	1.3	2.3	2.5	2.3	1.6
Minimum Depth	0.7	0.3	0.0	0.0	0.5	1.4	1.2	0.7

Middle Fork Salmon River near Thomas Creek

Average Depth	1.1	1.0	0.7	1.0	2.0	2.7	1.6	0.8
Maximum Depth	1.8	1.4	1.1	1.6	3.4	3.7	3.0	1.7
Minimum Depth	0.3	0.6	0.1	0.4	0.8	1.5	0.5	0.3

Salmon River near Sawtooth Hatchery

Average Depth	2.5	2.2	1.9	2.1	2.5	3.0	2.7	1.6
Maximum Depth	3.5	2.9	2.7	2.7	3.2	3.7	3.5	2.5
Minimum Depth	1.9	1.7	1.2	1.4	1.9	2.4	2.2	0.6

Valley Creek

Average Depth	1.5	1.4	1.1	1.3	1.6	2.0	1.9	0.9
Maximum Depth	1.9	1.9	1.8	2.1	2.7	2.6	2.6	1.9
Minimum Depth	1.0	1.0	0.5	0.6	0.9	1.5	1.4	0.5

Salmon River below confluence with Yankee Fork

Average Depth	1.1	1.0	0.6	1.0	1.6	2.2	1.7	0.8
Maximum Depth	1.7	1.3	1.2	1.8	2.7	3.6	3.0	1.9
Minimum Depth	0.6	0.5	0.0	0.3	1.0	1.1	0.9	0.3

Appendix Table 25. Monthly water temperature information (°C) at five monitoring sites in the Salmon River drainage from December 1993 to July 1994. These data were provided by Pacific Northwest Laboratories.

Marsh Creek

	December	January	February	March	April	May	June	July
Average Temp.	0.30	0.59	0.64	2.82	4.11	7.54	10.83	13.21
Maximum Temp.	0.30	3.30	4.50	9.60	11.10	15.30	19.70	21.20
Minimum Temp.	0.30	0.30	0.30	0.10	0.20	2.10	3.60	5.50

Middle Fork Salmon River near Thomas Creek

Average Temp.	0.30	0.31	0.42	3.26	6.46	9.12	12.83	16.86
Maximum Temp.	0.50	0.60	3.00	7.50	10.50	14.10	19.30	22.30
Minimum Temp.	0.30	0.21	0.30	0.30	3.20	5.70	6.90	8.90

Salmon River near Sawtooth Hatchery

Average Temp.	0.50	1.30	1.59	4.27	6.67	9.86	12.75	14.73
Maximum Temp.	3.00	4.20	6.20	10.00	13.10	16.50	20.10	21.80
Minimum Temp.	0.20	0.10	0.10	0.10	1.80	5.00	7.10	8.60

Valley Creek

Average Temp.	0.59	0.81	0.90	2.59	5.34	9.84	13.09	16.83
Maximum Temp.	0.90	1.60	2.00	10.00	13.10	17.50	22.70	25.70
Minimum Temp.	0.40	0.40	0.30	0.30	0.80	4.10	6.00	8.40

Salmon River below confluence with Yankee Fork

Average Temp.	0.29	0.44	0.76	3.15	5.71	8.92	12.96	16.97
Maximum Temp.	0.50	1.20	3.80	6.80	10.10	14.70	19.70	'22.50
Minimum Temp.	0.20	0.20	0.20	0.30	2.10	5.00	6.90	10.00

Appendix Table 26. Monthly pH information at five monitoring sites in the Salmon River drainage from December 1993 to July 1994. These data were provided by Pacific Northwest Laboratories.

Marsh Creek

	December	January	February	March	April	May	June	July
Average pH	7.35	7.56	7.57	7.69	7.69	7.94	8.33	8.05
Maximum pH	7.74	7.98	7.83	7.96	8.32	8.30	9.17	9.16
Minimum pH	7.17	7.36	7.28	7.53	7.25	7.60	7.94	7.54

Middle Fork Salmon River near Thomas Creek

Average pH	8.23	9.23	9.36	8.60	8.37	7.72	7.88	8.12
Maximum pH	9.22	9.66	9.62	9.14	9.21	9.16	8.65	8.81
Minimum pH	7.96	8.60	8.66	8.21	7.95	7.41	7.57	7.70

Salmon River near Sawtooth Hatchery

Average pH	8.21	8.30	8.28	8.28	8.19	8.09	8.18	7.86
Maximum pH	8.58	9.00	8.73	8.76	8.77	8.77	8.92	8.91
Minimum pH	8.01	8.01	8.00	7.98	7.81	7.61	7.67	7.27

Valley Creek

Average pH	7.53	7.84	7.96	7.96	----	----	7.47	7.97
Maximum pH	7.78	8.85	9.02	8.65	----	----	7.69	8.60
Minimum pH	7.43	7.51	7.53	7.05	____	----	7.01	7.32

Salmon River below confluence with Yankee Fork

Average pH	8.01	8.15	8.18	8.18	8.18	8.12	8.24	8.54
Maximum pH	8.13	8.69	8.62	8.43	8.56	8.80	9.11	9.37
Minimum pH	7.92	7.99	8.06	8.01	7.90	7.72	7.78	7.88

Appendix Table 27. Monthly specific conductance information in microsiemens/cubic centimeter (uS/cm^3) at five monitoring sites in the Salmon River drainage from December 1993 to July 1994. These data were provided by Pacific Northwest Laboratories.

Marsh Creek

	December	January	February	March	April	May	June	July
Average Conductance	60.59	60.42	59.10	59.26	49.78	42.27	55.57	61.50
Maximum Conductance	67.00	76.00	64.00	66.00	62.00	73.00	72.00	66.00
Minimum Conductance	56.00	54.00	54.00	39.00	32.00	33.00	44.00	55.00

Middle Fork Salmon River near Thomas Creek

Average Conductance	72.98	87.35	**93.16**	**89.83**	**69.77**	**56.97**	**71.58**	88.30
Maximum Conductance	89.00	98.00	104.00	97.00	84.00	65.00	85.00	97.00
Minimum Conductance	63.00	79.00	85.00	79.00	48.00	48.00	57.00	64.00

Salmon River near Sawtooth Hatchery

Average Conductance	154.48	160.62	163.40	158.42	128.73	92.33	107.58	144.24
Maximum Conductance	167.00	173.00	184.00	174.00	158.00	120.00	141.00	154.00
Minimum Conductance	112.00	148.00	150.00	126.00	93.00	69.00	79.00	124.00

Valley Creek

Average Conductance	74.28	77.87	82.32	83.76	68.37	52.62	54.73	69.85
Maximum Conductance	78.00	85.00	87.00	**101.00**	85.00	63.00	67.00	79.00
Minimum Conductance	66.00	69.00	78.00	66.00	49.00	43.00	45.00	56.00

Salmon River below confluence with Yankee Fork

Average Conductance	110.73	110.76	114.24	109.62	82.03	61.16	69.48	107.82
Maximum Conductance	118.00	126.00	126.00	122.00	**100.00**	75.00	87.00	128.00
Minimum Conductance	98.00	100.00	101.00	95.00	59.00	48.00	54.00	81.00

Appendix Table 28. Monthly dissolved oxygen information in percent saturation at five monitoring sites in the Salmon River drainage from December 1993 to July 1994. These data were provided by Pacific Northwest Laboratories.

Marsh Creek

	December	January	February	March	April	May	June	July
Average % Dis. Oxygen	82.63	88.78	92.52	98.24	95.97	90.76	75.12	75.13
Maximum % Dis. Oxygen	86.40	95.50	101.50	107.80	103.60	98.50	89.70	90.13
Minimum % Dis. Oxygen	79.80	81.60	86.70	91.60	81.80	83.30	59.20	48.30

Middle Fork Salmon River near Thomas Creek

Average % Dis. Oxygen	103.34	28.74	30.92	60.83	93.79	86.32	89.49	91.23
Maximum % Dis. Oxygen	114.10	67.30	49.30	86.40	102.80	100.80	100.10	107.00
Minimum % Dis. Oxygen	67.30	19.10	24.40	39.90	82.20	44.70	84.90	84.40

Salmon River near Sawtooth Hatchery

Average % Dis. Oxygen	79.16	78.99	77.67	86.36	90.29	88.54	72.51	83.03
Maximum % Dis. Oxygen	86.00	88.50	90.30	101.10	103.30	112.70	102.80	111.80
Minimum % Dis. Oxygen	75.60	49.20	20.50	77.80	84.30	62.60	41.30	34.80

Valley Creek

Average % Dis. Oxygen	83.25	89.34	93.19	93.01	72.19	84.18	85.38	90.34
Maximum % Dis. Oxygen	87.30	98.10	104.90	114.90	89.30	94.00	93.90	105.00
Minimum % Dis. Oxygen	80.90	83.80	87.60	65.00	56.80	66.20	74.40	77.60

Salmon River below confluence with Yankee Fork

Average % Dis. Oxygen	83.97	87.03	90.31	91.55	92.15	99.03	102.66	90.44
Maximum % Dis. Oxygen	89.30	91.40	94.90	98.00	110.40	122.60	137.60	107.60
Minimum % Dis. Oxygen	82.20	82.90	87.30	83.60	87.30	92.10	91.20	80.00

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