Monitoring the Migrations of Wild Snake River Spring/Summer Chinook Salmon Juveniles, 2004-2005

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Report of research by

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for

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, Oregon 97208-3621
Project 1991-028-00
Contract No. 00021961

May 2006

EXECUTIVE SUMMARY

This report provides results from an ongoing project to monitor the migration behavior and survival of wild juvenile spring/summer Chinook salmon in the Snake River Basin. Data reported is from 2005 detections of fish tagged in Idaho by the National Marine Fisheries Service in summer 2004 and of fish tagged in Oregon during 2004 by the Oregon Department of Fish and Wildlife. Our analyses include arrival timing and estimated survival to Lower Granite Dam. Principal results from tagging and interrogation during 2004-2005 are listed below:

1) In July and August 2004, we tagged 19,886 wild Chinook salmon parr with passive integrated transponder (PIT) tags. Fish were collected and released in 15 Idaho streams.

2) Average overall observed mortality from collection, handling, tagging, and after a 24-h holding period was 0.8%.

3) Of 2,511 Chinook salmon parr tagged and released in Valley Creek, 14.2% (357) were detected at two instream PIT-tag monitoring systems in lower Valley Creek from late summer 2004 to the following spring 2005. Of these, 77.3% were detected in late summer/fall, 14.0% in winter, and 8.7% in spring. Estimated parr-to-smolt survival to Lower Granite Dam was 10.9% for the late summer/fall group, 22.7% for the winter group, and 32.9% for the spring group. An estimated 41.5 to 46.4% of all tagged parr survived to migrate out of Valley Creek, and their estimated survival to Lower Granite Dam was 13.9%. Overall parr-to-smolt survival to the dam for all tagged parr from this stream was estimated at 5.9%. Development and improvement of instream PIT-tag monitoring systems continued throughout 2004 and 2005.

4) At Little Goose Dam in 2005, length and weight was measured for 656 recaptured fish from 15 Idaho streams. Fish had grown an average of 44.5 mm in length and 9.6 g in weight over an average of 282 d. Their mean condition factor declined from 1.24 at release (parr) to 0.96 at recapture (smolt).

5) Fish that were larger at release were detected at a significantly higher rate the following spring and summer than their smaller cohorts ($P<0.001$).

6) Fish that arrived at Lower Granite Dam in April and May were significantly larger at release than fish that arrived after May ($P<0.001$).

7) In 2005, peak detections at Lower Granite Dam of all fish tagged as parr during summer 2004 (from the 15 streams in Idaho and 4 streams in Oregon) occurred during low flows of 60.4 kcfs on 5 May. The 10th, 50th, and 90th percentile passage dates were 25 April, 7 May, and 24 May, respectively.

8) Estimated parr-to-smolt survival to Lower Granite Dam for Idaho and Oregon streams combined averaged 8.4% (range 3.7-13.3% depending on stream of origin). This was the second lowest average survival rate measured in the last 13 years. The low survival rate may have been related to high parr densities in 2004, which resulted from a comparatively large number of wild spawners in 2003.

In 2005, the 50th and 90th percentile passage dates of wild fish at Lower Granite Dam occurred in early and late May, respectively. Although climate conditions were cool and wet, flows were considered low until mid-May 2005. We again concluded that the annual migration of these wild stocks is driven by complex interrelationships involving several factors.

CONTENTS

INTRODUCTION

This report provides information on wild Chinook salmon tagged as parr using passive integrated transponder (PIT) tags. Fish were tagged in late summer 2004 and subsequently monitored through spring 2005. Survival and migration timing to Lower Granite Dam is reported, as well as interrogation data from several other PIT-tag monitoring sites throughout the Snake and Columbia Rivers. This research continues studies that began in 1991 with funding from the Bonneville Power Administration. Results from previous study years were reported by Achord et al. (1994, 1995a,b, 1996a, 1997, 1998, 2000, 2001a,b, 2002, 2003, 2004, 2005). The goals of this ongoing study are:

1) Characterize the migration timing and estimate parr-to-smolt survival of different stocks of wild Snake River spring/summer Chinook salmon smolts at Lower Granite Dam.
2) Determine whether consistent migration patterns are apparent.
3) Determine what environmental factors influence these migration patterns.
4) Characterize the migrational behavior and estimate survival of different wild juvenile fish stocks as they emigrate from their natal rearing areas.

This study provides critical information for recovery planning of wild stocks listed as endangered or threatened under the U.S. Endangered Species Act.

During 2004-2005 in the Salmon River Basin, Idaho, we collected data from five monitoring stations that measured water temperature, dissolved oxygen, specific conductance, turbidity, water depth, and pH. We also collected weather data from three stations and stream flow data from two stations for the Baseline Environmental Monitoring Program. These environmental data can be compared with parr/smolt migration, survival, and timing data to help to discern whether patterns or characteristic relationships exist that may help in recovery planning for threatened stocks.

METHODS

Fish Collection and Tagging

National Marine Fisheries personnel tagging fish in Idaho streams during 2004 used the safe handling methods developed for wild fish during this study. These handling methods are detailed in Matthews et al. (1990) and in previous reports from this study (Achord et al. 1994, 1995a,b, 2003, 2004).

The Oregon Department of Fish and Wildlife (ODFW) PIT tagged wild Chinook salmon parr in the Grande Ronde and Imnaha River drainages in northeast Oregon in 2004. All tagging, detection, and migration timing information for theses fish will be reported by ODFW. However, in agreement with ODFW, we report the timing and overall estimated survival to Lower Granite Dam of fish from these Oregon streams.

Interrogation at Instream PIT-Tag Monitors

Until recently, the opportunities to monitor migrating PIT-tagged wild juvenile fish were limited to a few manually operated traps in streams or rivers, the PIT-tag monitors within juvenile fish bypass systems at dams, and the PIT-tag detector trawl operated in the upper Columbia River estuary. In an effort to detect fish closer to tagging sites, we began development of passive instream PIT-tag monitoring systems in Valley Creek in 2002.

We placed instream monitoring systems at two sites located 1.6 km apart. Development of these systems continued throughout 2003, 2004, and 2005, and details about the equipment used was described by Achord et al. (2004, 2005). In summary, both systems were set up to automatically interrogate, store, and transmit data to the PIT Tag Information System (PTAGIS; PSMFC 1996) in the same manner as interrogation systems at the dams. Here we report data collected at the instream monitors from August 2004 through July 2005.

Juvenile Migrant Traps

Some fish PIT tagged as parr in natal rearing areas are subsequently collected at migrant traps (Figure 1). During fall 2004 and spring 2005, juvenile migrant fish traps were operated at Knox Bridge on the South Fork of the Salmon River, on Lake Creek, near Chinook Campground on the Secesh River, on Marsh Creek, and near the Sawtooth Hatchery on the upper Salmon River. Also during spring 2005, juvenile migrant fish traps were operated on the lower Salmon River near Whitebird, Idaho, and on the Snake River at Lewiston, Idaho. Traps were operated by the Nez Perce Tribe and the Idaho Department of Fish and Game.

Generally, fish at these traps were anesthetized, scanned for PIT tags, and then measured for length and weight. Upon recovery from the anesthetic, all fish were released back to the streams or rivers.

Recaptures at Dams

While collecting and PIT tagging fish at dams for various studies, NMFS and other personnel occasionally encounter wild fish that are already PIT tagged. In such cases, biological data are usually collected from these fish. To increase sample sizes for parr-to-smolt growth information on previously PIT-tagged wild fish, in 2005 we continued efforts begun in 2001 to utilize the PIT-tag separation-by-code system (Downing et al. 2001) at Little Goose Dam. The system was programmed to separate up to a maximum of 100 wild fish from each stream so that we could take length and weight measurements from a sample of fish. All fish that were separated at the dam were handled using water-to-water transfers and other best handling practices. After handling, all tagged and untagged fish were returned to the bypass system for release below the dam.

In addition to length and weight measurements on these wild smolts at Little Goose Dam, a Fulton-type condition factor (CF) was calculated as

$$\mathrm{CF} = \frac{\text{weight (g)}}{\text{length (mm)}} \times 10^5$$

Condition factors were calculated for these fish both at release and recapture.

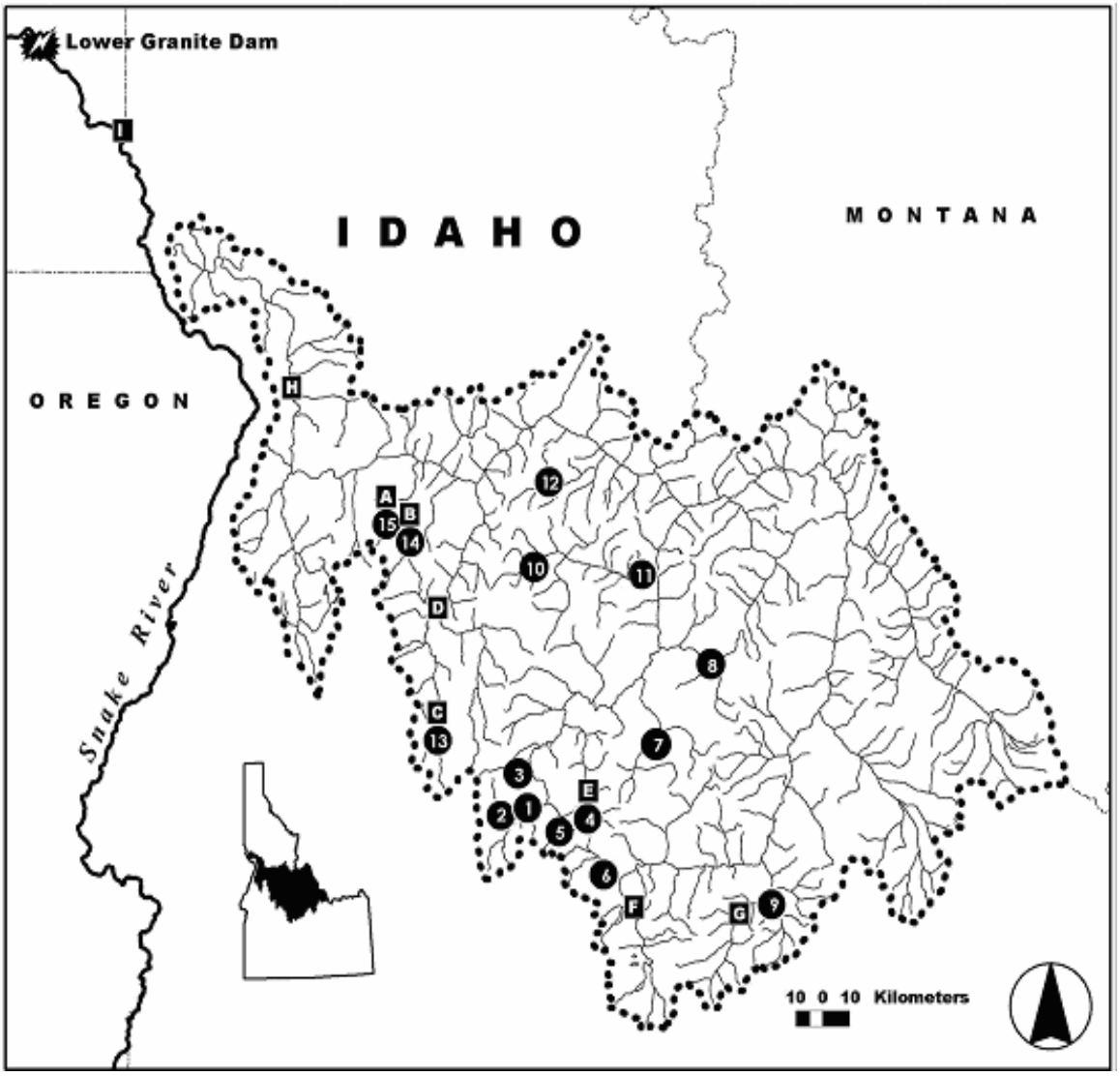

Figure 1. Wild spring/summer Chinook salmon parr were PIT tagged during 2004 in the following streams:

1-Bear Valley Creek
2-Elk Creek
3-Sulphur Creek
4-Marsh Creek
5-Cape Horn Creek
6-Valley Creek
7-Loon Creek
8-Camas Creek
9-Herd Creek
10-Big Creek (upper)
11-Big Creek (lower)
12-W.F. Chamberlain/Chamberlain Creek
13-South Fork Salmon River
14-Secesh River
15-Lake Creek

Juvenile migrant fish traps shown above are as follows:

A-Lake Creek Trap
B-Secesh River Trap
C-South Fork Salmon River (Knox Bridge) Trap
D-Lower S.F. Salmon River Trap
E-Marsh Creek Trap
F-Sawtooth Trap
G-East Fork Salmon River Trap
H-Salmon River Trap
I-Snake River Trap

Interrogation at Dams and in the Columbia River Estuary

A portion of wild Chinook salmon PIT tagged as parr in summer 2004 survived over winter to migrate downstream on the Snake and Columbia Rivers during spring and summer 2005. As migrating smolts, these fish encountered eight dams on the lower Snake and Columbia River. Of these eight, the following seven dams were equipped with smolt collection or PIT-tag interrogation systems: Lower Granite, Little Goose, Lower Monumental, and Ice Harbor Dams on the Snake River; and McNary, John Day, and Bonneville Dams on the Columbia River.

At each of these seven dams, smolts passed via the spillway, juvenile bypass diversion system, or turbines. All smolts that were guided into juvenile bypass systems were electronically monitored for PIT tags. The PIT-tag interrogation systems were the same as those described by Prentice et al. (1990). Dates and times to the nearest second were automatically recorded on a computer as PIT-tagged fish passed each detector, and detection data were transferred once daily to PTAGIS (PSMFC 1996).

Tagged fish were also monitored by a surface trawl detector operated in the upper Columbia River estuary (approximately 150 km downstream from Bonneville Dam). The trawl system and its operation are described by Ledgerwood et al. (2004).

Migration Timing

We monitored within-season migration timing based on daily detection numbers at Lower Granite Dam of all wild PIT-tagged Chinook salmon smolts. Detection numbers were expanded based on estimated daily detection probabilities, which were calculated using the methods of Sandford and Smith (2002). This method provided daily estimates of the number of PIT-tagged wild spring/summer Chinook salmon smolts that passed the dam. Daily estimates were then pooled to obtain a yearly survival estimate, which we compared to survival estimates from previous years.

Migration timing at Lower Granite Dam was calculated by totaling the (expanded) number of detections in 3-d intervals and dividing by total detections during the season. This method was applied to detection data for fish from combined streams.

There was no straightforward way of comparing Lower Granite Dam arrival statistics (10th, median, and 90th percentiles) between streams to find statistically significant differences. We used an approach analogous to analysis of variance with multiple comparisons. Bootstrap methods were used to calculate estimates of the standard error for each statistic (Efron and Tibshirani 1993). A "representative" estimate of variance for each statistic was then calculated as the median of the standard errors (SEs) for fish from all 19 streams. This method assumed that the timing of passage percentiles had similar distributions among streams. The Student-Newmann-Keuls (SNK) multiple comparison method was used to make comparisons between streams for each statistic ($\alpha = 0.05$; Petersen 1985).

We also examined the migration timing at Lower Granite Dam of individual populations over a period of years to determine similarities or differences between years and between populations. We chose populations with 8 or more years of timing data for these analyses. Comparisons of the 10th, 50th, and 90th percentile passage dates were made among 18 streams using a two-factor analysis of variance (ANOVA). "Year" was considered a random factor and "stream" a fixed factor. Residuals were visually examined to assess normality. Treatment means were compared using Fisher's least significant difference procedure (Peterson 1985). Statistical significance was set at $\alpha = 0.05$.

Environmental Information

In 2004-2005, we collected hourly measurements of water temperature, dissolved oxygen, specific conductance, turbidity, water depth, and pH from the following locations: 1) Marsh Creek, 2) Valley Creek, 3) Sawtooth Hatchery in the upper Salmon River, 4) South Fork of the Salmon River (Knox Bridge), and 5) Secesh River (near Chinook Campground).

All monitoring systems except the system at Valley Creek were close to juvenile migrant fish traps. The water quality monitor at Valley Creek was located near our instream PIT-tag monitoring system (VC2). Also, we collected weather/climate data from 3 weather stations and stream flows from 2 stations in the Salmon River basin.

RESULTS

Fish Collection and Tagging

From 21 July to 27 August 2004, we collected 30,154 wild Chinook salmon parr in 15 Idaho streams (Figure 1) over a distance of about 33.3 stream kilometers and approximately 346,581 m^2 (Table 1; Appendix Table 2). Of these fish, 19,886 were PIT tagged and released back into the streams along with the remaining untagged live fish. Fish were rejected for tagging because of small size, injury, precocious maturation, or because excess numbers of fish had been collected. In addition, some fish were rejected because they were previously tagged, and others were collected for unrelated studies of genetics and marine derived nutrients. Numbers of tagged fish released per stream ranged from 298 in Chamberlain Creek to 2,511 in Valley Creek (Table 1 and Appendix Tables 2 and 3a).

Fork lengths of all collected Chinook salmon parr ranged from 37 to 177 mm (mean 60.2 mm), and weights ranged from 0.5 to 32.0 g (mean 3.1 g). Fork lengths of tagged and released Chinook salmon parr ranged from 47 to 157 mm (mean 63.2 mm) (occasionally fish smaller than 55 mm are inadvertently tagged), and weights ranged from 1.1 to 13.5 g (mean 3.2 g; Appendix Table 2). In 2004, collection areas within the streams were further delineated by recording Global Positioning System (GPS) coordinates using Universal Transverse Mercator (UTM) grid (Appendix Table 3b).

Other than Chinook salmon parr, unidentified fry were the most abundant fish observed during collection operations (Table 2). However, the records of non-target fish do not represent total abundances in the collection areas, as we targeted only Chinook salmon and not other coincident species.

Overall mortality associated with collection, tagging, and 24-h holding averaged 0.8% (Table 3; Appendix Table 4).

Table 1. Summary of collection, PIT tagging, and release of wild Chinook salmon parr with average fork lengths and weights, approximate distances, and estimated areas sampled in streams of Idaho during July and August 2004.

Tagging location	Number of fish		Average fish length (mm)		Average fish weight (g)		Collection area to mouth of stream (km)	Estimated area sampled in streams (m^2)
	Collected	Tagged and released	Collected	Tagged	Collected	Tagged		
Bear Valley Creek.	2,640	1,500	56.4	59.9	2.4	2.5	9, 13, and 14	17,140
Elk Creek	2,098	1,471	58.4	61.1	2.9	3.0	0-4	18,109
Marsh Creek	2,316	1,501	60.4	64.7	3.4	3.7	11 and 14	3,010
Sulphur Creek	2,086	1,157	55.7	61.3	2.9	2.9	5-7	4,550
Cape Horn Creek	2,703	1,022	53.1	61.3	3.1	3.1	0-3	30,640
Valley Creek	4,577	2,511	57.3	63.0	2.9	3.0	4, 9, and 18	23,278
Loon Creek	1,619	1,501	61.7	62.5	3.3	3.3	33-37	29,939
Camas Creek	1,742	1,500	60.8	62.1	3.4	3.5	22-24	34,129
Herd Creek	1,818	1,559	64.9	66.8	3.8	3.9	1 & 3	22,297
Big Creek (upper)	1,801	1,516	63.4	63.5	3.0	3.0	55-57	24,864
Big Creek (lower)	393	374	71.1	71.2	4.2	4.2	8-10	16,562
W.F. Chamb. Creek	1,039	1,030	66.1	66.0	3.4	3.4	1-2	3,120
Chamberlain Creek.	355	298	60.0	61.0	3.0	3.0	25-26	10,068
S.F. Salmon River	2,489	1,222	56.1	61.4	2.8	2.7	117 and 123	44,047
Secesh River	1,506	1,074	59.9	62.8	2.8	2.9	25-29	40,787
Lake Creek	972	650	58.7	62.2	2.8	3.0	1-3	24,041
Totals or averages	30,154	19,886	60.2	63.2	3.1	3.2	33.3	346,581

Table 2. Summary of species other than Chinook salmon parr observed during collection operations in Idaho in July and August 2004. Numbers of steelhead in parentheses were PIT tagged for the Idaho Department of Fish and Game.

Streams	Steelhead	Tagged steelhead	Unidentified fry	Brook trout	Cutthroat trout	Bull trout	Sculpin	Dace	Sucker	Whitefish	Shiner
Bear Valley Creek	47	(9)	384	29	0	1	30	55	10	265	0
Elk Creek	107	(35)	72	110	0	0	35	51	21	117	0
Marsh Creek	6	(0)	193	80	0	0	42	0	0	57	0
Sulphur Creek	65	(9)	50	0	1	0	25	0	0	5	0
Cape Horn Creek	75	(22)	96	47	0	4	1,068	1	0	0	0
Valley Creek	73	(43)	171	49	0	4	574	416	106	98	142
Loon Creek	157	(45)	1,111	0	0	0	412	0	0	19	0
Camas Creek	122	(56)	1,973	0	0	1	0	0	0	8	0
Herd Creek	88	(29)	580	0	0	1	490	0	0	8	0
Big Creek (upper)	195	(27)	395	83	0	7	2,049	0	0	0	0
Big Creek (lower)	145	(52)	733	0	9	0	34	329	16	0	0
W.F. Chamberlain Creek	68	(0)	173	0	0	4	13	0	0	30	0
Chamberlain Creek	42	(0)	239	0	0	2	130	0	0	0	0
S. Fork Salmon River	407	(101)	859	14	0	3	524	16	3	6	0
Secesh River	97	(20)	912	22	0	3	139	6	3	1	0
Lake Creek	33	(12)	356	25	0	9	404	0	0	1	0
Totals	1,727	(460)	8,297	459	10	39	5,969	874	159	615	142

Table 3. Mortality percentages for wild Chinook salmon parr collected and PIT-tagged in Idaho in July and August 2004. Only one tag loss occurred during the 2004 study. The tag was lost from a Big Creek (upper) file.

	Mortality per stream (%)		
Tagging location	Collection	Tagging and 24-h post tagging	Overall
Bear Valley Creek	0.3	0.1	0.4
Elk Creek	0.7	0.0	0.7
Marsh Creek	0.2	0.1	0.3
Sulphur Creek	0.1	0.1	0.1
Cape Horn Creek	0.6	0.1	0.7
Valley Creek	1.3	0.2	1.4
Loon Creek	0.6	0.1	0.6
Camas Creek	1.7	0.1	1.8
Herd Creek	1.0	0.0	1.0
Big Creek (upper)	0.4	0.0	0.4
Big Creek (lower)	3.3	0.3	3.6
West Fork Chamberlain Creek	0.0	0.3	0.3
Chamberlain Creek	1.7	0.0	1.7
South Fork Salmon River	0.6	0.2	0.8
Secesh River	0.6	0.1	0.7
Lake Creek	0.5	0.0	0.5
Totals or averages	0.7	0.1	0.8

Detections at Instream PIT-Tag Monitors

From 2 to 4 August 2004, 2,511 wild Chinook salmon parr were collected, PIT tagged, and released in natal rearing areas from 3 to 16 km above the upper instream PIT-tag monitor in lower Valley Creek (VC1; Table 1). Between 2 August 2004 and 30 June 2005, the two instream monitors (VC1 and VC2) recorded 357 unique detections of these summer-tagged Chinook salmon juveniles (Figure 2). Average downstream travel time for the 29 fish detected at both monitors was 19 h and 5 min (range from 11 h and 54 min to 12 d). Of the 357 unique detections at instream monitors, 276 (77.3%) occurred in late-summer/fall (August to October), 50 (14.0%) in winter (November to February), and 31 (8.7%) in spring (March to June; Figure 2). An estimated 41.5 to 46.4% of all summer-tagged parr survived to migrate from Valley Creek.

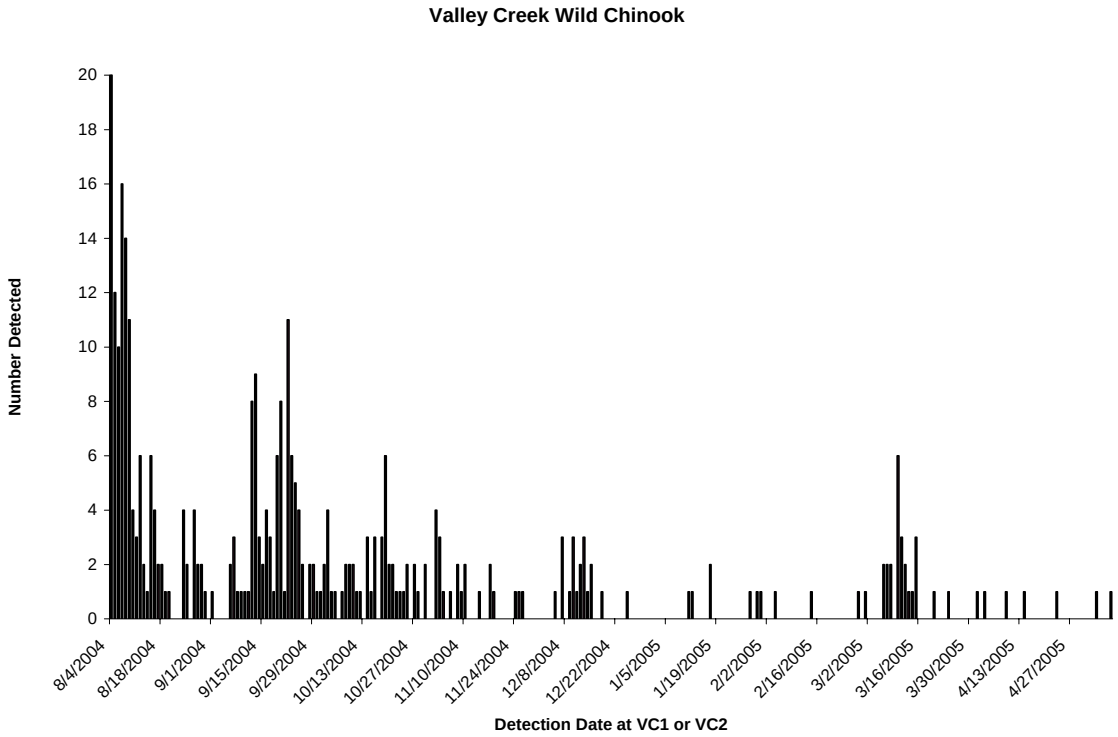

Figure 2. Detections of 357 PIT-tagged wild spring/summer Chinook salmon parr, pre-smolts, and smolts at the upper and lower instream PIT-tag monitoring antennas in lower Valley Creek from August 2004 through June 2005. A total of 2,511 Chinook salmon parr were PIT tagged and released in areas from 3 to 16 kilometers above these antennas from 2 to 4 August 2004.

Fork lengths and median fork lengths of the 357 fish detected in lower Valley Creek from August 2004 through May 2005 increased from the time of tagging to the time of detection (Figure 3).

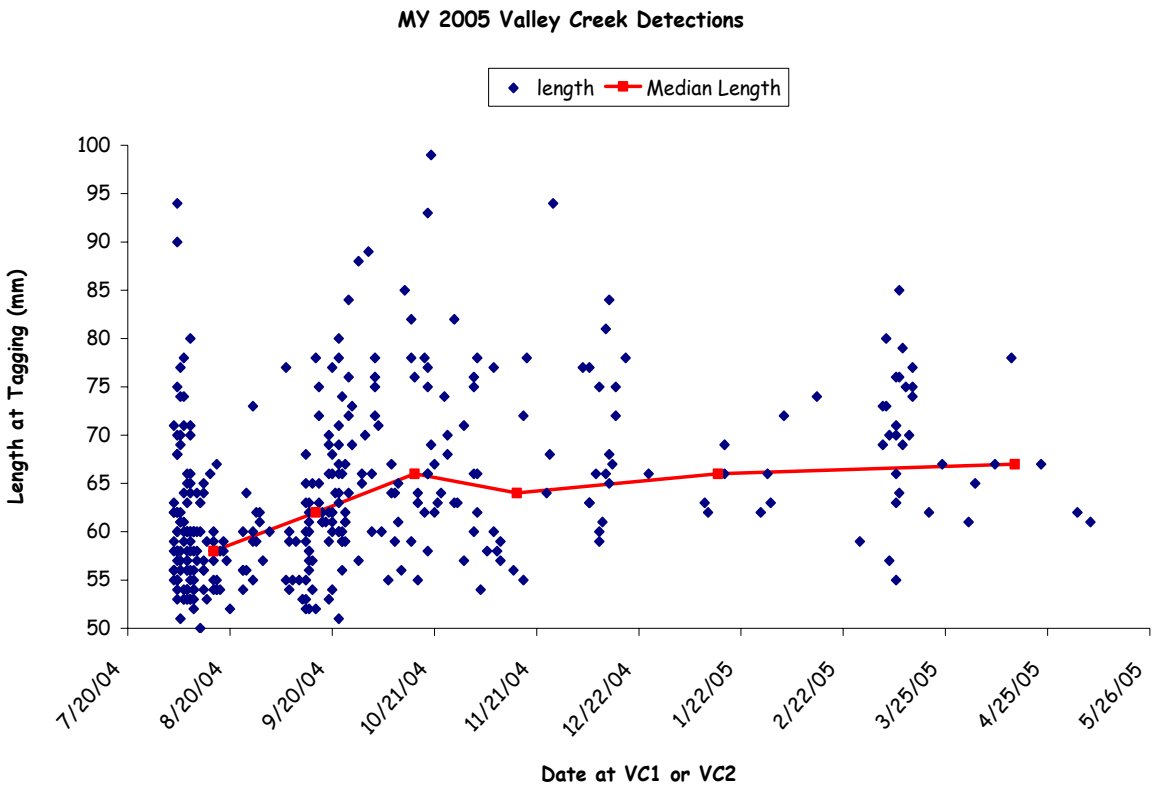

Figure 3. Fork length and median fork length of the 357 summer-tagged parr detected at instream PIT-tag monitoring antennas in lower Valley Creek (upper and lower monitors combined) from August 2004 through June 2005.

Recaptures at Traps and Dams

A total of 450 wild fish PIT-tagged in summer 2004 were recaptured at traps above Lower Granite Dam from summer/fall 2004 to spring 2005. At Little Goose Dam, a total of 656 study fish were diverted by the separation-by-code system in the juvenile fish facility, and at McNary Dam a total of 6 study fish were recaptured (Table 4). As shown in Table 4, fish from both the traps and Little Goose Dam had variable increases in weight and length, depending upon the elapsed time between release and recapture.

Detections at Dams

Based on expanded detections (1,568 fish) at Lower Granite Dam from 4 April to 20 June 2005, estimated parr-to-smolt survival for Idaho fish averaged 7.9% (SE = 0.3%) and ranged from 3.7 to 11.3% (SE = 1.0-2.0%; Table 5; Appendix Tables 5-20).† An additional 329 first-time detections (unadjusted) were recorded at Little Goose, Lower Monumental, McNary, and John Day Dams (Appendix Tables 5-19 and 21-23). No first-time PIT-tag detections occurred at Bonneville Dam, Ice Harbor Dam, or in the surface trawl detector operated near the mouth of the Columbia River. By comparing all first-time detections at interrogation dams (1,441) to the expanded number of detections at Lower Granite Dam (1,568), we estimated that 8.1% of the wild fish from Idaho passed the dams undetected.

For parr tagged in Idaho, average fork length at release was 63.2 mm (Table 1; Appendix Table 2). However, fish from this group that were detected the following spring at dams had significantly higher average fork length at release (65.8 mm; $P<0.01$). Fish that were larger at release tended to pass Lower Granite Dam earlier than their smaller cohorts (Figure 4). The release-length distribution of detected fish was also significantly different from that of released fish in all length categories ($P<0.01$; Figure 5).

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† Due to rounding of numbers, the expanded detection numbers at Lower Granite Dam in Table 5 may vary slightly from expanded detection numbers in Appendix Tables 5-20.

Table 4. Recapture information on PIT-tagged wild spring/summer Chinook salmon from Idaho that were tagged in summer 2004 and recaptured by the separation-by-code system in juvenile fish bypass system at Little Goose Dam in 2005 and at traps and dams downstream from Little Goose in summer and fall 2004 and spring 2005.

	Length gain (mm)			Weight gain (g)			Condition Factor		Recapture interval (d)	
	n	Range	Mean	n*	Range	Mean	Release	Recapture	Range	Mean
Little Goose Dam										
Bear Valley Creek	26	33-65	50.0	15	7.7-14.1	10.5	1.20	0.96	281-332	302
Elk Creek	49	20-61	46.0	40	3.1-16.4	9.8	1.26	0.98	278-329	302
Sulphur Creek	30	27-71	45.8	11	4.5-14.5	8.5	1.19	0.96	277-316	293
Marsh Creek	37	17-56	39.3	21	3.6-12.7	8.2	1.28	0.95	274-309	290
Cape Horn Creek	26	24-64	43.5	14	4.9-14.5	9.3	1.26	1.02	273-313	290
Valley Creek	56	31-64	49.4	33	6.8-16.1	11.3	1.19	0.97	269-323	294
Loon Creek	60	30-68	49.3	46	5.1-15.1	10.7	1.36	0.98	265-307	287
Camas Creek	80	21-61	43.8	19	4.8-13.5	8.8	1.48	0.97	261-312	287
Herd Creek	61	22-68	45.3	13	4.2-14.9	8.8	1.18	0.93	263-300	278
Big Creek (upper)	47	19-63	42.5	24	6-16.3	9.8	1.16	0.98	261-313	281
South Fork Salmon River	47	18-63	43.8	25	5-15.7	9.9	1.15	0.99	248-293	273
Big Creek (lower)	17	28-49	37.9	4	5.6-11.5	8.3	1.08	0.92	255-265	261
West Fork Chamberlain Cr	53	25-54	40.2	23	5.4-13.5	8.7	1.21	0.91	254-292	263
Secesh River	42	23-68	43.2	26	4.3-12.5	8.5	1.13	0.93	242-291	257
Lake Creek	23	27-51	42.4	4	4.6-10.5	7.7	1.08	0.92	245-286	253
Totals or averages	654	17-71	44.5	318	3.1-16.4	9.6	1.24	0.96	242-332	282

Table 4. Continued.

	Length gain (mm)			Weight gain (g)			Condition Factor		Recapture interval (d)	
	n	Range	Mean	n*	Range	Mean	Release	Recapture	Range	Mean
Traps										
South Fork Salmon River										
Knox Bridge (fall)	151	-4-10	0.3	62	-0.8-1.1	-0.08	1.12	1.13	1-65	20
Knox Bridge (spring)	22	5-22	12.6	11	0.3-2.8	1.47	1.20	1.10	192-254	234
Lower SF Salmon R. (fall)	--	--	--	--	--	--	--	--	--	--
Lake Creek										
Fall	75	-4-7	1.0	16	-0.5-0.8	0.01	1.16	1.08	1-62	17
Spring	3	3-9	6.7	0	--	--	--	1.03	224-241	235
Secesh River										
Fall	29	-1-10	2.2	6	-0.2-0.89	0.17	0.19	1.06	1-69	25
Spring	4	8-27	16.8	0	--	--	1.09	--	231-284	250
Marsh Creek										
Fall	158	-32-22	1.8	0	--	--	1.25	--	1-83	11
Spring	2	25-28	27.0	0	--	--	1.48	--	239-251	245
Salmon River (spring)	0	--	--	0	--	--	--	--	--	--
Snake River (spring)	2	39-41	40.0	0	--	--	1.67	--	283-285	284
Trap Totals	446			95						
McNary Dam										
	6	--	--	0	--	--	1.28	--	222-306	270

* Fewer fish weights were available for comparison because fewer fish had been weighed when they were tagged as parr.

Table 5. Summary of observed and expanded detections at Lower Granite Dam in 2005 of PIT-tagged wild spring/summer Chinook salmon smolts marked in Idaho the previous year as parr. Table includes expanded numbers used for parr-to-smolt survival estimates and also includes standard error percentages (SE%). See Table 1 for numbers released.

	Lower Granite Dam detections			
	Observed		Expanded	
	N	%	N	% (SE)
Bear Valley Creek	39	2.6	55	3.7 (1.0)
Elk Creek	57	3.9	86	5.9 (1.0)
Marsh Creek	82	5.5	110	7.3 (1.0)
Cape Horn Creek	54	5.3	78	7.6 (1.0)
Sulphur Creek	57	4.9	79	6.9 (1.0)
Valley Creek	95	3.8	147	5.9 (1.0)
Loon Creek	102	6.8	148	9.9 (1.0)
Camas Creek	122	8.1	176	11.7 (1.0)
Herd Creek	125	8.0	174	11.1 (1.0)
Big Creek (upper)	91	6.0	132	8.7 (1.0)
Big Creek (lower)	34	9.1	42	11.3 (2.0)
W Fork Chamberlain Creek*	105	7.9	134	10.1 (1.0)
S Fork Salmon River	58	4.7	87	7.1 (1.0)
Secesh River	58	5.4	76	7.1 (1.0)
Lake Creek	33	5.1	44	6.8 (1.0)
Totals or averages	1,112	5.6	1,568	7.9 (0.3)

* Includes fish from Chamberlain Creek.

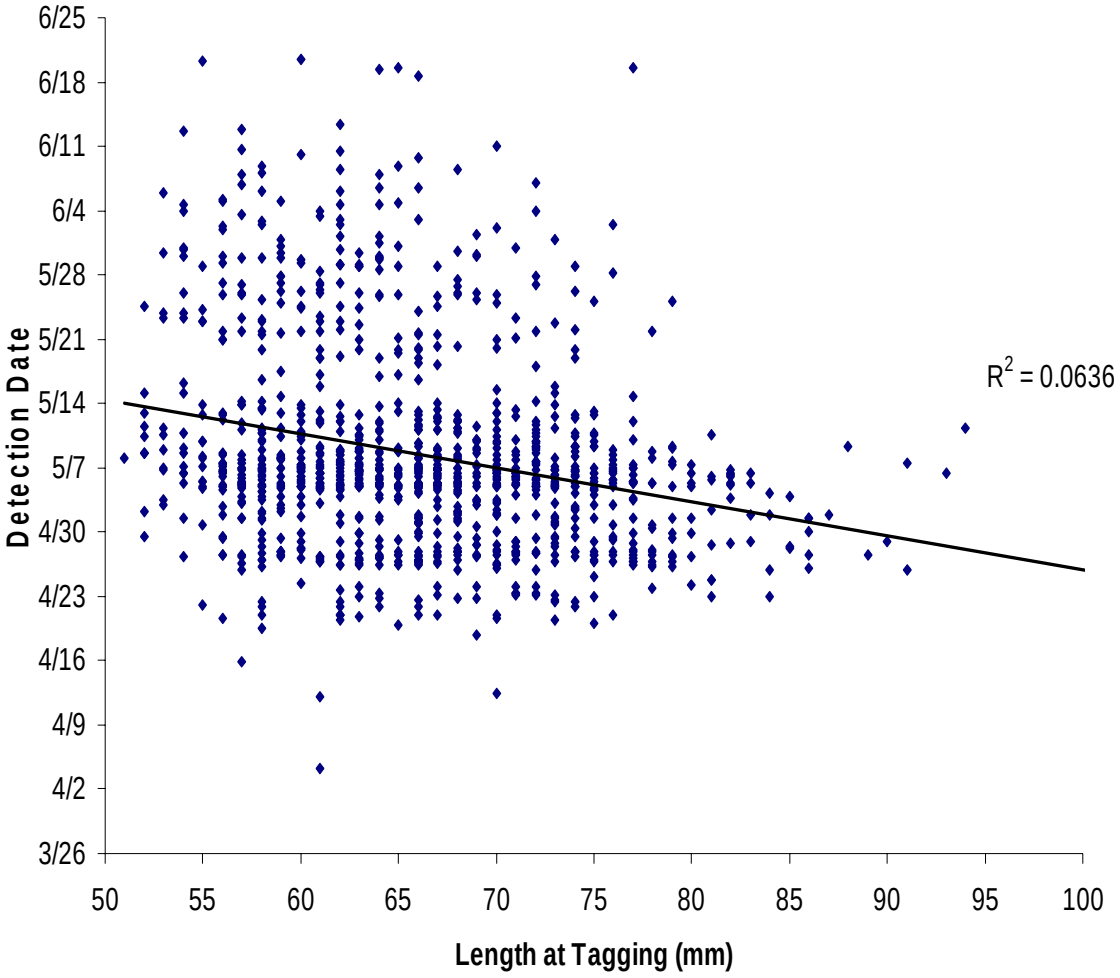

Figure 4. The relationship between fork length of parr at tagging (in 2004) to detection date at Lower Granite Dam in 2005.

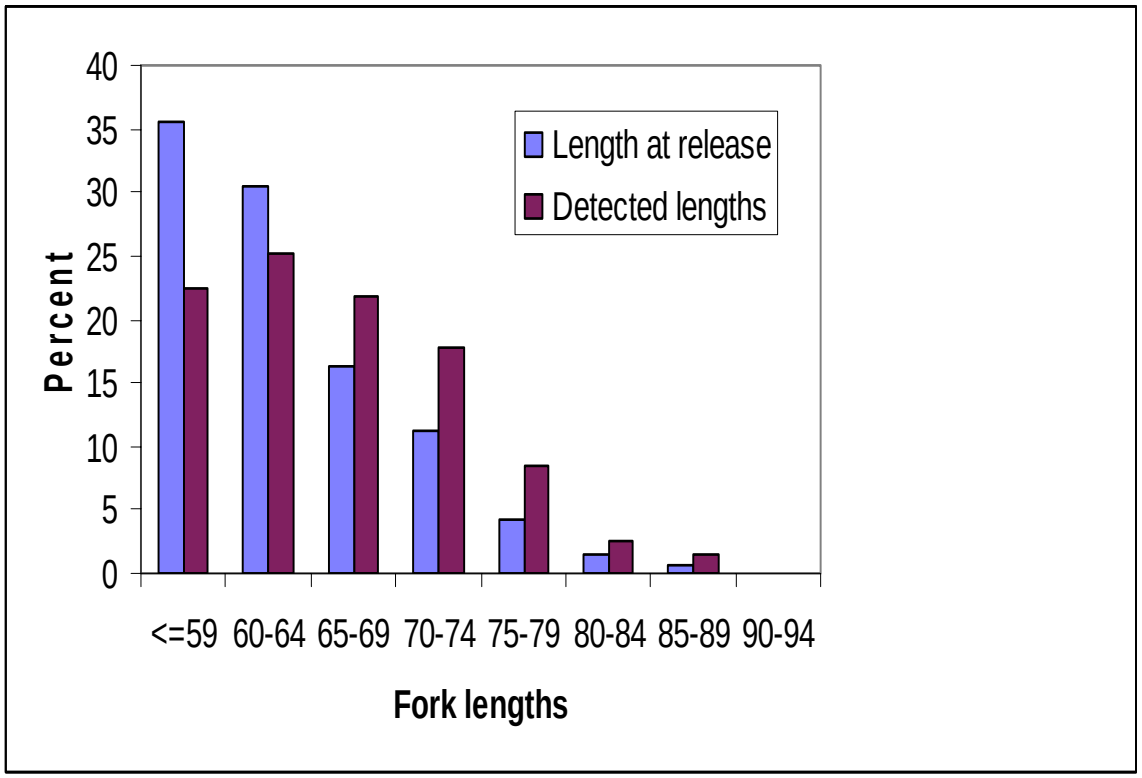

Figure 5. Percent by fork length in 5-mm increments of PIT-tagged wild spring/summer Chinook salmon parr released in Idaho streams in 2004 (n = 19,845) and percent of fish in these same length increments detected at dams in spring and summer 2005 (n = 1,439).

In 2005, we again found a significant difference in fork length at release between fish that passed through Lower Granite Dam in April-May and those that passed the dam after May ($P< 0.01$). Fish arriving at the dam in April-May were an average of 4.5 mm larger at release than fish arriving after May. These data suggest that fish size influences migration timing or overwinter location.

In 2005, we estimated a 13.9% overall survival rate to Lower Granite Dam for Chinook salmon juveniles previously detected at the Valley Creek instream PIT-tag monitors. Overall parr-to-smolt survival estimated for fish from this stream was 5.9% (Table 5). Estimated parr-to-smolt survival rates in 2004-2005 were 10.9% for fish leaving Valley Creek in late-summer/fall, 22.7% for those leaving in winter, and 32.9% for fish leaving in spring.

Migration Timing

Lower Granite Dam

Passage timing at Lower Granite Dam varied for fish from the 19 Idaho and Oregon streams (Figure 6). Among all 19 Idaho and Oregon streams (Appendix Tables 1a-1b, Figure 6), fish from the Lostine River had a significantly earlier timing for 10th percentile passage than fish from all other streams except Imnaha, Minam, and Secesh Rivers, and Bear Valley, Catherine, Lake, and Big (lower) Creeks ($P<0.05$).

The 10th percentile passage date of fish from Loon and Sulphur Creeks was significantly later than that of fish from all other streams except Cape Horn, Camas, Valley, Big (upper), Marsh, Herd, Elk, and Chamberlain/WF Chamberlain Creeks, and the South Fork Salmon River ($P<0.05$). Standard errors on these passage estimates ranged from 0.6 to 3.9 d (median 1.7 d). Overall, the 10th percentile passage dates for fish from all 19 streams ranged from 16 April to 4 May (Appendix Table 1a-1b).

The 50th percentile passage dates at Lower Granite Dam were significantly earlier for fish from Lake Creek than for fish from all other streams except Lostine, Imnaha, and Secesh Rivers, and Chamberlain/WF Chamberlain and Big (lower) Creeks ($P<0.05$). Fish from Valley Creek arrived significantly later at the dam than fish from all other streams except Loon, Elk, and Catherine Creeks and the South Fork Salmon River ($P<0.05$). Standard errors on these passage estimates ranged from 0.5 to 4.2 d (median 1.5 d). The overall 50th percentile passage dates for fish from all 19 streams ranged from 28 April to 15 May (Appendix Tables 1a-1b).

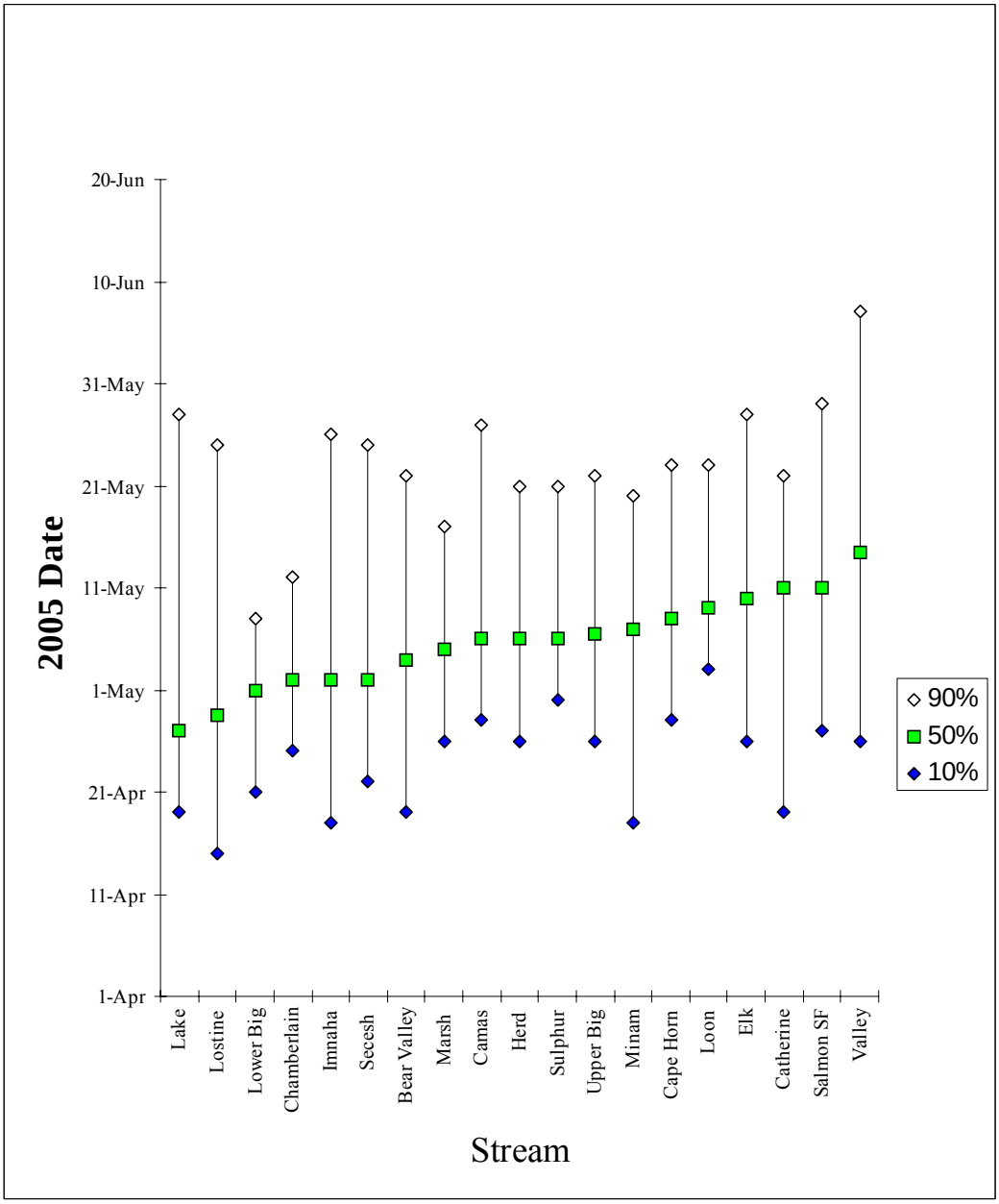

Figure 6. Estimated passage distributions at Lower Granite Dam in 2005 for wild spring/summer Chinook salmon smolts marked as parr in Idaho and Oregon in 2004. Chamberlain and West Fork Chamberlain Creeks are combined and Big Creek is divided into lower and upper portions for these analyses. See Appendix Tables 5-19 for daily estimated passage numbers from Idaho streams at the dam.

In terms of the 90th percentile passage date at the dam, fish from Big (lower) Creek were significantly earlier than fish from all other streams except Chamberlain/WF Chamberlain Creek ($P<0.05$). Fish from Valley Creek were significantly later than fish from all other streams except Lake Creek and the South Fork Salmon River ($P<0.05$). Standard errors on these passage estimates ranged from 0.5 to 5.9 d (median 2.5 d). The overall 90th percentile passage dates for fish from all streams ranged from 9 May to 8 June (Appendix Tables 1a-1b).

Migration timing at Lower Granite Dam based on streams with 8 or more years of data indicated that 10th, 50th, and 90th percentage of passage timing varied between streams (Table 6). Secesh River fish had a significantly earlier timing at Lower Granite Dam for the 10th percentile passage than fish from all other streams except Lake and Big(lower)/Rush Creeks and Lostine and Imnaha (upper) Rivers ($P<0.05$). Also, Big Creek (upper) fish had significantly later migration timing at the dam than all the other streams except Loon and Catherine Creeks ($P<0.05$).

For the 50th percentile passage at the dam, Secesh River and Big(lower)/Rush Creeks had significantly earlier arrival timing than fish from all other streams except Lake and Herd Creeks ($P<0.05$). Fish from Big Creek (upper) had significantly later timing at the dam than fish from all other streams ($P<0.05$). For the 90th percentile passage at the dam, Big(lower)/Rush Creeks fish had significantly earlier timing than fish from all other streams except Herd Creek ($P<0.05$). Fish from Big Creek (upper) and South Fork of the Salmon River had significantly later timing at the dam than fish from all other streams except Cape Horn, Lake, Catherine, Valley, and Chamberlain/WF Chamberlain Creeks ($P<0.05$).

Table 6. The 95% confidence interval (CI) and mean passage dates of 10th, 50th, and 90th percentiles with standard errors (SE) in days, at Lower Granite Dam for wild spring/summer Chinook salmon smolts from streams in Idaho and Oregon over all data years.

		Percentile passage dates at Lower Granite Dam			
Stream	95% CI	10th (SE)	50th (SE)	90th (SE)	Data years
	Lo CI	11 April	23 April	23 May	
	Up CI	17 April	30 April	08 June	
Secesh River	Mean	14 April (1)	27 April (1)	31 May (4)	17
	Lo CI	15 April	07 May	01 June	
	Up CI	23 April	13 May	11 June	
South Fork Salmon River	Mean	19 April (2)	10 May (2)	06 June (2)	16
	Lo CI	23 April	11 May	28 May	
	Up CI	30 April	17 May	08 June	
Catherine Creek	Mean	26 April (2)	14 May (2)	02 June (3)	15
	Lo CI	14 April	28 April	18 May	
	Up CI	20 April	06 May	28 May	
Imnaha River (upper)	Mean	17 April (1)	02 May (2)	23 May (2)	13
	Lo CI	18 April	04 May	27 May	
	Up CI	26 April	12 May	06 June	
Bear Valley Creek	Mean	22 April (2)	08 May (2)	01 June (2)	14
	Lo CI	25 April	13 May	30 May	
	Up CI	06 May	27 May	21 June	
Big Creek (upper)	Mean	01 May (2)	20 May (3)	10 June (5)	11
	Lo CI	16 April	02 May	25 May	
	Up CI	25 April	10 May	05 June	
Elk Creek	Mean	20 April (2)	06 May (2)	30 May (3)	13
	Lo CI	20 April	09 May	30 May	
	Up CI	30 April	18 May	12 June	
Valley Creek	Mean	25 April (2)	14 May (2)	06 June (3)	14
	Lo CI	17 April	01 May	20 May	
	Up CI	23 April	09 May	30 May	
Marsh Creek	Mean	20 April (1)	05 May (2)	25 May (2)	12
	Lo CI	12 April	26 April	27 May	
	Up CI	19 April	04 May	11 June	
Lake Creek	Mean	15 April (2)	30 April (2)	03 June (4)	13
	Lo CI	12 April	30 April	17 May	
	Up CI	21 April	08 May	27 May	
Lostine River	Mean	16 April (2)	04 May (2)	22 May (2)	14
	Lo CI	14 April	01 May	20 May	
	Up CI	28 April	20 May	07 June	
Sulphur Creek	Mean	21 April (3)	11 May (4)	29 May (4)	9
	Lo CI	19 April	06 May	24 May	
	Up CI	01 May	20 May	11 June	
Cape Horn Creek	Mean	25 April (3)	13 May (3)	02 June (4)	9

Table 6. Continued.

Stream	95% CI	Percentile passage dates at Lower Granite Dam 10th (SE)	50th (SE)	90th (SE)	Data years
	Lo CI	16 April	26 April	07 May	
	Up CI	21 April	30 April	16 May	
Big (lower)/Rush Creeks	Mean	19 April (1)	28 April (1)	12 May (2)	9
	Lo CI	15 April	25 April	13 May	
	Up CI	24 April	07 May	23 May	
E. F. Salmon River	Mean	19 April (2)	01 May (2)	18 May (2)	7
	Lo CI	24 April	07 May	19 May	
	Up CI	02 May	14 May	27 May	
Loon Creek	Mean	28 April (2)	11 May (2)	23 May (2)	8
	Lo CI	16 April	26 April	11 May	
	Up CI	24 April	03 May	19 May	
Herd Creek	Mean	20 April (2)	30 April (2)	15 May (2)	9
	Lo CI	23 April	13 May	21 May	
	Up CI	10 May	04 June	03 July	
Grand Ronde River (upper)	Mean	01 May (3)	24 May (4)	12 June (8)	5
	Lo CI	05 April	14 April	02 May	
	Up CI	20 April	05 May	15 May	
Imnaha River (lower)	Mean	12 April (2)	25 April (3)	09 May (2)	4
	Lo CI	16 April	27 April	16 May	
Chamberlain/	Up CI	26 April	12 May	20 June	
W.F. Chamberlain Creeks	Mean	21 April (2)	04 May (3)	03 June (7)	8
	Lo CI	22 April	08 May	25 May	
	Up CI	02 May	21 May	01 June	
Camas Creek	Mean	27 April (2)	14 May (3)	29 May (2)	7
	Lo CI	12 April	25 April	18 May	
	Up CI	26 April	15 May	31 May	
Minam River	Mean	19 April (2)	05 May (3)	25 May (2)	5

Comparison with Flows

We grouped first-time detections (expanded) at Lower Granite Dam of all Idaho and Oregon streams combined and compared their collective timing with river flows during the same periods (Figure 7 and Appendix Table 20). Overall, passage at the dam during 2005 occurred between early April and late-June, with the middle 80th percentile passage occurring from 25 April to 24 May (Table 7). The peak passage date was 5 May, which coincided with a low flow of 60.4 kcfs (Appendix Table 20).

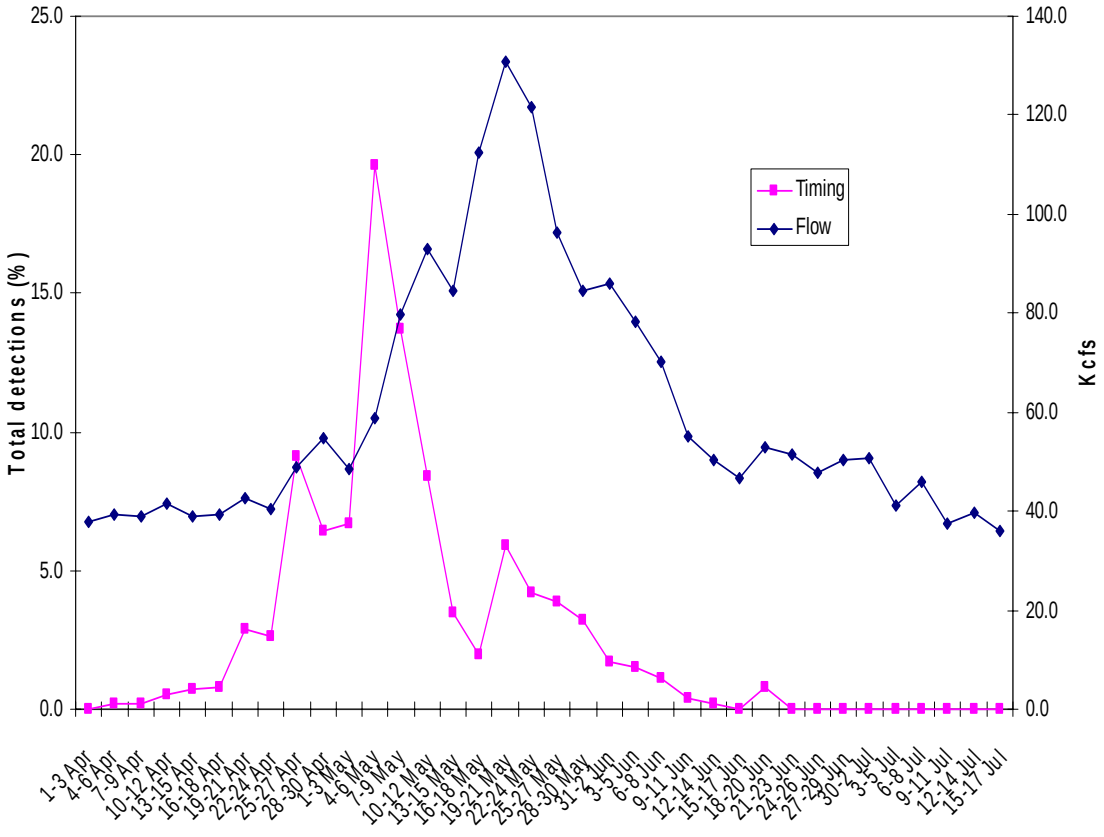

Figure 7. Overall migration timing of PIT-tagged wild spring/summer Chinook salmon smolts with associated river flows at Lower Granite Dam, 2005. Daily detections from 15 Idaho and 4 Oregon streams were pooled in 3-d intervals and expanded based on daily detection probability. River flows at the dam were averaged daily over the same periods.

Table 7. Accumulated and 2005 passage dates at Lower Granite Dam for combined populations of wild spring/summer Chinook salmon smolts PIT tagged as summer parr in Idaho and Oregon streams.

	Percentile passage dates at Lower Granite Dam			
Year	10th	50th	90th	Range
1989[a]	23 April	14 May	13 June	04 April-22 July
1990	19 April	07 May	07 June	05 April-18 July
1991	01 May	18 May	12 June	13 April-20 July
1992	15 April	02 May	27 May	05 April-27 July
1993	26 April	14 May	31 May	14 April-10 August
1994	22 April	08 May	01 June	13 April-04 Sept.
1995	17 April	09 May	04 June	08 April-22 Sept.
1996[a,b]	15 April	27 April	19 May	09 April-15 July
1997[a,b]	12 April	24 April	18 May	31 March-22 Sept.
1998[b]	11 April	02 May	23 May	31 March-07 Aug.
1999	20 April	03 May	28 May	27 March-08 July
2000	17 April	07 May	30 May	10 April-20 July
2001	26 April	09 May	27 May	06 April-07 July
2002	16 April	03 May	30 May	28 March-05 July
2003	18 April	11 May	29 May	31 March-04 July
2004	16 April	03 May	26 May	01 April-16 July
2005	25 April	07 May	24 May	04 April-20 June

a No fish were tagged from the Middle Fork of the Salmon River drainage for this migration year.
b This migration year represented by a much higher proportion of fish from Oregon streams than other years.

Environmental Information

Environmental factors varied by month and between locations (Appendix Tables 24-28), as did the percentage of fish collected and/or detected at adjacent traps (Appendix Figures 1-7). Weather/climate and stream-flow data also varied by month and between locations (Appendix Table 29).

DISCUSSION

Mortality rates associated with collection and tagging in 2004 were comparable to those in earlier years (Achord et al. 1992, 1994, 1995a,b, 1996a,b, 1997, 1998, 2000, 2001a,b, 2002, 2003, 2004, 2005).

The instream PIT-tag monitoring system used in Valley Creek in 2003-2004 and 2004-2005, enabled us to calculate survival estimates and migration timing for wild Chinook salmon juveniles leaving this stream. However, only 10-14% of the tagged juvenile Chinook salmon were detected at instream monitors during these two years. In order to increase precision for these estimates, we will need to increase either the number of antennas or the tagging sample size. Significantly, the results from instream monitoring indicated that a higher-than-expected proportion of wild juvenile Chinook salmon were observed moving out of Valley Creek in winter. This has important implications for intensive fish monitoring studies throughout Idaho that use rotary screw traps, since these traps are inoperable during winter in most areas. Perhaps a combination of rotary screw traps and instream PIT-tag monitors may be appropriate for some locations or studies.

Overall mean growth per day from the parr to smolt stage, as measured at Little Goose Dam in 2005, was identical to that observed in 2001 (0.16 mm/d) (Achord et al. 2002). However, overall mean weight gain was higher in 2001 (0.042 g/d) than in 2005 (0.034 g/d). Length and weight growth rates observed in 2005 were higher than in the previous 3 years (Achord et al. 2003, 2004, 2005).

Annual combined (Idaho and Oregon steams) parr-to-smolt survival estimates over the last 13 years have ranged from 8.1 to 24.4%, with an average annual survival rate of 16.2%. We observed the lowest parr-to-smolt survival in 2004 (8.1%) and 2005 (8.4%). These low estimates may have resulted from conditions with much higher parr density. Returns of wild adults to the Snake River basin from 2001 to 2003 were more than one order of magnitude greater than returns from 1994 to 1996, when we measured the highest parr to smolt survival (20.6 to 24.4%).

In 2005, as observed in previous years, larger fish (at tagging) tended to migrate earlier than smaller fish at Lower Granite Dam. In addition, we again observed that wild fish detected at the dam in April and May had been significantly larger at release than fish migrating after May. This suggests that size is an important factor related either to

the initiation of smoltification or to other life-history dynamics that affect the migration timing of wild fish. We also observed that the dates of the overall 50 and 90th percentile passage of wild fish at the dam occurred in early and late May, respectively.

In spring 2005, climatic conditions were cool and wet, but flows were considered low until mid-May. As noted in our previous annual reports, wild Chinook salmon smolt passage timing at Lower Granite Dam for individual populations has been highly variable and usually protracted, with timing patterns for some populations ranging from early to late spring. However, shifts in the passage timing distribution for these populations have been less than 1 to 5 weeks over all years. Complex yearly interrelationships between flow and climatic conditions are primary factors contributing to passage timing. However, water temperatures in streams above the dam, turbidity, physiological development, variability in stock behavior, fish size, and other yet unknown factors may all contribute substantially to wild smolt passage timing.

As additional environmental monitors, instream PIT-tag monitors, and traps are installed in study streams, we can more accurately monitor fry, parr, and smolt movements out of rearing areas and examine the relationships between these movements and environmental conditions within the streams. Mapped over time, this information, along with weather and climate data, may provide tools for the prediction of movement in different wild fish stocks. Such tools are vital to recovery planning for Pacific salmon species listed as threatened or endangered under the U.S. Endangered Species Act.

ACKNOWLEDGMENTS

We thank Bonneville Power Administration for funding this project and Richard Nelson, William Muir, Richard Zabel, Jeffery Moser, Steve Brewer, John Ferguson, Lanesa Hodge, Mark Hall, Robert Emmett, Paul Kemp, Darren Ogden, Shane Collier, Richard Ledgerwood, Michael Gessel, Holly Kenyon, and Colin Christianson for their excellent assistance in collecting and PIT tagging fish for this study. Also, thanks to personnel from the Idaho Department of Fish and Game and the Nez Perce Tribe for providing data from trapping operations in natal rearing areas. Special thanks to William Wassard for the successful maintenance of the instream PIT-tag monitoring systems in lower Valley Creek.

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APPENDIX

Data Tables and Figures

Appendix Table 1a. Accumulated and 2005 passage dates at Lower Granite Dam for PIT-tagged wild spring/summer Chinook salmon smolts from streams in Idaho.

	Percentile passage dates at Lower Granite Dam			
Year	10th	50th	90th	Range
Bear Valley Creek				
1990[a]	19 April	05 May	31 May	11 April-18 July
1991	03 May	20 May	12 June	18 April-23 June
1992	15 April	02 May	24 May	07 April-28 June
1993	29 April	16 May	22 June	22 April-27 July
1994	22 April	06 May	29 May	16 April-15 July
1995	28 April	18 May	12 June	13 April-20 July
1996-1997[a]	---	---	---	---
1998	25 April	06 May	23 May	31 March-25 June
1999	23 April	03 May	07 June	20 April-21 June
2000	18 April	07 May	02 June	14 April-02 July
2001	08 May	16 May	28 May	26 April-17 June
2002	16 April	04 May	31 May	12 April-26 June
2003	14 April	05 May	28 May	12 April-14 June
2004	15 April	07 May	28 May	13 April-05 July
2005	20 April	05 May	23 May	20 April-10 June
Elk Creek				
1990[a]	---	---	---	---
1991	03 May	20 May	16 June	25 April-24 June
1992	11 April	30 April	28 May	05 April-17 July
1993	02 May	16 May	11 June	21 April-26 June
1994	23 April	04 May	21 May	18 April-09 July
1995	18 April	11 May	05 June	10 April-09 July
1996-1997[a]	---	---	---	---
1998	07 April	02 May	15 May	04 April-21 June
1999	21 April	03 May	27 May	01 April-08 July
2000	15 April	28 April	19 May	13 April-28 May
2001	30 April	11 May	27 May	30 April-27 May
2002	16 April	29 April	02 June	13 April-05 July
2003	20 April	06 May	29 May	31 March-30 May
2004	18 April	08 May	04 July	14 April-July 12
2005	27 April	11 May	29 May	18 April-12 June
Sulphur Creek				
1990	18 April	30 April	31 May	11 April-27 June
1991[a]	---	---	---	---
1992	16 April	03 May	23 May	10 April-01 June
1993	28 April	16 May	12 June	24 April-28 June
1994[a]	---	---	---	---
1995	02 May	23 May	09 June	11 April-09 July
1996[a]	---	---	---	---
1997[a]	---	---	---	---

Appendix Table 1a. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
Sulphur Creek(Continued)				
1998	---	---	---	---
1999	24 April	19 May	27 May	22 April-29 may
2000	15 April	07 May	24 May	12 April-30 May
2001-2002[a]	---	---	---	---
2003	02 May	25 May	08 May	22 April-24 June
2004	10 April	25 April	11 May	02 April-24 May
2005	01 May	07 May	22 May	22 April-5 June
Cape Horn Creek				
1990[a]	---	---	---	---
1991	24 April	16 May	28 May	19 April-06 June
1992	12 April	28 April	30 May	10 April-01 June
1993	08 May	19 May	26 June	05 May-01 July
1994[a]	---	---	---	---
1995	29 April	14 May	19 June	14 April-28 July
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999	29 April	22 May	29 May	25 April-12 June
2000	01 May	24 May	01 June	20 April-09 July
2001-2002[a]	---	---	---	---
2003	21 April	17 May	01 June	15 April-18 June
2004	15 April	04 May	24 May	14 April-28 May
2005	29 April	09 May	24 May	11 April-29 May
Camas Creek				
1993	03 May	16 May	27 May	24 April-24 June
1994	30 April	15 May	26 May	24 April-11 July
1995	27 April	12 May	05 June	17 April-11 June
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999[a]	---	---	---	---
2000	26 April	25 May	02 June	13 April-24 June
2001a 2002a	---	---	---	---
2003	02 May	24 May	30 May	26 April-06 June
2004	18 April	08 May	24 May	16 April-04 June
2005	29 April	07 May	28 May	12 April-19 June
Marsh Creek				
1990	17 April	29 April	31 May	09 April-01 July
1991	26 April	20 May	09 June	17 April-18 June
1992	17 April	07 May	02 June	10 April-13 July

Appendix Table 1a. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
Marsh Creek (Continued)				
1993	29 April	15 May	27 May	24 April-10 August
1994	23 April	04 May	18 May	16 April-08 August
1995	17 April	09 May	24 May	11 April-08 July
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999	21 April	01 May	25 May	11 April-13 June
2000	21 April	28 April	27 May	14 April-16 June
2001[a]	---	---	---	---
2002	18 April	04 May	23 May	14 April-26 May
2003	14 April	05 May	29 May	03 April-09 June
2004	16 April	28 April	10 May	03 April-30 May
2005	27 April	06 May	18 May	22 April-04 June
Valley Creek				
1989	24 April	14 May	12 June	09 April-17 June
1990	16 April	08 May	05 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-04 June
1993	30 April	16 May	02 June	24 April-06 June
1994	24 April	04 May	03 June	22 April-09 June
1995	04 May	02 June	08 July	22 April-18 July
1996-1998[a]	---	---	---	---
1999	24 April	13 May	12 June	19 April-01 July
2000	20 April	12 May	29 May	13 April-14 July
2001	10 May	19 May	01 June	28 April-03 July
2002	24 April	20 May	03 June	19 April-19 June
2003	14 April	17 May	28 May	01 April-31 May
2004	25 April	11 May	26 May	04 April-16 June
2005	27 April	15 May	08 June	23 April-20 June
Loon Creek				
1993	05 May	12 May	17 May	03 May-5 June
1994	29 April	10 May	24 May	22 April-07 June
1995	23 April	11 May	28 May	13 April-07 June
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999	30 April	18 May	27 May	22 April-16 June
2000	22 April	08 May	24 May	14 April-01 June
2001-2002[a]	---	---	---	---
2003	30 April	17 May	28 May	21 April-30 May
2004	23 April	05 May	15 May	15 April-26 May
2005	04 May	10 May	24 May	20 April-03 June

Appendix Table 1a. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
East Fork Salmon River				
1989	22 April	03 May	18 May	07 April-08 June
1990[a]	---	---	---	---
1991	22 April	09 May	26 May	16 April-20 June
1992	13 April	21 April	16 May	10 April-03 June
1993	25 April	06 May	18 May	22 April-01 June
1994	22 April	28 April	17 May	20 April-25 May
1995	14 April	28 April	10 May	11 April-27 May
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999[a]	---	---	---	---
2000	21 April	07 May	25 May	15 April-27 May
2001[a]	---	---	---	---
2002[a]	---	---	---	---
2003[a]	---	---	---	---
2004-2005[a]	---	---	---	---
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[b]	---	---	---	---
1995	18 April	03 May	14 May	11 April-28 May
1996-1998[a]	---	---	---	---
1999	20 April	29 April	10 May	30 March-20 May
2000	16 April	25 April	18 May	14 April-19 May
2001	30 April	04 May	14 May	28 April-07 June
2002[b]	---	---	---	---
2003	16 April	03 May	26 May	06 April-29 May
2004	16 April	30 April	10 May	12 April-21 June
2005	27 April	07 May	22 May	20 April-13 June
South Fork Salmon River				
1989	25 April	13 May	14 June	16 April-20 June
1990[a]	---	---	---	---
1991	20 April	16 May	10 June	17 April-13 July
1992	14 April	29 April	27 May	07 April-27 July
1993	29 April	16 May	02 June	26 April-28 June
1994	27 April	15 May	28 June	22 April-09 July
1995	20 April	10 May	10 June	13 April-13 July
1996	19 April	15 May	09 June	19 April-03 July
1997	13 April	28 April	12 June	07 April-15 June
1998	25 April	12 May	15 June	02 April-07 August
1999	31 March	04 May	01 June	27 March-11 June

Appendix Table 1a. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
South Fork Salmon River (continued)				
2000	20 April	18 May	31 May	12 April-20 July
2001	29 April	14 May	01 June	26 April-07 July
2002	15 April	03 May	24 May	11 April-09 June
2003	19 April	16 May	03 June	19 April-12 June
2004	16 April	10 May	02 June	08 April-19 June
2005	28 April	12 May	30 May	22 April-19 June
Big Creek (upper)				
1990	27 April	30 May	22 June	17 April-18 July
1991	18 May	10 June	26 June	26 April-01 July
1992	22 April	08 May	03 June	15 April-26 June
1993	08 May	18 May	26 May	26 April-15 June
1994	03 May	19 May	19 July	25 April-30 August
1995	05 May	23 May	09 June	02 May-26 June
1996-1998a	---	---	---	---
1999	28 April	14 May	03 June	25 April-19 June
2000	30 April	27 May	14 June	15 April-29 June
2001[a]	---	---	---	---
2002[a]	---	---	---	---
2003	06 May	25 May	01 June	01 May-21 June
2004	18 April	12 May	05 May	15 April-17 June
2005	27 April	07 May	23 May	20 April-07 June
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
1995	19 April	01 May	14 May	11 April-05 June
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999	19 April	28 April	23 May	04 April-30 May
2000	19 April	30 April	13 May	16 April-26 May
2001[a]	---	---	---	---
2002	15 April	25 April	07 May	12 April-22 May
2003	14 April	26 April	18 May	12 April-25 May
2004	15 April	23 April	04 May	06 April-15 May
2005[d]	22 April	02 May	09 May	06 April-15 May
West Fork Chamberlain Creek				
1992[c]	15 April	26 April	03 June	12 April-24 June
1993	28 April	15 May	23 June	23 April-22 July
1994[c]	24 April	01 May	05 July	24 April-04 September
1995[c]	16 April	09 May	20 June	12 April-22 September

Appendix Table 1a. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
West Fork Chamberlain Creek (continued)				
1996[a]	---	---	---	---
1997[a]	---	---	---	---
1998[a]	---	---	---	---
1999[a]	---	---	---	---
2000[a]	---	---	---	---
2001[a]	---	---	---	---
2002	26 April	04 May	20 May	18 April-29 May
2003[c]	23 April	20 May	26 May	21 April-26 May
2004[c]	11 April	24 April	10 May	07 April-23 June
2005[c]	26 April	03 May	13 May	20 April-30 May
Secesh River				
1989	20 April	27 April	09 June	09 April-19 July
1990	14 April	22 April	07 June	10 April-13 July
1991	20 April	27 April	14 June	13 April-20 July
1992	13 April	29 April	04 June	05 April-03 July
1993	26 April	16 May	16 June	22 April-15 July
1994	22 April	26 April	11 July	21 April-07 August
1995	14 April	01 May	24 May	10 April-10 July
1996	14 April	25 April	29 May	12 April-15 July
1997	10 April	18 April	04 May	04 April-11 July
1998	08 April	24 April	28 May	03 April-06 July
1999	03 April	23 April	25 May	29 March-21 June
2000	13 April	23 April	04 June	12 April-11 July
2001	16 April	28 April	13 May	06 April-13 June
2002	13 April	21 April	17 May	11 April-01 July
2003	18 April	30 April	01 June	03 April-04 July
2004	04 April	27 April	28 May	01 April-13 June
2005	23 April	03 May	26 May	04 April-19 June
Lake Creek				
1989	23 April	02 May	16 June	12 April-01 July
1990[a]	---	---	---	---
1991[a]	---	---	---	---
1992[a]	---	---	---	---
1993	23 April	09 May	22 June	22 April-25 June
1994	21 April	28 April	19 May	20 April-24 June
1995	17 April	10 May	10 June	14 April-20 July
1996	15 April	21 April	19 May	15 April-02 June
1997	11 April	25 April	02 July	07 April-22 September
1998	04 April	25 April	26 May	02 April-16 July
1999	20 April	26 April	27 May	08 April-20 June
2000	13 April	04 May	04 June	13 April-18 July

Appendix Table 1a. Continued.

	Percentile passage dates at Lower Granite Dam			
Year	10th	50th	90th	Range
Lake Creek (continued)				
2001[a]	---	---	---	---
2002	16 April	29 April	03 June	13 April-03 June
2003	06 April	06 May	04 June	06 April-20 June
2004	14 April	25 April	28 May	09 April-16 June
2005	20 April	28 April	29 May	19 April-19 June

a No parr were tagged the summer prior to this migration year.
b Insufficient numbers detected to estimate timing.
c Includes fish from Chamberlain Creek.
d No fish were tagged in Rush Creek for this migration year.

Appendix Table 1b. Accumulated and 2005 passage dates at Lower Granite Dam for PIT-tagged wild spring/summer Chinook salmon smolts from streams in Oregon.

	Percentile passage dates at Lower Granite Dam			
Year	10th	50th	90th	Range
Catherine Creek				
1991	01 May	14 May	08 June	17 April-23 June
1992	16 April	01 May	21 May	09 April-29 June
1993	06 May	18 May	05 June	29 April-26 June
1994	25 April	11 May	20 May	13 April-26 July
1995	01 May	19 May	09 June	26 April-02 July
1996[a]	19 April	13 May	29 May	14 April-14 June
1997	08 May	14 May	01 June	24 April-10 June
1998	28 April	21 May	28 May	24 April-04 June
1999	26 April	25 May	15 June	26 April-26 June
2000	30 April	08 May	23 May	12 April-06 June
2001	29 April	17 May	17 June	28 April-03 July
2002	24 April	10 May	18 June	15 April-01 July
2003	26 April	10 May	09 June	14 April-09 June
2004	22 April	15 May	11 June	15 April-25 June
2005	20 April	12 May	23 May	14 April-02 June
Grande Ronde River (upper)				
1989	12 May	06 June	19 June	27 April-22 July
1990[b]	---	---	---	---
1991[b]	---	---	---	---
1992[b]	---	---	---	---
1993	05 May	16 May	25 May	23 April-20 June
1994	28 April	23 May	07 July	23 April-29 August
1995	27 April	29 May	12 June	12 April-01 July
1996[c]	26 April	17 May	29 May	19 April-06 June
1997 through 2005[b]	---	---	---	---
Imnaha River (lower)				
1989	11 April	30 April	11 May	04 April-05 June
1990	10 April	18 April	09 May	05 April-27 May
1991	20 April	01 May	13 May	14 April-15 May
1992	10 April	21 April	03 May	06 April-21 May
1993 through 2005[b]	---	---	---	---
Imnaha River (upper)				
1993	24 April	14 May	28 May	15 April-23 June
1994	24 April	08 May	09 June	20 April-11 August
1995	13 April	02 May	03 June	10 April-07 July
1996	16 April	26 April	18 May	14 April-12 June
1997	11 April	19 April	11 May	03 April-02 June
1998	11 April	28 April	13 May	03 April-24 May

Appendix Table 1b. Continued.

Year	Percentile passage dates at Lower Granite Dam			
	10th	50th	90th	Range
Imnaha River (upper; continued)				
1999	22 April	08 May	26 May	17 April-03 June
2000	14 April	02 May	24 May	12 April-16 June
2001	21 April	30 April	16 May	08 April-28 May
2002	16 April	04 May	17 May	15 April-31 May
2003	22 April	08 May	26 May	17 April-31 May
2004	19 April	04 May	22 May	18 April-8 June
2005	19 April	03 May	27 May	05 April-11 June
Lostine River				
1990[d]	---	---	---	---
1991	29 April	14 May	26 May	20 April-09 July
1992	16 April	30 April	11 May	12 April-02 June
1993	23 April	03 May	17 May	17 April-01 June
1994	22 April	30 April	16 May	19 April-07 June
1995	12 April	02 May	17 May	08 April-09 June
1996	23 April	15 May	07 June	17 April-19 June
1997	17 April	28 April	16 May	09 April-21 May
1998[b]	---	---	---	---
1999	30 March	09 May	27 May	29 March-29 May
2000	13 April	08 May	25 May	13 April-03 June
2001	25 April	09 May	22 May	10 April-12 June
2002	11 April	21 April	13 May	28 March-29 May
2003	13 April	08 May	26 May	11 April-03 June
2004	15 April	04 May	05 June	14 April-15 June
2005	16 April	29 April	26 May	05 April-18 June
Minam River				
1999	08 April	28 April	25 May	31 March-02 June
2000	15 April	03 May	22 May	10 April-29 May
2001	25 April	07 May	23 May	08 April-12 June
2002	17 April	03 May	20 May	16 April-31 May
2003	17 April	13 May	29 May	13 April-01 June
2004	15 April	28 April	28 May	08 April-31 May
2005	19 April	08 May	21 May	08 April-08 June

a Includes fish tagged from summer 1995 through spring 1996.
b No parr were tagged the summer prior to this migration year.
c All fish tagged at traps in fall or spring for this migration year.
d Insufficient numbers detected to estimate timing.

Appendix Table 2. Summary of numbers collected, tagged, and released with minimum, maximum, and mean length and weight of PIT-tagged wild Chinook salmon parr collected in 2004 from Idaho streams.

	Number of fish			Collected				Tagged and released			
				Length		Weight		Length		Weight	
	Collected	Tagged	Released	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Bear Valley Creek	2,640	1,502	1,500	40-132	56.4	0.7-21.9	2.4	50-132	59.9	1.2-6.0	2.5
Elk Creek	2,098	1,471	1,471	39-134	58.4	0.7-32.0	2.9	49-121	61.1	1.3-8.6	3.0
Marsh Creek	2,316	1,503	1,501	39-128	60.4	0.9-21.9	3.4	50-120	64.7	1.1-8.6	3.7
Sulphur Creek	2,086	1,158	1,157	37-126	55.7	0.6-26.0	2.9	47-97	61.3	1.5-7.7	2.9
Cape Horn Creek	2,703	1,023	1,022	37-127	53.1	0.5-22.7	3.1	47-92	61.3	1.3-8.6	3.1
Valley Creek	4,577	2,517	2,511	38-177	57.3	0.7-25.6	2.9	49-105	63.0	1.3-13.5	3.0
Loon Creek	1,619	1,502	1,501	40-157	61.7	1.2-7.0	3.3	50-157	62.5	1.3-7.0	3.3
Camas Creek	1,742	1,501	1,500	43-92	60.8	1.0-7.7	3.4	51-92	62.1	1.4-7.7	3.5
Herd Creek	1,818	1,559	1,559	42-122	64.9	0.8-18.1	3.8	50-105	66.8	1.6-11.1	3.9
Big Creek (upper)	1,801	1,516	1,516	45-111	63.4	1.1-16.4	3.0	51-96	63.5	1.2-6.9	3.0
Big Creek (lower)	393	375	374	55-94	71.1	1.9-8.2	4.2	55-94	71.2	1.9-8.2	4.2
WF Chamberlain Cr	1,039	1,033	1,030	49-130	66.1	1.1-15.4	3.4	51-84	66.0	1.6-8.0	3.4
Chamberlain Creek	355	298	298	46-110	60.0	1.6-5.5	3.0	52-78	61.0	1.7-5.5	3.0
S Fork Salmon R	2,489	1,225	1,222	37-125	56.1	0.8-20.6	2.8	49-98	61.4	1.4-11.2	2.7
Secesh River	1,506	1,075	1,074	39-100	59.9	1.0-8.6	2.8	54-100	62.8	1.5-8.6	2.9
Lake Creek	972	650	650	41-97	58.7	0.5-7.2	2.8	52-97	62.2	1.7-7.2	3.0
Total or mean	30,154	19,908	19,886	37-177	60.2	0.5-32.0	3.1	47-157	63.2	1.1-13.5	3.2

Appendix Table 3a. Tagging dates, times (PST) and temperatures (°C) and release dates, times, and temperatures. Also presented are methods of capture and distance (km) from the mouth of the stream to the release point, number released in 2004, and number/percent of first-time detections (unadjusted) for each tag group at seven downstream dams and in the surface-trawl detector in the upper Columbia River estuary during 2005.

	Tagging			Capture	Release			Stream distance	Released	Detected	
Group	Date	Time	Temp (°C)	method	Date	Time	Temp (°C)	(km)	(n)	(n)	(%)
Bear Valley Creek											
SA04203.BV1	7/21	0637	13.0	B Seine	7/22	0600	12.5	09	141	3	2.1
SA04203.BV2	7/21	0818	13.5	B Seine	7/21	0818	15.0	10	115	4	3.5
SA04203.BV3	7/21	1019	14.5	Shock	7/21	1115	16.0	10	211	10	4.7
SA04204.BV1	7/22	0631	12.5	B Seine	7/22	1100	15.5	10	727	23	3.2
SA04205.BV1	7/23	0553	12.5	B Seine	7/23	0815	13.5	14	306	14	4.6
Elk Creek											
SA04205.EC1	7/23	0807	13.0	B Seine	7/24	0730	15.0	01	197	15	7.6
SA04205.EC2	7/23	0923	13.5	B Seine	7/23	1100	15.0	01	430	30	7.0
SA04208.EC1	7/26	0633	13.0	B Seine	7/26	0800	14.0	02	25	1	4.0
SA04208.EC2	7/26	0725	13.0	Shock	7/26	1100	16.0	02	482	15	3.1
SA04209.EC1	7/27	0602	12.5	Shock	7/27	1000	14.0	04	337	20	5.9
Marsh Creek											
SA04210.MC1	7/28	0726	09.0	B Seine	7/29	0509	09.0	11	110	7	6.4
SA04210.MC2	7/28	0850	10.0	B Seine	7/28	1200	16.0	11	552	35	6.3
SA04211.MC1	7/29	0604	08.0	B Seine	7/29	1210	15.0	14	839	62	7.4

Appendix Table 3a. Continued.

Group	Tagging			Capture method	Release			Stream distance (km)	Released (n)	Detected	
	Date	Time	Temp (°C)		Date	Time	Temp (°C)			(n)	(%)
Cape Horn Creek											
SA04212.CH1	7/30	0630	07.0	Shock	7/31	0445	07.0	01	139	9	6.5
SA04212.CH2	7/30	0911	08.0	Shock	7/30	1230	14.5	01	350	24	6.9
SA04213.CH1	7/31	0606	07.0	Shock	7/31	1000	09.0	03	532	30	5.6
Sulphur Creek											
SA04210.SU1	7/28	0814	10.0	B Seine	7/29	0630	10.0	05	144	5	3.5
SA04210.SU2	7/28	0926	11.0	B Seine	7/28	1100	14.0	05	356	23	6.5
SA04210.SU3	7/28	1135	14.0	B Seine	7/28	1215	14.0	06	85	10	11.8
SA04211.SU1	7/29	0637	10.0	B Seine	7/29	0930	12.0	07	572	36	6.3
Valley Creek											
SA04215.VC1	8/02	0613	12.5	B Seine	8/03	0515	12.0	05	199	6	3.0
SA04215.VC2	8/02	0817	12.5	B Seine	8/02	1130	13.0	05	255	11	4.3
SA04215.VC3	8/02	0856	12.5	Shock	8/03	0515	12.0	05	199	7	3.5
SA04215.VC4	8/02	1021	13.0	Shock	8/02	1130	13.0	05	252	12	4.8
SA04216.VC1	8/03	0647	12.0	B Seine	8/03	1030	16.5	09	750	23	3.1
SA04217.VC1	8/04	0615	09.0	Shock	8/05	0730	09.0	18	200	20	10.0
SA04217.VC2	8/04	0719	09.0	B Seine	8/05	0730	09.0	18	197	12	6.1
SA04217.VC3	8/04	1110	13.0	Shock	8/04	1145	16.0	18	229	21	9.2
SA04217.VC4	8/04	0950	11.5	B Seine	8/04	1145	16.0	18	230	10	4.3

Appendix Table 3a. Continued.

Group	Tagging			Capture method	Release			Stream distance (km)	Released (n)	Detected	
	Date	Time	Temp (°C)		Date	Time	Temp (°C)			(n)	(%)
Loon Creek											
SA04219.LN1	8/06	0542	09.5	Shock	8/07	0500	09.0	33	107	14	13.1
SA04219.LN2	8/06	0756	09.0	Shock	8/06	1200	13.5	34	782	74	9.5
SA04220.LN1	8/07	0530	09.0	Shock	8/07	1000	12.0	36	612	55	9.0
Camas Creek											
SA04219.CA1	8/06	0738	10.0	Shock	8/07	0700	10.0	22	96	7	7.3
SA04219.CA2	8/06	0913	11.0	Shock	8/06	1130	17.0	23	632	53	8.4
SA04220.CA1	8/07	0600	10.0	Shock	8/07	1100	14.0	23	772	103	13.3
Herd Creek											
SA04222.HC1	8/09	0648	09.5	Shock	8/10	0700	09.0	01	201	23	11.4
SA04222.HC2	8/09	0830	10.0	Shock	8/09	1145	17.5	02	1358	136	10.0
Big Creek (upper)											
SA04224.BC1	8/11	0623	08.0	Shock	8/12	0445	08.0	55	123	9	7.3
SA04224.BC2	8/11	0829	08.5	Shock	8/11	1230	15.0	56	863	62	7.2
SA04225.BC1	8/12	0613	08.0	B Seine	8/12	0830	09.0	56	530	40	7.5
Big Creek (lower)											
SA04230.LB1	8/17	0619	15.0	Shock	8/18	0330	14.0	10	95	9	9.5
SA04230.LB2	8/17	0928	15.0	Shock	8/17	1200	15.0	09	279	30	10.8

Appendix Table 3a. Continued.

Group	Tagging			Capture method	Release			Stream distance (km)	Released (n)	Detected	
	Date	Time	Temp (°C)		Date	Time	Temp (°C)			(n)	(%)
West Fork Chamberlain Creek											
SA04230.WC1	8/17	0823	11.5	B Seine	8/18	0700	12.0	02	117	9	7.7
SA04230.WC2	8/17	0911	12.0	B Seine	8/17	1130	14.0	02	913	104	11.4
Chamberlain Creek											
SA04231.CB1	8/18	0832	09.0	Shock	8/18	1130	16.0	25	298	14	4.7
South Fork Salmon River											
SA04233.SF1	8/20	0649	12.0	Shock	8/21	0700	12.0	117	111	8	7.2
SA04233.SF2	8/20	0821	12.0	Shock	8/20	1140	16.0	117	552	39	7.1
SA04237.SF1	8/24	0658	07.0	B Seine	8/24	1000	08.0	123	08	0	0.0
SA04237.SF2	8/24	0842	08.0	Shock	8/24	1300	10.0	123	551	43	7.8
Secesh River											
SA04238.SE1	8/25	0647	09.0	Shock	8/26	0530	08.0	26	91	7	7.7
SA04238.SE2	8/25	0953	09.0	Shock	8/25	1200	09.0	27	399	25	6.3
SA04239.SE1	8/26	0647	08.0	Shock	8/26	1200	10.0	27	584	39	6.7
Lake Creek											
SA04240.LC1	8/27	0710	07.0	Shock	8/27	1230	10.0	02	650	40	6.2

Appendix Table 3b. Universal Transverse Mercator (UTM) grid coordinates of Global Positioning System that identify sampling areas at the beginning and end of daily collections in streams for each collection crew in 2004. Hand-held Garmin GPS III-plus units were used.

			UTM Coordinates			
			Start		End	
	Date	Area covered	Northing	Easting	Northing	Easting
Bear Valley Creek	7/-21-04	Entire Stream	4920620	11T0633022	4920920	11T0632690
	7-21-04	Left bank	4920645	11T0633068	4920980	11T0632752
	7-21-04	Right bank	4920645	11T0633068	4920980	11TO632752
	7-22-04	Entire stream	4919079	11T0630182	4918920	11T0629895
	7-23-04	Entire stream	4918755	11T0629588	4986340	11T0629623
Elk Creek	7-23-04	Entire stream	4918749	11T0629570	4918793	11T0629437
	7-26-04	Entire stream	4916534	11T0622003	4918543	11T0629226
	7-26-04	Left bank	4918854	11T0629226	4918840	11T0628907
	7-26-04	Right bank	4918854	11T0629226	4918840	11T0628907
	7-27-04	Right bank	4919254	11T0628154	4919406	11T0627964
	7-27-04	Left bank	4919259	11T0628154	4919406	11T0627964
Marsh Creek	7-28-04	Entire stream	4917099	11T0646308	4917113	11T0646300
	7-29-04	Entire stream	4916445	11T0646887	4915789	11T0647274
Sulphur Creek	7-28-04	Entire stream	4233058	11T0630960	4932520	11T0630367
Cape Horn Creek	7-30-04	Right bank	4917424	11T0645803	4916672	11T0645372
	7-30-04	Left bank	4917424	11T0645803	4916452	11T0645200
	7-31-04	Right bank	4916672	11T0645200	4916487	11T0645284
	7-31-04	Left bank	4916487	11T0645289	4916104	11T0645119
	7-31-04	Right bank	4916487	11T0645289	4916104	11T0645119

Appendix Table 3b. Continued.

			UTM Coordinates			
			Start		End	
	Date	Area covered	Northing	Easting	Northing	Easting
Valley Creek	8-02-04	Entire stream	4899452	11T0661137	4899649	11T0660937
	8-02-04	Entire stream	4899374	11T0661141	4899614	11T0660879
	8-02-04	Entire stream	4899452	11T0661137	4899614	11T0660879
	8-03-04	Entire stream	4901920	11T0659205	4902238	11T0659331
	8-04-04	Entire stream	4906317	11T0657653	4906524	11T0657313
	8-04-04	Entire stream	4906317	11T0657653	4906524	11T0657313
Camas Creek	8-06-04	Left bank	4968226	11T0696518	4967798	11T0696962
	8-06-04	Right bank	4968226	11T0696518	4967798	11T0696962
	8-07-04	Right bank	4967784	11T0699696	4967190	11T0697274
	8-07-04	Left bank	4967784	11T0699696	4967190	11T0697274
Loon Creek	8-06-04	Left bank	4942059	11T0674895	4940921	11T0673872
	8-06-04	Right bank	4942059	11T0674895	4940921	11T0673872
	8-07-04	Left bank	4940681	11T0673741	4940227	11T0673251
	8-07-04	Right bank	4940681	11T0673741	4940227	11T0673251
Herd Creek	8-09-04	Entire stream	4893223	11T0716726	4891510	11T0716792
	8-09-04	Right bank	4892106	11T0716230	4891792	11T0716584
	8-09-04	Left bank	4892106	11T0716230	4891792	11T0716584
Big Creek (upper)	8-11-04	Right bank	4996705	11T0631585	4996097	11T0631435
	8-11-04	Left bank	4996705	11T0631585	4996097	11T0631435
	8-11-04	Entire stream	4996103	11T0631365	4995570	11T0631327
	8-12-04	Entire stream	4995559	11T0631325	4995357	11T0631329

Appendix Table 3b. Continued.

			UTM Coordinates			
			Start		End	
	Date	Area covered	Northing	Easting	Northing	Easting
Big Creek (lower)	8-17-04	Left bank	4996769	11T0670259	4996631	11T0669466
	8-17-04	Right bank	4996769	11T0670259	4996631	11T0669466
West Fork Chamberlain Creek	8-17-04	Entire stream	5027524	11T0641825	5027868	11T064128
Chamberlain Creek	8-18-04	Entire stream	5026370	11T0642256	5026010	11T0641976
South Fork Salmon River	8-20-04	Right bank	4943991	11T0603505	4942996	11T0603447
	8-20-04	Left bank	4943991	11T0603505	4942966	11T0603447
	8-24-04	Entire stream	4940125	11T0604741	4939823	11T0604693
	8-24-04	Right bank	4939823	11T0604693	4939314	11T0604521
	8-24-04	Left bank	4939823	11T0604693	4939314	11T0604521
Secesh River	8-25-04	Left bank	5005723	11T0592869	5007221	11T0593501
	8-25-04	Right bank	5005723	11T0592869	5007221	11T0593501
	8-26-04	Right bank	5007225	11T0593481	5008500	11T0593520
	8-26-04	Left bank	5007225	11T0593481	5008500	11T0593520
Lake Creek	8-27-04	Left bank	5012378	11T0586066	5013419	11T0585383
	8-27-04	Right bank	5012378	11T0586066	5013419	11T0585383

Appendix Table 4. Summary of observed total mortality for PIT-tagged wild Chinook salmon parr collected from Idaho streams during July and August 2004. Number rejected includes; fish too small to tag, precocious males, injured fish, fish collected for genetic evaluation, previously tagged fish, and in some cases extra collected fish.

	Total number collected	Total number tagged	Total number rejected (No. precocious males)	Percent rejected	Observed mortality			
					Collection and handling	Tagging (delayed)	n.	%
Bear Valley Creek	2,640	1,502	1,129 (01)	42.8	9	2	11	0.4
Elk Creek	2,098	1,471	612 (07)	29.2	15	0	15	0.7
Marsh Creek	2,316	1,503	809 (01)	34.9	4	2	6	0.3
Sulphur Creek	2,086	1,158	927 (11)	44.4	1	1	2	0.1
Cape Horn Creek	2,703	1,023	1,663 (25)	61.5	17	1	18	0.7
Valley Creek	4,577	2,517	2,000 (12)	43.7	60	6	66	1.4
Loon Creek	1,619	1,502	108 (00)	6.7	9	1	10	0.6
Camas Creek	1,742	1,501	211 (01)	12.1	30	1	31	1.8
Herd Creek	1,818	1,559	241 (04)	13.3	18	0	18	1.0
Big Creek (upper)	1,801	1,516	277 (14)	15.4	8	0	8	0.4
Big Creek (lower)	393	375	05 (00)	1.5	13	1	14	3.6
W.F. Chamberlain Cr	1,039	1,033	06 (05)	0.6	0	3	3	0.3
Chamberlain Creek	355	298	51 (01)	14.4	6	0	6	1.7
S.F. Salmon River	2,489	1,225	1,248 (23)	50.1	16	3	19	0.8
Secesh River	1,506	1,075	422 (05)	28.0	9	1	10	0.7
Lake Creek	972	650	317 (03)	32.6	5	0	5	0.5
Totals/Averages	30,154	19,908	10,026	33.3	220	22	242	0.8

Appendix Table 5. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,500 wild Chinook salmon from Bear Valley Creek released 21-23 July 2004. Release sites were 629-634 km above Lower Granite Dam.

	Bear Valley Creek						
	Lower Granite		First detection				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
21 Apr	1	1					
22 Apr	1	1					
25 Apr	1	1					
26 Apr	1	1					
28 Apr	1	1					
29 Apr	2	2					
30 Apr	2	3					
01 May	3	4					
02 May	2	3					
03 May	2	2					
04 May	3	4					
05 May	4	5					
06 May							
07 May	1	1					
08 May	2	3	2				
09 May	1	1	1				
10 May							
11 May	2	3					
12 May	1	2					
13 May							
14 May	1	2		1			
15 May							
16 May	1	2					
17 May			1				
18 May			1				
19 May	1	3					
20 May							
21 May	1	3	1				
24 May							
25 May							
26 May	1	2	2				
27 May							
28 May							
29 May			1				
31 May	1	2	1				
01 June			1				
03 June	1	2	1				
07 June			1				
08 June	1	1					
10 June	1	1					
28 June					1		
Totals	39	56	13	1	1	0	0

Appendix Table 6. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,471 wild Chinook salmon from Elk Creek released 23-27 July 2004. Release sites were 634-638 km above Lower Granite Dam.

	Elk Creek						
	Lower Granite		First detection				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
18-Apr	1	1					
20-Apr							
21-Apr	1	1					
22-Apr							
23-Apr							
24-Apr							
25-Apr							
26-Apr	4	5					
27-Apr	2	2					
28-Apr							
29-Apr	3	4					
30-Apr							
01-May	1	1					
02-May	2	3					
03-May	2	2					
04-May	4	5					
05-May	6	7					
06-May	3	4					
07-May	2	3					
08-May	1	1					
09-May							
10-May	1	1					
11-May	3	4	1				
12-May	2	3					
13-May							
14-May							
15-May	1	2					
16-May							
17-May	1	2					

Appendix Table 6. Continued.

	Elk Creek (continued)						
	Lower Granite		First detection				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
18-May							
19-May	1	3					
20-May							
21-May	2	6					
22-May	1	3	2				
23-May			1	1			
24-May	1	2	2				
25-May	2	5	1				
26-May			3				
27-May	3	5	1				
29-May	2	3	2				
30-May	2	3	1				
31-May							
01-Jun	1	2	1				
02-Jun			1				
03-Jun	1	2					
05-Jun							
06-Jun			1				
09-Jun							
10-Jun				1			
11-Jun			2				
12-Jun	1	1					
13-Jun							
14-Jun							
19-Jun			1				
26-Jun					1		
30-Jun					1		
Totals	57	86	20	2	2	0	0

Appendix Table 7. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,501 wild Chinook salmon from Marsh Creek released 28-29 July 2004. Release sites were 630-634 km above Lower Granite Dam.

	Marsh Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
14-Apr							
15-Apr							
16-Apr							
19-Apr							
20-Apr							
22-Apr	1	1					
23-Apr	1	1					
24-Apr	1	1					
25-Apr							
26-Apr	3	4					
27-Apr	3	4					
28-Apr							
29-Apr	2	2					
30-Apr							
01-May	6	7					
02-May	2	3					
03-May	5	6					
04-May	4	5					
05-May	15	18					
06-May	12	15					
07-May	5	6	1				
08-May	4	5	1				
09-May	3	4	2				
10-May	5	7	1				
11-May			3				
12-May	3	5					
13-May	1	2	1				
14-May							
15-May	1	2	1				

Appendix Table 7. Continued.

	Marsh Creek (continued)						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
17-May			3				
18-May	1	2	1				
19-May							
20-May			1				
21-May	2	6					
23-May			2				
24-May			2				
25-May	1	2	1				
26-May			1				
28-May							
02-Jun			1				
04-Jun	1	1					
05-Jun							
Totals	82	109	22	0	0	0	0

Appendix Table 8. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,022 wild Chinook salmon from Cape Horn Creek released 30-31 July 2004. Release sites were 629-632 km above Lower Granite Dam.

	Cape Horn Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
11-Apr	1	1					
14-Apr							
15-Apr							
17-Apr							
18-Apr							
20-Apr	1	1					
24-Apr	1	1					
25-Apr	1	1					
26-Apr	1	1					
27-Apr							
28-Apr	1	1					
29-Apr	2	2					
30-Apr							
01-May	1	1					
02-May			1				
03-May	2	2					
04-May	3	4					
05-May	13	15					
06-May	2	2					
07-May	3	4					
08-May	1	1					
09-May	2	3					
10-May	3	4			1		
11-May	3	4	1				
12-May	2	3					
13-May	1	2					
14-May			1				
15-May	1	2					
19-May	1	3					
20-May							
23-May	2	5	2				
24-May	2	5					
25-May	1	2					
26-May			2				
28-May	1	2					
29-May	2	3					
03-Jul					1		
Totals	54	75	7	0	2	0	0

Appendix Table 9. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,157 wild Chinook salmon from Sulphur Creek released 28-29 July 2004. Fish were released 604-606 km above Lower Granite Dam.

	Sulphur Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
02-Apr							
10-Apr							
15-Apr							
17-Apr							
16-Apr							
19-Apr							
22-Apr	1	1					
24-Apr							
25-Apr							
26-Apr	2	2					
27-Apr	2	2					
28-Apr	1	1					
29-Apr							
30-Apr	1	1					
01-May	3	4	1				
02-May			1				
03-May							
04-May	8	9					
05-May	9	11	1				
06-May	4	5					
07-May	7	9					
08-May	2	3	2				
09-May	3	4					
10-May	3	4					
11-May	3	4	1				
12-May	1	2					
17-May	1	2					
21-May	2	6					
22-May	1	3	1				
23-May			1				
24-May			1	1			
25-May			2				
26-May	1	2	2				
29-May	1	2					
30-May			1				
02-Jun			1				
05-Jun	1	1					
26-Jun					1		
Totals	57	78	15	1	1	0	0

Appendix Table 10. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 2,511 wild Chinook salmon from Valley Creek released 02-05 August 2004. Release sites were 743-757 km above Lower Granite Dam.

	Valley Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
04-Apr							
14-Apr							
15-Apr							
19-Apr							
21-Apr							
23-Apr	1	1					
24-Apr							
25-Apr							
26-Apr	2	2					
27-Apr	10	12					
28-Apr	2	2					
29-Apr	3	4					
30-Apr	2	3					
01-May	2	2					
02-May	1	1					
03-May	2	2					
04-May	1	1					
05-May	6	7					
06-May	5	6					
07-May	4	5	1				
08-May	5	6					
09-May	6	9	1				
10-May	2	3					
11-May	1	1	1				
12-May	2	3					
13-May	1	2					
14-May			2				
15-May			1				
16-May							
17-May							
18-May	1	2		1			
19-May	1	3					
20-May	1	3					
21-May	1	3	1				
22-May	2	6	3				
23-May	1	2	2				

Appendix Table 10. Continued.

	Valley Creek (continued)						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
24-May	2	5					
25-May	1	2	4				
26-May	1	2					
27-May	1	2					
28-May	1	2	1				
29-May	2	3	1				
30-May	1	1	1			1	
31-May			1				
01-Jun	2	3	1				
02-Jun	3	5	2				
03-Jun	3	5					
04-Jun	1	1					
05-Jun	2	3					
06-Jun	2	3					
08-Jun	2	3					
09-Jun	1	1					
10-Jun	2	3					
12-Jun	1	1					
18-Jun	1	1					
19-Jun			1				
20-Jun	1	7					
28-Jun					1		
Totals	95	147	24	1	1	1	0

Appendix Table 11. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,501 wild Chinook salmon from Loon Creek released 06-07 August 2004. Release sites were 555-559 km above Lower Granite Dam.

	Loon Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
20-Apr	1	1					
21-Apr	1	1					
22-Apr	1	1					
25-Apr							
26-Apr							
27-Apr	3	4					
28-Apr							
29-Apr	3	4					
30-Apr							
01-May	2	2					
02-May	1	1					
03-May			1				
04-May	3	4					
05-May	16	19					
06-May	13	16	1				
07-May	5	6	1				
08-May	9	12	1				
09-May	3	4	2				
10-May	6	9	1				
11-May	7	10	2				
12-May	7	11					
13-May	4	7	1				
14-May	1	2	1				
15-May			1				
16-May	2	5	1				
17-May	1	2					
18-May			1				
19-May							
20-May							
21-May	3	9	2				
22-May			2				
23-May	2	5	8				
24-May	1	2	5				
25-May	2	5	2				
26-May							
28-May			1				
29-May			2				
30-May	2	3	2				
31-May			2				
01-Jun	1	2	1				
02-Jun	1	2					
03-Jun	1	2					
Totals	102	151	41	0	0	0	0

Appendix Table 12. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,500 wild Chinook salmon from Camas Creek released 06-07 August 2004. Release sites were 526-528 km above Lower Granite Dam.

	Camas Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
12-Apr	1	1					
17-Apr							
19-Apr							
20-Apr							
21-Apr							
22-Apr							
23-Apr	3	4					
24-Apr	1	1					
25-Apr	1	1					
26-Apr	3	4					
27-Apr	2	2					
28-Apr	2	2					
29-Apr	2	2					
30-Apr	1	1					
01-May	2	2					
02-May	2	3					
03-May	3	4					
04-May	9	11					
05-May	13	15	1				
06-May	24	29	1				
07-May	6	8					
08-May	1	1	2				
09-May	1	1	2				
10-May	5	7	2	1			
11-May	5	7	1				
12-May	2	3					
13-May	5	9					
14-May							
15-May	1	2					
16-May			1				
17-May							
18-May	1	2	1				
19-May	3	8					

Appendix Table 12. Continued.

	Camas Creek (continued)						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
20-May	1	3					
21-May	3	9	2				
22-May							
23-May	1	2	7		1		
24-May	1	2					
25-May	2	5	2				
26-May	1	2	3				
27-May							
28-May	2	3	3				
29-May	3	5	2				
30-May	1	1	2				
31-May	1	2					
01-Jun			2				
02-Jun			1				
04-Jun	1	1					
05-Jun	1	1					
06-Jun	2	3					
07-Jun	1	1	1				
08-Jun			1				
10-Jun	1	1					
14-Jun			1				
19-Jun	1	1					
28-Jun					1		
Totals	122	172	38	1	2	0	0

Appendix Table 13. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,559 wild Chinook salmon from Herd Creek released 09-10 August 2004. Fish were released 699-701 km above Lower Granite Dam.

	Herd Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
20-Apr	2	2					
21-Apr							
22-Apr	1	1					
23-Apr							
24-Apr							
25-Apr	2	2					
26-Apr	5	6					
27-Apr	7	8					
28-Apr	4	5					
29-Apr	2	2	1				
30-Apr	1	1					
01-May	7	9					
02-May	2	3	1				
03-May	1	1					
04-May	4	5					
05-May	9	11					
06-May	14	17	1				
07-May	12	15	1				
08-May	16	21	2				
09-May	6	9	1				
10-May	2	3	4				
11-May	5	7	3				
12-May	3	5					
13-May	3	5		1			
14-May	2	4					
15-May			2		1		
16-May	1	2	2	1			
17-May							
18-May	3	7			1		
19-May	2	5	1				
20-May			1				
21-May			1				
22-May	1	3	1	1			
23-May	1	2					
24-May	1	2	1	1			
25-May			2				
28-May			1				
01-Jun	4	7	1				
04-Jun			1				
06-Jun	1	2					
13-Jun	1	1					
Totals	125	173	28	4	2	0	0

Appendix Table 14. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,516 wild Chinook salmon from Big Creek (upper) released 11-12 August 2004. Release sites were 530-532 km above Lower Granite Dam.

	Herd Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
20-Apr	1	1					
22-Apr	1	1					
23-Apr	1	1					
26-Apr	1	1					
27-Apr	8	10					
28-Apr	4	5					
29-Apr	1	1					
30-Apr	1	1					
01-May	1	1					
02-May	3	4					
03-May	2	2					
04-May	5	6					
05-May	11	13					
06-May	10	12					
07-May	5	6					
08-May	7	9	2				
09-May	5	7					
10-May			1				
11-May	1	1	2				
12-May	1	2					
13-May	1	2			1		
14-May							
15-May	1	2					
16-May				1			
17-May			1				
18-May	1	2					
20-May	2	6	1				
21-May	1	3	1				
22-May	1	3			1		
23-May	3	7	3				
24-May	1	2					
25-May	1	2		1			
26-May			1	1			
27-May	3	5					
28-May	2	3	2				
29-May	1	2					
31-May	1	2					
01-Jun							
02-Jun	1	2					
03-Jun	1	2					
07-Jun	1	1					
30-Jun					1		
Totals	91	130	14	3	3	0	0

Appendix Table 15. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 374 wild Chinook salmon from Big Creek (lower) released 17-18 August 2004. Release sites were 487-488 km above Lower Granite Dam.

	Big Creek (lower)						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
06-Apr							
07-Apr							
14-Apr							
15-Apr							
16-Apr							
17-Apr							
18-Apr							
19-Apr							
20-Apr	1	1					
21-Apr	1	1					
22-Apr	2	2					
23-Apr	1	1					
24-Apr							
25-Apr	1	1					
26-Apr	4	5					
27-Apr	2	2					
28-Apr	1	1					
29-Apr	1	1					
30-Apr							
01-May	2	2					
02-May	2	3	1				
03-May	1	1					
04-May							
05-May	6	7					
06-May	4	5	1				
07-May	1	1					
08-May	1	1	1				
09-May	2	3					
10-May	1	1					
11-May							
12-May				1			
14-May			1				
15-May							
28-May							
Totals	34	39	4	1	0	0	0

Appendix Table 16. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,328 wild Chinook salmon from West Fork Chamberlain Creek* released 17-18 August 2004. Release sites were 437-438 km above Lower Granite Dam.

	West Fork Chamberlain Creek*						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
15-Apr							
17-Apr							
18-Apr							
19-Apr							
20-Apr	1	1					
21-Apr							
22-Apr	2	2					
23-Apr	2	2					
24-Apr	3	4					
25-Apr							
26-Apr	8	10					
27-Apr	18	22	1				
28-Apr	7	9					
29-Apr	4	5	2				
30-Apr	3	4	1				
01-May	4	5					
02-May	1	1					
03-May	6	7	2				
04-May	8	9					
05-May	8	9	2				
06-May	9	11	1				
07-May	4	5	2				
08-May	3	4	3				
09-May	3	4	3				
10-May	2	3	2				
11-May	2	3					
13-May	1	2					
15-May							
16-May							
17-May							
19-May	1	3					
22-May	1	3					
23-May							
25-May							
26-May	1	2					
29-May	1	2					
30-May	2	3					
31-May			1				
01-Jun			1				
04-Jun			1				
Totals	105	135	22	0	0	0	0

* Includes fish from Chamberlain Creek

Appendix Table 17. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,222 wild Chinook salmon from South Fork Salmon River released 20-24 August 2004. Release sites were 467-473 km above Lower Granite Dam.

	South Fork Salmon River						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
16-Apr							
17-Apr							
18-Apr							
20-Apr							
21-Apr							
22-Apr	2	2					
24-Apr							
25-Apr							
26-Apr	3	4					
27-Apr	2	2	1				
28-Apr	1	1					
29-Apr	2	2					
01-May	1	1					
03-May							
04-May	4	5					
05-May	4	5	3				
06-May	7	8					
07-May	3	4					
08-May	5	6					
09-May	1	1	1				
10-May			1				
11-May			1				
12-May	2	3	1				
13-May			1				
14-May	1	2					
15-May	1	2	1				
16-May						1	
18-May							
19-May							
20-May	1	3	1				
21-May							
22-May	1	3					
23-May			1	1			
24-May			1				
25-May	5	11	4				
26-May	1	2	1				

Appendix Table 17. Continued.

South Fork Salmon River (continued)							
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
27-May	3	5					
28-May	1	2	2				
29 May	1	2	1	1			
30-May	1	1					
31-May					1		
01-Jun			3				
02-Jun	1	2					
03-Jun				1			
04-Jun	1	1					
06-Jun	1	2					
08-Jun	1	1					
09-Jun							
11-Jun							
12-Jun				1			
13-Jun							
17-Jun							
19-Jun	1	1					
30-Jun					1		
01-Jul					1		
Totals	58	84	24	4	3	1	0

Appendix Table 18. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 1,074 wild Chinook salmon from Secesh River released 25-26 August 2004. Release sites were 429-431 km above Lower Granite Dam.

	Secesh River						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
04-Apr	1	1					
08-Apr							
15-Apr	1	1					
18-Apr							
19-Apr	1	1					
20-Apr	2	2					
23-Apr	2	2					
24-Apr	2	2					
25-Apr							
26-Apr	5	6					
27-Apr	4	5					
28-Apr	2	2					
29-Apr	1	1	1				
30-Apr	3	4					
01-May	4	5					
02-May	2	3					
03-May	3	4	2				
04-May							
05-May	4	5					
06-May	5	6					
07-May	3	4					
08-May	1	1					
10-May	1	1					
11-May			1				
12-May	1	2	1				
13-May	2	3					
14-May	1	2					
15-May							
16-May				1			
21-May							
22-May							
24-May							
26-May	2	4	2				
28-May							
29-May	1	2					
31-May	2	3					
01-Jun			1				
04-Jun			1				
08-Jun							
10-Jun			1				
11-Jun			1				
19-Jun	1	1					
Totals	58	74	12	1	0	0	0

Appendix Table 19. Detections during 2005 of PIT-tagged smolts by date at three Snake River dams and three Columbia River dams for 650 wild Chinook salmon from Lake Creek released 27 August 2004. Release sites were 451-452 km above Lower Granite Dam.

	Lake Creek						
	Lower Granite		First detections				
Detection date	First detection	Expanded	Little Goose	Lower Monumental	McNary	John Day	Bonneville
09-Apr							
14-Apr							
15-Apr							
16-Apr							
19-Apr	1	1					
20-Apr	5	6					
21-Apr							
22-Apr	1	1					
24-Apr	1	1					
25-Apr							
26-Apr	2	2					
27-Apr	7	8					
28-Apr	2	2					
29-Apr	2	2	1				
30-Apr							
01-May	1	1					
02-May			1				
03-May	1	1	1				
04-May							
06-May	2	2					
07-May	1	1					
08-May			1				
09-May	1	1	1				
10-May							
11-May	1	1	1				
12-May							
14-May							
16-May							
19-May							
20-May	1	3					
22-May							
23-May							
26-May	1	2					
28-May							
29-May	1	2					
04-Jun							
05-Jun							
06-Jun							
08-Jun	1	1					
11-Jun							
19-Jun	1	1					
30-Jun					1		
Totals	33	39	6	0	1	0	0

Appendix Table 20. Daily and expanded detections of PIT-tagged wild spring/summer Chinook salmon smolts from Idaho and Oregon at Lower Granite Dam during 2005, with associated river flows (kcfs), spill (kcfs), and water temperatures (°C) at the dam.

				Idaho only		Idaho and Oregon	
Date	Average flow (kcfs)	Average spill (kcfs)	Scroll-case water temperature	Numbers detected	Expanded numbers detected	Numbers detected	Expanded numbers detected
01 Apr	38.9	0.0	7.8	0	0	0	0
02 Apr	38.3	0.0	7.2	0	0	0	0
03 Apr	36.1	0.0	7.2	0	0	0	0
04 Apr	33.9	0.0	7.2	1	1	1	1
05 Apr	41.1	0.0	7.2	0	0	2	3
06 Apr	42.9	0.0	7.2	0	0	0	0
07 Apr	37.7	0.0	7.2	0	0	2	2
08 Apr	36.3	0.0	7.2	0	0	1	1
09 Apr	42.8	0.0	8.3	0	0	0	0
10 Apr	40.4	0.0	8.7	0	0	0	0
11 Apr	47.0	0.0	10.0	1	1	3	4
12 Apr	37.1	0.0	10.0	1	1	4	5
13 Apr	38.0	0.0	10.0	0	0	2	2
14 Apr	39.1	0.0	10.0	0	0	4	5
15 Apr	39.5	0.0	10.0	1	1	6	7
16 Apr	35.7	0.0	10.0	0	0	3	4
17 Apr	37.7	0.0	9.4	0	0	0	0
18 Apr	45.0	0.0	9.4	1	1	9	11
19 Apr	43.3	0.0	9.4	2	2	11	14
20 Apr	43.5	0.0	9.4	14	17	24	30
21 Apr	41.3	0.0	9.4	5	6	10	12
22 Apr	39.6	0.0	10.0	13	16	15	19
23 Apr	39.8	0.0	10.0	11	13	14	17
24 Apr	41.9	0.0	10.0	9	11	12	14
25 Apr	45.9	0.0	10.6	6	7	11	13
26 Apr	47.9	0.0	11.1	44	53	54	65
27 Apr	52.7	0.0	11.1	70	85	81	98
28 Apr	55.1	0.0	11.1	28	34	37	45
29 Apr	54.9	0.0	11.1	30	37	44	54
30 Apr	54.1	2.7	11.1	14	18	20	25
01 May	51.6	0.0	11.7	40	50	47	58
02 May	47.7	3.8	11.1	20	26	27	34
03 May	46.1	0.0	11.1	30	35	32	38
04 May	49.4	0.0	11.1	56	66	63	74
05 May	60.4	0.0	11.7	124	147	132	156
06 May	67.0	0.0	11.7	114	138	125	151
07 May	79.4	3.1	11.7	62	79	73	93
08 May	82.4	0.0	11.7	58	75	72	93
09 May	77.6	6.2	11.7	37	55	54	80
10 May	91.3	6.2	11.7	31	44	43	61

Appendix Table 20. Continued.

Date	Average flow (kcfs)	Average spill (kcfs)	Scroll-case water temperature	Idaho only		Idaho and Oregon	
				Numbers detected	Expanded numbers detected	Numbers detected	Expanded numbers detected
11 May	98.9	13.5	11.1	33	46	41	57
12 May	88.7	4.0	11.1	27	41	29	44
13 May	85.1	1.5	11.7	19	33	23	40
14 May	84.6	0.0	11.7	6	12	8	16
15 May	83.9	0.0	11.7	6	12	6	12
16 May	91.7	7.6	11.7	4	9	5	11
17 May	124.1	37.9	11.7	3	7	5	11
18 May	121.8	35.8	11.7	7	15	8	17
19 May	118.7	33.6	11.7	10	27	13	35
20 May	135.3	48.6	11.1	6	17	9	26
21 May	138.0	51.6	11.7	15	45	18	53
22 May	125.6	39.9	12.2	8	23	10	29
23 May	122.8	37.1	12.2	10	25	12	30
24 May	116.2	30.3	12.2	9	22	9	22
25 May	100.9	15.8	11.7	15	34	15	34
26 May	98.8	14.0	12.2	9	19	10	21
27 May	89.2	4.7	13.3	10	18	11	20
28 May	87.4	2.7	13.3	7	11	8	13
29 May	84.3	0.0	13.3	19	31	21	34
30 May	81.4	0.0	13.3	9	13	10	15
31 May	79.0	5.0	13.3	5	8	7	12
01 Jun	88.7	11.2	13.3	4	6	6	10
02 Jun	89.9	8.0	13.3	6	9	7	11
03 Jun	83.8	1.6	13.9	7	11	10	15
04 Jun	76.5	0.0	13.9	4	6	6	9
05 Jun	74.3	0.0	13.9	4	6	4	6
06 Jun	74.0	11.0	13.9	6	9	6	9
07 Jun	74.1	16.8	13.3	2	3	2	3
08 Jun	62.7	0.0	13.3	5	7	6	9
09 Jun	59.9	2.9	14.4	1	1	1	1
10 Jun	54.1	0.0	14.4	4	5	4	5
11 Jun	51.6	0.0	13.9	0	0	1	1
12 Jun	50.3	0.0	----	2	3	2	3
13 Jun	50.6	0.0	13.9	1	1	1	1
14 Jun	50.4	0.0	13.9	0	0	0	0
15 Jun	48.3	0.0	14.4	0	0	0	0
16 Jun	44.8	0.0	14.4	0	0	0	0
17 Jun	46.3	0.0	14.4	0	0	0	0
18 Jun	50.7	0.0	14.4	1	1	2	3
19 Jun	52.6	0.1	15.0	4	5	4	5
20 Jun	55.6	39.2	15.0	1	7	1	7
21 Jun	51.5	23.4	15.0	0	0	0	0
22 Jun	51.0	18.1	14.4	0	0	0	0
23 Jun	51.5	33.9	15.0	0	0	0	0

Appendix Table 21. Daily first-time detections of PIT-tagged wild spring/summer Chinook salmon smolts from Idaho at Little Goose Dam during 2005, with associated river flows (kcfs), spill (kcfs), and water temperatures (°C) at the dam.

Date	Average flow(kcfs)	Average Spill(kcfs)	Scroll-case water temperature (ºC)	Numbers detected
22 Apr	39.4	0.0	10.0	1
27 Apr	53.0	0.0	11.7	2
29 Apr	55.8	0.0	11.7	5
30 Apr	53.4	0.0	11.7	1
01 May	53.6	0.0	11.7	1
02 May	47.8	0.0	12.2	5
03 May	48.1	0.0	12.5	6
05 May	60.5	0.0	12.8	7
06 May	65.5	0.0	12.8	5
07 May	79.7	0.0	12.2	6
08 May	82.5	0.0	12.2	17
09 May	78.5	0.0	12.2	14
10 May	89.6	0.0	12.2	12
11 May	97.9	0.0	11.7	18
12 May	88.5	0.0	11.7	2
13 May	85.0	0.0	12.2	3
14 May	84.8	0.0	12.2	5
15 May	84.0	0.0	12.2	6
16 May	89.2	0.0	11.7	4
17 May	121.8	13.5	11.7	5
18 May	115.8	6.7	12.2	4
19 May	112.6	5.5	12.2	1
20 May	129.1	18.6	12.2	4
21 May	134.1	24.1	12.2	8
22 May	120.2	23.1	12.2	9
23 May	118.4	9.5	12.2	27

Appendix Table 21. Continued.

Date	Average flow(kcfs)	Average Spill(kcfs)	Scroll-case water temperature (ºC)	Numbers detected
24 May	111.9	2.0	12.2	12
25 May	98.2	0.0	12.2	18
26 May	97.1	0.0	12.2	17
27 May	88.4	0.0	12.2	1
28 May	86.0	0.0	12.2	10
29 May	85.8	0.0	12.8	9
30 May	81.5	0.0	12.8	7
31 May	77.7	0.0	12.8	5
01 Jun	86.0	1.0	13.3	12
02 Jun	89.1	0.0	13.3	6
03 Jun	84.7	0.0	13.3	1
04 Jun	75.2	0.0	13.9	3
06 Jun	72.8	0.0	14.4	1
07 Jun	70.6	0.0	13.9	2
08 Jun	62.0	0.0	14.4	1
10 Jun	54.1	0.0	14.4	1
11 Jun	50.4	0.0	13.9	3
14 Jun	51.5	0.0	14.5	1
19 Jun	53.7	0.0	15.6	2

Appendix Table 22. Daily first-time detections of PIT-tagged wild spring/summer Chinook salmon smolts from Idaho at Lower Monumental Dam during 2005, with associated river flows (kcfs), spill (kcfs), and water temperatures (ºC) at the dam.

Date	Average flow(kcfs)	Average Spill(kcfs)	Scroll-case water temperature (ºC)	Numbers detected
10 May	92.4	5.3	12.2	1
12 May	93.9	3.2	12.2	1
13 May	87.5	5.0	12.2	1
14 May	87.1	15.3	12.2	1
16 May	91.6	2.1	12.2	3
18 May	119.0	24.0	12.2	1
22 May	123.8	32.1	12.2	1
23 May	119.6	24.3	12.2	2
24 May	116.6	21.6	12.8	2
25 May	102.6	9.3	13.3	1
26 May	101.3	13.8	13.3	1
29 May	89.5	1.5	13.3	1
03 Jun	89.7	2.7	14.4	1
10 Jun	56.5	0.0	15.0	1
12 Jun	51.0	0.0	15.0	1

Appendix Table 23. Daily first-time detections of PIT-tagged wild spring/summer Chinook salmon smolts from Idaho at McNary Dam during 2005, with associated river flows (kcfs), spill (kcfs), and water temperatures at the dam. Two first-time detections occurred at John Day Dam (16 and 30 May); no first-time detections occurred at Bonneville Dam, Ice Harbor Dam, or the surface-trawl detector at the mouth of the river.

Date	Average flow(kcfs)	Average Spill(kcfs)	Water temperature (ºC)	Numbers detected
10 May	242.5	85.1	12.5	1
13 May	247.5	105.2	12.6	1
15 May	242.5	78.7	13.2	1
18 May	277.5	118.2	12.6	1
22 May	263.8	173.9	12.7	1
23 May	251.3	105.0	12.9	1
31 May	193.0	65.3	14.7	1
26 Jun	200.5	24.6	17.2	2
28 Jun	188.9	20.5	17.2	3
30 Jun	215.5	41.8	17.3	4
01 Jul	230.1	175.3	----	1
03 Jul	184.9	130.1	18.1	1

Appendix Table 24. Monthly environmental data collected from Marsh Creek (RKm 179.5 from the mouth of the Middle Fork Salmon River) from August 2004 through July 2005.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Temperature (°C)						
Min	6.1	3.5	0.0	-0.1	0.0	0.0	---	---	0.0	0.7	3.2	6.7
Max	15.9	15.8	11.9	5.6	3.7	0.0	---	---	10.5	12.8	15.9	15.9
Mean	11.1	8.5	5.0	1.6	0.4	0.0	---	---	3.7	5.9	8.5	11.4
						Dissolved Oxygen (ppm)						
Min	8.9	0.9	---	---	13.9	13.6	---	---	4.8	1.2	---	---
Max	13.2	12.7	---	---	14.2	14.2	---	---	12.3	11.4	---	---
Mean	11.0	6.7	---	---	14.1	14.0	---	---	10.8	10.0	---	---
						Specific Conductance (µS/cm)						
Min	58.0	57.0	56.0	47.0	58.0	61.0	---	---	20.0	20.0	23.0	34.0
Max	65.0	65.0	65.0	66.0	68.0	66.0	---	---	57.0	42.0	35.0	42.0
Mean	61.2	61.6	60.2	60.4	63.0	63.2	---	---	48.7	30.7	30.0	38.7
						Turbidity (ntu)						
Min	0.0	0.0	0.0	0.0	---	---	---	---	0.0	2.3	7.2	16.0
Max	47.1	3.9	26.9	35.3	---	---	---	---	46.9	39.6	49.5	50.0
Mean	10.4	0.9	3.3	1.7	---	---	---	---	5.6	7.1	18.5	36.7
						Depth (feet)						
Min	0.7	0.7	0.4	0.2	0.7	0.5	---	---	0.4	1.2	1.4	1.1
Max	1.4	1.3	1.3	1.5	2.4	2.7	---	---	1.9	2.9	2.4	1.6
Mean	1.1	1.0	0.9	1.0	1.5	1.5	---	---	1.0	1.9	1.8	1.3
						pH						
Min	7.4	7.4	7.4	7.3	7.6	7.5	---	---	6.6	6.7	7.3	7.4
Max	8.4	8.4	8.6	8.4	8.2	7.9	---	---	7.9	8.3	8.8	8.9
Mean	7.7	7.8	7.8	7.6	7.8	7.6	---	---	7.3	7.3	7.7	7.8

Appendix Table 25. Monthly environmental data collected from the Salmon River near Sawtooth Hatchery (RKm 627.9) from August 2004 through July 2005.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Temperature (°C)						
Min	10.1	10.3	1.3	0.0	0.0	0.0	0.0	0.0	1.0	3.6	---	9.1
Max	15.9	10.0	9.8	7.0	5.3	5.0	6.3	8.3	10.0	10.0	9.0	15.9
Mean	12.7	10.5	6.9	3.0	1.4	1.1	1.5	3.7	6.2	8.3	10.6	13.0
						Dissolved Oxygen (ppm)						
Min	8.1	10.0	10.1	11.6	11.9	10.2	12.2	10.1	11.7	7.3	9.7	---
Max	9.9	13.0	14.1	14.2	14.2	14.2	14.2	14.2	9.9	10.0	10.7	---
Mean	9.6	10.6	11.7	13.0	13.5	13.6	13.5	13.3	9.3	8.6	8.9	---
						Specific Conductance (µS/cm)						
Min	132.0	131.0	136.0	133.0	126.0	132.0	136.0	128.0	112.0	100.0	71.0	92.0
Max	152.0	159.0	174.0	172.0	149.0	149.0	154.0	153.0	157.0	99.0	96.0	145.0
Mean	142.6	148.5	154.8	149.2	137.6	138.3	142.4	138.4	136.5	90.1	85.8	121.9
						Turbidity (ntu)						
Min	0.0	0.0	0.0	0.5	---	---	---	---	---	---	---	---
Max	4.3	30.5	43.9	49.9	---	---	---	---	---	---	---	---
Mean	1.1	0.5	3.6	16.8	---	---	---	---	---	---	---	---
						Depth (feet)						
Min	1.2	1.3	1.0	1.0	0.7	0.6	0.9	0.8	1.1	1.6	1.6	0.3
Max	1.8	1.9	2.0	1.9	2.3	2.1	1.9	1.8	1.9	2.8	2.5	2.0
Mean	1.6	1.6	1.6	1.5	1.4	1.4	1.4	1.3	1.5	2.1	2.0	1.7
						pH						
Min	7.8	7.8	7.9	7.7	7.4	7.5	7.6	7.8	7.8	7.4	7.5	7.7
Max	8.6	8.7	8.7	8.7	8.6	8.6	8.6	8.8	8.8	8.4	8.6	8.2
Mean	8.2	8.2	8.2	8.2	8.1	8.1	8.1	8.2	8.1	7.8	7.9	8.1

Appendix Table 26. Monthly environmental data collected from Valley Creek (RKm 609.4 from the mouth of the Salmon River) from August 2004 through July 2005.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Temperature (°C)						
Min	8.5	5.2	0.4	0.0	---	---	---	---	0.3	2.1	4.6	8.7
Max	15.9	15.9	14.1	6.4	---	---	---	---	13.1	15.1	15.9	15.9
Mean	12.7	10.2	6.2	1.8	---	---	---	---	4.7	7.8	10.3	13.0
						Dissolved Oxygen (ppm)						
Min	5.6	6.3	8.9	11.0	---	---	---	---	8.9	8.6	8.5	7.2
Max	10.4	11.9	13.3	13.5	---	---	---	---	11.6	11.4	11.7	11.6
Mean	8.1	9.7	11.2	12.5	---	---	---	---	10.4	10.1	9.9	9.1
						Specific Conductance (µS/cm)						
Min	68.0	64.0	68.0	71.0	---	---	---	---	48.0	40.0	39.0	48.0
Max	81.0	81.0	79.0	96.0	---	---	---	---	80.0	58.0	50.0	68.0
Mean	75.4	73.6	74.1	79.4	---	---	---	---	64.2	48.1	45.8	55.4
						Turbidity (ntu)						
Min	0.2	0.0	0.1	0.2	---	---	---	---	0.9	2.1	1.3	3.3
Max	33.0	45.7	46.8	44.8	---	---	---	---	49.3	46.2	49.0	36.2
Mean	2.0	2.4	2.2	2.5	---	---	---	---	7.5	9.0	6.8	13.4
						Depth (feet)						
Min	0.8	0.9	0.5	0.1	---	---	---	---	0.8	1.2	1.3	0.9
Max	1.6	1.5	1.5	1.5	---	---	---	---	1.7	2.6	2.3	1.6
Mean	1.3	1.2	1.1	1.2	---	---	---	---	1.2	1.8	1.7	1.3
						pH						
Min	7.6	7.6	7.7	7.7	---	---	---	---	7.4	7.1	7.1	7.3
Max	8.5	8.5	8.2	8.1	---	---	---	---	8.3	8.7	8.2	8.4
Mean	8.0	7.9	7.9	7.9	---	---	---	---	7.7	7.6	7.5	7.7

Appendix Table 27. Monthly environmental data collected from Secesh River (27 km upstream from its confluence with the South Fork Salmon River) from August 2004 through July 2005.

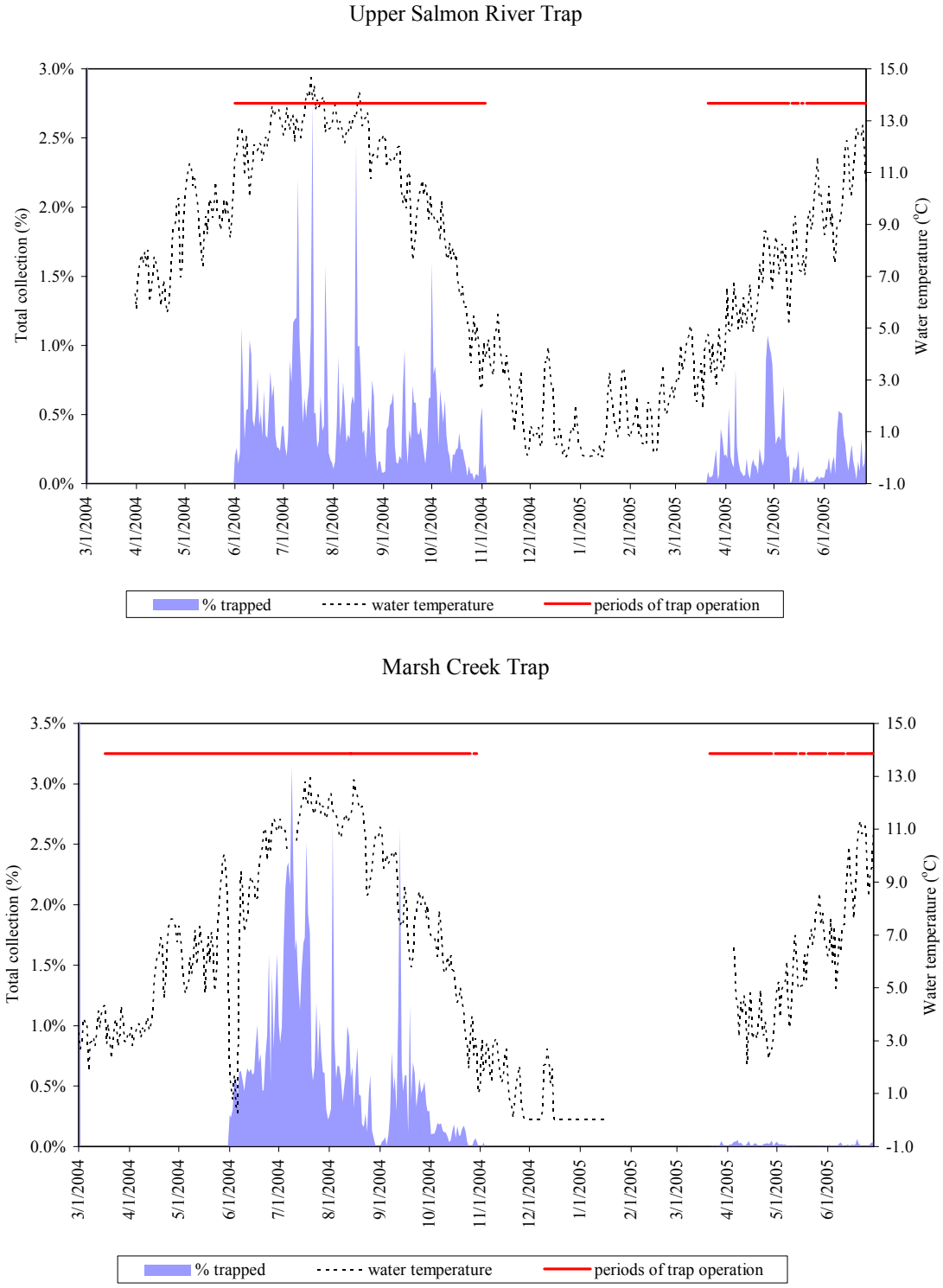
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Temperature (°C)						
Min	---	---	---	-0.5	-0.4	-0.4	-0.4	-0.4	-0.5	0.5	3.4	7.9
Max	---	---	---	1.9	-0.4	-0.4	-0.4	-0.4	7.2	10.2	14.7	15.9
Mean	---	---	---	-0.3	-0.4	-0.4	-0.4	-0.4	1.5	4.6	7.9	12.6
						Dissolved Oxygen (ppm)						
Min	---	---	---	11.9	10.7	10.6	11.3	11.5	10.6	9.8	8.8	6.0
Max	---	---	---	14.2	12.2	12.3	12.6	13.0	12.7	12.5	11.8	10.6
Mean	---	---	---	12.8	11.3	11.2	11.7	12.1	11.8	11.2	10.4	8.4
						Specific Conductance (µS/cm)						
Min	---	---	---	21.0	31.0	33.0	36.0	34.0	20.0	16.0	18.0	25.0
Max	---	---	---	36.0	36.0	36.0	38.0	38.0	38.0	23.0	27.0	35.0
Mean	---	---	---	31.4	33.8	35.2	36.8	35.8	28.1	19.1	23.0	30.8
						Turbidity (ntu)						
Min	---	---	---	0.0	0.0	0.0	0.0	0.0	0.4	1.2	0.5	0.0
Max	---	---	---	9.8	1.7	1.1	0.8	2.4	30.6	37.3	6.5	3.7
Mean	---	---	---	0.5	0.3	0.3	0.1	0.6	3.4	4.0	1.3	0.4
						Depth (feet)						
Min	---	---	---	1.7	1.8	1.8	2.3	2.0	1.2	2.4	2.0	1.4
Max	---	---	---	3.1	3.2	3.3	3.3	3.4	3.4	3.4	3.4	2.2
Mean	---	---	---	2.1	2.6	2.7	2.8	2.8	2.0	3.0	2.5	1.7
						pH						
Min	---	---	---	6.9	6.8	6.9	6.9	6.9	6.8	6.5	6.7	6.7
Max	---	---	---	7.4	7.1	7.2	7.2	7.3	7.3	7.2	7.3	7.9
Mean	---	---	---	7.2	6.9	7.0	7.0	7.0	7.0	6.9	6.9	7.1

Appendix Table 28. Monthly environmental data collected from South Fork Salmon River (112 km from its confluence with the Salmon River) from August 2004 through July 2005.

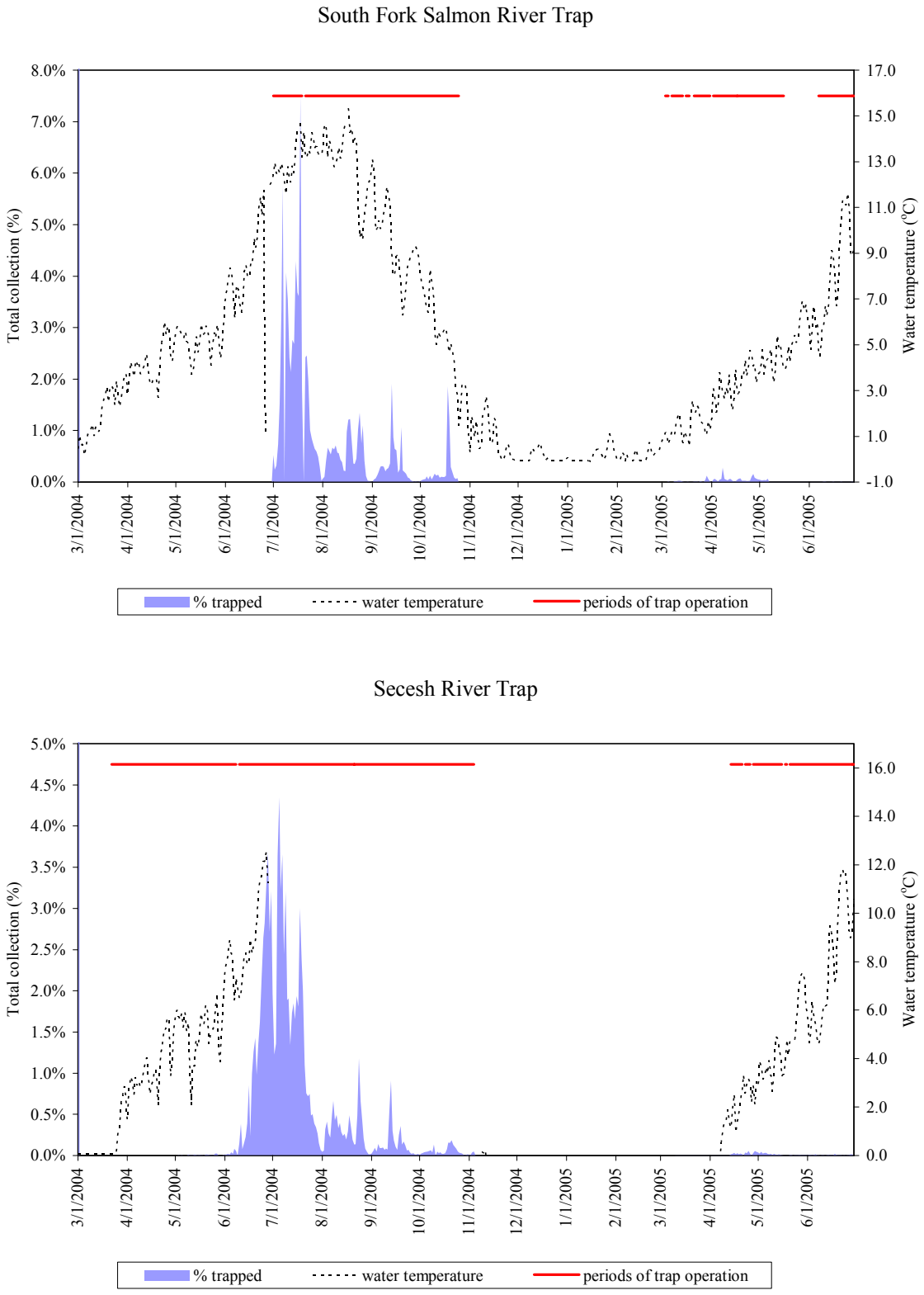
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Temperature (°C)						
Min	7.9	5.0	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	1.4	3.3	7.8
Max	15.9	15.8	10.7	3.8	1.2	1.9	2.4	4.1	7.9	9.5	14.5	15.9
Mean	13.0	9.5	5.1	0.9	0.1	0.2	0.1	1.4	3.3	4.9	7.9	12.7
						Dissolved Oxygen (ppm)						
Min	---	---	---	2.0	1.2	1.2	0.9	3.1	11.7	14.1	9.6	7.2
Max	---	---	---	13.1	13.6	14.1	14.2	14.2	14.2	14.1	14.2	14.2
Mean	---	---	---	9.8	7.9	7.7	6.8	11.2	13.5	14.1	13.4	12.2
						Specific Conductance (µS/cm)						
Min	38.0	43.0	47.0	42.0	40.0	40.0	40.0	39.0	29.0	19.0	21.0	30.0
Max	51.0	53.0	57.0	69.0	59.0	57.0	61.0	59.0	52.0	33.0	31.0	47.0
Mean	46.7	49.4	51.6	53.0	52.8	53.0	55.2	51.8	40.6	24.8	26.0	39.0
						Turbidity (ntu)						
Min	0.0	0.2	---	0.0	0.0	0.0	0.0	0.0	1.1	1.8	1.0	0.1
Max	33.4	49.7	---	2.2	3.5	2.7	8.0	15.2	17.9	48.8	16.0	19.6
Mean	4.6	15.0	---	0.2	0.4	0.2	0.3	1.1	3.3	11.9	2.6	0.7
						Depth (feet)						
Min	0.5	0.5	0.2	0.5	0.3	0.4	0.5	0.2	0.5	1.3	1.1	0.4
Max	1.2	1.1	1.2	1.7	2.3	2.1	2.0	1.3	1.6	3.4	2.2	1.3
Mean	0.9	0.8	0.7	0.9	1.4	1.2	1.0	0.7	1.1	2.0	1.5	0.9
						pH						
Min	7.3	7.3	7.4	7.4	7.3	7.5	7.6	7.4	7.1	6.7	7.0	7.2
Max	8.6	8.6	8.4	8.3	7.8	8.1	8.1	8.2	7.8	7.8	8.2	8.8
Mean	7.6	7.7	7.6	7.6	7.6	7.6	7.7	7.7	7.4	7.1	7.3	7.6

Appendix Table 29. Monthly air temperature, precipitation, and snowfall at three weather stations and mean monthly stream flow data at two sites in the Salmon River drainage, Idaho, August 2004 to July 2005.

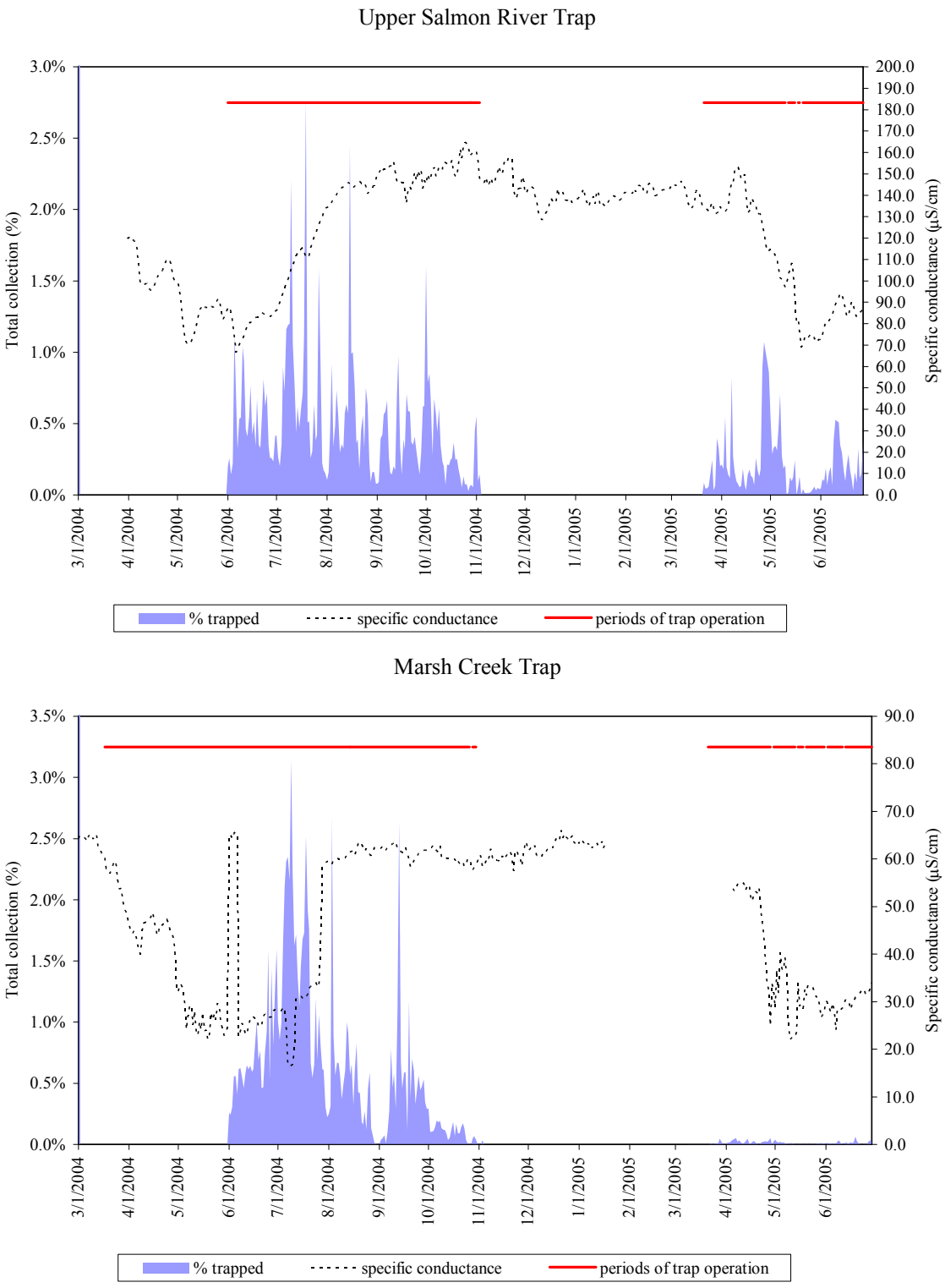
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
						Stanley						
Air temperature (°C)												
Min	2.3	-1.9	-5.8	-11.6	-13.1	-16.9	-20.6	-11.6	-6.3	-1.8	-0.2	2.0
Max	24.8	18.0	12.3	2.4	-0.7	-3.2	1.8	6.5	10.8	15.0	17.7	27.5
Mean	13.6	8.1	3.2	-4.6	-6.9	-10.1	-9.4	-2.6	2.2	6.6	8.7	14.7
Precipitation (cm)	0.0	0.0	0.0	0.1	3.1	1.9	0.8	5.8	0.0	0.0	0.5	0.0
Snowfall (cm)	0.0	0.0	8.9	7.6	45.7	35.6	8.9	26.7	0.0	0.0	0.0	0.0
						Taylor Ranch						
Air temperature (°C)												
Min	10.2	5.7	1.6	-4.6	-5.5	-9.3	-8.0	-2.1	0.9	4.8	6.8	10.6
Max	29.1	21.8	15.7	4.4	1.3	0.1	4.5	10.8	14.5	19.7	21.6	32.7
Mean	19.6	13.8	8.7	-0.1	-2.1	-4.6	-1.7	4.3	7.7	12.3	14.2	21.7
Precipitation (cm)	5.2	5.2	0.2	1.2	2.6	0.9	0.3	1.4	3.0	5.8	7.5	0.4
Snowfall (cm)	0.0	0.0	0.0	3.8	12.7	17.5	7.4	6.6	0.0	0.0	0.0	0.0
						Middle Fork Lodge						
Air temperature (°C)												
Min	8.3	3.7	-0.3	-6.0	-7.0	-10.2	-9.5	-4.1	-1.4	3.3	5.0	8.6
Max	29.1	22.2	16.3	6.2	2.5	2.1	6.0	11.4	14.8	18.6	21.0	30.5
Mean	18.6	12.9	8.0	0.1	-2.3	-4.1	-1.7	3.7	6.7	11.0	13.0	19.5
Precipitation (cm)	5.2	4.4	3.0	1.2	3.5	1.5	0.5	2.1	1.6	6.4	6.7	0.7
Snowfall (cm)	0.0	0.0	0.0	5.1	43.9	23.4	7.6	4.6	3.8	0.0	0.0	0.0
						Valley Creek						
Stream flow (m^3/s)	2.3	2.8	2.5	2.3	2.0	1.9	1.8	2.1	5.1	11.7	9.8	4.1
						Salmon River at Shoup, Idaho						
Stream flow (m^3/s)	36.2	34.3	29.7	26.0	24.1	21.6	22.2	27.3	51.2	202.8	150.3	56.4



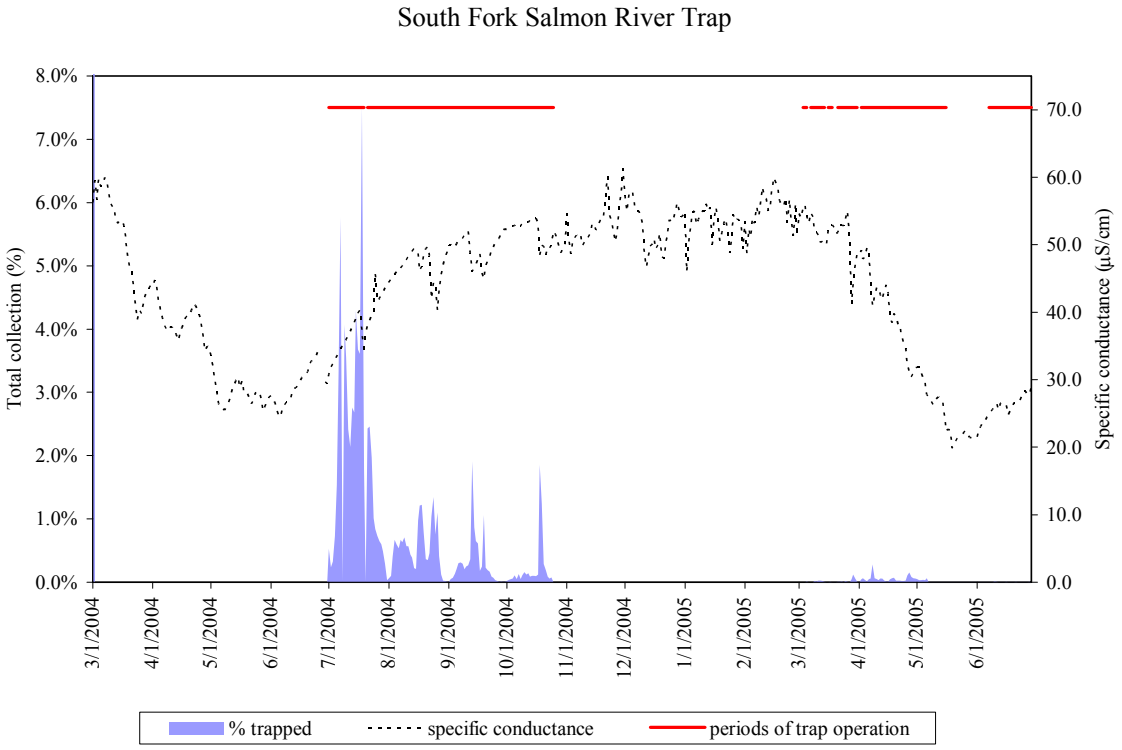
Appendix Figure 1. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily water temperatures collected near traps. Periods of trap operation are also shown.

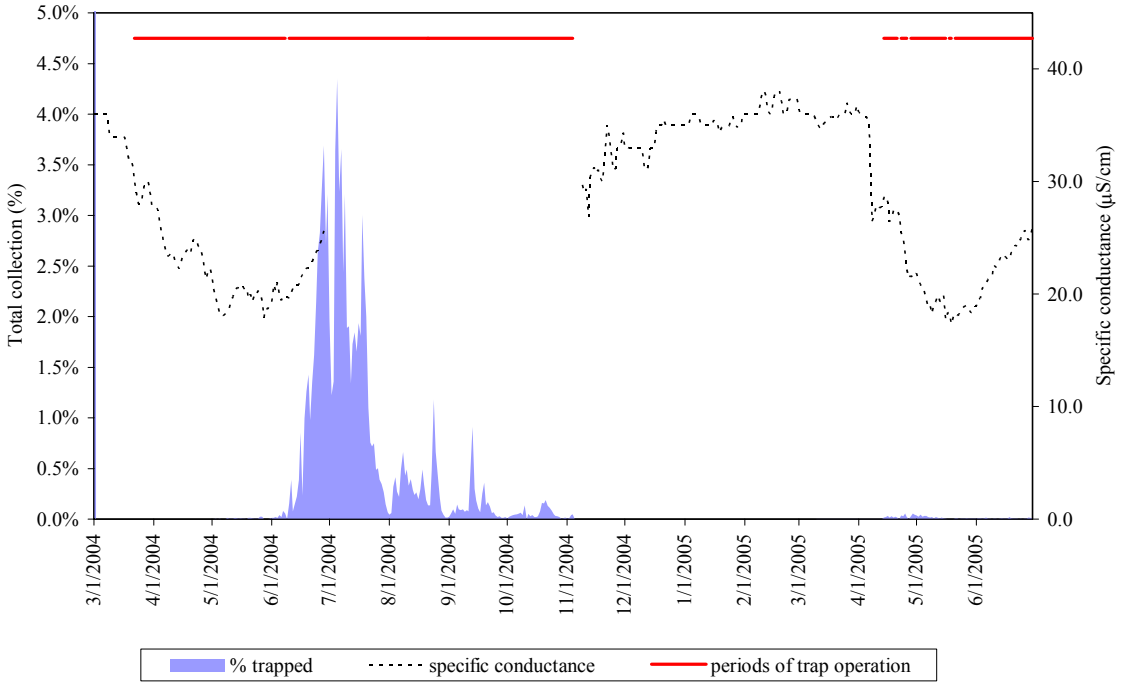


Appendix Figure 1. Continued.

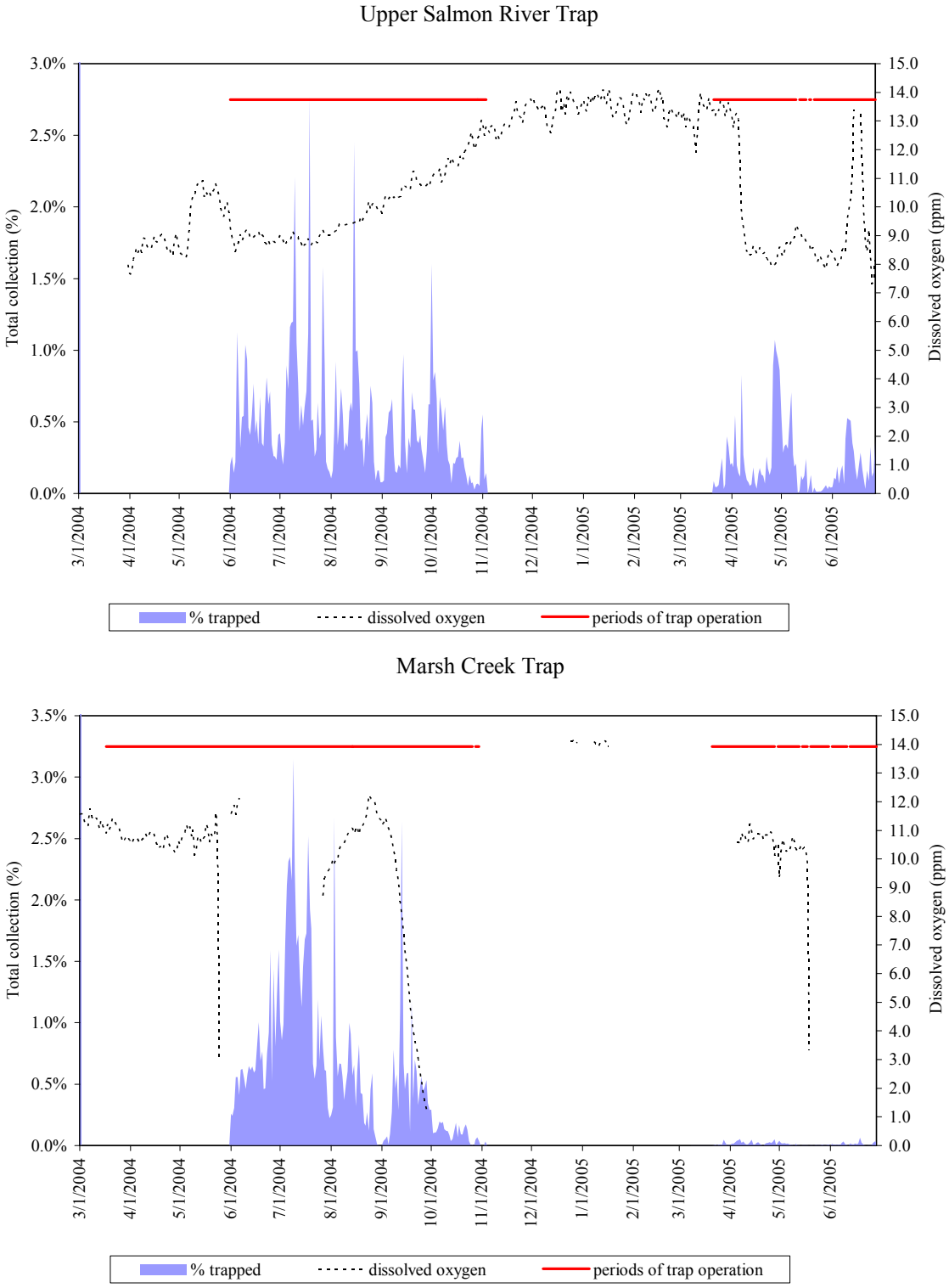


Appendix Figure 2. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily specific conductance collected near traps. Periods of trap operation are also shown.

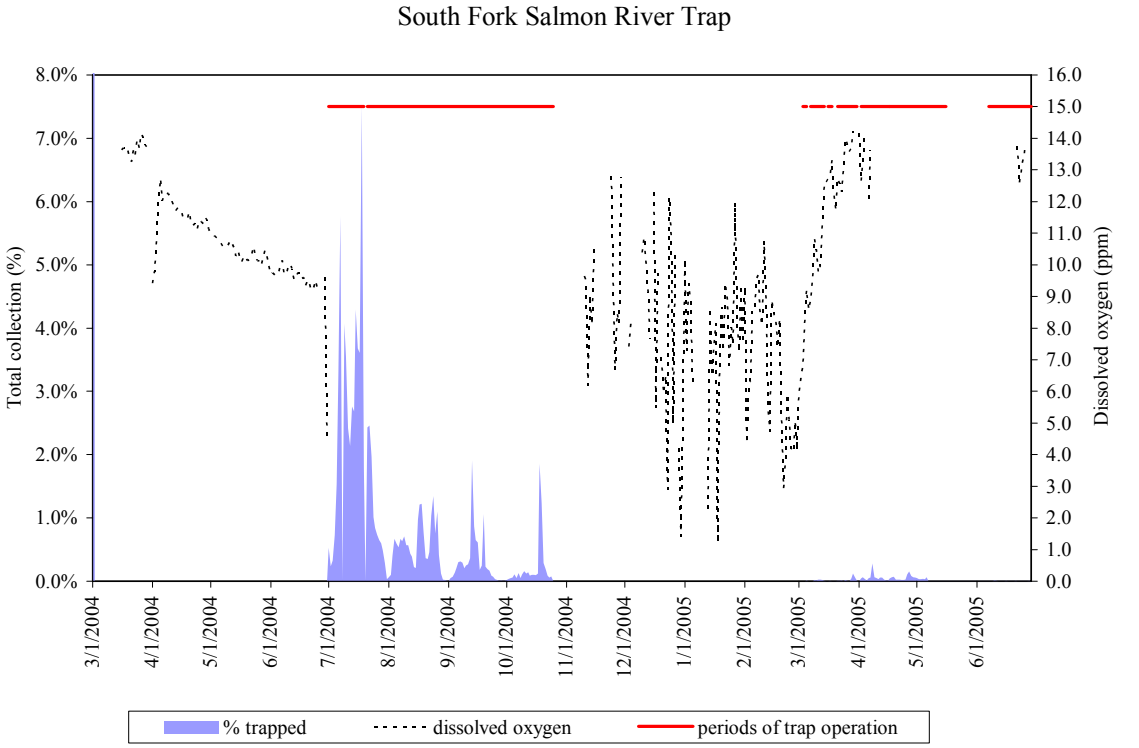


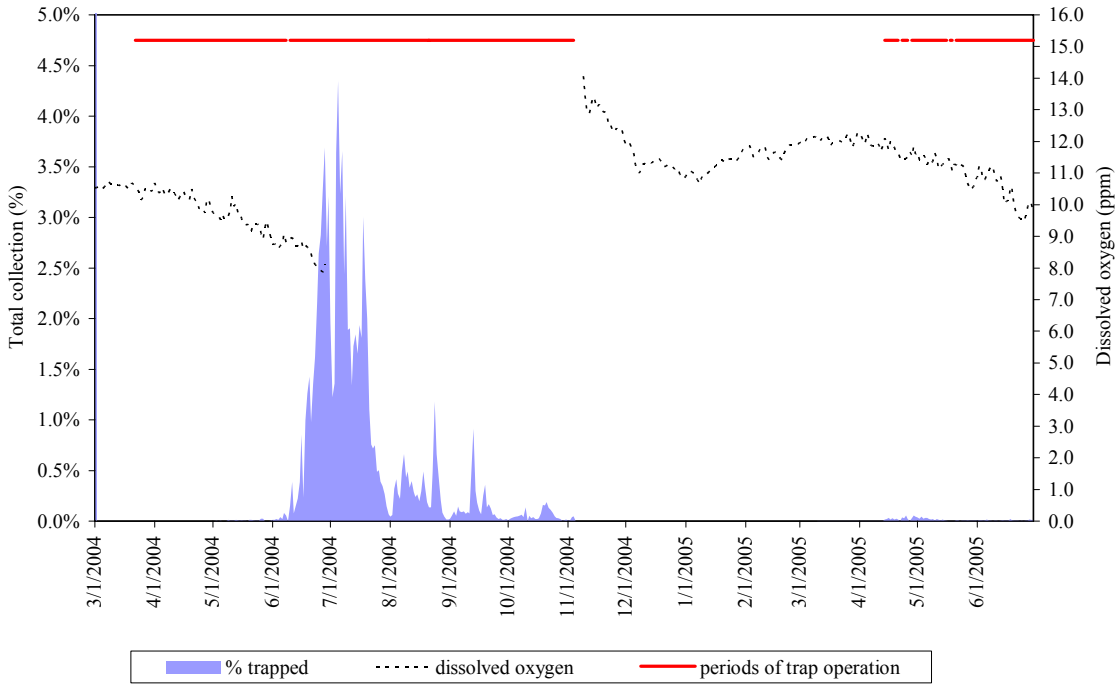


Appendix Figure 2. Continued.

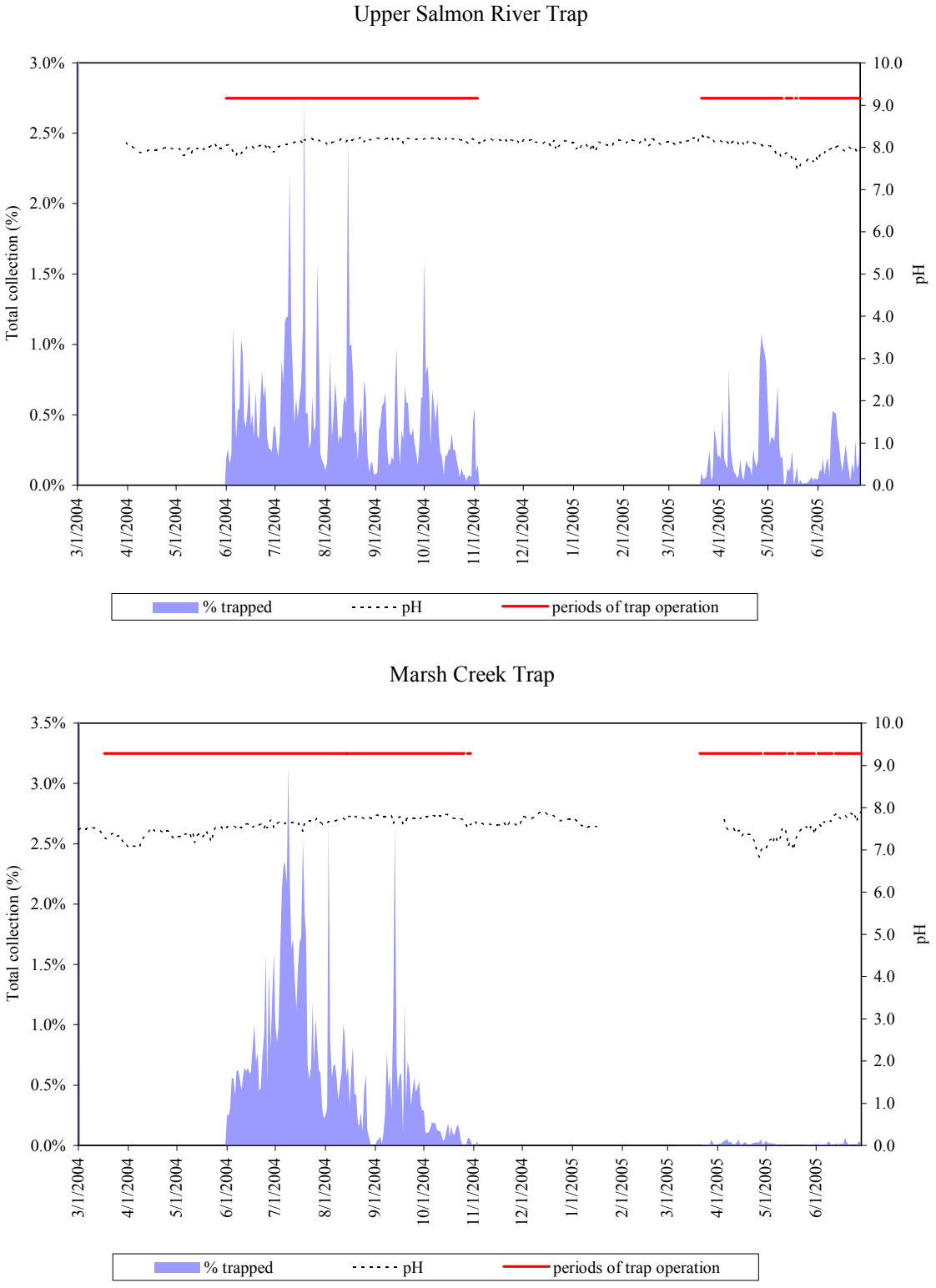


Appendix Figure 3. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily dissolved oxygen collected near traps. Periods of trap operation are also shown.

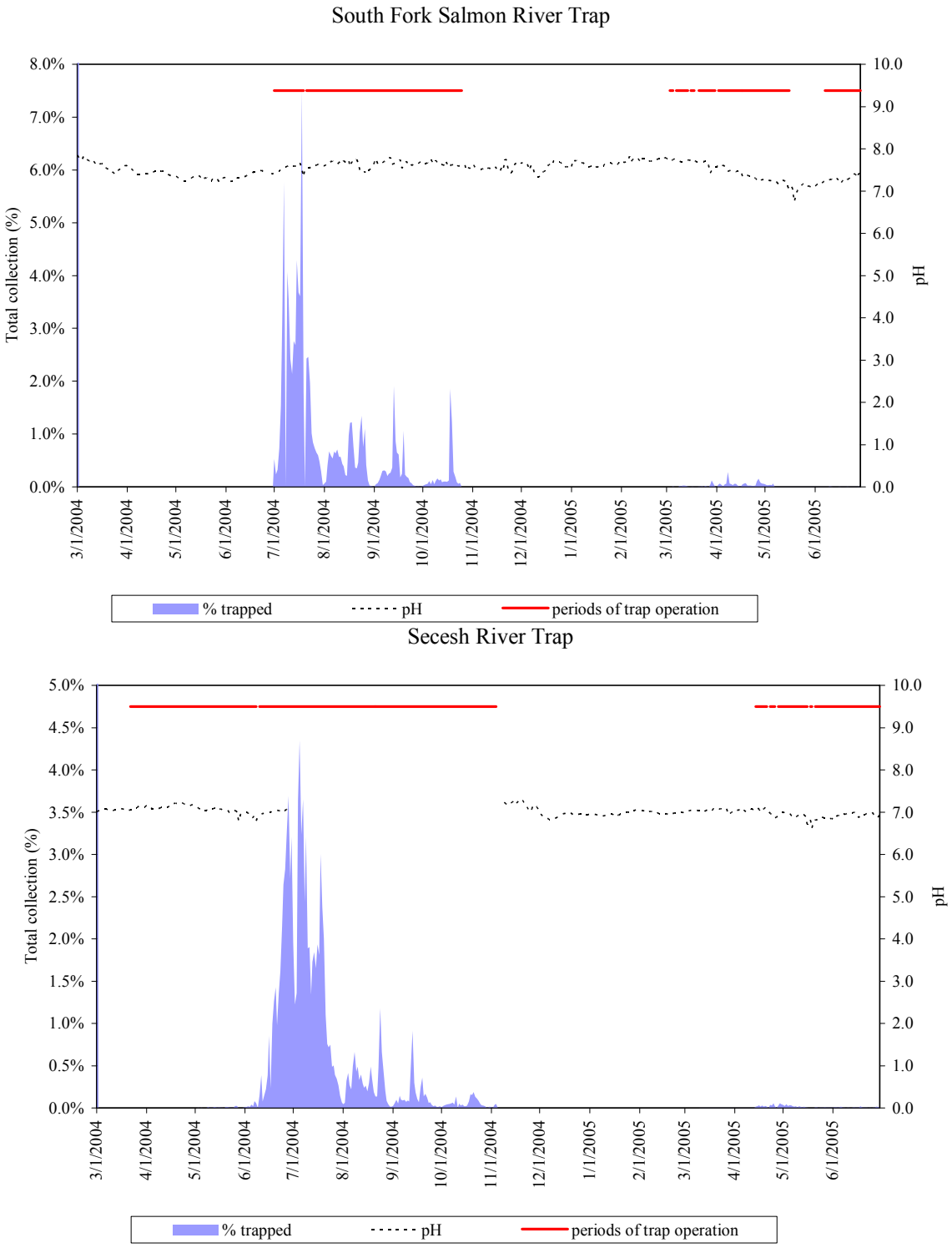




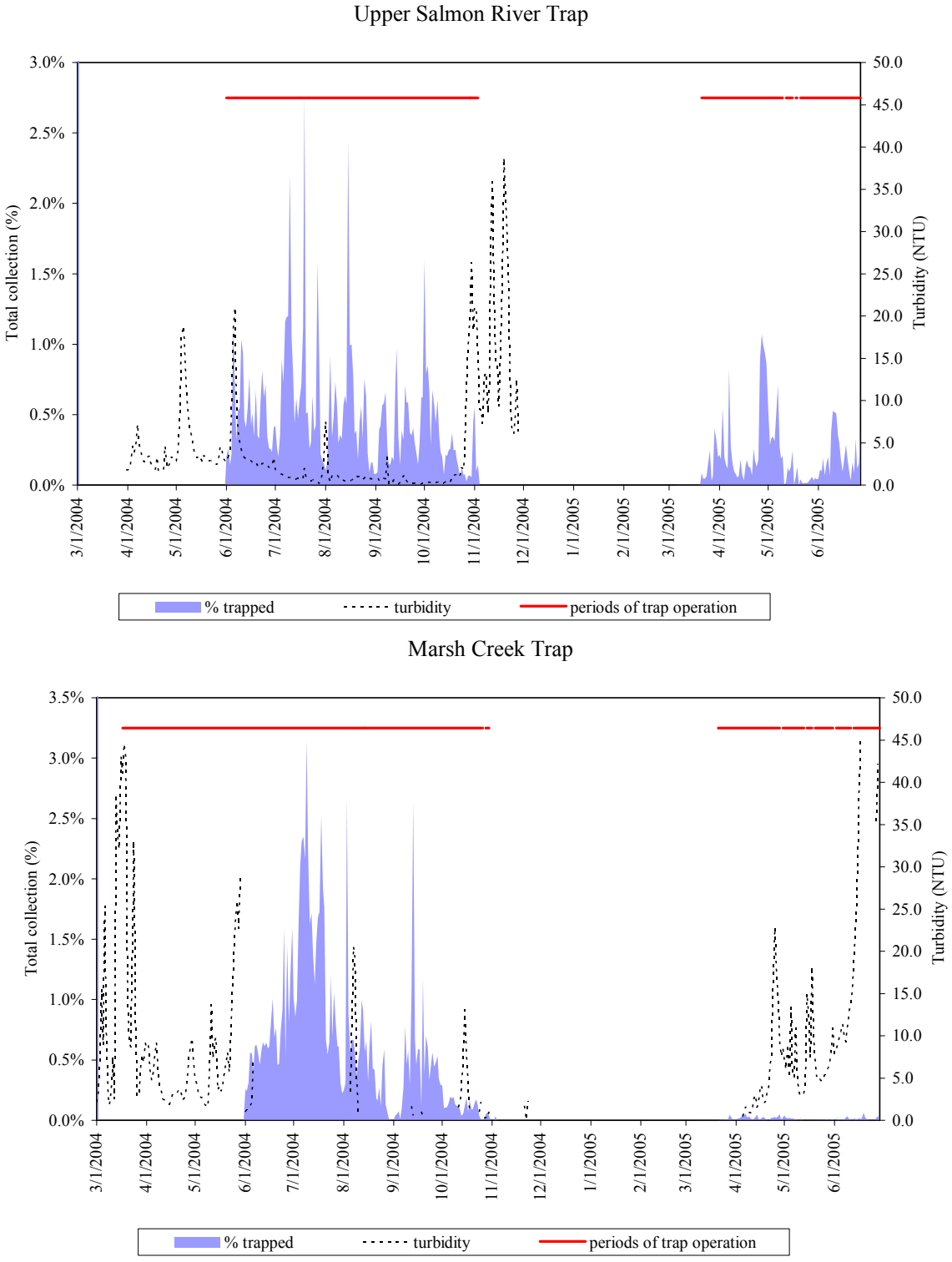
Appendix Figure 3. Continued.



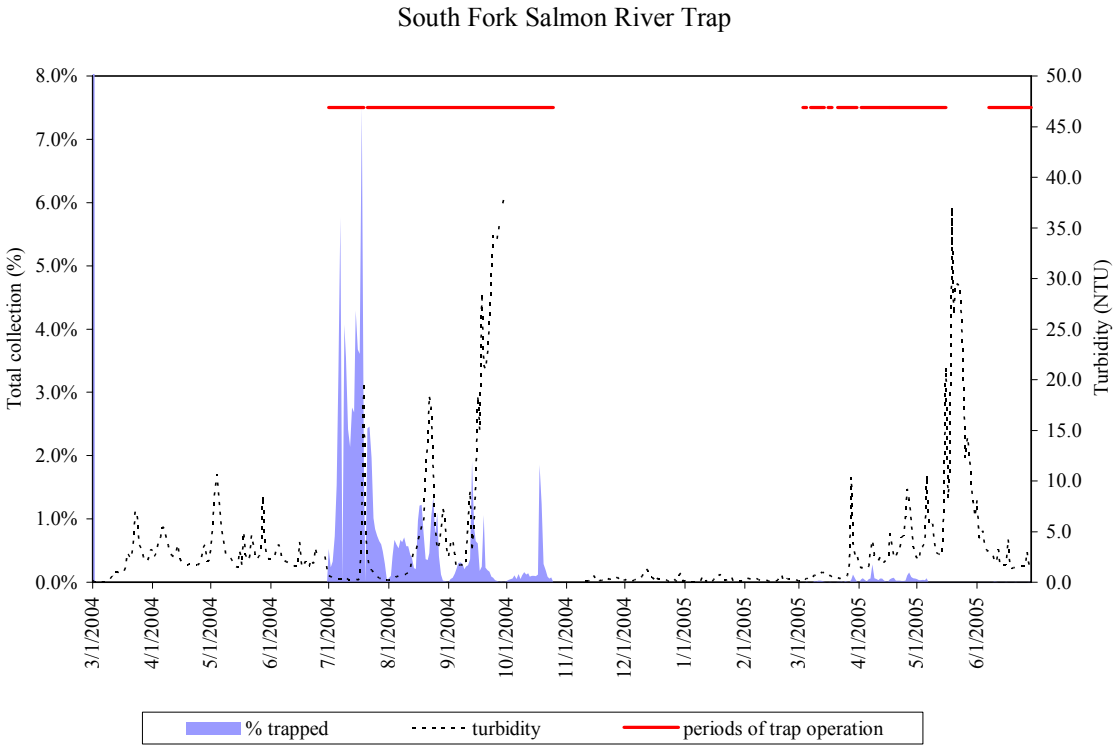
Appendix Figure 4. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily pH collected near traps. Periods of trap operation are also shown.

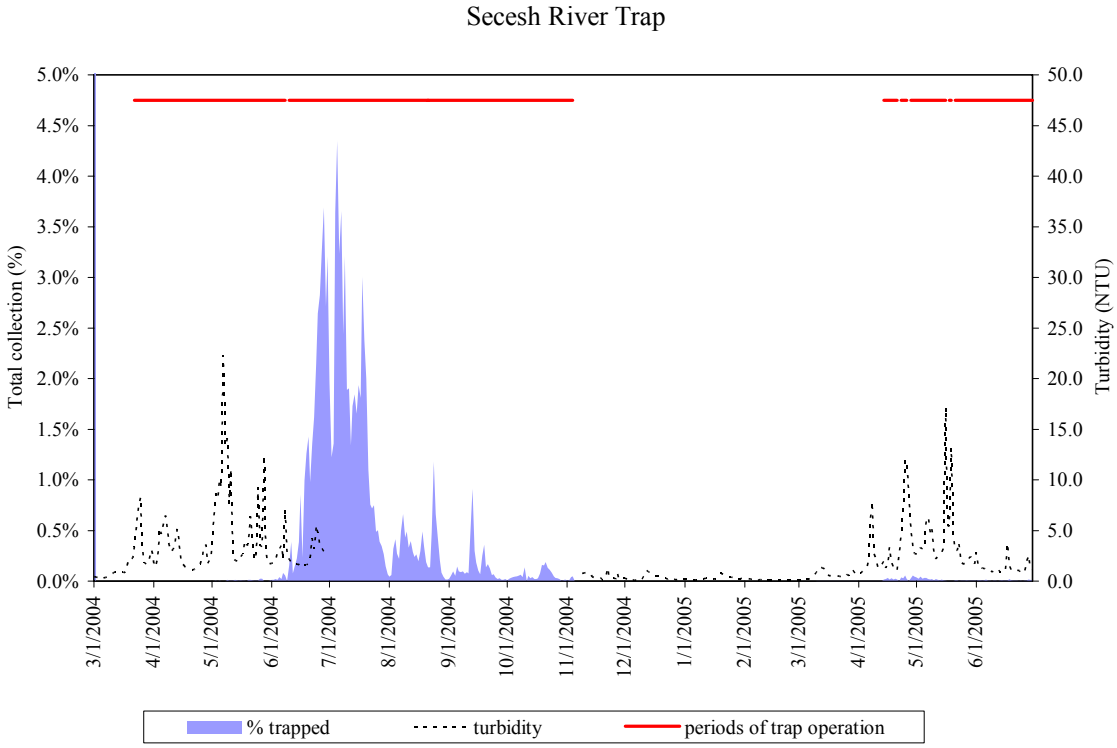


Appendix Figure 4. Continued.

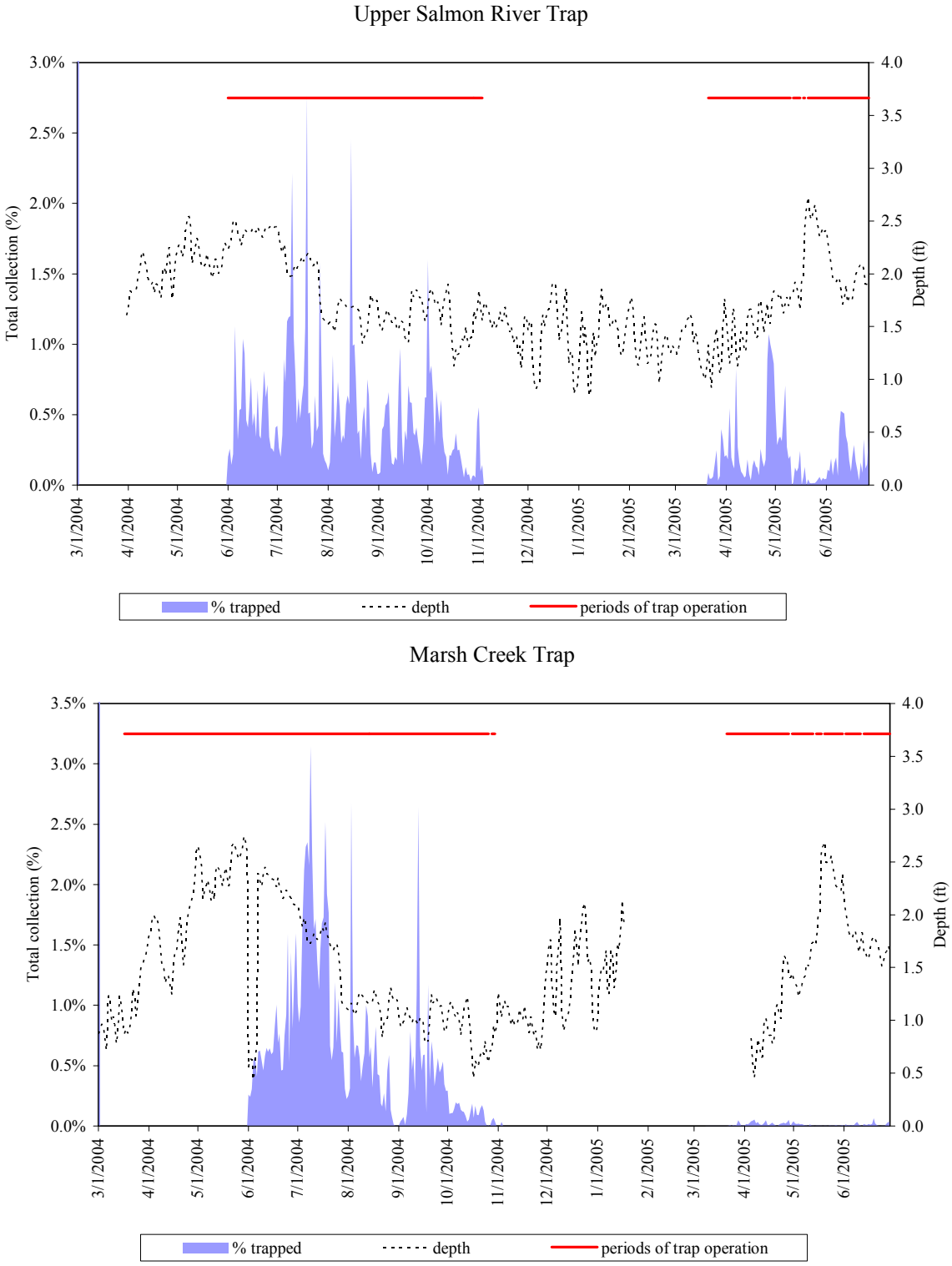


Appendix Figure 5. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily turbidity collected near traps. Periods of trap operation are also shown.

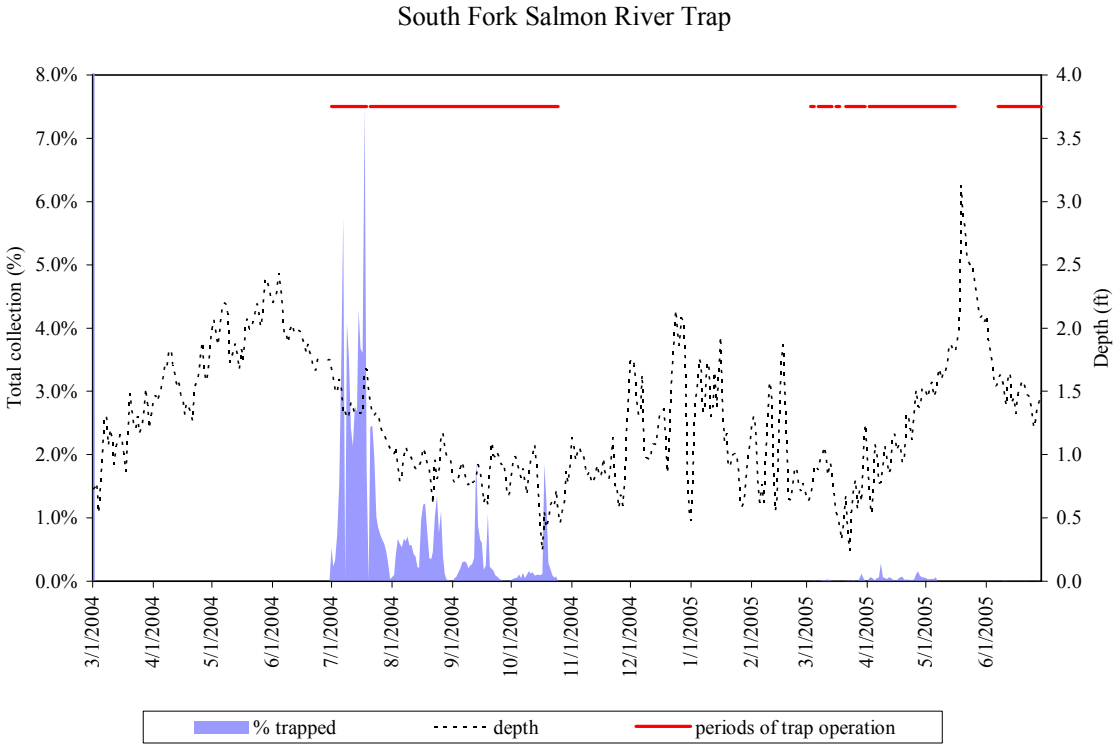


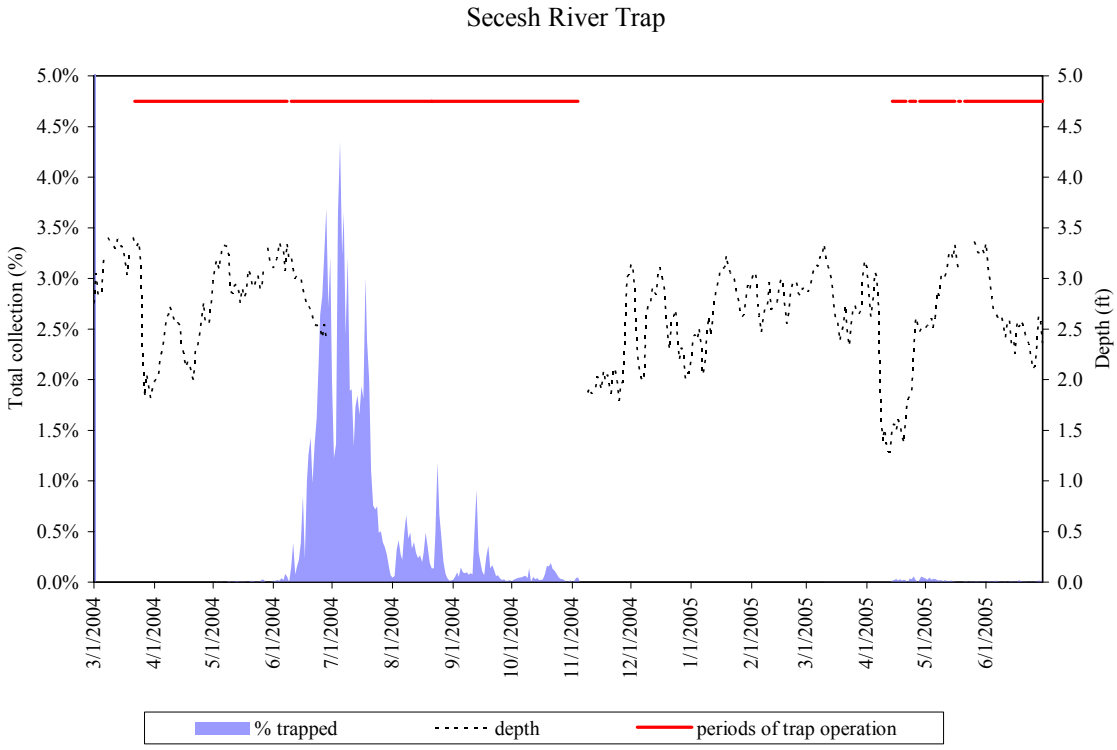


Appendix Figure 5. Continued.

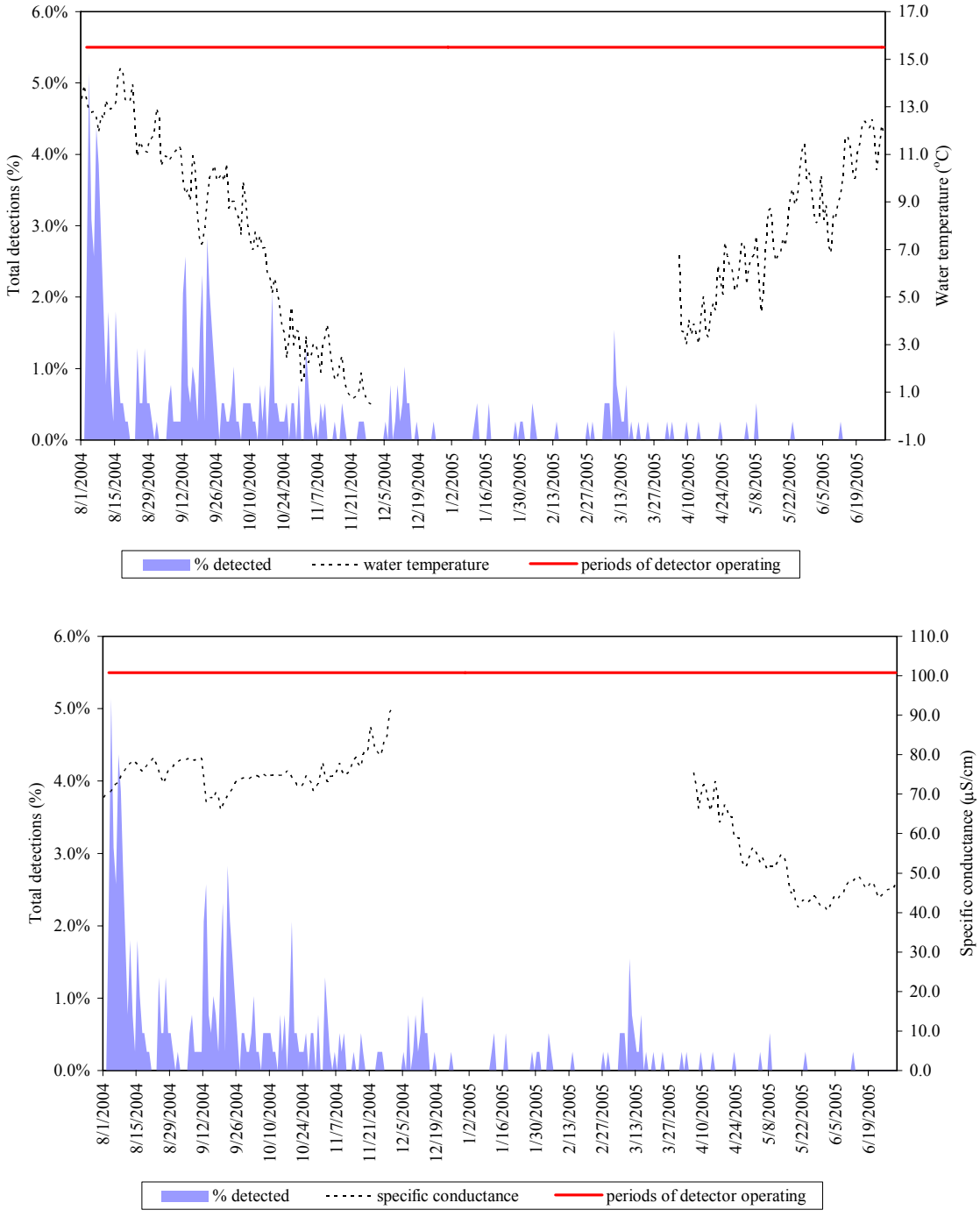


Appendix Figure 6. Daily passage of wild Chinook salmon fry, parr, and smolts at four migrant traps, expressed as percentages of total collected, and plotted against average daily depth collected near traps. Periods of trap operation are also shown.

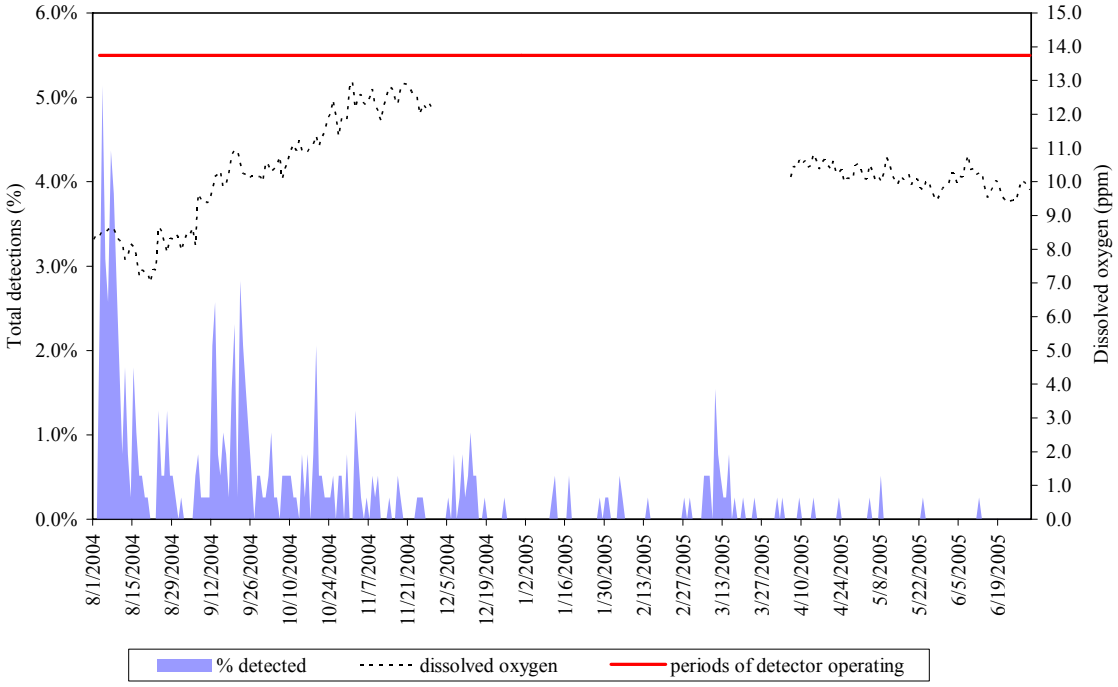


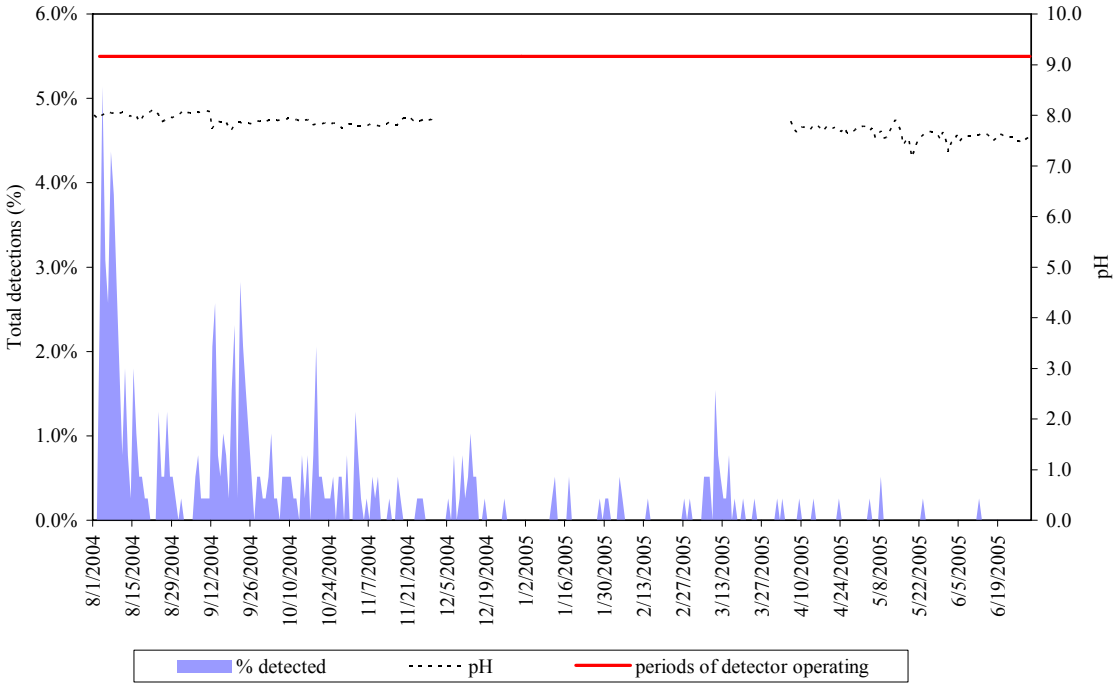


Appendix Figure 6. Continued.

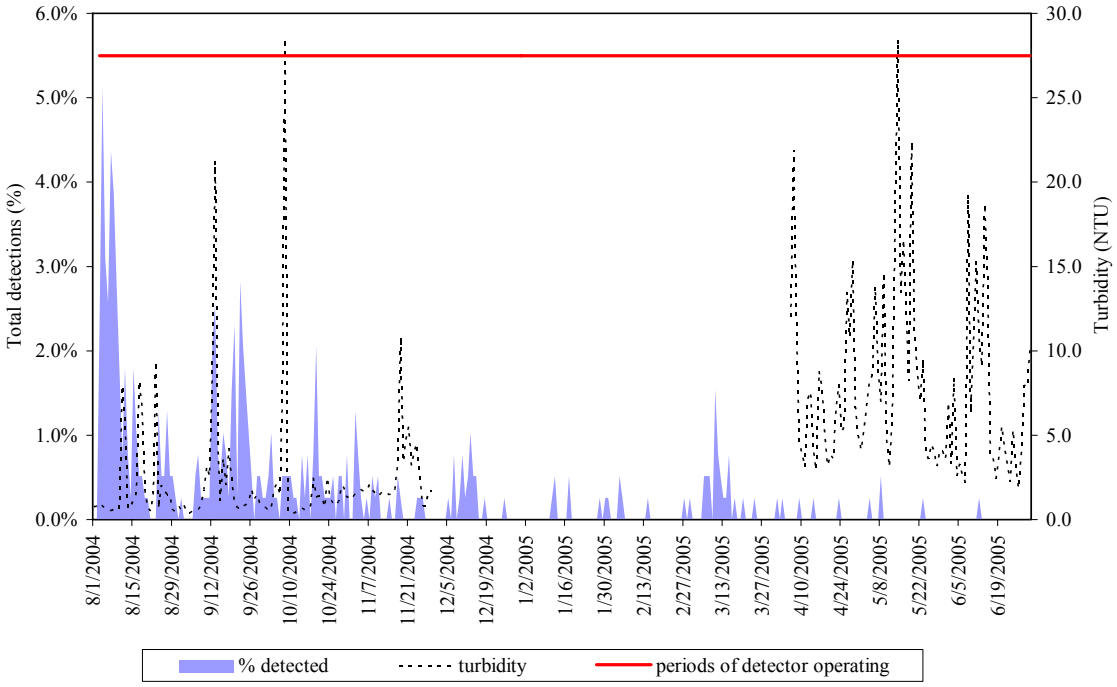


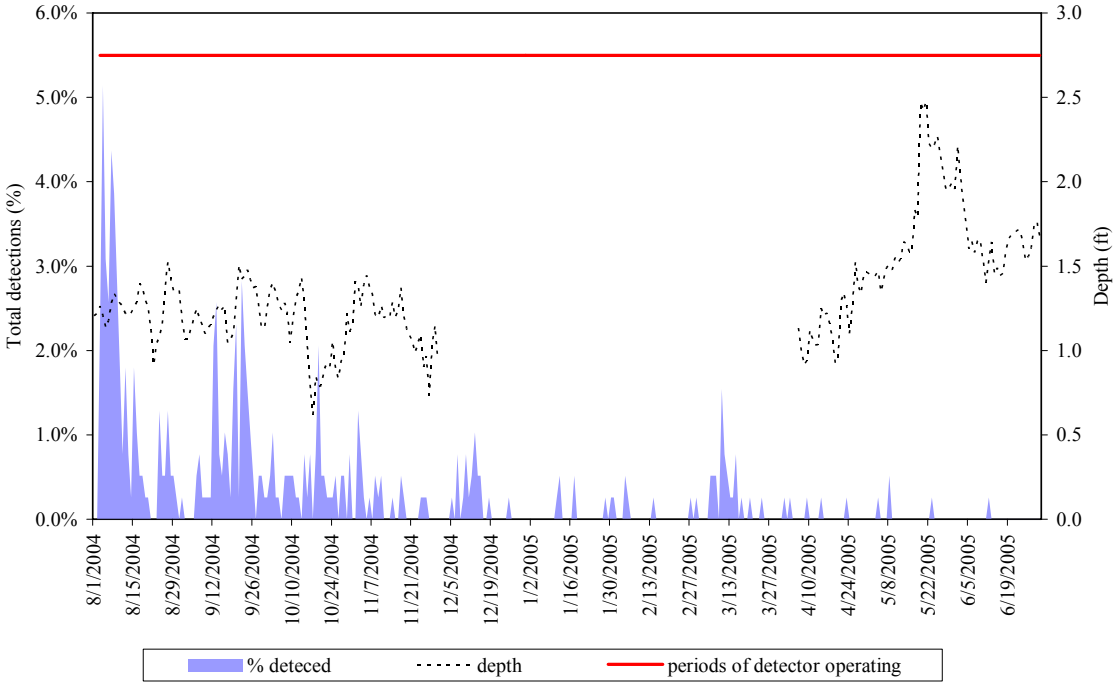
Appendix Figure 7. Combined daily PIT-tag detections of wild Chinook salmon parr at in-stream PIT-tag detectors in Valley Creek, expressed as percentages of total collected, and plotted against average daily aquatic conditions collected near the detectors. Periods of operation for the detectors are also shown.





Appendix Figure 7. Continued.





Appendix Figure 7. Continued.