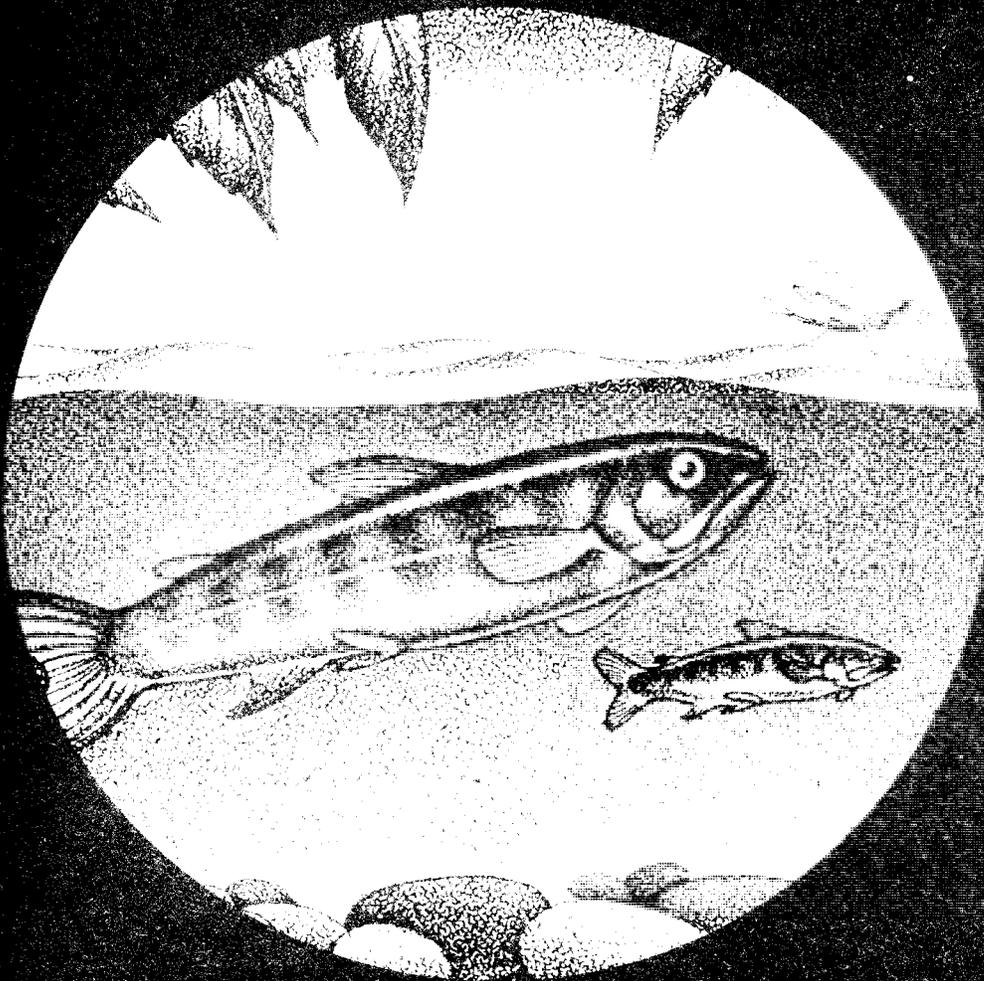


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Smolt Monitoring at the Head of Lower Granite Reservoir and Lower Granite Dam



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Bonneville Power Administration
Division of Fish & Wildlife

Idaho Department of Fish and Game

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SMOLT MONITORING AT THE HEAD OF LOWER GRANITE
RESERVOIR AND LOWER GRANITE DAM

ANNUAL REPORT 1994

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TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	1
INTRODUCTION	3
OBJECTIVES	4
METHODS	5
Releases of Hatchery-Produced Smolts	5
Smolt Monitoring Traps	5
Snake River Trap	5
Clearwater Trap	7
Salmon River Trap	8
Trap Efficiency	8
Travel Time and-Migration Rates	9
Interrogation Rates of PIT-Tagged Fish	9
RESULTS AND DISCUSSION	11
Hatchery Releases	11
Chinook Salmon	11
Steelhead Trout	11
Smolt Monitoring Traps	11
Snake River Trap Operation	11
Clearwater River Trap Operation	21
Salmon River Trap Operation	26
Travel Time and Migration Rates	30
Release Sites to Snake River Trap	30
Hatchery Chinook Salmon	30
Wild Chinook Salmon	30
Hatchery Steelhead Trout	30
Wild Steelhead Trout	32
Sockeye Salmon	32
Release Sites to the Clearwater River Trap	32
Hatchery Chinook Salmon	32
Wild Chinook Salmon	32
Hatchery Steelhead Trout	32
Wild Steelhead Trout	33
Release Sites to the Salmon River Trap	33
Hatchery Chinook Salmon	33
Wild Chinook Salmon	33
Hatchery Steelhead Trout	33
Wild Steelhead Trout	33
Sockeye Salmon	33
Head of Lower Granite Reservoir to Lower Granite Dam	33
Hatchery Chinook Salmon PIT Tag Groups	34
Wild Chinook Salmon PIT Tag Groups	38
Hatchery Steelhead Trout PIT Tag Groups	41
Wild Steelhead Trout PIT Tag Groups	43
Age 0 Chinook Salmon Migration Rate and Interrogation Rate	44
Interrogation Rate of PIT-Tagged Fish	44
SUMMARY	50

LITERATURE CITED52

LIST OF TABLES

	<u>Page</u>
Table 1. River mile and kilometer location for the Snake River drainage	10
Table 2. Hatchery chinook salmon released into the Snake River system upriver from Lower Granite Dam contributing to the 1994 outmigration	12
Table 3. Hatchery steelhead trout released into the Snake River system upriver from Lower Granite Dam contributing to the 1994 outmigration	15
Table 4. Migration rates (km/d), stratified by 5-kcfs intervals from the Snake River trap to Lower Granite Dam, 1994	35
Table 5. Linear regression statistics for migration rate/discharge relation by species, rearing type, and trap, using data stratified by 5-kcfs intervals, 1994	36
Table 6. Migration rates (km/d), stratified by 5-kcfs intervals from the Clearwater River trap to Lower Granite Dam, 1994	37
Table 7. Migration rates (km/d), stratified by 5-kcfs intervals from the Salmon River trap to Lower Granite Dam, 1994	40
Table 8. Interrogations of PIT-tagged fish from the Snake River trap, 1987-1994; Clearwater River trap, 1989-1994; and Salmon River trap, 1993-1994 at downstream collection facilities	46

LIST OF FIGURES

Figure 1. Map of study area..	6
Figure 2. Snake River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Snake River discharge, 1994	19
Figure 3. Snake River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Snake River discharge, 1994	20
Figure 4. Daily temperature and secchi disk transparency at the Snake River trap, 1994	22
Figure 5. Clearwater River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Clearwater River discharge, 1994	23

LIST OF FIGURES (Cont.)

	<u>Page</u>
Figure 6. Clearwater River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Clearwater River discharge, 1994	25
Figure 7. Daily temperature and Secchi disk transparency at the Clearwater River trap, 1994	27
Figure 8. Salmon River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Salmon River discharge, 1994	28
Figure 9. Salmon River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Salmon River discharge, 1994	29
Figure 10. Daily temperature and Secchi disk transparency at the Salmon River trap, 1994	31
Figure 11. Chinook salmon migration rate/discharge relations for Snake River trap PIT tag groups, 1988-1994 .	39

ABSTRACT

This project monitored the daily passage of chinook salmon *Oncorhynchus tshawytscha* and steelhead trout *O. mykiss* smolts during the 1994 spring outmigration at migrant traps on the Snake River, Clearwater River, and Salmon River. The 1994 snowpack was among the lowest since the beginning of the present drought, and the subsequent runoff was very poor.

All hatchery chinook salmon released above Lower Granite Dam were marked with a fin clip in 1994. Total annual (hatchery + wild) chinook salmon catch at the Snake River trap was 1.5 times greater than in 1993. The trap captured 1,462 wild age 1 chinook salmon, which was only 54% of 1993. Hatchery and wild steelhead trout catches were similar to 1993. Differences in trap catch between years is due to fluctuations not only in smolt production, but also differences in trap efficiency and trap operation duration. For the third year, operations at the Snake River trap were extended through the end of July to collect summer-migrating age 0 chinook. The differentiation of age 0 chinook from spring and summer chinook (age 1) using physical characteristics was again employed in 1994. The Snake River trap collected 30 age 0 chinook salmon.

Hatchery chinook salmon catch at the Clearwater River trap was 3.5 times higher than in 1993, and wild chinook salmon catch was 4.2 times higher. The higher trap catch was associated with increased operation of the trap due to low flows. Hatchery steelhead trout trap catch was less than half of 1993 numbers because the trap was fishing near the north shore during the majority of the hatchery steelhead movement due to flow augmentations from Dworshak. Wild steelhead trout trap catch was 2 times higher than in 1993. Age 0 chinook salmon catch was 21 fish, which was about the same as the previous year.

The Salmon River trap was operated for about a month longer in 1994 than in 1993 due to extremely low flows. Hatchery chinook salmon catch was 1.4 times greater in 1994 than the previous year. Wild chinook salmon catch was slightly less in 1994. The 1994 hatchery steelhead trout collection did not change significantly from 1993 numbers. Wild steelhead trout collection in 1994 was 59% of the 1993 catch.

Fish tagged with Passive Integrated Transponder (PIT) tags at the Snake River trap were interrogated at four dams with PIT tag detection systems (Lower Granite, Little Goose, Lower Monumental, and McNary dams). Because of the addition of the fourth interrogation site (Lower Monumental) in 1993, cumulative interrogation data is not comparable with the prior five years (1988-1992). Cumulative interrogations at the four dams for fish marked at the Snake River trap were 62% for hatchery chinook, 66% for wild chinook, 51% for hatchery steelhead, and 73% for wild steelhead. Cumulative interrogations at the four dams for fish PIT-tagged at the Clearwater River trap was 57% for hatchery chinook salmon, 69% for wild chinook salmon, 71% for hatchery steelhead trout, and 54% for wild steelhead trout. Cumulative interrogations at the four dams for fish marked at the Salmon River trap were 50% for hatchery chinook salmon, 50% for wild chinook salmon, 49% for hatchery steelhead trout, and 65% for wild steelhead trout.

Travel time (d) and migration rate (km/d) through Lower Granite Reservoir for PIT-tagged chinook salmon and steelhead trout marked at the head of the reservoir were affected by discharge. For fish tagged at the Snake River trap, statistical analysis of five years of data showed that a two-fold increase in discharge increased migration rate by 2.3 times for hatchery chinook salmon, 3.0 times for hatchery steelhead trout, and 2.1 times for wild steelhead. Not enough data were available in 1994 for wild chinook salmon to develop a migration rate/discharge relation. In 1993, a two-fold increase in discharge increased migration rate by 4.1 times for wild chinook.

Hatchery chinook salmon marked at the Clearwater River trap in 1994 migrated two times faster with a two-fold increase in discharge. Not enough wild chinook salmon were tagged at the Clearwater River trap to conduct an analysis. The statistical analysis could not detect a relation between migration rate and discharge for hatchery steelhead trout in 1994. A two-fold increase in discharge increased migration rate by 2.1 times for wild steelhead trout.

For fish marked at the Salmon River trap a two-fold increase in discharge increased migration rate by 2.0 times for hatchery chinook salmon, 2.0 times for wild chinook salmon, 4.0 times for hatchery steelhead trout, and 2.4 times for wild steelhead trout.

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INTRODUCTION

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501) directed the Northwest Power Planning Council (NPPC) to develop programs to mitigate for fish and wildlife losses on the Columbia River system resulting from hydroelectric projects. Section 4(h) of the Act explicitly gives the Bonneville Power Administration (BPA) the authority and responsibility to use its resources "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River system."

Water storage and regulation for hydroelectric generation severely reduces flows necessary for downstream migration of juvenile steelhead trout *Oncorhynchus mykiss* and chinook salmon *O. tshawytscha*. In response to the fishery agencies and Indian tribes' recommendations for migration flows, the NPPC Columbia River Basin Fish and Wildlife Program proposed a "water budget" for augmenting spring flows.

The Northwest Power Planning Council's water budget in the Columbia's Snake River tributary is 1.19 million acre-feet of stored water for use between April 15 and June 15 to enhance the smolt migration. This is the fourth year since the establishment of the water budget that over a million acre-feet of water were made available. In the past, only about a third of the requested 1.19 million acre-feet has been provided.

To provide information to the Fish Passage Center (FPC) on smolt movement prior to arrival at the lower Snake River reservoirs, the Idaho Department of Fish and Game (IDFG) monitors the daily passage of smolts at the head of Lower Granite Reservoir. This information allows the FPC to request the limited Snake River water budget for optimal use to provide improved passage and migration conditions.

Smolt monitoring is beneficial for water budget management under all flow conditions and becomes critical when low flow conditions reduce migration rates. In years of low flow (drought years), knowledge of when most smolts have left tributaries and entered areas that can be affected by releases of stored water allows managers to make the most timely use of the limited water budget resource. Six low-flow years (1987, 1988, 1990, 1991, 1992, 1994) have occurred during this smolt monitoring project. The indications are that judicious use of the water budget can greatly enhance the timing and migration rate of juvenile chinook salmon and steelhead trout.

The IDFG smolt monitoring project also collects other useful data on relative species composition, hatchery and wild steelhead trout ratios, travel time, and migration rate. All age 0 chinook are tagged with Passive Integrated Transponder (PIT) tags to determine migration rate through Lower Granite Reservoir and cumulative interrogation rate (Prentice et al. 1987). All wild steelhead trout smolts are tagged with PIT tags to determine timing of wild adult steelhead trout one and two years later as they return to spawn. By monitoring smolt passage at the head of Lower Granite Reservoir and at Lower Granite Dam, migration rates (km/d) under various riverine and reservoir conditions can be estimated

and compared. Monitoring sites on both the Snake and Clearwater, arms of Lower Granite Reservoir and on the Salmon River permit migration timing to be determined for smolts from each drainage. It is possible to determine the relative abundance of hatchery and wild stocks of steelhead trout which can be used to document wild stock rebuilding progress. This smolt monitoring program's information is complementary to other Snake and Columbia River NPPC-supported projects.

OBJECTIVES

1. Provide daily trap catch data at the head of Lower Granite Reservoir for water budget and fish transportation management purposes.
2. Determine riverine travel time from the point of release to the smolt traps (index sites) at the upper end of Lower Granite Reservoir for freeze branded and PIT-tagged smolts.

Provide an interrogation site for PIT-tagged smolts, marked on other projects, at the end of their migration in a riverine environment and the beginning of their migration in a reservoir environment.

4. Determine reservoir travel time for hatchery spring/summer chinook salmon, wild spring/summer chinook salmon, age 0 chinook salmon, hatchery steelhead trout, and wild steelhead trout from the head of Lower Granite Reservoir to Lower Granite Dam using PIT-tagged smolts marked at the traps and PIT-tagged smolts passing the traps from upriver hatchery releases and rearing areas.
5. Determine cumulative interrogation rate at Lower Granite, Little Goose, Lower Monumental, and McNary dams during the spring outmigration period for PIT-tagged hatchery and wild spring/summer chinook salmon, age 0 chinook salmon, hatchery and wild steelhead trout.
6. Correlate smolt migration rate with river flow for fish moving in riverine and reservoir environments.
7. Determine trap efficiency for each species at each trap over a range of discharges.
8. PIT tag all age 0 chinook collected in the Snake River trap and determine travel time and cumulative interrogation rate.
9. Evaluate timing of returning adult wild and natural steelhead crossing Lower Granite Dam.

METHODS

Releases of Hatchery-Produced Smolts

Anadromous hatchery release information was reported for hatchery smolts which contributed to the 1994 outmigration in the Snake River drainage, upstream of Lower Granite Dam. This information included species, number released, date, release location, number PIT-tagged, number freeze branded, and associated brand.

Smolt Monitoring Traps

During the 1994 outmigration, three smolt monitoring traps were operated to monitor the passage of juvenile chinook salmon and steelhead trout. One scoop trap (Raymond and Collins 1974) was located on the Clearwater River, near Lewiston, Idaho. A second scoop trap was located on the Salmon River near White Bird, Idaho. A new trap site for the Salmon River trap was under construction 17 km upstream but was not completed for the 1994 field season. The new trap site will allow the trap to be operated at higher discharge levels. The third trap, a dipper trap (Mason 1966), was located on the Snake River near Lewiston, Idaho (Figure 1). Smolts were captured, examined, and enumerated daily at the traps and released back to the river. Fork length of up to 100 smolts for each species were measured to the nearest millimeter, and up to 2,000 fish were examined for hatchery brands. Smolts were anesthetized before handling with tricaine methanesulfonate (MS-222). These fish were allowed to recover from the anesthesia before being returned to the river.

Water temperature (°C) and turbidity (m) were recorded daily at each trap using a centigrade thermometer and 20 cm Secchi disk. The Snake River discharge was measured at the U.S. Geological Survey (USGS) Anatone gauge (#13334300), 44.4 km upstream from the Snake River trap. Clearwater River discharge was measured at the USGS Spalding gauge (#13342500), 8.8 km upstream from the Clearwater River trap. Salmon River discharge was measured at the USGS White Bird gauge (#13317000), 1.6 km upstream from the Salmon River trap.

Snake River Trap

The Snake River trap was positioned approximately 40 m downstream from the Interstate Bridge between Lewiston, Idaho and Clarkston, Washington. The trap was attached to bridge piers just east of the drawbridge span by steel cables. This location is at the head of Lower Granite Reservoir, 0.5 km upstream from the convergence of the Snake and Clearwater arms. River width and depth at this location are approximately 260 m and 12 m, respectively.

Chinook salmon and steelhead trout smolts were PIT-tagged at the Snake River trap to estimate travel time from the head of Lower Granite Reservoir to Lower Granite Dam. Up to 100 hatchery chinook salmon, 75

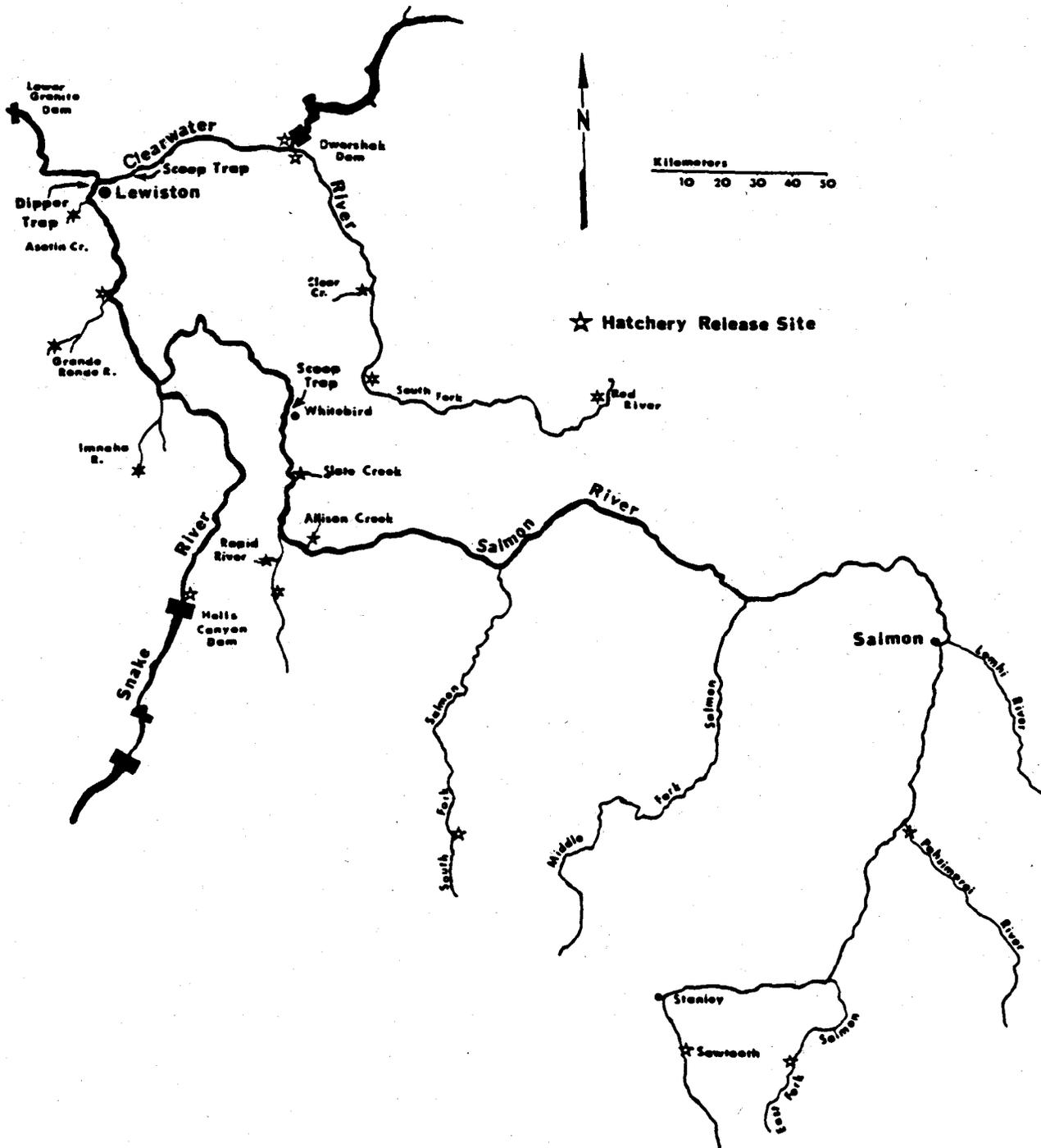


Figure 1. Map of study area.

wild chinook salmon, 60 hatchery steelhead trout, all wild steelhead trout, and all age 0 chinook salmon were PIT-tagged daily, when available. Median travel time of the daily PIT-tagged release groups was converted to migration rate. Migration rate was correlated with mean Lower Granite Reservoir inflow discharge for the number of days equal to the median travel time to determine how changes in discharge affected smolt migration rate through Lower Granite Reservoir.

Snake River trap operation began on March 14 and continued through July 19, 1994. The Snake River trap was not in operation for a total of 2 days during the 1994 season due to mechanical failure or heavy debris loads. All fish captured in the Snake River trap were passively interrogated for PIT tags as they entered the live well. The interrogation and tagging information was sent to the PTAGIS Data Center (managed by Pacific States Marine Fisheries Commission) daily.

The PIT tag interrogation system on the Snake River trap consists of an 8-inch PVC pipe with two interrogation coils (D-4 and D-6). Each coil is connected to an exciter card and a PIT tag reader. The system does not have the capability to provide exact-time of capture. Since it is checked once daily, the interrogation time is set to 00:00 h. Coil efficiency tests were conducted on the dipper trap interrogation system. Six hundred forty-five test tags were sent through the system. The reading efficiency was calculated to be 99.2⁹⁶ for both coils combined.

Clearwater River Trap

The Clearwater River scoop trap was located 10 km upstream from the convergence of the Clearwater River and Snake River arms of Lower Granite Reservoir (4.5 km upstream from slack water). The river channel at this location forms a gentle bend and is 150 to 200 m wide and 4 m to 7 m deep, depending on discharge.

Chinook salmon and steelhead trout smolts were PIT-tagged at the Clearwater River trap to estimate travel time from the head of Lower Granite Reservoir to Lower Granite Dam for Clearwater River fish. Up to 100 hatchery chinook salmon, 75 wild chinook salmon, 60 hatchery steelhead trout, all wild steelhead trout, and all age 0 chinook salmon were PIT-tagged daily, when available. Median travel time of the daily PIT-tagged release groups were converted to migration rate. Migration rate was correlated with mean Lower Granite Reservoir inflow discharge for the median travel time to determine how changes in discharge affected smolt migration rate through Lower Granite Reservoir.

Trap operation began March 14 and continued through July 28 when operations were terminated for the year. Operations were temporarily suspended for two days during the season due to mechanical failure. All fish were interrogated for PIT tags as the fish were removed from the live well. The tagging and interrogation files were sent to the PTAGIS Data Center daily.

The PIT tag interrogation system on the Clearwater River trap consists of a 4-inch PVC pipe with two interrogation coils (D-0 and D-2). Each coil is attached to an exciter card and a PIT tag reader. This system

is battery-powered. Coil efficiency tests were conducted on the Clearwater River trap interrogation system in 1994. Five hundred test tags were sent through the system. Reading efficiency was calculated to be 98.0% for both coils combined.

Salmon River Trap

The Salmon River scoop trap was located 1.5 km downstream from the mouth of White Bird Creek (rkm 86.6) between a rock island and the western shore, and immediately over a rock shelf. This location was chosen because juvenile migrants are concentrated both vertically and horizontally due to the morphology of the site, thus making them more vulnerable to capture. River width at this location is approximately 70 m and depth ranges from 1.5 m at 4 kcfs to 5.0 m at 25 kcfs.

Chinook salmon and steelhead trout juveniles were tagged with PIT tags at the Salmon River trap to estimate travel time from the trap to Lower Granite Dam for Salmon River fish. Up to 100 hatchery chinook salmon, 75 wild chinook salmon, 60 hatchery steelhead, and all wild steelhead were PIT-tagged daily, when available. Median travel time of the daily PIT-tagged release groups was converted to migration rate. Migration rate was correlated with mean Lower Granite Reservoir inflow for the median travel time to determine how changes in discharge affected smolt migration rate through Lower Granite Reservoir.

Trap operation began on March 16 and continued uninterrupted until June 16 when operations were terminated for the season. All fish were interrogated for PIT tags as they were removed from the live well. The tagging and interrogation files were sent to the PTAGIS Data Center daily.

The PIT tag interrogation system on the Salmon River trap consists of a 4-inch PVC pipe with two interrogation coils. Each coil is connected to an exciter card-(D-8) which is in turn, attached to a single PIT tag reader. The reader is connected to a personal computer that contains software which places a date and time stamp with each PIT tag code interrogated. The system is battery-powered.

Coil efficiency tests were conducted on the Salmon River trap interrogation system in 1994. Two hundred fifty test tags were sent through the system. Reading efficiency was calculated to be 98.8% for both coils combined.

Trap Efficiency

Trap efficiency is the proportion of the migration run being sampled. Since trap efficiency may change as river discharge changes, efficiency has been estimated several times through the range of discharge at which the trap was operated. A linear regression equation (Ott 1977) describing the relation of trap efficiency and discharge was derived to estimate efficiency at any given discharge. During the 1994 trap operations, trap efficiencies were not calculated for any of the smolt traps. Previous trap efficiency estimates are reported by Buettner (1991).

Travel Time and Migration Rates

Migration statistics were calculated for hatchery release groups from release sites to traps. Travel time and migration rates to the traps were calculated using median arrival times at the Snake River, Clearwater River, and Salmon River traps. Median arrival (or passage) date is the date the 50th percentile fish arrived at the trap or collection facility. Smolts were PIT-tagged at the Snake and Clearwater River traps to determine travel time from the head of Lower Granite Reservoir to Lower Granite Dam. Smolts were PIT-tagged at the Salmon River trap to determine migration rate in a free-flowing section of river plus Lower Granite Reservoir. Distances from release point to recovery location are listed in Table 1. Individual arrival times at the Lower Granite collection facility were determined for each daily release group. A minimum recapture number, sufficient for use in travel time and migration rate estimations, was derived from an empirical distribution function of the travel time for each individual release group (Steinhorst et al. 1988). If recapture numbers were less than five or less than the number derived from the empirical distribution function, the daily data were combined with another day's data or the data were not used. If they were combined, they were added to daily data from an adjacent release day that had similar discharge and travel time.

Smolt migration rate/discharge relations through Lower Granite Reservoir were investigated using linear regression analysis after both variables were stratified into 5-kcfs discharge intervals (Mosteller and Tukey 1977) and log (ln) transformed (Zar 1984). The 0.05 level was used to determine significance. This analysis was performed for the PIT-tagged hatchery spring/summer chinook salmon, wild spring/summer chinook salmon, hatchery steelhead trout, and wild steelhead trout groups marked at the Snake, Clearwater, or Salmon River traps.

The migration rate/discharge relations for PIT-tagged chinook salmon, hatchery steelhead trout, and wild steelhead trout were individually examined from 1988 to 1994 using analysis of covariance to determine if there were groups of years with common slopes and intercepts. Plots are used to help identify years that differ when non-homogeneous slopes between years are found. Subsequent analyses were run, without these years, to determine if common slopes and intercepts existed for a smaller subset of years. Also, the analysis of variance was used to determine if there was a sufficient overlap in the covariate (discharge) between years to continue the analysis (Ostle and Mensing 1975). If the final hypothesis of common intercepts was not rejected, then a significant difference in the migration rate/discharge relations between years was not detected and the yearly data were pooled. After pooling, linear regression was used to find the best-fitting equation to describe the relation between migration rate and discharge for an individual species over several years.

Interrogation Rates of PIT-Tagged Fish

Interrogation rates of PIT-tagged fish, marked at the head of Lower Granite Reservoir, to Lower Granite Dam, Little Goose Dam, Lower Monumental,

Table 1. River mile & kilometer location for the Snake River Drainage.

	Mouth of Columbia R.		Mouth of Snake River		Lower Granite Dam		Snake River trap site		Clearwater R. trap site		Salmon River trap site	
	mi	km	mi	km	mi	km	mi	km	mi	km	mi	km
Asotin Creek Rel. Site	470.3	756.7	146.0	234.9	38.5	61.9	6.4	10.3	--	--	--	--
Big Canyon Creek	585.9	942.7	261.6	420.9	154.1	247.9	122.0	196.3	--	--	--	--
Catherine Creek	636.9	1024.8	312.6	503.0	205.1	330.0	173.0	278.4	--	--	--	--
Clearwater R. trap site	470.0	756.2	145.7	234.4	38.2	61.5	--	--	0.0	0.0	--	--
Cottonwood Creek	521.7	839.4	197.4	317.6	89.9	144.6	57.8	93.0	--	--	--	--
Crooked River	604.3	972.3	280.0	450.5	172.5	277.6	--	--	134.3	216.0	--	--
Deer Creek	504.3	811.4	180.0	289.6	72.5	116.7	40.4	65.0	--	--	--	--
Dworshak NFH	504.3	811.4	180.0	289.6	72.5	116.6	--	--	34.3	55.2	--	--
E. F. Salmon @ trap site	873.6	1405.6	549.3	883.8	441.8	710.9	409.7	659.2	--	--	307.9	495.4
Grande Ronde R. Mouth	493.0	793.2	168.7	271.4	61.2	98.5	29.1	46.8	--	--	--	--
Hazard Creek	618.7	995.5	294.4	473.7	186.9	300.7	154.8	249.1	--	--	53.0	85.3
Hells Canyon Dam	571.3	919.2	247.0	397.4	139.5	224.5	107.4	172.8	--	--	--	--
Highway 95 Boat Launch	473.2	761.4	148.9	239.6	41.5	66.8	--	--	3.2	5.1	--	--
Imnaha Coll. Facility	565.6	910.2	241.3	388.3	133.8	215.4	101.7	163.6	--	--	--	--
Imnaha River Mouth	516.0	830.3	191.7	309.1	84.2	135.7	52.1	83.8	--	--	--	--
Kooskia NFH	541.6	871.4	217.3	349.6	109.8	176.7	--	--	71.5	115.0	--	--
Little Sheep Creek	553.8	891.1	229.5	369.3	122.0	196.3	89.9	144.6	--	--	--	--
Lookingglass Creek	580.4	933.9	256.1	412.1	148.6	239.1	116.5	187.4	--	--	--	--
Lower Granite Dam	431.8	694.8	107.5	173.0	0.0	0.0	32.1	51.6	38.3	61.5	133.9	215.4
Lower Monumental Dam	365.9	588.7	41.6	66.9	65.9	106.0	98.0	157.7	--	--	181.2	291.5
Pahsimeroi Hatchery	817.5	1315.4	493.2	793.6	385.7	620.6	353.6	568.9	--	--	251.8	405.1
Rapid River Hatchery	605.8	974.7	281.5	452.9	174.0	280.0	141.9	228.3	--	--	40.1	64.5
Red River Rearing Pond	618.0	994.4	293.7	472.6	186.2	299.6	--	--	148.0	238.1	--	--
Salmon River Mouth	512.5	824.6	188.2	302.8	80.7	129.8	48.6	78.2	--	--	53.2	85.6
Salmon River trap site	565.7	910.2	241.4	388.4	133.9	215.4	101.8	163.8	--	--	0.0	0.0
Sawtooth Hatchery	896.7	1444.2	573.3	922.4	465.8	749.5	433.7	697.8	--	--	331.9	534.0
Snake River Mouth	324.3	521.8	0.0	0.0	107.5	172.9	139.6	224.6	145.7	234.5	241.4	388.4
Snake River trap site	463.9	746.4	139.6	224.6	32.1	51.6	0.0	0.0	--	--	101.8	163.8
S. E. Salmon @ Knox Bridge	719.7	1158.0	395.4	636.2	287.9	463.2	255.8	411.6	--	--	154.0	247.8
Spring Creek	614.4	988.6	290.1	466.8	182.6	293.8	150.5	242.2	--	--	--	--
Wildcat Creek	546.2	878.8	221.9	357.0	114.4	184.3	82.3	132.4	--	--	--	--

and McNary Dam collection facilities included data from 1988 to 1994 for the Snake River trap, 1989 to 1994 for the Clearwater River trap, and 1993 to 1994 for the Salmon River trap. The data have been examined to ensure that multiple interrogations within a dam and between dams have been removed.

RESULTS AND DISCUSSION

Hatchery Releases

Chinook Salmon

Chinook salmon released into the Snake River drainage upstream from Lower Granite Dam were reared at ten locations in Idaho and one in Oregon. The Washington Department of Fish and Wildlife did not release any juvenile chinook salmon in the Snake River drainage upstream from Lower Granite Dam that contributed to the 1994 outmigration. A total of 8,049,403 chinook salmon smolts were released at 19 locations in Idaho and 2 locations in Oregon (Table 2).

During the late summer and fall of 1993, seven groups of chinook salmon juveniles (280,809 chinook salmon) were released from Idaho hatcheries. All other chinook salmon releases for the 1994 outmigration occurred in the spring of 1994 (Table 2).

Steelhead Trout

Steelhead trout were reared at five locations in Idaho, one in Washington, and one in Oregon for release into the Snake River drainage upstream from Lower Granite Dam. A total of 9,351,931 steelhead trout smolts were released at 21 locations in Idaho, 6 locations in Oregon, and 3 locations in Washington (Table 3). Fall releases of steelhead trout juveniles have not been included in this total.

Smolt Monitoring Traps

Snake River Trap Operation

The Snake River trap captured 22,342 hatchery and 1,471 wild age 1 chinook salmon, 55 age 0 chinook salmon, 31,662 hatchery steelhead trout, 3,439 wild steelhead trout, and 260 sockeye/kokanee salmon *Oncorhynchus nerka*.

The 1994 outmigration year was the second migration season that all hatchery chinook salmon produced in Idaho were marked. To compare 1994 data with previous years data, total catch of hatchery and wild chinook salmon was added together. Total catch of chinook salmon (hatchery + wild) was 23,804 in 1994 (low flow year). The 1994 catch of chinook salmon was

Table 2. Hatchery chinook salmon released into the Snake River system upriver from Lower Granite Dam contributing to the 1994 outmigration.

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. Pit tagged]	Brand
<u>Salmon River</u>				
South Fork Salmon River @ Knox Bridge (McCall)	Summer	4/9-13	1,060,163 [5,100]	
Pahsimeroi River (Pahsimeroi)	Summer	4/8-12	130,510 [1,000]	
Rapid River (Rapid River)	Spring	4/8-25	2,547,642 [3,001]	
East Fork Salmon River (Sawtooth)	Spring	4/8	12,368 [500]	
Sawtooth Weir (Sawtooth)	Spring	4/9-13	141,545 [3,501]	
Upper Salmon River (Sawtooth)	Spring	4/9	72,300 [1,000]	
Drainage Total			3,964,528	
<u>Snake River and Non-Idaho Tributaries</u>				
Hells Canyon (Rapid River) (Lookingglass)	Spring	4/20-21	380,504 [250]	
		4/12	84,050	
Immaha River @ River Km. 74.2 (Lookingglass)	Spring	4/10	438,699 [2,993]	
Lookingglass Cr. R. Km. 3.5 (Lookingglass)	Spring	4/10-12	614,990 (20,292) [499]	LA-J-2
			(20,294) [501]	RA-J-2
			(20,501) [500]	LA-J-4
			{20,895) [497]	RA-J-4
		5/06	150,233	
Drainage Total			1,668,476	

Table 2. Continued.

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. PIT tagged]	Brand
<u>Clearwater River</u>				
Clear Creek (Kooskia NFH)	Spring	4/18	305,813	
North Fork Clearwater Dworshak (Dworshak NFH)	Spring	4/8	69,642 (22,664) (18,226) (18,976) [6,000]	RA-U-1 RA-U-2 RA-U-3
		4/14-15	1,049,477 [2,400]	
		4/22	84,654 (22,315) (30,663) (24,799) [6,000]	RD-U-1 RD-U-2 RD-U-3
		5/6	74,500 (19,630) (21,377) (20,405) [6,000]	RD-T-1 RD-T-2 RD-T-3
Upper Meadow Creek (Clearwater)	Spring	7/20/93	54,100	
Lower Meadow Creek (Clearwater)	Spring	7/22/93	59,600	
Papoose Creek (Clearwater)	Spring	4/13-15	77,170 [1,009]	
Walton Creek (Clearwater)	Spring	4/14	— 55,745 [500]	
White Sands Creek (Clearwater)	Spring	8/4-5/93	79,988 [1,003]	
Squaw Creek (Clearwater)	Spring	8/5-6/93	12,000 [1,000]	
Pete King Creek (Clearwater)	Spring	8/5-6/93	12,000 [1,000]	
Big Flat Creek (Clearwater)	Spring	8/5-6/93	40,875 [1,000]	
Walton Creek (Powell)	Spring	4/8-13	144,82 [1,000]	

Table 2. Continued

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. PIT tagged]	Brand
Upper Crooked River (Crooked River)	Spring	4/8-14	273,766	
Red River (Red River)	Spring	10/12/93	22,246 [1,000]	
Drainage Total			2,416,399	
GRAND TOTAL			8,049,403	

Table 3. Hatchery steelhead trout released into the Snake River system upriver from Lower Granite Dam contributing to the 1994 outmigration.

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. Pit tagged]	Brand
Salmon River				
L. Salmon River @ Hazard Creek (Magic Valley)	B	4/22-28	238,725 [300]	
(Hagerman NFH)	A	4/25	328,163 [200]	
L. Salmon River @ Warm Springs Bdg. (Magic Valley)	A	4/23-27	467,550 [200]	
North Fork Salmon River (Niagara Springs)	A	4/14-15	134,979 [200]	
East Fork Salmon River (Magic Valley)	B	4/11-16	517,180 [600]	
Bruno Landing (Hagerman NFH)	A	4/12	182,083 [100]	
Lemhi River (Hagerman NFH)	A	4/06	235,788 [200]	
Pahsmeroi River (Magic Valley)	A	4/16-22	484,440 [301]	
(Niagara Springs)	A	4/10-12	379,948 [316]	
Salmon River @ Challis (Niagara Springs)	A	4/13	199,962 [200]	
Salmon River @ Sawtooth Weir (Hagerman NFH)	A	4/15 & 29	773,134 [602]	
Salmon River @ Slate Creek (Magic Valley)	B	4/12-20	211,355 [300]	
Salmon River @ Hammer Creek (Niagara Springs)	A	5/2-5	193,022 [300]	
Salmon River @ Pine Bar Rapids (Niagara Springs)	A	4/19	21,070	
Drainage Total			4,367,399	

Table 3. Continued.

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. Pit tagged]	Brand
<u>Snake River and Non-Idaho Tributaries</u>				
Hells Canyon (Niagara Springs)	A	4/16-18 & 4/25-5/1	265,835 [202] 343,280 [200]	
Catherine Creek @ R.Km. 28.8 (Irrigon)	A	4/18	62,556	
Spring Creek @ R.Km. 1.6 (Irrigon)	A	4/18	494,342 (19,911) [243] (19,735) [248]	LA-A-1 RA-A-1
		5/2	211,635	
Little Sheep Creek @ R.Km. 24 (Irrigon)	A	4/18	300,774 (20,339) [534] (19,246) [488] (17,900) (19,893) [495]	LA-A-2 RA-A-2 LA-A-4 RA-A-4
Deer Creek @ R.Km. 0.16 (Irrigon)	A	4/22	155,751 [993]	
Imnaha River @ R.Km. 26.1 (Irrigon)	A	4/26	49,767	
Grande Ronde River @ R.Km. 256 (Irrigon)	A	4/13-15	200,806	
Grande Ronde River @ R.Km. 46.4 (Lyons Ferry)	A	4/08-27	273,000	
Asotin Creek R.Km. 0.8 (Lyons Ferry)	A'	4/25-26	30,460	
Wildcat Creek R.Km. 1.6 (Lyons Ferry)	A	4/26-27	49,508	
		Drainage Total	2,437,714	

Table 3. continued.

Release site (hatchery)	Stock	Release date	No. released (No. branded) [No. Pit tagged]	Brand
Clearwater River				
Clearwater River (Dworshak NFH)		5/2-6	1,153,417 (9,545) (8,758) (9,001) (8,894) [3,810]	RD-T-1 RD-T-3 LD-T-1 LA-T-3
Clear Creek (Dworshak NFH)	B	4/21	349,633 (729) [249]	RA-T-2
(Clearwater)	B	5/3	153,860 [300]	
South Fork Clearwater River P Km 14 N (Dworshak NFH)	B	4/18-22	97,429	
Crooked River (Clearwater)	B	4/29-5/3	176,016 [5,768]	
South Fork Clearwater River @ Mill Creek (Clearwater)	B	4/25-26	185,067 [200]	
Cottonwood Creek (Dworshak NFH)	B	4/18-22	86,951	
(Clearwater)	B	4/25	103,696 [200]	
Button Beach (Dworshak NFH)		4/20-25	136,447	
South Fork Clearwater River R.Km. 28.8 (Clearwater)		4/25-26	104,302 [199]	
Drainage Total			2,546,818	
GRAND TOTAL			9,351,931	

about 1.3 times greater than in 1993 (trap out of operation for 32 d), nearly 13 times greater than in 1992 (low flow year), 6 times greater than in 1991 (low flow year), but nearly 26% less than the record catch of 32,131 in 1989 (near-normal flow year).

Hatchery chinook salmon first arrived at the trap on April 7. Peak passage of hatchery chinook began on April 19 and continued through April 30 (Figure 2). There was a minor peak in passage that began on May 7 and continued through May 17. Peaks in hatchery chinook salmon passage were associated with increases in Snake River discharge. The 1994 total catch of hatchery chinook salmon was 1.5 times greater than in 1993. Nearly 90% of the total catch of hatchery chinook salmon was captured in April, 10% in May, and less than 1% in June.

Wild chinook salmon passage timing was similar to that of hatchery chinook salmon. Peak passage of wild chinook salmon began on April 19 and concluded on April 30. There was a minor peak in passage that began on May 7 and lasted until May 15. Peaks in wild chinook salmon passage were associated with increases in Snake River discharge. The 1994 total catch of wild chinook salmon was 45.5% less than in 1993. Less than 1% of the total catch of wild chinook salmon was captured in March, 72% in April, 25.2% in May, and 1.7% in June. Wild chinook salmon passage had virtually ended by June 10.

Both hatchery and wild chinook salmon outmigrated several weeks earlier in 1994 than in 1993. The difference in migrational timing between the two years can probably be attributed to the early spring runoff of low elevation snow in 1994.

Physical characteristics were used to differentiate between age 0 chinook salmon and other chinook salmon. Peak trap catch of age 0 chinook salmon was during May and June when 90% of the season total was collected. Capture of age 0 chinook had virtually ceased by the end of June. The lack of age 0 chinook salmon in the Snake River trap catch was due to either a lack of fish movement or low water velocities reducing trap efficiency.

There was one major peak in hatchery steelhead trout passage. The peak began on April 19 and subsided on May 21 (Figure 3). During the period of peak passage, 30,328 hatchery steelhead trout, or 96% of the season total, were collected. Following the period of peak passage, hatchery steelhead trout were collected at a rate of less than 100 per day throughout the remainder of the migration season. Analysis of catch by month revealed that less than 1% of the season total was collected in March, 37% in April, 61% in May, 1.9% in June, and only 0.6% in July. The hatchery steelhead trout catch in 1994 was nearly 10% less than in 1993, 1.5 times greater than in 1992, 1.7 times greater than in 1991, and 1.4 times higher than in 1989 (near-normal flow year).

Wild steelhead trout passage timing was similar to hatchery steelhead trout passage (Figure 3). Peak passage began on April 19 and concluded on May 19. Ninety-four percent of the total catch for the season was collected during this period of major movement. Major movement periods of hatchery and wild steelhead trout were associated with increases in discharge. The relationship between discharge and passage has been observed in past migration seasons. Less than 1% of the total catch of wild steelhead trout was collected in March, 55% in April, 44% in May, and 1%

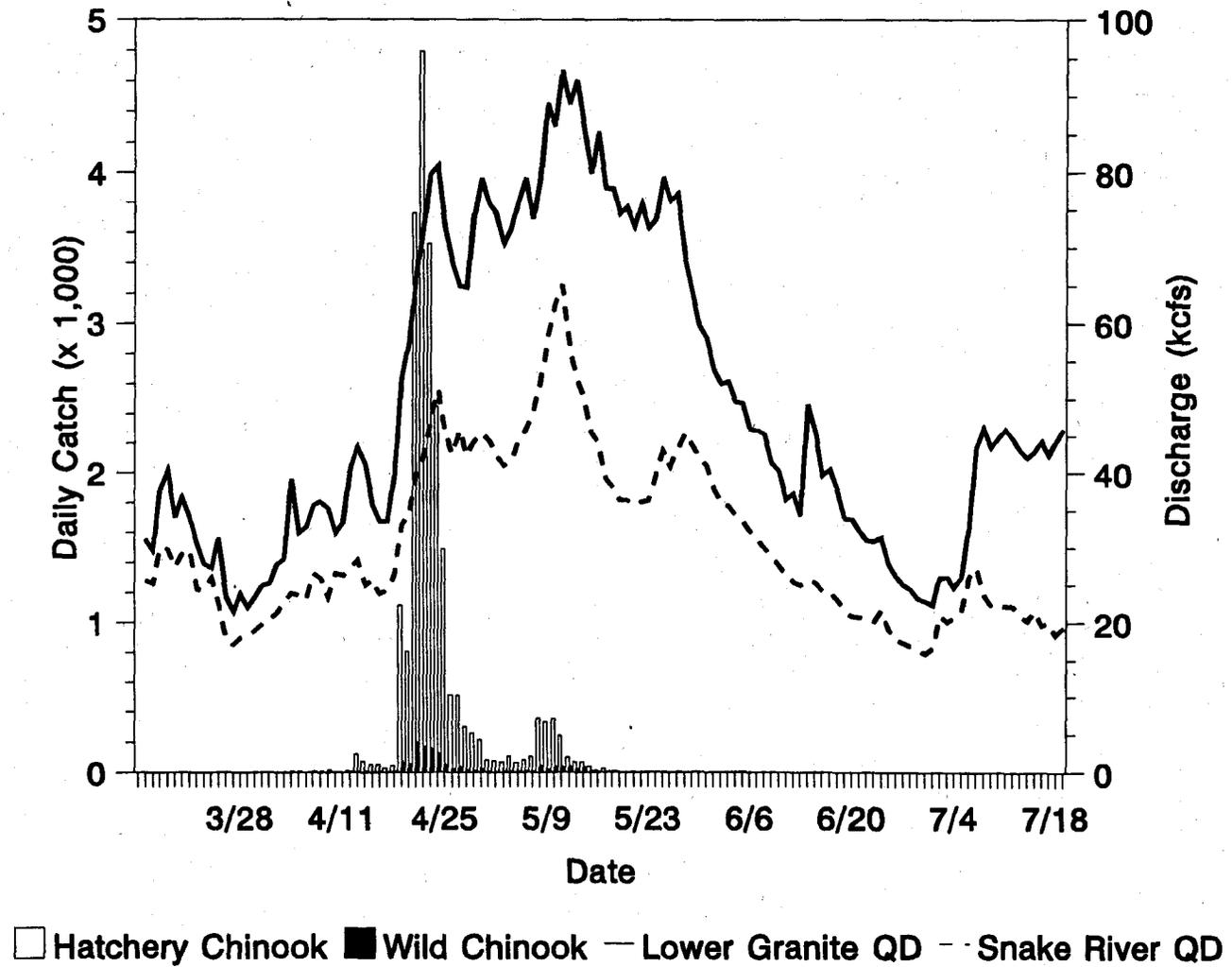


Figure 2. Snake River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Snake River discharge, 1994.

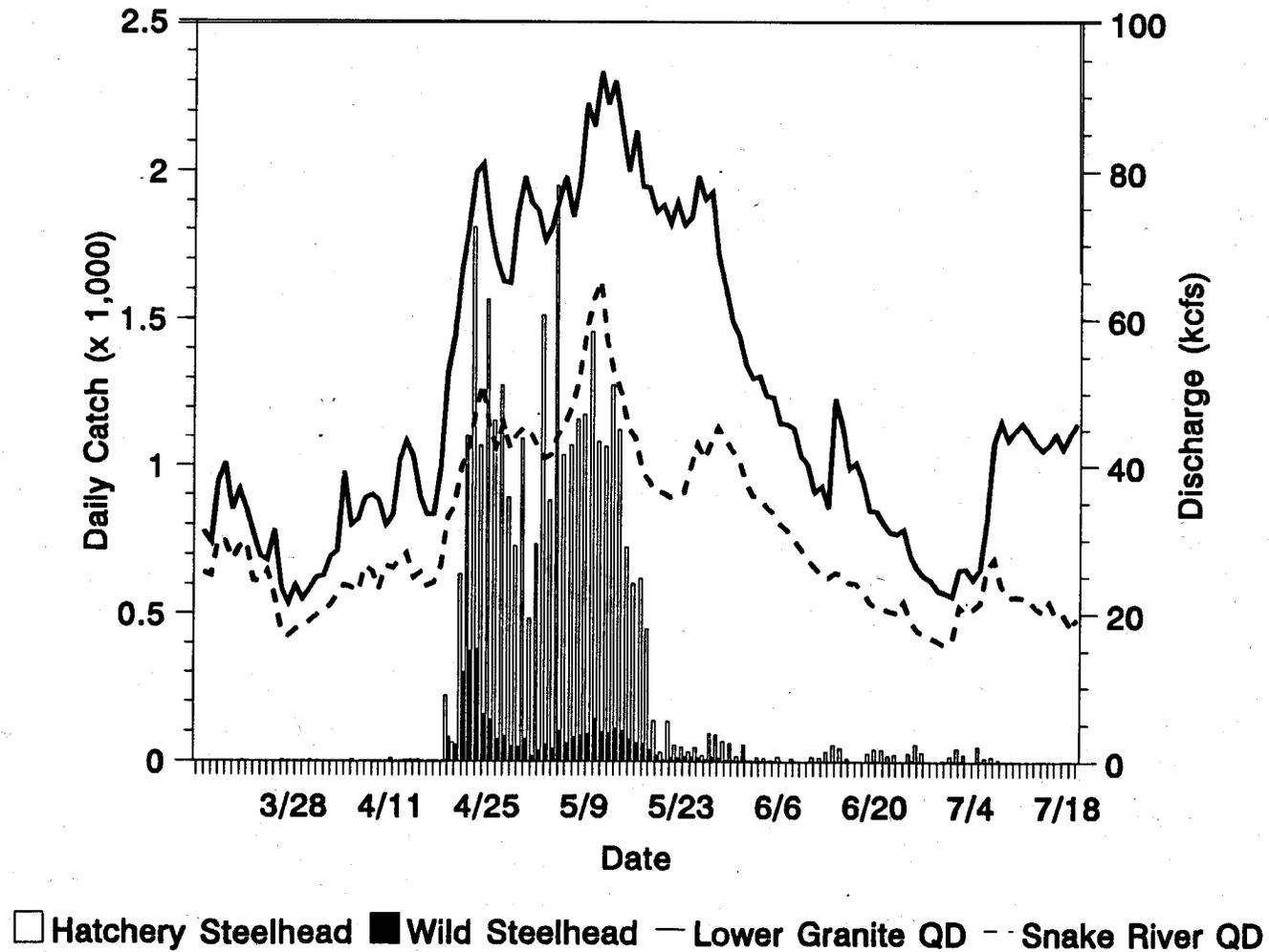


Figure 3. Snake River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Snake River discharge, 1994.

in June. Snake River trap catch for wild steelhead trout was 1.1 times greater than the 1993 total of 3,046. The 1994 trap catch of wild steelhead trout was 1.3 times greater than in 1992, 17% less than in 1991, and 1.6 times greater than in 1989.

Snake River discharge, measured at the Anatone gauge, ranged from 17.0 kcfs to 30.0 kcfs (March). The average discharge in March of 23.6 kcfs was 14.3 kcfs lower than in 1993, 1.8 kcfs higher than in 1992, 5.5 kcfs lower than in 1991, and 16.8 kcfs lower than in 1989. The average April discharge was 31.9 kcfs, with a peak of 51.3 kcfs on April 24. The April average discharge was 18.0 kcfs lower than in 1993, 7.3 kcfs higher than in 1992, 11.8 kcfs greater than in 1991, but 26.6 kcfs lower than in 1989. The average May discharge was 44.9 kcfs, which was 40.8 kcfs lower than in 1993, 12.2 kcfs greater than in 1992, similar to 1991, and 7.2 kcfs lower than in 1989. Flows were moderate at the beginning of June, but slowly decreased throughout the month. Average discharge for June was 25.2 kcfs, which was 49.6 kcfs lower than in 1993, 8.3 kcfs greater than in 1992, 23.3 kcfs lower than in 1991, and 19.6 kcfs lower than in 1989. July average discharge was 19.9 kcfs. Flows were at 16.5 kcfs at the beginning of July and fluctuated throughout the month. Flows were at 12.6 kcfs at the end of the month.

Water temperature in the Snake River at the trap steadily increased throughout the sampling season (Figure 4). By the end of the season, July 19, water temperature had risen to 21.0°C. Water temperatures in 1994 were virtually the same as experienced in the early portion of the 1993 outmigration. However, water temperatures in the latter portion of the 1994 season were generally 2°C to 3°C warmer than what was experienced during the same period in the 1993 field season.

Secchi disk transparency measurements were taken daily at the Snake River trap. Transparencies fluctuated throughout the trapping season and ranged from 0.6 m to 3.0 m (Figure 4).

Clearwater River Trap Operation

The Clearwater River trap caught 32,789 age 1 hatchery chinook salmon, 1,343 age 1 wild chinook salmon, 31 age 0 chinook salmon, 4,615 hatchery steelhead trout, 1,798 wild steelhead trout, and 156 sockeye/kokanee salmon in 1994. As mentioned previously, total catch of hatchery and wild chinook salmon was added together. The total chinook salmon catch (hatchery + wild) was 34,132. The total chinook salmon trap catch for 1994 was 3.4 times greater than in 1993, 60% less than the total catch in 1992, nearly 14% less than in 1991, but 3.4 times greater than the total catch in 1989 (lowest trap catch on record).

There was one large peak in passage of hatchery chinook salmon (Figure 5). Numbers of hatchery chinook salmon collected at the Clearwater River trap began to increase on April 9 (>100/d). Numbers of hatchery chinook salmon collected at the trap remained high until the Clearwater River trap was moved out of the thalweg due to high discharge on April 24. After the trap was moved, catch rates dropped to less than 50 hatchery chinook per day. The Clearwater River trap was moved back into the thalweg at the end of May. Any additional peaks in hatchery chinook salmon passage

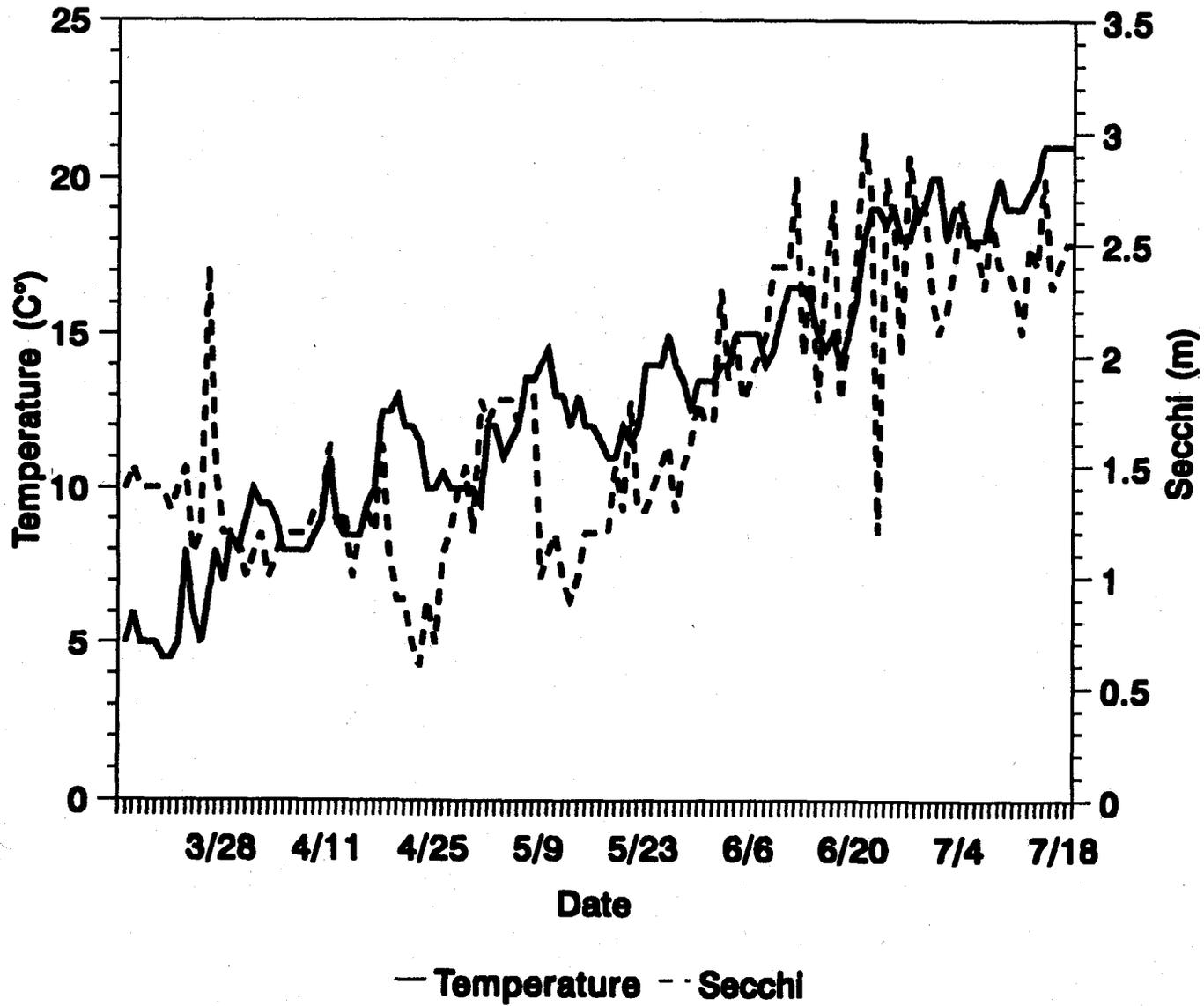


Figure 4. Daily temperature and secchi disk transparency at the Snake River trap, 1994.

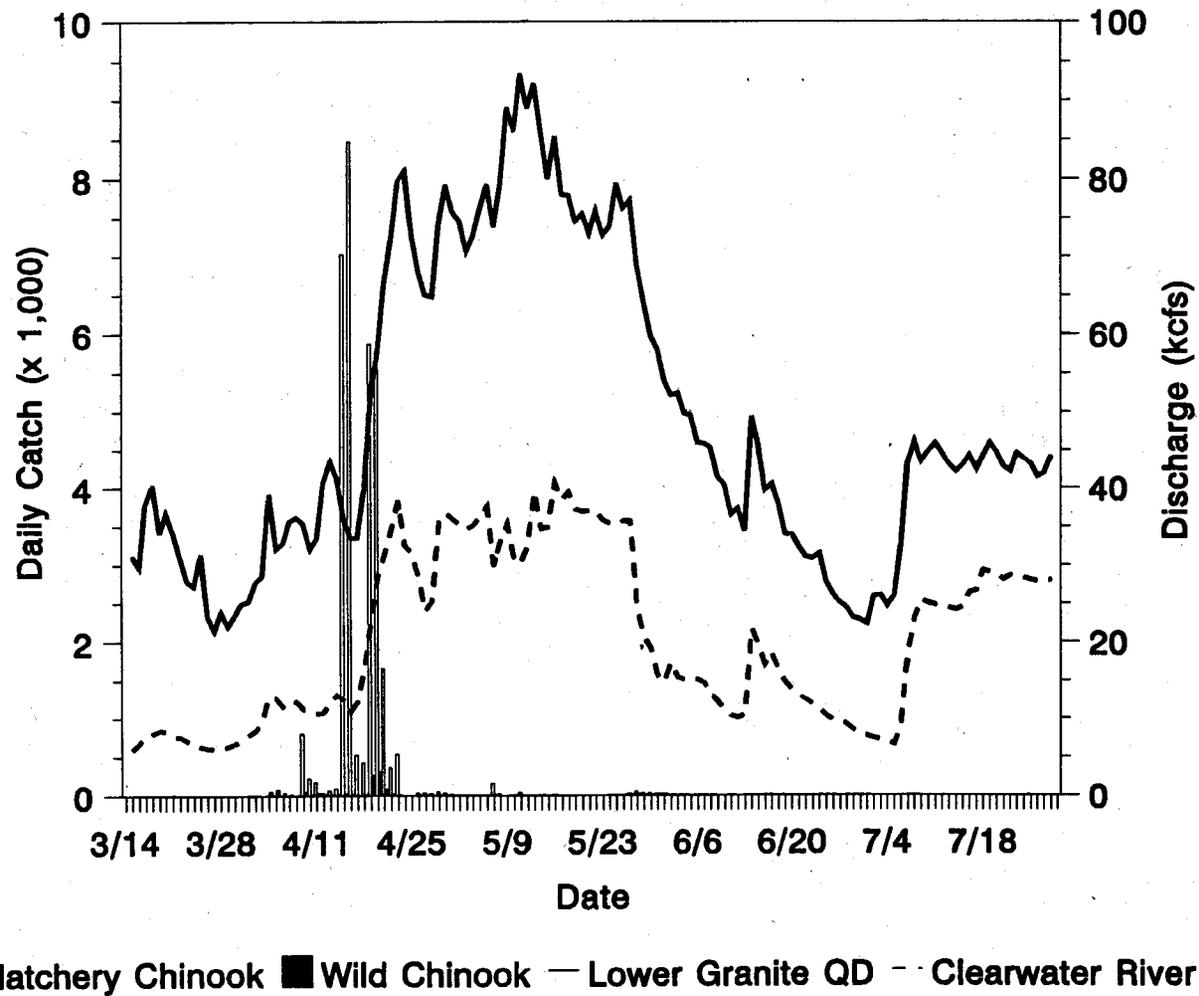


Figure 5. Clearwater River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Clearwater River discharge, 1994.

that might have occurred in late April and May were not detected due to the location of the trap. Less than 1% of the 1994 total catch was captured in March, 98.3% in April, 1.4% in May, and less than 1% in both June and July.

Wild chinook salmon began arriving at the trap in mid-March. Numbers remained low (<10/d) until April 4. Wild chinook salmon passage timing was similar to that of hatchery chinook salmon (Figure 5). Peak passage began on April 4 and ended at an unknown date for reasons previously mentioned. Less than 1% of the total catch of wild chinook salmon were collected in March, 82.9% in April, 8.3% in May, 7.1% in June, and 1.3% in July. The 1994 total catch of wild chinook salmon was 4.2 times greater than in 1993.

Peak passage of age 0 chinook salmon occurred in June and July. About 5% of the season total catch was captured in May, 38% in June and 57% in July.

There were two major peaks of hatchery steelhead trout passage. The first peak began on April 19 and lasted until April 29. This peak was due to movement of smolts outplanted in the Clearwater River drainage by Dworshak National and Clearwater fish hatcheries. The second peak began on May 3 and ended May 8 (Figure 6). The second peak consisted mainly of smolts released by Dworshak National Fish Hatchery into the mainstem Clearwater River (Figure 6). The 1994 hatchery steelhead trout trap catch was about 54% less than the 1993 catch. The large difference in total catch between 1994 and 1993 was due to trap location. In 1994, the majority of hatchery steelhead trout outmigrated when the trap was not operating in the thalweg of the river. There were no hatchery steelhead trout captured in March, 42.9% in April, 53.8% in May, 2.4% in June, and less than 1% in July. The 1994 total trap catch of hatchery steelhead trout was 54.4% less than in 1993, 35.4% less than in 1992, 50% less than in 1991, but 4.1 times greater than in 1989.

Wild steelhead trout were present in the trap catch in low numbers (<12/d) from March 19 until April 19 when numbers of wild steelhead trout collected increased to 704. Numbers of wild steelhead trout collected remained high until the trap was moved out of the thalweg three days later due to high discharge. Following the move, catch rates for wild steelhead trout decreased dramatically (Figure 6)-. Daily collections of wild steelhead trout remained low (<30/d) throughout the remainder of the field season. The timing of the 1994 wild steelhead trout outmigration was similar to the timing observed in the 1993 outmigration. One wild steelhead trout was captured in March, 95.4% were collected in April, 4% in May, and less than 1% in both June and July. The 1994 total trap catch of wild steelhead trout was about two times greater than in 1993, nearly 49% less than in 1992, 2.2 times greater than in 1991, and 12.7 times greater than in 1989.

Clearwater River discharge, measured at the Spalding gauge, ranged from 4.7 kcfs to 10.9 kcfs (March). Discharge averaged 7.1 kcfs for the month of March, which was the lowest average discharge recorded for that month in the past seven years. Discharge began to increase in April and ranged from 7.8 kcfs to 38.4 kcfs. The average April discharge of 19.2 kcfs was about the same as in 1993, but 3.0 kcfs greater than in 1992 and 1991. The average April discharge was 29.9 kcfs in 1989. May discharge ranged from 15.7 kcfs to 40.6 kcfs. The average May discharge of 33.5

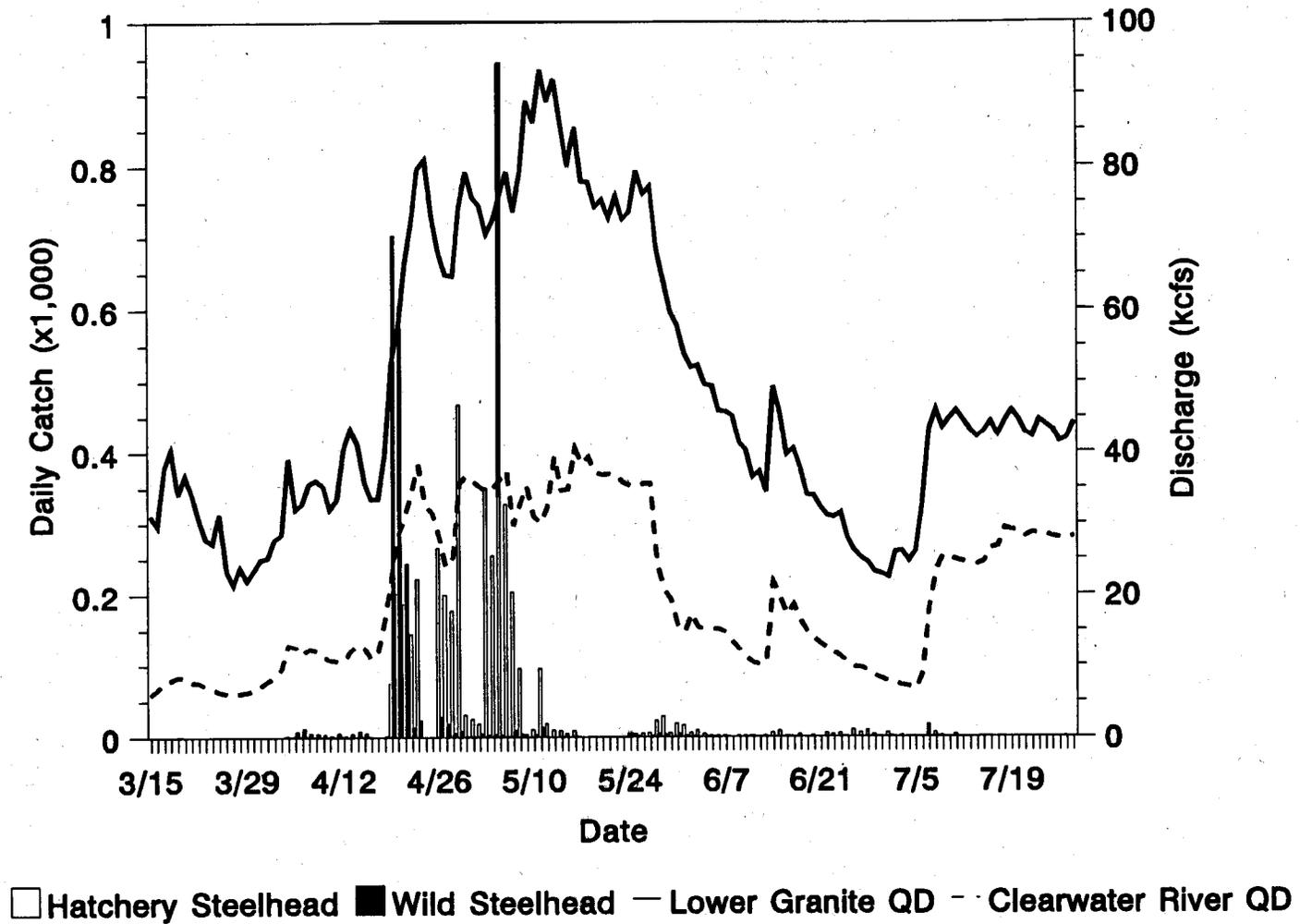


Figure 6. Clearwater River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Clearwater River discharge, 1994.

kcfs was 14.0 kcfs lower than in 1993, 4.3 kcfs greater than in 1992, 4.5 kcfs less than in 1991, and about the same as in 1989.

Water temperature measured at the Clearwater River trap was 7°C at the beginning of the season and gradually increased to 19°C by the end of the first week of July (Figure 7). Water temperatures decreased throughout the remainder of the field season due to releases of large quantities (15-20 kcfs) of cool water from Dworshak Reservoir.

Secchi disk transparency measurements were taken daily at the Clearwater River trap. Transparencies fluctuated throughout the trapping season and ranged from 0.5 m to 3.0 m (Figure 7).

Salmon River Trap Operation

The Salmon River trap captured 38,902 age 1 hatchery chinook salmon, 4,774 age 1 wild chinook salmon, 7,383 hatchery steelhead trout, 564 wild steelhead trout, and 17 sockeye/kokanee.

Small numbers (<5/d) of hatchery chinook salmon were collected daily during the latter part of March. Catch numbers increased significantly on April 10 due to the arrival of the Rapid River Hatchery release. Collection remained high (>100/d) until May 12 when the catch rate dropped to 39 hatchery chinook salmon. Daily trap catch of hatchery chinook salmon remained low (<50/d) for the remainder of the trapping season (Figure 8). The timing of the hatchery chinook salmon outmigration in 1994 was similar to the timing observed in 1993. Less than 1% of the total catch of hatchery chinook salmon was captured in March, 92.2% was collected in April, 7.5% in May, and less than 1% in June. The 1994 total catch of hatchery chinook salmon was about 1.4 times greater than in 1993.

Wild chinook salmon began arriving at the Salmon River trap in low numbers (<10/d) in mid-March. There were two major peaks in chinook passage (Figure 8). The first peak began on March 30 and reached its maximum on April 11. The second began on April 16 and peaked on April 19. The timing of the wild chinook salmon outmigration in 1994 was similar to that observed in 1993. Less than 1% of the total catch of wild chinook salmon was collected in March, 76.9% was captured in April, 16.5% in May, and 5.6% in June. The 1994 total catch of wild chinook salmon was about 7% less than what was realized in 1993.

Two major peaks of hatchery steelhead trout passage were observed at the Salmon River trap in 1994. The first began on April 19 and peaked on April 28 (Figure 9). The second began on May 18 and peaked on May 23. The first peak in passage of hatchery steelhead trout was similar to what was experienced in 1993. The second peak cannot be compared to the 1993 data. The 1993 trapping operations were terminated a month earlier than in 1994. There were no hatchery steelhead trout collected in March. About 46% of the season total was collected in April, 50.4% in May, and 3.4% in June. The 1994 total catch of hatchery steelhead trout was virtually the same as in 1993.

Wild steelhead trout began to arrive in small numbers (<5/d) at the beginning of April. Wild steelhead trout passage began to increase on

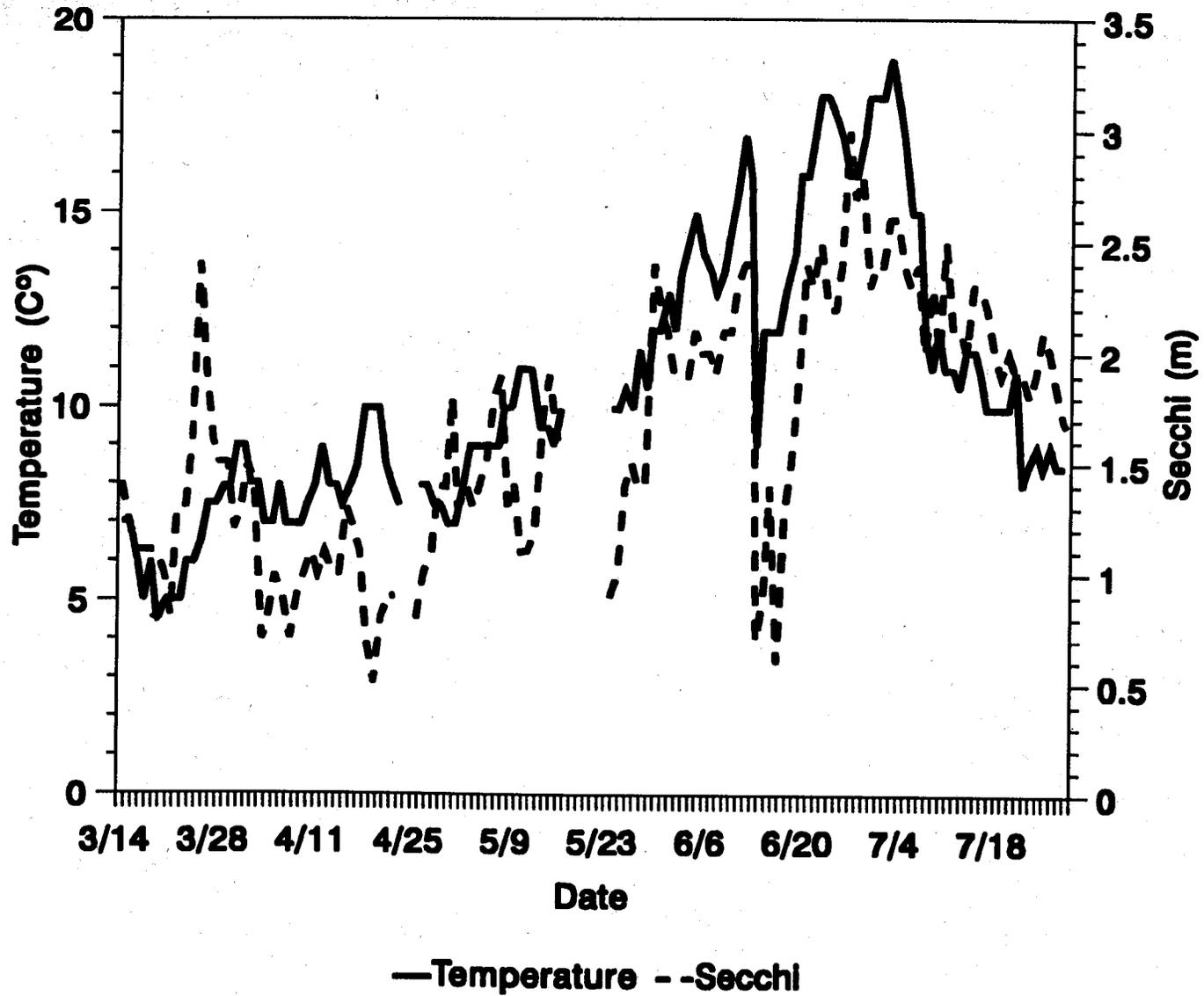


Figure 7. Daily temperature and secchi disk transparency at the Clearwater River trap, 1994.

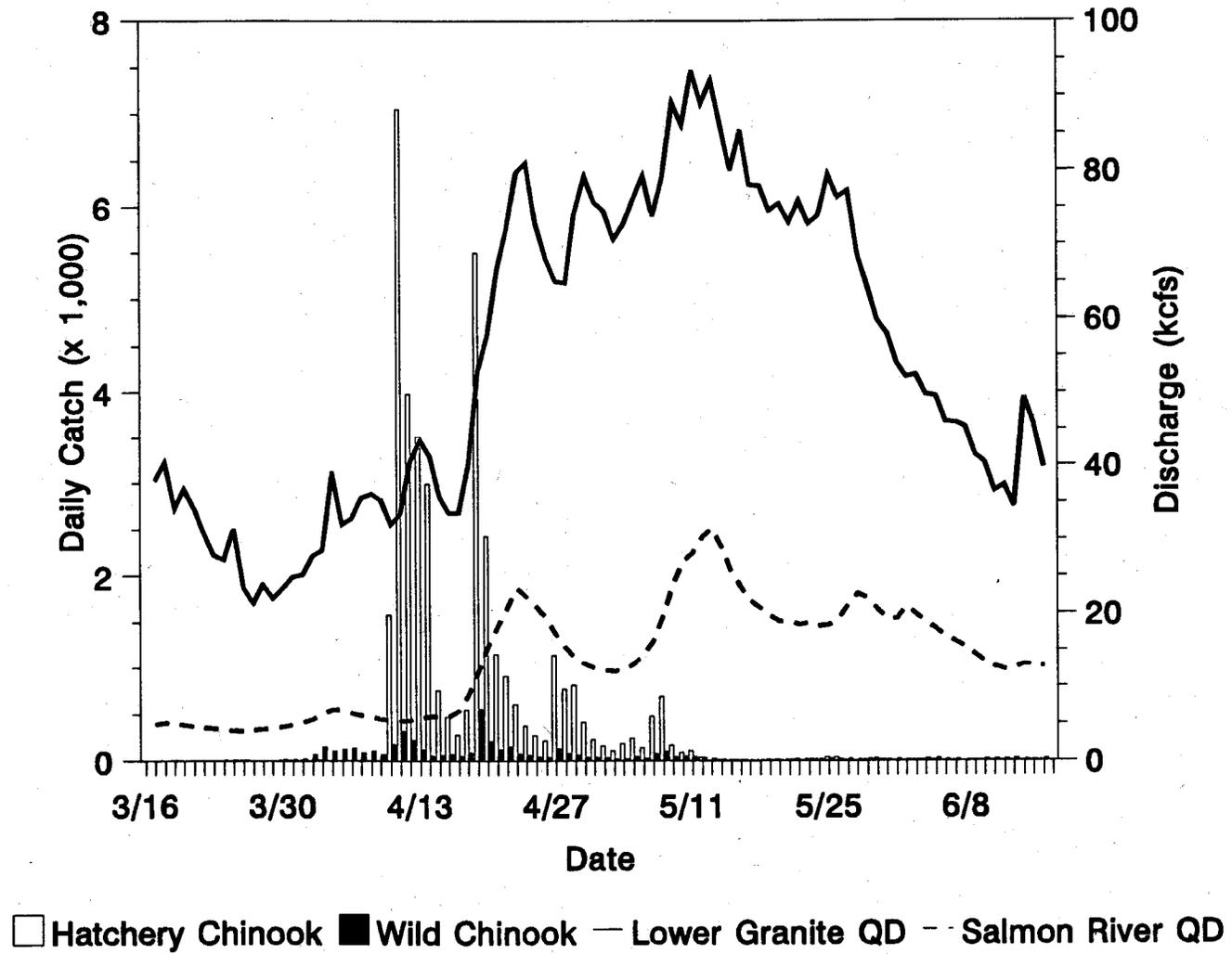
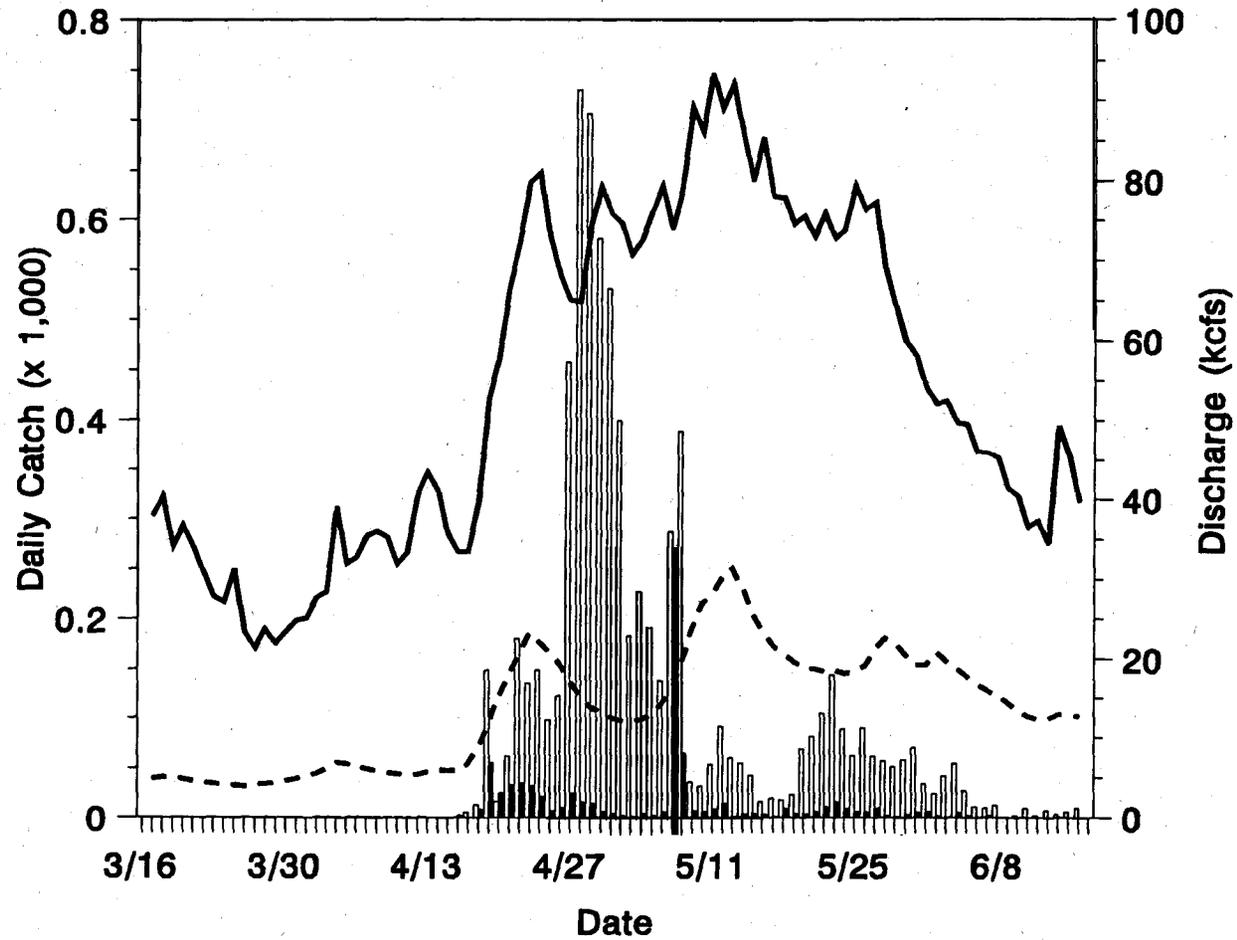


Figure 8. Salmon River trap daily catch of hatchery chinook salmon and wild chinook salmon overlaid by Salmon River discharge, 1994.



□ Hatchery Steelhead ■ Wild Steelhead — Lower Granite QD - - Salmon River QD

Figure 9. Salmon River trap daily catch of hatchery steelhead trout and wild steelhead trout overlaid by Salmon River discharge, 1994.

April 18 and peaked on April 19. Numbers collected remained above 25/d for four days following April 19. Passage began to increase again on May 6 and reached its maximum on May 8. Wild steelhead trout continued to be collected in low numbers (<16/d) until June 8. Following June 8, catch rates dropped to zero and remained at that level for the remainder of the trapping season. Approximately 53% of the season total was captured in April, 43.2% in May, and 3.6% in June. The 1994 total catch of wild steelhead trout was nearly 41% less than the total catch in 1993.

Salmon River discharge in March, measured at the White Bird gauge, ranged from 3.8 kcfs to 5.1 kcfs and averaged 4.4 kcfs. Average March discharge in 1994 was 1.2 kcfs less than in 1993 and 1992 but similar to that experienced in 1991. Discharge increased in April and ranged from 5.2 kcfs to 23.3 kcfs. The April average discharge of 10.7 kcfs was 2.0 kcfs higher than in 1993 but slightly lower than in 1992 and 4.0 kcfs higher than in 1991. May average discharge was 20.3 kcfs and ranged from 12.1 kcfs to 31.4 kcfs. May average discharge for 1993, 1992, and 1991 was 38.9 kcfs, 19.5 kcfs, and 18.9 kcfs, respectively.

Water temperature at the Salmon River trap was 6.5°C at the beginning of the field season. Water temperatures gradually increased throughout the field season to a maximum of 14.5°C (Figure 10).

Secchi disk transparency in the Salmon River fluctuated throughout the trapping season and ranged from 0.5 m to 2.1 m (Figure 10).

Travel Time and Migration Rates

Release Sites to Snake River Trap

Hatchery Chinook Salmon-In 1994, 69 hatchery chinook salmon were interrogated at the Snake River trap. Chinook salmon released in the Imnaha River and captured at the Snake River trap migrated the distance in 7 to 28 d with the mean travel time being 11 d. Mean travel time for 15 McCall Hatchery fish released on the South Fork of the Salmon River at the Knox Bridge was 19 d. Mean travel time for 10 Rapid River Hatchery fish was 12 d.

Eleven hatchery chinook salmon tagged at the Salmon River trap were interrogated at the Snake River trap. Travel time ranged from 2 to 5 d and averaged 3 d.

Wild Chinook Salmon-In 1994, 37 wild chinook salmon were interrogated at the Snake River trap. Eleven of the fish were tagged in the spring of 1994, four of which were tagged at the Salmon River trap, and 26 were marked in the summer/fall of 1993.

Hatchery Steelhead Trout-In 1994, 76 PIT-tagged hatchery steelhead trout were interrogated at the Snake River trap. Twenty-one of those had been PIT-tagged, released from the Snake River trap, and subsequently recaptured. Mean travel time of one group reared at Irrigon Hatchery and

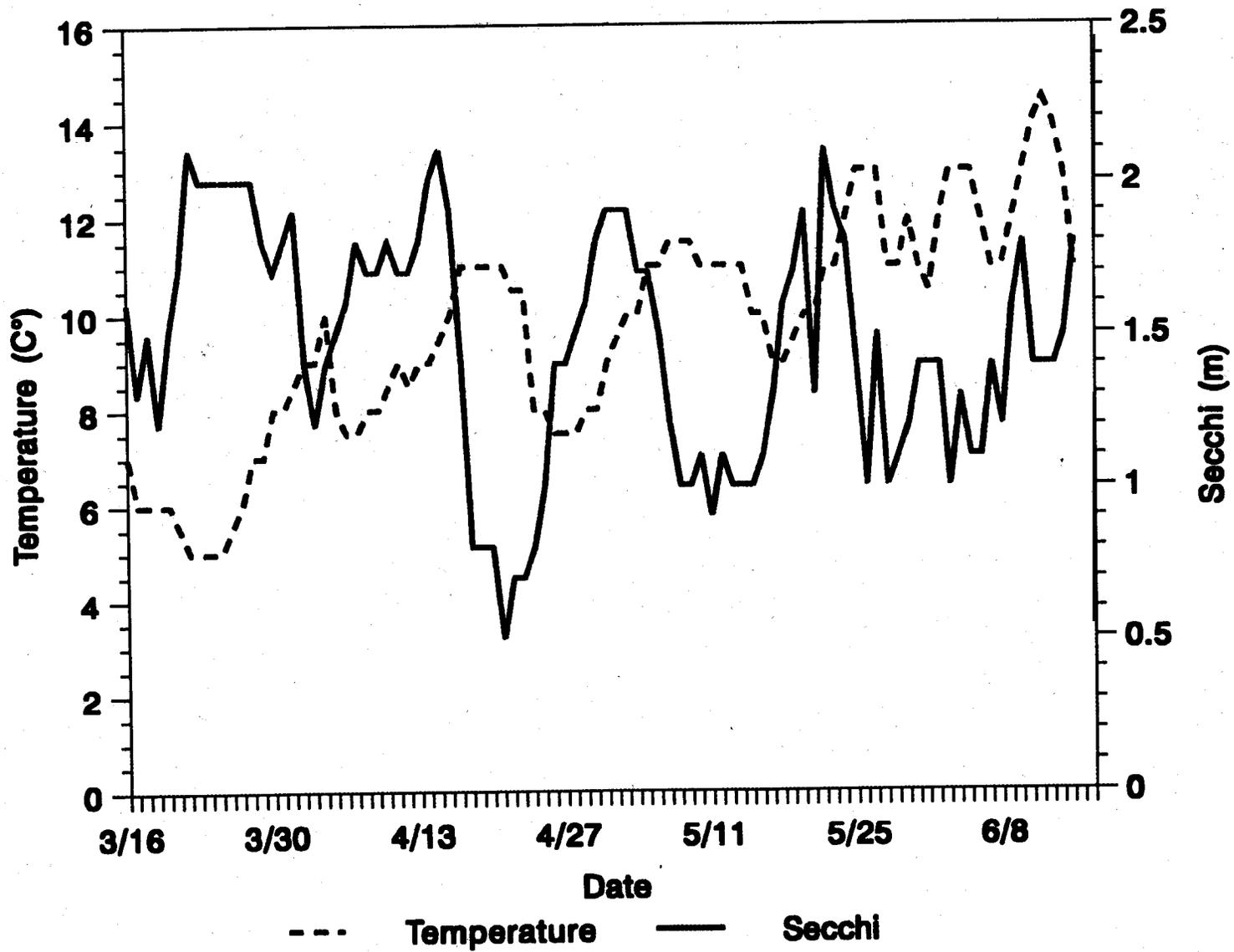


Figure 10. Daily temperature and secchi disk transparency at the Salmon River trap, 1994.

released at Big Canyon facility was about 7 d (28 km/d). The Snake River trap interrogated 1.75% (10 fish) of this group. Six fish from the Little Sheep Creek group were interrogated at the trap, four of which had a mean travel time of 13 d and two whose travel time average was 64 d. The interrogation rate for this group was 0.9% at the trap. Three fish from the Wallowa Hatchery release site were interrogated at the trap with a mean travel time of 10 d and an interrogation rate of 1.2% (3 fish). The Hells Canyon release groups' mean travel time was about 13 d (13 km/d) with 1.5% (3 fish) being interrogated at the trap. Three fish from the Hazard Creek release were interrogated at the trap with a mean travel time of 9 d and an interrogation rate of 1.0% (3 fish).

Eight hatchery steelhead trout tagged at the Salmon River trap were interrogated at the Snake River trap. Travel time varied from six days to one day.

Wild Steelhead Trout-In 1994, there were 20 PIT-tagged wild steelhead trout interrogated at the Snake River trap. Three were PIT-tagged in the Grande Ronde River, five from the Imnaha River trap, one from the Pahsimeroi River trap, one from Rapid River, three from the Salmon River trap and six from the Snake River trap.

Sockeye Salmon-In 1994, there were two sockeye salmon interrogated at the Snake River trap. Both were tagged and released from the Redfish Lake Creek trap in early May.

Release Sites to the Clearwater River Trap

Hatchery Chinook Salmon-In 1994, there were 229 PIT-tagged hatchery chinook salmon interrogated at the Clearwater River trap. Dworshak National Fish Hatchery releases accounted for 158 interrogations, 8 from Kooskia National Fish Hatchery, 12 from Papoose Creek, 33 from the Powell Rearing Pond, 16 from the Crooked River trap, and one each from Pete King Creek and White Sand Creek. Because of the short distance between Dworshak National Fish Hatchery and the trap, fish generally took less than a day to arrive at the trap. Mean travel time for Kooskia National Fish Hatchery chinook was about 2 d, the Papoose Creek chinook was about 5 d, the Powell Rearing Pond chinook was about 7 d, and the Crooked River trap fish was about 4 d.

Wild Chinook Salmon-In 1994, there were 22 PIT-tagged wild chinook salmon interrogated at the Clearwater River trap. Release locations for the interrogated fish were as follows: Crooked Fork Creek (3), Clear Creek (2), Crooked Creek (4), Lolo Creek (6), Red River (3), and the lower Clearwater River (3 fall chinook). Release location was not available for one fish.

Hatchery Steelhead Trout-In 1994, two PIT-tagged hatchery steelhead trout were interrogated at the Clearwater River trap. The majority of the PIT-tagged hatchery steelhead passed the trap during periods of high discharge, when the trap was positioned away from the main current.

Wild Steelhead Trout-In 1994, five PIT-tagged wild steelhead trout were interrogated at the Clearwater River trap. Two of these fish had been released at Fish Creek, two from the Clearwater River trap, and release location was not available for one fish.

Release Sites to the Salmon River Trap

Hatchery Chinook Salmon-In 1994, 44 PIT-tagged hatchery chinook salmon were interrogated at the Salmon River trap. Only two release groups had enough fish interrogated at the trap to calculate travel time; one group was released in the South Fork Salmon River and one from Rapid River Hatchery. Mean travel time for fish from the South Fork Salmon River was 16 d and for the Rapid River group was 7 d.

Wild Chinook Salmon-In 1994, 52 PIT-tagged wild chinook salmon were interrogated at the Salmon River trap. Twenty-eight were from summer and fall tagging on Marsh Creek, 12 from fall and spring tagging on the South Fork Salmon River, 4 from the Pahsimeroi River, 1 from Beaver Creek, 2 from Big Creek, 1 from French Creek, 1 from Chamberlain Creek, 1 from the East Fork Salmon River, 1 from Valley Creek, and 1 from the Sawtooth trap.

Hatchery Steelhead Trout-In 1994, two PIT-tagged hatchery steelhead trout were interrogated at the Salmon River trap.

Wild Steelhead Trout-In 1994, five PIT-tagged wild steelhead, trout were interrogated at the Salmon River trap.

Sockeye Salmon-In 1994, one PIT-tagged wild sockeye salmon was interrogated at the Salmon River trap.

Head of Lower Granite Reservoir to Lower Granite Dam

The PIT tag sample rate at the dams changed significantly during the 1994 outmigration mainly due to the initiation of spill. This is the second year since the smolt monitoring project began. PIT tagging in 1987 that a significant period of spill occurred. The following example illustrates how median travel time estimates are affected by spill.

A group of fish tagged and released at the Snake River trap passes Lower Granite Dam over a ten-day period. When spill occurs, the facility sampling efficiency for these fish is decreased because a portion of the fish that would normally be sampled, instead pass via spill. Spill during the second half of the passage period could cause the number of fish during that half to be underestimated, making the date the median fish passed Lower Granite earlier than the actual date. Likewise, spill during the first half of the passage period would artificially

during the first half of the passage period would artificially shift the date of median passage later than the true date. The calculation of mean discharge for the median migration period is affected by the incorrect estimate of the median migration period. If discharge were increasing for the passage period of the above group and spill occurred during the second half thereby making the date of median passage earlier, then mean discharge for that group is also underestimated.

Another effect spill may have on migration rate is that the more highly smolted fish are more buoyant and migrate higher in the water column. They are also the fastest migrating fish (Beeman and Rondorf, in press). The ten-foot-deep debris boom in front of the turbines at Lower Granite Dam may divert a greater portion of these higher floating fish to the spill where they are not interrogated. A greater portion of the deeper migrating, slower moving fish may migrate through the powerhouse and be collected and subsequently interrogated (Giorgi et al. 1988). This type of bias would incorrectly estimate migration rate with the estimated median migration rate being less than the true rate. This makes any interpretation of the PIT tag data at the dams extremely difficult during the periods of major operational changes.

Hatchery Chinook Salmon PIT Tag Groups-In 1994, hatchery chinook salmon smolts were PIT-tagged at the Snake River trap to provide travel time information through Lower Granite Reservoir. Thirty daily PIT tag groups (2,759 total PIT-tagged hatchery chinook salmon) were released from the Snake River trap between April 13 and May 14 (Appendix A, Table A-1), providing median travel time estimates ranging from 11.0 d (4.9 km/d) in mid-April to 3.25d (15.9 km/d) in early May.

Data stratified by 5-kcfs groups (Table 4) were used in a linear regression analysis. Migration rate was significantly related to discharge, indicating that PIT-tagged chinook salmon migration rate increased in Lower Granite Reservoir as discharge increased (Table 5).

Sixteen daily groups (totaling 1,934 hatchery chinook salmon) were released from the Clearwater River trap between April 9 and April 30 (Appendix A, Table A-5), providing median travel time estimates ranging from 24.7 d (2.5 km/d) in early April to 11.1 (5.5 km/d) in late April.

Migration rate and discharge data stratified by 5-kcfs groups (Table 6) were used for a linear regression analysis. The linear regression analysis of the Clearwater River hatchery chinook salmon PIT tag data showed a significant correlation between migration rate and discharge (Table 5). The regression analysis showed that 64% of the variation in migration rate was accounted for by change in discharge.

The hatchery chinook salmon migration rate/discharge relation for Snake River trap PIT tag groups was examined to determine if there was a difference in this relation among the seven years of available data (1988-1994). Due to the inability to differentiate between hatchery and wild, the 1988 through 1992 chinook salmon data were a combination of both hatchery and wild. Probably less than 10% of the chinook PIT-tagged in those years were wild. The analysis of covariance was used with the data averaged

Table 4. Migration rates (km/d), stratified by 5-kcfs intervals from the Snake River trap to Lower Granite Dam, 1994.

Discharge interval	Hatchery chinook	Wild chinook	Hatchery steelhead	Wild steelhead
35 - 40	-	-	-	8.40
40 - 45	-	-	7.20	-
45 - 50	-	-	-	-
50 - 55	5.33	-	-	-
55 - 60	5.10	-	8.80	14.90
60 - 65	-	-	12.10	-
65 - 70	8.10	-	11.88	14.30
70 - 75	5.81	8.80	12.04	15.47
75 - 80	7.77	8.16	13.41	15.11
80 - 85	11.12	-	13.85	17.80
85 - 90	11.83	-	17.20	16.02
90 - 95	11.80	-	13.30	16.00

Table 5. Linear regression statistics for migration rate/discharge relation by species, rearing type, and trap, using data stratified by 5-kcfs intervals, 1994.

Species	Trap	N	Intercept	Slope	r ²	
Hatchery chinook	SNK	8	-5.050	1.649	0.800	0.003
	CLW	6	-2.883	0.993	0.784	0.019
	SAL	9	-1.300	1.022	0.644	0.009
wild chinook	SNK	2				
	CLW					
	SAL	11	-1.003	0.964	0.685	0.002
Hatchery steelhead	SNK	9	-1.892	1.020	0.850	<0.001
	CLW	4	-4.423	1.570	0.502	0.292
	SAL	7	-5.288	1.994	0.940	<0.001
Wild steelhead	SNK	8	-0.515	0.745	0.827	0.002
	CLW	5	-1.939	1.079	0.911	0.012
	SAL	6	-1.829	1.293	0.595	0.073

Table 6. Migration rates (km/d), stratified by 5-kcfs intervals from the Clearwater River trap to Lower Granite Dam, 1994.

<u>Discharge interval</u>	<u>Hatchery chinook</u>	<u>Wild chinook</u>	<u>Hatchery steelhead</u>	<u>Wild steelhead</u>
35 - 40	-	-	-	7.60
40 - 45	-	-	-	0.00
45 - 50	-	-	-	0.00
50 - 55	2.80	-	-	0.00
55 - 60	3.70	-	-	0.00
60 - 65	3.50	-	-	14.20
65 - 70	3.70	-	10.50	14.10
70 - 75	3.84	-	9.54	13.10
75 - 80	4.55	-	10.30	17.45
80 - 85	-	-	14.50	-

by 5-kcfs groups. The analysis showed a significant difference in the slope of the migration rate/discharge relation between years at the 0.05 level of significance ($F=6.899$, $N=69$, $P<0.001$). A graph of the data showed that 1989 data had a slightly steeper slope (Figure 11). With the 1989 data removed, a significant difference in the slopes was not detected ($F=1.034$, $N=59$, $P=0.409$). The analysis of variance was used to determine if there was a sufficient overlap in the covariate (discharge) between years to continue with the analysis of covariance ($F=8.654$ $N=59$, $P<0.000$). Because of the violation of this assumption of equal range in discharge between years the analysis of covariance can not be continued.

Comparing the 1988 through 1994 migration rate/discharge equations for Chinook, it is apparent that in the discharge range between 30 and 150 kcfs, all years showed the same basic pattern: as discharge increases, migration rate increases (Figure 11). The amount of increase between 60, and 100 kcfs is consistent for 1988 and for 1990 to 1994 (two-fold) but slightly higher for 1989 (three-fold).

Thirty-two daily groups (totaling 3,369 hatchery chinook salmon) were released from the Salmon River trap from April 10 through May 11 (Appendix A, Table A-9), providing median travel time estimates ranging from 16.0 d (13.5 km/d) in early April to 6.3 d (34.2 km/d) in early May.

Data stratified by 5-kcfs groups (Table 7) were used in the regression analysis. The linear regression analysis of the Salmon River hatchery chinook salmon PIT tag data showed a strong correlation between migration rate and discharge (Table 5).

Wild Chinook Salmon PIT Tag Groups-In 1994, wild chinook salmon smolts were PIT-tagged at the Snake River trap to provide travel time information through Lower Granite Reservoir. Ten daily groups (totaling 553 wild chinook salmon) were released from the Snake River trap from April 19 through April 29 (Appendix A, Table A-2).

Mean discharge for the median migration period varied between 68 and 75 kcfs. When data is stratified by 5-kcfs groups (Table 4), all data is compressed into only two discharge intervals and the regression analysis can not be conducted.

In 1994, 738 wild chinook salmon were PIT-tagged at the Clearwater River trap for migration rate analysis. Not enough data were available to develop the migration rate/discharge relation for wild chinook salmon.

In 1994, wild chinook salmon smolts were PIT-tagged at the Salmon River trap to provide travel time information through Lower Granite Reservoir. Thirty-six daily groups (totaling 2,566 wild chinook salmon) were released from the Salmon River trap from March 31 through May 11 (Appendix A, Table A-10)

Data stratified by 5-kcfs groups (Table 7) were used in the regression analysis. The linear regression analysis of the Salmon River wild chinook salmon PIT tag data detected a significant correlation between migration rate and discharge (Table 5).

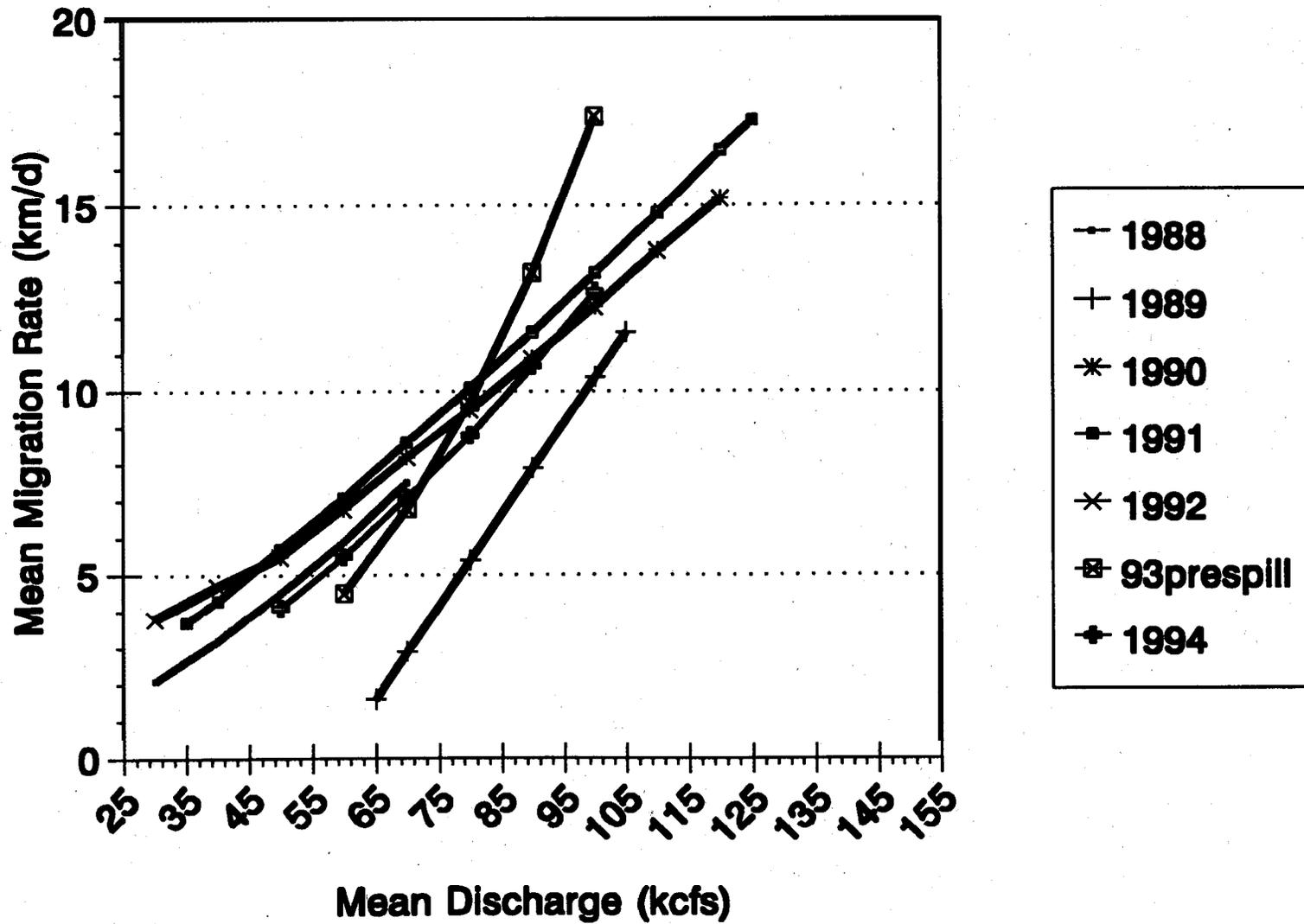


Figure 11. Chinook salmon migration rate/discharge relations for Snake River trap PIT tag groups, 1988-1994.

Table 7. Migration rates (km/d), stratified by 5-kcfs intervals from the Salmon River trap to Lower Granite Dam, 1994.

Discharge interval	Hatchery chinook	Wild chinook	Hatchery steelhead •	Wild steelhead
35 - 40		10.65	-	-
40 - 45	-	14.23	9.20	-
45 - 50	13.90	14.90	12.20	-
50 - 55	16.50	18.97	-	-
55 - 60	17.20	23.95	-	-
60 - 65	18.35	27.00	-	31.80
65 - 70	18.00	25.35	31.20	47.30
70 - 75	14.83	17.69	30.16	37.34
75 - 80	20.23	21.98	27.72	52.40
80 - 85	27.68	27.35	35.45	47.80
85 - 90	28.43	25.60	35.50	52.80

Hatchery Steelhead Trout PIT Tag Groups-Sufficient numbers of hatchery steelhead trout were PIT-tagged daily at the Snake River trap to provide 37 daily release groups (3,213 individual fish) for median migration rate calculations through Lower Granite Reservoir. Median travel time ranged from 7.1 to 2.4 d (7.2 km/d to 21.1 km/d migration rate) and averaged 4.3 d (12.8 km/d), which was 65% as fast as in 1993 (Appendix A, Table A-3). Inflow discharge during the period when the PIT tag groups migrated through the reservoir averaged 75 kcfs in 1994, which was 78% of the average discharge level in 1993 (96 kcfs).

Linear regression analysis detected a significant relation between migration rate in Lower Granite Reservoir and average Lower Granite inflow (Table 4) for PIT-tagged hatchery steelhead trout groups (Table 5). The equation shows that as discharge increases, migration rate increases.

The hatchery steelhead trout migration rate/discharge relation for Snake River trap PIT tag groups was examined to determine if there was a difference in this relation between years (1988-1994). The analysis of covariance was used with the data averaged by 5-kcfs groups. The analysis showed a significant difference in the slope of the migration rate/discharge relation between years ($F=6.902$, $N=84$, $P<0.001$).

The slope of the regression line for 1988, 1992, and 1994 was slightly less steep than the other years' data (Figure 12). Interestingly, these three years are the poorest flow years of the present drought. After removing the three years' data, a significant difference in the slopes was not detected between the remaining years ($F=0.267$, $N=49$, $P=0.849$). The analysis of covariance was continued and a significant difference was detected in the intercepts (heights) of the four years' data ($F=4.261$, $N=49$, $P=0.010$). Figure 12 shows the differences are minor, so the data were pooled, despite the difference in the height of the lines, and the regression analysis was run. A very strong relation was found between migration rate and discharge ($r^2=0.899$, $N=49$, $P<0.001$). The linear regression equation was:

$$\ln (\text{migration rate}) = -4.408 + 1.605 \ln (\text{mean discharge}).$$

The analysis of covariance was used with the three years' data (1988, 1992, and 1994), which were removed from the above analysis, and no significant difference between years was detected ($F=0.013$, $N=27$, $P=0.987$); The analysis of covariance was continued and a significant difference was detected in the intercepts (heights) of the three years' data ($F=4.618$, $N=27$, $P=0.021$). Figure 12 shows that the differences are not major, so the data were pooled despite the difference in the height of the lines and the regression analysis was run. A very strong relation was found between migration rate and discharge ($r^2=0.865$, $N=27$, $P<0.001$). The linear regression equation was:

$$\ln (\text{migration rate}) = -2.568 + 1.163 \ln (\text{mean discharge}).$$

Using the two data sets from above, a 2-fold increase in discharge will translate into a 3.0-fold increase in migration rate through Lower Granite Reservoir for the first group and a 2.2-fold increase for the second group of hatchery steelhead marked at the Snake River trap. Fish from the three severe drought years had slightly faster migration rates below 65 kcfs and slightly slower migration rates above 65 kcfs than do fish

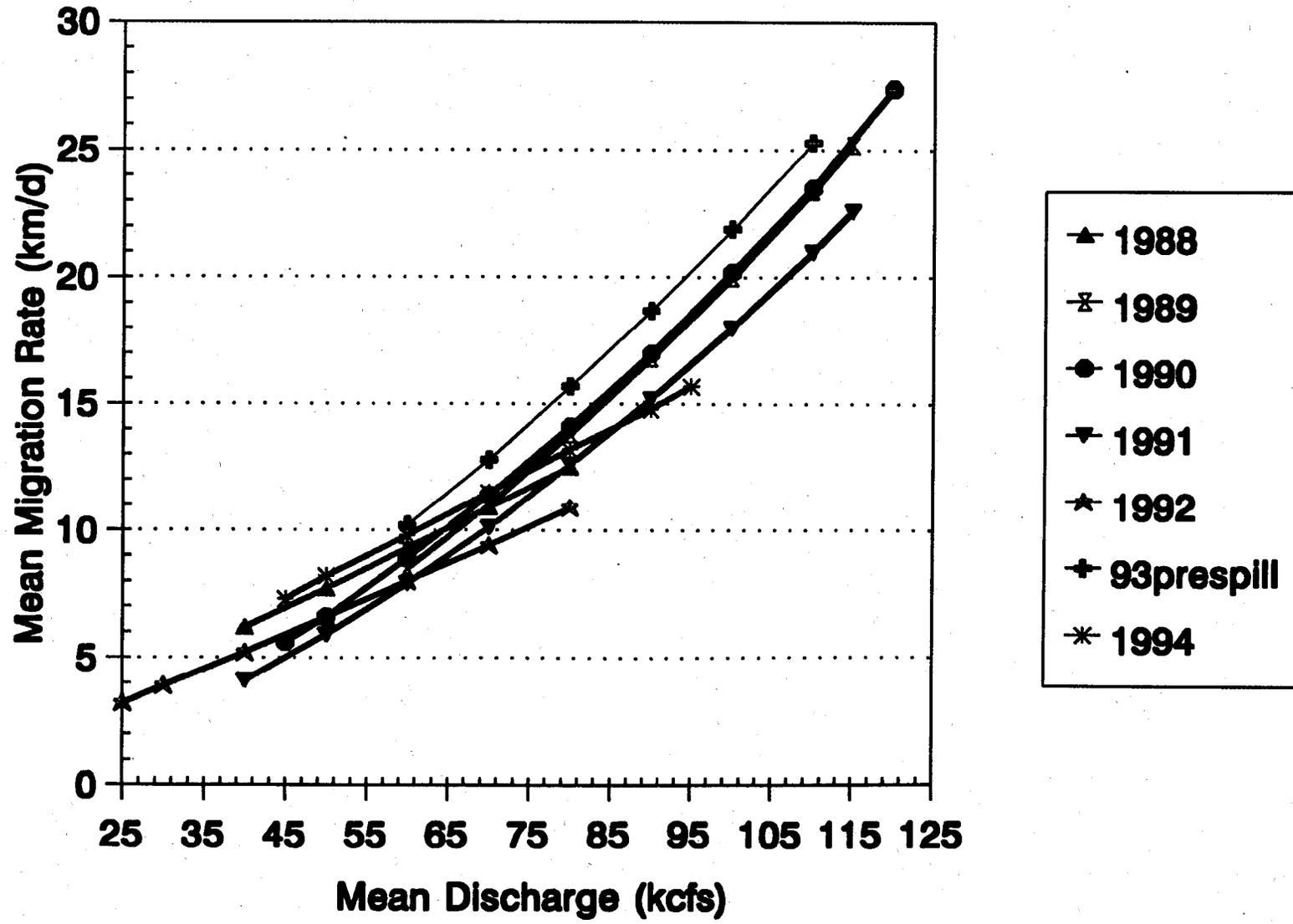


Figure 12. Hatchery steelhead migration rate/discharge relations for Snake River trap PIT tag groups, 1988-1994.

from the higher flow years, implying the importance to fish migration of other factors (water temperature, migration timing, stock, smoltification, etc.) are greater in low flow years.

Sixteen groups of hatchery steelhead trout (1,136 fish) were PIT-tagged at the Clearwater River trap in 1994 for use in median migration rate calculations through Lower Granite Reservoir (Appendix A, Table A-7). Median travel time ranged from 7.6 to 4.3 d (8.1 km/d to 14.5 km/d) and averaged 6.2 d (10.2 km/d).

Data stratified by 5-kcfs groups were used in the regression analysis (Table 6). The linear regression analysis failed to detect a significant relation between migration rate in Lower Granite Reservoir and average Lower Granite inflow discharge for Clearwater River PIT-tagged hatchery steelhead trout. The reason the analysis did not detect a significant relation was because the discharge Variable covered too narrow a range.

Twenty-seven groups of hatchery steelhead trout (2,401 fish) were PIT-tagged at the Salmon River trap in 1994 for use in median migration rate calculations to Lower Granite Reservoir (Appendix A, Table A-11). Median travel time ranged from 23.3 to 4.8 d (9.2 km/d to 44.9 km/d) and averaged 8.3 d (29.2 km/d). Average inflow discharge to Lower Granite Reservoir during the period PIT tag groups were migrating through the reservoir was 73 kcfs.

Data stratified by 5-kcfs groups were used in the regression analysis (Table 7). The linear regression analysis detected a significant relation between migration rate in Lower Granite Reservoir and average Lower Granite discharge for PIT-tagged hatchery steelhead trout groups marked at the Salmon River trap (Table 5). The equation shows that as discharge increases, migration rate increases.

Wild Steelhead Trout PIT Tag Groups-Sufficient numbers of wild steelhead trout were PIT-tagged at the Snake River trap to provide 31 daily release groups (2,534 fish) for estimating travel time and migration rate to Lower Granite Dam (Appendix A, Table A-4). Median travel time ranged from 6.1 d (8.4 km/d) to 2.5 d (20.4 km/d) and averaged 3.5 d (15.3 km/d).

Data stratified by 5-kcfs groups were used in the regression analysis (Table 4). Linear regression analysis showed a strong significant relation between median migration rate in Lower Granite Reservoir and mean discharge for PIT-tagged wild steelhead trout groups (Table 5). The analysis shows that 83% of the variation in migration rate is accounted for by changes in discharge. In other words, migration rate is very dependent on discharge; the higher the discharge, the faster wild steelhead trout migrate.

The wild steelhead trout migration rate/discharge relation for fish released from the Snake River trap was examined to see if this relation was constant over years. The analysis of covariance was used to determine if there was a significant difference between years (1988-1994) in migration rates using groups averaged by 5-kcfs intervals. The analysis showed no significant difference in the slopes between years for wild steelhead trout migration rate/discharge relations ($F=1.756$, $N=73$, $P=0.124$). The analysis was continued and no significant difference was detected in the intercepts (heights) of the regression lines between years ($F=0.877$, $N=73$, $P=0.517$).

The data were pooled and the linear regression analysis was run using the log transformed data ($r^2=0.836$, $N=73$, $P<0.001$). The best linear regression equation was:

$$\ln (\text{migration rate}) = -1.805 + 1.051 \ln (\text{mean discharge}).$$

The analysis indicates that 84% of the variation in migration rate for PIT-tagged wild steelhead trout released from the Snake River trap between 1988 and 1994 was accounted for by changes in discharge. The equation shows that a two-fold increase in discharge will increase migration rate 2.1 times.

Eight wild steelhead trout PIT-tagged groups (1,267 fish) were released from the Clearwater River trap in 1994 for median migration rate calculations through Lower Granite Reservoir (Appendix A, Table A-8). Median travel time ranged from 9.3 d to 2.9 d (6.6 to 21.1 km/d respectively) and averaged 5.2 d (13.1 km/d).

Data stratified by 5-kcfs groups were used in the regression analysis (Table 6). The linear regression analysis showed a significant relation between migration rate and discharge for wild steelhead trout groups released from the Clearwater River trap (Table 5). The analysis indicates that 91% of the variation in wild steelhead trout migration rate for fish released from the Clearwater River trap is accounted for by changes in discharge. Discharge is a very important variable associated with the rate of movement of wild steelhead trout in the Lower Granite Reservoir. As discharge increases, so does migration rate.

Twelve groups of wild steelhead trout (408 fish) were PIT-tagged at the Salmon River trap in 1994 for use in median migration rate calculations to Lower Granite Dam (Appendix A, Table A-12). Seven of the 12 groups were associated with a single discharge range of 70-75 kcfs. Median travel time ranged from 7.4 to 4.1 d (29.1 km/d to 52.8 km/d) and averaged 5.5 d (41.1 km/d). Average inflow to Lower Granite Reservoir during the period PIT tag groups were migrating through the reservoir was 74 kcfs. Because of lack of data over a wide range of discharge, the linear regression analysis failed to detect a significant relation between migration rate and discharge for PIT-tagged wild steelhead trout groups (Table 5).

Age 0 Chinook Salmon Migration Rate and Interrogation Rate

In 1994, only 30 age 0 chinook salmon were PIT-tagged at the Snake River trap and 21 on the Clearwater River trap. Not enough data are available to perform a statistical analysis between migration rate and discharge or to calculate interrogation rate for age 0 chinook salmon in 1994.

Interrogation Rate of PIT-Tagged Fish

Interrogation data in 1994 are not directly comparable with the earlier years. All species-run-rearing types will be underestimated due to a reduction in collection efficiency during spill at the dams. During other times of the season the interrogation rate may vary sporadically due to

fluctuations in turbine operations. The fourth collection facility in the system, at Lower Monumental Dam, became operational in 1993 and therefore total interrogations may be greater in 1993 and 1994 than in previous years. Therefore, any comparison in trends of cumulative detections at dams must be done cautiously, in a manner that incorporates these additional factors.

Interrogation rate of Snake River trap daily release groups for PIT-tagged hatchery chinook salmon and wild chinook salmon at Lower Granite Dam, after combining to remove groups with inadequate sample size, ranged from 10.9% to 45.0% and 8.0% to 62.5% respectively (Appendix B, Tables B-1, B-2). Cumulative interrogation rate (including Lower Granite, Little Goose, Lower Monumental, and McNary dams) ranged between 39.6% and 84.2% and averaged 62.2% for hatchery fish. Wild chinook salmon ranged between 38.2% and 83.3% and averaged 65.7% (Table 8).

Interrogation rate of Clearwater River trap daily release groups for PIT-tagged hatchery chinook salmon and wild chinook salmon at Lower Granite Dam, after combining to remove groups with inadequate sample size, ranged from 4.0% to 40.2% and 36.0% to 62.5%, respectively (Appendix B, Table B-5, B-6). Percent interrogation for wild chinook salmon tagged at the Clearwater River trap may be misleading because of low sample size and a lack of marked fish after April 22. Cumulative interrogation, including Lower Granite, Little Goose, Lower Monumental, and McNary dams, ranged between 20.0% and 73.8% and averaged 56.4% for hatchery chinook (Table 8). Wild chinook salmon ranged between **64.9%** and 93.8%, and averaged 68.9% (Table 8).

Interrogation rates of Salmon River trap daily release groups for PIT-tagged hatchery chinook salmon and wild chinook salmon at Lower Granite Dam, after combining to remove groups with inadequate sample size, ranged from 10.9% to 46.0% and averaged 23.9% for hatchery fish (Appendix B, Table B-9). Wild chinook salmon ranged from 15.4% to 61.2% and averaged 30.8% (Appendix B, Table B-10). Hatchery chinook cumulative interrogation, including Lower Granite, Little Goose, Lower Monumental, and McNary dams, ranged from 26.2% to 66.0% and averaged 49.6%. Wild chinook salmon cumulative interrogation rates ranged between 39.1% and 86.7%, and averaged 49.5% (Table 8).

Percent interrogation of Snake River trap hatchery steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove groups with small sample size, ranged from 0% to 84.5% and averaged 40.1% (Appendix B, Table B-3). Seasonal cumulative interrogation rate of PIT-tagged hatchery steelhead trout to Lower Granite, Little Goose, Lower Monumental, and McNary dams ranged between 2.5% and 97.4%, and averaged 51.4% (Table 8).

Percent interrogation of Clearwater River trap hatchery steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove groups with small sample size, ranged from 11.3% to 94.9% and averaged 58.3% (Appendix B, Table B-7). Interrogation rates at Lower Granite, Little Goose, Lower Monumental, and McNary dams, combined, for Clearwater River trap hatchery steelhead trout daily PIT tag release groups ranged from 24.3% to 98.3% and averaged 71.0% (Table 8).

Percent interrogation of Salmon River trap hatchery steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove

Table 8. Interrogations of PIT-tagged fish from the Snake River trap, 1987-1994; Clearwater River trap, 1989-1994; and Salmon River trap, 1993-1994, at downstream collection facilities.

Site	Year	Species	Number Tagged	Number Interrogated/Site									
				Lower Granite		Little Goose		Lower Monumental		McNary		Total	
				No	%	No	%	No	%	No	%	No	%
Snake	1994	CH	2,844	885	31.1	332	11.7	223	7.8	329	11.	1,769	62.2
	1993	CH	3,203	1,336	41.7	494	15.4	246	7.7	134	4.2	69.0	65.7
	1992	CH	410	166	40.5	83	20.2	-	-	48	11.7	297	72.4
	1994	CW	934	354	37.9	95	10.2	82	8.8	83	8.9	614	65.7
	1993	CW	1,125	576	51.1	150	13.3	57	5.1	46	4.1	828	73.6
	1992	CU	615	249	40.5	106	17.2	-	-	72	11.	427	69.4
	1991	CU	2,131	929	43.6	409	19.2	-	-	115	5.4	1,453	68.2
	1990	CU	2,245	956	42.6	310	13.8	-	-	180	8.0	1,446	64.4
	1989	CU	6,222	2,387	38.3	1,367	22.0	-	-	482	7.7	4,233	68.0
	1988	CU	3,767	1,237	32.8	543	14.4	-	-	299	7.9	2,079	55.2
	1987 ^b	CU	3,275	1,067	32.9	338	10.3	-	-	308	9.4	1,713	52.3
	1994	SH	3,239	1,298	40.1	216	6.7	112	3.5	40	1.2	1,666	51.4
	1993	SH	2,521	1,925	76.4	235	9.3	63	2.5	13	0.5	2,236	88.7
	1992	SH	3,904	1,496	38.3	227	5.8	-	-	30	0.8	1,753	44.9
	1991	SH	2,577	2,032	78.9	268	10.4	-	-	11	0.4	2,311	89.7
	1990	SH	3,112	2,272	73.0	282	9.1	-	-	33	1.1	2,587	83.1
1989	SH	2,525	1,77	70.2	268	10.6	-	-	35	1.4	2,076	82.2	

Table 8. Continued.

Site	Year	Species	Number Interrogated/Site										
			Number Tagged	Lower Granite		Little Goose		Lower Monumental		McNary		Total	
				No	%	No	%	No	%	%	I	No	%
Snake	1988	SH	1,743	1,069	61.3	190	10.9	-		12	0.7	1,271	72.9
	1987	SH	827	324	39.2	52	6.3		-	6	0.7	382	46.2
	1994	SW	2,840	1,546	54.4	319	11.2	158	5.6	51	1.8	2,074	73.0
	1993	SW	2,867	1,982	69.1	267	9.3	133	4.6	32	1.1	2,414	84.2
	1992	SW	2,538	1,511	59.5	307	12.1			31	1.2	1,849	72.9
	1991	SW	3,549	2,266	63.9	625	17.6	-	-	66	1.9	2,957	83.3
	1990	SW	3,078	2,016	65.5	356	11.6	-		60	2.0	2,432	79.0
	1989	SW	1,798	1,170	65.1	240	13.3	-		52	2.9	1,462	81.3
	1988	SW	1,186	698	58.9	166	14.0	-	-	20	1.7	884	74.5
	1987	SW	464	229	49.4	48	10.3	-		8	1.7	285	61.4
Clearwater		CH	1,998	500	25.0	192	9.6	188	9.4	247	12.4	1,127	56.4
	1993	CH	1,624	553	34.1	193	11.9	106	6.5	77	4.7	929	57.2
	1992	CH	5,200	1,654	31.8	745	14.3	-		429	8.3	2,828	54.4
	1994	CW	761	308	40.5	94	12.4	81	10.6	41	5.4	524	68.9
	1993	CW	298	134	45.0	43	14.4	25	8.4	18	6.0	220	73.8

Table 8. Continued.

Site	Year	Species	Number Interrogated/Site										
			Number	Lower Granite		Little Goose		Lower Monumental		McNary	Total		
			Tagged	No	%	No	%	No	%	No	\$	No	%
Clearwater	1992	CU	1,461	502	34.4	202	13.8	-	-	136	9.3	840	57.5
	1991	CU	3,943	1,483	37.6	668	16.9	-	-	235	6.0	2,386	60.5
	1990	CU	4,242	1,359	32.0	674	15.9	-	-	281	6.6	2,314	54.6
	1989	CU	2,441	756	31.0	452	18.5	-	-	140	5.7	1,348	55.2
	1994	SH	1,250	729	58.3	119	9.5	30	2.4	10	0.8	888	71.0
	1993	SH	1,102	813	73.8	79	7.2	24	2.2	6	0.5	922	83.7
	1992	SH	1,567	823	52.3	118	7.5	-	-	6	0.4	947	60.4
	1991	SH	1,215	926	76.2	89	7.3	-	-	3	0.3	1,018	83.8
	1990	SH	1,228	880	71.7	63	5.1	-	-	10	0.8	953	77.6
	1989	SH	290	173	59.7	16	5.5	-	-	2	0.7	191	65.9
	1994	SW	1,297	421	32.5	150	11.6	106	8.2	24	1.9	701	54.0
	1993	SW	849	560	66.0	106	12.5	58	6.8	9	1.1	733	86.3
	1992	SW	2,996	1,599	53.4	477	15.9	-	-	113	3.8	2,189	73.1
	1991	SW	1,300	767	59.0	126	9.7	-	-	22	1.7	915	70.4
	1990	SW	727	409	56.3	102	14.0	-	-	28	3.9	539	74.1
	1989	SW	104	53	51.0	16	15.4	-	-	3	2.9	72	69.2

Table 8. Continued.

Site	Year	Species	Number Interrogated/Site										
			Numbe Tagged	Lower Granite		Little Goose		Lower Monumental		McNary		Total No	
				No	%	No	%	No	%	No	%		
Salmon	1994	CH	3,633	870	23.9	322	8.9	258	7.1	358	9.9	1,808	49.6
	1993	CH	3,138	1,144	36.5		385	233	7.4	157	5.0	1,919	61.2
							112.						
	1994	CW	2,913	1,113	30.8	287	7.9	188	5.2	202	5.6	1,790	49.5
	1993	CW	2,169	1,112	51.3	286	13.2	125	5.8	91	4.2	1,614	74.4
	1994	SH	2,596	1,001	38.6	164	6.3	70	2.7.	36	1.4	1,271	48.9
	1993	SH	1,641	1,203	73.3	112	6.8	44	2.7	13	0.8	1,372	83.6
	1994	SW	532	260	48.9	44	8.2	32	6.0	10	1.9	346	65.0
1993	SW	902	575	63.7	73	8.1	36	4.0	5	0.6	689	76.4	

^aCH=hatchery chinook, CW=wild chinook, CU=unknown chinook, SH=hatchery steelhead, SW=wild steelhead.

^bBias may exist as only "quality" fish were tagged.

groups with small sample size, ranged from 11.1% to 82.8% and averaged 38.6% (Appendix B, Table B-11). Seasonal cumulative interrogation rate of PIT-tagged hatchery steelhead trout to Lower Granite, Little Goose, Lower Monumental, and McNary dams ranged between 14.8% and 87.9%, and averaged 48.9% (Table 8).

Percent interrogation of Snake River trap wild steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove groups with small sample size, ranged from 18.8% to 88.9% and averaged 54.4% (Appendix B, Table B-4). Cumulative interrogation rate of PIT-tagged wild steelhead trout to Lower Granite, Little Goose, Lower Monumental, and McNary dams, combined, ranged from 40.7% to 94.4% and averaged 73.0% (Table 8).

Percent interrogation of Clearwater River trap wild steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove groups with small sample size, ranged from 52.8% to 74.1% and averaged 63.8% (Appendix B, Table 8). The combined interrogation rates at Lower Granite, Little Goose, Lower Monumental, and McNary dams for daily wild steelhead trout PIT tag groups released from the Clearwater River trap ranged from 75.0% to 88.9% and averaged 85.6% (Table 8). Percent interrogation for Clearwater River wild steelhead may be misleading because the majority of fish (94%) were tagged over seven days in mid-April.

Percent interrogation of Salmon River trap wild steelhead trout daily PIT tag release groups at Lower Granite Dam, after combining to remove groups with small sample size, ranged from 32.5% to 82.4% and averaged 48.9% (Appendix B, Table B-12). The combined interrogation rates at Lower Granite, Little Goose, Lower Monumental, and McNary dams for daily wild steelhead trout PIT tag groups released from the Salmon River trap ranged from 31.2% to 94.1% and averaged 65.0% (Table 8).

SUMMARY

Hatchery chinook salmon releases above Lower Granite Dam were 144% of 1993 numbers but 74% of 1992's total. Hatchery steelhead trout releases remained stable at 1993 and 1992 numbers. Hatchery production of chinook salmon in the Clearwater River drainage was 261%, the Grande Ronde drainage 207%, and the Salmon River drainage 103% of 1993. Although total hatchery steelhead trout production above Lower Granite was about the same as in 1993, production in the Clearwater River drainage was 99%, the Grande Ronde was 104%, and the Salmon River was 105% of last year's total. Hatchery production of chinook salmon and steelhead trout released above Lower Granite Dam was 8,049,403 and 9,351,931, respectively, in 1994.

The Snake River trap was operated on the east side of the river from March 14 through July 19, but was out of operation for two days during this period due to high flow and mechanical failures. The Snake River trap captured 22,342 age 1 hatchery chinook salmon, 1,471 wild chinook salmon, 55 age 0 chinook salmon, 31,662 hatchery steelhead trout, and 3,439 wild steelhead trout.

The Clearwater River trap was operated from March 14 through July 28. The trap was out of operation for two days during the season due to

mechanical failure. Clearwater River trap catch was 32,789 age 1 hatchery -chinook salmon, 1,343 age 1 wild chinook salmon, 31 age 0 chinook salmon, 4,615 hatchery steelhead trout, and 1,798 wild steelhead trout.

The Salmon River trap operation began on March 16 and continued until June 16. Trap catch was 38,902 age 1 hatchery chinook salmon, 4,774 age 1 wild chinook salmon, 7,383 hatchery steelhead trout, 564 wild steelhead trout, and 17 sockeye/kokanee.

Fish were PIT-tagged for migration rate statistics at all three traps. The number of fish PIT-tagged at the Snake River trap was 9,716, Clearwater River trap was 3,873, and Salmon River trap was 7,850.

A significant migration rate/discharge relation was detected for hatchery chinook salmon released from each of the three traps to Lower Granite Dam. A significant migration rate/discharge relation was detected for wild chinook salmon from the Salmon River traps to Lower Granite Dam. Not enough fish were tagged at the Snake and Clearwater River traps to calculate statistics. A significant migration rate/discharge relation was detected for both hatchery and wild steelhead trout from the Snake and Salmon River traps. A significant relation was **not** detected for either hatchery or wild steelhead from the Clearwater River trap. The inability to detect a relation for hatchery or wild steelhead trout from the Clearwater River trap was probably due to the lack of data over a wide range of discharge and the inconsistent collection efficiency at Lower Granite Dam caused by operational changes during the 1994 outmigration.

In all instances where the migration rate/discharge relation was significant the same trend was seen; as discharge increased migration rate increased. A two-fold increase in discharge would generally produce a two- to three-fold increase in migration rate.

The four dam interrogation rates for 1994 were comparable to 1993 only because of the addition of a new collection facility at Lower Monumental Dam in 1993. The comparability between 1993 and 1994 is questionable because the collection efficiency changed during the outmigration due to operational changes and spill at the dams.

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APPENDIX A

Travel time to Lower Granite Dam for fish PIT-tagged at Smolt Monitoring Project traps on the Snake, Salmon, and Clewarwater rivers, 1994.

Table A-1. PIT-tagged hatchery chinook salmon travel time, with 95% confidence intervals, from the Snake River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
4/13	10.53	9.46	12.00	38	37.6	50.55
4/14	9.59	7.32	11.55	20	29.4	51.27
4/15	9.11	6.81	10.55	17	36.2	52.39
4/16	10.18	6.36	12.18	12	37.5	58.95
4/19	6.37	5.44	8.19	47	39.2	68.32
4/20	6.99	5.54	8.30	43	43.0	71.14
4/21	7.93	5.93	10.26	40	40.0	71.27
4/22	8.49	6.59	10.74	45	45.0	72.25
4/23	8.84	7.53	13.59	42	38.5	73.42
4/24	10.97	6.77	13.50	34	34.3	72.61
4/25	10.10	8.69	12.57	39	39.0	71.77
4/26	10.48	8.78	11.23	42	42.4	72.10
4/27	10.63	9.49	11.73	37	36.6	73.27
4/28	9.40	7.89	10.70	47	35.1	74.13
4/29	9.03	7.84	10.15	46	41.4	75.13
4/30	7.83	7.47	8.52	35	34.7	75.24
5/1	7.16	6.09	8.29	31	39.7	74.67
5/2	7.49	6.29	8.04	23	32.9	75.14
5/3	6.23	5.50	7.24	18	30.5	75.23
5/4	5.60	4.83	6.13	31	31.0	78.32
5/5	5.21	4.62	5.68	24	38.1	79.48
5/6	4.81	3.93	6.28	12	14.8	81.48
5/7	4.10	3.40	4.56	25	24.3	82.02
5/8	3.25	2.67	4.04	28	27.2	84.77
5/9	3.78	2.95	5.76	21	21.6	89.40
5/10	5.29	3.01	7.74	13	11.9	89.30
5/11	4.36	3.70	7.36	16	16.2	90.10
5/12	4.31	3.81	8.36	13	12.9	86.75
5/13	6.28	5.11	9.27	10	14.7	83.22
5/14	6.30	6.05	8.06	13	19.4	80.28
^b 5/15	8.15	0.00	0.00	5	12.8	77.51
^b 5/16	5.18	0.00	0.00	2	15.4	78.26
^b 5/17	4.58	3.13	6.11	9	33.3	75.76
^b 5/18	6.76	0.00	0.00	1	14.3	74.74
^b 5/19	9.95	0.00	0.00	2	22.2	74.70
^b 5/20	2.85	0.00	0.00	1	50.0	74.77
^b 5/21	6.27	0.00	0.00	1	25.0	75.17
^b 5/28	12.13	0.00	0.00	1	33.3	53.81
^b 5/30	5.17	0.00	0.00	1	50.0	55.26
^b 7/6	11.17	0.00	0.00	1	100.0	43.03

^aConfidence intervals calculated with nonparametric statistics.

^bNot used in statistical analysis because analysis showed too few recaptures.

Table A-2. PIT-tagged wild chinook salmon travel time, with 95% confidence intervals, from the Snake River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured ('6)	Mean discharge (kcfs)
		Upper	Lower			
^b 4/14	8.23	0.00	0.00	3	50.0	45.09
^b 4/15	7.21	0.00	0.00	2	66.7	45.64
¹)4/16	9.41	0.00	0.00	1	33.3	57.41
4/19	5.87	5.14	6.56	45	62.5	68.32
4/20	5.44	4.50	5.71	27	50.9	71.42
4/21	5.21	4.68	6.55	39	53.4	74.46
4/22	5.71	5.28	6.66	32	44.4	73.15
4/23	6.42	5.58	7.37	28	47.5	71.92
4/24	6.49	5.71	8.27	26	47.3	71.00
4/25	6.86	4.83	10.22	21	48.8	71.43
4/26	6.83	4.82	11.31	14	58.3	71.69
4/27	7.87	6.19	10.75	18	46.2	72.10
4/28.29.30-5/1.2	7.10	6.12	8.19	25	39.7	74.73
^b 5/3	7.31	0.00	0.00	2	25.0	77.21
¹)5/4	5.62	0.00	0.00	3	42.9	78.32
¹)5/5	5.46	0.00	0.00	2	50.0	79.48
^b 5/6	4.76	0.00	0.00	4	66.7	81.48
¹)5/7	3.46	0.00	0.0,0	2	28.6	80.67
^b 5/8	4.68	3.41	6.32	9	36.0	87.34
^b 5/9	4.39	0.00	0.00	5	25.0	89.40
^b 5/10	4.71	0.00	0.00	5	13.2	89.30
¹)5/11	4.75	0.00	0.00	5	12.5	88.08
¹)5/12	5.06	4.19	5.82	9	24.3	86.48
^b 5/13	8.30	0.00	0.00	1	4.0	81.16
^b 5/14	6.12	4.14	8.73	7	20.6	80.28
^b 5/15	3.72	0.00	0.00	1	11.1	80.33
¹)5/17	4.31	0.00	0.00	1	20.0	76.47
^b 5/18	5.71	0.00	0.00	1	11.1	74.90
^b 5/19	4.15	0.00	0.00	2	100.0	74.70
¹³ 5/20	26.78	0.00	0.00	2	50.0	56.83
¹)5/22	26.71	0.00	0.00	1	33.3	54.30
^b 5/24	4.75	0.00	0.00	1	20.0	75.10
¹)5/25	5.22	0.00	0.00	2	25.0	73.20
^b 5/27	53.34	0.00	0.00	1	14.3	40.65
^b 5/28	4.92	0.00	0.00	1	11.1	60.96
^b 6/2	5.92	0.00	0.00	1	100.0	49.27
^b 6/3	6.08	0.00	0.00	1	25.0	48.13
¹)6/4	38.68	0.00	0.00	1	100.0	36.13
¹)6/5	23.80	0.00	0.00	1	20.0	36.96
^b 6/6	43.02	0.00	0.00	1	25.0	36.49
^b 6/15	9.77	0.00	0.00	1	50.0	35.74
¹)7/1	11.71	0.00	0.00	1	100.0	35.52

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-3. PIT-tagged hatchery steelhead travel time, with 95% confidence intervals, from the Snake River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval		Number captured	Percent captured (t)	Mean discharge (kcfs)
		Upper	Lower			
4/13,14,15,16	7.13	5.09	9.75	13	72.2	42.03
4/19	4.25	3.38	6.15	44	80.0	62.28
4/20	4.05	3.10	4.85	45	76.3	69.03
4/21	4.18	3.32	5.07	49	84.5	74.88
4/22	4.14	3.52	5.68	45	73.8	76.45
4/23	3.77	3.08	4.64	46	74.2	75.43
4/24	4.45	3.69	5.15	46	76.7	71.72
4/25	4.12	3.04	6.73	50	73.5	67.67
4/26	4.31	3.75	6.03	56	82.4	68.05
4/27	3.53	3.03	4.13	64	84.2	70.83
4/28	5.67	3.63	7.91	48	78.7	73.22
4/29	2.91	2.14	3.75	49	74.2	76.43
4/30	4.49	3.25	6.32	42	71.2	75.05
5/1	3.70	2.91	5.08	46	75.4	73.38
5/2	4.61	2.97	5.87	40	65.6	74.62
5/3	3.33	2.84	4.46	41	67.2	73.07
5/4	3.58	2.93	4.81	46	75.4	75.42
5/5	3.03	2.75	3.66	37	58.7	76.40
5/6	3.04	2.73	3.73	43	67.2	77.40
5/7	3.21	2.64	3.54	39	63.9	80.67
5/8	2.74	2.47	3.26	25	43.1	84.77
5/9	2.44	1.79	2.97	29	47.5	87.60
5/10	4.05	2.72	5.31	14	23.3	90.15
5/11	3.70	2.74	8-.92	13	19.7	90.10
5/12	3.89	2.12	7.77	6	9.8	86.75
5/13	4.50	2.60	13.15	8	13.6	84.28
5/14	5.73	3.68	10.45	9	13.2	80.28
5/15	5.41	3.76	11.97	10	15.6	79.16
5/16	4.82	3.77	6.66	15	25.0	78.26
5/17	3.77	3.12	5.75	15	22.1	76.47
5/18	5.08	3.08	6.83	17	28.3	75.34
5/19	6.18	4.70	7.10	14	20.0	74.22
5/20	4.77	3.76	5.16	9	31.0	74.16
5/21	3.93	3.67	4.83	24	38.7	73.83
5/22,23,24	3.98	2.85	5.92	29	23.0	75.55
5/25,27	5.02	3.72	6.98	35	27.8	65.62
^b 5/26	3.19	0.00	0.00	2	33.3	74.10
5/28,29,30	5.85	4.97	9.84	35	18.7	56.77
^b 5/31	22.50	0.00	0.00	2	10.5	42.92
^b 6/1	21.60	4.14	35.75	11	19.6	42.23
^b 6/2	3.23	0.00	0.00	1	25.0	51.40
^b 6/3	21.29	0.00	0.00	3	21.4	40.66
^b 6/4	4.87	0.00	0.00	1	7.7	47.28
^b 6/6	24.34	0.00	0.00	4	25.0	35.86
^b 6/11	19.88	0.00	0.00	4	25.0	33.23
^b 6/12	10.60	0.00	0.00	2	14.3	37.82
^b 6/13	9.68	3.07	41.73	6	17.1	37.87
^b 6/14	22.77	9.91	39.26	7	13.0	31.07
^b 6/15	24.03	0.00	0.00	5	10.9	31.44
^b 6/16	32.13	0.00	0.00	3	25.0	34.45
^b 6/19	5.19	0.00	0.00	5	18.5	32.44

Table A-3. Continued.

Release date	Median travel time (day)	Confidence interval ^a		Number captured	Percent captured (^g)	Mean discharge (kcfs)
		Upper	Lower			
^b 6/20	26.83	0.00	0.00	2	4.7	33.63
^b 6/21	4.17	0.00	0.00	1	2.5	31.45
^b 6/22	16.62	0.00	0.00	3	15.8	28.86
^b 6/23	15.00	0.00	0.00	1	4.3	27.57
^b 6/25	19.24	0.00	0.00	3	11.1	32.58
^b 6/26	12.10	10.48	15.68	6	10.2	26.93
^b 6/27	20.14	10.04	27.79	8	26.7	34.71
^b 7/1	12.83	0.00	0.00	2	10.5	36.10
^b 7/2	14.12	4.84	26.58	8	17.8	37.99
^b 7/3	9.14	4.53	21.36	6	28.6	37.02
^b 7/5	9.80	2.98	21.96	8	16.7	41.22
^b 7/6	2.26	0.00	0.00	1	10.0	38.00
^b 7/7	15.99	0.00	0.00	5	33.3	43.92
^b 7/8	14.15	0.00	0.00	2	28.6	44.10

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table-A-4. PIT-tagged wild steelhead trout travel time, with 95% confidence intervals, from the Snake River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
4/13,14,15,16	6.13	4.49	8.78	11	78.6	39.43
4/19	3.47	3.26	4.27	61	74.4	58.97
4/20	3.45	2.78	3.57	38	66.7	65.43
4/21	3.35	3.20	3.59	186	72.4	72.83
4/22	3.26	3.02	3.42	222	73.5	77.67
4/23	3.09	2.56	4.05	42	63.6	77.87
4/24	3.54	2.75	4.10	41	70.7	71.72
4/25	3.67	3.50	4.34	91	71.7	67.67
4/26	3.74	3.46	4.33	56	73.7	68.05
4/27	3.91	3.34	4.26	71	83.5	70.83
4/28	3.30	2.68	3.61	36	70.6	72.77
4/29	2.95	2.64	3.62	38	77.6	76.43
4/30	3.48	3.04	4.40	51	68.0	76.53
5/1	3.34	2.63	5.34	16	88.9	73.67
5/2	2.73	2.50	3.71	26	74.3	72.57
5/3	3.39	3.11	4.07	41	71.9	73.07
5/4	3.15	2.57	3.90	25	62.5	75.97
5/5	3.38	2.98	3.91	71	69.6	76.40
5/6	2.93	2.67	3.41	38	63.3	77.40
5/7	2.62	2.47	3.02	54	66.7	80.67
5/8	2.62	2.46	3.01	52	63.4	84.77
5/9	2.53	2.26	2.86	52	56.5	89.53
5/10	3.32	2.81	3.59	49	34.3	89.50
5/11	3.23	2.64	4.54	24	25.5	91.50
5/12	4.31	3.23	6.07	42	35.9	86.75
5/13	3.65	2.64	4.70	9	8.1	85.85
5/14	3.69	3.39	4.71	23	22.3	82.33
5/15	4.97	3.96	6.09	13	18.8	79.16
5/16	3.80	3.19	5.13	17	27.9	78.95
5/17	3.62	2.69	4.93	12	20.3	76.47
5/18	3.73	2.78	6.25	9	23.1	75.20
^b 5/19	3.82	0.00	0.00	5	23.8	74.70
^b 5/20	11.08	0.00	0.00	1	14.3	72.42
¹³ 5/21	4.60	2.98	13.13	7	58.3	74.94
^b 5/22	3.20	2.73	4.40	7	53.8	74.13
^b 5/23	2.94	2.73	32.25	7	43.8	75.30
^b 5/24	5.37	0.00	0.00	4	25.0	75.10
^b 5/25	10.03	0.00	0.00	2	16.7	64.23
^b 5/26	5.84	0.00	0.00	3	42.9	67.40
^b 5/27	4 ¹ .15	0.00	0.00	3	21.4	67.53
^b 5/28	2.90	0.00	0.00	5	41.7	64.27
^b 5/29	4.88	0.00	0.00	1	20.0	57.64
^b 5/30	17.23	0.00	0.00	1	20.0	46.92
^b 6/1	23.31	0.00	0.00	2	50.0	41.74
¹ 6/4	4.18	0.00	0.00	1	100.0	47.77
¹ 6/16	31.94	0.00	0.00	1	100.0	34.45
¹ 7/2	16.79	0.00	0.00	1	100.0	38.99

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-5. PIT-tagged hatchery chinook salmon travel time, with 95% confidence intervals, from the Clearwater River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Lower	Upper			
^b 4/5	16.63	0.00	0.00	3	42.9	40.11
^b 4/6	14.46	0.00	0.00	3	37.5	37.56
^b 4/8	14.05	0.00	0.00	1	100.0	41.54
4/9	22.03	15.56	25.66	26	25.7	54.66
4/10	24.65	14.56	31.48	22	20.2	58.43
4/11	23.81	16.68	28.67	24	25.5	59.53
4/12,13	14.23	11.78	18.56	25	26.6	55.57
4/14	12.97	10.51	17.52	22	26.2	56.51
4/15	13.95	11.34	18.50	31	31.0	58.80
4/16	17.72	10.46	22.48	26	25.2	64.55
4/17	20.14	13.57	22.63	31	31.0	67.81
4/18	14.42	10.57	19.55	32	32.3	67.84
4/19	17.06	13.03	19.21	43	40.2	70.81
4/20	19.36	18.13	19.65	28	28.6	72.79
4/21	18.29	14.45	20.46	21	21.0	73.64
4/22	17.55	16.65	18.49	24	23.8	74.89
4/23	16.70	15.32	17.53	27	28.1	75.05
4/26,27,28	11.12	10.14	13.74	20	23.3	73.27
4/29,30-5/1	11.34	9.70	12.28	23	24.2	77.84
^b 5/2	9.05	0.00	0.00	1	12.5	77.91
^b 5/3	5.55	0.00	0.00	1	14.3	75.23
^b 5/4	5.58	0.00	0.00	1	7.7	78.32
^b 5/5	15.17	0.00	0.00	2	33.3	82.65
^b 5/7	5.60	3.42	12.14	15	16.5	85.08
^b 5/8	9.22	0.00	0.00	5	21.7	86.68
^b 5/10	9.04	0.00	0.00	4	44.4	85.31
^b 5/11	8.07	5.24	8.38	9	23.7	85.21
^b 5/12	7.12	0.00	0.00	1	14.3	84.04
^b 5/27	4.52	0.00	0.00	4	17.4	65.62
^b 5/28	8.11	5.98	17.43	7	16.3	57.38
^b 5/29	6.61	4.69	14.26	6	19.4	55.76
^b 5/31	6.91	0.00	0.00	3	10.7	51.67
^b 6/1	18.66	0.00	0.00	4	20.0	43.78
^b 6/2	44.35	0.00	0.00	2	25.0	37.31
^b 6/3	48.76	0.00	0.00	1	33.3	37.83
^b 6/4	4.35	0.00	0.00	2	66.7	47.77

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-6. PIT-tagged wild chinook salmon travel time, with 95W confidence intervals, from the Clearwater River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean dischar (kcfs)
		Lower	Upper			
^b 4/5	16.67	16.46	17.78	42	53.2	40.11
^b 4/6	15.66	14.63	17.61	16	42.1	40.62
^b 4/7	15.05	13.20	18.53	10	62.5	41.14
¹ 4/8	16.61	0.00	0.00	4	80.0	47.91
^b 4/9	14.11	13.12	15.18	22	51.2	44.11
^b 4/10	12.23	11.03	15.78	9	56.2	42.51
^b 4/11	12.18	11.59	13.55	16	51.6	45.86
^b 4/12	11.80	10.59	18.43	7	50.0	49.73
^b 4/13	10.15	0.00	0.00	3	50.0	47.63
^b 4/14	9.71	7.02	15.30	8	50.0	51.27
^b 4/15	9.56	0.00	0.00	1	11.1	55.25
^b 4/16	19.91	0.00	0.00	2	66.7	65.52
^b 4/18	7.44	0.00	0.00	3	60.0	64.24
^b 4/19	9.07	7.02	10.36	37	46.8	68.42
^b 4/20	11.61	8.12	16.66	33	42.9	71.42
^b 4/21	11.46	8.64	14.81	27	36.0	-72.68
^b 4/22	11.57	9.48	15.17	10	45.5	73.18
^b 4/23	11.43	0.00	0.00	5	62.5	73.27
^b 4/26	16.52	0.00	0.00	2	40.0	77.11
^b 4/27	12.46	0.00	0.00	3	42.9	73.76
^b 4/29	10.42	0.00	0.00	3	37.5	75.53
^b 4/30	10.58	0.00	0.00	4	80.0	77.84
^b 5/3	16.76	0.00	0.00	2	66.7	81.34
^b 5/4	8.36	0.00	0.00	2	66.7	81.17
^b 5/5	5.93	0.00	0.00	1	25.0	80.58
^b 5/7	2.63	0.00	0.00	1	20.0	80.67
^b 5/11	7.82	0.00	0.00	2	20.0	85.21
^b 5/12	13.31	0.00	0.00	2	66.7	79.51
¹ 5/27	7.96	0.00	0.00	3	37.5	60.83
^b 5/28	7.31	6.83	8.30	6	37.5	58.47
^b 5/29	6.71	0.00	0.00	3	30.0	55.76
^b 5/30	41.53	0.00	0.00	2	50.0	37.97
^b 5/31	49.45	0.00	0.00	2	11.1	38.46
^b 6/1	38.95	0.00	0.00	3	23.1	36.72
^b 6/2	12.38	0.00	0.00	1	16.7	44.23
^b 6/4	35.09	0.00	0.00	2	40.0	35.15
^b 6/7	34.20	0.00	0.00	5	100.0	34.51
^b 6/8	8.74	0.00	0.00	1	33.3	41.10
^b 6/15	17.15	0.00	0.00	1	10.0	31.15
^b 6/16	17.24	0.00	0.00	1	33.3	29.99
^b 7/7	6.98	0.00	0.00	1	6.2	44.47

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-7. PIT-tagged hatchery steelhead trout travel time, with 95% confidence intervals, from the Clearwater River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Lower	Upper			
^b 4/12	4.54	0.00	0.00	1	100.0	38.90
^b 4/16	4.55	0.00	0.00	1	100.0	43.44
4/19	5.83	3.89	7.41	48	78.7	68.32
4/20	5.21	4.09	5.98	38	64.4	71.42
4/21	6.39	4.89	7.16	43	71.7	73.40
4/22	5.52	4.52	6.95	41	68.3	73.15
4/23	6.26	4.54	8.02	56	94.9	71.92
4/26	6.55	4.76	9.51	44	73.3	71.69
4/27	6.54	4.52	9.13	48	81.4	72.04
4/28	7.55	5.36	10.70	41	67.2	73.49
4/29	7.35	4.56	8.45	50	80.6	74.73
4/30	7.58	3.82	8.21	22	71.0	75.24
5/1	7.38	4.86	8.20	18	78.3	74.67
5/2	6.70	5.02	8.23	13	68.4	75.14
5/3	6.18	4.68	7.07	40	66.7	75.23
5/4	5.41	4.75	6.49	38	63.3	76.16
5/5	4.79	4.06	5.23	44	73.3	79.48
5/6	4.25	3.48	6.52	34	56.7	80.32
^b 5/7	4.59	3.95	5.50	37	60.7	84.30
^b 5/8	4.30	3.37	6.81	25	41.0	86.92
^b 5/9	5.57	0.00	0.00	1	25.0	89.27
^b 5/10	10.61	0.00	0.00	2	20.0	83.44
^b 5/11	7.35	3.12	14.19	7	11.3	86.26
^b 5/12	6.39	0.00	0.00	3	16.7	85.07
^b 5/25	7.18	0.00	0.00	1	25.0	69.11
^b 5/26	3.99	0.00	0.00	1	20.0	71.65
^b 5/27	27.85	0.00	0.00	2	33.3	46.00
^b 5/28	3.77	2.58	58.10	7	31.8	62.70
^b 5/29	5.98	0.00	0.00	5	17.2	56.77
^b 5/30	51.90	0.00	0.00	2	33.3	39.13
^b 5/31	6.50	3.13	42.19	6	31.6	51.67
^b 6/1	3.90	0.00	0.00	4	25.0	52.05
^b 6/2	14.86	0.00	0.00	2	33.3	44.37
^b 6/3	6.10	0.00	0.00	1	12.5	48.13
^b 6/13	3.00	0.00	0.00	1	50.0	43.13
^b 6/15	34.08	0.00	0.00	2	25.0	35.07
^b 7/7	22.72	0.00	0.00	2	12.5	43.77
^b 7/8	13.87	0.00	0.00	1	16.7	44.10

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-8. PIT-tagged wild steelhead trout travel time, with 95% confidence intervals, from the Clearwater River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
4/5,6,7,8	9.29	8.17	12.87	15	51.7	36.71
4/9,11,12,13,14	7.19	6.43	8.91	20	80.0	38.26
4/19	4.32	4.19	4.46	469	66.7	62.28
4/20	4.78	4.19	5.18	94	64.4	71.42
4/21	4.64	4.14	5.06	137	62.0	74.46
4/22,23	4.47	3.10	7.14	21	58.3	75.43
4/26,27,28	4.37	3.54	5.63	28	52.8	68.05
4/29	2.92	2.53	11.04	8	88.9	76.43
^b 4/30	3.48	0.00	0.00	1	100.0	76.53
^b 5/1	8.92	0.00	0.00	1	100.0	76.77
^b 5/2	3.56	0.00	0.00	3	60.0	73.45
^b 5/3	5.85	0.00	0.00	3	100.0	75.23
^b 5/4	5.64	0.00	0.00	4	100.0	78.32
^b 5/5	5.46	0.00	0.00	2	66.7	79.48
^b 5/7	3.05	2.52	4.18	6	75.0	80.67
^b 5/8	4.37	0.00	0.00	2	50.0	86.92
^b 5/10	3.36	0.00	0.00	1	33.3	89.50
^b 5/11	5.90	0.00	0.00	2	14.3	87.63
^b 5/28	6.12	0.00	0.00	1	25.0	59.48
^b 5/31	51.31	0.00	0.00	2	40.0	38.73
^b 6/7	42.58	0.00	0.00	1	100.0	36.48
^b 6/16	8.28	0.00	0.00	1	100.0	35.02

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-9. PIT-tagged hatchery chinook salmon travel time, with 95% confidence intervals, from the Salmon River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
^b 3/31	31.73	0.00	0.00	2	50.0	48.76
^b 4/1	18.68	0.00	0.00	4	80.0	35.70
^b 4/2	19.17	0.00	0.00	3	75.0	37.41
^b 4/6	17.10	0.00	0.00	1	100.0	42.48
4/10	15.47	13.55	18.96	33	32.4	49.54
4/11	13.55	12.44	15.72	39	39.0	50.79
4/12	14.19	13.09	17.82	39	39.0	53.61
4/13	11.70	10.70	14.67	32	32.0	53.09
4/14	14.48	10.56	17.90	34	34.0	57.11
4/15	11.05	9.79	11.69	30	30.0	56.85
4/16	13.55	12.10	15.68	39	38.6	61.55
4/17	10.34	8.67	13.75	24	24.0	62.41
4/18	12.39	10.58	14.72	46	46.0	66.22
4/19	11.57	9.64	15.72	34	34.3	69.51
4/20	11.75	10.65	15.16	35	33.7	71.42
4/21	15.12	12.22	18.67	36	36.4	72.89
4/22	14.53	11.68	15.72	34	34.3	73.74
4/23	15.49	11.91	17.23	33	39.3	73.85
4/24	15.99	13.53	19.06	29	24.4	74.76
4/25	15.13	13.52	17.92	23	22.8	74.34
4/26	14.43	12.49 ^h	15.51	20	20.0	74.45
4/27	13.54	12.60	16.48	19	18.8	75.74
4/28	12.69	10.82	14.01	22	22.2	76.56
4/29	12.03	10.81	13.40	23	22.8	77.54
4/30	11.35	10.57	13.96	25	25.0	77.84
5/1	10.05	8.49	12.05	11	10.9	77.70
5/2	8.61	7.43	10.53	13	12.9	77.91
5/3	8.47	7.63	12.76	16	15.8	78.33
5/4	8.96	6.75	10.23	16	16.3	82.04
5/5	7.64	6.42	9.60	13	13.0	83.24
5/6	6.29	5.64	7.27	15	15.0	83.47
5/7	6.83	6.01	8.37	16	16.7	86.09
5/8	7.45	5.49	8.77	11	11.3	87.81
5/9	7.17	5.04	9.20	13	12.7	87.94
5/10	9.26	6.18	12.39	13	14.4	85.31
5/11	8.88	6.91	10.31	18	17.3	84.02
^b 5/12	10.14	0.00	0.00	5	12.8	81.12
^b 5/13	18.85	0.00	0.00	2	20.0	75.18
^b 5/14	16.78	0.00	0.00	1	7.7	75.19
^b 5/16	8.95	0.00	0.00	1	16.7	76.29
^b 5/18	15.36	0.00	0.00	1	25.0	70.73
^b 5/19	8.02	0.00	0.00	1	9.1	75.12
^b 5/20	14.84	0.00	0.00	3	21.4	67.54
^b 5/21	11.91	0.00	0.00	1	7.1	69.42
^b 5/22	13.10	0.00	0.00	1	5.9	66.52
^b 5/23	13.03	0.00	0.00	3	15.8	64.50
^b 5/24	9.21	0.00	0.00	3	13.6	67.96
^b 5/25	10.55	0.00	0.00	4	11.1	62.91
^b 5/26	9.89	7.28	22.05	6	14.3	61.26
^b 5/27	10.22	0.00	0.00	1	9.1	58.58
^b 5/28	7.32	0.00	0.00	1	12.5	58.47
^b 5/29	48.16	0.00	0.00	2	13.3	39.12
^b 5/30	27.60	5.95	58.26	6	25.0	41.55
^b 5/31	16.68	0.00	0.00	4	25.0	45.74

Table A-9. Continued.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
^b 6/1	32.26	0.00	0.00	1	10.0	37.18
^b 6/3	38.07	0.00	0.00	2	20.0	36.08
^b 6/4	44.97	0.00	0.00	2	13.3	37.07
^b 6/5	38.01	0.00	0.00	1	7.1	35.77
^b 6/7	33.38	0.00	0.00	1	50.0	34.20
^b 6/9	27.85	0.00	0.00	1	20.0	32.30
^b 6/13	28.04	0.00	0.00	1	20.0	33.09
^b 6/14	15.41	0.00	0.00	1	25.0	34.03
^b 6/15	23.82	0.00	0.00	1	33.3	31.44

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-10. PIT-tagged wild chinook salmon travel time, with 95' confidence intervals, from the Salmon River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
3/31	20.57	16.18	25.50	9	60.0	36.23
4/1	21.14	18.21	21.74	11	55.0	38.21
4/2	20.17	19.48	21.50	38	54.3	38.86
4/3	19.17	18.30	21.23	41	54.7	39.45
4/4	18.37	17.61	19.39	39	52.0	40.06
4/5	17.16	15.62	17.98	41	55.4	40.11
4/6	16.62	15.77	17.46	40	53.3	42.48
4/7	16.33	15.27	16.82	41	54.7	43.08
4/8	14.85	14.19	15.41	33	44.0	43.58
4/9	13.83	12.58	14.72	41	61.2	44.11
4/10	14.48	13.38	15.96	33	44.0	47.29
4/11	11.32	10.74	13.01	13	40.6	43.46
4/12	13.14	11.27	15.56	17	43.6	52.13
4/13	10.64	9.47	11.64	26	57.8	50.55
4/14	10.61	9.83	11.40	30	51.7	53.97
4/15	9.52	8.45	10.19	31	50.0	55.25
4/16	8.52	8.06	9.38	33	45.2	57.41
4/17	7.99	7.21	8.77	30	55.6	60.40
4/18	8.32	7.37	9.72	32	43.2	65.31
4/19	8.67	7.54	10.73	40	46.0	68.42
4/20	10.02	7.43	11.75	31	42.5	70.21
4/21	11.80	10.17	14.68	38	50.7	72.84
4/22	10.35	8.83	14.05	34	43.6	73.30
4/23	13.89	11.65	16.66	33	43.4	73.85
4/24	14.33	10.02	15.48	25	41.0	73.42
4/25	13.61	11.37	16.64	12	27.3	73.29
4/26	13.33	7.73	15.53	10	30.3	73.32
4/27	12.55	10.66	13.53	31	41.3	74.94
4/28	11.41	10.45	12.30	34	45.9	74.55
4/29	11.80	10.51	12.54	22	33.3	77.54
4/30	11.57	9.64	19.46	12	28.6	79.13
5/1	9.71	8.41	11.17	18	45.0	77.70
5/2,3,4	7.48	6.81	9.33	22	31.4	77.21
5/5,6	6.62	6.25	7.75	20	31.2	82.41
5/7,8	8.41	6.26	11.22	27	18.9	86.06
5/9,10,11,12	9.72	7.32	12.17	27	15.4	83.17
^b 5/13	12.74	4.69	55.81	6	26.1	78.77
^b 5/14	12.83	0.00	0.00	2	12.5	77.55
^b 5/16	55.76	0.00	0.00	2	22.2	47.27
^b 5/17	17.69	0.00	0.00	2	28.6	69.08
^b 5/18	20.20	0.00	0.00	1	33.3	65.53
^b 5/20	7.78	0.00	0.00	1	25.0	75.47
^b 5/21	40.08	0.00	0.00	2	18.2	47.44
^b 5/22	7.35	0.00	0.00	2	50.0	74.87
^b 5/23	10.18	0.00	0.00	3	16.7	68.43
^b 5/24	9.24	0.00	0.00	3	17.6	67.96
^b 5/25	10.23	5.81	15.28	8	30.8	64.23
^b 5/26	9.58	0.00	0.00	1	5.0	61.26
^b 5/27	11.83	8.18	44.97	7	35.0	56.48
^b 5/28	11.61	0.00	0.00	2	14.3	53.81
^b 5/29	32.37	0.00	0.00	4	22.2	40.64
^b 5/30	41.77	0.00	0.00	3	27.3	37.97
^b 5/31	33.38	0.00	0.00	2	12.5	37.81
^b 6/1	21.89	0.00	0.00	3	16.7	42.23
^b 6/2	36.77	0.00	0.00	2	14.3	36.07

Table A-10. Continued.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
b6/3	43.20	0.00	0.00	5	31.2	36.97
^b 6/4	33.14	0.00	0.00	5	20.8	34.57
^b 6/5	17.81	0.00	0.00	1	4.2	40.05
^b 6/6	14.64	0.00	0.00	4	28.6	40.53
^b 6/7	32.39	0.00	0.00	3	21.4	33.91
^b 6/8	39.38	0.00	0.00	3	33.3	35.65
^b 6/9	38.23	0.00	0.00	1	11.1	35.39
^b 6/10	28.79	0.00	0.00	4	23.5	32.84
^b 6/11	22.86	0.00	0.00	3	20.0	32.14
^b 6/12	43.12	0.00	0.00	2	10.5	36.69
^b 6/13	27.33	8.07	46.93	7	30.4	32.66
^b 6/15	12.77	0.00	0.00	1	11.1	33.58
^b 6/16	25.16	0.00	0.00	4	22.2	31.89

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-11. PIT-tagged hatchery steelhead travel time, with 95t confidence intervals, from the Salmon River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Mean discharge (kcfs)
		Upper	Lower			
4/19	6.56	5.61	8.48	43	70.5	68.96
4/20	4.80	4.64	11.76	9	69.2	71.42
4/21	6.42	5.03	7.99	48	82.8	73.40
4/22	7.62	6.10	10.65	45	68.2	72.25
4/23	7.36	5.83	10.04	46	73.0	72.26
4/24	7.74	5.59	10.06	45	72.6	72.62
4/25	8.11	5.73	10.92	40	66.7	71.83
4/26	6.26	4.75	9.85	45	73.8	71.20
4/27	10.84	8.14	12.19	44	64.7	73.27
4/28	7.56	6.23	9.67	43	70.5	73.49
4/29	7.65	6.26	9.20	34	55.7	75.30
4/30	9.43	6.86	9.78	37	60.7	75.67
5/1	6.89	6.65	8.72	37	61.7	74.67
5/2	8.04	6.79	8.64	49	71.0	76.89
5/3	6.85	5.11	8.24	32	53.3	77.21
5/4	5.83	4.87	7.75	36	60.0	78.32
5/5	5.94	5.18	7.19	33	55.0	80.58
5/6	6.29	4.21	8.06	29	48.3	83.47
5/7	4.95	4.29	7.98	24	40.0	84.30
5/8,9,10	6.06	4.74	9.75	34	26.8	88.13
5/11,12,13	7.75	5.76	12.18	26	14.9	82.85
5/14,15	10.66	5.81	38.79	15	16.1	76.91
^b 5/16	38.57	0.00	0.00	3	18.8	54.63
5/17,18,19,20	6.87	5.79	7.82	28	23.0	74.96
5/21,22,23,24	8.32	7.11	12.59	54	21.7	71.54
5/25,26,27	7.28	5.89	26.38	43	21.0	65.49
^b 5/28	10.14	6.76	56.44	9	16.1	55.45
5/29,30	17.64	5.99	29.16	19	17.8	46.52
5/31-6/1,2,3	23.30	16.55	28.82	36	21.7	41.74
^b 6/4	24.35	15.72	44.18	12	22.2	38.01
^b 6/5	28.10	0.00	0.00	3	11.1	35.05
^b 6/6	16.51	0.00	0.00	2	20.0	39.49
^b 6/7	41.19	0.00	0.00	2	20.0	36.06
^b 6/8	41.07	0.00	0.00	1	9.1	36.02
^b 6/11	5.04	0.00	0.00	1	11.1	40.64
^b 6/14	24.71	0.00	0.00	1	50.0	32.16
^b 6/15	7.91	0.00	0.00	2	33.3	36.88
^b 6/16	8.32	0.00	0.00	1	10.0	35.02

^a Confidence intervals calculated with nonparametric statistics.

^b Not used in statistical analysis because analysis showed too few recaptures.

Table A-12. PIT-tagged wild steelhead travel time, with 95% confidence intervals, from the Salmon River trap to Lower Granite Dam, 1994.

Release date	Median travel time (day)	Confidence Interval ^a		Number captured	Percent captured (%)	Average discharge (kcfs)
		Upper	Lower			
^b 4/3	17.80	0.00	0.00	1	100.0	37.94
^b 4/7	20.10	0.00	0.00	1	100.0	49.55
^b 4/12	8.08	0.00	0.00	1	100.0	40.08
^b 4/16	9.36	0.00	0.00	1	50.0	57.41
4/18	6.78	3.62	8.16	7	87.5	64.24
4/19	4.55	4.23	5.26	26	81.2	65.78
4/20	5.18	3.73	6.84	14	58.3	71.42
4/21	4.36	3.69	6.25	20	60.6	74.88
4/22	4.11	3.59	6.78	22	62.9	76.45
4/23	4.88	4.39	7.22	24	77.4	73.34
4/24	6.36	4.65	9.04	16	76.2	71.00
4/25,26	6.50	4.35	13.78	14	82.4	71.69
4/27,28	7.39	5.33	10.75	21	53.8	72.04
4/29,30-5/1	7.13	5.95	9.45	17	68.0	74.73
5/2,4,5,6,7	4.51	3.53	5.21	23	65.7	84.30
5/8	4.08	3.63	4.49	20	31.2	86.92
^b 5/9	4.34	0.00	0.00	1	14.3	89.40
^b 5/10	3.62	0.00	0.00	3	50.0	90.15
^b 5/11	11.89	0.00	0.00	2	25.0	81.71
^b 5/12	4.68	0.00	0.00	3	21.4	86.48
^b 5/14	7.23	0.00	0.00	1	33.3	79.60
ⁱ 5/16	4.32	0.00	0.00	1	33.3	78.95
^b 5/18	9.29	0.00	0.00	1	11.1	75.43
^b 5/19	5.03	0.00	0.00	1	25.0	74.30
^b 5/21	6.00	0.00	0.00	1	20.0	75.17
^b 5/22	4.76	0.00	0.00	2	18.2	75.62
^b 5/23	6.51	0.00	0.00	2	12.5	73.21
^b 5/24	6.87	0.00	0.00	1	11.1	71.37
^b 5/25	10.86	0.00	0.00	1	16.7	62.91
^b 5/26	5.24	0.00	0.00	1	16.7	69.28
^b 5/27	7.80	0.00	0.00	1	10.0	60.83
^b 5/28	25.95	0.00	0.00	2	100.0	45.38
^b 5/29	54.19	0.00	0.00	1	100.0	39.67
^b 5/30	6.57	0.00	0.00	2	66.7	53.64
^b 5/31	51.41	0.00	0.00	2	40.0	38.73
^b 6/1	20.93	0.00	0.00	1	16.7	42.76
^b 6/2	18.84	0.00	0.00	1	50.0	42.72
^b 6/4	17.16	0.00	0.00	1	25.0	41.60

^aConfidence intervals calculated with nonparametric statistics.

^bNot used in statistical analysis because analysis showed too few recaptures.

APPENDIX B

Interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams of fish PIT-tagged at Smolt Monitoring Project traps on the Snake, Salmon, and Clearwater rivers, 1994.

Table B-1. PIT-tagged hatchery chinook salmon interrogations at Lower Granite, Little Goose, Lower Monumental and McNary dams from the Snake River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/13	101	38	37.6	23	22.8	15	14.9	9	8.9	85	84.2
4/14	68	20	29.4	9	13.2	12	17.6	6	8.8	47	69.1
4/15	47	17	36.2	9	19.1	3	6.4	3	6.4	32	68.1
4/16	32	12	37.5	5	15.6	5	15.6	0	0.0	22	68.8
4/19	120	47	39.2	13	10.8	12	10.0	8	6.7	80	66.7
4/20	100	43	43.0	16	16.0	6	6.0	9	9.0	74	74.0
4/21	100	40	40.0	12	12.0	12	12.0	13	13.0	77	77.0
4/22	100	45	45.0	7	7.0	10	10.0	7	7.0	69	69.0
4/23	109	42	38.5	12	11.0	7	6.4	11	10.1	72	66.1
4/24	99	34	34.3	10	10.1	5	5.1	13	13.1	62	62.6
4/25	100	39	39.0	5	5.0	9	9.0	14	14.0	67	67.0
4/26	99	42	42.4	8	8.1	5	5.1	10	10.1	65	65.7
4/27	101	37	36.6	8	7.9	7	6.9	10	9.9	62	61.4
4/28	134	47	35.1	14	10.4	12	9.0	13	9.7	86	64.2
4/29	111	46	41.4	7	6.3	3	2.7	22	19.8	78	70.3
4/30	101	35	34.7	10	9.9	10	9.9	11	10.9	66	65.3
5/1	78	31	39.7	5	6.4	6	7.7	10	12.8	52	66.7
5/2	70	23	32.9	8	11.4	9	12.9	9	12.9	49	70.0
5/3	59	18	30.5	5	8.5	2	3.4	6	10.2	31	52.5
5/4	100	31	31.0	10	10.0	6	6.0	15	15.0	62	62.0
5/5	63	24	38.1	7	11.1	4	6.3	9	14.3	44	69.8
5/6	81	12	14.8	10	12.3	7	8.6	10	12.3	39	48.1
5/7	103	25	24.3	11	10.7	6	5.8	10	9.7	52	50.5
5/8	103	28	27.2	11	10.7	11	10.7	16	15.5	66	64.1
5/9	97	21	21.6	10	10.3	5	5.2	21	21.6	57	58.8
5/10	109	12	11.0	13	11.9	8	7.3	18	16.5	51	46.8
5/11	99	16	16.2	17	17.2	4	4.0	11	11.1	48	48.5
5/12	101	11	10.9	18	17.8	4	4.0	7	6.9	40	39.6
5/13	68	12	17.6	16	23.5	2	2.9	8	11.8	38	55.9
5/14	67	13	19.4	5	7.5	4	6.0	8	11.9	30	44.8
5/15	39	5	12.8	8	20.5	7	17.9	5	12.8	25	64.1
5/16	13	2	15.4	2	15.4	0	0.0	1	7.7	5	38.5
5/17	27	9	33.3	4	14.8	2	7.4	3	11.1	18	66.7

Table B-1. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/18	7	1	14.3	0	0.0	0	0.0	2	28.6	3	42.9
5/19	9	2	22.2	1	11.1	1	11.1	0	0.0	4	44.4
5/20	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
5/21	4	1	25.0	0	0.0	1	25.0	0	0.0	2	50.0
5/23	2	0	0.0	2	100.0	0	0.0	0	0.0	2	100.0
5/25	2	0	0.0	0	0.0	0	0.0	1	50.0	1	50.0
5/27	1	0	0.0	0	0.0	1	100.0	0	0.0	1	100.0
5/28	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
5/29	1	0	0.0	1	100.0	0	0.0	0	0.0	1	100.0
5/30	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
7/6	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
Total	2,833	885		332		223		329		1,769	

Table B-2. PIT-tagged wild chinook salmon interrogations at Lower Granite, Little Goose, Monumental and McNary dams from the Snake River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/13	4	0	0.0	1	25.0	0	0.0	0	0.0	1	25.0
4/14	6	3	50.0	2	33.3	0	0.0	1	16.7	6	100.0
4/15	3	2	66.7	0	0.0	0	0.0	1	33.3	3	100.0
4/16	3	1	33.3	1	33.3	0	0.0	0	0.0	2	66.7
4/19	72	45	62.5	3	4.2	6	8.3	4	5.6	58	80.6
4/20	53	27	50.9	6	11.3	3	5.7	5	9.4	41	77.4
4/21	73	39	53.4	6	8.2	7	9.6	7	9.6	59	80.8
4/22	72	32	44.4	7	9.7	12	16.7	4	5.6	55	76.4
4/23	59	28	47.5	7	11.9	7	11.9	4	6.8	46	78.0
4/24	55	26	47.3	1	1.8	7	12.7	4	7.3	38	69.1
4/25	43	21	48.8	4	9.3	2	4.7	1	2.3	28	65.1
4/26	24	14	58.3	4	16.7	1	4.2	1	4.2	20	83.3
4/27	39	18	46.2	3	7.7	6	15.4	4	10.3	31	79.5
4/28-29	63	25	39.7	7	11.1	10	15.9	7	11.1	49	77.8
5/3	8	2	25.0	0	0.0	0	0.0	1	12.5	3	37.5
5/4	7	3	42.9	0	0.0	1	14.3	0	0.0	4	57.1
5/5	4	2	50.0	1	25.0	0	0.0	0	0.0	3	75.0
5/6	6	4	66.7	0	0.0	0	0.0	0	0.0	4	66.7
5/7	7	2	28.6	1	14.3	0	0.0	2	28.6	5	71.4
5/8	25	9	36.0	1	4.0	0	0.0	4	16.0	14	56.0
5/9	20	5	25.0	2	10.0	2	10.0	5	25.0	14	70.0
5/10	38	5	13.2	6	15.8	1	2.6	8	21.1	20	52.6
5/11	40	5	12.5	5	12.5	4	10.0	8	20.0	22	55.0
5/12	37	8	21.6	7	18.9	3	8.1	3	8.1	21	56.8
5/13	25	2	8.0	6	24.0	2	8.0	2	8.0	12	48.0
5/14	34	7	20.6	4	11.8	0	0.0	2	5.9	13	38.2
5/15	9	1	11.1	1	11.1	0	0.0	0	0.0	2	22.2
5/16	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
5/17	5	1	20.0	0	0.0	1	20.0	0	0.0	2	40.0
5/18	9	1	11.1	2	22.2	2	22.2	3	33.3	8	88.9
5/19	2	2	100.0	0	0.0	0	0.0	0	0.0	2	100.0
5/20	4	2	50.0	1	25.0	0	0.0	1	25.0	4	100.0
5/21	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
5/22	3	1	33.3	0	0.0	2	66.7	0	0.0	3	100.0
5/24	5	1	20.0	0	0.0	0	0.0	0	0.0	1	20.0
5/25	8	2	25.0	3	37.5	0	0.0	1	12.5	6	75.0

Table B-2. Continued

Date	Number tagged	Int. at Lower Granite	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/27	7	1	14.3	14.3	2	28.6	0	0.0	4	57.1
5/28	9	1	11.1	11.1	1	11.1	0	0.0	3	33.3
6/1	5	0	0.0	0.0	1	20.0	0	0.0	1	20.0
6/2	1	1	100.0	0.0	0	0.0	0	0.0	1	100.0
6/3	4	1	25.0	25.0	0	0.0	0	0.0	2	50.0
6/4	1	1	100.0	0.0	0	0.0	0	0.0	1	100.0
6/5	5	1	20.0	0.0	0	0.0	0	0.0	1	20.0
6/6	4	1	25.0	0.0	0	0.0	0	0.0	1	25.0
7/1	1	1	100.0	0.0	0	0.0	0	0.0	1	100.0
7/6	2	0	0.0	0.0	1	50.0	0	0.0	1	50.0
Total	908	354			84		83		618	

Table B-3. PIT-tagged hatchery steelhead interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Snake River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/13,14 15,16	18	13	72.2	0	0.0	1	5.6	0	0.0	14	77.8
4/19	55	44	80.0	3	5.5	2	3.6	0	0.0	49	89.1
4/20	59	45	76.3	5	8.5	2	3.4	1	1.7	53	89.8
4/21	58	49	84.5	1	1.7	0	0.0	0	0.0	50	86.2
4/22	61	45	73.8	6	9.8	3	4.9	1	1.6	55	90.2
4/23	62	46	74.2	4	6.5	3	4.8	0	0.0	53	85.5
4/24	60	46	76.7	4	6.7	2	3.3	0	0.0	52	86.7
4/25	68	50	73.5	4	5.9	5	7.4	0	0.0	59	86.8
4/26	68	56	82.4	7	10.3	0	0.0	0	0.0	63	92.6
4/27	76	64	84.2	6	7.9	4	5.3	0	0.0	74	97.4
4/28	61	48	78.7	4	6.6	2	3.3	0	0.0	54	88.5
4/29	66	49	74.2	6	9.1	4	6.1	0	0.0	59	89.4
4/30	59	42	71.2	4	6.8	2	3.4	0	0.0	48	81.4
5/1	61	46	75.4	1	1.6	5	8.2	1	1.6	53	86.9
5/2	61	40	65.6	3	4.9	2	3.3	1	1.6	46	75.4
5/3	61	41	67.2	3	4.9	2	3.3	0	0.0	46	75.4
5/4	61	46	75.4	2	3.3	1	1.6	1	1.6	50	82.0
5/5	63	37	58.7	6	9.5	2	3.2	0	0.0	45	71.4
5/6	64	43	67.2	3	4.7	2	3.1	1	1.6	49	76.6
5/7	61	39	63.9	0	0.0	2	3.3	1	1.6	42	68.9
5/8	58	25	43.1	7	12.1	3	5.2	1	1.7	36	62.1
5/9	61	29	47.5	6	9.8	1	1.6	3	4.9	39	63.9
5/10	60	14	23.3	10	16.7	2	3.3	0	0.0	26	43.3
5/11	66	13	19.7	6	9.1	9	13.6	2	3.0	30	45.5
5/12	61	6	9.8	6	9.8	5	8.2	6	9.8	23	37.7
5/13	59	8	13.6	13	22.0	6	10.2	1	1.7	28	47.5
5/14	68	9	13.2	11	16.2	4	5.9	1	1.5	25	36.8
5/15	64	10	15.6	12	18.8	4	6.2	1	1.6	27	42.2
5/16	60	15	25.0	7	11.7	0	0.0	2	3.3	24	40.0
5/17	68	15	22.1	4	5.9	3	4.4	3	4.4	25	36.8
5/18	60	17	28.3	8	13.3	2	3.3	1	1.7	28	46.7
5/19	70	14	20.0	11	15.7	4	5.7	5	7.1	34	48.6
5/20	29	9	31.0	1	3.4	2	6.9	0	0.0	12	41.4
5/21	62	24	38.7	4	6.5	1	1.6	5	8.1	34	54.8
5/22, 23, 24	126	29	23.0	11	8.7	4	3.2	0	0.0	44	34.9
5/25, 27	126	35	27.8	10	7.9	2	1.6	1	0.8	48	38.1
5/26	6	2	33.3	0	0.0	1	16.7	0	0.0	3	50.0

Table B-3. Continued

Date	Number tagged	Int. at Lower Granite	I	Int Little Goose	I	Int. at Lower Monumental	I	Int. at McNary	I	Total int.	Total
5/28	60	10	16.7	5	8.3	1	1.7	0	0.0	16	26.7
5/29	66	13	19.7	3	4.5	3	4.5	0	0.0	19	28.8
5/30	61	10	16.4	2	3.3	2	3.3	1	1.6	15	24.6
5/31	19	2	10.5	0	0.0	1	.5.3	0	0.0	3	15.8
6/1	56	8	14.3	0	0.0	1	1.8	0	0.0	9	16.1
6/2	4	1	25.0	0	0.0	1	25.0	0	0.0	2	50.0
6/3	14	3	21.4	0	0.0	0	0.0	0	0.0	3	21.4
6/4	13	2	15.4	0	0.0	1	7.7	0	0.0	3	23.1
6/6	16	4	25.0	0	0.0	3	18.8	0	0.0	7	43.8
6/8	8	1	12.5	0	0.0	0	0.0	0	0.0	1	12.5
6/11	16	4	25.0	0	0.0	0	0.0	0	0.0	4	25.0
6/12	14	2	14.3	0	0.0	0	0.0	0	0.0	2	14.3
6/13	35	7	20.0	0	0.0	1	2.9	0	0.0	8	22.9
6/14	54	8	14.8	1	1.9	2	3.7	0	0.0	11	20.4
6/15	46	6	13.0	1	2.2	0	0.0	0	0.0	7	15.2
6/16	12	3	25.0	0	0.0	0	0.0	0	0.0	3	25.0
6/19	27	5	18.5	1	3.7	0	0.0	0	0.0	6	22.2
6/20	43	4	9.3	0	0.0	0	0.0	0	0.0	4	9.3
6/21	40	0	0.0	1	2.5	0	0.0	0	0.0	1	2.5
6/22	19	3	15.8	0	0.0	0	0.0	0	0.0	3	15.8
6/23	23	1	4.3	0	0.0	0	0.0	0	0.0	1	4.3
6/25	27	3	11.1	0	0.0	0	0.0	0	0.0	3	11.1
6/26	59	6	10.2	1	1.7	0	0.0	0	0.0	7	11.9
6/27	30	8	26.7	0	0.0	0	0.0	0	0.0	8	26.7
7/1	19	2	10.5	0	0.0	0	0.0	0	0.0	2	10.5
7/2	45	8	17.8	4	8.9	0	0.0	0	0.0	12	26.7
7/3	21	6	28.6	0	0.0	0	0.0	0	0.0	6	28.6
7/5	48	8	16.7	0	0.0	0	0.0	0	0.0	8	16.7
7/6	10	1	10.0	0	0.0	0	0.0	0	0.0	1	10.0
7/7	15	6	40.0	0	0.0	0	0.0	0	0.0	6	40.0
7/8	7	2	28.6	0	0.0	0	0.0	0	0.0	2	28.6
Total	3,234	1,310		218		115		40		1,683	

Table B-4. PIT-tagged wild steelhead trout interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Snake River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/13,14,15											
16	14	11	78.6	1	7.1	1	7.1	1	7.1	100.0	
4/19	82	61	74.4	8	9.8	8	9.8	0	0.0	77	93.9
4/20	57	38	66.7	6	10.5	5	8.8	0	0.0	49	86.0
4/21	257	186	72.4	34	13.2	10	3.9	2	0.8	232	90.3
4/22	302	222	73.5	33	10.9	12	4.0	3	1.0	270	89.4
4/23	66	42	63.6	3	4.5	9	13.6	1	1.5	55	83.3
4/24	58	41	70.7	8	13.8	3	5.2	0	0.0	52	89.7
4/25	127	91	71.7	10	7.9	11	8.7	1	0.8	113	89.0
4/26	76	56	73.7	5	6.6	4	5.3	2	2.6	67	88.2
4/27	85	71	83.5	3	3.5	3	3.5	0	0.0	77	90.6
4/28	51	36	70.6	4	7.8	3	5.9	0	0.0	43	84.3
4/29	49	38	77.6	4	8.2	1	2.0	1	2.0	44	89.8
4/30	75	51	68.0	8	10.7	3	4.0	3	4.0	65	86.7
5/1	18	16	88.9	1	5.6	0	0.0	0	0.0	17	94.4
5/2	35	26	74.3	2	5.7	2	5.7	0	0.0	30	85.7
5/3	57	41	71.9	6	10.5	2	3.5	1	1.8	50	87.7
5/4	40	25	62.5	3	7.5	0	0.0	0	0.0	28	70.0
5/5	102	71	69.6	6	5.9	4	3.9	1	1.0	82	80.4
5/6	60	38	63.3	5	8.3	7	11.7	3	5.0	53	88.3
5/7	81	54	66.7	6	7.4	5	6.2	0	0.0	65	80.2
5/8	82	52	63.4	6	7.3	2	2.4	2	2.4	62	75.6
5/9	92	52	56.5	8	8.7	3	3.3	2	2.2	65	70.7
5/10	143	49	34.3	23	16.1	13	9.1	8	5.6	93	65.0
5/11	94	24	25.5	18	19.1	5	5.3	2	2.1	49	52.1
5/12	117	30	25.6	15	12.8	16	13.7	4	3.4	65	55.6
5/13	111	21	18.9	23	20.7	8	7.2	4	3.6	56	50.5
5/14	103	23	22.3	18	17.5	4	3.9	4	3.9	49	47.6
5/15	69	13	18.8	15	21.7	1	1.4	4	5.8	33	47.8
5/16	61	17	27.9	10	16.4	7	11.5	0	0.0	34	55.7
5/17	59	12	20.3	10	16.9	2	3.4	0	0.0	24	40.7
5/18	39	9	23.1	3	7.7	2	5.1	2	5.1	16	41.0
5/19	21	5	23.8	5	23.8	0	0.0	0	0.0	10	47.6
5/20	7	1	14.3	1	14.3	2	28.6	0	0.0	4	57.1

Table B-4. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/21	12	7	58.3	1	8.3	0	0.0	0	0.0	8	66.7
5/22	13	7	53.8	1	7.7	0	0.0	0	0.0	8	61.5
5/23	16	6	37.5	0	0.0	1	6.2	0	0.0	7	43.8
5/24	16	4	25.0	1	6.2	0	0.0	0	0.0	5	31.2
5/25	12	2	16.7	0	0.0	1	8.3	0	0.0	3	25.0
5/26	7	3	42.9	0	0.0	0	0.0	0	0.0	3	42.9
5/27	14	3	21.4	5	35.7	1	7.1	0	0.0	9	64.3
5/28	12	5	41.7	0	0.0	0.7	0.0	0	0.0	5	41.7
5/29	5	1	20.0	1	20.0	0	0.0	0	0.0	2	40.0
5/30	5	1	20.0	0	0.0	0	0.0	0	0.0	1	20.0
6/1	4	1	25.0	1	25.0	0	0.0	0	0.0	2	50.0
6/4	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
6/8	1	0	0.0	1	100.0	0	0.0	0	0.0	1	100.0
6/16	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
7/2	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
Total	,2,810	1,566		322		161		51		2,100	

77

Table B-5. PIT-tagged hatchery chinook salmon interrogations at Lower Granite, Little Goose, Lower Monumental and McNary dams from the Clearwater River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/5	7	3	42.9	2	28.6	0	0.0	1	14.3	6	85.7
4/6	8	3	37.5	1	12.5	0	0.0	0	0.0	4	50.0
4/8	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
4/9	101	26	25.7	12	11.9	15	14.9	8	7.9	61	60.4
4/10	109	22	20.2	9	8.3	11	10.1	10	9.2	52	47.7
4/11	94	24	25.5	10	10.6	7	7.4	10	10.6	51	54.3
4/12,13	94	25	26.6	13	13.8	12	12.8	12	12.8	62	65.6
4/14	84	22	26.2	9	10.7	13	15.5	9	10.7	53	63.1
4/15	100	31	31.0	5	5.0	11	11.0	15	15.0	62	62.0
4/16	103	26	25.2	7	6.8	14	13.6	17	16.5	64	62.1
4/17	100	31	31.0	9	9.0	9	9.0	15	15.0	64	64.0
4/18	99	32	32.3	10	10.1	8	8.1	13	13.1	63	63.6
4/19	107	43	40.2	12	11.2	10	9.3	14	13.1	79	73.8
4/20	98	28	28.6	5	5.1	7	7.1	16	16.3	56	57.1
4/21	100	21	21.0	9	9.0	12	12.0	14	14.0	56	56.0
4/22	101	24	23.8	8	7.9	3	3.0	18	17.8	53	52.5
4/23	96	27	28.1	6	6.2	5	5.2	17	17.7	55	57.3
4/26,27,28	86	20	23.3	13	15.1	8	9.3	11	12.8	52	60.5
4/29,30-5/1	95	23	24.2	15	15.8	6	6.3	7	7.4	51	53.7
5/2	8	1	12.5	0	0.0	2	25.0	1	12.5	4	50.0
5/3	7	1	14.3	1	14.3	2	28.6	1	14.3	5	71.4
5/4	13	1	7.7	1	7.7	1	7.7	3	23.1	6	46.2
5/5	6	2	33.3	0	0.0	0	0.0	2	33.3	4	66.7
5/6	3	0	0.0	0	0.0	0	0.0	3	100.0	3	100.0
5/7	91	15	16.5	10	11.0	6	6.6	11	12.1	42	46.2
5/8	23	5	21.7	3	13.0	1	4.3	2	8.7	11	47.8
5/10	9	4	44.4	2	22.2	1	11.1	0	0.0	7	77.8
5/11	38	9	23.7	5	13.2	1	2.6	3	7.9	18	47.4
5/12	7	1	14.3	0	0.0	1	14.3	2	28.6	4	57.1
5/25	7	0	0.0	1	14.3	0	0.0	1	14.3	2	28.6
5/26	5	0	0.0	1	20.0	1	20.0	0	0.0	2	40.0
5/27	23	4	17.4	2	8.7	2	8.7	2	8.7	10	43.5
5/28	43	7	16.3	3	7.0	5	11.6	3	7.0	18	41.9
5/29	31	6	19.4	0	0.0	7	22.6	1	3.2	14	45.2
5/30	25	1	4.0	2	8.0	1	4.0	1	4.0	5	20.0
5/31	28	3	10.7	4	14.3	3	10.7	2	7.1	12	42.9

Table B-5. Continued

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
6/1	20	4	20.0	2	10.0	1	5.0	1	5.0	8	40.0
6/2	8	2	25.0	0	0.0	1	12.5	1	12.5	4	50.0
6/3	3	1	33.3	0	0.0	2	66.7	0	0.0	3	100.0
6/4	3	2	66.7	0	0.0	0	0.0	0	0.0	2	66.7
6/6	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
Total	1,986	501		193		189		247		1,130	

Table B-6. PIT-tagged wild chinook salmon interrogations at Lower Granite, Little **Goose**; tower Monumental, and McNary dams from the Clearwater, River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/5	79	42	53.2	12	15.2	7	8.9	3	3.8	64	81.0
4/6	38	16	42.1	9	23.7	8	21.1	1	2.6	34	89.5
4/7	16	10	62.5	3	18.8	2	12.5	0	0.0	15	93.8
4/8	5	4	80.0	0	0.0	0	0.0	1	20.0	5	100.0
4/9	43	22	51.2	5	11.6	4	9.3	3	7.0	34	79.1
4/10	16	9	56.2	3	18.8	1	6.2	0	0.0	13	81.2
4/11	31	16	51.6	3	9.7	6	19.4	2	6.5	27	87.1
4/12	14	7	50.0	3	21.4	2	14.3	1	7.1	13	81.2
4/13	6	3	50.0	1	16.7	1	16.7	0	0.0	5	92.9
4/14	16	8	50.0	4	25.0	0	0.0	2	12.5	14	83.3
4/15	9	1	11.1	2	22.2	2	22.2	0	0.0	5	87.5
4/16	3	2	66.7	0	0.0	0	0.0	0	0.0	2	55.6
4/18	5	3	60.0	0	0.0	1	20.0	0	0.0	4	66.7
4/19	79	37	46.8	6	7.6	14	17.7	7	8.9	64	80.0
4/20	77	33	42.9	4	5.2	10	13.0	3	3.9	50	81.0
4/21	75	27	36.0	14	18.7	9	12.0	6	8.0	56	64.9
4/22	22	10	45.5	3	13.6	2	9.1	1	4.5	16	74.7
4/23	8	5	62.5	1	12.5	0	0.0	1	12.5	7	72.7
4/26	5	2	40.0	2	40.0	0	0.0	0	0.0	4	87.5
4/27	7	3	42.9	2	28.6	0	0.0	1	14.3	6	80.0
4/29	8	3	37.5	1	12.5	2	25.0	1	12.5	7	85.7
4/30	5	4	80.0	0	0.0	0	0.0	1	20.0	5	87.5
5/2	3	0	0.0	1	33.3	0	0.0	0	0.0	1	100.0
5/3	3	2	66.7	0	0.0	0	0.0	1	33.3	3	100.0
5/4	3	2	66.7	0	0.0	1	33.3	0	0.0	3	75.0
5/5	4	1	25.0	1	25.0	0	0.0	1	25.0	3	50.0
5/6	2	0	0.0	0	0.0	0	0.0	1	50.0	1	100.0
5/7	5	1	20.0	1	20.0	2	40.0	1	20.0	5	60.0
5/10	5	0	0.0	2	40.0	0	0.0	1	20.0	3	70.0
5/11	10	2	20.0	3	30.0	1	10.0	1	10.0	7	70.0
5/12	3	2	66.7	0	0.0	0	0.0	0	0.0	2	66.7
5/27	8	3	37.5	2	25.0	0	0.0	0	0.0	5	43.8
5/28	16	6	37.5	0	0.0	1	6.2	0	0.0	7	40.0
5/29	10	3	30.0	0	0.0	1	10.0	0	0.0	4	40.0
5/30	4	2	50.0	0	0.0	0	0.0	0	0.0	2	50.0
5/31	18	2	11.1	1	5.6	2	11.1	0	0.0	5	27.8
6/1	13	3	23.1	0	0.0	1	7.7	0.	0.0	4	30.8

08

Table B-6. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
6/2	6	1	16.7	0	0.0	2	33.3	0	0.0	3	50.0
6/3	3	0	0.0	0	0.0	1	33.3	1	33.3	2	66.7
6/4	5	2	40.0	1	20.0	0	0.0	0	0.0	3	60.0
6/6	5	0	0.0	2	40.0	0	0.0	0	0.0	2	40.0
6/7	5	5	100.0	0	0.0	0	0.0	0	0.0	5	100.0
6/8	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
6/10	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
6/13	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
6/15	10	1	10.0	1	10.0	1	10.0	0	0.0	3	30.0
6/16	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
6/27	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
7/7	16	1	6.2	0	0.0	0	0.0	0	0.0	1	6.2
7/23	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
Total	738	311		94		84		41		530	

Table B-7. PIT-tagged hatchery steelhead interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Clearwater River trap, 1994.

Date	Numbe tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	Int. at McNary	%	Total int.	Total %
4/12	1	1	100.0	0	0.0	0	0.0	0.0	1	100.0
4/16	1	1	100.0	0	0.0	0	0.0	0.0	1	100.0
4/19	61	47	77.0	6	9.8	1	1.6	3.3	56	91.8
4/20	59	38	64.4	11	18.6	4	6.8	0.0	53	89.8
4/21	60	43	71.7	5	8.3	5	8.3	0.0	53	88.3
4/22	60	41	68.3	8	13.3	1	1.7	0.0	50	83.3
4/23	59	56	94.9	1	1.7	1	1.7	0.0	58	98.3
4/26	60	44	73.3	4	6.7	1	1.7	1.7	50	83.3
4/27	59	48	81.4	3	5.1	1	1.7	0.0	52	88.1
4/28	61	41	67.2	5	8.2	1	1.6	3.3	49	80.3
4/29	62	50	80.6	7	11.3	0	0.0	0.0	57	91.9
4/30	31	22	71.0	4	12.9	2	6.5	0.0	28	90.3
5/1	23	18	78.3	0	0.0	0	0.0	0.0	18	78.3
5/2	19	13	68.4	3	15.8	0	0.0	0.0	16	84.2
5/3	60	40	66.7	5	8.3	1	1.7	0.0	46	76.7
5/4	60	38	63.3	3	5.0	2	3.3	0.0	43	71.7
5/5	60	44	73.3	3	5.0	0	0.0	1.7	48	80.0
5/6	60	33	55.0	5	8.3	0	0.0	0.0	38	63.3
5/7	61	37	60.7	4	6.6	1	1.6	1.6	43	70.3
5/8	61	25	41.0	11	18.0	1	1.6	1.6	38	62.3
5/9	4	1	25.0	1	25.0	0	0.0	25.0	3	15.0
5/10	10	2	20.0	0	0.0	0	0.0	0.0	2	20.0
5/11	62	7	11.3	15	24.2	6	9.7	0.0	28	45.2
5/12	18	3	16.7	6	33.3	1	5.6	0.0	10	55.6
5/25	4	1	25.0	0	0.0	0	0.0	0.0	1	25.0
5/26	5	1	20.0	0	0.0	0	0.0	0.0	1	20.0
5/27	6	1	16.7	1	16.7	0	0.0	0.0	2	43.3
5/28	22	7	31.8	1	4.5	1	4.5	0.0	9	40.9
5/29	29	5	17.2	1	3.4	1	3.4	0.0	7	24.1
5/30	6	2	33.3	0	0.0	0	0.0	0.0	2	33.3
5/31	19	6	31.6	2	10.5	0	0.0	0.0	8	42.1
6/1	16	4	25.0	1	6.2	0	0.0	0.0	5	31.2
6/2	6	2	33.3	1	16.7	1	16.7	0.0	4a	66.7
6/3	8	1	12.5	0	0.0	0	0.0	0.0	1	12.5

Table B-7. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
6/5	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
6/7	2	0	0.0	1	50.0	0	0.0	0	0.0	1	50.0
6/13	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
6/15	8	2	25.0	0	0.0	0	0.0	1	12.5	3	37.5
7/7	16	2	12.5	0	0.0	0	0.0	0	0.0	2	12.5
7/8	6	1	16.7	0	0.0	0	0.0	0	0.0	1	16.7
Total	1,229	729		119		32		10		890	

Table 8. PIT-tagged wild steelhead trout interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Clearwater River trap, 1994.

Date	Number tagged	Int. Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/5,6,7,8	29	15	51.7	5	17.2	2	6.9	0	0.0	22	75.9
4/9,10,11											
12,13,14	27	20	74.1	1	3.7	3	11.1	0	0.0	24	88.9
4/15	1	0	0.0	0	0.0	1	100.0	0	0.0	1	100.0
4/18	2	2	100.0	0	0.0	0	0.0	0	0.0	2	100.0
4/19	703	468	66.6	79	11.2	60	8.5	14	2.0	621	88.3
4/20	146	94	64.4	18	12.3	7	4.8	6	4.1	125	85.6
4/21	221	137	62.0	35	15.8	14	6.3	2	0.9	188	85.1
4/22,23	36	21	58.3	4	11.1	2	5.6	0	0.0	27	75.0
4/26,27,28	53	28	52.8	3	5.7	10	18.9	0	0.0	41	77.4
4/29	9	8	88.9	0	0.0	1	11.1	0	0.0	9	100.0
4/30	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
5/1	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
5/2	5	3	60.0	0	0.0	0	0.0	0	0.0	3	60.0
5/3	3	3	100.0	0	0.0	0	0.0	0	0.0	3	100.0
5/4	4	4	100.0	0	0.0	0	0.0	0	0.0	4	100.0
5/5	3	2	66.7	1	33.3	0	0.0	0	0.0	3	100.0
5/6	1	0	0.0	0	0.0	1	100.0	0	0.0	1	100.0
5/7	8	6	75.0	0	0.0	0	0.0	0	0.0	6	75.0
5/8	4	2	50.0	0	0.0	0	0.0	0	0.0	2	50.0
5/10	3	1	33.3	0	0.0	0	0.0	1	33.3	2	66.7
5/11	14	1	7.1	2	14.3	4	28.6	1	7.1	8	57.1
5/27	2	0	0.0	0	0.0	1	50.0	0	0.0	1	50.0
5/28	4	1	25.0	1	25.0	0	0.0	0	0.0	2	50.0
5/31	5	2	40.0	1	20.0	0	0.0	0	0.0	3	60.0
6/2	1	0	0.0	0	0.0	1	100.0	0	0.0	1	100.0
6/7	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
Total	1,287	821		150		107		24		1,102	

Table B-9. PIT-tagged hatchery chinook salmon interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Salmon River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total 96	
3/31	4	2	50.0	0	0.0	0	0.0	0	0.0	2	50.0
4/1	5	4	80.0	0	0.0	1	20.0	0	0.0	5	100.0
4/2	4	3	75.0	0	0.0	0	0.0	0	0.0	3	75.0
4/6	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
4/10	102	33	32.4	7	6.9	12	11.8	4	3.9	56	54.9
4/11	100	39	39.0	11	11.0	8	8.0	6	6.0	64	64.0
4/12	100	39	39.0	8	8.0	9	9.0	10	10.0	66	66.0
4/13	100	32	32.0	11	11.0	8	8.0	7	7.0	58	58.0
4/14	100	34	34.0	10	10.0	9	9.0	3	3.0	56	56.0
4/15	100	30	30.0	6	6.0	11	11.0	2	2.0	49	49.0
4/16	101	39	38.6	3	3.0	10	9.9	7	6.9	59	58.4
4/17	100	24	24.0	8	8.0	8	8.0	5	5.0	45	45.0
4/18	100	46	46.0	6	6.0	5	5.0	2	2.0	59	59.0
4/19	99	34	34.3	8	8.1	10	10.1	6	6.1	58	58.6
4/20	104	35	33.7	6	5.8	7	6.7	9	8.7	57	54.8
4/21	99	36	36.4	3	3.0	8	8.1	16	16.2	63	63.6
4/22	99	34	34.3	5	5.1	6	6.1	11	11.1	56	56.6
4/23	84	33	39.3	7	8.3	6	7.1	5	6.0	51	60.7
4/24	119	29	24.4	6	5.0	6	5.0	17	14.3	58	48.7
4/25	101	23	22.8	10	9.9	7	6.9	16	15.8	56	55.4
4/26	100	20	20.0	7	7.0	3	3.0	9	9.0	39	39.0
4/27	101	19	18.8	4	4.0	5	5.0	18	17.8	46	45.5
4/28	99	22	22.2	7	7.1	4	4.0	15	15.2	48	48.5
4/29	101	23	22.8	10	9.9	8	7.9	7	6.9	48	47.5
4/30	100	25	25.0	12	12.0	8	8.0	12	12.0	57	57.0
5/1	101	11	10.9	14	13.9	4	4.0	16	15.8	45	44.6
5/2	101	13	12.9	9	8.9	9	8.9	15	14.9	46	45.5
5/3	101	16	15.8	14	13.9	8	7.9	18	17.8	56	55.4
5/4	98	16	16.3	11	11.2	7	7.1	14	14.3	48	49.0
5/5	100	13	13.0	6	6.0	7	7.0	17	17.0	43	43.0
5/6	100	15	15.0	13	13.0	10	10.0	15	15.0	53	53.0
5/7	96	16	16.7	9	9.4	10	10.4	14	14.6	49	51.0
5/8	97	11	11.3	14	14.4	8	8.2	15	15.5	48	49.5
5/9	102	13	12.7	13	12.7	7	6.9	9	8.8	42	41.2
5/10	90	13	14.4	7	7.8	5	5.6	10	11.1	35	38.9
5/11	104	18	17.3	16	15.4	3	2.9	12	11.5	49	47.1

Table B-9. Continued.

Date	Number tagged	Int. Lower Granit	Int. Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/12	39	5	12.8	25.6	5	12.8	2	5.1	22	56.4
5/13	10	2	20.0	30.0	1	10.0	0	0.0	6	60.0
5/14	13	1	7.7	15.4	0	0.0	1	7.7	4	30.8
5/15	9	0	0.0	33.3	1	11.1	1	11.1	5	55.6
5/16	6	1	16.7	0.0	1	16.7	0	0.0	2	33.3
5/17	5	0	0.0	0.0	1	20.0	0	0.0	1	20.0
5/18	4	1	25.0	0.0	1	25.0	0	0.0	2	50.0
5/19	11	1	9.1	18.2	0	0.0	1	9.1	4	36.4
5/20	14	3	21.4	0.0	2	14.3	0	0.0	5	35.7
5/21	14	1	7.1	0.0	1	7.1	2	14.3	4	28.6
5/22	17	1	5.9	17.6	3	17.6	1	5.9	8	47.1
5/23	19	4	21.1	5.3	0	0.0	1	5.3	6	31.6
5/24	22	3	13.6	4.5	0	0.0	0	0.0	4	18.2
5/25	36	4	11.1	11.1	3	8.3	2	5.6	13	36.1
5/26	42	6	14.3	4.8	1	2.4	2	4.8	11	26.2
5/27	11	1	9.1	0.0	0	0.0	1	9.1	2	18.2
5/28	8	1	12.5	25.0	0	0.0	0	0.0	3	37.5
5/29	15	2	13.3	6.7	3	20.0	0	0.0	6	40.0
5/30	24	6	25.0	4.2	0	0.0	2	8.3	9	37.5
5/31	16	3	18.8	12.5	0	0.0	0	0.0	5	31.2
6/1	10	1	10.0	0.0	0	0.0	0	0.0	1	10.0
6/3	10	2	20.0	10.0	0	0.0	0	0.0	3	30.0
6/4	15	2	13.3	20.0	1	6.7	0	0.0	6	40.0
6/5	14	1	7.1	7.1	0	0.0	0	0.0	2	14.3
6/7	2	1	50.0	0.0	0	0.0	0	0.0	1	50.0
6/9	5	1	20.0	0.0	0	0.0	0	0.0	1	20.0
6/13	5	2	40.0	20.0	0	0.0	0	0.0	3	60.0
6/14	4	1	25.0	0.0	0	0.0	0	0.0	1	25.0
6/15	3	1	33.3	0.0	0	0.0	0	0.0	1	33.3
Total	3,616	812			261		358		1,815	

Table B-10. PIT-tagged wild chinook salmon interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Salmon River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
3/31	15	9	60.0	2	13.3	1	6.7	0	0.0	12	80.0
4/1	20	11	55.0	1	5.0	3	15.0	1	5.0	16	80.0
4/2	70	38	54.3	8	11.4	6	8.6	2	2.9	54	77.1
4/3	75	41	54.7	8	10.7	5	6.7	4	5.3	58	77.3
4/4	75	39	52.0	7	9.3	7	9.3	1	1.3	54	72.0
4/5	74	41	55.4	7	9.5	6	8.1	2	2.7	56	75.7
4/6	75	40	53.3	4	5.3	6	8.0	5	6.7	55	73.3
4/7	75	41	54.7	14	18.7	3	4.0	1	1.3	59	78.7
4/8	75	33	44.0	15	20.0	7	9.3	2	2.7	57	76.0
4/9	67	41	61.2	7	10.4	2	3.0	4	6.0	54	80.6
4/10	75	33	44.0	11	14.7	6	8.0	4	5.3	54	72.0
4/11	32	13	40.6	4	12.5	1	3.1	2	6.2	20	62.5
4/12	39	17	43.6	5	12.8	7	17.9	0	0.0	29	74.4
4/13	45	26	57.8	9	20.0	2	4.4	2	4.4	39	86.7
4/14	58	30	51.7	7	12.1	5	8.6	3	5.2	45	77.6
4/15	62	31	50.0	4	6.5	6	9.7	3	4.8	44	71.0
4/16	73	33	45.2	12	16.4	3	4.1	6	8.2	54	74.0
4/17	54	30	55.6	6	11.1	3	5.6	1	1.9	40	74.1
4/18	74	32	43.2	9	12.2	4	5.4	6	8.1	51	68.9
4/19	87	40	46.0	13	14.9	8	9.2	4	4.6	65	74.7
4/20	73	30	41.1	9	12.3	5	6.8	8	11.0	52	71.2
4/21	75	38	50.7	4	5.3	10	13.3	7	9.3	59	78.7
4/22	78	34	43.6	7	9.0	5	6.4	6	7.7	52	66.7
4/23	76	33	43.4	4	5.3	2	2.6	11	14.5	50	65.8
4/24	61	25	41.0	5	8.2	2	3.3	7	11.5	39	63.9
4/25	44	12	27.3	4	9.1	1	2.3	4	9.1	21	47.7
4/26	33	10	30.3	2	6.1	2	6.1	5	15.2	19	57.6
4/27	75	31	41.3	5	6.7	6	8.0	5	6.7	47	62.7
4/28	74	34	45.9	5	6.8	0	0.0	11	14.9	50	67.6
4/29	66	22	33.3	5	7.6	3	4.5	4	6.1	34	51.5
4/30	42	12	28.6	0	0.0	3	7.1	6	14.3	21	50.0

Table B-10. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/1	40	18	45.0	3	7.5	3	7.5	6	15.0	30	75.0
5/2,3,4	70	22	31.4	4	5.7	8	11.4	4	5.7	38	54.3
5/5,6	64	20	31.3	5	7.8	3	4.7	11	17.2	39	60.9
5/7,8	143	27	18.9	17	11.9	8	5.6	23	16.1	75	52.4
5/9,10,11,12	175	27	15.4	25	14.3	14	8.0	19	10.9	85	48.6
5/13	23	6	26.1	1	4.3	1	4.3	1	4.3	9	39.1
5/14	16	2	12.5	5	31.2	0	0.0	1	6.2	8	50.0
5/15	7	0	0.0	1	14.3	1	14.3	0	0.0	2	28.6
5/16	9	2	22.2	0	0.0	0	0.0	1	11.1	3	33.3
5/17	7	2	28.6	3	42.9	0	0.0	0	0.0	5	71.4
5/18	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
5/19	4	0	0.0	2	50.0	0	0.0	1	25.0	3	75.0
5/20	4	1	25.0	0	0.0	0	0.0	0	0.0	1	25.0
5/21	11	2	18.2	0	0.0	1	9.1	1	9.1	4	36.4
5/22	4	2	50.0	0	0.0	0	0.0	1	25.0	3	75.0
5/23	18	3	16.7	0	0.0	3	16.7	1	5.6	7	38.9
5/24	17	3	17.6	2	11.8	1	5.9	0	0.0	6	35.3
5/25	26	8	30.8	3	11.5	1	3.8	1	3.8	13	50.0
5/26	20	1	5.0	1	5.0	1	5.0	1	5.0	4	20.0
5/27	20	7	35.0	1	5.0	3	15.0	0	0.0	11	55.0
5/28	14	2	14.3	0	0.0	1	7.1	0	0.0	3	21.4
5/29	18	4	22.2	1	5.6	1	5.6	1	5.6	7	38.9
5/30	11	3	27.3	1	9.1	0	0.0	0	0.0	4	36.4
5/31	16	3	18.8	1	6.2	1	6.2	1	6.2	6	37.5
6/1	18	3	16.7	2	11.1	2	11.1	0	0.0	7	38.9
6/2	14	2	14.3	0	0.0	2	14.3	0	0.0	4	28.6
6/3	16	5	31.2	0	0.0	1	6.2	1	6.2	7	43.8
6/4	24	5	20.8	2	8.3	1	4.2	0	0.0	8	33.3
6/5	24	1	4.2	3	12.5	2	8.3	0	0.0	6	25.0
6/6	14	5	35.7	1	7.1	0	0.0	0	0.0	6	42.9

Table B-10. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
6/7	14	4	28.6	0	0.0	0	0.0	0	0.0	4	28.6
6/8	9	3	33.3	0	0.0	0	0.0	0	0.0	3	33.3
6/9	9	1	11.1	0	0.0	0	0.0	0	0.0	1	11.1
6/10	17	4	23.5	0	0.0	1	5.9	0	0.0	5	29.4
6/11	15	3	20.0	1	6.7	1	6.7	0	0.0	5	33.3
6/12	19	2	10.5	0	0.0	0	0.0	0	0.0	2	10.5
6/13	23	6	26.1	1	4.3	2	8.7	0	0.0	9	39.1
6/14	13	0	0.0	1	7.7	0	0.0	0	0.0	1	7.7
6/15	9	3	33.3	0	0.0	0	0.0	0	0.0	3	33.3
6/16	18	4	22.2	1	5.6	0	0.0	0	0.0	5	27.8
Total	2,913	1,117		291		193		202		1,803	

Table B-11. PIT-tagged hatchery steelhead trout interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Salmon River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/19	61	43	70.5	4	6.6	4	6.6	1	1.6	52	85.2
4/20	13	9	69.2	1	7.7	1	7.7	0	0.0	11	84.6
4/21	58	48	82.8	1	1.7	2	3.4	0	0.0	51	87.9
4/22	66	45	68.2	6	9.1	5	7.6	0	0.0	56	84.8
4/23	63	46	73.0	0	0.0	2	3.2	0	0.0	48	76.2
4/24	62	45	72.6	2	3.2	0	0.0	0	0.0	47	75.8
4/25	60	40	66.7	0	0.0	4	6.7	3	5.0	47	78.3
4/26	61	45	73.8	4	6.6	1	1.6	0	0.0	50	82.0
4/27	68	44	64.7	5	7.4	0	0.0	0	0.0	49	72.1
4/28	61	43	70.5	4	6.6	0	0.0	0	0.0	47	77.0
4/29	61	34	55.7	6	9.8	1	1.6	0	0.0	41	67.2
4/30	61	37	60.7	3	4.9	1	1.6	2	3.3	43	70.5
5/1	60	37	61.7	3	5.0	2	3.3	0	0.0	42	70.0
5/2	69	49	71.0	2	2.9	2	2.9	1	1.4	54	78.3
5/3	60	32	53.3	6	10.0	1	1.7	0	0.0	39	65.0
5/4	60	36	60.0	2	3.3	4	6.7	2	3.3	44	73.3
5/5	60	33	55.0	4	6.7	1	1.7	0	0.0	38	63.3
5/6	60	29	48.3	5	8.3	2	3.3	0	0.0	36	60.0
5/7	60	24	40.0	4	6.7	0	0.0	4	6.7	32	53.3
5/8,9,10	127	34	26.8	21	16.5	5	3.9	1	0.8	61	48.0
5/11,12,13	174	26	14.9	28	16.1	8	4.6	8	4.6	70	40.2
5/14,15	93	14	15.1	13	14.0	2	2.2	0	0.0	29	31.2
5/16	16	3	18.8	0	0.0	0	0.0	1	6.2	4	25.0
5/17,18,19,20	122	28	23.0	6	4.9	3	2.5	3	2.5	40	32.8
5/21,22,23,24	249	54	21.7	10	4.0	7	2.8	7	2.8	78	30.8
5/25,26,27	205	42	20.5	8	3.9	4	1.9	2	1.0	56	27.3
5/28	56	9	16.1	2	3.6	1	1.8	0	0.0	12	21.4
5/29,30	107	18	16.8	5	4.7	2	1.9	1	0.9	26	24.3
5/31-6/1,2,3	166	33	19.9	9	5.4	5	3.0	1	0.6	48	28.9
6/4	54	12	22.2	1	1.9	1	1.9	0	0.0	14	25.9

Table B-11. Continued.

Date	Number tagged	Int. at Lower Granite	Int. at Little Goose	Int. at Lower Monumental	Int. at McNary	Total int.	Total				
6/5	27	3	11.1	1	3.7	0	0.0	0	0.0	4	14.8
6/6	10	2	20.0	0	0.0	0	0.0	0	0.0	2	20.0
6/7	10	2	20.0	0	0.0	0	0.0	0	0.0	2	20.0
6/8	11	1	9.1	0	0.0	0	0.0	0	0.0	1	9.1
6/11	9	1	11.1	0	0.0	1	11.1	0	0.0	2	22.2
6/13	7	0	0.0	1	14.3	0	0.0	0	0.0	1	14.3
6/14	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
6/15	6	2	33.3	0	0.0	0	0.0	0	0.0	2	33.3
Total	2,575	1,004		167		72		37		1,280	

Table B-12. PIT-tagged wild steelhead trout interrogations at Lower Granite, Little Goose, Lower Monumental, and McNary dams from the Salmon River trap, 1994.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
4/3	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
4/4	1	0	0.0	0	0.0	1	100.0	0	0.0	1	100.0
4/6	1	0	0.0	1	100.0	0	0.0	0	0.0	1	100.0
4/7	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
4/12	1	1	100.0	0	0.0	0	0.0	0	6.0	1	100.0
4/16	2	1	50.0	0	0.0	1	50.0	0	0.0	2	100.0
4/18	8	7	87.5	0	0.0	0	0.0	0	0.0	7	87.5
4/19	32	26	81.2	3	9.4	0	0.0	1	3.1	30	93.8
4/20	24	14	58.3	5	20.8	1	4.2	0	0.0	20	83.3
4/21	33	20	60.6	7	21.2	1	3.0	1	3.0	29	87.9
4/22	35	22	62.9	2	5.7	3	8.6	0	0.0	27	77.1
4/23	31	24	77.4	0	0.0	1	3.2	0	0.0	25	80.6
4/24	21	16	76.2	1	4.8	2	9.5	0	0.0	19	90.5
4/25,26	17	14	82.4	0	0.0	2	11.8	0	0.0	16	94.1
4/28	39	21	53.8	0	0.0	3	7.7	1	2.6	25	64.1
4/29,30-5/1	25	17	68.0	1	4.0	2	8.0	1	4.0	21	84.0
5/2,5,6,7	35	23	65.7	1	2.9	1	2.9	0	0.0	25	71.4
5/8	64	20	31.2	11	17.2	5	7.8	1	1.6	37	57.8
5/9	7	1	14.3	3	42.9	1	14.3	0	0.0	5	71.4
5/10	6	3	50.0	0	0.0	2	33.3	0	0.0	5	83.3
5/11	8	2	25.0	2	25.0	0	0.0	1	12.5	5	62.5
5/12	14	3	21.4	3	21.4	0	0.0	0	0.0	6	42.9
5/14	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
5/16	3	1	33.3	0	0.0	0	0.0	0	0.0	1	33.3
5/17	1	0	0.0	1	100.0	0	0.0	0	0.0	1	100.0
5/18	9	1	11.1	1	11.1	0	0.0	0	0.0	2	22.2
5/19	4	1	25.0	0	0.0	0	0.0	0	0.0	1	25.0
5/20	3	0	0.0	0	0.0	1	33.3	0	0.0	1	33.3
5/21	5	1	20.0	0	0.0	1	20.0	0	0.0	2	40.0
5/22	11	2	18.2	1	9.1	0	0.0	0	0.0	3	27.3
5/23	16	2	12.5	0	0.0	2	12.5	1	6.2	5	31.2
5/24	9	1	11.1	0	0.0	1	11.1	0	0.0	2	22.2

Table B-12. Continued.

Date	Number tagged	Int. at Lower Granite	%	Int. at Little Goose	%	Int. at Lower Monumental	%	Int. at McNary	%	Total int.	Total %
5/25	6	1	16.7	0	0.0	1	16.7	0	0.0	2	33.3
5/26	6	1	16.7	1	16.7	1	16.7	2	33.3	5	83.3
5/27	10	1	10.0	0	0.0	0	0.0	0	0.0	1	10.0
5/28	2	2	100.0	0	0.0	0	0.0	0	0.0	2	100.0
5/29	1	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0
5/30	3	2	66.7	0	0.0	0	0.0	0	0.0	2	66.7
5/31	5	2	40.0	0	0.0	0	0.0	0	0.0	2	40.0
6/1	6	1	16.7	0	0.0	0	0.0	1	16.7	2	33.3
6/2	2	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
6/4	4	1	25.0	0	0.0	0	0.0	0	0.0	1	25.0
Total	515	260		44		33		10		347	