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STEELHEAD SUPPLEMENTATION IN IDAHO RIVERS

Project Progress Report

2004 Annual Report

By

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TABLE OF CONTENTS

Page

ABSTRACT 1
INTRODUCTION 2
METHODS 3
Objective 1 3
Collect and Outplant Adult Steelhead 3
Evaluation of Spawner Success 3
Objective 2 5
Fingerling and Smolt Stocking Prior to 2004 and Subsequent Adult Returns 5
Estimate Juvenile Production from Naturally Spawning Adult Returns 5
Objective 3 6
Estimate Steelhead Escapement in Fish Creek 6
PIT-tagged Adult Steelhead Returns 6
Estimate Chinook Salmon Escapement in Fish Creek 6
Estimate Wild Juvenile Steelhead Densities 6
PIT Tag Juvenile Steelhead from Wild Populations 7
Estimate the Number of Juvenile Steelhead Out-migrating from Fish Creek 8
Estimate Smolt Detection Rates and Travel Times for PIT-tagged Steelhead Smolts 8
Estimate Age Composition of Adult and Juvenile Steelhead Populations 9
Characterize Genetic Structure and Introgression Rates of Steelhead Populations 10
Chinook Salmon Parr, Resident Trout, and Other Fish Trapped at Screw Traps 10
Document Water Temperature in Steelhead Streams 10
RESULTS 10
Objective 1 10
Collect and Outplant Adult Steelhead 10
Evaluation of Spawner Success 11
Objective 2 11
Fingerling and Smolt Stocking Prior to 2004 and Subsequent Adult Returns 11
Estimate Juvenile Production from Naturally Spawning Adult Returns 11
Objective 3 11
Estimate Steelhead Escapement in Fish Creek 11
PIT-tagged Adult Steelhead Returns 12
Estimate Chinook Salmon Escapement in Fish Creek 12
Estimate Wild Juvenile Steelhead Densities 13
PIT Tag Juvenile Steelhead from Wild Populations 13
Estimate the Number of Juvenile Steelhead Out-migrating from Fish Creek 14
Estimate Smolt Detection Rates and Travel Times for PIT-tagged Steelhead Smolts 14
Estimate Age Composition of Adult and Juvenile Steelhead Populations 15
Adults 15
Juveniles, Spring Collection Period 16
Juveniles, Summer Collection Period 16
Juveniles, Fall Collection Period 17
Characterize Genetic Structure and Introgression Rates of Steelhead Populations 17
Chinook Salmon Parr, Resident Trout, and Other Fish Trapped at Screw Traps 17
Fish Creek Screw Trap 17
Lick Creek Screw Trap 18
Rapid River Screw Trap 18
Document Water Temperature in Steelhead Streams 18

Table of Contents, continued.

Page

DISCUSSION 18
LITERATURE CITED 72
APPENDICES 73

LIST OF TABLES

Table 1. The number of PIT-tagged hatchery steelhead that were stocked in Red River and the SF Red River from 1993 to 1999 and the year, number, and percentage of the stocked fish that were detected as smolts at the Snake River dams. 21

Table 2. The number of PIT-tagged adults, detected at Lower Granite Dam, from the smolt and fingerling stockings that were detected at Lower Granite Dam and expected to return to and spawn in Red River and SF Red River. The smolt-to-adult survival (SAR) of each release group was based on the adult detections at Lower Granite Dam and the total number of smolt detections. 21

Table 3. The number of adult steelhead that were captured at the Fish Creek weir and passed upstream to spawn and the number of kelts that were recovered in 2004. Length (cm) measured was the fork length. 95% CI = ± cm. 22

Table 4. The date that the first and last steelhead adult was captured at the Fish Creek weir in 2004, and the date that 10%, 25%, 50%, 75%, and 90% of the total number of adults were captured. The spawner rows are adults that were caught in the trap box and passed upstream to spawn. N = number of fish. 22

Table 5. Maximum likelihood (ML) estimates of the 2004 steelhead escapement in Fish Creek for the entire run. Adults that were trapped were marked with a right operculum punch before being released upstream to spawn. The marked kelts captured column is the number of kelts that were recovered with a right operculum punch. 22

Table 6. Mean fish densities (fish/100 m^2) by habitat type in streams of the Clearwater River drainage that were snorkeled during summer 2004. Area = total area snorkeled (m^2); N = number of sites snorkeled; Trout fry = all trout (except brook trout) ≤75 mm; Age-1 steelhead = juvenile steelhead 76 mm to 127 mm; Age-2+ steelhead = all juvenile steelhead >127 mm; Brook fry = all brook trout <75 mm; Brook parr = all brook trout ≥75 mm; PW = pocket water. 23

List of Tables, continued.

Page

Table 7. Mean fish densities (fish/100 m^2) by habitat type in streams of the Salmon River and the SF Salmon River drainages that were snorkeled during summer 2004. Area = total area snorkeled (m^2); N = number of sites snorkeled; Trout fry = all trout (except brook trout) ≤75 mm; Age-1 steelhead = juvenile steelhead 76 mm to 127 mm; Age-2+ steelhead = all juvenile steelhead >127 mm; Brook fry = all brook trout <75 mm; Brook parr = all brook trout ≥75 mm; PW = pocket water. 26

Table 8. The mean stream density (fish/100m^2) of juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, brook trout, and mountain whitefish in streams that were snorkeled in 2004. The age-1 change column is the percent change of the age-1 steelhead parr density from 2003. ns = stream was not surveyed in 2003. 28

Table 9. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead that were PIT tagged at screw traps in the Clearwater River drainage. 29

Table 10. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead that were PIT tagged at screw traps in the Salmon River drainage. 30

Table 11. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead captured by flyfishing, electrofishing, or in minnow traps and PIT tagged. 31

Table 12. The number of juvenile steelhead caught, released upstream of the trap (Marks), and recaptured at the Fish Creek screw trap during each trap period in 2004. p = trap efficiency estimate. 31

Table 13. The number of wild steelhead that were detected as smolts in 2004, the number of steelhead PIT tagged, and the percent of all PIT-tagged fish that were ≥125 mm from each period that were detected in 2004. Tagging periods were Period 1 = March 1, 2004 to May 31, 2004; Period 2 = August 15, 2003 to December 15, 2003; Period 3 = June 1, 2003 to August 14, 2003; Period 4 = March 1, 2003 to May 31, 2003; Period 5 = all fish tagged before March 1, 2003. na = not applicable; no fish were tagged during the period. 32

Table 14. The median travel time in days and km/day and the 90% upper (UP) and lower (LO) confidence interval from release site to Lower Granite Dam (LGR). All smolts were PIT tagged and detected during the spring 2004. 33

Table 15. The number of scales that were collected from adult and juvenile steelhead during 2004. 33

List of Tables, continued.

Page

Table 16. The number (N), percent of the year's return, mean length (cm) and 95% CI (in parenthesis), by sex and ocean age, of adult steelhead captured at the Fish Creek weir in 2003 and 2004 and the Rapid River weir from 2002 to 2004. 34

Table 17. The total number of individuals per stream that were analyzed using microsatellites in 2004 at the Alaska Science Center. 35

Table 18. The number trapped and the length (mm) and weight (g) statistics of steelhead too small to PIT tag (<80 mm), Chinook salmon parr, cutthroat trout, bull trout, and dace that were caught in the Fish Creek, Lick Creek, and Rapid River screw traps in 2004. nm = not measured. 36

Table 19. Streams that were sampled for water temperatures in 2004 and the associated winter and summer temperature recording intervals. The water temperature was measured within 1 km of the mouth of each stream unless noted. The winter recording interval in the Salmon River drainage was used from January 1 to April 29 and from October 28 to December 31. The winter recording interval in the Clearwater River drainage was used from January 1 to March 21 and from November 1 to December 31. The Fish Creek air temperature, relative humidity, and barometric pressure were measured at the trailhead. NR = not recorded. 37

LIST OF FIGURES

Figure 1. The location of the study sections in Beaver and Frenchman creeks where hatchery adults were stocked and summer snorkel surveys conducted. 38

Figure 2. The sites where hatchery steelhead fingerlings were stocked from 1993 through 1996 in the SF Red River and the site in the Red River where hatchery steelhead smolts were stocked from 1996 through 1999. A snorkel survey was done in the SF Red River from its mouth to the WF SF Red River and in Red River from the SF Red River to Shissler Creek in 2004. 39

Figure 3. The Fish Creek drainage showing the location of the Fish Creek screw trap and adult weir. 40

Figure 4. Map of the Clearwater River, Salmon River, and SF Salmon River drainages showing streams that were snorkeled in 2004. 41

Figure 5. Map of the Salmon and Clearwater drainages showing the locations of the screw traps and the streams where crews captured and PIT tagged juvenile steelhead in 2004. 42

List of Figures, continued.

Page

Figure 6. The location of dams on the Snake and Columbia Rivers where PIT tags were detected during the juvenile smolt out-migration in 2004. 43

Figure 7. Map showing sites where scales were collected from adult and juvenile steelhead for aging. We collected scales at all sites except Gedney Creek and the Lower SF Salmon River in 2004. 44

Figure 8. The mean density (fish/100m^2) of age-1 and age-2+ steelhead in Beaver (top) and Frenchman (bottom) creeks from 1993 to 2004. Adult steelhead were stocked in Beaver Creek annually from 1993 through 2004. The years marked with an arrow in the graphs indicate that adult steelhead were not stocked the previous year. 45

Figure 9. The mean stream density (fish/100 m^2) of age-1 and age-2+ steelhead from 1993 to 2004 in the South Fork (SF) Red River (top) and Red River (bottom) upstream of the SF Red River. 46

Figure 10. The estimated wild steelhead escapement in Fish Creek from 1992 to 2004. The open bar is an estimate of unhandled adults that entered Fish Creek in the years the weir was breached or damaged. The solid and crosshatched bars are the number of fish that were trapped at the weir and passed upstream and the number of unmarked kelts that were recovered. 47

Figure 11. The number of adult female and male steelhead that were trapped at the Fish Creek weir and passed upstream to spawn from March 17 to June 16, 2004 (Upper graph) and the cumulative proportion of the total number of spawners that were captured on each date (Lower graph). 48

Figure 12. The length frequency of steelhead spawners trapped at the Fish Creek weir during the spring 2004. 49

Figure 13. The cumulative proportion of the total number of male and female steelhead kelts recovered at the Fish Creek weir from April 19 to July 12, 2004. 49

Figure 14. The number of PIT-tagged adult steelhead detected at Bonneville Dam between August 9 and September 14, 2003. These adults were tagged in Fish Creek as juveniles or were tagged elsewhere and captured at the Fish Creek weir during spring 2004. 50

Figure 15. The number of adult steelhead that were PIT tagged in Fish Creek as juveniles and observed at Bonneville, McNary, and Lower Granite dams between August 9, 2003 and March 30, 2004, and the number of spawners and kelts trapped at the Fish Creek weir during 2004. One adult was detected at the Fish Creek weir that was not detected at any dam. One kelt was detected at the dams but not at the weir when it was passed upstream to spawn. 50

List of Figures, continued.

Page

Figure 16 The number of naturally produced adult male (n = 16) and female Chinook salmon (n = 9) and the number of hatchery origin Chinook salmon (n = 64) trapped at the Fish Creek weir between June 9 and September 15, 2004. 51

Figure 17. The percent change in the mean density of age-1 steelhead (top graph) and all age-1 and older steelhead parr (bottom graph) from those observed in 2003 in tributaries of the Lochsa and Selway rivers. 52

Figure 18. The mean stream density (fish/100 m^2) from 1996 to 2004 of all juvenile steelhead (except fry) in the Lochsa River tributaries Canyon, Deadman, Post Office, and Weir creeks. 53

Figure 19. The mean stream density (fish/100 m^2) from 1993 to 2004 of all juvenile steelhead (except fry) in Fish Creek, Gedney Creek stratum 1, and West Fork Gedney Creek. 53

Figure 20. Length frequency of PIT-tagged wild steelhead juveniles captured in screw traps located in tributaries of the Clearwater River drainage during 2004. 54

Figure 21. Length frequency of PIT-tagged wild steelhead juveniles captured in screw traps located in tributaries of the Salmon River drainage during 2004. 55

Figure 22. Length frequency of PIT-tagged wild steelhead juveniles captured flyfishing during the summer 2004 in Fish, Gedney, Hungery, and O'Hara creeks. The Gedney Creek graph includes fish caught in the WF Gedney Creek. 56

Figure 23. The number of juvenile steelhead that were PIT tagged daily and the river level at Fish Creek from March 10 to November 16, 2004. 57

Figure 24. The number of juvenile steelhead (and 95% CI) that migrated past the screw trap in Fish Creek during the entire trapping season (Year, top graph) and from August 15 to the end of trapping in November (Fall, bottom graph) from 1994 to 2004. The large upper CI of yearly migration estimate for 2002 was a result of getting only one recapture during the spring high flow. In 1994, the trap was fished from September 22 to November 2. In 1995, the trap was fished from March 16 to June 14 and from August 18 to November 2. Beginning in 1996, IDFG crews have fished the trap (conditions permitting) continuously from mid-March until the creek freezes in the fall. 58

Figure 25. The percentage of all PIT-tagged steelhead and steelhead >124 mm detected as smolts at the downriver dams. Steelhead were tagged in the spring 2004 (Period 1) in the Clearwater drainage (A) and Salmon drainage (B) and during the fall 2003 (Period 2) in the Clearwater drainage (C) and the Salmon drainage (D). 59

List of Figures, continued.

Page

Figure 26. The mean length and 95% CI, at the time of PIT tagging, of smolts that were detected at dams on the Snake and Columbia rivers in 2004. All fish were tagged between August 15, 2003 and May 31, 2004. Streams in the Clearwater drainage are to the left of the dashed line, and streams in the Salmon drainage are to the right of the dashed line. 60

Figure 27. The date that 10%, 25%, 50%, 75%, and 90% of the total number of steelhead smolt detections at Lower Granite Dam in 2004 was attained from tributaries of the Clearwater River (below dashed line) and Salmon River (above dashed line). The left edge of each block is the date that the lower quantile of the block was reached. The number of detections from each site is in parenthesis. 61

Figure 28. The relationship between median smolt travel time from tag site to Lower Granite Dam (LGR) and the distance to LGR in 2004. 62

Figure 29. The percentage of adult steelhead that spent one year (Age-1), two years (Age-2), and three years (Age-3) in the ocean before returning to Rapid River in 2002, 2003, and 2004 or Fish Creek in 2003 and 2004. 62

Figure 30. The percent of juvenile steelhead in each age class from an analysis of scales that were collected during the spring (March 1 to June 15). The streams below the dashed line are in the Clearwater River drainage, and the remaining streams are in the Salmon River drainage. The number next to the stream code on the y-axis is the year scales were collected. Colt = Colt Killed Creek, Cfck = Crooked Fork Creek, Lsfr = Lower SF Salmon River, Mars = Marsh Creek, Pahr = Pahsimeroi River, Salr = Salmon River (Sawtooth), Sfsr = SF Salmon River. 63

Figure 31. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the spring (March 1 to June 15). The data for all years that were aged in 2004 were combined for this analysis. 64

Figure 32. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the summer (June 15 to August 14). The data for all years aged in 2004 were combined for this analysis. 65

Figure 33. The proportion of juvenile steelhead in each age class from scales collected during the fall (collected after August 14). The streams below the dashed line are in the Clearwater River drainage, and the remaining streams are in the Salmon River drainage. The number next to the stream code on the y-axis is the year scales were collected. Cfck = Crooked Fork Creek, Fish = Fish Creek, Gedc = Gedney Creek, Lemh = Lemhi River, Lsfr = Lower SF Salmon River, Mars = Marsh Creek, Pahr = Pahsimeroi River, Salr = Salmon River (Sawtooth), Sfsr = SF Salmon River. 66

List of Figures, continued.

Page

Figure 34. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the fall (August 15 to December 15). The data for all years aged in 2004 were combined for this analysis. The Fish Creek data includes juveniles collected in fall of 2002 that were aged in 2003. 67

Figure 35. The number of steelhead fry (A) and cutthroat trout (B) that were caught in the Fish Creek screw trap from June 20, 2004 to November 16, 2004. The solid line is the cumulative proportion of the total that had been captured on each date. Before June 20, five steelhead fry and nine cutthroat trout were caught in the trap. 68

Figure 36. The number of steelhead (A) and the number of Chinook salmon parr (B) trapped at the Lick Creek screw trap from August 19, 2004 to October 24, 2004. The solid line is the cumulative proportion of the total that had been captured on each date. 69

Figure 37. The number of steelhead (A), Bull trout (B), and Chinook salmon parr (C) caught in the Rapid River screw trap from September 8 to November 10, 2004. The solid line is the cumulative proportion of the total captured on each date. 70

Figure 38. The daily mean, maximum, and minimum stream temperature (°C) recorded in Fish Creek at the screw trap location. 71

LIST OF APPENDICES

Appendix 1. The boundaries of the streams in the Clearwater River drainage snorkeled in 2004. In streams with more than one stratum, the downstream boundary of stratum 2 begins at the upstream boundary of the previous stratum. 74

Appendix 2. The boundaries of the streams in the Salmon River drainage snorkeled in 2004. In streams with more than one stratum, the downstream boundary of stratum 2 begins at the upstream boundary of the previous stratum. 75

Appendix 3. Dates the IDFG, U.S. Fish and Wildlife Service (USFWS), and Nez Perce Tribe (NPT) screw traps were installed, removed, and unable to fish during 2004. 76

Appendix 4. The proportion of juvenile steelhead in each age class based on the scale analysis done in 2004 from streams in the Salmon River drainage. The spring period includes scales collected between March 1 and June 15, and the summer period is from June 16 to August 14. Fall scales were collected after August 14 of each year. 77

List of Appendices, continued.

Page

Appendix 5. The proportion of juvenile steelhead in each age class based on the scale analysis done in 2004 from streams in the Clearwater River drainage. The spring period includes scales collected between March 1 and June 15, and the fall scales were collected after August 14 of each year. We did not age any fish that were sampled during the summer period from the Clearwater River drainage. 78

Appendix 6. The mean length (mm) and 95% CI (in parenthesis) of juvenile steelhead aged in 2004. Numbers in italics indicate that the sample size for that age class was <5 fish and the 95% CI was not reported. The spring period includes scales collected between March 1 and June 15 of each year, summer period is from June 16 to August 14, and the fall collection period was after August 14 of each year. 79

ABSTRACT

The Steelhead Supplementation Studies (SSS) is an ongoing project that began in 1993 to investigate the feasibility of supplementing depressed wild and natural steelhead *Oncorhynchus mykiss* populations using hatchery populations and to monitor and collect life history information and genetic characteristics from wild and natural steelhead populations in the Salmon and Clearwater basins. This report provides a summary of project activities from January 1, 2004 to December 31, 2004. Idaho Department of Fish and Game (IDFG) personnel have stocked adult steelhead from Sawtooth Fish Hatchery into Frenchman and Beaver creeks since 1993 and have estimated the number of age-1 parr produced from each outplant the following year. I estimated that 39 age-1 juveniles were produced per female spawner in Beaver Creek from the 2003 adult outplant. In Frenchman Creek, six age-1 juveniles were produced per female spawner from the 2003 outplant. The wild adult steelhead escapement in Fish Creek, a tributary to the Lochsa River in the Clearwater Basin, was 204. I estimated that 43,239 steelhead juveniles out-migrated from Fish Creek between March 10 and November 16, 2004. The mean age-1 steelhead densities decreased from those observed in 2003 in eight of the 12 tributaries of the Lochsa and Selway rivers that are surveyed yearly. A SSS snorkel crew surveyed nine streams in the South Fork (SF) Salmon River drainage. This was the first year that a snorkel survey was done in the SF Salmon drainage by this project. We also began operating screw traps in two new locations in 2004. The Rapid River trap was operated from September 8 to November 10, 2004, and the Lick Creek trap was operated from August 19 to October 24, 2004. Additionally, this project collaborated with the Chinook salmon trapping operations being conducted by IDFG, the Nez Perce Tribe (NPT), the Shoshone-Bannock Tribe (SBT), and the United States Fish and Wildlife Service (USFWS) in conjunction with the Idaho Supplementation Studies (ISS) to tag juvenile steelhead. Trap tenders PIT tagged 17,507 steelhead juveniles at 15 screw trap sites in the Clearwater and Salmon drainages. In 2004, 3,385 and 1,131 smolts were detected at downriver dams from SSS tagging sites in the Clearwater River and Salmon River drainages, respectively. We aged 3,276 steelhead juveniles from scales that were collected from September 1998 to June 2004 and 772 adults from scales collected at Fish Creek and Rapid River from 2002 to 2004. Dr. Jennifer Nielsen at the U.S. Geological Survey Alaska Biological Science Center, Anchorage continued the microsatellite analysis of the juvenile steelhead tissue samples that were collected from Idaho streams in 2000. Two thousand seventy-one samples from 40 streams were analyzed in 2004. She expects the microsatellite analysis to be completed in 2005.

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INTRODUCTION

The Steelhead Supplementation Studies (SSS) was designed to assess the effects of supplementation and to gather life history and genetic data from wild steelhead *Oncorhynchus mykiss* populations. A detailed experimental design for this project was submitted to Bonneville Power Administration in 1992 and fieldwork began in 1993 (Byrne 1994). This report documents the work conducted from January 1, 2004 to December 31, 2004. Previous reports have summarized the work performed before January 1, 2003 (Byrne 1996; Byrne 1997; Byrne 1999; Byrne 2001a; Byrne 2001b; Byrne 2002; Byrne 2003; Byrne 2004). From January 1, 2004 to December 31, 2004, our effort focused on three objectives.

Objective 1: Assess the performance of hatchery and wild brood sources to reestablish steelhead *Oncorhynchus mykiss* in streams where extirpated.

The original plan was to assess the performance of hatchery stock and a wild stock with a paired watershed study in tributaries of the upper Salmon River (Byrne 1994). However, this approach was abandoned when wild steelhead abundance declined and Idaho Department of Fish and Game (IDFG) decided that "mining" a wild stock for this experiment was no longer appropriate. Wild steelhead were subsequently listed under the Endangered Species Act (ESA) in 1997. Since 1993, IDFG personnel have stocked adult hatchery steelhead in Beaver and Frenchman creeks and estimated the yield of age-1 parr from the outplants (Figure 1). In 2004, IDFG personnel stocked Beaver Creek with hatchery adult steelhead that returned to the Sawtooth Fish Hatchery. We did not stock adults in Frenchman Creek this year. A SSS crew snorkeled both streams in August 2004 to estimate the juvenile production of the brood year 2003 adults.

Objective 2: Evaluate the ability of returning adults from hatchery smolt and fingerling releases to produce progeny in streams.

This objective was designed to assess which life stage of release (fish stocked as fingerlings or those stocked as smolts) would be best for supplementation by comparing the number of age-1 parr produced by the two groups of adults when they returned to spawn naturally. This experiment was implemented in the Red River drainage, a tributary of the South Fork (SF) Clearwater River, with the Dworshak hatchery stock (Figure 2). Fingerlings were stocked yearly in the SF Red River from 1993 to 1996, and smolts were stocked in Red River in the spring from 1996 to 1999 (Byrne 2001a). The last sizeable smolt migration resulting from these stockings likely occurred in 1999. Since most adults spend two years in the ocean, adult returns from the juvenile stockings were largely completed in 2002. IDFG has conducted yearly snorkel surveys to monitor the densities of juvenile steelhead in the sections of Red River and SF Red River that were stocked with fingerlings and smolts.

Objective 3: Assess the abundance, habitat, genetic, and life-history characteristics of existing wild and natural steelhead populations in the Clearwater and Salmon River drainages.

SSS crews conducted snorkel surveys during the summer to estimate juvenile steelhead abundance in tributaries of the South Fork Salmon, Selway, and Lochsa rivers. This was the first year that SSS crews surveyed streams in the SF Salmon River drainage. This project coordinated passive integrated transponder (PIT) tagging of wild steelhead juveniles throughout the Salmon and Clearwater river drainages. SSS personnel operated the Fish Creek screw trap

from March 10 to November 16, 2004 and installed screw traps at two new sites in Lick Creek on August 18, 2004 and Rapid River on September 8, 2004. The addition of these traps will expand our monitoring of juvenile steelhead into two additional drainages—the South Fork Salmon River (Lick Creek) and the main Salmon River (Rapid River). The PIT-tagged fish provide data on the length distribution of juvenile steelhead, timing of juvenile migrants past the trap sites, and timing of smolt passage at Lower Granite Dam, and contribute to estimates of juvenile in-river survival and smolt-to-adult survival rates. The Fish Creek adult weir was operated from March 9 until September 18, 2004 to determine the escapement of wild steelhead and Chinook salmon *Oncorhynchus tshawytscha*.

Dr. Jennifer Nielsen at the Alaska Biological Science Center in Anchorage continued the genetic analysis of the wild and hatchery steelhead populations IDFG collected in 2000. Her lab completed the analysis of 2,071 samples from 40 streams. One hundred seventy-six samples from three streams remain to be analyzed.

We aged 3,276 steelhead juveniles and 511 adults from scales that were collected in previous years. We have now aged all scales collected before 2004. Our database contains the ages of 7,275 juveniles from nine streams and 1,243 adults from Fish Creek and Rapid River.

METHODS

Objective 1

Collect and Outplant Adult Steelhead

Sawtooth Fish Hatchery personnel installed a temporary weir at the upstream and downstream boundary of a 1 km stream segment in Beaver Creek and stocked adults in this section (Figure 1). We did not stock hatchery adults in Frenchman Creek in 2004. The Beaver Creek stocking location was the same stream segment that has been used for this experiment since 1993. The outplanted hatchery adults were randomly sorted from fish that returned to the Sawtooth Fish Hatchery. I assumed that all females remained in the outplant section and spawned successfully. I used the mean eggs per female, calculated by dividing the total green egg take by the number of females spawned at Sawtooth Fish Hatchery, to estimate the number of eggs deposited in Beaver Creek.

Evaluation of Spawner Success

I used the mean age-1 juvenile steelhead density (fish/100 m^2) in Frenchman Creek and Beaver Creek as an index of the reproductive success of the hatchery adults that were stocked in 2003. The length of the stream sections used to evaluate the reproductive success were approximately 3 km and 4 km in Beaver Creek and Frenchman Creek, respectively. The adults were stocked in the upper 1 km of each section. In 2003, IDFG stocked each creek with 10 males and 10 females. I assumed that all age-1 steelhead in Beaver and Frenchman creeks were the progeny of the previous year's hatchery adult outplant. I estimated the age-1 population in each stream and the number of age-1 parr produced per female.

An IDFG crew did a systematic snorkel survey to estimate the density of fish by species and size category in each study stream. Each snorkel site consisted of a single distinct habitat

type (pool, pocket water, riffle, or run) and was chosen randomly throughout the stream. A minimum of seven sites per kilometer of stream were snorkeled. The number of snorkel sites per habitat type was proportional to the type's abundance in the stream. One to five snorkelers counted fish in each site, depending on the stream size. Each snorkel site was separated by at least one distinct habitat type change from a prior site. Snorkelers estimated the size of all fish to the nearest inch except Chinook salmon *Oncorhynchus tshawytscha* parr, dace *Rhinichthys sp.,* and sculpin *Cottus sp*. After the crew snorkeled each site, they measured its length and three to six widths to calculate the surface area.

Chinook salmon parr were counted and classified as age-0 (<100 mm) or age-1 (≥100 mm). Steelhead parr were classified as age-1, length 3 in to 5 in (76 mm to 127 mm) and age-2+, length >5 in (127 mm). Because steelhead fry (age-0, <75 mm) are indistinguishable from westslope cutthroat trout *O. clarkii* fry, snorkelers classified both as trout fry. I did not partition westslope cutthroat trout, bull trout *Salvelinus confluentus*, brook trout *S. fontinalis*, or mountain whitefish *Prosopium williamsoni* into age classes. Mean densities (fish/100 m^2) by habitat type in each stream stratum were calculated for trout fry, the two age classes of steelhead and Chinook salmon, resident trout, and mountain whitefish.

I calculated the mean stream density (m_t) for each species as:

$$m_t = \sum p_i \overline{d_{it}}$$

where p_i = proportion of habitat i in the stream,
$\overline{d_{it}}$ = mean age t parr density (fish/100 m^2) in habitat i,
t = fish species (and age class, if steelhead or Chinook), and
i = pool, riffle, run, pocket water.

I estimated the age-1 steelhead population (N) and confidence intervals in Beaver and Frenchman creeks using the stratified sampling estimates of Scheaffer et al. (1986):

$$N = \sum A_i \overline{d_{i1}}$$

where N = population total,
A_i = total surface area (m^2) of habitat i,
$\overline{d_{i1}}$ = mean age-1 parr density (fish/m^2) of habitat i, and
i = pool, riffle, run, pocket water.

An approximate 95% confidence interval (CI) on the age-1 steelhead population estimate was calculated as:

$$CI = 2\sqrt{\sum A_i^2 \left(\frac{A_i - a_i}{A_i}\right)\left(\frac{s_i^2}{x_i}\right)}$$

where A_i = total surface area of habitat i,
s_i^2 = the sample variance of the mean age-1 parr density (fish/m^2) in habitat i,
a_i = total surface area that was snorkeled in habitat i,

x_i = number of habitat i sites snorkeled, and
i = pool, run, pocket water, or riffle habitat.

I treated A_i and a_i as constants when calculating the confidence interval and assumed that the variance was due to differences of densities in each snorkel site, not area measurements. This assumption implies that all area measurements were obtained without error. The total surface area (A_i) of each habitat type in the stream was calculated as:

$$A_i = lp_i w_i$$

where l = length of the study section (m) in each stream,
p_i = proportion of habitat i in the study section, and
w_i = mean width of habitat i.

Objective 2

Fingerling and Smolt Stocking Prior to 2004 and Subsequent Adult Returns

Personnel from IDFG stocked 50,000 Dworshak Hatchery fingerlings in the SF Red River yearly from 1993 to 1996 and about 4,000 to 8,000 Dworshak Hatchery smolts in Red River yearly from 1996 to 1999. Each fingerling stocking had 5,000 fish marked with a PIT tag and the other 45,000 with a coded-wire tag (CWT). Half of the 1996 smolt release were marked with a PIT tag, and the other half were marked with a CWT. All smolts released from 1997 to 1999 were PIT tagged (Byrne 2001a). The last year a smolt was detected at the Snake River dams from these stockings was 1999 (Table 1).

The Red River weir was not operated to trap adult steelhead during spring 2004. Based on adult detections at Lower Granite Dam, the last adults from the smolt stockings returned to Red River and spawned in spring 2002, and the last adults from the fingerling stockings returned to SF Red River and spawned in spring 2003 (Table 2). It is possible, although unlikely, that some adults returned to spawn in 2004 from the 1996 fingerling stocking. Since 1994, only two PIT-tagged adults have been detected at Lower Granite Dam from all the fingerlings that were stocked.

Estimate Juvenile Production from Naturally Spawning Adult Returns

Crews snorkeled the SF Red River from its mouth upstream to the West Fork (WF) SF Red River in 2004 to assess juvenile steelhead densities, using the procedures outlined in the Methods section for Objective 1. Juvenile steelhead densities in Red River upstream of the SF Red River to Shissler Creek were obtained from six stream transects snorkeled yearly by IDFG Clearwater Region crews. Several habitat types may exist within each Red River snorkel transect. The Red River juvenile steelhead densities were calculated as the average density of the snorkel transects. Crews snorkeled the same stream sections that were stocked with fingerlings and smolts (Figure 2).

Objective 3

Estimate Steelhead Escapement in Fish Creek

A SSS crew worked from March 6-9 to install a temporary weir in Fish Creek. Operations to enumerate and sample adult steelhead and pass them upstream of the weir began on March 9, 2004 (Figure 3). Adult steelhead trapped at the weir entered a holding box that was checked throughout the day. When adults were present, the trap tender removed them with a net and placed them in a large plastic water trough. The trap tender determined the sex of each adult fish based on external characteristics, measured fork length to the nearest cm, scanned for the presence of a PIT tag, collected scales, snipped a small portion of the anal fin for future DNA analysis, and used a paper punch to mark the right operculum before releasing the fish upstream of the weir. Steelhead kelts were collected at the weir and checked for a right operculum punch, sexed, scanned for PIT tag, and measured for length. If the kelt were alive, the trap tender punched the left operculum and passed it downstream of the weir. I estimated the adult steelhead escapement using two methods: 1) summing the number of adults trapped in the upstream live-box and the number of unmarked kelts recovered, and 2) a maximum likelihood estimate using the number of marked adults passed upstream of the weir, the total number of kelts recovered, and the number of marked kelts recovered (Steinhorst et al. 2004).

PIT-tagged Adult Steelhead Returns

I queried the PTAGIS database (http://www.psmfc.org) on June 1, 2004 and obtained the date adult steelhead were detected at Bonneville, McNary, and Lower Granite dams. I restricted the query to include only those fish that were PIT tagged in Fish Creek as juveniles and detected as adults at the three dams between July 1, 2003 and May 30, 2004. These fish were expected to return to Fish Creek and spawn during the spring 2004. I calculated the proportion of adults detected at Bonneville Dam that were later detected at McNary Dam, Lower Granite Dam, and the Fish Creek weir. I calculated the number of days the spawners spent in Fish Creek for all PIT-tagged adults that were recaptured as kelts.

Estimate Chinook Salmon Escapement in Fish Creek

The weir used to trap adult steelhead was left in the stream until September 19, 2004 to capture adult Chinook salmon that returned to Fish Creek. Hatchery origin Chinook salmon were marked with a caudal fin clip and released downstream of the weir. The Chinook salmon escapement was made by counting the number of naturally produced adults that were trapped and passed upstream of the weir. The trap tender determined the sex of each naturally produced Chinook salmon based on external characteristics, measured fork length to the nearest cm, scanned for the presence of a PIT tag, collected scales, snipped a small portion of the anal fin for future DNA analysis, and used a paper punch to mark the right operculum before releasing the fish upstream of the weir.

Estimate Wild Juvenile Steelhead Densities

The SSS crews use the same snorkel methods described for Objective 1 to estimate juvenile fish densities in wild production streams. During the summer of 2004, SSS crews

snorkeled Basin Creek in the Salmon River drainage; Gedney, WF Gedney, and O'Hara creeks in the Selway River drainage; Buckhorn Creek, Dollar Creek, Fitsum Creek, Lick Creek, Secesh River, East Fork (EF) SF Salmon River (upstream of Johnson Creek), Profile Creek, Sugar Creek, and Tamarack Creek in the SF Salmon River drainage; and Canyon, Crooked Fork, Deadman, Fish, Hungery, Bald Mountain, Boulder, Stanley, Weir, Post Office, and Lake creeks in the Lochsa River drainage (Figure 4). The strata boundaries of the streams SSS crews snorkeled are provided in Appendices 1 and 2.

This was the first year that a SSS snorkel crew surveyed streams in the SF Salmon River drainage. We determined the proportion of pools, pocket water, runs, and riffles in Lick Creek from its mouth to Steep Creek and in the Secesh River from the Lick Creek road bridge to Butterfly Creek by identifying the dominant habitat type every 10 m. We did not do a habitat survey in the other SF Salmon River drainage tributaries we snorkeled; hence, fish densities were reported by habitat type only in these streams.

PIT Tag Juvenile Steelhead from Wild Populations

This project operates screw traps in Fish Creek, Lick Creek, and Rapid River and coordinated steelhead tagging at screw traps used in the Idaho Supplementation Study (ISS). Steelhead were tagged at eight ISS screw traps operated by IDFG in Crooked Fork Creek, Colt Killed Creek, Red River, SF Salmon River at Knox Bridge, Pahsimeroi River, Lemhi River 0.2 km downstream of Hayden Creek, Marsh Creek, and the Salmon River at Sawtooth Fish Hatchery; three ISS traps operated by the Nez Perce Tribe in the South Fork Salmon River drainage in Lake Creek, Secesh River, and Johnson Creek; and one ISS trap operated by the U.S. Fish and Wildlife Service in Clear Creek (Figure 5). The screw trap in Clear Creek was fished from March 12 to June 12, 2004; the Lick Creek trap was fished from August 19 to October 26, 2004; and the Rapid River trap was fished from September 1, 2004 to November 9, 2004. At most other sites, the screw traps were fished continuously from early March until ice-up in November, river conditions permitting (Appendix 3). The traps were checked daily, and the number of steelhead captured and tagged was recorded. Each fish was scanned before tagging to verify that it had not been tagged previously. All steelhead >80 mm were PIT tagged, measured (fork length) to the nearest mm, and weighed to the nearest 0.1 g.

In addition to the screw traps, SSS crews PIT tagged wild steelhead that were collected flyfishing in Fish Creek on June 28, July 11, and July 12; 2004; Gedney Creek on July 26 and July 27; 2004; WF Gedney Creek on July 27, 2004, and O'Hara Creek on September 4 and September 5, 2004. I combined all fishing occasions in each stream for the data analysis. Crews from NOAA Fisheries, Pasco, Washington (supervised by Steve Achord) tagged juvenile steelhead >100 mm that were collected during their summer sampling of Chinook salmon parr in Bear Valley Creek, Big Creek, Camas Creek, Capehorn Creek, Elk Creek, Herd Creek, Loon Creek, Secesh River, SF Salmon River, Sulfur Creek, and Valley Creek from July 21 to August 27, 2004 (Figure 5).

I calculated the mean length, weight, and condition factor of steelhead at each screw trap site for the spring (start of trapping to May 31), summer (June 1 to August 31), and fall (September 1 to end of trapping) periods. I also calculated the mean length, weight, and condition factor of steelhead collected in streams by flyfishing and electrofishing. At all sites, the PIT-tagged fish were grouped into 5 mm interval length classes (class 70 = fish 70-74 mm, class 75 = fish 75-79 mm, etc.). I plotted the length frequency for all screw trap sites that had >100 steelhead tagged and all fly-fishing sites.

Estimate the Number of Juvenile Steelhead Out-migrating from Fish Creek

The trap tender released PIT-tagged steelhead about 600 m upstream of the Fish Creek screw trap and recorded the number of recaptures at the trap daily to estimate trap efficiency. All recaptures were released downstream of the trap. When more than 50 steelhead were tagged in a day, only 50 fish were released upstream of the trap and the remainder downstream of the trap. When less than 50 steelhead were trapped in a day, all the newly tagged fish were released upstream of the trap.

I stratified the trapping season based on flow and time of year and determined the number of steelhead trapped, fish released upstream (marks), and recaptured fish in each strata. This data was used as input for a maximum likelihood estimator (Steinhorst et al. 2004) to estimate the number of migrants and a 95% CI that left the stream during each period, during the entire year, and from August 15 to October 31. In Fish Creek, most of the juvenile steelhead during the season are trapped after August 15 (>90% of the total in all years since 1996).

Estimate Smolt Detection Rates and Travel Times for PIT-tagged Steelhead Smolts

I queried the PTAGIS database on September 16, 2004 and obtained the date and dam of detection, date of tagging, and the length and weight at tagging of all wild steelhead smolts tagged at SSS release sites and subsequently detected at Lower Granite (LGR), Little Goose (LGO), Lower Monumental (LMN), McNary (MCN), John Day (JDA), and Bonneville (BON) dams during 2004 (Figure 6). For each release site, I calculated the number of smolt detections from steelhead that were tagged from March 1, 2004 to May 31, 2004 (Period 1); August 15, 2003 to December 15, 2003 (Period 2); June 1, 2003 to August 14, 2003 (Period 3); fish tagged March 1, 2003 to May 31, 2003 (Period 4); and fish tagged before March 1, 2003 (Period 5). For each tag period, I determined the number of steelhead juveniles that were tagged and the number of tagged fish that were detected as smolts in 2004. I calculated the percentage of steelhead that were ≥125 mm when tagged that were detected as smolts in 2004 from each period.

I used the length of the fish when they were PIT tagged between August 15, 2003 and May 31, 2004 to estimate the mean smolt length from each stream. Steelhead tagged and detected during the spring 2004 (Period 1) are undergoing smoltification as they migrate to the ocean. Steelhead that were tagged between August 15, 2003 and December 15, 2003 (Period 2) and detected as a smolt in 2004 may grow after being tagged; however, most steelhead growth occurs before August each year (A. Byrne, unpublished data). Steelhead that were tagged prior to August 15, 2003 (Periods 3, 4, and 5) had additional time to grow before smolting; hence, their length at the time of tagging would likely underestimate smolt length. Steelhead PIT tagged between August 15, 2003 and May 31, 2004 and detected as smolts in 2004 were grouped into 5 mm interval length classes (class 130 = fish 130-134 mm, class 135 = fish 135-139 mm, etc.), and the length frequency was plotted.

I determined the date that 10%, 25%, 50%, 75%, and 90% of the total number of smolt detections at LGR was attained from each stream regardless of the tagging date. I determined the median travel time and 90% CI from release site to LGR of fish tagged in 2004 and subsequently detected as smolts at LGR. I only included sites with >15 detections at LGR in the travel time analysis. I calculated travel time as kilometers travel per day from the release site to LGR.

Estimate Age Composition of Adult and Juvenile Steelhead Populations

Trap tenders collected scales from adult steelhead trapped at the Fish Creek and Rapid River weirs (Figure 7). Personnel from IDFG collected scales from juvenile steelhead caught in screw traps in Crooked Fork Creek, Colt Killed Creek, Fish Creek, Lemhi River, Lick Creek, Marsh Creek, Pahsimeroi River, Rapid River, SF Salmon River at Knox Bridge, and the Salmon River at Sawtooth Fish Hatchery (Figure 7). The collectors measured the fork length of each fish and obtained scales from the preferred area (MacLellan 1987). This area is located just above the lateral line, posterior of a vertical line drawn from the posterior end of the dorsal fin.

Adult and juvenile scales were mounted between two glass microscope slides. The scales were observed on a computer video monitor using a Leica DME microscope and a Leica DC300 digital camera. A technician chose the best scale(s) for aging the fish and saved the scale as a digitized image. Most juvenile scale images were obtained using 100x magnification, and most adult images were obtained using 25x magnification. The saltwater age of adults and the freshwater age of juvenile steelhead were determined by counting the number of overwinter annuli. At least three technicians aged each scale independently using the same digitized scale image without knowledge of the length of the fish. If there was no age consensus among the readers, the readers collectively examined the image to resolve their differences before a final age was assigned to the fish. If a consensus was not attained, the scale was excluded from our analysis.

In 2004, final ages were assigned to adults that returned to Fish Creek in 2003 and 2004 and Rapid River from 2002 to 2004. Final ages were assigned to juvenile steelhead collected in Colt Killed Creek in 2002 and 2003, Crooked Fork Creek in 2002 and 2003, Fish Creek in 2003, Gedney Creek from 1998 to 2001, Lemhi River in 2003, Marsh Creek in 2002 and 2003, Pahsimeroi River from 1998 to 2000, 2002, and the spring 2004, Salmon River juveniles collected at the Sawtooth Fish Hatchery site in 2003, SF Salmon River collected at the Knox Bridge screw trap site in 2000 to 2003, and the Lower SF Salmon River 1 km upstream of the EF SF Salmon River (Figure 7).

Once an age consensus was reached for a stream, I put the juvenile fish in three groups to calculate the age proportions and the mean length of each age class. I put juvenile fish sampled between March 1 and June 15 of each year in the spring period, fish sampled between June 16 and August 14 in the summer period, and all fish sampled on or after August 15 of each year in the fall period. Although these three classes are somewhat arbitrary, the intention was to acknowledge that fish grow during sampling period; hence, the mean length of an age class will increase throughout the year in a stream. I determined the proportion of each juvenile age class in the stream for each year and collection period. I calculated the mean length of each juvenile age class in the stream for each collection period by combining data for all the years we aged in 2004. Since we only aged Fish Creek juveniles from 2003 this year, I included data from 2002 to calculate the mean length of each age class. I only had one year of data from juveniles sampled in the Lemhi River; hence, this was the only stream where age proportions and mean length of age classes were based on one years' data. The Fish Creek and Rapid River ocean age proportions and mean length of each ocean age class were calculated for each spawn year.

Characterize Genetic Structure and Introgression Rates of Steelhead Populations

This project collected and is presently analyzing tissue samples from steelhead populations that span the range of geographic, temporal, and phenotypic variability observed in the Salmon and Clearwater basins. IDFG collected tissue samples from juvenile steelhead in 2000 from five hatchery stocks and 74 wild populations. Analyses were completed on 31 of the wild populations and all five hatchery stocks. An interim report based on these analyses was completed in December 2003 (Byrne 2004). Microsatellite allelic diversity on the remaining streams was visualized and analyzed at the U.S. Geological Survey Alaska Science Center's Conservation Genetics Laboratory (Byrne 2001b). The microsatellite analysis continued on the remaining 40 streams in 2004.

Chinook Salmon Parr, Resident Trout, and Other Fish Trapped at Screw Traps

Trap tenders recorded the number of steelhead parr that were too small to tag (usually <80 mm), cutthroat trout, bull trout, and Chinook salmon parr that were caught in the Fish Creek, Lick Creek, and Rapid River screw traps each day. We recorded the number of longnose dace *Rhinichthys cataractae* and speckled dace *Rhinichthys osculus* that were caught each day at the Fish Creek trap. The trap tenders PIT tagged bull trout, Chinook salmon parr, and cutthroat trout at each trap. All Chinook salmon parr, cutthroat trout, and bull trout that were PIT tagged and a subsample of untagged steelhead were measured to the nearest mm and weighed to the nearest 0.1 g. A daily subsample of the longnose and speckled dace that were trapped at Fish Creek were measured and weighed.

Document Water Temperature in Steelhead Streams

I recorded water temperatures in tributaries throughout the Clearwater and Salmon river drainages with HOBO™ temperature recorders to obtain yearly temperature profiles from streams with wild steelhead populations. The streams span a range of elevation, geomorphic, and vegetative cover found in Idaho's steelhead streams. The water temperatures were recorded every 0.5 h to 1.6 h from early spring until late October. Winter water temperatures were recorded every 0.5 h to 2.5 h, depending on location and access. The daily mean, maximum, and minimum water temperatures were calculated for each stream.

RESULTS

Objective 1

Collect and Outplant Adult Steelhead

Sawtooth Fish Hatchery personnel stocked 29 females and 30 males in Beaver Creek on April 22, 2004. The mean length of both males and females was 58 cm (±1 cm). Sawtooth Fish Hatchery staff obtained 2,639,117 green eggs from the 576 female steelhead spawned at the hatchery in 2004. The pooled mean fecundity per female spawner was 4,582 eggs/female. I estimated that 132,878 eggs were deposited in Beaver Creek from the adults stocked in 2004.

Evaluation of Spawner Success

A SSS crew snorkeled Beaver and Frenchman creeks on August 17 and August 18, 2004. The age-1 steelhead densities in Beaver and Frenchman creeks were 2.85 and 0.54 fish/100m^2, respectively (Figure 8). The estimated age-1 steelhead populations and 95% CI in Beaver and Frenchman creeks were 391 (±139) and 59 (±45) fish, respectively. The estimated number of age-1 steelhead produced per female spawner for Brood Year (BY) 2003 was 39 in Beaver Creek and six in Frenchman Creek.

Objective 2

Fingerling and Smolt Stocking Prior to 2004 and Subsequent Adult Returns

The last smolt detection from the hatchery fingerling stockings in the SF Red River and smolt stockings in Red River occurred in 1999. The percentage of smolts stocked in Red River and detected at the Snake River dams ranged from 27.6% to 43.9%. Less than 1% of the fingerlings from each stocking were detected as smolts at the Snake River dams (Table 1).

There were 24 adults detected at Lower Granite Dam from the four years of smolt stockings. The SAR for the smolt stockings ranged from 0% to 0.93%. Two adults that originated from fingerling releases were detected at Lower Granite Dam. Both adults were from the 1996 release group (Table 2). None of the adults detected at LGR were trapped at the Red River weir.

Estimate Juvenile Production from Naturally Spawning Adult Returns

A SSS crew snorkeled the SF Red River from its mouth upstream to the WF SF Red River on June 29 and June 30, 2004. The mean age-1 and age-2+ steelhead densities (fish/100 m^2) were 1.14 and 1.69, respectively. The IDFG Clearwater Region crew snorkeled Red River upstream of the SF Red River to Shissler Creek on July 9 and July 11, 2004. The mean age-1 and age-2+ steelhead densities (fish/100 m^2) were 0.09 and 0.05, respectively (Figure 9).

Objective 3

Estimate Steelhead Escapement in Fish Creek

An IDFG crew began installing the Fish Creek weir on March 6 and trapping commenced during the afternoon of March 10, 2004. The weir remained intact during the steelhead spawning run; however, some small openings in the weir were discovered after a high flow event, caused by heavy rains, from May 22 to June 2. The trap technicians repaired the openings when it was safe to work on the weir. They trapped 118 females and 75 males at the weir and passed them upstream to spawn (Table 3). This years' escapement was the fourth highest since monitoring of the Fish Creek escapement began in 1992 (Figure 10). The median date of arrival of the female and male spawners was April 29 and April 26, respectively (Table 4 and Figure 11). The mean length of females and males were 80 cm (±1) and 78 cm (±2), respectively. The smallest and the largest fish we captured at the weir were males (Figure 12).

Trap tenders captured 99 marked female kelts, 48 marked male kelts, nine unmarked female kelts, and one unmarked male kelt. They recovered all of the unmarked kelts after June 4. The first kelt (a male) was captured on April 24, and the last kelt (a female) was captured on July 9. The median date of kelt capture was May 24 for males and June 3 for females (Table 4 and Figure 13). A higher proportion of the female kelts (68%) were alive than male kelts (55%) when they were recovered at the weir. The maximum likelihood estimate (ML) of the escapement the upper 95% CI were 206 and 230, respectively (Table 5). The lower CI value was less than the actual number of adults handled.

PIT-tagged Adult Steelhead Returns

Twenty-one steelhead adults with a PIT tag were trapped at the Fish Creek weir during spring 2004. Seventeen of the 21 PIT-tagged adults trapped at the Fish Creek weir were tagged as juveniles in Fish Creek, three were tagged at LGR as smolts, and one was tagged at Bonneville Dam as an adult. Nineteen of these adults were first detected at Bonneville Dam, one adult was first detected at McNary Dam, and one adult was not detected at any dam on the Columbia or Snake rivers. The first PIT-tagged adult returning to Fish Creek was detected at Bonneville Dam on August 9, 2003, and the last PIT-tagged adult was detected on September 12, 2003. The median date of passage at Bonneville Dam was September 3, 2003. On August 27, 2003, the date used to separate A-run and B-run steelhead at Bonneville Dam, 11% of the PIT-tagged adults bound for Fish Creek had passed the dam (Figure 14).

Sixteen of the adults PIT tagged in Fish Creek as juveniles were detected at Bonneville Dam. Fourteen of the 16 adults of Fish Creek origin that were detected at Bonneville were also detected at McNary and Lower Granite dams, and 11 were captured at the Fish Creek weir (Figure 15). The conversion rate from Bonneville Dam to McNary and Lower Granite dams was 87.5%, from Bonneville Dam to Fish Creek weir was 68.8%, and from Lower Granite Dam to Fish Creek weir was 78.6%.

The trap tenders recovered five PIT-tagged kelts at the Fish Creek weir; however, one adult was not detected when it was passed upstream of the weir to spawn. The four adults captured before and after spawning spent 27, 47, 53, and 54 days in Fish Creek.

Estimate Chinook Salmon Escapement in Fish Creek

The weir used to trap steelhead was left in the stream until September 17, 2004 to trap adult Chinook salmon returning to Fish Creek. We trapped 16 wild male and nine wild female Chinook salmon at the weir and passed them upstream to spawn. The first wild adult was caught on June 10 and the last on September 7, 2004. The mean length of females was 78 cm (95% CI, ±6 cm) and the mean length of the males was 74 cm (95% CI, ±3 cm). The tenders also trapped 64 hatchery origin adult Chinook salmon (31 males and 33 females) at the weir. The first hatchery origin adult was caught on June 21 and the last on September 15, 2004 (Figure 16).

Estimate Wild Juvenile Steelhead Densities

Crews began the snorkel surveys in the SF Red River on June 29, 2004 and completed the surveys in Basin Creek on August 19, 2004. Snorkel conditions were excellent in all streams during the summer surveys. The estimated mean densities by tributary, habitat type, and species for the Clearwater River drainage and the Salmon River drainage are in Tables 6 and 7. The mean age-1 steelhead densities decreased from those observed in 2003 in eight of the 13 tributaries of the Lochsa and Selway rivers that are surveyed yearly (Table 8). The age-1 steelhead densities increased in Bald Mountain, Boulder, Lake, and O'Hara creeks. The age-1 densities decreased by >50% in Canyon and Post Office creeks. The age-1 densities in Fish Creek and Gedney Creek decreased by 5% and 7%, respectively (Figure 17).

The mean density of all steelhead parr (except fry) decreased from the density observed in 2003 and ranged from 3.23 to 8.27 fish/100 m^2 in the four Lochsa River tributaries (Canyon, Deadman, Post Office, and Weir) that have been monitored since 1996 (Figure 18). Steelhead parr densities were 11.57 fish/100 m^2 in stratum 1 of Gedney Creek, 14.51 fish/100 m^2 in the WF Gedney Creek, and 12.17 fish/100 m^2 in Fish Creek (Figure 19).

The percent of each habitat type in Lick Creek from its mouth to Steep Creek was 5.8% pool; 57.5% pocket water; 18.7% riffle; and 17.9% run. The percent of each habitat type in the Secesh River from the Lick Creek Road Bridge to Butterfly Creek was 1.2% pool; 79.3% pocket water; 4.2% riffle; and 15.3% run. The mean stream age-1 and age-2+ steelhead densities in Lick Creek were 7.08 fish/100 m^2 and 1.17 fish/100 m^2. In the Secesh River mean stream age-1 and age-2+ steelhead densities were 2.40 and 1.60 fish/100 m^2, respectively (Table 8).

In the seven other SF Salmon River drainage tributaries we snorkeled that did not have a habitat survey done, the age-1 and age-2+ steelhead density in pools ranged from 15.58 and 17.18 fish/100 m^2 in Dollar Creek to zero steelhead counted in Profile Creek. The age-1 pocket water density in these streams ranged from 5.80 fish/100 m^2 in Fitsum Creek to zero in Sugar Creek. The age 2+ pocket water density in these streams ranged from 3.22 fish/100 m^2 in EF SF Salmon River to 0.76 fish/100 m^2 in Sugar Creek (Table 7).

PIT Tag Juvenile Steelhead from Wild Populations

Trap tenders tagged 11,555 juvenile steelhead at the five screw trap sites in the Clearwater River drainage. Eighty-four percent (9,680 fish) were tagged in Fish Creek. The mean length of all tagged steelhead ranged from 115 mm (±1 mm) in Fish Creek to 161 mm (±4 mm) in Colt Killed Creek (Table 9 and Figure 20).

Trap tenders tagged 5,952 juvenile steelhead at the 10 screw trap sites in the Salmon River drainage. Seventy-four percent (4,400 fish) of all steelhead tagged in the Salmon River drainage were trapped at Pahsimeroi River, Lemhi River, Johnson Creek, and SF Salmon River. The mean length of all tagged fish ranged from 122 mm (±3 mm) in Marsh Creek to 170 mm (±4 mm) in Rapid River (Table 10 and Figure 21).

Summer field crews using flyfishing gear collected and PIT tagged 1,562 juvenile steelhead in Fish, Hungery, Gedney, and O'Hara creeks. The mean length ranged from 118 mm (±3 mm) in O'Hara Creek to 132 mm (±2 mm) in Fish Creek (Table 11 and Figure 22).

The NOAA Fisheries crew used electrofishing gear to collect and PIT tag 461 juvenile steelhead from 12 streams for this study. They collected and tagged fewer than 40 steelhead in seven of these streams (Table 11). The mean length of the steelhead in the streams where >40 were tagged ranged from 117 mm (±9 mm) in Camas Creek to 128 mm in Big Creek (±5 mm) and SF Salmon River (±4 mm).

Estimate the Number of Juvenile Steelhead Out-migrating from Fish Creek

I split the trapping season into 14 periods. The first period, from March 10 to June 15, was the longest duration. During the first period, the river level was usually between 3.5 and 4.5 feet. In this first period, 130 steelhead were released upstream of the trap and three were recaptured. During the second period, from June 16 to June 26, the river level dropped steadily from 3.47 to 2.94 feet. The trap was fished in the thalweg once the river level was less than 3.0 feet. The river level dropped below 3.0 feet on June 16 and only exceeded 3.0 feet on August 25 for the remainder of the trapping season (Figure 23). Beginning June 17, the trap periods were usually 14 days long. The major exception to the 14 day duration was Period 8, which was a two day high flow event caused by a heavy rain (Table12).

I estimated that 43,239 juvenile steelhead (lower CI = 37,380, upper CI = 45,446) left Fish Creek from March 10 to November 16. The number of steelhead that left Fish Creek from August 15 to October 31 was 19,288 (lower CI = 18,053, upper CI = 20,764). The 2004 yearly migration estimate was the second highest since 1994; however, the number of migrants that left in the fall declined by 16,474 fish compared to the 2003 estimate (Figure 24).

Estimate Smolt Detection Rates and Travel Times for PIT-tagged Steelhead Smolts

During MY04, 3,385 and 1,131 smolts were detected at downriver dams from SSS tagging sites in the Clearwater River and Salmon River drainages, respectively. The Clearwater drainage smolt detections were dominated by Fish Creek (75% of the total), followed by Clear Creek (12%) and Crooked Fork Creek (8%). The remaining four tag sites from the Clearwater drainage each contributed less than 3% of the total Clearwater drainage smolt detections. The most abundant smolt detections from the Salmon drainage were from Johnson Creek (25% of the total), Marsh Creek (17%), SF Salmon River (16%), and Salmon River (13%). The remaining nine sites from the Salmon River drainage each contributed less than 10% of the total Salmon drainage detections (Table 13).

The Period 1 smolt detection rate of fish >125 mm when tagged from the Clearwater River sites ranged from 43.1% at Fish Creek to 73.8% at Colt Killed Creek. The detection rates of fish >125 mm when tagged from the Clearwater sites for Period 2 ranged from 23.6% at Boulder Creek to 43.2% from Fish Creek. The Period 1 smolt detection rate of fish >125 mm when tagged from the Salmon River sites ranged from 7% from the Lemhi River to 61.5% from Johnson Creek. The detection rates of fish >125 mm when tagged from the Salmon sites for Period 2 ranged from 4.6% from the Lemhi River to 36.6% from Johnson Creek. The smolt detection rate for Period 1 was higher than Period 2 at all sites except Fish Creek, Lake Creek, and Marsh Creek (Table 13 and Figure 25).

The mean smolt length, based on steelhead tagged between August 15, 2003 and May 31, 2004, ranged from 150 mm (±1 mm) in Fish Creek to 185 mm (±3 mm) from Crooked Fork Creek. The mean smolt length at most Clearwater River sites ranged between 150 mm

and 160 mm. In the Salmon River drainage, the mean smolt length at most sites ranged from 158 mm to 170 mm (Figure 26).

The median arrival date at Lower Granite Dam of smolts from Clearwater River sites was between May 3 and May 5, except Red River. The median arrival date of the Red River smolts was May 21. Smolts from Red River reached the 25% arrival quantile on May 12, nearly one week later than the 75% arrival quantile date was attained from all other Clearwater River sites. The duration of the middle 50% quantile of the smolt run (25% date to 75% date), ranged from four days from Colt Killed Creek to 11 days from Red River. The earliest 90% arrival quantile date was attained on May 5 from Gedney Creek and was attained at all other sites except Red River by May 12. The 90% arrival quantile date from Red River was May 26 (Figure 27).

The median arrival date at Lower Granite Dam of smolts from Salmon River sites was between May 6 and May 12, except Lemhi River. The median date of the Lemhi River smolt was May 21. The duration of the middle 50% quantile of the smolt run (25% date to 75% date), ranged from four days from Lake Creek to 14 days from Lemhi River. The 90% arrival quantile date ranged from May 12 from SF Salmon River to May 29 from the Lemhi River (Figure 27).

The median smolt travel time from release site to LGR was >30 km/day from four of the six sites in the Salmon River drainage and two of the five sites from the Clearwater River drainage. The fastest median travel time was 69 km/day from the Pahsimeroi River and the slowest was 11.9 km/day from Fish Creek (Table 14). The relation of median travel time and distance to LGR was not significant ($r^2 = 0.1$, $p = 0.35$; Figure 28).

Estimate Age Composition of Adult and Juvenile Steelhead Populations

We collected 203 scales from adult steelhead that returned to Fish Creek and 121 scales from adults that returned to Rapid River in 2004. In the Clearwater River drainage, we collected scales from 171 juvenile steelhead in Colt Killed Creek, 249 juveniles in Crooked Fork Creek, and 614 juveniles in Fish Creek. In the Salmon River drainage, we collected scales from 267 juveniles in Lemhi River, 93 juveniles in Lick Creek, 179 juveniles in Marsh Creek, 295 juveniles in Pahsimeroi River, 107 juveniles in Rapid River, 216 juveniles in the Salmon River, and 260 juveniles in the SF Salmon River (Table 15).

We aged 3,276 steelhead juveniles from scales that were collected from September 1998 to June 2004. One thousand four hundred forty-six fish were sampled in the spring, 215 were sampled in the summer, and 1,615 were sampled in the fall. We were able to complete the aging of all scales this project had collected prior to 2004. Our database now contains ages of 7,275 juveniles from nine streams and 1,243 adults from Fish Creek and Rapid River.

Adults

We aged 317 adults that returned to Fish Creek in 2003 and 194 adults that returned in 2004. The 2004 adult return was composed of 40 (20.6%) 1-ocean adults, 152 (78.4%) 2-ocean adults, and two (1%) 3-ocean adults. The 2003 adult return was composed of 47 (14.9%) 1-ocean adults, 264 (83.3%) 2-ocean adults, and six (1.9%) 3-ocean adults (Table 16 and Figure 29).

The Rapid River adult return was made up of 1-ocean and 2-ocean fish in the years 2002 to 2004. The Rapid River 1-ocean age class made up over 55% of the adult return in 2002 and 2004 and was 39.2% of the 2003 return. Male and female adults of a similar ocean age in Rapid River were smaller than the Fish Creek adults in 2003 and 2004 (Table 16 and Figure 29).

Juveniles, Spring Collection Period

We aged 352 steelhead from the Clearwater River drainage that were collected in Colt Killed and Crooked Fork creeks in 2002 and 2003. We aged 1,094 steelhead from the Salmon River drainage that were collected in the Lower SF Salmon River in 1999, 2000, and 2002; Marsh Creek in 2002 and 2003; Pahsimeroi River in 1999, 2000, and 2004; Salmon River in 2003; and SF Salmon River in 2001, 2002, and 2003.

In the Salmon River drainage, the age-1 and age-2 age classes made up >70% of the migrants at each site every year except from the Lower SF Salmon River in 1999. The fish in 1999 from Lower SF Salmon River were made up of 24% age-2 fish, 54% age-3 fish, 20% age-4 fish, and 1% age-5 fish. The Pahsimeroi River had the highest proportion of age-1 migrants, ranging from 46% in 2000 to 68% in 2004. Age-4 and age-5 fish were only observed in the Lower SF Salmon River, Marsh Creek, and SF Salmon River. The oldest fish we aged was six years from Marsh Creek in 2002 (Figure 30 and Appendix 4).

In the Clearwater River drainage, the age-3 and age-4 fish were the most abundant in Crooked Fork Creek and Colt Killed Creek. The age-3 fish in Crooked Fork Creek made up 43% and 65% of the fish aged in 2002 and 2003, respectively. The age-4 fish in Colt Killed Creek made up 53% and 65% of the fish aged in 2002 and 2003, respectively. Age-1 and age-2 fish made up less than 15% of the fish aged in these streams, except in 2002 from Crooked Fork Creek. In 2002, the age-1 and age-2 classes from Crooked Fork Creek made up of 10% and 24%, respectively, of the fish aged. Colt Killed Creek was the only stream that had >5% of fish aged 5-years old from every year we sampled (Figure 30 and Appendix 5).

The steelhead from the Pahsimeroi River had the largest mean length of age classes 1, 2, and 3 (Figure 31). The mean length of age-1 fish in the Pahsimeroi River was 123 mm (± 4 mm); age-2 was 191 mm; and age-3 was 206 mm (±13 mm). The smallest age-1 fish mean length was 87 mm (±7 mm) from Crooked Fork Creek; smallest age-2 and age-3 fish mean lengths were 121 mm (±5 mm) and 153 mm from Marsh Creek. The mean length of age-4 steelhead ranged from 180 mm (±3 mm) in Crooked Fork Creek to 195 mm (±7 mm) in the Lower SF Salmon River. The sample size of age-5 fish was >10 only in Colt Killed Creek. The mean length of age-5 steelhead from Colt Killed Creek was 195 mm (±7 mm).

Juveniles, Summer Collection Period

We aged 215 fish that were collected during the summer from Lower SF Salmon River in 2002, Marsh Creek in 2003, and the SF Salmon River in 2000, 2002, and 2003. The number of fish aged was >40 only from the SF Salmon River in 2002 and 2003. Age-1 and age-2 fish were the most abundant age class, making up >70% of the fish aged from every stream each year. The percent of age-3 fish was 30% in the SF Salmon River in 2000. At all other sites and all other years in the SF Salmon River, age-3 fish made up <6% of the fish aged (Appendix 4).

The largest mean lengths of age-1 and age-2 fish were 129 mm (±7 mm) and 161 mm (±7 mm), respectively, from the Lower SF Salmon River. The smallest mean lengths of age-1 and age-2 fish were 103 mm (±10 mm) and 141 mm (±10 mm), respectively, from Marsh Creek. The mean length of age-3 fish in the Lower SF Salmon River and the SF Salmon River were 173 mm (±6 mm) and 178 (±9 mm), respectively (Figure 32).

Juveniles, Fall Collection Period

We aged 1,611 scales that were collected from Crooked Fork Creek in 2002 and 2003; Fish Creek in 2003; Gedney Creek in 1998, 1999, and 2001; Lower SF Salmon River in 1999, 2000, and 2001; Lemhi River in 2003; Marsh Creek in 2002 and 2003; Pahsimeroi River in 1998 and 2002; Salmon River in 2003; and SF Salmon River in 2000, 2002, and 2003.

Age-1 and age-2 fish made up >80% of the migrants at each site each year except the Lemhi and Pahsimeroi rivers. In the Pahsimeroi River, all aged fish were either age-0 or age-1 in 1998 and 2002. In the Lemhi River, 38.7% of the aged fish were age-0, 58.1% were age-1, and 3.1% were age-2. Age-3 fish were sampled in all streams except the Lemhi and Pahsimeroi rivers, and their abundance ranged from 18% of the fish aged in Crooked Fork to 2% in Gedney Creek in 2001 and the SF Salmon River in 2003. Gedney Creek and the Lower SF Salmon River were the only streams where age-4 juveniles were observed (Figure 33, Appendices 4 and 5).

The mean length of age-0 fish was 108 (±6 mm) in the Lemhi River and 109 (±3 mm) in the Pahsimeroi River. The smallest age-1 fish mean length was 120 mm (±3 mm) in both Fish Creek and Gedney Creek, and the largest age-1 fish mean length was 177 mm (±6 mm) from the Lemhi River. The smallest age-2 fish mean length was 158 mm (±2 mm) in Fish Creek, and the largest age-2 fish mean length was 180 mm (±9 mm) from the Salmon River. The mean length of age-3 fish ranged from 159 mm (±45 mm) from the Lower SF Salmon River to 188 mm (±5 mm) in Fish Creek (Figure 34).

Characterize Genetic Structure and Introgression Rates of Steelhead Populations

Personnel at the Alaska Science Center completed the microsatellite analysis of 2,071 samples from 40 streams (Table 17). Microsatellite analysis of all samples IDFG collected in 2000 will be complete after the samples from Collins Creek, Little Bear Creek, and Little Weiser River are run. We expect to complete the microsatellite analysis, proof and analyze the data, and begin working on a peer reviewed article to publish the results in 2005.

Chinook Salmon Parr, Resident Trout, and Other Fish Trapped at Screw Traps

Fish Creek Screw Trap—In addition to the 9,689 juvenile steelhead we PIT tagged, we captured 160 steelhead parr that were not PIT tagged, 880 steelhead fry (age-0), 10 Chinook salmon parr, nine bull trout, 242 westslope cutthroat trout, 2,811 longnose dace, 676 speckled dace, and 80 dace that were not identified to species in the Fish Creek screw trap. Trap tenders PIT tagged eight Chinook salmon parr, seven bull trout, and 223 westslope cutthroat trout (Table 18). Most of the steelhead fry (76% of the total) were trapped in August and September (Figure 35A). We captured over 70 percent of the cutthroat trout during three brief periods: 40% were caught between June 22 and July 18; 2004; 22% were caught between August 22 and

September 10, 2004; and 11% were caught between October 1 and October 8, 2004 (Figure 35B).

Lick Creek Screw Trap—In addition to the 112 juvenile steelhead we PIT tagged, we captured 455 steelhead fry (age-0), 253 Chinook salmon parr, and seven westslope cutthroat trout. The trap tender PIT tagged 188 Chinook salmon parr and five cutthroat trout (Table 18). The number of steelhead trapped daily was highest during the first 10 days we operated the trap. After August 29, 2004, we only caught more than 10 steelhead parr and fry on four days (Figure 36A). The daily number of Chinook parr trapped exceeded 10 fish on three days; however, the daily catch remained fairly consistent, although low, throughout September and October (Figure 36 B).

Rapid River Screw Trap—In addition to the 188 juvenile steelhead we PIT tagged, we captured 30 steelhead fry (age-0), eight steelhead parr >80 mm, 321 Chinook salmon parr, 161 bull trout, and three cutthroat trout (Table 18). The trap tender PIT tagged 248 Chinook salmon parr, 128 bull trout, and two cutthroat trout. Sixty-nine percent of the steelhead and 69% of the bull trout were trapped between September 9 and September 30, 2004. Ninety percent of all bull trout and steelhead were trapped by October 12 and October 19, 2004, respectively (Figure 37A and 37B). We trapped Chinook salmon parr throughout the period we operated the trap. Fifty percent of all Chinook parr were trapped in September, 30% in October, and 20% in November (Figure 37C).

Document Water Temperature in Steelhead Streams

The water temperature was recorded at 12 locations in the Salmon River drainage and 25 locations in the Clearwater River drainage (Table 19). All data were entered into a stream temperature database maintained at the IDFG Nampa Research Office. The daily mean, maximum, and minimum temperature from Fish Creek is shown in Figure 38.

DISCUSSION

The two small-scale studies involving hatchery fish in the Salmon River upstream of the Sawtooth Fish Hatchery and in the Red River drainage upstream of the satellite hatchery facility have been completed. In the upper Salmon River hatchery, adults were stocked in Beaver Creek and Frenchman Creek from 1993 to 2004 and the resultant age-1 parr abundance was estimated. Although there was an increase in juvenile parr densities following adult stockings, the number of smolts produced was low. For example, the estimated number of age-1 parr produced per female spawner in Beaver Creek this year was 39, more than six times the estimate for Frenchman Creek. If we assume that all age-1 parr survive and become smolts and the smolt-to-adult survival rate is 2% (the lowest recommended recovery target), then less than one adult would be expected to return. Given the additional natural mortality that would be expected from over-wintering and the need to rear an additional year and another winter before smolting, this estimate is biased high. However, even with the optimistic assumptions the stocked adults were not able to replace themselves.

The Red River experiment was designed assuming that at least 10 pair of adults would return from each stocking to evaluate parr production of the returning spawners. However, the assumptions I used to calculate the number of smolts and fingerlings to stock were overly

optimistic. Less than 1% of each PIT-tagged fingerling release group was detected at Lower Granite Dam. Two PIT-tagged adults returned to Lower Granite Dam from the 1996 fingerling release and none from the other three fingerling release groups. The adult return to Lower Granite Dam from the four smolt release groups ranged from 0 to 15. The lack of adult returns prevented a comparison of parr production of the two release groups as planned. However, it is apparent that releasing fingerlings in the SF Red River did not produce many smolts or return many adults. The parr densities in the SF Red River were the highest in those years following fingerling stockings from 1994 to 1997. However, parr densities decreased to levels observed prior to the initiation of stocking in 1998, two years after the last fingerlings were stocked, and only two adults were detected at LGR. Parr densities in the section of Red River where smolts were released have been less than 1 fish / 100 m^2 in all years except 2002, an indication that adults returning from the smolt stocking (if any) have not boosted natural production above the levels observed prior to 2000.

The primary objective of this project is to collect abundance and life-history data from wild steelhead populations. It is necessary to collect long-term data sets to describe and analyze population trends and life-history characteristics of wild steelhead populations. This data is being assembled in databases to assess adult and juvenile population trends, parr growth, parr and smolt migration patterns, and smolt age of selected wild steelhead populations. As such, viewing data on a yearly basis does not provide much information. The data yields insight only when viewed over the long-term or at a minimum over the period of several years. Since this report is intended to document the work completed in a calendar year, a through analysis has not been provided. The vehicle for this analysis is peer-reviewed journal articles or multiyear summary reports that are in progress. A brief summary of the analysis in progress is provided to help the reader understand how the data this project collects is being used.

Describing the stock-recruit relation or productivity of a steelhead stock is difficult due to the life history of the fish. Adults spawn during the spring runoff, making redd counts unreliable in most locations. Most adult survive spawning so recovering carcass is very difficult, hence there is little stock specific data on spawn timing, adult length, age, and sex ratios. Fish weirs can be employed to collect data from adults; however, they are costly to maintain and can be damaged or destroyed by high flows, precluding widespread use of them. This project has been monitoring the steelhead population in Fish Creek since 1994 and has collected enough data to estimate the juvenile production from female spawners from eight brood years. The Fish Creek adult weir provides an estimate of the adult escapement and sex ratio, and it is the only steelhead weir not associated with a hatchery where IDFG has a long-term escapement record. The number of juvenile out-migrants is obtained from the screw trap. The scale samples the trap tenders obtain from the migrants will allow us to determine the age structure and assign migrants to the correct brood year. With these three pieces of information, the number of migrants per female spawners can be calculated.

Unlike Chinook salmon parr where nearly all fish from a brood year migrate to the ocean at the same age, steelhead become smolts at multiple ages that differ among streams. This project has sampled juvenile steelhead throughout the Clearwater and Salmon drainages to estimate juvenile age structure. Age structure of steelhead smolts should be considered in recovery planning as it could explain productivity differences among streams. A stream with older smolts most likely will produce less smolts per female spawner due to the increase in natural mortality from an “extra” year(s) of freshwater rearing before smoltification occurs. Our juvenile aging has found that streams within the same drainage can have very different age structures. For example, most smolts from Fish Creek are either age-2 or age-3, whereas smolts in Colt Killed Creek are ages 3, 4, and 5. In addition, the age composition of migrants

differs yearly within a stream. For example, the proportion of age-1 juveniles from Fish Creek has ranged from 25% to 60% of the total fall migrants.

The genetic stock structure of Idaho steelhead is largely unknown. This project in cooperation with the USGS Alaska Biological Lab has nearly completed an analysis of 79 *O. mykiss* populations. Upon completion of the analysis (expected in March 2005), a series of peer-reviewed articles is being planned for publication that will address the stock structure and the degree of introgression of hatchery fish into wild populations.

Wild steelhead populations in the Snake River were listed as "threatened" under ESA in 1997. One of the most commonly used abundance index to assess steelhead is the number of wild adult steelhead counted at Bonneville and Lower Granite dams. The adult return at Bonneville Dam has been split into an "A-run" and "B-run" component for management purposes. All "B-run" adults are assumed to return to Idaho, whereas the "A-run" component is assumed to return to all areas available to steelhead upstream of Bonneville Dam. Two methods have been employed to separate these runs: the date method and the length method. The date method assumes all adults counted at Bonneville Dam on and before August 27 are "A-run" and all adults counted thereafter are "B-run." The length method classifies all adults ≤77 cm as "A-run" and all adults ≥78 cm "B-run." The date method is not used at Lower Granite Dam. This type of management cannot assess trends at an individual river or a drainage level, and it is possible that strong stocks can mask declines in weaker stocks. Newer monitoring techniques may become available in the future—for example, stock identification using microsatellites or other genetic markers or an expanded PIT-tagging program in natural production areas. However, until they are established it is likely that management decisions will be driven by the present A/B classification in place. Obtaining adult lengths from wild steelhead streams can lend an insight into the accuracy of the "length method," and data from PIT-tag detections can lend insight into the "date method." Fish Creek is one of the few streams where enough steelhead have been PIT tagged and where adult lengths are available. In the 2004 spawn year, 32% of the adults returning to Fish Creek, a stream classified as "B-run", were <78 cm and would be classified as "A-run" fish using the length method. If the date method were used to classify, then 11% of the adults returning to Fish Creek would have been put in the "A-run" group. If Fish Creek represents adults in areas thought of as "B-run," then the actual number of wild B-run fish may have been underestimated (and "A-run overestimated) by 11% using the date method or 32% using the length method.

Table 1. The number of PIT-tagged hatchery steelhead that were stocked in Red River and the SF Red River from 1993 to 1999 and the year, number, and percentage of the stocked fish that were detected as smolts at the Snake River dams.

Year stocked	Number tagged	Detections during Smolt Migration Year						Total	Percent
		1994	1995	1996	1997	1998	1999		
Smolts in Red River									
1996	3,999	—	—	1,101	2	0	0	1,103	27.6%
1997	4,983	—	—	—	1,392	14	0	1,406	28.2%
1998	4,497	—	—	—	—	1,971	5	1,976	43.9%
1999	5,003	—	—	—	—	—	1,606	1,606	32.1%
Fingerlings in SF Red River									
1993	5,000	3	3	20	1	0	0	27	0.54%
1994	5,000	—	1	0	0	1	0	2	0.04%
1995	5,000	—	—	0	17	7	0	24	0.48%
1996	5,000	—	—	—	0	9	34	43	0.86%

Table 2. The number of PIT-tagged adults, detected at Lower Granite Dam, from the smolt and fingerling stockings that were detected at Lower Granite Dam and expected to return to and spawn in Red River and SF Red River. The smolt-to-adult survival (SAR) of each release group was based on the adult detections at Lower Granite Dam and the total number of smolt detections.

Year stocked	Adults returning in Spawn Year						Total	SAR
	1999	2000	2001	2002	2003	2004		
Smolt stocking in Red River								
1996	1	0	0	0	0	0	1	0.09%
1997	0	0	0	0	0	0	0	0%
1998	—	0	8	0	0	0	8	0.40%
1999	—	—	4	11	0	0	15	0.93%
Fingerling stocking in SF Red River								
1993	0	0	0	0	0	0	0	0%
1994	0	0	0	0	0	0	0	0%
1995	0	0	0	0	0	0	0	0%
1996	0	0	0	1	1[a]	0	2	2.33%

[a] This adult was not detected as a smolt; hence, it was excluded from the SAR calculation for the 1996 fingerling release group.

Table 3. The number of adult steelhead that were captured at the Fish Creek weir and passed upstream to spawn and the number of kelts that were recovered in 2004. Length (cm) measured was the fork length. 95% CI = ± cm.

Sex	Adults trapped	Unmarked kelts recovered	Total handled	Mean length (cm)	95% CI	Maximum length	Minimum length	Marked kelts recovered	Percent of adults recovered as kelts
Female	118	9	127	80	1	88	64	99	84%
Male	75	1	76	78	2	94	59	48	64%
All	193	10	203	79	1	94	59	147	76%

Table 4. The date that the first and last steelhead adult was captured at the Fish Creek weir in 2004, and the date that 10%, 25%, 50%, 75%, and 90% of the total number of adults were captured. The spawner rows are adults that were caught in the trap box and passed upstream to spawn. N = number of fish.

Life stage	Sex	N	Date the quantile was attained						
			First	10%	25%	50%	75%	90%	Last
Spawner	Female	118	3/22	4/4	4/18	4/29	5/17	5/20	5/26
Spawner	Male	75	3/20	3/30	4/12	4/26	5/15	5/20	6/9
Spawner	All	193	3/20	4/2	4/17	4/29	5/16	5/20	6/9
Kelt	Female	108	4/22	5/8	5/16	6/3	6/15	6/24	7/9
Kelt	Male	49	4/24	4/28	5/7	5/24	6/14	6/21	6/30
Kelt	All	157	4/22	5/2	5/14	5/29	6/15	6/23	7/9

Table 5. Maximum likelihood (ML) estimates of the 2004 steelhead escapement in Fish Creek for the entire run. Adults that were trapped were marked with a right operculum punch before being released upstream to spawn. The marked kelts captured column is the number of kelts that were recovered with a right operculum punch.

Estimate type	Marked adults released	Total kelts captured	Marked kelts captured	Unmarked kelts captured	ML Escapement	Lower 95% CI	Upper 95% CI
All fish	193	157	147	10	206	184	230

Table 6. Mean fish densities (fish/100 m^2) by habitat type in streams of the Clearwater River drainage that were snorkeled during summer 2004. Area = total area snorkeled (m^2); N = number of sites snorkeled; Trout fry = all trout (except brook trout) ≤75 mm; Age-1 steelhead = juvenile steelhead 76 mm to 127 mm; Age-2+ steelhead = all juvenile steelhead >127 mm; Brook fry = all brook trout <75 mm; Brook parr = all brook trout ≥75 mm; PW = pocket water.

							Steelhead parr		Chinook parr						
Stream	**Date**	**Habitat type**	**Stratum**	**N**	**Area**	**Trout fry**	**Age-1**	**Age-2+**	**Age-0**	**Age-1**	**Cutthroat**	**Bull**	**Brook fry**	**Brook parr**	**Whitefish**
Bald Mountain Creek	8/3	Pool	1	3	94	14.61	29.98	15.88	0.00	0.00	16.31	0.00	0.00	0.00	0.00
Bald Mountain Creek		PW	1	14	1,266	1.99	12.49	3.44	0.00	0.00	2.25	0.00	0.00	0.00	0.00
Bald Mountain Creek		Riffle	1	2	91	5.35	20.95	5.35	0.00	0.00	12.57	0.00	0.00	0.00	0.00
Bald Mountain Creek		Run	1	3	164	7.75	14.40	7.31	0.00	0.00	7.92	0.00	0.00	0.00	0.00
Boulder Creek	8/4	Pool	1	6	611	3.43	24.59	18.56	1.28	0.00	1.49	0.00	0.00	0.00	0.00
Boulder Creek		PW	1	30	6,680	1.32	10.56	5.45	0.10	0.00	0.18	0.00	0.02	0.03	0.00
Boulder Creek		Riffle	1	2	320	3.69	9.02	2.77	0.38	0.00	0.00	0.00	0.00	0.00	0.00
Boulder Creek		Run	1	9	1,281	1.06	13.73	6.96	0.18	0.09	0.80	0.00	0.00	0.00	0.00
Canyon Creek	8/8	Pool	1	5	203	8.00	11.04	7.77	0.00	0.00	4.50	0.00	0.00	0.00	0.00
Canyon Creek		PW	1	15	1,951	5.44	5.46	2.11	0.00	0.05	0.05	0.00	0.00	0.00	0.00
Canyon Creek		Riffle	1	3	318	10.47	5.29	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canyon Creek		Run	1	5	388	9.93	5.44	1.96	0.00	0.00	0.32	0.00	0.00	0.00	0.00
Crooked Fork Creek	8/6	Pool	1	2	1,028	2.88	1.05	1.05	9.68	0.00	0.57	0.20	0.00	0.00	0.00
Crooked Fork Creek		PW	1	2	1,776	13.02	2.86	1.80	7.81	0.00	0.11	0.00	0.00	0.00	0.11
Crooked Fork Creek		Riffle	1	1	999	12.01	1.00	0.20	6.80	0.00	0.10	0.00	0.00	0.00	0.00
Crooked Fork Creek		Run	1	3	1,756	6.80	1.03	1.03	6.29	0.00	0.71	0.00	0.00	0.00	0.05
Deadman Creek	8/8	Pool	1	4	195	23.09	11.45	3.23	0.39	0.00	0.56	0.00	0.00	0.00	0.00
Deadman Creek		PW	1	15	1,320	12.73	8.90	1.77	0.61	0.00	0.10	0.07	0.00	0.00	0.00
Deadman Creek		Riffle	1	5	579	18.28	5.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deadman Creek		Run	1	5	373	17.23	8.36	0.51	1.70	0.00	0.00	0.00	0.00	0.00	0.00
Fire Creek	8/6	PW	1	2	886	12.03	11.76	4.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fish Creek	7/9	Pool	1	8	1,687	0.15	11.60	9.85	1.30	0.00	1.65	0.00	0.00	0.00	0.00
Fish Creek	to	PW	1	26	13,120	0.83	8.09	3.87	0.47	0.00	0.29	0.00	0.00	0.00	0.00
Fish Creek	7/14	Riffle	1	6	3,001	0.40	2.97	1.83	0.00	0.00	0.45	0.00	0.00	0.00	0.00
Fish Creek		Run	1	19	5,343	1.03	9.39	4.79	0.36	0.00	0.60	0.00	0.00	0.00	0.02
Fish Creek	7/12	Pool	2	3	402	0.00	10.66	3.83	0.00	0.00	1.97	0.00	0.00	0.00	0.00
Fish Creek		PW	2	6	1,606	0.41	4.08	1.45	0.00	0.00	0.23	0.00	0.00	0.00	0.00
Fish Creek		Run	2	6	1,379	1.29	3.17	1.12	0.00	0.00	0.61	0.00	0.00	0.00	0.00

Table 6. Continued.

Stream	Date	Habitat type	Stratum	N	Area	Trout fry	Steelhead parr Age-1	Steelhead parr Age-2+	Chinook parr Age-0	Chinook parr Age-1	Cutthroat	Bull	Brook fry	Brook parr	Whitefish
Gedney Creek	7/22	Pool	1	7	1,036	9.44	8.96	10.22	2.46	0.12	1.24	0.91	0.00	0.00	1.32
Gedney Creek	to	PW	1	23	8,516	8.12	5.49	2.78	0.64	0.00	0.16	0.01	0.00	0.00	0.32
Gedney Creek	7/28	Riffle	1	5	2,139	12.30	4.13	1.83	0.85	0.00	0.16	0.00	0.00	0.00	0.29
Gedney Creek		Run	1	12	2,903	11.29	7.71	5.03	2.91	0.06	0.57	0.00	0.00	0.00	0.22
Gedney Creek	7/24	Pool	2	3	159	6.80	27.02	11.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gedney Creek		PW	2	9	1,279	7.98	9.16	4.10	0.19	0.00	0.00	0.00	0.00	0.00	0.00
Gedney Creek		Riffle	2	3	362	10.65	12.70	2.89	0.00	0.00	0.28	0.00	0.00	0.00	0.00
Gedney Creek		Run	2	3	340	15.05	13.16	5.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WF Gedney Creek	7/24	Pool	1	4	560	5.80	14.56	8.05	0.00	0.00	0.96	0.16	0.00	0.00	0.68
WF Gedney Creek		PW	1	8	2,195	3.39	7.80	3.08	0.00	0.00	0.05	0.05	0.00	0.00	0.04
WF Gedney Creek		Riffle	1	3	897	21.24	6.98	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WF Gedney Creek		Run	1	4	703	16.82	10.84	6.79	0.11	0.00	0.00	0.11	0.00	0.00	0.00
Hungery Creek	7/12	Pool	1	4	184	0.00	17.99	17.17	0.00	0.00	0.96	0.00	0.00	0.00	0.00
Hungery Creek		PW	1	8	1,932	0.77	13.93	5.29	0.00	0.00	0.38	0.00	0.00	0.00	0.00
Hungery Creek		Run	1	5	913	1.51	13.89	3.95	0.00	0.00	0.61	0.00	0.00	0.00	0.00
Lake Creek	8/9	Pool	1	3	317	4.15	7.45	4.59	0.99	0.00	0.15	0.15	0.00	0.00	0.00
Lake Creek		PW	1	15	3,321	3.39	3.69	0.75	0.00	0.00	0.12	0.00	0.00	0.00	0.00
Lake Creek		Riffle	1	3	786	2.89	2.90	0.87	0.00	0.00	0.40	0.00	0.00	0.00	0.00
Lake Creek		Run	1	4	777	3.65	2.53	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O'Hara Creek	8/5	PW	1	2	1,140	9.77	8.16	2.23	4.03	0.00	0.15	0.00	0.00	0.00	0.00
O'Hara Creek	8/5	Pool	2	8	388	13.92	19.68	4.06	1.40	0.37	1.30	0.00	0.00	0.00	0.13
O'Hara Creek		PW	2	26	4,389	9.40	11.88	2.60	0.21	0.02	0.08	0.00	0.00	0.00	0.00
O'Hara Creek		Riffle	2	10	1,991	7.86	6.99	1.29	0.20	0.00	0.00	0.00	0.00	0.00	0.00
O'Hara Creek		Run	2	10	1,462	9.92	9.65	3.08	0.83	0.12	0.25	0.00	0.00	0.00	0.06
Hanby Fork	8/5	Pool	1	2	59	7.03	7.89	4.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hanby Fork		PW	1	3	225	2.86	12.14	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hanby Fork		Run	1	1	59	5.08	13.55	3.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pete King Creek	8/10	Pool	1	6	297	49.56	14.83	2.91	4.18	0.00	0.19	0.00	0.00	0.00	0.00
Pete King Creek		PW	1	11	1,161	20.15	5.54	0.93	0.09	0.00	0.08	0.00	0.00	0.00	0.00
Pete King Creek		Riffle	1	11	1,056	29.46	4.24	0.11	0.19	0.00	0.71	0.00	0.00	0.00	0.00
Pete King Creek		Run	1	8	834	30.03	7.47	0.72	1.14	0.00	0.37	0.00	0.00	0.00	0.00

Table 6. Continued.

Stream	Date	Habitat type	Stratum	N	Area	Trout fry	Steelhead parr Age-1	Steelhead parr Age-2+	Chinook parr Age-0	Chinook parr Age-1	Cutthroat	Bull	Brook fry	Brook parr	Whitefish
Post Office Creek	8/7	Pool	1	4	218	57.73	8.42	3.89	2.27	0.00	2.20	0.00	0.00	0.00	0.00
Post Office Creek		PW	1	6	712	10.44	3.94	0.71	0.00	0.00	0.11	0.11	0.00	0.00	0.00
Post Office Creek		Riffle	1	10	1,238	19.05	2.39	0.51	0.00	0.00	0.32	0.00	0.00	0.00	0.00
Post Office Creek		Run	1	8	823	49.33	3.47	0.83	0.31	0.00	0.62	0.15	0.00	0.00	0.00
SF Red River	6/29	Pool	1	3	180	0.00	4.31	6.40	0.00	0.00	2.58	0.00	0.00	0.00	0.00
SF Red River		PW	1	4	806	0.00	1.56	0.72	0.00	0.00	0.26	0.00	0.00	0.00	0.24
SF Red River		Riffle	1	5	1,269	0.00	0.51	0.93	0.00	0.00	1.19	0.00	0.00	0.00	0.09
SF Red River		Run	1	9	1,911	0.03	1.11	1.82	0.00	0.00	1.31	0.00	0.00	0.07	0.13
SF Red River	6/29	Pool	2	4	190	0.00	0.46	3.07	0.00	0.00	2.95	0.00	0.00	1.47	0.00
SF Red River		PW	2	3	371	0.00	0.80	1.72	0.00	0.00	1.02	0.00	0.00	0.48	0.00
SF Red River		Riffle	2	9	1,289	0.45	0.66	1.87	0.00	0.00	0.56	0.00	0.00	0.11	0.07
SF Red River		Run	2	14	1,707	0.00	1.03	2.05	0.00	0.00	1.47	0.07	0.00	0.28	0.11
SF Red River	6/30	Pool	3	2	70	0.00	5.07	0.00	0.00	0.00	10.02	0.00	0.00	0.00	0.00
SF Red River		PW	3	2	203	0.00	2.08	1.54	0.00	0.00	0.99	0.00	0.00	0.00	0.00
SF Red River		Riffle	3	2	123	0.00	1.50	0.00	0.00	0.00	3.89	0.00	0.00	0.00	0.00
SF Red River		Run	3	2	118	0.73	1.02	0.00	0.00	0.00	3.63	0.00	0.00	0.00	0.00
Split Creek	8/6	PW	1	2	814	9.87	9.48	3.34	0.78	0.00	1.23	0.00	0.00	0.00	0.97
Stanley Creek	8/9	Pool	1	6	262	2.30	21.46	6.80	0.00	0.00	2.93	0.00	0.00	0.00	0.00
Stanley Creek		PW	1	15	1,686	5.01	10.95	1.74	0.00	0.00	0.24	0.00	0.00	0.00	0.00
Stanley Creek		Run	1	4	232	8.84	17.97	0.92	0.00	0.00	1.67	0.00	0.00	0.00	0.00
Trapper Creek	6/30	Pool	1	1	16	0.00	6.44	0.00	0.00	0.00	25.74	0.00	0.00	0.00	0.00
Trapper Creek		PW	1	3	252	0.37	2.44	1.16	0.00	0.00	0.79	0.00	0.00	0.00	0.00
Trapper Creek		Riffle	1	1	54	0.00	1.86	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.00
Trapper Creek		Run	1	3	149	0.00	2.29	3.37	0.00	0.00	0.63	0.00	0.00	0.00	0.00
Warm Springs Creek	8/6	Riffle Run	1	1	858	2.91	0.35	0.47	2.21	0.00	1.05	0.00	0.00	0.00	0.00
Weir Creek	8/7	Pool	1	4	144	49.65	11.90	3.32	0.00	0.00	6.79	0.00	0.00	0.00	0.00
Weir Creek		PW	1	7	758	29.02	4.11	0.34	0.00	0.00	1.31	0.00	0.00	0.00	0.00
Weir Creek		Riffle	1	8	727	30.13	3.02	0.34	0.00	0.00	0.97	0.00	0.00	0.00	0.00
Weir Creek		Run	1	5	393	46.15	8.42	0.84	0.00	0.00	1.46	0.28	0.00	0.00	0.00
WF SF Red River	6/30	Pool	1	1	32	0.00	15.55	6.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WF SF Red River		Riffle	1	3	220	0.00	2.40	0.46	0.00	0.00	0.38	0.00	0.00	0.00	0.00
WF SF Red River		Run	1	2	169	0.00	1.18	0.58	0.00	0.00	1.18	0.00	0.00	1.18	0.00

Table 7. Mean fish densities (fish/100 m^2) by habitat type in streams of the Salmon River and the SF Salmon River drainages that were snorkeled during summer 2004. Area = total area snorkeled (m^2); N = number of sites snorkeled; Trout fry = all trout (except brook trout) ≤75 mm; Age-1 steelhead = juvenile steelhead 76 mm to 127 mm; Age-2+ steelhead = all juvenile steelhead >127 mm; Brook fry = all brook trout <75 mm; Brook parr = all brook trout ≥75 mm; PW = pocket water.

Stream	Date	Habitat type	Stratum	N	Area	Trout fry	Steelhead parr		Chinook parr		Cutthroat	Bull	Brook fry	Brook parr	Whitefish
							Age-1	Age-2+	Age-0	Age-1					
Salmon River drainage															
Basin Creek	8/16	Pool	1	1	130	6.17	3.08	2.31	9.25	0.00	0.00	3.08	0.00	0.00	13.11
Basin Creek	and	PW	1	2	399	5.75	9.99	3.00	16.88	0.00	0.00	0.24	0.00	0.00	0.24
Basin Creek	8/17	Riffle	1	10	2,192	5.84	2.95	0.88	3.70	0.00	0.04	0.09	0.00	0.00	0.40
Basin Creek		Run	1	6	1,141	9.99	5.24	2.21	16.47	0.00	0.41	0.40	0.00	0.00	1.55
Basin Creek	8/19	Riffle	2	6	683	3.53	1.44	0.46	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Basin Creek		Run	2	4	463	3.42	2.59	1.64	0.00	0.00	0.00	0.20	0.00	0.00	0.00
Beaver Creek	8/17	Pool	2	5	165	12.42	3.06	1.53	8.53	0.00	0.00	0.44	7.36	1.89	0.00
Beaver Creek		PW	2	3	219	13.20	3.26	0.00	1.84	0.00	0.00	0.00	2.70	1.12	0.00
Beaver Creek		Riffle	2	8	611	15.03	2.57	0.00	4.00	0.00	0.00	0.00	6.86	0.29	0.00
Beaver Creek		Run	2	15	1,249	15.41	2.93	0.60	14.12	0.00	0.00	0.07	7.30	1.95	0.00
Beaver Creek	8/18	Pool	3	3	164	0.00	0.72	1.26	0.00	0.00	0.00	0.00	15.80	7.92	0.00
Beaver Creek		Riffle	3	2	122	0.00	1.27	0.64	0.00	0.00	0.00	0.00	10.42	3.69	0.00
Beaver Creek		Run	3	5	497	0.00	0.18	0.22	0.00	0.00	0.00	0.00	10.86	5.84	0.00
Frenchman Creek	8/18	Pool	1	6	141	0.00	3.01	2.20	7.43	0.00	0.00	0.00	34.17	5.14	0.00
Frenchman Creek		PW	1	4	203	1.32	1.59	0.00	4.26	0.00	0.00	0.00	1.58	0.00	0.00
Frenchman Creek		Riffle	1	8	400	0.00	0.26	0.26	0.47	0.00	0.00	0.26	18.35	1.23	0.00
Frenchman Creek		Run	1	19	1,176	0.26	0.34	0.41	2.21	0.00	0.00	0.16	15.91	2.73	0.00
SF Salmon River drainage															
Buckhorn Creek	8/8	Pool	1	1	50	0.00	5.97	1.99	39.83	0.00	0.00	0.00	0.00	0.00	0.00
Buckhorn Creek		PW	1	5	762	5.95	4.01	1.87	6.13	0.00	0.00	0.00	0.00	0.00	0.00
Buckhorn Creek		Riffle	1	1	296	1.01	0.00	0.00	3.38	0.00	0.00	0.00	0.00	0.00	0.00
Buckhorn Creek		Run	1	4	509	4.13	2.21	0.81	19.46	0.00	0.00	0.00	0.00	0.00	0.00
Dollar Creek	8/11	Pool	1	3	115	0.00	15.58	17.18	32.53	0.00	0.00	0.00	0.00	0.00	0.00
Dollar Creek		PW	1	7	813	1.52	4.20	0.43	8.31	0.00	0.00	0.12	0.00	0.23	0.00
Dollar Creek		Riffle	1	2	169	5.07	3.60	2.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dollar Creek		Run	1	3	345	1.37	0.84	1.36	19.20	0.00	0.00	0.38	0.00	0.30	0.00

Table 7. Continued.

Stream	Date	Habitat type	Stratum	N	Area	Trout fry	Steelhead parr Age-1	Steelhead parr Age-2+	Chinook parr Age-0	Chinook parr Age-1	Cutthroat	Bull	Brook fry	Brook parr	Whitefish
EF SF Salmon River	8/9	PW	2	10	2,462	3.28	3.64	3.22	8.13	0.00	0.08	0.21	0.00	0.00	0.16
EF SF Salmon River	and	Riffle	2	3	1,356	5.02	2.33	1.69	9.00	0.00	0.00	0.00	0.00	0.00	0.07
EF SF Salmon River	8/10	Run	2	7	1,618	5.02	2.81	4.14	23.97	0.00	0.26	0.20	0.00	0.00	0.40
Fitsum Creek	8/8	PW	1	9	1,459	14.04	5.80	1.83	0.81	0.00	0.00	0.00	0.00	0.00	0.00
Fitsum Creek		Run	1	2	279	21.17	6.06	0.72	12.47	0.00	0.00	0.00	0.00	0.00	0.00
Lick Creek	8/5	Pool	1	6	557	12.22	13.64	5.51	0.00	0.00	0.00	0.00	3.41	3.92	0.00
Lick Creek	and	PW	1	10	2,151	12.67	6.66	0.76	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Lick Creek	8/6	Riffle	1	2	382	16.95	4.86	0.53	0.00	0.00	0.00	0.00	0.00	0.90	0.00
Lick Creek		Run	1	7	1,253	17.23	8.70	1.73	3.22	0.00	0.00	0.00	0.00	0.58	0.00
Profile Creek	8/9	Pool	1	1	45	0.00	0.00	0.00	0.00	0.00	4.42	2.21	0.00	0.00	0.00
Profile Creek		PW	1	2	324	0.00	1.58	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Profile Creek		Run	1	1	84	0.00	0.00	1.18	0.00	0.00	0.00	2.37	0.00	0.00	0.00
Secesh River	8/6	PW	1	4	2,203	1.54	2.57	1.45	16.86	0.00	0.00	0.00	0.00	0.00	0.15
Secesh River		Run	1	4	2,697	0.53	1.71	2.21	27.51	0.00	0.00	0.00	0.00	0.00	1.40
Sugar Creek	8/10	Pool	1	2	79	13.00	7.13	5.69	2.98	0.00	0.99	4.42	0.00	0.00	0.00
Sugar Creek		PW	1	1	131	0.00	0.00	0.76	4.58	0.00	0.00	0.76	0.00	0.00	0.00
Sugar Creek		Riffle	1	1	110	4.54	0.00	0.91	0.91	0.00	0.00	0.00	0.00	0.00	0.00
Sugar Creek		Run	1	2	198	9.74	3.62	1.02	1.82	0.00	0.00	2.71	0.00	0.00	0.00
Tamarack Creek	8/9	PW	1	3	339	10.17	5.66	1.51	2.50	0.00	0.21	1.03	0.00	0.00	0.00
Tamarack Creek		Riffle	1	1	178	5.63	3.94	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamarack Creek		Run	1	1	89	3.35	7.82	3.35	15.64	0.00	0.00	1.12	0.00	0.00	0.00

Table 8. The mean stream density (fish/100m^2) of juvenile steelhead, Chinook salmon parr, cutthroat trout, bull trout, brook trout, and mountain whitefish in streams that were snorkeled in 2004. The age-1 change column is the percent change of the age-1 steelhead parr density from 2003. ns = stream was not surveyed in 2003.

Drainage / Tributary	Stratum	Trout fry	Steelhead parr		Chinook parr		Cutthroat	Bull	Brook fry	Brook parr	Whitefish	Age-1 change
			Age-1	Age-2+	Age-0	Age-1						
Clearwater River												
Fish Creek	1	0.80	7.90	4.01	0.43	0.00	0.40	0.00	0.00	0.00	0.01	-5%
Gedney Creek	1	9.43	5.98	3.63	1.24	0.02	0.32	0.07	0.00	0.00	0.37	-24%
	2	8.83	11.00	4.77	0.14	0.00	0.01	0.00	0.00	0.00	0.00	25%
	1 & 2	9.29	7.62	3.96	0.94	0.01	0.24	0.05	0.00	0.00	0.26	-7%
WF Gedney Creek	1	7.47	9.72	4.77	0.02	0.00	0.23	0.08	0.00	0.00	0.16	-34%
SF Red River	1	0.01	1.11	1.46	0.00	0.00	1.11	0.00	0.00	0.03	0.13	-43%
	2	0.14	0.83	2.05	0.00	0.00	1.27	0.03	0.00	0.38	0.07	66%
	1 & 2	0.11	1.14	1.69	0.00	0.00	1.51	0.02	0.00	0.17	0.09	1%
Bald Mountain Creek	1	2.65	13.32	4.05	0.00	0.00	3.03	0.00	0.00	0.00	0.00	45%
Boulder Creek	1	1.45	12.02	6.58	0.20	0.01	0.36	0.00	0.01	0.02	0.00	34%
Canyon Creek	1	6.37	6.04	2.66	0.00	0.03	0.54	0.00	0.00	0.00	0.00	-53%
Deadman Creek	1	14.75	8.27	1.25	0.68	0.00	0.08	0.04	0.00	0.00	0.00	-31%
Lake Creek	1	3.40	3.59	0.90	0.03	0.00	0.13	0.00	0.00	0.00	0.00	220%
O'Hara Creek	2	9.10	10.61	2.32	0.26	0.02	0.09	0.00	0.00	0.00	0.01	37%
Pete King Creek	1	28.31	5.70	0.55	0.54	0.00	0.47	0.00	0.00	0.00	0.00	-33%
Post Office Creek	1	24.78	3.23	0.76	0.15	0.00	0.40	0.06	0.00	0.00	0.00	-75%
Weir Creek	1	32.95	4.64	0.53	0.00	0.00	1.40	0.04	0.00	0.00	0.00	-19%
Salmon River												
Basin Creek	1	7.06	3.85	1.36	7.98	0.00	0.15	0.24	0.00	0.00	0.96	235%
Beaver Creek	2	14.92	2.85	0.47	9.97	0.00	0.00	0.08	6.93	1.40	0.00	-27%
Frenchman Creek	1	0.23	0.54	0.50	2.37	0.00	0.00	0.16	17.25	2.61	0.00	60%
Lick Creek	1	14.25	7.08	1.17	1.44	0.00	0.00	0.00	0.20	0.50	0.00	ns
Secesh River	1	1.34	2.40	1.60	18.99	0.00	0.00	0.00	0.00	0.00	0.40	ns

Table 9. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead that were PIT tagged at screw traps in the Clearwater River drainage.

	Fork length (mm)				Weight (g)			Condition factor	
Release site	**Number**	**Mean**	**CI**	**Median**	**Number**	**Mean**	**CI**	**Mean**	**CI**
Spring trapping (March 1 to May 31)									
Crooked Fork Creek	207	172	3	175.0	207	48.5	2.4	0.9142	0.0083
Clear Creek[a]	613	154	2	154.0	602	37.7	1.0	0.9929	0.0057
Colt Killed Creek	122	184	4	184.5	122	55.0	3.4	0.8700	0.0084
Fish Creek	97	136	7	133.0	92	27.9	4.1	0.9353	0.0311
Red River	56	144	7	150.0	53	30.4	5.6	0.9609	0.0225
Summer trapping (June 1 to August 31)									
Crooked Fork Creek	616	112	2	104.0	616	17.0	1.0	1.0741	0.0065
Colt Killed Creek	106	133	6	125.0	106	28.4	3.9	1.0439	0.0147
Fish Creek	5,793	113	1	107.0	4,222	15.5	0.3	1.0341	0.0021
Red River	19	101	5	102.0	19	12.2	2.0	1.1367	0.0457
Fall trapping (September 1 to December 15)									
Crooked Fork Creek	79	157	5	154.0	79	40.7	3.9	0.9869	0.0162
Colt Killed Creek	47	165	6	169.0	47	45.2	4.5	0.9680	0.0154
Fish Creek	3,790	118	1	113.0	3,754	17.7	0.4	0.9733	0.0017
Year totals									
Crooked Fork Creek	902	130	2	118.0	902	26.3	1.3	1.0298	0.0067
Clear Creek	613	154	2	154.0	602	37.7	1.0	0.9929	0.0057
Colt Killed Creek	275	161	4	171.0	275	43.1	2.4	0.9538	0.0119
Fish Creek	9,680	115	1	110.0	8,068	16.9	0.5	1.1087	0.0076
Red River[b]	76	133	7	141.0	73	25.5	3.2	1.0070	0.0267

[a] Includes three steelhead trapped and tagged in June.
[b] Includes one steelhead trapped during the fall period.

Table 10. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead that were PIT tagged at screw traps in the Salmon River drainage.

	Fork length (mm)				Weight (g)			Condition factor	
Release site	**Number**	**Mean**	**CI**	**Median**	**Number**	**Mean**	**CI**	**Mean**	**CI**
Spring trapping (March 1 to May 31)									
Johnson Creek	105	164	4	165.0	105	43.2	2.7	0.9516	0.0129
Lake Creek	24	154	13	152.5	23	47.3	11.0	1.2731	0.1929
Lemhi River	921	122	2	112.0	921	23.4	1.5	1.1087	0.0054
Marsh Creek	226	127	4	127.0	226	25.2	2.7	1.0320	0.0119
Pahsimeroi River	601	128	2	120.0	600	23.4	1.1	1.0240	0.0067
Salmon River	354	161	3	161.5	353	42.8	2.4	0.9542	0.0094
Secesh River	12	138	20	139.5	10	24.6	10.2	1.0181	0.0645
SF Salmon River	167	122	3	115.0	167	20.9	2.1	1.0428	0.0162
Summer trapping (June 1 to August 31)									
Johnson Creek	742	132	2	130.0	739	27.8	1.4	1.0563	0.0077
Lake Creek	130	145	6	143.0	130	42.1	5.3	1.2706	0.0698
Lemhi River	186	124	3	119.0	185	23.4	1.8	1.1561	0.0129
Lick Creek	55	142	7	147.0	55	31.9	3.9	1.0245	0.0218
Marsh Creek	212	116	4	107.5	211	20.1	2.2	1.0752	0.0112
Pahsimeroi River	55	123	5	116.0	55	21.5	2.8	1.1025	0.0175
Salmon River	47	164	6	162.0	45	48.2	5.9	1.0324	0.0239
Secesh River	109	148	5	146.0	108	39.6	4.6	1.0953	0.0301
SF Salmon River	625	135	2	132.0	625	31.4	1.5	1.1434	0.0083
Fall trapping (September 1 to December 12)									
Johnson Creek	141	151	4	151.0	141	35.3	2.6	0.9623	0.0098
Lake Creek	37	149	16	136.0	37	46.2	16.0	1.0380	0.0232
Lemhi River	290	179	5	191.0	289	76.0	5.6	1.1021	0.0083
Lick Creek	57	136	9	145.0	57	28.8	5.3	0.9760	0.0162
Marsh Creek	43	128	9	123.0	43	23.2	4.9	0.9661	0.0476
Pahsimeroi River	365	123	3	115.0	365	21.4	1.8	1.0145	0.0088
Rapid River	197	170	4	171.0	186	54.2	3.8	1.0312	0.0115
Salmon River	20	149	13	155.0	20	35.5	7.9	0.9759	0.0194
Secesh River	29	141	11	144.0	29	31.4	6.8	0.9913	0.0306
SF Salmon River	202	140	4	138.0	200	31.9	2.7	1.0408	0.0147
Year totals									
Johnson Creek	988	138	2	139.0	985	30.5	1.2	1.0317	0.0066
Lake Creek	191	147	5	145.0	190	43.5	4.6	1.2256	0.0541
Lemhi River	1,397	134	2	117.0	1,395	34.3	1.9	1.1136	0.0053
Lick Creek	112	139	6	145.0	112	30.3	3.3	0.9989	0.0142
Marsh Creek	481	122	3	116.0	480	22.8	1.7	1.0451	0.0082
Pahsimeroi River	1,021	126	1	118.0	1,020	22.6	0.9	1.0248	0.0053
Rapid River	197	170	4	171.0	186	54.2	3.8	1.0312	0.0115
Salmon River	421	161	2	161.0	418	43.1	2.1	0.9637	0.0087
Secesh River	150	146	5	146.0	147	37.0	3.7	1.0695	0.0241
SF Salmon River	994	134	2	130.0	992	29.7	1.2	1.1058	0.0073

Table 11. The mean length, weight, condition factor (K), and 95% CI of juvenile steelhead captured by flyfishing, electrofishing, or in minnow traps and PIT tagged.

		Fork length (mm)				Weight (g)			Condition factor	
Release site	**Date**	**Number**	**Mean**	**CI**	**Median**	**Number**	**Mean**	**CI**	**Mean**	**CI**
Captured by fly-fishing										
Gedney Creek	7/26 & 7/27	520	130	2	130.0	502	26.4	1.4	1.0583	0.0062
WF Gedney Creek	7/27	123	126	4	120.0	111	23.6	3.0	1.0290	0.0110
Fish Creek	6/28, 7/11&12	499	132	2	134.0	455	27.9	1.4	1.1087	0.1056
Hungery Creek	7/12	63	132	7	134.0	63	29.6	4.8	1.1270	0.0159
O'Hara Creek	9/4 & 9/5	357	118	3	111.0	329	20.6	1.6	1.0816	0.0098
Captured in minnow trap										
Fish Creek	3/16 to 5/4	91	104	3	104.0	83	10.9	1.0	0.9386	0.0240
Captured electroshocking										
Bear Valley Creek	7/21 to 7/23	9	118	10	114.0					
Big Creek	8/11 to 8/17	82	128	5	121.5	42	24.3	5.5	1.0720	0.0266
Camas Creek	8/6 & 8/7	56	117	6	114.0	13	21.3	6.6	1.2680	0.0980
Capehorn Creek	7/30 & 7/31	22	130	9	126.5					
Elk Creek	7/23 to 7/27	34	117	9	107.0	32	21.8	7.1	1.1734	0.0309
Herd Creek	8/9	28	162	11	161.5	10	40.7	9.3	1.1357	0.0602
Lake Creek	8/27	12	113	11	107.0					
Loon Creek	8/6 & 8/7	45	123	7	114.0	13	29.5	10.1	1.1719	0.0686
SF Salmon River	8/20 to 8/24	101	128	4	126.0	29	21.2	4.3	1.0861	0.0561
Secesh River	8/25 & 8/26	20	118	10	109.0	12	23.2	11.0	1.1384	0.0779
Sulfur Creek	7/29	9	118	10	117.0					
Valley Creek	8/2 to 8/4	43	125	6	120.0					

Table 12. The number of juvenile steelhead caught, released upstream of the trap (Marks), and recaptured at the Fish Creek screw trap during each trap period in 2004. p = trap efficiency estimate.

								95% CI	
Period	**Start date**	**End date**	**Catch**	**Marks**	**Recaps**	**p**	**Migrants**	**Lower**	**Upper**
1	3/10	6/15	156	130	3	0.02	5,109	1,778	7,402
2	6/16	6/25	106	103	2	0.02	3,675	1,273	5,437
3	6/26	7/4	725	306	64	0.21	3,424	2,479	4,905
4	7/5	7/19	2,010	769	175	0.23	8,864	6,648	12,511
5	7/20	8/3	359	333	72	0.22	1,643	1,193	2,286
6	8/4	8/14	363	251	73	0.29	1,236	944	1,664
7	8/15	8/24	983	141	36	0.26	3,773	2,847	5,109
8	8/25	8/26	1,155	101	66	0.65	1,758	1,540	2,015
9	8/27	9/10	1,044	562	189	0.34	3,080	2,434	3,919
10	9/11	9/24	1,062	552	167	0.30	3,478	2,707	4,572
11	9/25	10/7	499	310	127	0.41	1,212	981	1,502
12	10/8	10/22	1,856	603	281	0.47	3,922	3,282	4,744
13	10/23	11/5	680	439	194	0.45	1,519	1,257	1,855
14	11/6	11/16	168	129	38	0.30	546	410	735
Full year estimates:							**43,239**	**37,380**	**45,446**
Fall period (8/15 to 11/16):							**19,288**	**18,053**	**20,764**

Table 13. The number of wild steelhead that were detected as smolts in 2004, the number of steelhead PIT tagged, and the percent of all PIT-tagged fish that were ≥125 mm from each period that were detected in 2004. Tagging periods were Period 1 = March 1, 2004 to May 31, 2004; Period 2 = August 15, 2003 to December 15, 2003; Period 3 = June 1, 2003 to August 14, 2003; Period 4 = March 1, 2003 to May 31, 2003; Period 5 = all fish tagged before March 1, 2003. na = not applicable; no fish were tagged during the period.

	Number of detected smolts tagged in period						Number of fish tagged in period					Percent of all fish detected from period					Percent of fish ≥125 mm detected from period				
Release site	**All**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Clearwater River drainage																					
Boulder Creek	35	0	34	0	0	1	0	205	0	0	14	na	16.6%	na	na	7.1%	na	23.6%	na	na	0.0%
Crooked Fork Creek	262	127	77	36	1	21	208	202	180	97	514	61.1%	38.1%	20.0%	1.0%	4.1%	64.8%	38.2%	29.7%	0.0%	1.6%
Colt Killed Creek	101	90	7	4	0	0	122	18	28	92	298	73.8%	38.9%	14.3%	0.0%	0.0%	73.8%	38.9%	28.6%	0.0%	0.0%
Fish Creek[a]	2,524	26	2,017	198	8	275	189	6,502	1,321	58	5,198	13.8%	31.0%	15.0%	13.8%	5.3%	43.1%	43.2%	27.0%	0.0%	2.5%
Red River	40	30	0	0	0	10	56	0	14	1	156	53.6%	na	0.0%	0.0%	6.4%	66.7%	na	0.0%	na	0.0%
Clear Creek	396	396	0	0	0	0	610	0	6	597	685	64.9%	na	0.0%	0.0%	0.0%	68.1%	na	0.0%	0.0%	0.0%
Gedney Creek[b]	27	0	0	14	0	13	0	0	138	0	309	na	na	10.1%	na	4.2%	na	na	14.7%	na	2.0%
All Clearwater	**3,385**	**669**	**2,135**	**252**	**9**	**320**	**1,185**	**6,927**	**1,687**	**845**	**7,174**	**56.5%**	**30.8%**	**14.9%**	**1.1%**	**4.5%**	**66.6%**	**42.4%**	**25.6%**	**0.0%**	**2.0%**
Salmon River drainage																					
Bear Valley Creek	9	0	0	0	0	9	0	0	0	0	129	na	na	na	na	7.0%	na	na	na	na	0.0%
Elk Creek	4	0	0	0	0	4	0	0	0	0	68	na	na	na	na	5.9%	na	na	na	na	0.0%
Herd Creek	7	0	0	6	0	1	0	0	149	0	308	na	na	4.0%	na	0.3%	na	na	5.9%	na	0.0%
Johnson Creek	288	64	64	14	2	144	106	189	181	80	2,171	60.4%	33.9%	7.7%	2.5%	6.6%	61.5%	36.6%	21.9%	1.6%	4.7%
Lake Creek	39	2	18	13	0	6	24	101	166	23	255	8.3%	17.8%	7.8%	0.0%	2.4%	10.0%	20.5%	12.1%	0.0%	2.6%
Lemhi River	66	17	20	22	7	0	921	462	360	169	148	1.8%	4.3%	6.1%	4.1%	0.0%	7.0%	4.6%	10.0%	2.0%	0.0%
Lick Creek	49	0	7	23	0	19	3	230	364	0	593	0.0%	3.0%	6.3%	na	3.2%	0.0%	6.0%	9.4%	na	1.3%
Marsh Creek	190	24	54	34	6	72	227	289	248	40	831	10.6%	18.7%	13.7%	15.0%	8.7%	20.2%	23.9%	28.4%	15.4%	5.0%
Pahsimeroi River	98	49	29	3	17	0	608	795	87	1,370	1,201	8.1%	3.6%	3.4%	1.2%	0.0%	18.8%	5.4%	3.4%	0.6%	0.0%
Salmon River	133	111	15	5	2	0	354	96	43	390	358	31.4%	15.6%	11.6%	0.5%	0.0%	33.6%	15.6%	16.7%	0.3%	0.0%
Secesh River	62	4	17	7	1	33	12	59	111	17	344	33.3%	28.8%	6.3%	5.9%	9.6%	57.1%	32.7%	12.2%	0.0%	6.5%
SF Salmon River	183	15	23	52	30	63	168	174	282	168	615	8.9%	13.2%	18.4%	17.9%	10.2%	26.8%	21.2%	26.4%	10.0%	6.2%
Valley Creek	3	0	0	3	0	0	0	0	89	0	91	na	na	3.4%	na	0.0%	na	na	0.0%	na	0.0%
All Salmon	**1,131**	**286**	**247**	**182**	**65**	**351**	**2,423**	**2,395**	**2,080**	**2,257**	**7,112**	**11.8%**	**10.3%**	**8.8%**	**2.9%**	**4.9%**	**25.0%**	**14.1%**	**14.3%**	**1.0%**	**2.9%**

[a] Includes steelhead that were tagged in Hungery Creek.
[b] Includes steelhead that were tagged in WF Gedney Creek.

Table 14. The median travel time in days and km/day and the 90% upper (UP) and lower (LO) confidence interval from release site to Lower Granite Dam (LGR). All smolts were PIT tagged and detected during the spring 2004.

		Km to	Travel time (days)					Travel time (km/day)				
Stream	**Number**	**LGR**	**Median**	**Lo CI**	**Up CI**	**Max**	**Min**	**Median**	**Up CI**	**Lo CI**	**Slowest**	**Fastest**
Clearwater River drainage												
Crooked Fork Creek	92	324	8.0	7	9	44	5	40.5	46.3	36.0	7.4	64.8
Clear Creek	265	176	6.0	6	7	55	2	29.3	29.3	25.1	3.2	88.0
Colt Killed Creek	75	322	8.0	8	9	40	5	40.3	40.3	35.8	8.1	64.4
Fish Creek	19	249	21.0	10	42	49	3	11.9	24.9	5.9	5.1	83.0
Red River	26	278	9.5	6	14	59	4	29.3	46.3	19.9	4.7	69.5
Salmon River drainage												
Johnson Creek	52	407	12.0	9	21	69	5	33.9	45.2	19.4	5.9	81.4
Lemhi River	12	595	26.5	11	41	46	9	22.5	54.1	14.5	12.9	66.1
Marsh Creek	20	630	31.0	21	36	57	9	20.3	30.0	17.5	11.1	70.0
Pahsimeroi River	43	621	9.0	9	12	57	5	69.0	69.0	51.8	10.9	124.2
Salmon River	88	747	18.5	14	23	52	7	40.4	53.4	32.5	14.4	106.7
SF Salmon River	10	460	11.0	8	32	52	6	41.8	57.5	14.4	8.8	76.7

Table 15. The number of scales that were collected from adult and juvenile steelhead during 2004.

		Juvenile scales collected		
Stream	**Adult scales**	**3/1 to 6/15**	**6/16 to 8/14**	**8/14 to 12/15**
Clearwater drainage				
Colt Killed Creek	0	106	4	61
Crooked Fork Creek	0	143	18	88
Fish Creek	203	102	16	496
Clearwater drainage total	**203**	**351**	**38**	**645**
Salmon drainage				
Lemhi River	0	133	0	134
Lick Creek	0	0	0	93
Pahsimeroi River	0	151	0	144
Marsh Creek	0	121	12	46
Rapid River	121	0	0	107
Salmon River (Sawtooth)	0	189	1	26
SF Salmon River (Knox Bridge)	0	104	43	113
Salmon drainage total	**121**	**698**	**56**	**663**

Table 16. The number (N), percent of the year's return, mean length (cm) and 95% CI (in parenthesis), by sex and ocean age, of adult steelhead captured at the Fish Creek weir in 2003 and 2004 and the Rapid River weir from 2002 to 2004.

			Ocean Age-1			Ocean Age-2			Ocean Age-3		
Stream	**Year**	**Sex**	**N**	**Percent**	**Length (CI)**	**N**	**Percent**	**Length (CI)**	**N**	**Percent**	**Length (CI)**
Fish Creek	2003	F	11	3.5%	69 (4)	207	65.3%	81 (1)	5	1.6%	88 (1)
		M	36	11.4%	69 (1)	57	18.0%	87 (1)	1	0.3%	88
	2004	F	8	4.1%	67 (2)	108	55.7%	80 (1)	1	0.5%	88
		M	32	16.5%	66 (1)	44	22.7%	86 (1)	1	0.5%	83
Rapid River	2002	F	28	31.8%	63 (1)	30	34.1%	74 (2)	0	0%	
		M	22	25.0%	64 (2)	8	9.1%	76 (5)	0	0%	
	2003	F	19	25.7%	64 (2)	31	41.9%	76 (2)	0	0%	
		M	10	13.5%	63 (4)	14	18.9%	78 (3)	0	0%	
	2004	F	29	29.3%	63 (2)	26	26.3%	76 (2)	0	0%	
		M	40	40.4%	62 (2)	4	4.0%	83 (12)	0	0%	

Table 17. The total number of individuals per stream that were analyzed using microsatellites in 2004 at the Alaska Science Center.

Stream	Number analyzed	Drainage
Big Smokey Creek	46	Boise River
Jacks Creek	40	Clearwater River
Boulder Creek	52	Little Salmon River
Hazard Creek	51	Little Salmon River
Little Salmon River (upstream of falls)	50	Little Salmon River
Boulder Creek	53	Lochsa River
Crooked Fork Creek	56	Lochsa River
Deadman Creek	56	Lochsa River
Fish Creek (fall migrants)	56	Lochsa River
Hungery Creek	59	Lochsa River
Papoose Creek	46	Lochsa River
Storm Creek	56	Lochsa River
Warm Springs Creek	55	Lochsa River
Weir Creek	55	Lochsa River
Bear Valley Creek	56	MF Salmon River
Big Creek	48	MF Salmon River
Rapid River	55	MF Salmon River
Sulphur Creek	56	MF Salmon River
MF Payette River	45	Payette River
Bargamin Creek	56	Salmon River
Horse Creek	60	Salmon River
Morgan Creek	46	Salmon River
Owl Creek	58	Salmon River
Sheep Creek	23	Salmon River
Slate Creek	56	Salmon River
Valley Creek	51	Salmon River
Warm Springs Creek	50	Salmon River
WF Yankee Fork Creek	58	Salmon River
Meadow Creek	59	Selway River
Mink Creek	56	Selway River
NF Moose Creek	55	Selway River
O'Hara Creek	55	Selway River
Pettibone Creek	58	Selway River
Pistol Creek	28	Selway River
Lake Creek	56	SF Salmon River
Lick Creek (lower)	56	SF Salmon River
Lick Creek (upstream of barrier)	42	SF Salmon River
Stolle Meadow	49	SF Salmon River
Captain John Creek	58	Snake River
Sheep Creek	50	Snake River
Little Bear Creek	0	Clearwater River
Collins Creek	0	NF Clearwater River
Little Weiser Creek	0	Weiser River
Total samples analyzed	2,071	

Table 18. The number trapped and the length (mm) and weight (g) statistics of steelhead too small to PIT tag (<80 mm), Chinook salmon parr, cutthroat trout, bull trout, and dace that were caught in the Fish Creek, Lick Creek, and Rapid River screw traps in 2004. nm = not measured.

	Number of fish			Length (mm)			Weight (g)		
Species	**Trapped**	**Tagged**	**Recaps**	**N**	**Mean**	**CI**	**N**	**Mean**	**CI**
Fish Creek									
Steelhead (<80 mm)[a]	1,040	0		844	61	1			
Cutthroat trout	242	223	10	224	199	7	220	94.3	13.4
Chinook parr	10	8	1	8	89	4	8	6.9	0.6
Bull trout	9	7	2	7	298	71	7	320.5	168.8
Longnose dace	2,811	0		511	104	1	507	14.0	0.6
Speckled dace	676	0		248	88	1	247	8.8	0.4
Dace spp.[b]	80	0		nm			nm		
Lick Creek									
Steelhead (<80 mm)	455	0		145	54	1	145	1.7	0.1
Chinook parr	253	188	3	188	73	1	188	4.3	0.2
Cutthroat trout	7	5	2	5	137	35	5	27.0	19
Rapid River									
Steelhead (<80 mm)	30	0		30	60	1	30	2.5	0.5
Chinook salmon	321	248	58	248	88	1	247	7.7	0.3
Bull trout	161	128	0	128	206	4	128	84.9	5.2
Cutthroat trout[c]	3	2	0						

[a] Weight of fry is not a random sample because most fry <50 mm were not weighed.
[b] Dace that were not identified to species.
[c] Length and weight statistics not reported because of small sample size.

Table 19. Streams that were sampled for water temperatures in 2004 and the associated winter and summer temperature recording intervals. The water temperature was measured within 1 km of the mouth of each stream unless noted. The winter recording interval in the Salmon River drainage was used from January 1 to April 29 and from October 28 to December 31. The winter recording interval in the Clearwater River drainage was used from January 1 to March 21 and from November 1 to December 31. The Fish Creek air temperature, relative humidity, and barometric pressure were measured at the trailhead. NR = not recorded.

	Recording Interval (Hours)	
Stream	**Winter**	**Other**
Salmon River drainage		
Basin Creek, 500 m upstream of hot springs	2.5	1.5
Beaver Creek, 2 km upstream of irrigation diversion	1.0	1.0
East Fork Salmon River, upstream of Bowery Hot Springs	2.5	1.5
East Fork Salmon River	2.5	1.5
Frenchman Creek, first meadow upstream of mouth	1.0	1.0
Germania Creek	2.5	1.5
Marsh Creek, 100 m downstream of screw trap site	2.5	1.5
Pole Creek, 2 km upstream of irrigation diversion	1.0	1.0
Redfish Lake Creek at weir	2.5	1.5
Salmon River at Sawtooth Fish Hatchery	1.0	0.5
Valley Creek, 200 m upstream of Meadow Creek	2.5	1.5
West Pass Creek at irrigation diversion	2.5	1.5
Clearwater River drainage		
Bald Mountain Creek	2.0	1.0
Bimerick Creek	2.0	1.0
Boulder Creek	1.0	0.5
Brushy Fork Creek	1.0	1.0
Canyon Creek	1.0	0.5
Crooked Fork Creek, 50 m upstream of Brushy Fork Creek	1.0	1.0
Deadman Creek	2.0	1.0
Fish Creek #1 at screw trap site	0.5	0.5
Fish Creek #2, 100 m upstream of screw trap site	1.0	0.5
Fish Creek #3, 2 km upstream of Hungery Creek	1.0	1.0
Fish Creek air temperature	2.0	1.0
Fish Creek barometric pressure	NR	1.0
Fish Creek relative humidity	NR	1.0
Gedney Creek #1	1.0	0.5
Gedney Creek #2 upstream of mouth about 2 km	1.0	1.0
Hungery Creek	1.0	1.0
Lost Creek	2.0	1.0
O'Hara Creek, 2 km downstream of Hanby Fork	1.0	1.0
Post Office Creek	1.0	0.5
Red River, 1 km upstream of SF Red River	1.0	1.0
SF Red River, 50 m downstream of Schooner Creek	1.0	1.0
Squaw Creek	2.0	1.0
Trapper Creek	1.0	1.0
Weir Creek	1.0	0.5
Wendover Creek	2.0	1.0
WF Gedney Creek	1.2	1.2
Willow Creek (tributary of Fish Creek)	1.0	1.0

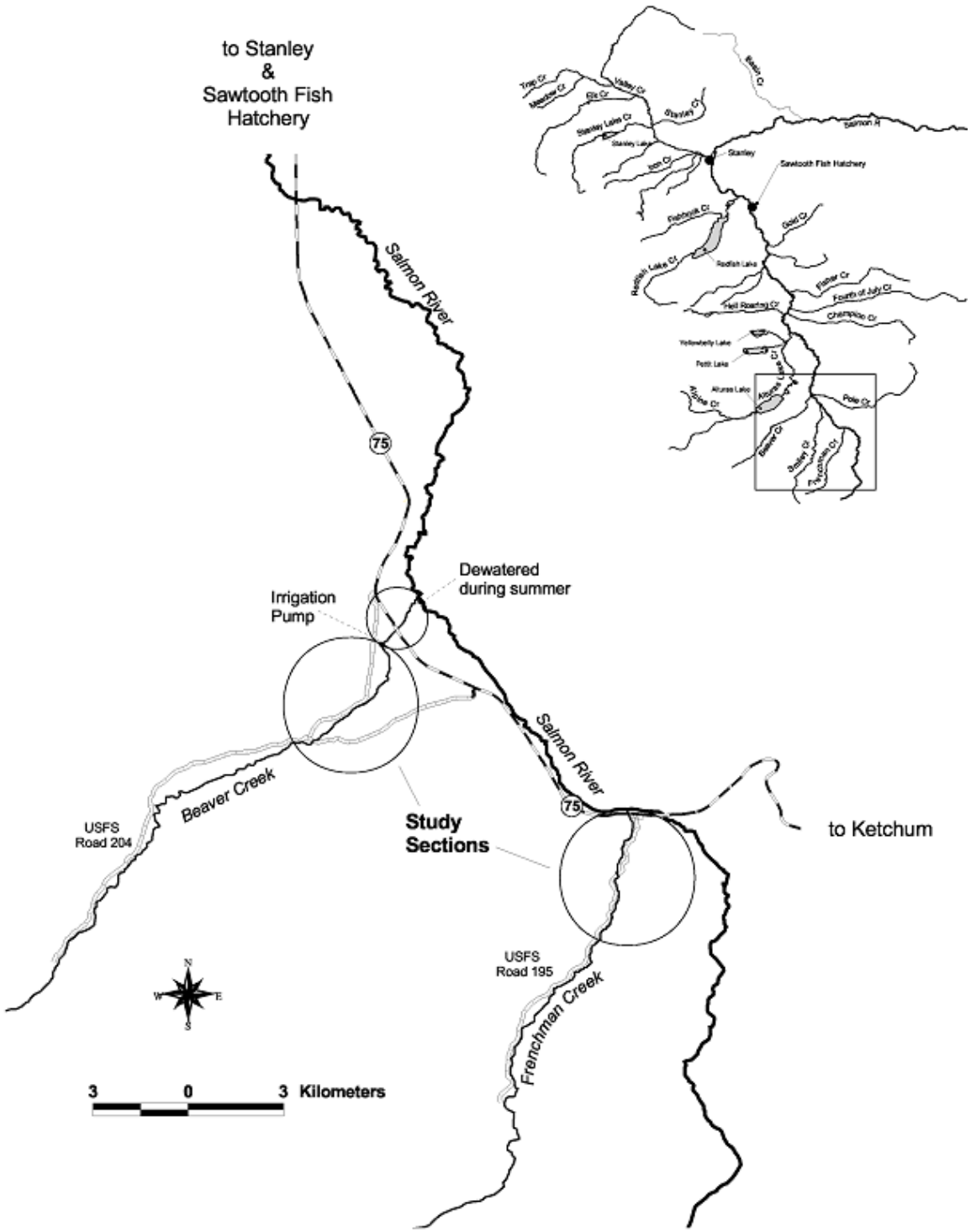


Figure 1. The location of the study sections in Beaver and Frenchman creeks where hatchery adults were stocked and summer snorkel surveys conducted.

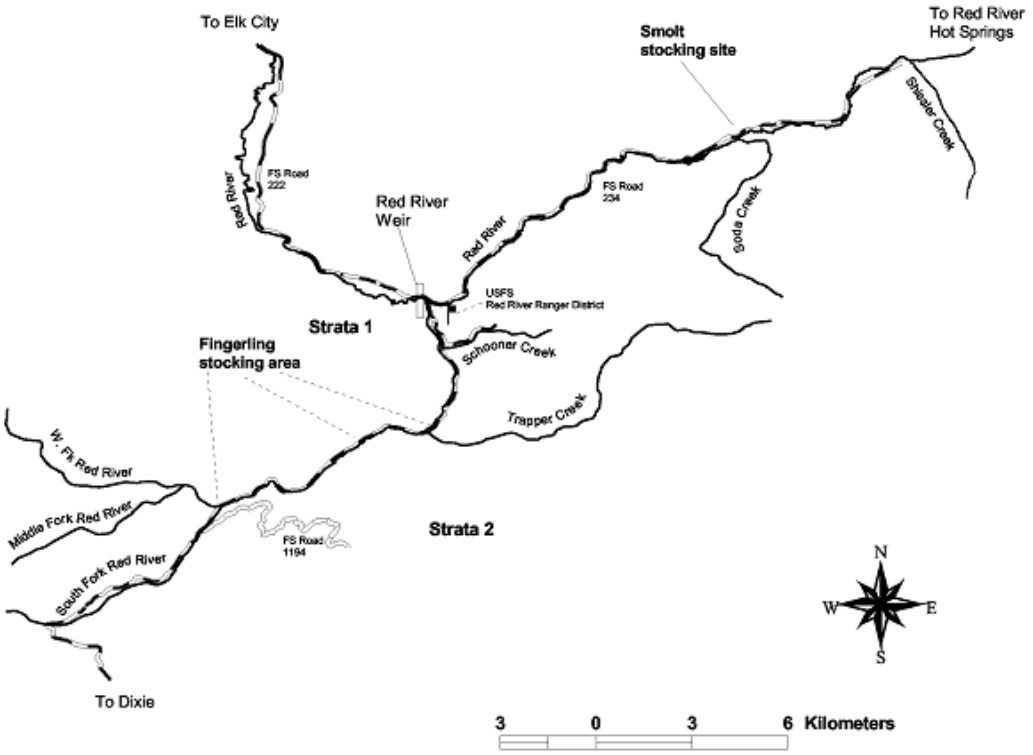


Figure 2. The sites where hatchery steelhead fingerlings were stocked from 1993 through 1996 in the SF Red River and the site in the Red River where hatchery steelhead smolts were stocked from 1996 through 1999. A snorkel survey was done in the SF Red River from its mouth to the WF SF Red River and in Red River from the SF Red River to Shissler Creek in 2004.

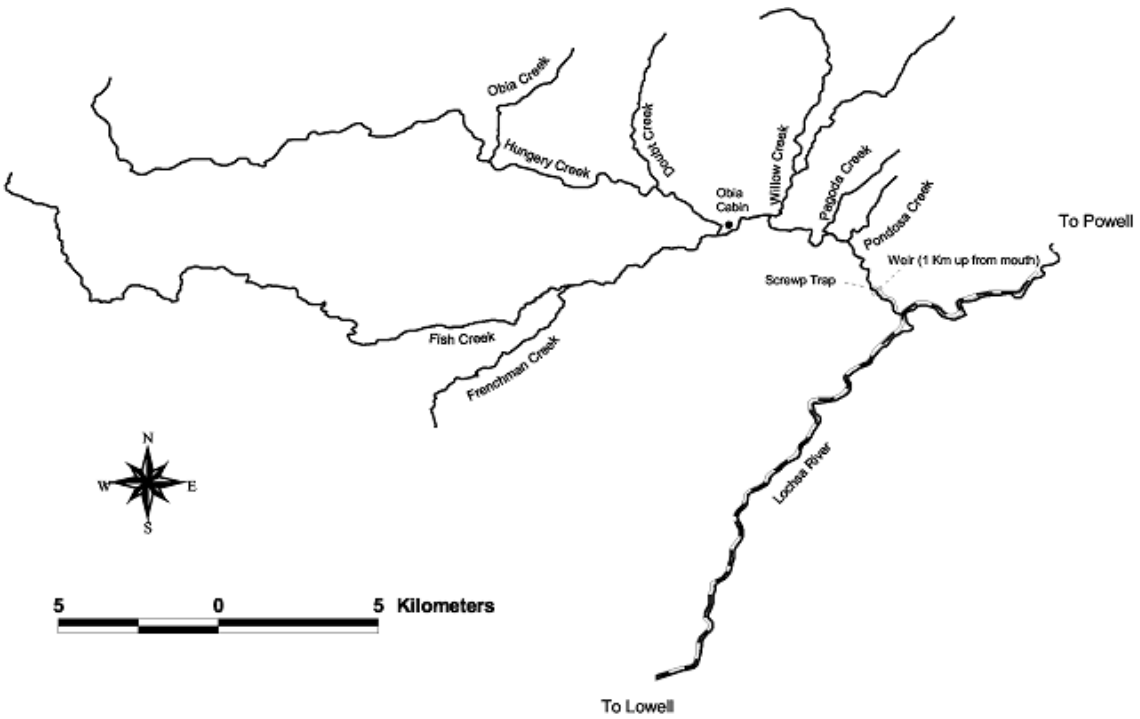


Figure 3. The Fish Creek drainage showing the location of the Fish Creek screw trap and adult weir.

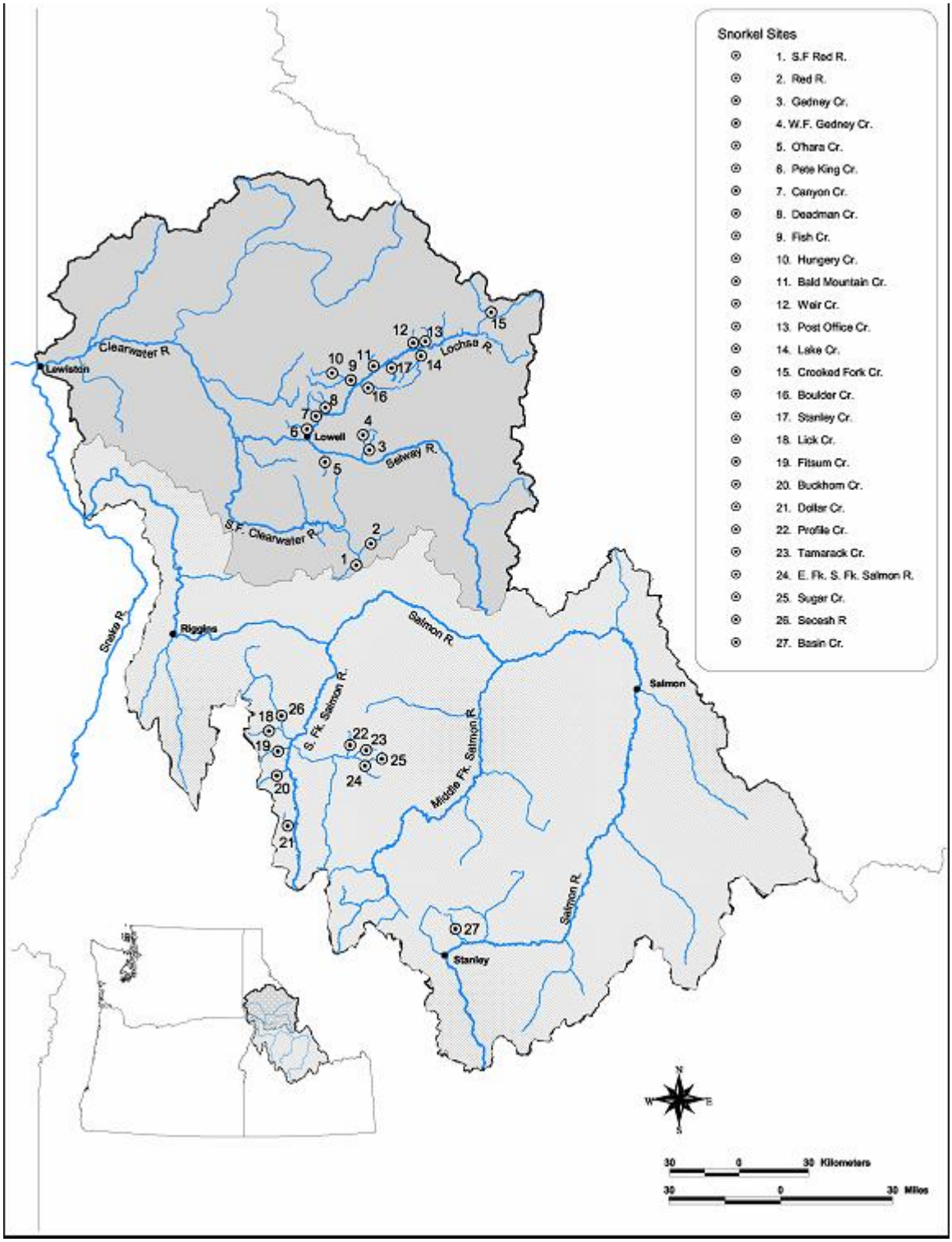


Figure 4. Map of the Clearwater River, Salmon River, and SF Salmon River drainages showing streams that were snorkeled in 2004.

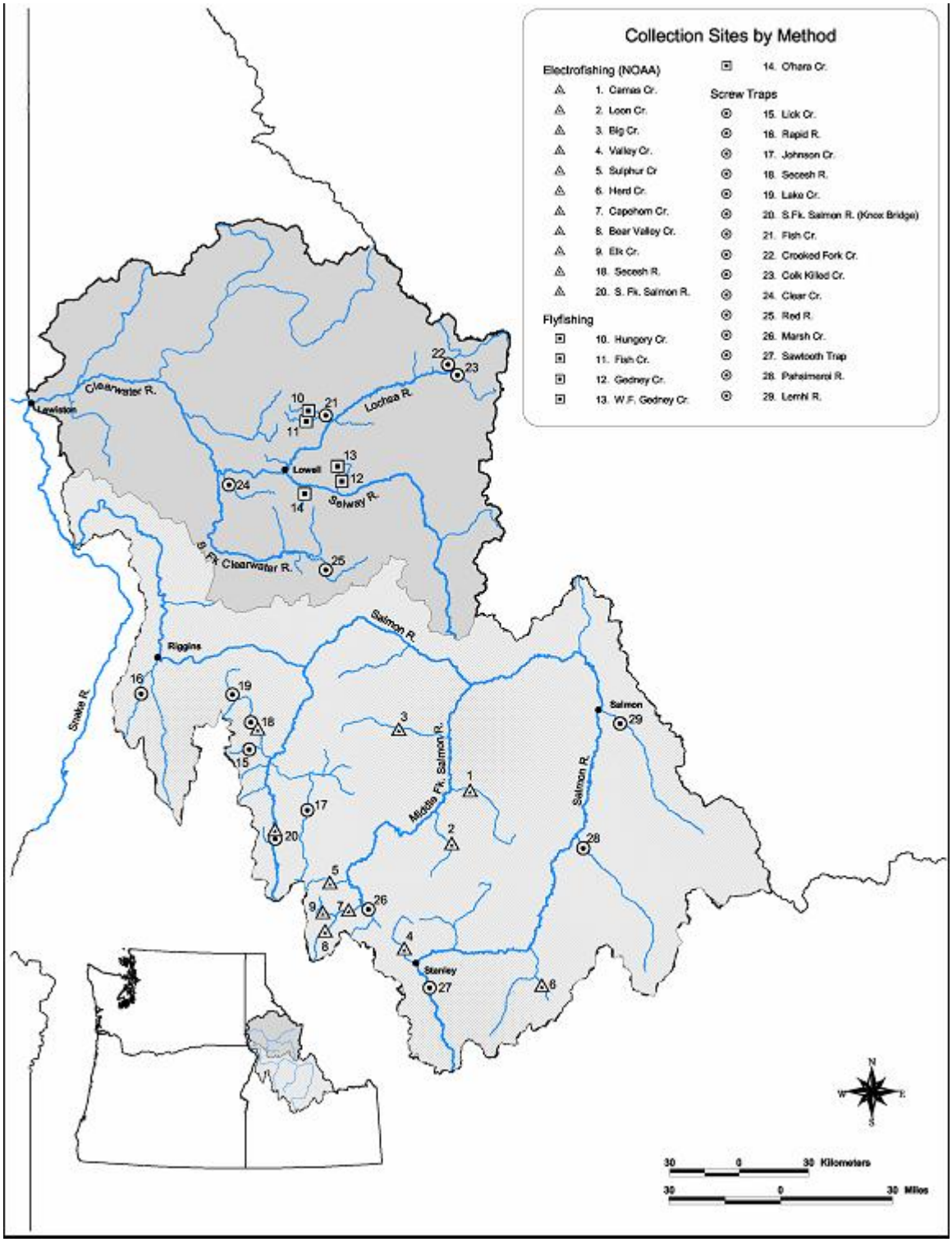


Figure 5. Map of the Salmon and Clearwater drainages showing the locations of the screw traps and the streams where crews captured and PIT tagged juvenile steelhead in 2004.

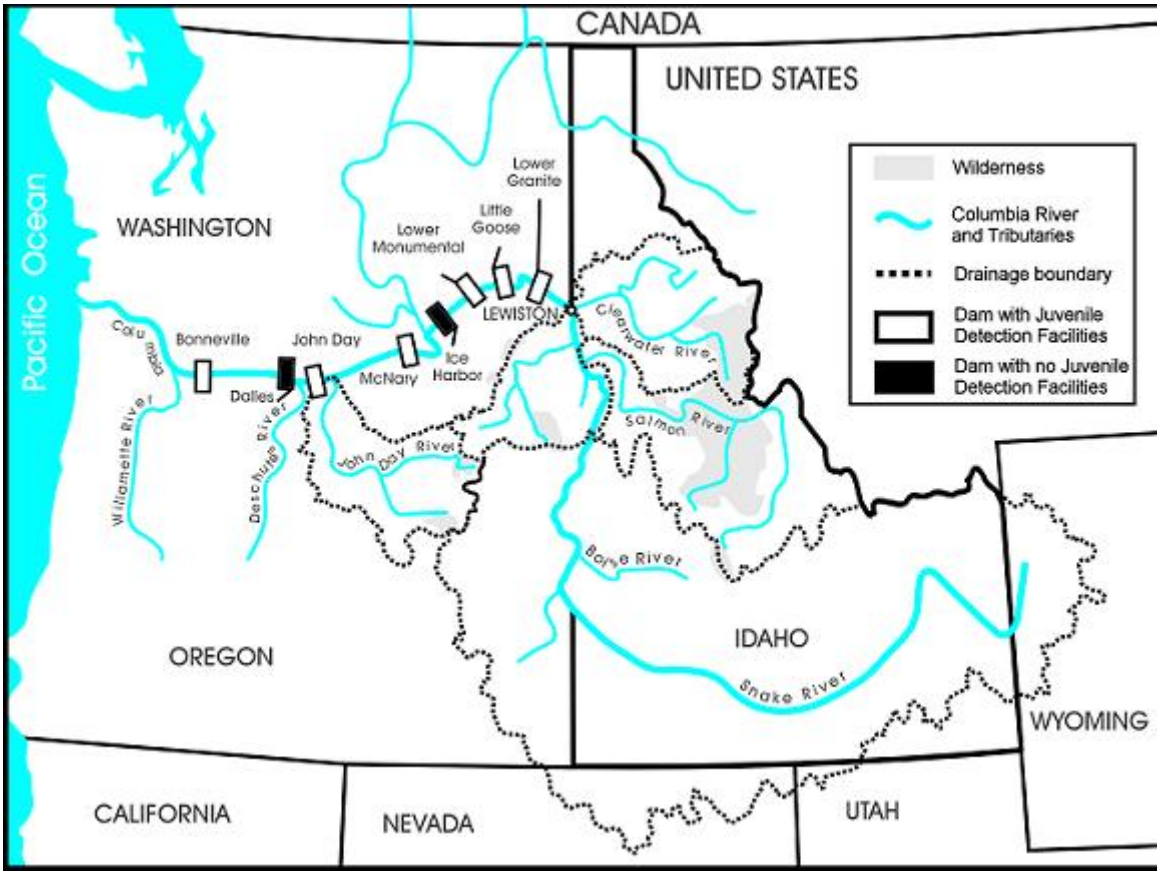


Figure 6. The location of dams on the Snake and Columbia Rivers where PIT tags were detected during the juvenile smolt out-migration in 2004.

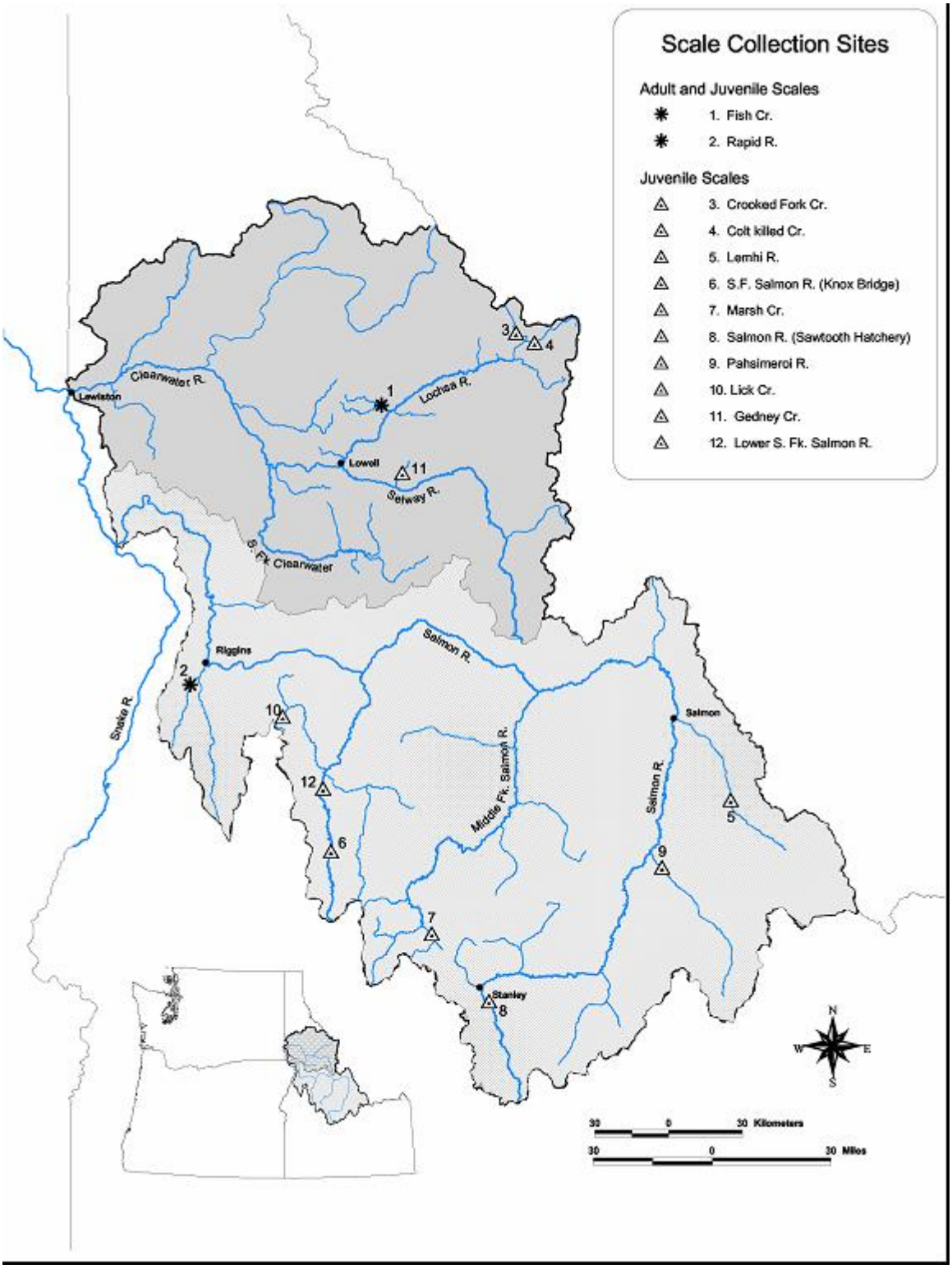


Figure 7. Map showing sites where scales were collected from adult and juvenile steelhead for aging. We collected scales at all sites except Gedney Creek and the Lower SF Salmon River in 2004.

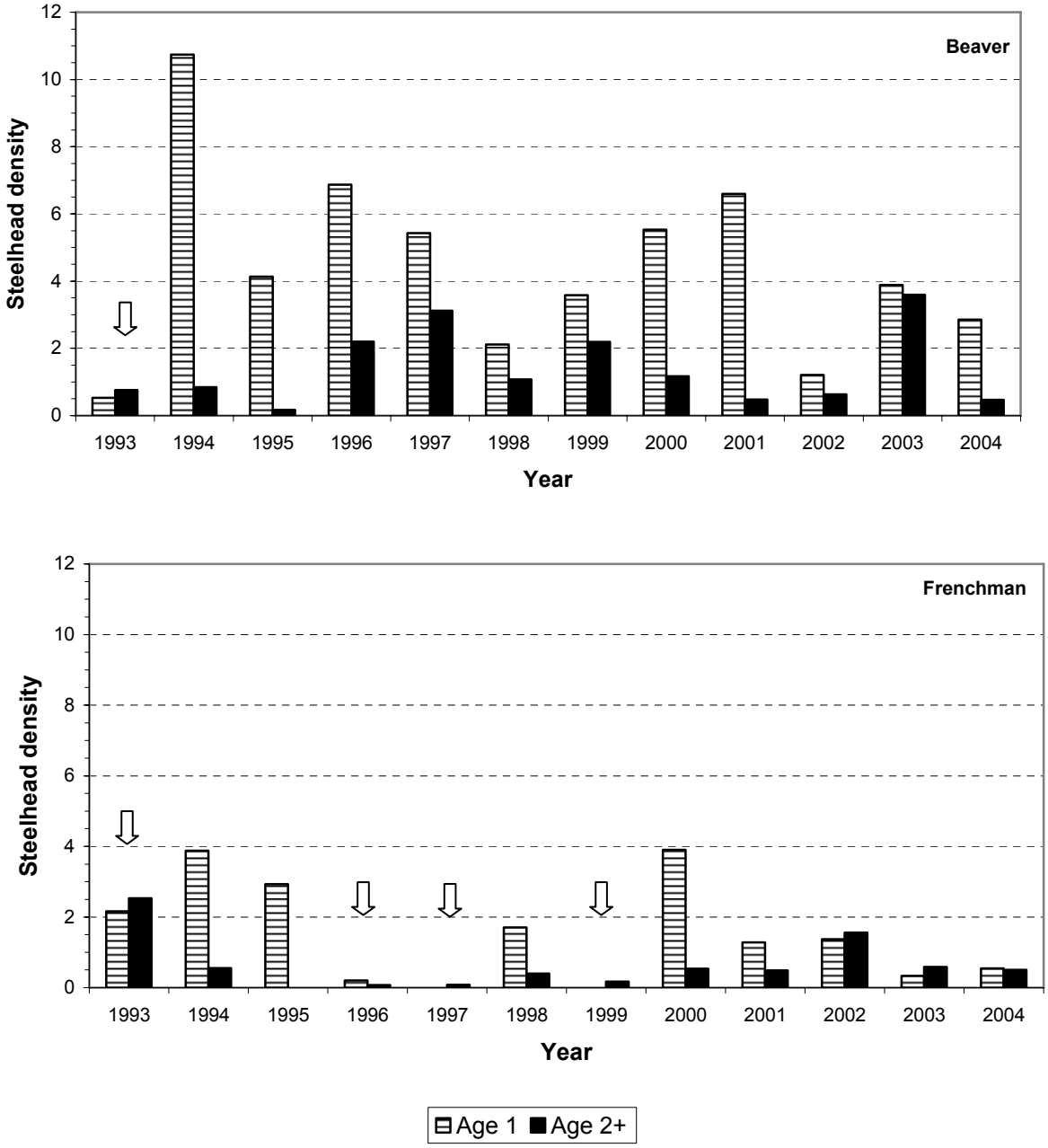


Figure 8. The mean density (fish/100m^2) of age-1 and age-2+ steelhead in Beaver (top) and Frenchman (bottom) creeks from 1993 to 2004. Adult steelhead were stocked in Beaver Creek annually from 1993 through 2004. The years marked with an arrow in the graphs indicate that adult steelhead were not stocked the previous year.

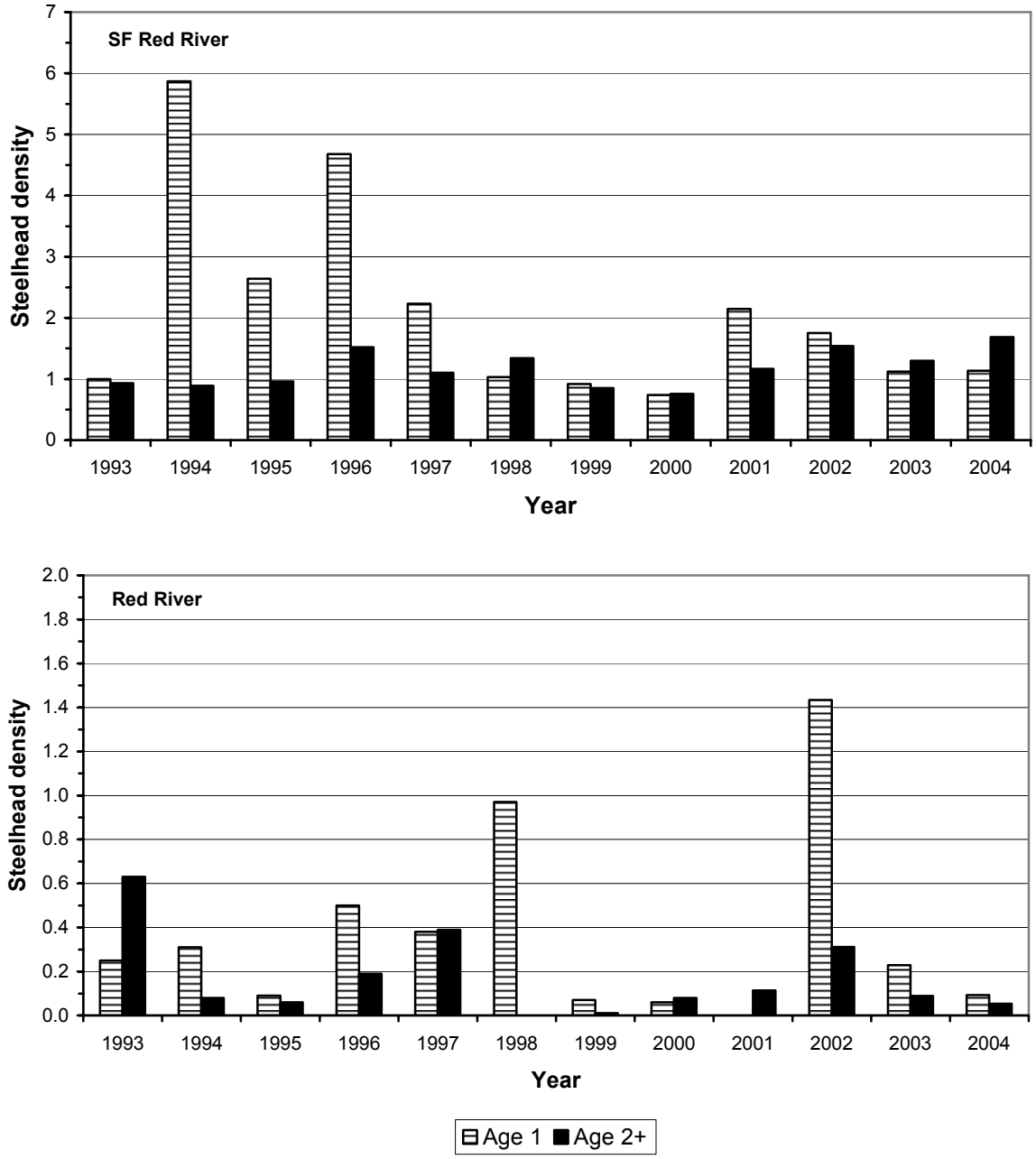


Figure 9. The mean stream density (fish/100 m^2) of age-1 and age-2+ steelhead from 1993 to 2004 in the South Fork (SF) Red River (top) and Red River (bottom) upstream of the SF Red River.

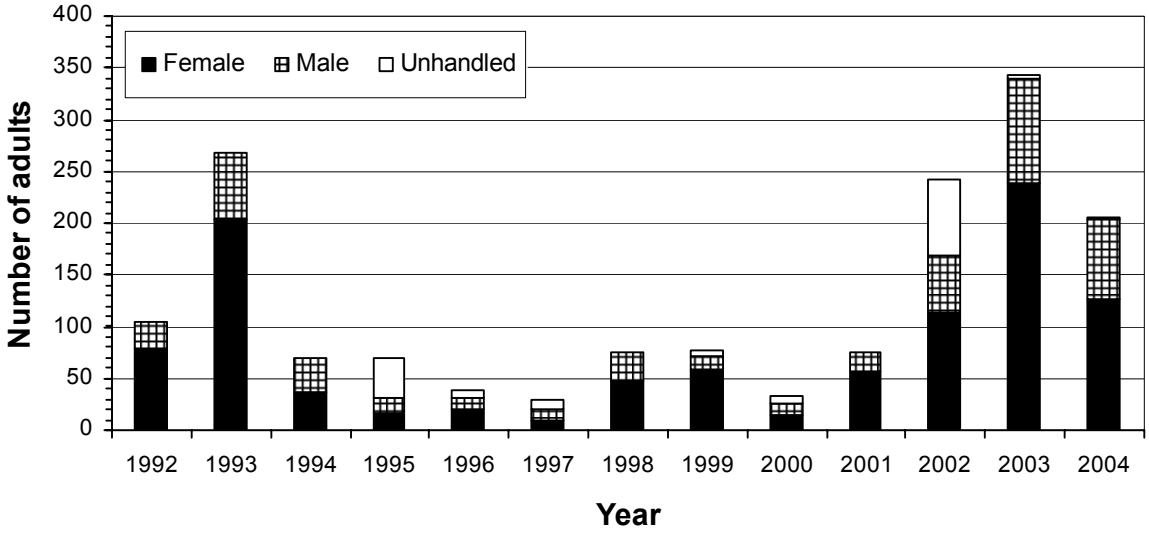


Figure 10. The estimated wild steelhead escapement in Fish Creek from 1992 to 2004. The open bar is an estimate of unhandled adults that entered Fish Creek in the years the weir was breached or damaged. The solid and crosshatched bars are the number of fish that were trapped at the weir and passed upstream and the number of unmarked kelts that were recovered.

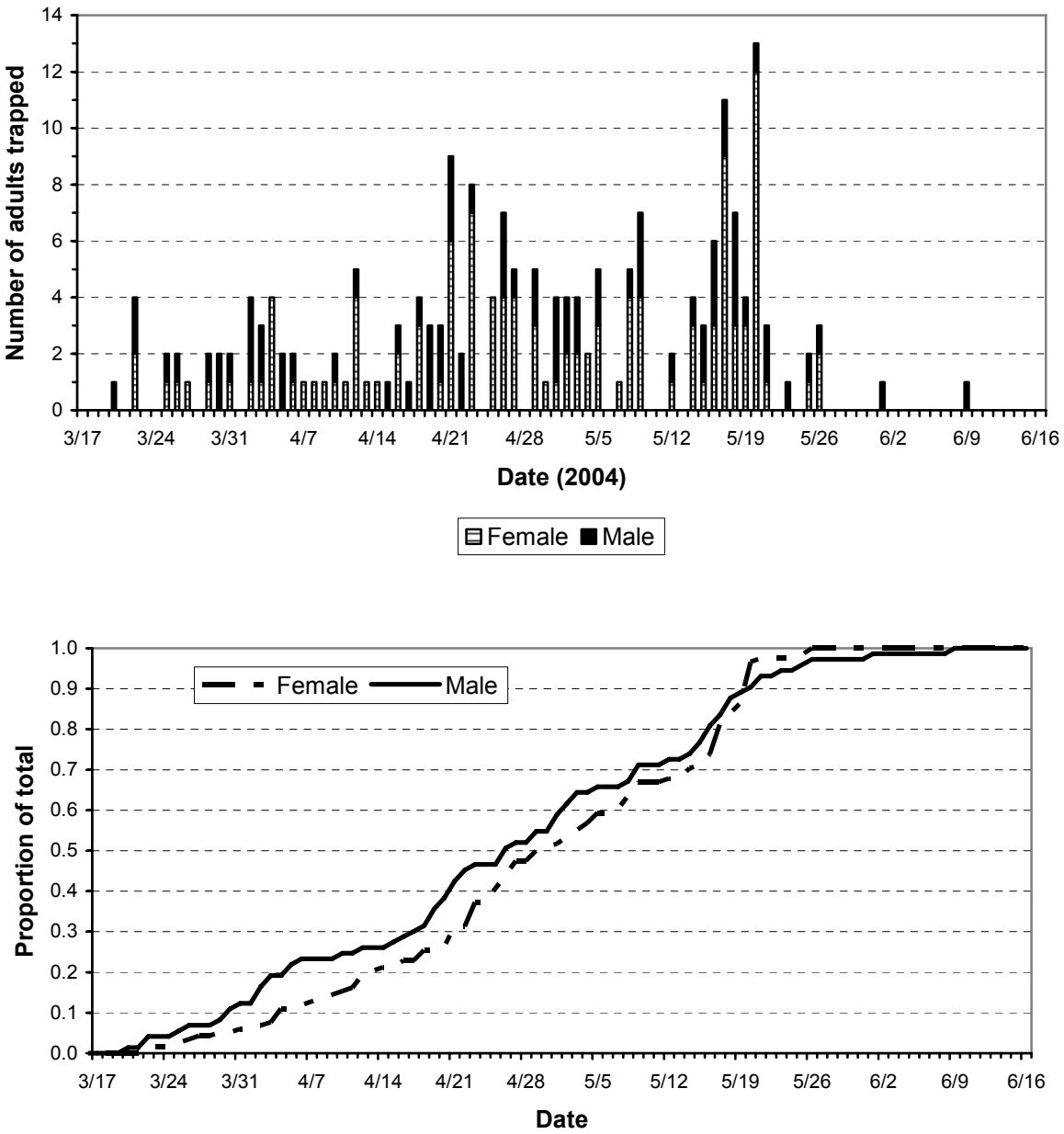


Figure 11. The number of adult female and male steelhead that were trapped at the Fish Creek weir and passed upstream to spawn from March 17 to June 16, 2004 (Upper graph) and the cumulative proportion of the total number of spawners that were captured on each date (Lower graph).

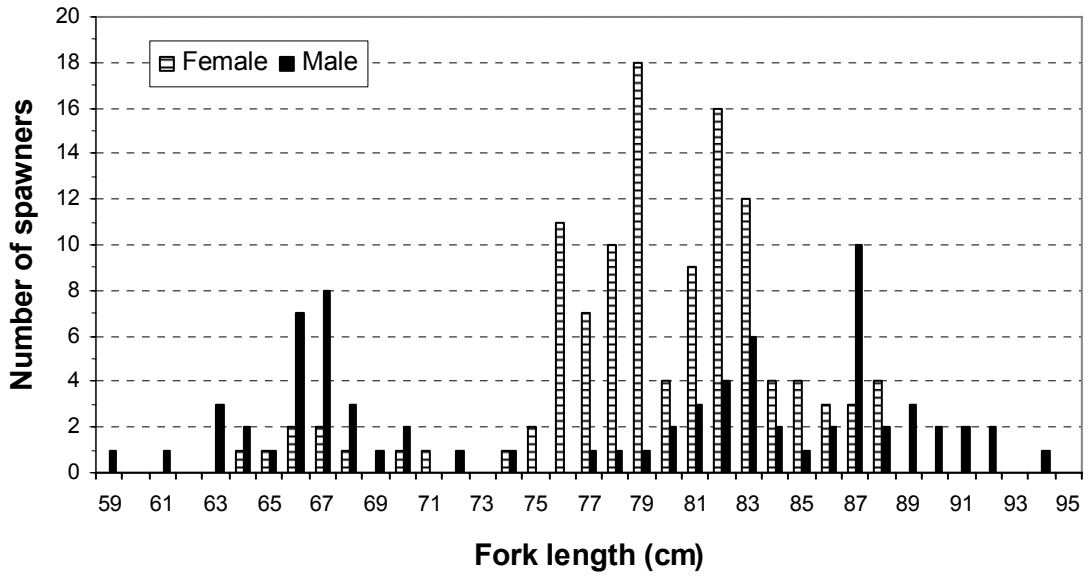


Figure 12. The length frequency of steelhead spawners trapped at the Fish Creek weir during the spring 2004.

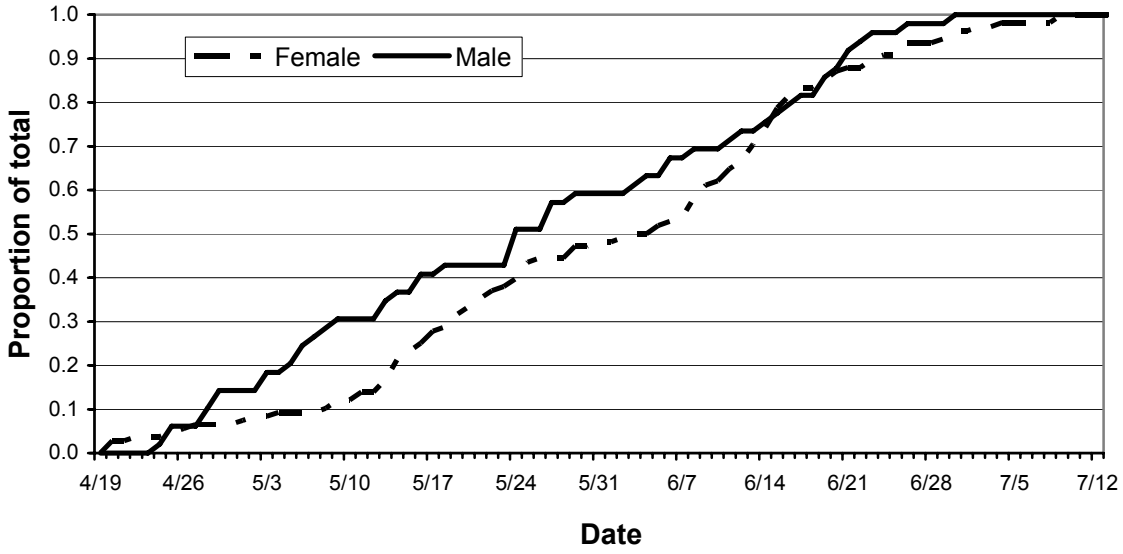


Figure 13. The cumulative proportion of the total number of male and female steelhead kelts recovered at the Fish Creek weir from April 19 to July 12, 2004.

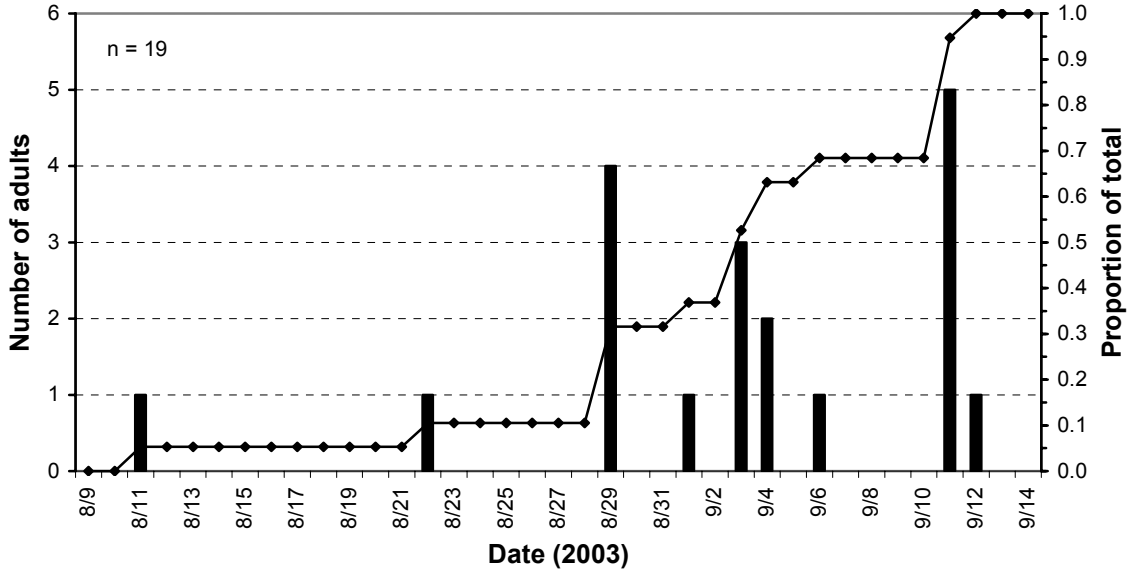


Figure 14. The number of PIT-tagged adult steelhead detected at Bonneville Dam between August 9 and September 14, 2003. These adults were tagged in Fish Creek as juveniles or were tagged elsewhere and captured at the Fish Creek weir during spring 2004.

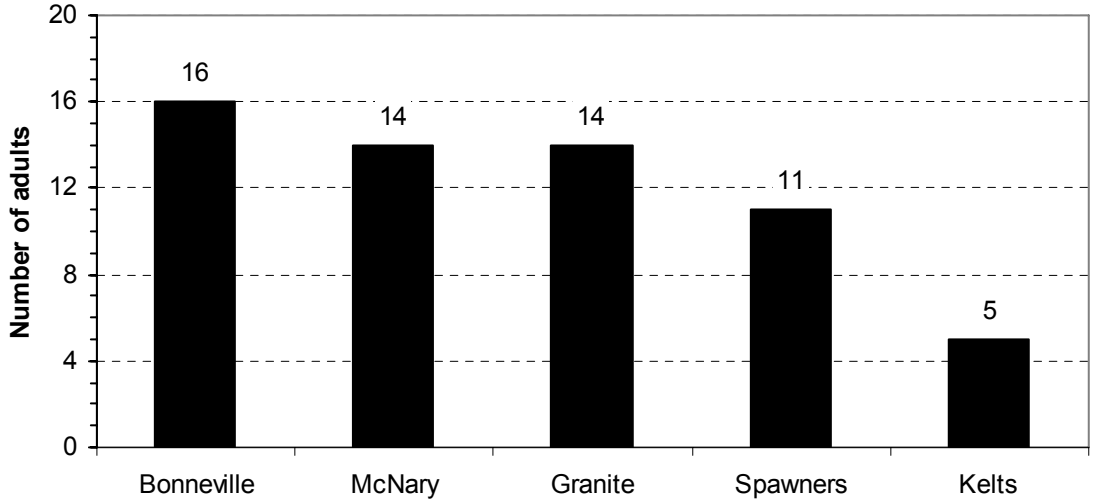


Figure 15. The number of adult steelhead that were PIT tagged in Fish Creek as juveniles and observed at Bonneville, McNary, and Lower Granite dams between August 9, 2003 and March 30, 2004, and the number of spawners and kelts trapped at the Fish Creek weir during 2004. One adult was detected at the Fish Creek weir that was not detected at any dam. One kelt was detected at the dams but not at the weir when it was passed upstream to spawn.

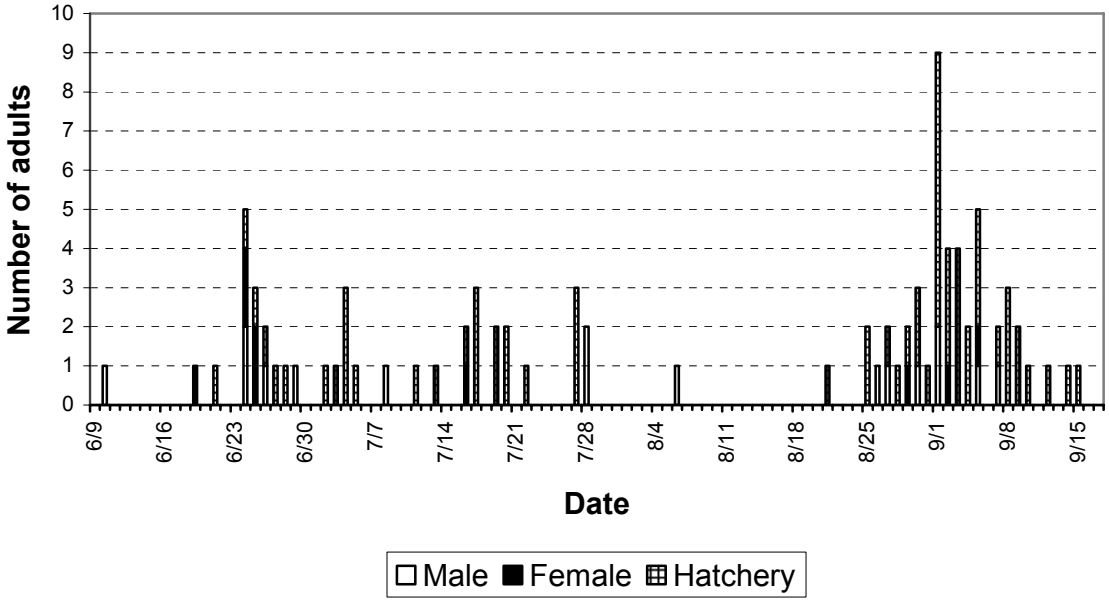
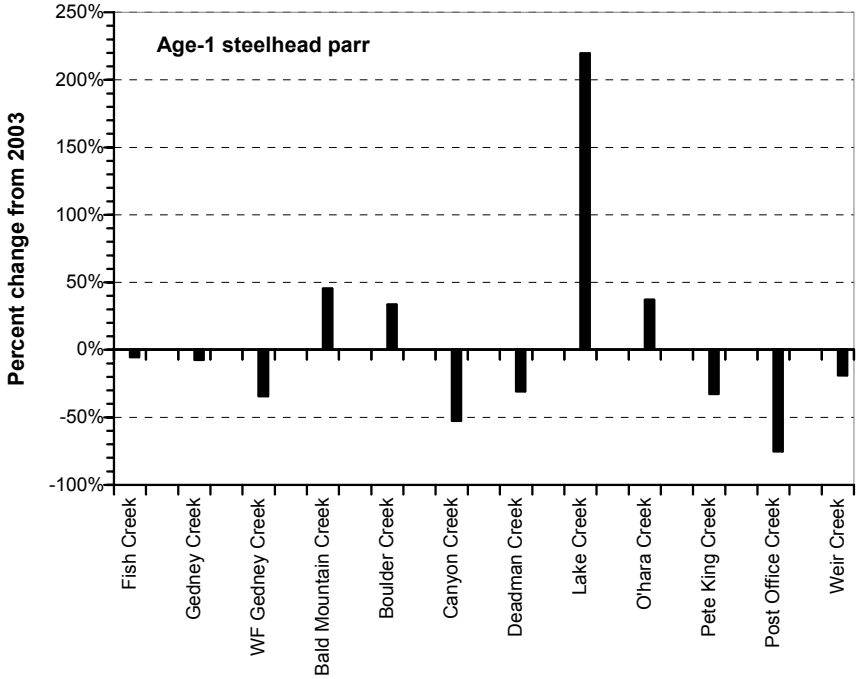


Figure 16 The number of naturally produced adult male (n = 16) and female Chinook salmon (n = 9) and the number of hatchery origin Chinook salmon (n = 64) trapped at the Fish Creek weir between June 9 and September 15, 2004.



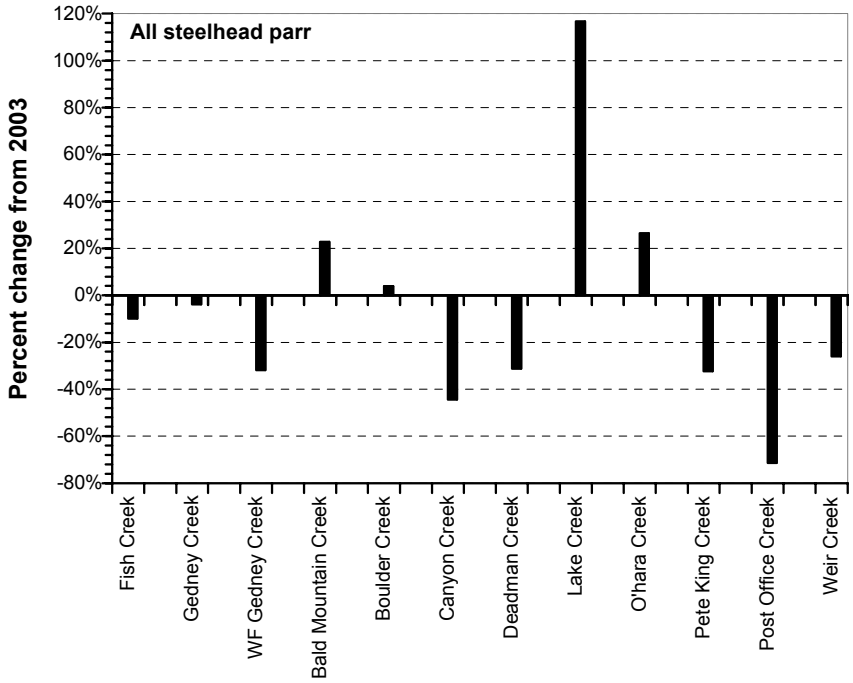


Figure 17. The percent change in the mean density of age-1 steelhead (top graph) and all age-1 and older steelhead parr (bottom graph) from those observed in 2003 in tributaries of the Lochsa and Selway rivers.

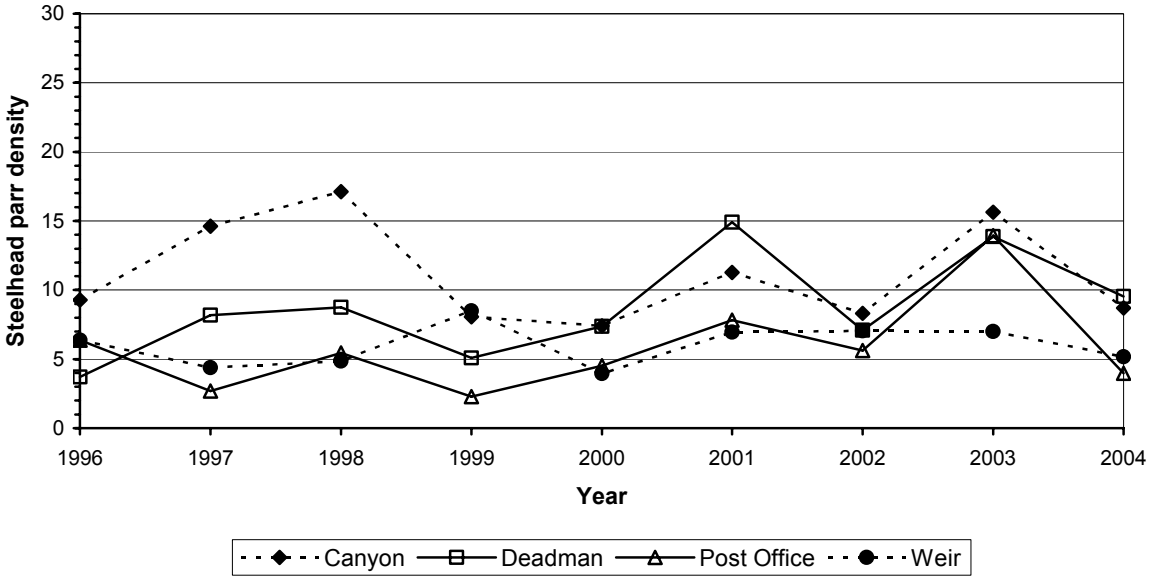


Figure 18. The mean stream density (fish/100 m^2) from 1996 to 2004 of all juvenile steelhead (except fry) in the Lochsa River tributaries Canyon, Deadman, Post Office, and Weir creeks.

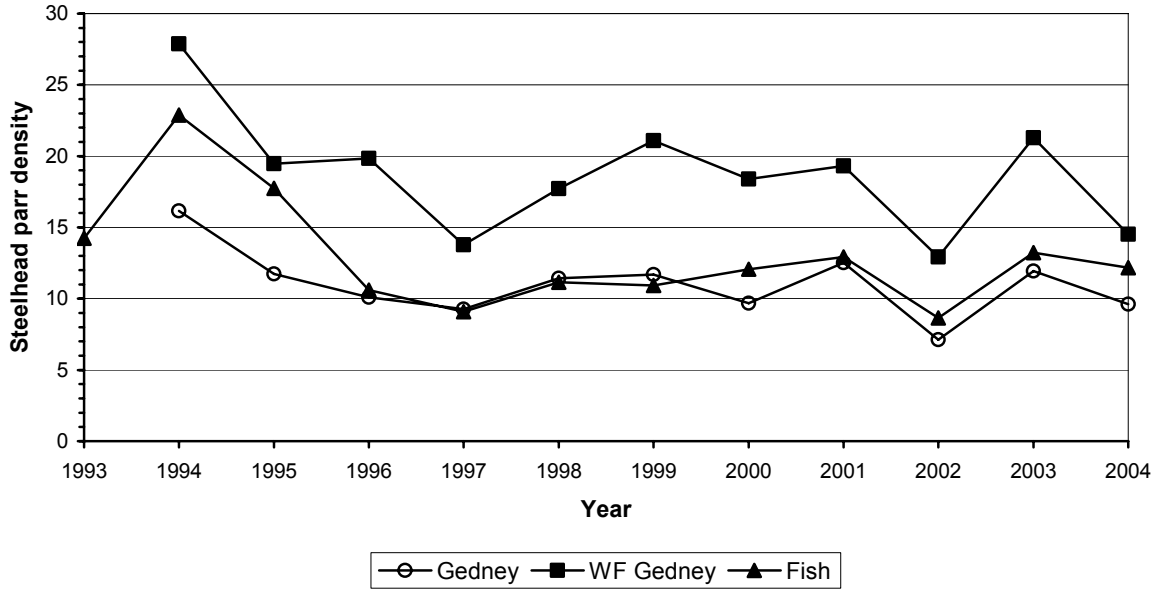


Figure 19. The mean stream density (fish/100 m^2) from 1993 to 2004 of all juvenile steelhead (except fry) in Fish Creek, Gedney Creek stratum 1, and West Fork Gedney Creek.

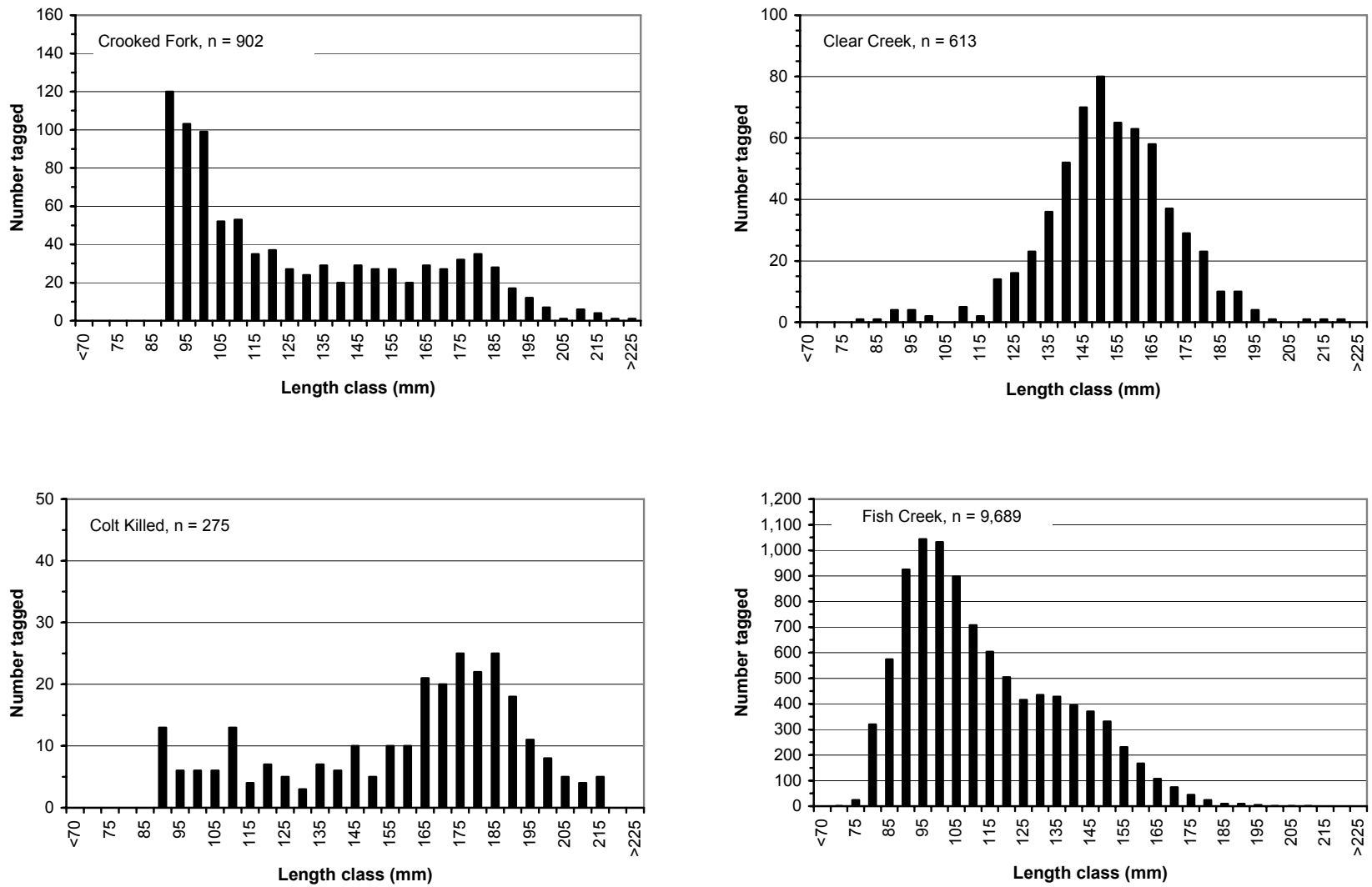


Figure 20. Length frequency of PIT-tagged wild steelhead juveniles captured in screw traps located in tributaries of the Clearwater River drainage during 2004.

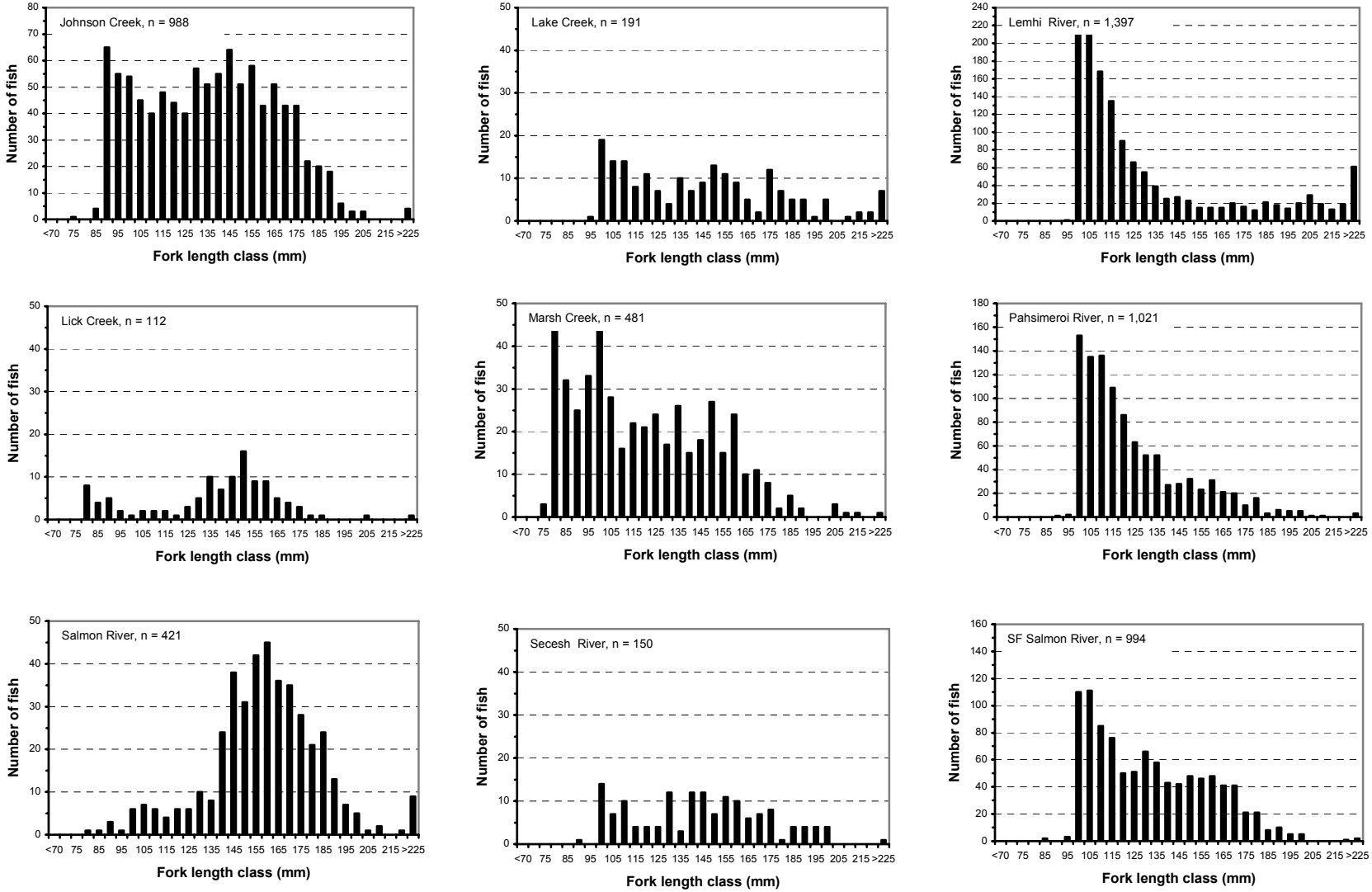


Figure 21. Length frequency of PIT-tagged wild steelhead juveniles captured in screw traps located in tributaries of the Salmon River drainage during 2004.

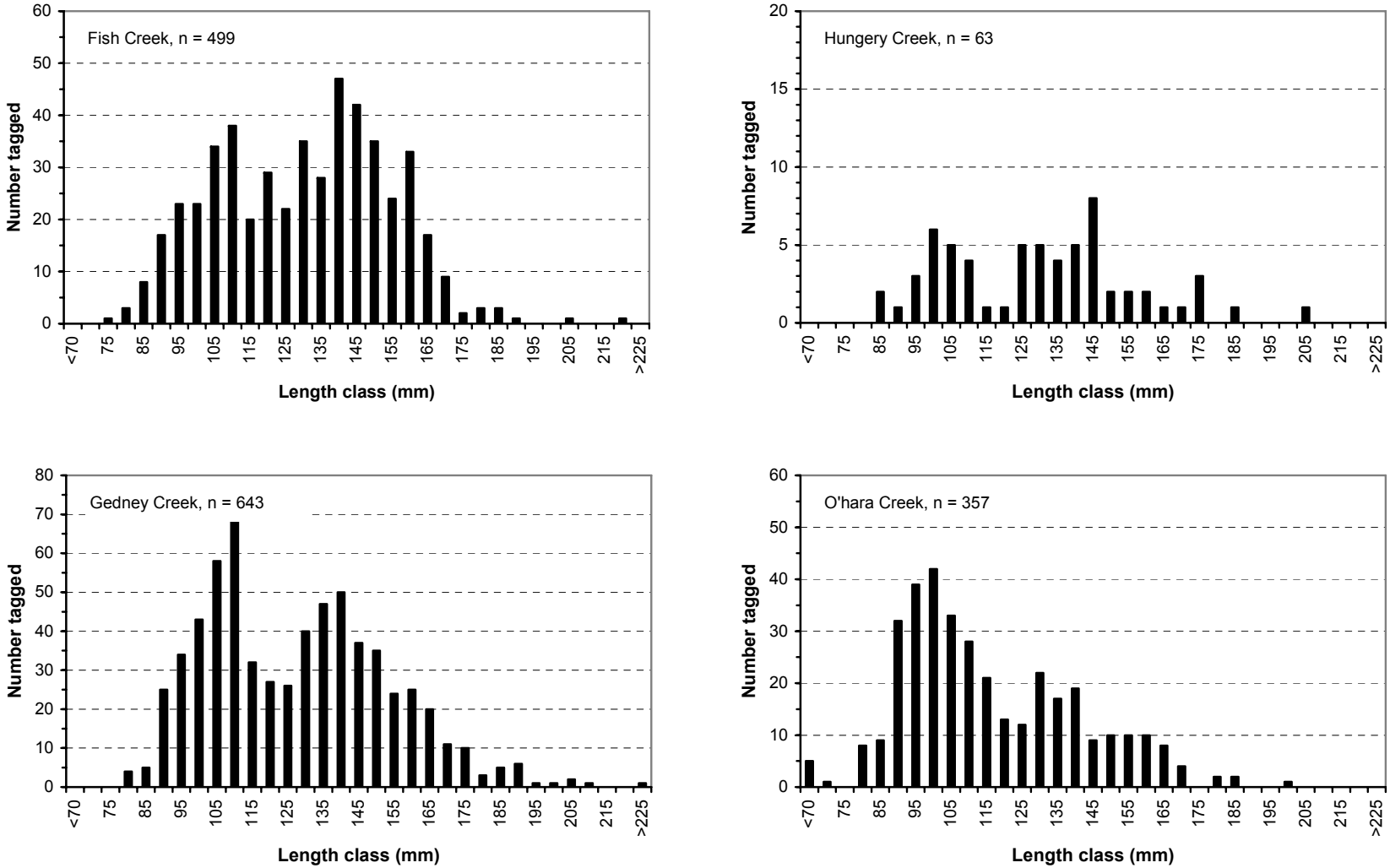


Figure 22. Length frequency of PIT-tagged wild steelhead juveniles captured flyfishing during the summer 2004 in Fish, Gedney, Hungery, and O'Hara creeks. The Gedney Creek graph includes fish caught in the WF Gedney Creek.

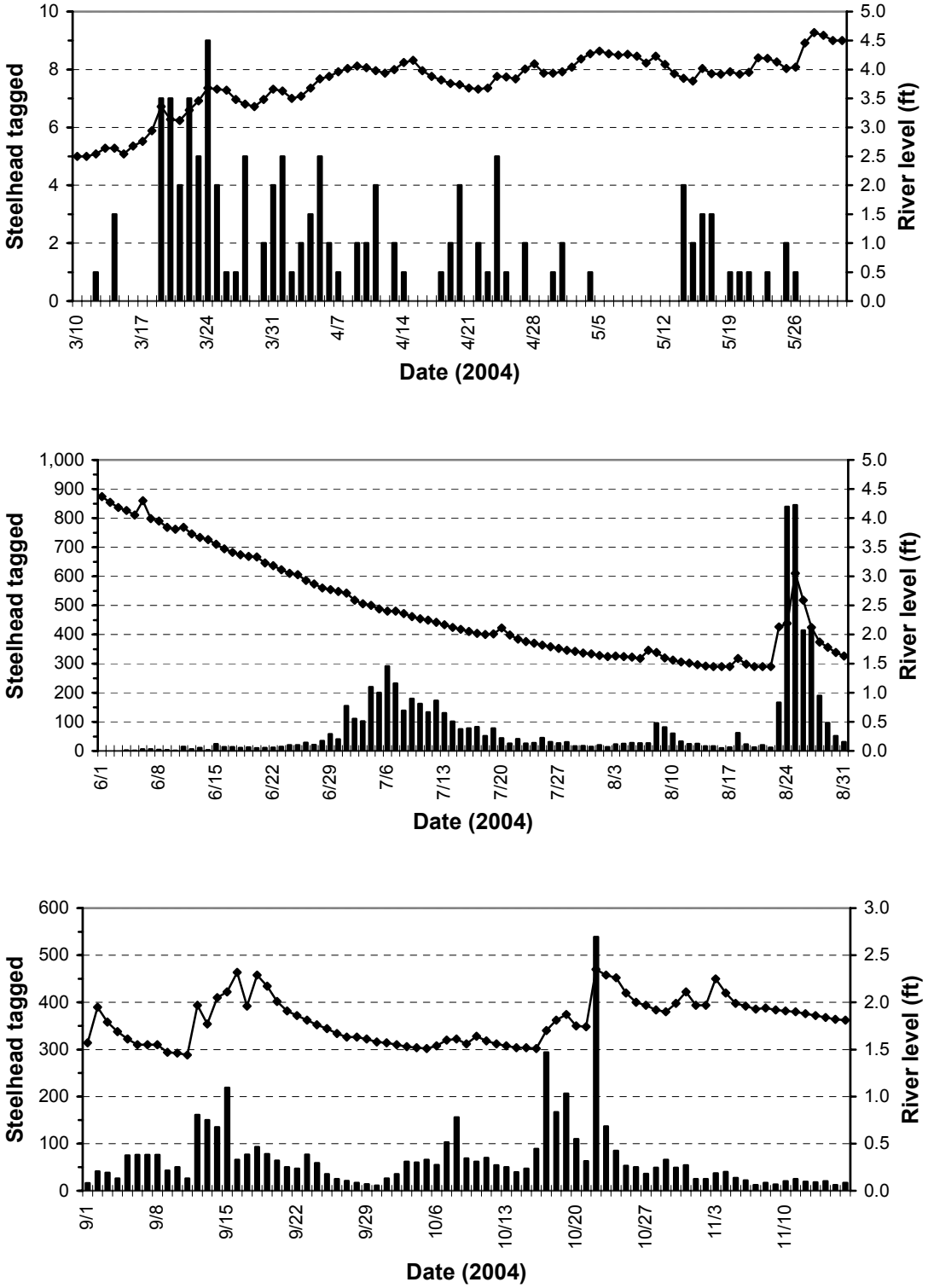


Figure 23. The number of juvenile steelhead that were PIT tagged daily and the river level at Fish Creek from March 10 to November 16, 2004.

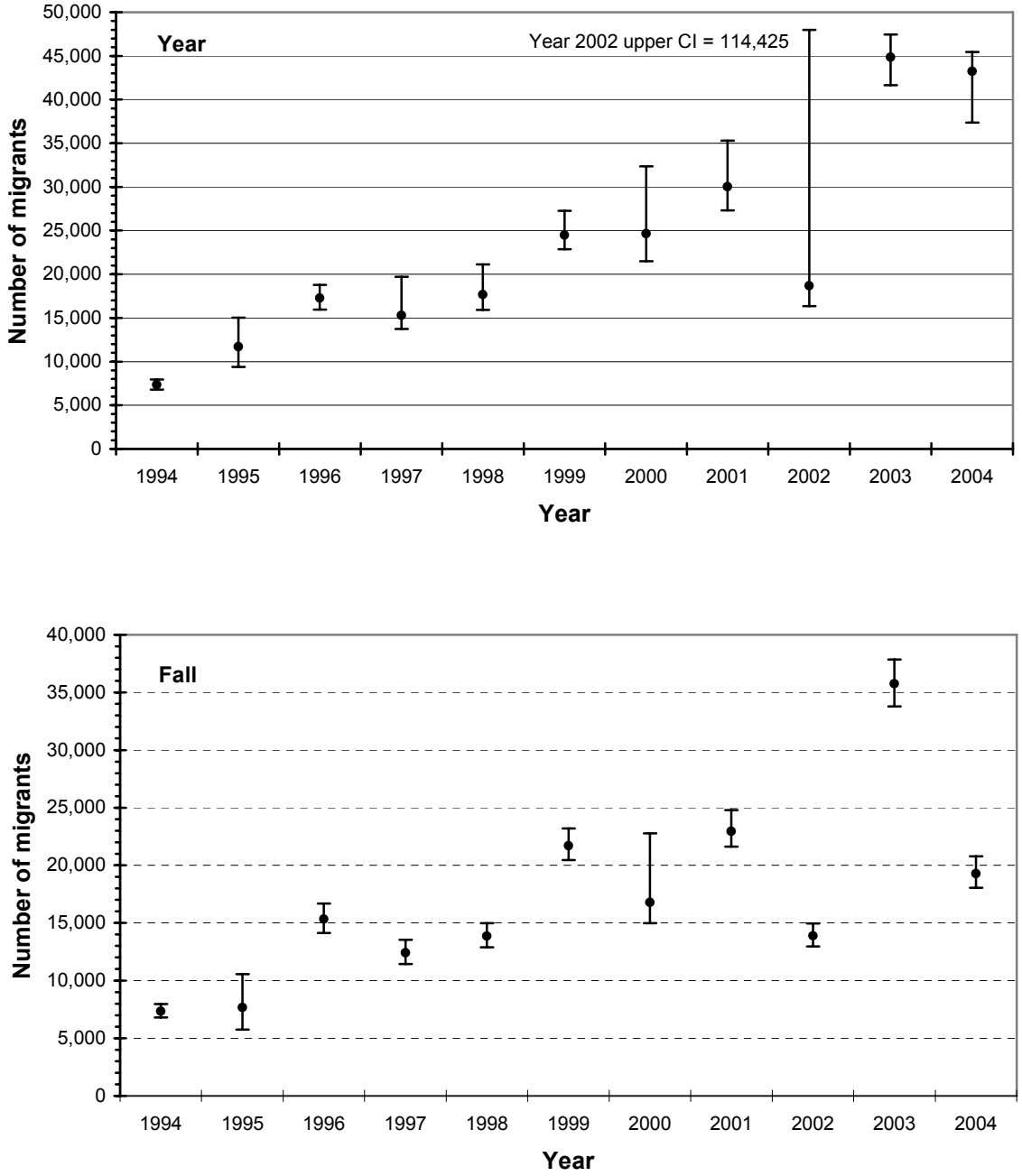


Figure 24. The number of juvenile steelhead (and 95% CI) that migrated past the screw trap in Fish Creek during the entire trapping season (Year, top graph) and from August 15 to the end of trapping in November (Fall, bottom graph) from 1994 to 2004. The large upper CI of yearly migration estimate for 2002 was a result of getting only one recapture during the spring high flow. In 1994, the trap was fished from September 22 to November 2. In 1995, the trap was fished from March 16 to June 14 and from August 18 to November 2. Beginning in 1996, IDFG crews have fished the trap (conditions permitting) continuously from mid-March until the creek freezes in the fall.

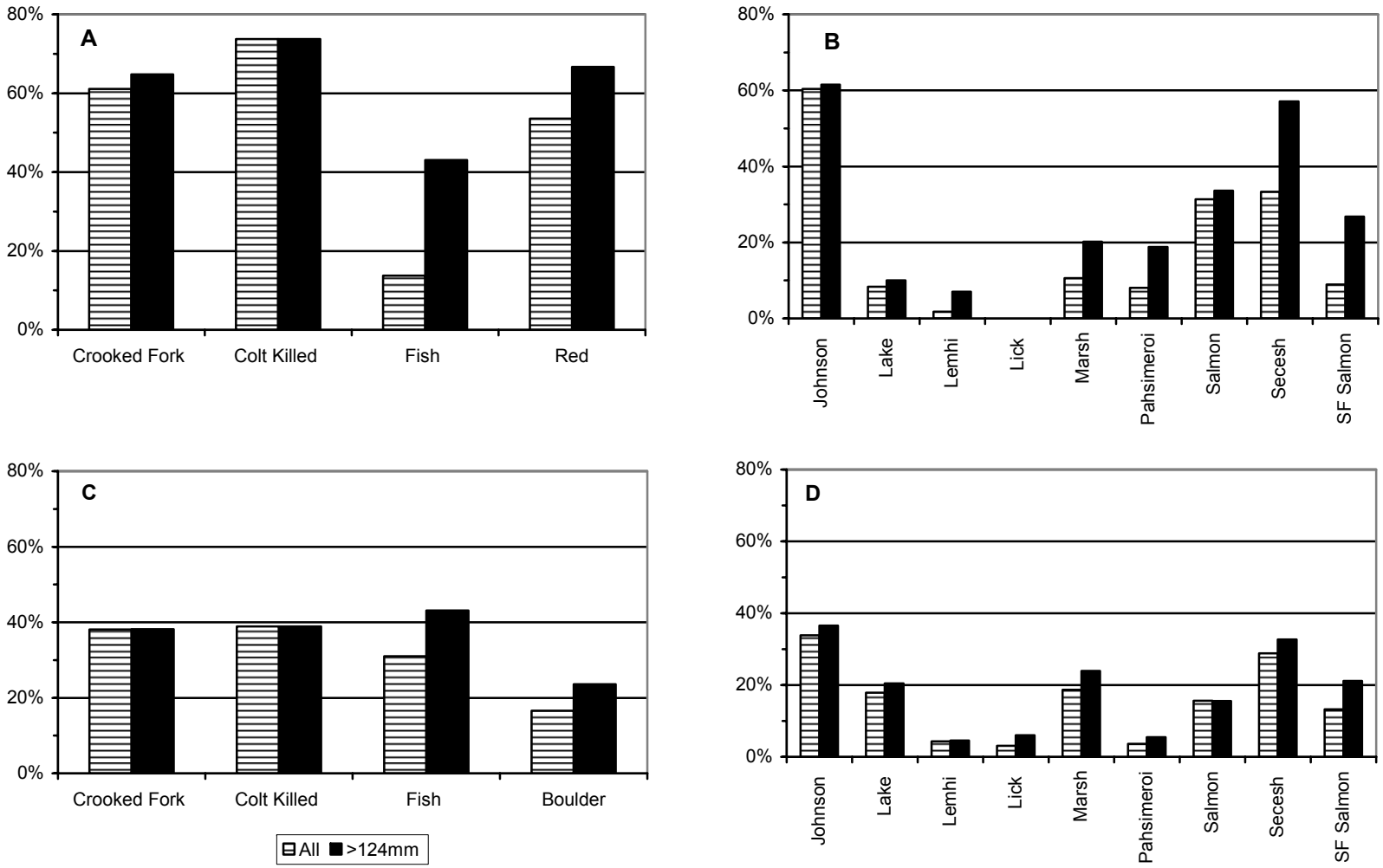


Figure 25. The percentage of all PIT-tagged steelhead and steelhead >124 mm detected as smolts at the downriver dams. Steelhead were tagged in the spring 2004 (Period 1) in the Clearwater drainage (A) and Salmon drainage (B) and during the fall 2003 (Period 2) in the Clearwater drainage (C) and the Salmon drainage (D).

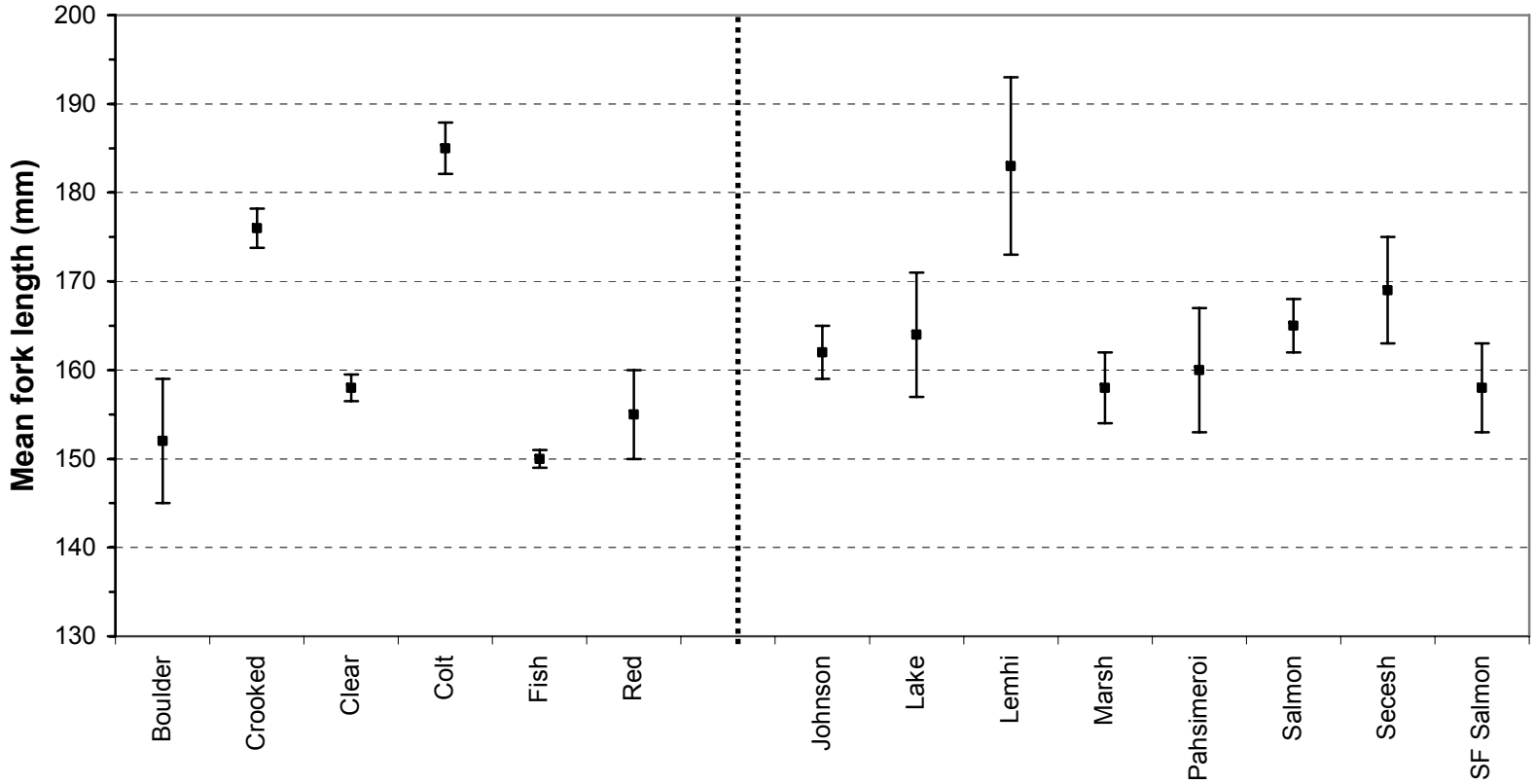


Figure 26. The mean length and 95% CI, at the time of PIT tagging, of smolts that were detected at dams on the Snake and Columbia rivers in 2004. All fish were tagged between August 15, 2003 and May 31, 2004. Streams in the Clearwater drainage are to the left of the dashed line, and streams in the Salmon drainage are to the right of the dashed line.

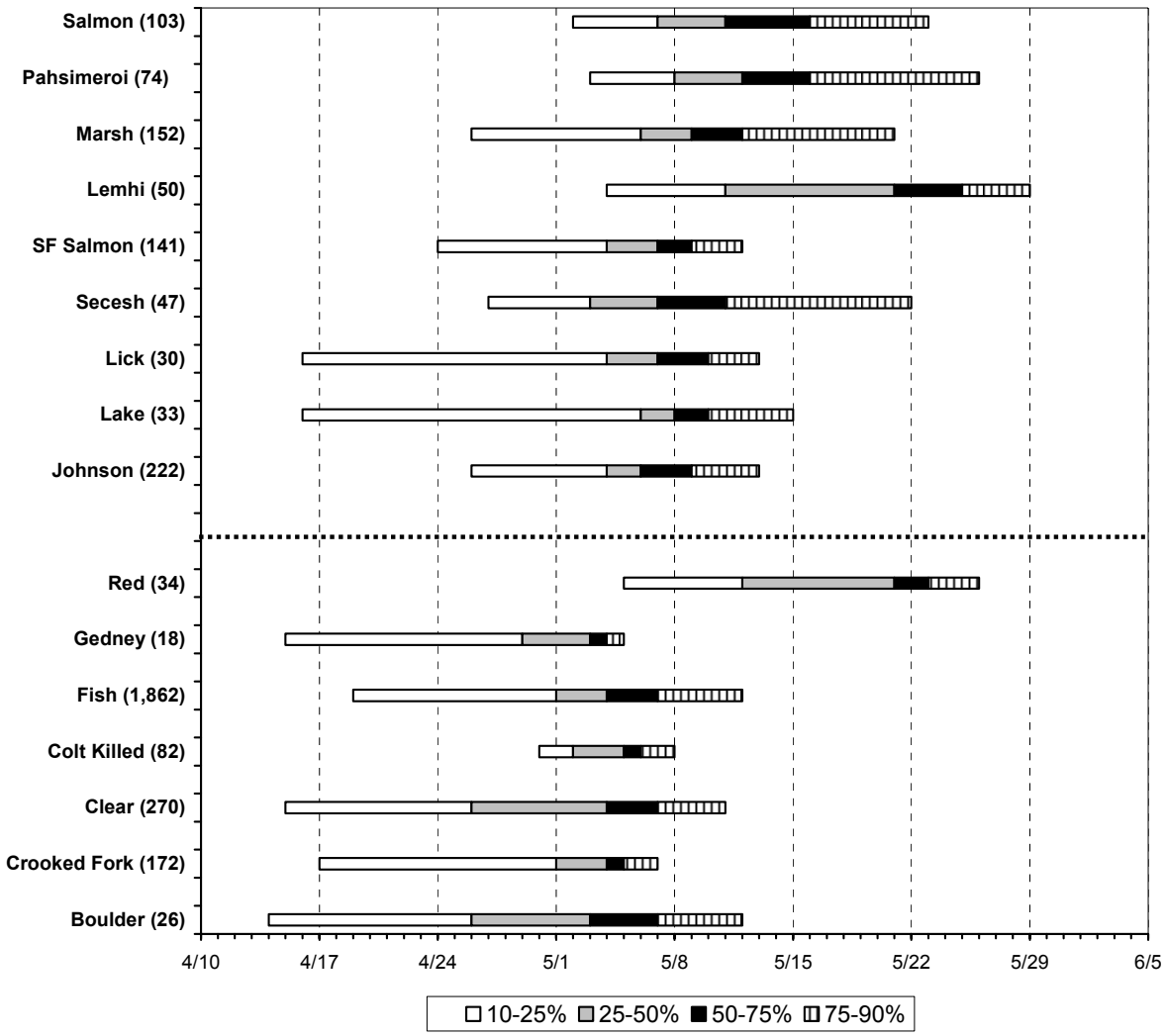


Figure 27. The date that 10%, 25%, 50%, 75%, and 90% of the total number of steelhead smolt detections at Lower Granite Dam in 2004 was attained from tributaries of the Clearwater River (below dashed line) and Salmon River (above dashed line). The left edge of each block is the date that the lower quantile of the block was reached. The number of detections from each site is in parenthesis.

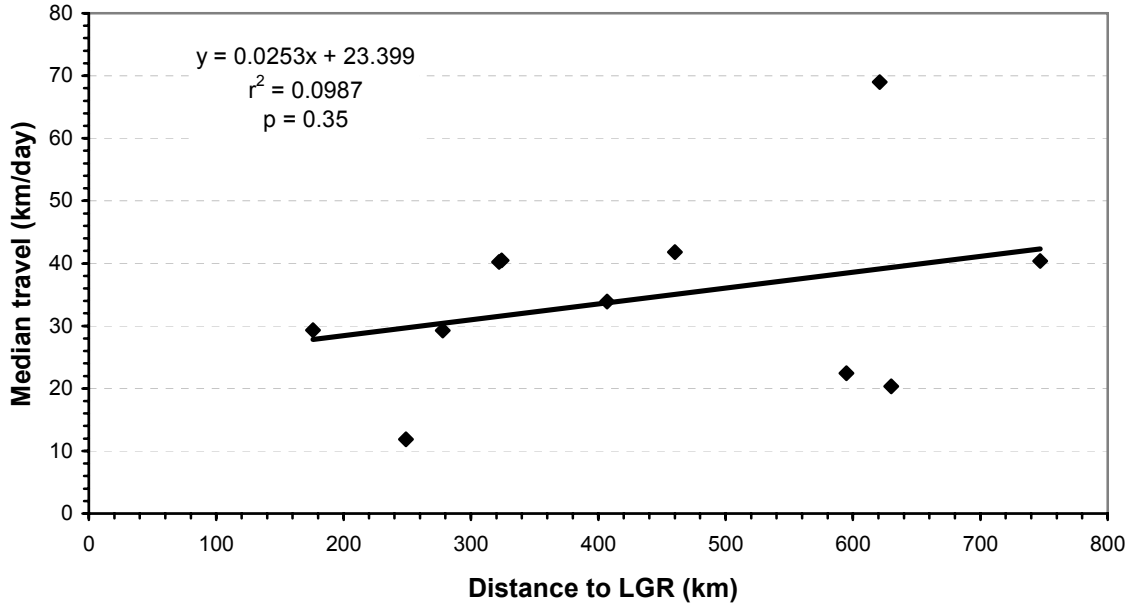


Figure 28. The relationship between median smolt travel time from tag site to Lower Granite Dam (LGR) and the distance to LGR in 2004.

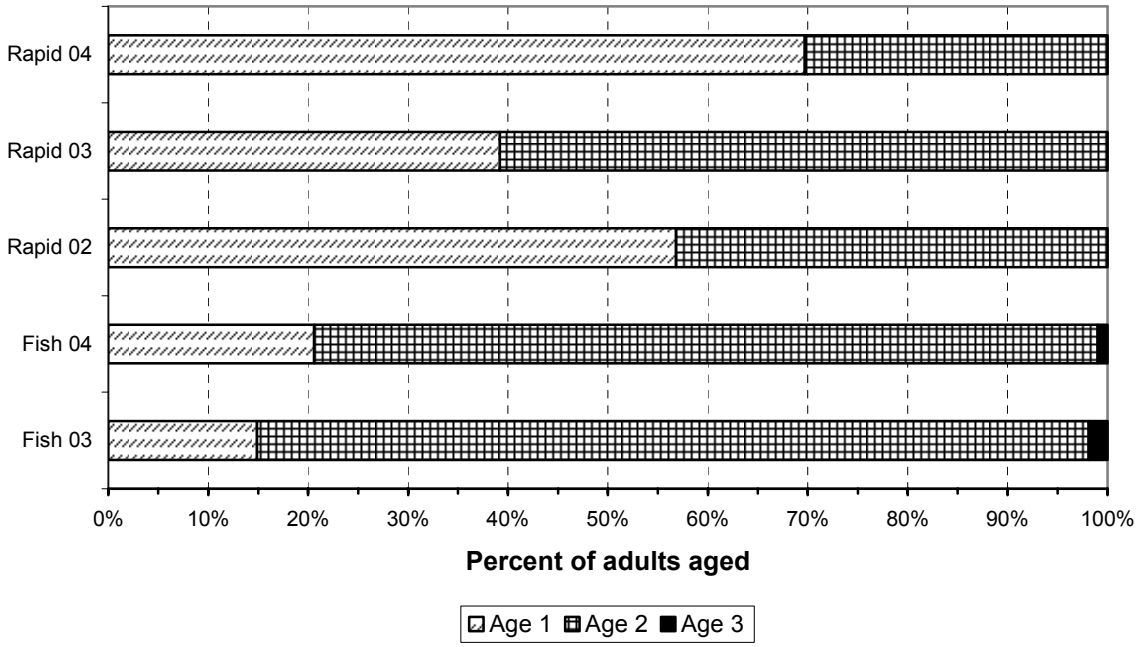


Figure 29. The percentage of adult steelhead that spent one year (Age-1), two years (Age-2), and three years (Age-3) in the ocean before returning to Rapid River in 2002, 2003, and 2004 or Fish Creek in 2003 and 2004.

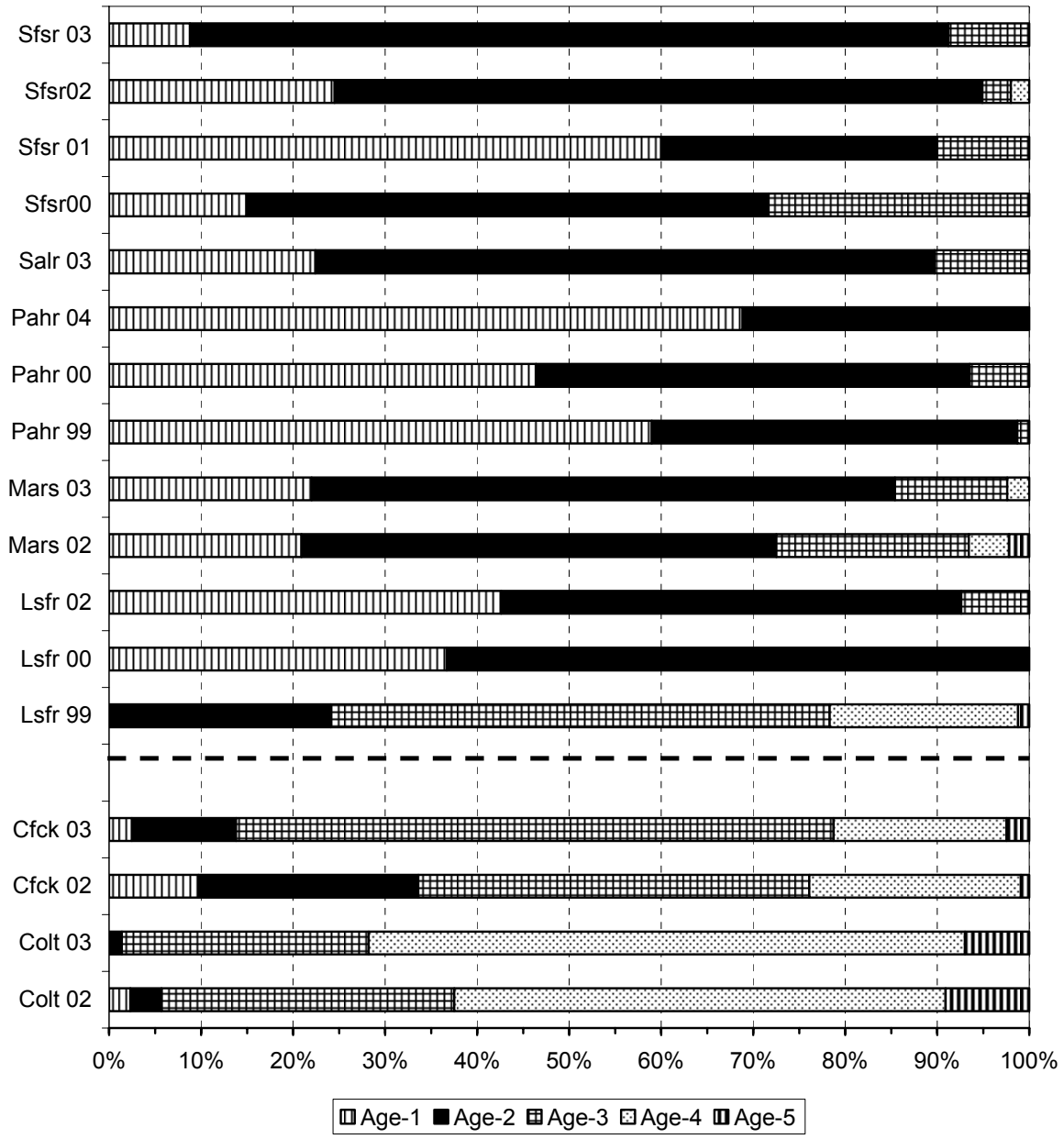


Figure 30. The percent of juvenile steelhead in each age class from an analysis of scales that were collected during the spring (March 1 to June 15). The streams below the dashed line are in the Clearwater River drainage, and the remaining streams are in the Salmon River drainage. The number next to the stream code on the y-axis is the year scales were collected. Colt = Colt Killed Creek, Cfck = Crooked Fork Creek, Lsfr = Lower SF Salmon River, Mars = Marsh Creek, Pahr = Pahsimeroi River, Salr = Salmon River (Sawtooth), Sfsr = SF Salmon River.

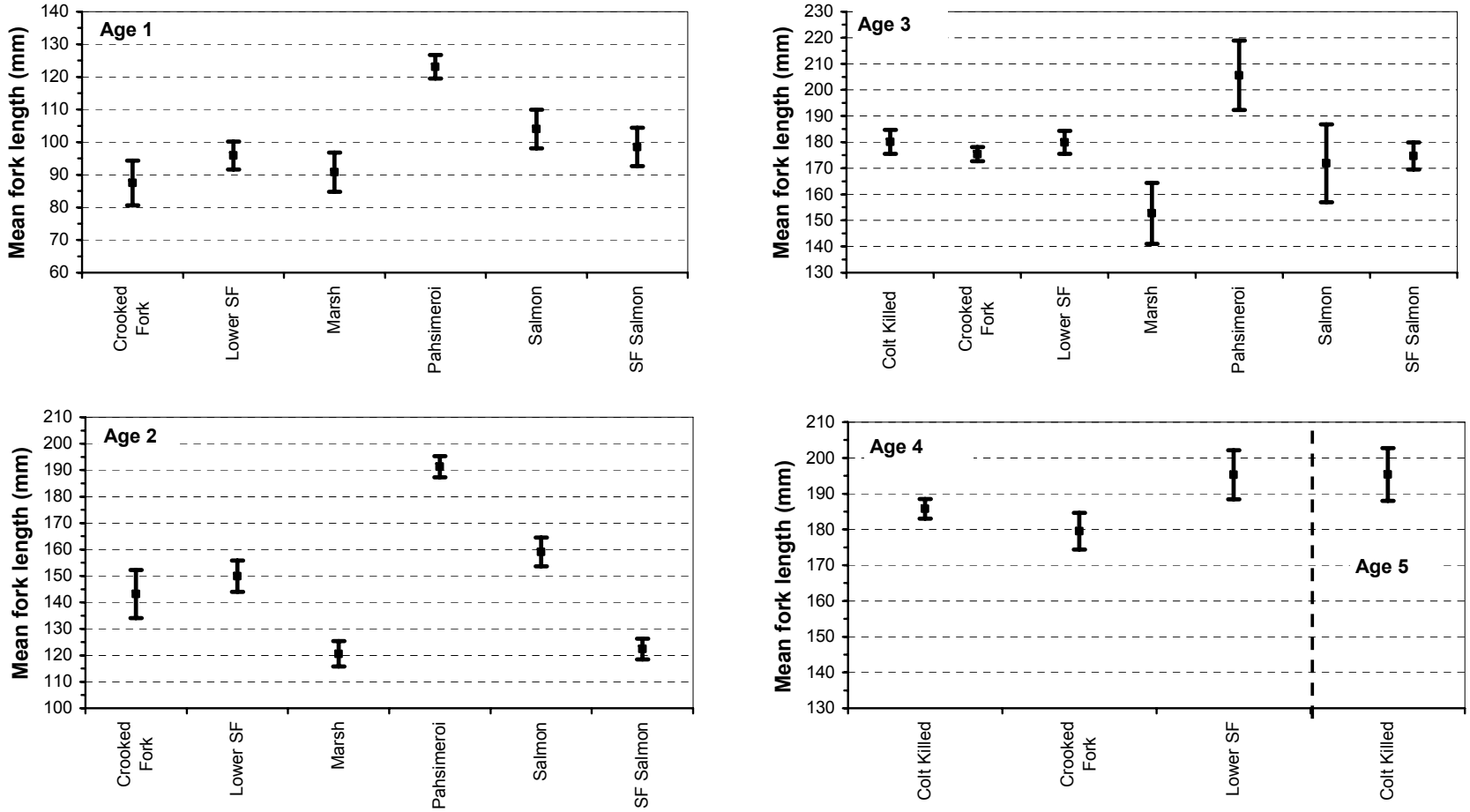


Figure 31. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the spring (March 1 to June 15). The data for all years that were aged in 2004 were combined for this analysis.

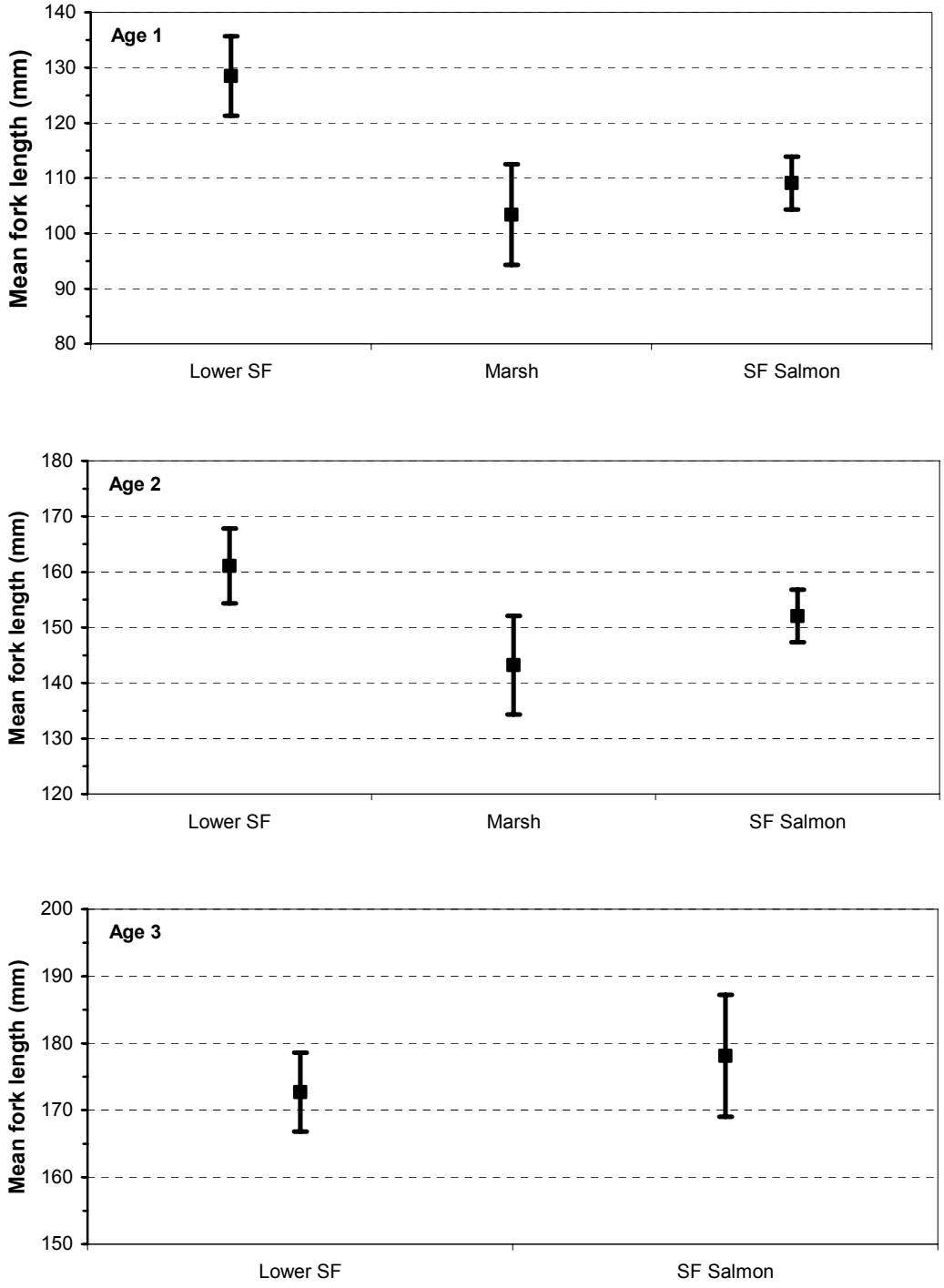


Figure 32. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the summer (June 15 to August 14). The data for all years aged in 2004 were combined for this analysis.

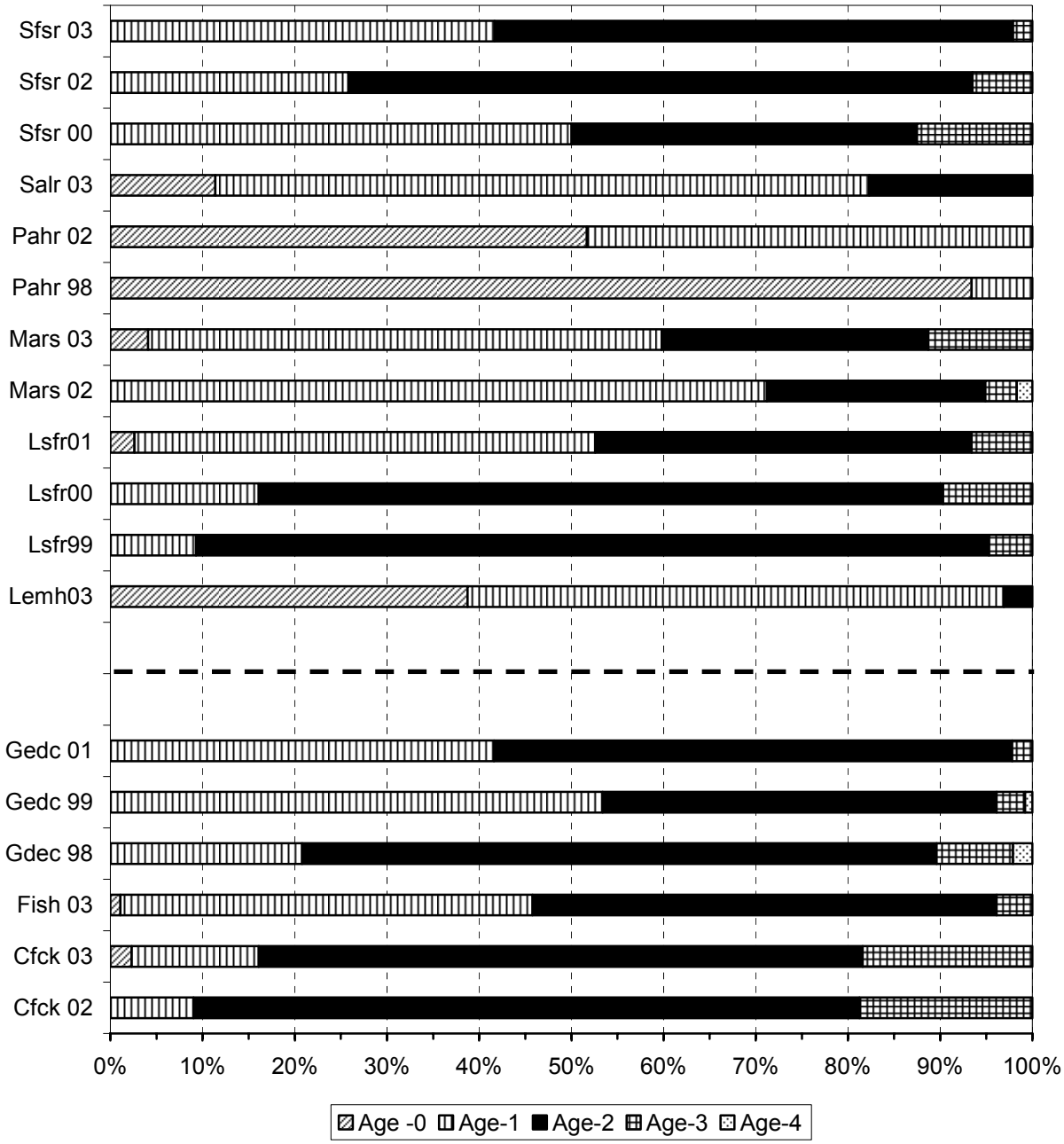


Figure 33. The proportion of juvenile steelhead in each age class from scales collected during the fall (collected after August 14). The streams below the dashed line are in the Clearwater River drainage, and the remaining streams are in the Salmon River drainage. The number next to the stream code on the y-axis is the year scales were collected. Cfck = Crooked Fork Creek, Fish = Fish Creek, Gedc = Gedney Creek, Lemh = Lemhi River, Lsfr = Lower SF Salmon River, Mars = Marsh Creek, Pahr = Pahsimeroi River, Salr = Salmon River (Sawtooth), Sfsr = SF Salmon River.

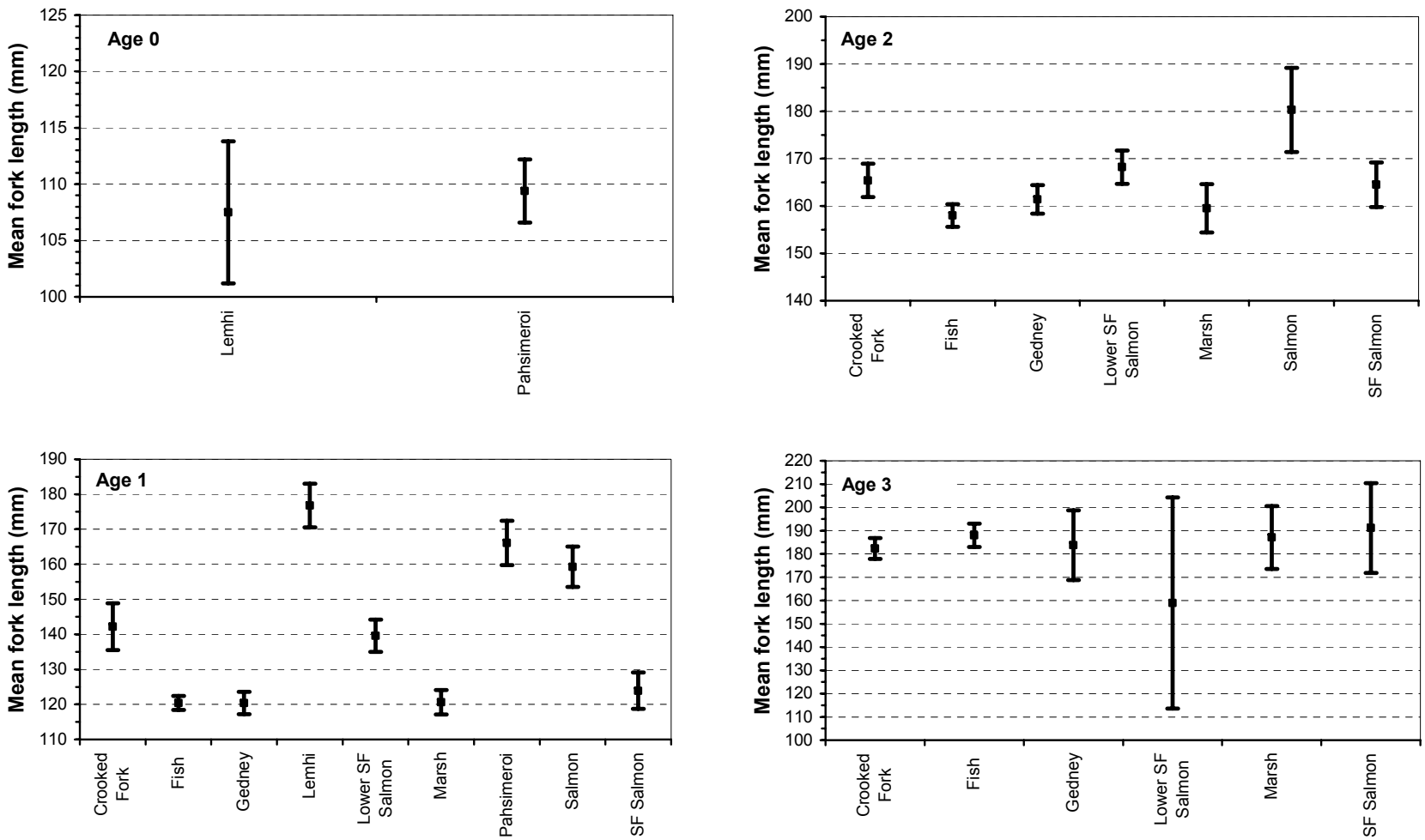


Figure 34. The mean length and 95% CI of juvenile steelhead, by age class, sampled during the fall (August 15 to December 15). The data for all years aged in 2004 were combined for this analysis. The Fish Creek data includes juveniles collected in fall of 2002 that were aged in 2003.

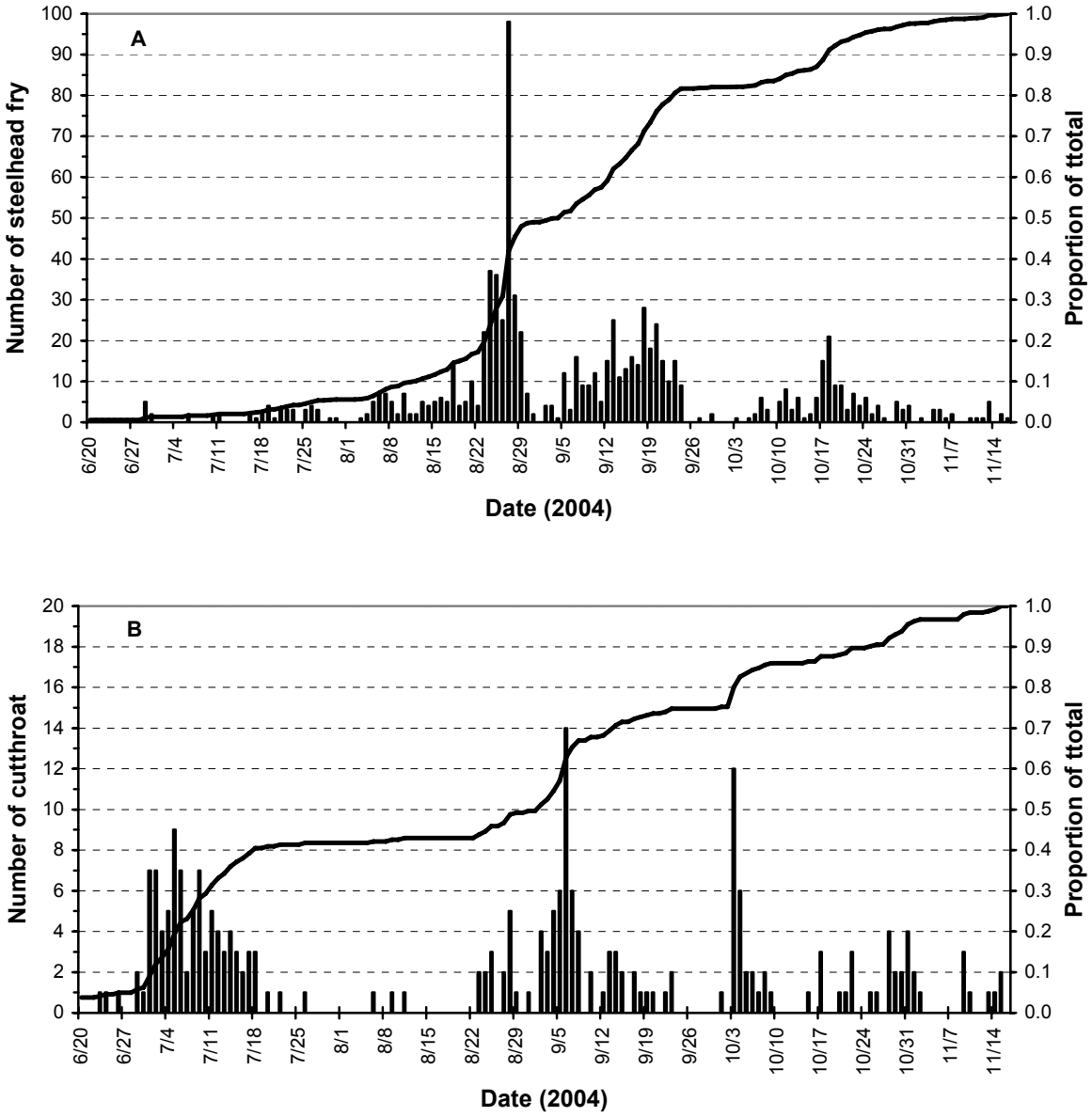


Figure 35. The number of steelhead fry (A) and cutthroat trout (B) that were caught in the Fish Creek screw trap from June 20, 2004 to November 16, 2004. The solid line is the cumulative proportion of the total that had been captured on each date. Before June 20, five steelhead fry and nine cutthroat trout were caught in the trap.

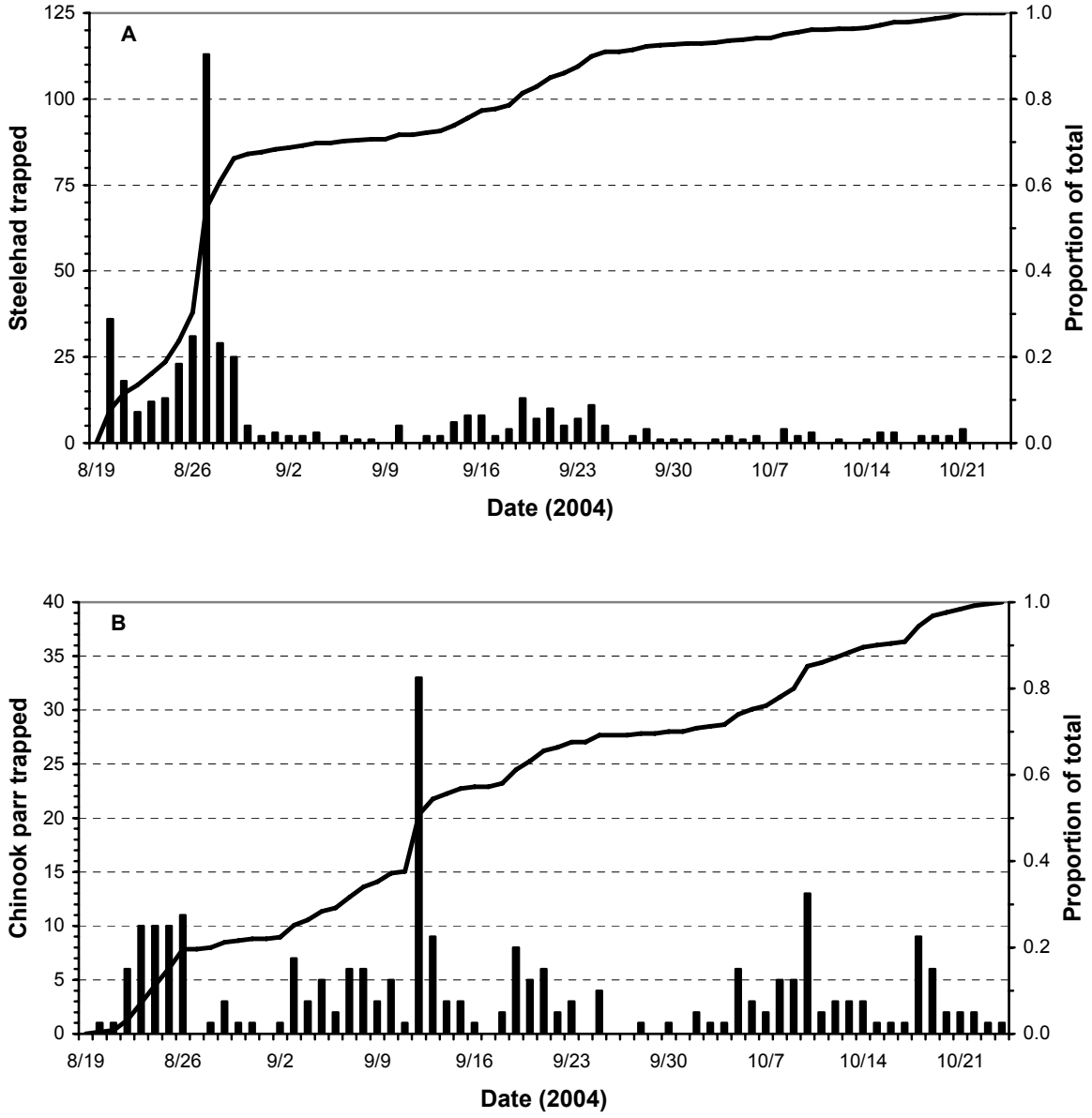


Figure 36. The number of steelhead (A) and the number of Chinook salmon parr (B) trapped at the Lick Creek screw trap from August 19, 2004 to October 24, 2004. The solid line is the cumulative proportion of the total that had been captured on each date.

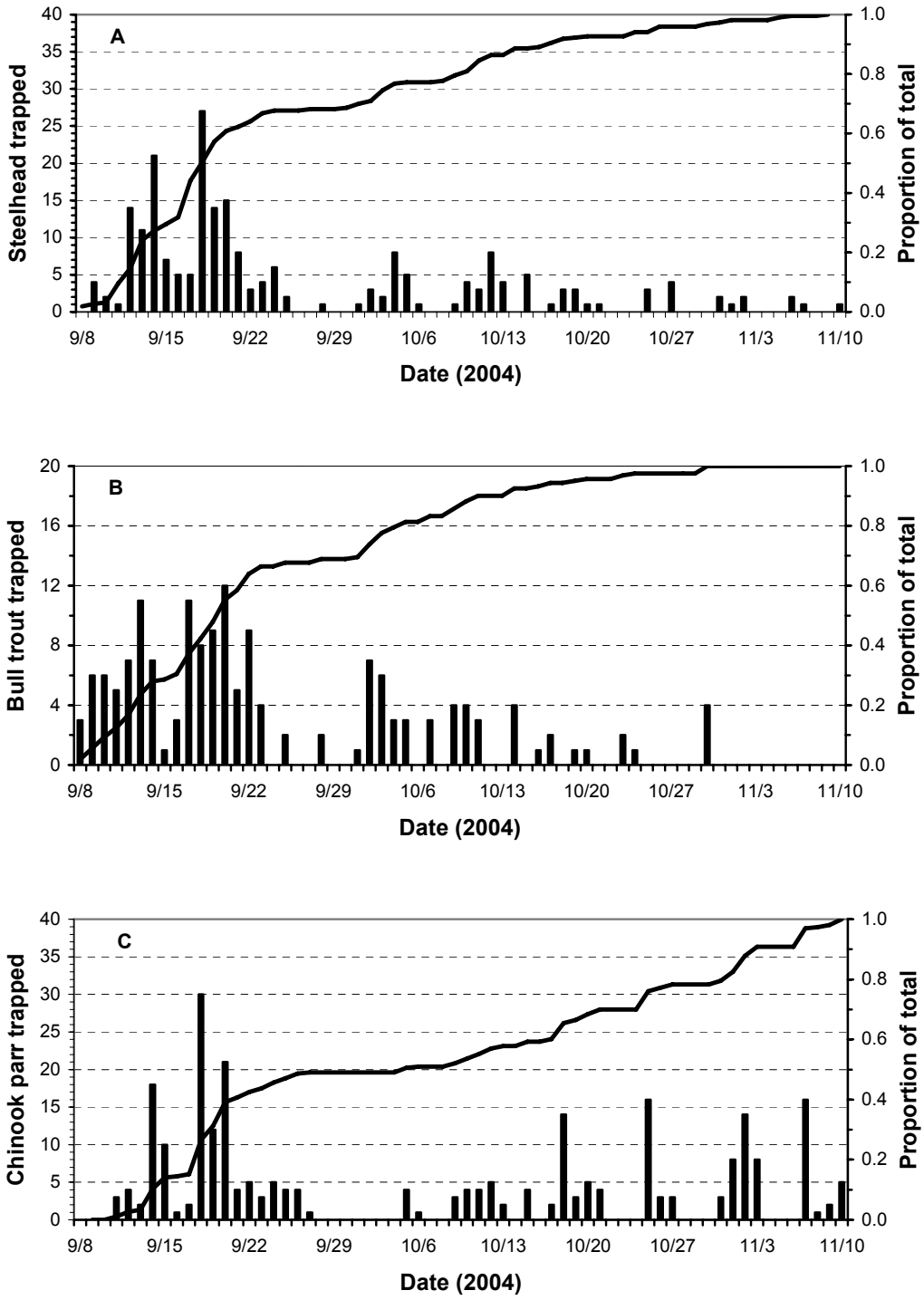


Figure 37. The number of steelhead (A), Bull trout (B), and Chinook salmon parr (C) caught in the Rapid River screw trap from September 8 to November 10, 2004. The solid line is the cumulative proportion of the total captured on each date.

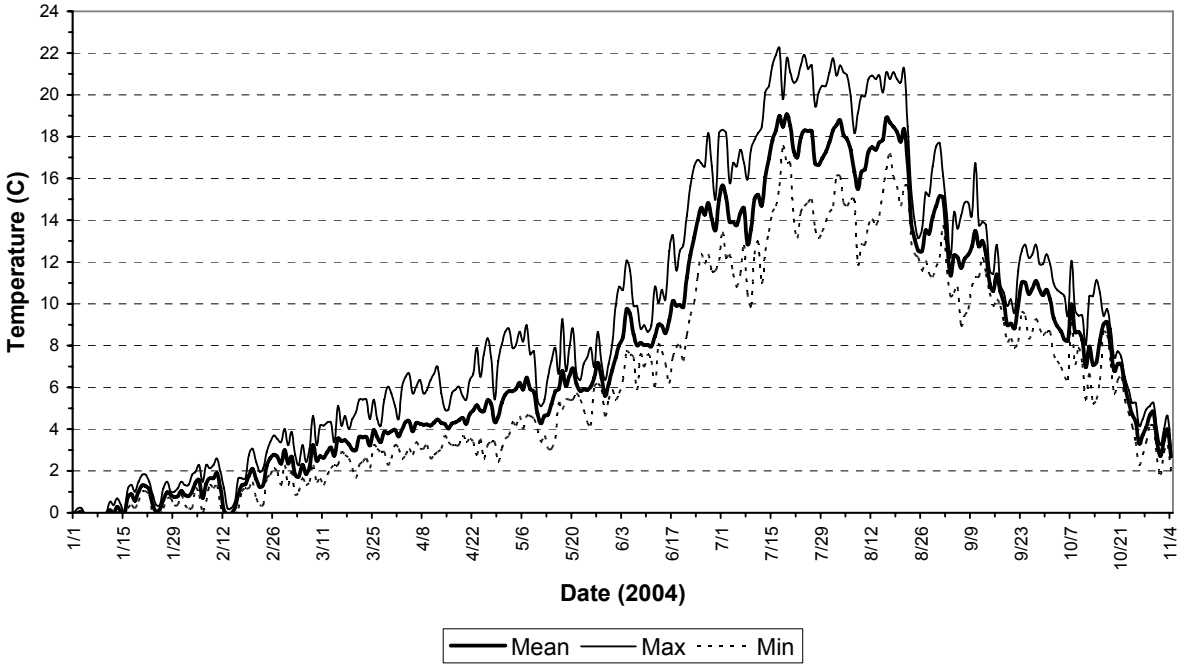


Figure 38. The daily mean, maximum, and minimum stream temperature (°C) recorded in Fish Creek at the screw trap location.

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APPENDICES

Appendix 1. The boundaries of the streams in the Clearwater River drainage snorkeled in 2004. In streams with more than one stratum, the downstream boundary of stratum 2 begins at the upstream boundary of the previous stratum.

		Stratum boundary	
Stream	**Stratum**	**Downstream**	**Upstream**
Fish Creek	1	mouth	Hungery Creek
	2	—	Frenchman Creek
Hungery Creek	1	mouth	Doubt Creek
Gedney Creek	1	mouth	West Fork Gedney Creek
	2	—	Canteen Creek
West Fork Gedney Creek	1	mouth	Waterfall about 2 km upstream (anadromous barrier)
South Fork Red River	1	mouth	Trapper Creek
	2	—	West Fork South Fork Red River
Canyon Creek	1	mouth	Upstream about 4 km
Crooked Fork Creek	1	mouth	Brushy Fork Creek
Deadman Creek	1	mouth	WF Deadman Creek
Weir Creek	1	mouth	Upstream about 3 km
Post Office Creek	1	mouth	about 2 km upstream of West Fork Post Office Creek
Lake Creek	1	mouth	Upstream about 4 km
Boulder Creek	1	mouth	Huckleberry Creek
Bald Mountain Creek	1	mouth	Upstream about 4 km
Pete King Creek	1	mouth	Placer Creek bridge
O'Hara Creek	1	mouth	Stillman Creek
	2	Stillman Creek	Saddle Creek
Stanley Creek	1	mouth	Gold Meadow Creek

Appendix 2. The boundaries of the streams in the Salmon River drainage snorkeled in 2004. In streams with more than one stratum, the downstream boundary of stratum 2 begins at the upstream boundary of the previous stratum.

		Strata boundary	
Stream	**Stratum**	**Downstream**	**Upstream**
Basin Creek	1	mouth	East Fork Basin Creek
	2	—	about 2 km upstream of East Fork Basin Creek
Beaver Creek[a]	1	mouth	Irrigation pump about 0.5 km upstream of Highway 75
	2	—	Jeep trail crossing about 3 km upstream of irrigation pump
	3		Upstream about 5 km
Frenchman Creek	1	mouth	start of the second meadow about 4 km upstream
Buckhorn Creek	1	mouth	Upstream about 4 km at 3rd trail bridge crossing
Dollar Creek	1	mouth	Upstream about 5 km
Fitsum Creek	1	mouth	About 5 km upstream at first RB tributary upstream of WF Fitsum Creek
EF SF Salmon River	1	mouth	Johnson Creek (not snorkeled in 2004)
	2	—	Sugar Creek
Lick Creek	1	mouth	0.5 km downstream of Steep Creek
Profile Creek	1	mouth	Upstream about 2 km
Sugar Creek	1	mouth	Upstream about 2 km
Tamarack Creek	1	mouth	Upstream about 2 km

[a] We did not snorkel Beaver Creek stratum 1, because it was dewatered.

Appendix 3. Dates the IDFG, U.S. Fish and Wildlife Service (USFWS), and Nez Perce Tribe (NPT) screw traps were installed, removed, and unable to fish during 2004.

Trap site	Date	Comments
Crooked Fork Creek	3/18	Trap installed
	4/15; 4/28-29; 5/2-5/12	not operated due to high flow
	5/28-6/1	not operated due to high flow
	11/8	Trap removed
Colt Killed Creek	3/18	Trap installed
	4/9; 4/15; 5/2-5/12; 5/28-6/1	not operated due to high flow
	11/8	Trap removed
Fish Creek	3/10	Trap installed
	4/28; 5/5-5/7; 5/26-6/2	not operated due to high flow
	11/16	trap removed
Lick Creek	8/19	Trap installed
	10/24	Trap removed
Marsh Creek	3/17	Trap installed
	3/20; 3/29; 10/31-11/3	not operated due to ice
	11/3	trap removed
Pahsimeroi River	2/26	Trap installed
	4/12 - 4/25	Not operated—hatchery release
	4/26 – 5/3	Fished nights only—hatchery releases
	12/1	Trap removed
Rapid River	9/8	Trap installed
	11/10	Trap removed
Salmon River at Sawtooth	3/17	Trap installed
	11/3	Trap removed
SF Salmon River at Knox Bridge	3/3	Trap installed
	5/5-6/1; 6/5-6/8;7/20	not operated due to high flow
	10/25	Trap removed
Lemhi River	3/8	Trap installed
	6/23 to 9/21	Steelhead were not tagged during this period
	12/13	Trap removed
Red River	3/24	Trap installed
	4/9; 4/10; 4/17-4/29	not operated-hatchery Chinook release
	6/29; 6/30; 7/1-7/6; 7/25	trap not operated
	9/5-9/8; 9/22; 10/4-10/6	trap not operated
	10/24	Trap removed
Clear Creek (USFWS)	3/13	Trap installed
	6/12	Trap removed
Johnson Creek (NPT)	2/24 to 11/27	Dates of operation
Lake Creek (NPT)	3/22	Trap installed
	5/25, 5/30, 6/9, 6/30	not operated due to high flow
	11/5	Trap removed
Secesh River (NPT)	3/31	Trap installed
	5/29 (half day); 6/9	not operated due to high flow
	11/5	Trap removed

Appendix 4. The proportion of juvenile steelhead in each age class based on the scale analysis done in 2004 from streams in the Salmon River drainage. The spring period includes scales collected between March 1 and June 15, and the summer period is from June 16 to August 14. Fall scales were collected after August 14 of each year.

			Proportion of Age class					
Stream	**Year**	**Number**	**Age-0**	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**
Spring collection								
Lower SF Salmon	1999	83	0	0	0.241	0.542	0.205	0.012
Lower SF Salmon	2000	30	0	0.367	0.633	0	0	0
Lower SF Salmon	2002	54	0	0.426	0.500	0.074	0	0
Marsh Creek	2002	92	0	0.207	0.511	0.207	0.043	0.022
Marsh Creek	2003	41	0	0.220	0.634	0.122	0.024	0
Pahsimeroi River	1999	151	0	0.589	0.397	0.013	0	0
Pahsimeroi River	2000	138	0	0.464	0.471	0.065	0	0
Pahsimeroi River	2004	148	0	0.676	0.304	0.002	0	0
Salmon River	2003	116	0	0.224	0.672	0.103	0	0
SF Salmon River	2000	45	0	0.156	0.593	0.296	0	0
SF Salmon River	2001	30	0	0.600	0.300	0.100	0	0
SF Salmon River	2002	98	0	0.245	0.704	0.031	0.02	0
SF Salmon River	2003	68	0	0.088	0.824	0.088	0	0
Summer collection								
Lower SF Salmon	2002	23	0	0.609	0.391	0	0	0
Marsh Creek	2003	38	0	0.400	0.543	0.057	0	0
SF Salmon River	2000	27	0	0.111	0.593	0.296	0	0
SF Salmon River	2002	63	0	0.683	0.302	0.016	0	0
SF Salmon River	2003	64	0	0.359	0.625	0.016	0	0
Fall collection								
Lemhi River	2003	125	0.387	0.581	0.031	0	0	0
Lower SF Salmon	1999	43	0	0.093	0.86	0.047	0	0
Lower SF Salmon	2000	31	0	0.161	0.742	0.097	0	0
Lower SF Salmon	2001	76	0.026	0.5	0.408	0.066	0	0
Marsh Creek	2002	59	0	0.712	0.237	0.034	0.017	0
Marsh Creek	2003	97	0.041	0.557	0.289	0.113	0	0
Pahsimeroi River	1998	91	0.934	0.066	0	0	0	0
Pahsimeroi River	2002	120	0.517	0.483	0	0	0	0
Salmon River	2003	79	0.114	0.709	0.177	0	0	0
SF Salmon River	2000	24	0	0.5	0.375	0.125	0	0
SF Salmon River	2002	31	0	0.258	0.677	0.065	0	0
SF Salmon River	2003	48	0	0.417	0.563	0.021	0	0

Appendix 5. The proportion of juvenile steelhead in each age class based on the scale analysis done in 2004 from streams in the Clearwater River drainage. The spring period includes scales collected between March 1 and June 15, and the fall scales were collected after August 14 of each year. We did not age any fish that were sampled during the summer period from the Clearwater River drainage.

			Proportion of Age class					
Stream	**Year**	**Number**	**Age-0**	**Age-1**	**Age-2**	**Age-3**	**Age-4**	**Age-5**
Spring collection								
Colt Killed Creek	2002	88	0	0.023	0.034	0.318	0.534	0.091
Colt Killed Creek	2003	71	0	0	0.014	0.268	0.648	0.070
Crooked Fork Creek	2002	113	0	0.097	0.239	0.425	0.230	0.009
Crooked Fork Creek	2003	80	0	0.025	0.113	0.65	0.188	0.025
Fall collection								
Crooked Fork Creek	2002	75	0	0.09	0.72	0.187	0	0
Crooked Fork Creek	2003	87	0.023	0.138	0.655	0.184	0	0
Fish Creek	2003	356	0.011	0.447	0.503	0.039	0	0
Gedney Creek	1998	49	0	0.208	0.688	0.083	0.021	0
Gedney Creek	1999	131	0	0.534	0.427	0.031	0.008	0
Gedney Creek	2001	89	0	0.416	0.562	0.022	0	0

Appendix 6. The mean length (mm) and 95% CI (in parenthesis) of juvenile steelhead aged in 2004. Numbers in italics indicate that the sample size for that age class was <5 fish and the 95% CI was not reported. The spring period includes scales collected between March 1 and June 15 of each year, summer period is from June 16 to August 14, and the fall collection period was after August 14 of each year.

		Mean length (mm) of age class					
Stream	**Year**	**0**	**1**	**2**	**3**	**4**	**5**
Spring collection							
Colt Killed Creek	2002		*81*	*166*	184 (7)	189 (4)	199 (12)
Colt Killed Creek	2003			*101*	174 (6)	182 (3)	189 (9)
Crooked Fork Creek	2002		87 (8)	140 (9)	176 (4)	179 (7)	*186*
Crooked Fork Creek	2003		*92*	154 (24)	175 (4)	181 (9)	*178*
Lower SF Salmon River	1999			155 (6)	182 (4)	195 (7)	*252*
Lower SF Salmon River	2000		136 (13)	162 (7)			
Lower SF Salmon River	2002		96 (4)	147 (9)	*159*		
Marsh Creek	2002		91 (8)	121 (6)	148 (14)	*210*	*186*
Marsh Creek	2003		90 (11)	120 (9)	173 (13)	*181*	
Pahsimeroi River	1999		127 (6)	204 (7)	*231*		
Pahsimeroi River	2000		126 (9)	191 (8)	203 (16)		
Pahsimeroi River	2004		118 (5)	174 (7)	*196*		
Salmon River	2003		104 (6)	159 (5)	172 (15)		
SF Salmon River	2000			153 (20)	179 (5)	*188*	
SF Salmon River	2001		125 (7)	148 (12)	*173*		
SF Salmon River	2002		101 (7)	126 (5)	*137*	*194*	
SF Salmon River	2003		90 (9)	114 (5)	171 (20)		
Summer collection							
Lower SF Salmon	2002		123 (8)	159 (19)			
Marsh Creek	2003		103 (10)	141 (10)	*175*		
SF Salmon River	2000		*133*	157 (9)	176 (10)		
SF Salmon River	2002		112 (6)	152 (9)	*199*		
SF Salmon River	2003		101 (7)	150 (7)	*175*		
Fall collection							
Crooked Fork Creek	2002		138 (21)	168 (4)	180 (6)		
Crooked Fork Creek	2003	*82*	145 (4)	163 (6)	184 (7)		
Fish Creek	2003	*98*	120 (2)	157 (2)	184 (4)		
Gedney Creek	1998		121 (11)	162 (7)	*169*	*190*	
Gedney Creek	1999		121 (5)	159 (6)	*189*	*214*	
Gedney Creek	2001		119 (4)	163 (5)	*195*		
Lemhi River	2003	108 (6)	177 (6)	*203*			
Lower SF Salmon	1999		*145*	167 (10)	*158*		
Lower SF Salmon	2000		129 (39)	162 (8)	*197*		
Lower SF Salmon	2001	*101*	146 (7)	170 (7)	190 (38)		
Marsh Creek	2002		121(5)	150 (4)	*198*	*208*	
Marsh Creek	2003	*93*	120 (5)	164 (7)	185 (16)		
Pahsimeroi River	1998	112 (3)	160 (39)				
Pahsimeroi River	2002		106 (4)	167 (7)			
Salmon River	2003	92 (7)	159 (6)	180 (9)			
SF Salmon River	2000		126 (7)	159 (13)	*195*		
SF Salmon River	2002		147 (8)	175 (8)	*228*		
SF Salmon River	2003		113 (10)	164 (7)	*162*		

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