FISHERY RESEARCH

STEELHEAD SUPPLEMENTATION IN IDAHO RIVERS

SUMMARY REPORT
January 1, 1993 – December 31, 1999

Prepared by:

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IDFG Report Number 00-
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Steelhead Supplementation in Idaho Rivers

Summary Report for 1993 through 1999

To evaluate the feasibility of using artificial production to increase natural steelhead populations and to collect baseline life history, genetic, and disease data from natural steelhead populations.

By

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Addendum: Correction to Table 24

In the original report, I included 304 steelhead that were captured fly-fishing in White Sands Creek in the screw trap data summary for 1999 (Table 24). The White Sands Creek Summer period and Year totals, in Table 24, include fish caught fly-fishing and at the screw trap. The corrected 1999 steelhead statistics for fish captured in the White Sands Creek screw trap are:

Table 24. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1999. The standard deviation is in parentheses.

	Collection Dates		Number	Fork Length		Weight		
Release Site	Start	End	Tagged	Number	Mean	Number	Mean	Condition Factor
Spring screw traps								
Crooked Fork Creek	03/11/99	05/21/99	150	150	179 (18)	50	52.4 (14.6)	0.92260 (0.06359)
Clear Creek[a]	04/02/99	05/31/99	234	234	163 (14)	0	—	—
Fish Creek	03/16/99	05/21/99	28	28	164 (24)	28	43.5 (15.5)	0.94271 (0.06825)
White Sands Creek	03/14/99	05/22/99	292	292	188 (15)	132	60.5 (13.5)	0.87922 (0.05176)
Red River	04/07/99	05/08/99	22	22	170 (12)	22	47.9 (10.4)	0.96102 (0.14244)
Johnson Creek			62	62	175 (35)	60	56.3 (28.1)	0.94016 (0.08655)
Lower SF Salmon River	03/11/99	05/21/99	114	114	178 (21)	109	57.2 (23.4)	0.98444 (0.14376)
Marsh Creek	03/19/99	05/31/99	6	6	193 (21)	6	72.1 (19.1)	0.98922 (0.09691)
Pahsimeroi River	03/17/99	05/31/99	634	634	172 (26)	634	54.2 (22.9)	1.00679 (0.06830)
SF Salmon River	03/14/99	05/22/99	3	3	189 (39)	3	79.8 (45.6)	1.03872 (0.03379)
Summer screw traps								
Crooked Fork Creek	06/28/99	08/31/99	137	137	142 (35)	117	39.8 (31.1)	1.09425 (0.08477)
Fish Creek	06/09/99	08/31/99	847	847	144 (21)	831	33.8 (15.3)	1.07725 (0.06861)
White Sands Creek	07/01/99	08/31/99	16	16	154 (27)	15	49.0 (29.3)	1.13095 (0.11407)
Red River	06/01/99	08/31/99	63	63	76 (23)	63	6.4 (8.3)	1.09998 (0.12997)
Johnson Creek	07/01/99	08/31/99	323	323	139 (38)	323	34.1 (27.5)	1.06436 (0.09187)
Lower SF Salmon River	07/16/99	08/31/99	166	166	145 (31)	122	33.6 (18.6)	1.09043 (0.09777)
Marsh Creek	06/01/99	08/31/99	64	64	133 (29)	63	37.0 (24.5)	1.40043 (0.38497)
Pahsimeroi River	06/01/99	08/31/99	131	131	168 (39)	129	57.8 (29.7)	1.09848 (0.09256)
SF Salmon River	07/01/99	08/31/99	172	172	128 (29)	156	26.9 (15.2)	1.17461 (0.11896)
Fall screw traps								
Crooked Fork Creek	09/01/99	11/10/99	139	138	170 (19)	87	51.8 (17.1)	0.99324 (0.07031)
Fish Creek	09/01/99	11/08/99	6,925	6,924	150 (21)	4,868	37.0 (15.8)	1.01096 (0.05351)
White Sands Creek	09/01/99	11/10/99	18	18	185 (16)	17	63.0 (15.4)	0.96978 (0.07203)
Red River	09/02/99	11/01/99	29	29	126 (47)	28	27.3 (25.9)	0.99366 (0.12437)
Johnson Creek			128	128	161 (30)	128	45.7 (25.0)	0.99342 (0.07295)
Lower SF Salmon River	09/01/99	11/18/99	130	130	172 (19)	114	53.6 (15.9)	1.03661 (0.06376)
Marsh Creek	09/06/99	11/03/99	25	25	156 (23)	25	56.8 (31.1)	1.37240 (0.25778)
Pahsimeroi River	09/01/99	11/30/99	227	227	161 (43)	226	53.3 (37.3)	1.06493 (0.10015)
SF Salmon River	09/01/99	10/16/99	46	46	154 (24)	36	38.2 (16.6)	1.07660 (0.08382)
Year Totals								
Crooked Fork Creek			426	425	163 (29)	254	46.4 (25.0)	1.02587 (0.10206)
Clear Creek			234	234	169 (14)	0	—	—
Fish Creek			7,800	7,799	148 (21)	5,727	36.6 (15.8)	1.02024 (0.06094)
White Sands Creek			326	326	187 (17)	164	59.7 (16.2)	0.91163 (0.09737)
Red River			114	114	106 (47)	113	19.7 (22.2)	1.04658 (0.14460)
Johnson Creek[b]			513	513	148 (38)	511	39.6 (28.1)	1.03201 (0.09784)
Lower SF Salmon River			410	410	162 (29)	345	47.7 (22.1)	1.03916 (0.11459)
Marsh Creek			95	95	143 (31)	94	44.5 (28.5)	1.36673 (0.35702)
Pahsimeroi River			992	992	168 (32)	989	54.5 (27.8)	1.03204 (0.08736)
SF Salmon River			221	221	134 (30)	195	29.8 (18.1)	1.15442 (0.11952)

[a] Operated by USFWS. Nine fish were tagged in June.

[b] Operated by Nez Perce Tribe

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ABSTRACT

The Steelhead Supplementation Study has conducted field experiments since 1993 that assess the ability of hatchery stocks to reestablish natural populations. We have stocked hatchery adult steelhead *Oncorhynchus mykiss* trapped at Sawtooth Fish Hatchery in Beaver Creek yearly and Frenchman creeks when enough fish were available. We stocked Dworshak Hatchery stock fingerlings in the South Fork Red River from 1993 to 1996 and smolts in Red River from 1996 to 1999. Although results from all experiments are not complete, preliminary findings indicate that these hatchery stocks will not reestablish natural steelhead populations.

We focused most of our effort on monitoring and evaluating wild steelhead stocks. We operated a temporary weir to estimate the wild steelhead escapement in Fish Creek, a tributary of the Lochsa River. We snorkeled streams to monitor juvenile steelhead abundance, captured and tagged steelhead with Passive Integrated Transponder (PIT) tags, and recorded stream temperatures in the Clearwater and Salmon River drainages. We operated screw traps in five to ten streams each year. We have documented growth rates in Fish and Gedney creeks, age of parr in Fish Creek, Gedney Creek, Lick Creek, and Rapid River, and documented parr and smolt migration characteristics.

This report summarizes our effort during the years 1993 to 1999.

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INTRODUCTION

The goal of supplementation, an increase in natural production without negative impacts on the natural target and nontarget populations, is a departure from previous fish hatchery management practices. The major supplementation question that needs to be resolved is whether it is possible to integrate artificial and natural production without an unacceptable risk to natural populations. The Steelhead Supplementation Study (SSS) was designed to assess the effects of supplementation on wild fish stocks. A detailed experimental design for this project was submitted to Bonneville Power Administration in 1992, and fieldwork began in 1993 (Byrne, 1994). We have focused our effort on three of the seven objectives that were outlined in the experimental design

Objective 1: Assess the performance of hatchery and wild brood sources to reestablish steelhead in streams where expirated.

The original plan was to assess the performance of a hatchery stock with a wild stock with a paired watershed study in tributaries of the upper Salmon River. This approach was not done because wild steelhead abundance declined, and Idaho Department of Fish and Game (IDFG) decided that "mining" wild stocks for this experiment was not appropriate. Wild steelhead were subsequently listed under the Endangered Species Act (ESA) in 1997. We have been assessing the performance of the Sawtooth Hatchery stock in Beaver and Frenchman creeks with adult outplants.

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

This objective was done in the Red River drainage, a tributary of the South Fork (SF) Clearwater River with Dworshak hatchery stock. Fingerlings were stocked yearly in the SF Red River from 1993 to 1996. Smolts were stocked in Red River in the spring from 1996 to 1999. Adult returns from these stockings are expected to continue until 2003.

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

We have focused most of our effort on this objective. We have been monitoring juvenile steelhead abundance using annual summer snorkel surveys, trapping and Passive Integrated Transponder (PIT) tagging wild steelhead, stream habitat surveys, stream temperature monitoring, and escapement estimation of wild fish.

METHODS

Objective 1

Collecting and Outplanting Adult Steelhead

Idaho Department of Fish and Game intended to assess a wild stock with the Sawtooth hatchery stock using a paired watershed approach (Byrne 1994). We attempted to capture wild adults from the Salmon River in the spring 1993 but were unable to collect enough to stock. Since then, IDFG decided not to mine wild fish for this experiment because of the low numbers of returning adults and the listing of steelhead as an endangered species under ESA in 1997. Idaho Department of Fish and Game personnel stocked hatchery adult steelhead that returned to Sawtooth Fish Hatchery in Beaver and Frenchman creeks to evaluate the reproductive success and long-term fitness of the stock for supplementation, following the procedures outlined by Byrne (1994, 1996, 1997, and 1998). We have outplanted adult hatchery steelhead in Beaver Creek each spring since 1993. Frenchman Creek was stocked with adults in 1993, 1994, 1997, and 1999. We installed a temporary picket weir at the upstream and downstream boundaries of a stream section about 1 km in length before stocking the adults. Hatchery adults that were outplanted were randomly sorted from fish that returned to the Sawtooth Fish Hatchery during the last week of April and early May. The adults were sexed and their fork length was measured to the nearest cm. The adults were trucked to the creeks, placed in large Coleman coolers filled with water, transported to the study site with snowmobiles, and distributed throughout the 1 km study site. Personnel monitored the spawning and counted redds from 1993 to 1996 only. The weirs were removed after all the fish had spawned.

I used regression analysis to develop a relation between fork length and fecundity of hatchery females spawned at Sawtooth Fish Hatchery in years 1993 to 1996. The fork length of the female was measured to the nearest cm. The eggs from each female were incubated in individual egg trays and enumerated with an egg counter.

Evaluation of Spawner Success

I used the weighted age-1 juvenile steelhead density abundance (fish/100 m^2) in strata 2 of Beaver Creek (Figure 1) and strata 1 of Frenchman Creek (Figure 2) and as an index of reproductive success. I assumed that all age-1 steelhead in Beaver and Frenchman creeks were the progeny of the previous years' hatchery adult outplants. I did an ANOVA to test for differences in the yearly weighted age-1 density. If a significant year effect was found in Beaver Creek, I did a Dunnett's test using 1993 as the control to find the years that the density was significantly higher after outplanting began. If a significant year effect was found in Frenchman Creek, I did a Tukey's multiple comparison test to determine which years had significantly different age-1 densities. I also contrasted the Frenchman Creek age-1 density in years that followed an adult outplant (1994, 1995, and 1999) with the age-1 density in the years where there was no adult outplant the previous spring (1993, 1996, and 1997). I compared age-2+ densities among years in Beaver Creek, but not in Frenchman Creek because it was not stocked in 1995, 1996, and 1998. If a significant year effect was found for age-2+ parr in Beaver Creek, I contrasted age-2+ densities in 1993 and 1994 with age-2+ densities from 1995 to 1999.

I estimated the age-1 population in each stream and then estimated the number of smolts that could be produced from the age-1 population of each brood year assuming a 50% yearly mortality rate. I made two smolt estimates, first assuming all parr become smolts after three summers in freshwater (age-2+) and assuming all parr become smolts after four summers in freshwater (age-3+). I estimated the mean number of smolts per female produced in Beaver Creek for fish that spawned in years 1994 to 1998 and in Frenchman Creek for adults spawning in 1993, 1997, and 1998 and then projected what smolt-to-adult survival would be needed to achieve replacement for the spawners.

Snorkel Procedures for Fish Densities and Population Totals

Each snorkel site consists of a single distinct habitat type (pool, pocket water, riffle, or run) and was chosen randomly throughout the stream. The number of snorkel sites of each habitat type was allocated proportional to the type's abundance in the stream strata. Depending on stream size, one to five snorkelers counted fish in each site. Each snorkel site was separated by at least one distinct habitat type change from a prior site. Snorkelers estimated the size of all fish except chinook salmon *O. tshawytscha* parr, dace *Rhinichthys sp.,* and sculpin *Cottus sp.* to the nearest inch. After the site was snorkeled, we measured the length and three to six widths of the site to calculate surface area.

Chinook salmon parr and steelhead parr were aged based on observed size. Chinook salmon parr were counted and classified as age-0 (<100 mm) or age-1 ($\geq$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 cutthroat trout *O. clarki* fry, we classified both as trout fry. We did not partition 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 strata were calculated for trout fry, the two age classes of steelhead and chinook salmon, resident trout, and mountain whitefish.

I calculated a weighted mean density (w_t) for each class of fish in each stream strata as:

$$W_t = \sum p_{it} d_{it} \qquad (1)$$

where p_{it} = proportion of habitat *i* in stream strata *t*,
d_{it} = mean density of fish in habitat *i* in stream strata *t*,
i = pool, riffle, run, pocket water, and
t = stream strata.

I estimated the age-1 and age-2+ steelhead population and confidence intervals in Beaver and Frenchman creeks using the stratified sampling estimates of Scheaffer et al. (1986):

$$N_s = \sum_{i=1}^{4} A_i \bar{d}_i \qquad (2)$$

where N_s = population total for strata *s*,
A_{it} = total surface area, in strata *t*, of habitat type *i*,
d_{it} = mean steelhead density, in strata *t*, of habitat *i*, and
i = pool, riffle, run, pocket water.

The total surface area (A_{it}) of each habitat type in stream strata t was calculated as:

$$A_i = L_s p_i w_i \quad (3)$$

where L_t = length of stream strata *t*,
p_{it} = proportion of habitat *i* in stream strata *t*, and
w_{it} = mean width of habitat *i* in strata *t*.

An approximate 95% confidence interval (CI_s) on the population estimates in the stream strata was calculated as:

$$CI_s = 2\sqrt{\sum_{i=1}^{h} A_i^2 \left(\frac{A_i - a_i}{A_i}\right)\left(\frac{s_i^2}{n_i}\right)} \quad (4)$$

where A_i = total surface area of habitat *i*,
s^2_i = the sample variance of mean steelhead density in habitat *i*,
a_i = total surface area of habitat *i* snorkeled in the strata,
n_i = number of habitat *i* sites snorkeled in the strata, and
i = pool, run, pocket water, or riffle habitat.

I treated A_i and a_i as constants when calculating the CI and assumed that the variance was due to differences of densities in each snorkel site, not area measurements. The estimated total abundance of each age class for the entire stream was found by summing the estimates of all strata.

Objective 2

This objective was designed to assess the juvenile production of returning adults that were stocked as fingerlings or smolts. We wanted to determine what life-stage of release would be best for supplementation by comparing the juvenile production of returning adults using age-1 parr abundance as the evaluation point. We choose to do this as a case history study with hatchery fish in habitat that was nearly vacant of natural steelhead in the Red River drainage upstream of the IDFG Red River satellite hatchery facility.

Fingerling Stocking

Idaho Department of Fish and Game personnel released about 50,000 steelhead fingerlings yearly from 1993 to 1996 in the South Fork Red River between Trapper Creek and the USFS 1194 road bridge. The fingerlings were stocked during the first week of September each year except 1994. A columnaris outbreak occurred in August 1994, and stocking was delayed until October 27, 1994 so fish could be treated. All fish were Dworshak Hatchery stock reared at the Clearwater Fish Hatchery. An IDFG marking crew PIT tagged about 5,000 fish and coded wire-tagged (CWT) the remaining 45,000 fish prior to release in all years except 1993. In 1993, we PIT tagged 5,000 fingerlings and used a left ventral fin clip on the remaining 45,000 fish. To prevent angler harvest on returning adults, the adipose fin was not clipped. All PIT-tagged fish were measured for fork length to the nearest 1 mm, and a random sample of at

least 300 fish were individually weighed to the nearest 0.1 gram. The condition factor (K) of the weighed steelhead was calculated as:

$$K = \frac{W(100{,}000)}{L^3} \quad (5)$$

where W = weight in grams and
L = fork length in mm.

Idaho Fish and Game crews snorkeled the South Fork Red River each year since 1993 in late June or early July (Figure 3). I calculated the weighted mean density of age-1 and age-2+ steelhead in strata 1 and 2, and did an ANOVA to test whether age-1 and age-2+ densities differed among the years. If a significant difference was found, I did a Dunnett's test using 1993 as the control to test if densities increased after the fingerling stocking began.

Smolt Stocking

Hatchery steelhead smolts were released each spring from 1996 to 1999 in Red River upstream of the South Fork Red River near the Soda Creek bridge (Figure 3). The smolts were Dworshak Hatchery stock reared at Clearwater Fish Hatchery. Idaho Department of Fish and Game personnel PIT tagged all hatchery smolts before release except the 1996 release. In 1996 about 4,000 of the 8,000 smolts were PIT tagged and the adipose fin of all smolts was clipped. All smolts that were released in 1997, 1998, and 1999 were PIT tagged and did not receive an adipose fin clip. The lag between the fingerling and smolt stockings was planned so that most of the steelhead released as fingerlings would migrate to the ocean as smolts during the years that hatchery smolts were released.

Smolt and Adult Detection

I queried the Pacific States Marine Fisheries Commission's Columbia River Basin PIT Tag Information System (PTAGIS) database on May 15, 2000 for all PIT-tagged fingerlings and smolts released for this experiment that were detected as smolts at the Snake River, McNary, John Day, and Bonneville dams since March 1, 1994. I then determined the percentage of fingerlings detected to estimate the total number of smolts that migrated to the ocean from the yearly fingerling releases. I queried the PTAGIS database on May 15, 2000 to obtain all adult detections at Lower Granite Dam from the fingerling and smolt releases.

IDFG personnel operated the weir at the Red River satellite facility each spring from 1997 to 1999 to trap any returning steelhead. Adults were scanned for a CWT and PIT tag and were inspected for fin clips to determine if the fish was released as a fingerling or smolt for this study. Most of the adults from the hatchery releases should return to spawn during the years 2000 to 2003.

Objective 3

Adult Steelhead Weir in Fish Creek

Idaho Department of Fish and Game personnel have installed and operated a temporary weir in Fish Creek about 1 km upstream of its mouth each spring since 1995. The weir was operated by the National Biological Survey (now Biological Resources Division, U.S. Geological Survey) from 1992 to 1994 as part of a BPA-funded study of stock performance impacts of hatchery supplementation. We installed the weir before March 15 each year. Adults enter a holding box that is checked throughout the day. When adult steelhead were present, we removed them with a net and placed them in a 100 gallon plastic water trough. We determined the sex, measured fork length to the nearest cm, collected scales, and used a paper punch to mark the right opercule prior to release upstream of the weir. We did not anesthetize the fish. Kelts were collected and checked for a right opercule punch, sexed, and measured for length. If the kelt was alive, we punched the left opercule and passed it downstream of the weir. The weir was removed in late June after the spring runoff subsided. Each morning we recorded the stream conductivity, TDS, pH, and the river level at the U.S. Forest Service (USFS) gauge located near the mouth of Fish Creek.

Habitat Survey

Idaho Department of Fish and Game personnel have walked streams we snorkel and classified the predominant stream habitat every 10 m into pool, run, riffle, and pocket water (Shepard 1983). Based on the survey, I divided streams into strata that reflect gradient, habitat, or stream order differences.

Juvenile Fish Densities

Steelhead supplementation crews have snorkeled streams yearly since 1993 in the Clearwater River and Salmon River drainages. Our snorkeling is done to: (1) evaluate the success of hatchery outplants done for Objective 1 and 2 experiments in Beaver Creek, Frenchman Creek, and the South Fork Red River and (2) to monitor steelhead densities in wild production streams. We use the same snorkel procedures that were outlined in the Objective 1 Methods section on wild production streams we monitor.

PIT Tagging

This project operates a screw trap in Fish Creek and coordinates steelhead tagging at screw traps used in the chinook supplementation study. From 1993 to 1995 screw traps were fished in the spring from early March to mid-June and fall from mid-August to ice-up in November. In 1996, we began fishing most screw traps continuously from early March until ice-up in November. However, in most years there was a period of high flow during the spring when we are unable to fish the screw traps. 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. We tagged steelhead >80 mm and measured fork length to the nearest mm and weight to the nearest 0.1 g. In addition to the screw traps, we PIT tagged wild steelhead that crews collected by fly-fishing in streams during the summer.

At screw traps where we tagged steelhead from 1993 to 1995, I calculated the mean length, weight, and condition factor for the spring and fall trapping periods. At those traps where we tagged steelhead from 1996 to 1999, I calculated the mean length, weight, and condition factor 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 calculated the mean length, weight, and condition factor of steelhead collected in stream by fly-fishing.

The PIT-tagged fish captured in screw traps in Crooked Fork Creek, Fish Creek, Red River, Pahsimeroi River, Marsh Creek, Rapid River, and South Fork Salmon River at Knox bridge were grouped into 5 mm length classes (class 70 = fish 70-74 mm, class 75 = fish 75-79 mm, etc.), and the length frequency of each was plotted for each year and with all years' data combined. I did an ANOVA to test for differences in length among sites using the combined data. If a significant difference was found, I did a Tukey's HSD multiple comparison test. I determined the date that 10%, 25%, 50%, 75%, and 90% fish was captured and tagged at each trap and plotted the yearly date quantiles for each site.

Juvenile Steelhead Migration Estimate in Fish Creek

We released PIT-tagged steelhead about 600 m upstream of the screw trap and recorded the number of recaptures at the trap daily. On the days when we tagged more than 50 steelhead, we released 50 to 60 fish upstream of the trap and the remainder downstream of the trap. Based on flow and time of year, I portioned the trapping season into periods and determined the number of steelhead trapped, fish released upstream (marks), and recaptured fish. I used a maximum likelihood estimator (Wu and Steinhorst 2000) to estimate the number of migrants and a 95% CI that left the stream during each period and throughout the entire trapping season.

Growth

The growth rate of individual juvenile steelhead was calculated from fish we PIT tagged in Fish and Gedney creeks that were recaptured. I put the recaptured fish into three groups: (1) fish that were tagged and recaptured the same year, (2) fish that were recaptured after spending one winter in the stream; and (3) fish that were recaptured after spending two or more winters in the stream. I dropped the fish from the analysis if it was recaptured $\leq$30 days after tagging. I calculated the growth rate (G) of a fish as:

$$G = \frac{L_2 - L_1}{D} \qquad (6)$$

where L_1 = length at first capture,
L_2 = length at second capture and,
D = number of days between the two captures.

I calculated the mean growth rate for each group in streams with $\geq$20 recaptures. I did a regression analysis on each group to determine the relation between growth rate and (1) length at first capture and (2) date of first capture.

Smolt Detections

I obtained the date and dam of detection, date of tagging, and the length and weight at tagging of all steelhead smolts that were detected at Lower Granite, Little Goose, Lower Monumental, McNary, and John Day dams from Crooked Fork Creek, Clear Creek, Fish Creek, Lower SF Salmon River, Marsh Creek, Pahsimeroi River, Red River, Rapid River, SF Salmon River at Knox bridge, and White Sands Creek from the PTAGIS database on February 3, 2000. I calculated the mean length at the time of tagging of smolts detected from each stream from MY1994 to MY1999. For the smolt length calculations, I only included fish that were tagged and detected the same spring and fish that were tagged the previous fall from September 1 to the end of tagging. I did an ANOVA on smolt length and used Tukey's HSD multiple comparison to compare all stream pairwise smolt lengths.

For each stream, I determined the date that 10%, 25%, 50%, 75%, and 90% of the total number of smolt detections at Lower Granite Dam (LGR) was attained for MY1994 to MY1999. I determined the travel time from release site to LGR of all fish that were tagged the same spring it was detected. Travel time was calculated as the number of days from release at the screw trap to detection at LGR and as the number of kilometers traveled per day from release site to LGR.

Adult and Juvenile Steelhead Scale Samples

We collected scales from wild adult steelhead trapped in Clear Creek at Kooskia National Fish Hatchery, Rapid River, and Fish Creek and from juvenile steelhead from tributaries of the Clearwater and Salmon River drainages. We measured the fork length of each fish we collected scales from. Scales were taken from both sides of the fish 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. The scales were mounted in acetate and aged. The juvenile fish scales collected in 1996 from Fish Creek and scales collected in 1997 from Fish Creek, Rapid River, Lick Creek, and Gedney Creek were aged and the mean length of each age class was determined. I developed length at age distribution curves for each stream using the mean length and standard deviation of each age and assuming a normal distribution. The adult and juvenile scales we obtained from other streams and scales obtained from 1993 to 1995, 1998, and 1999 have been mounted in acetate for aging in the future.

Stream Temperature

I recorded stream temperature in tributaries throughout the Clearwater River and Salmon River drainages with HOBO™ temperature recorders. The water temperature was recorded every 0.5 h to 1.6 h from early spring until late October. The recorders were reset to measure stream temperature every 0.5 h to 3.2 h, depending on location and access, throughout the winter. The daily mean, maximum, and minimum temperatures were calculated for each stream.

RESULTS

Objective 1

We have stocked Beaver Creek each spring since 1993 and have put adults in Frenchman Creek in years when fish were available (Table 1). The temporary weirs that we used to keep the adults in the study section held in all years except 1993 in Beaver Creek. The 12 males and 10 females we stocked in Beaver Creek on April 23, 1993 swam around the downstream weir and escaped the study area (Byrne, 1996). We walked Beaver Creek from the study site to its mouth and counted one redd less than 100 meters downstream of the breached weir. The weir was repaired, and five more females were stocked on May 6, 1993. We walked the study streams every few days from 1993 to 1996 to count and flag redds. When conditions were good, we could observe fish spawning; however, redds were difficult to find and were often overlooked if we did not observe fish constructing them. Additionally, known redds that were flagged could have easily been overlooked several days after they were dug had they not been marked. Most of the females began digging redds within three days of stocking, and we rarely observed new digging more than five days after fish were outplanted. Adults that were stocked in May often began digging redds the same day we outplanted them. When the flow increased in mid-May, we were unable to count redds because of the higher flow and increased turbidity. We counted fewer redds than the number of females we stocked in Beaver Creek each year (Table 1). In 1994, otters moved into the study area of Frenchman Creek and killed at least seven females, five males, and one adult whose sex we could not determine. The presence of otters could explain why there were more redds counted than females stocked; however, six of the 12 redds were small and may not have contained eggs (Byrne 1997).

From 1993 to 1996, a subsample of the females spawned at Sawtooth Fish Hatchery had their eggs incubated in individual trays to estimate the relation between length and fecundity. When the data was analyzed yearly, the regression of fecundity on fork length was significant each year except 1994. The regression was also significant when data from all years was combined (Table 2 and Figure 4). Although the regressions were significant, except in 1994, the relation between fecundity and length was weak ($r^2 \leq 24$) in all years. Because of the weak relation between fecundity and length, I used the mean number of eggs per female to estimate the egg deposition in the creeks. During the 1993 to 1996 period, I used the yearly mean number of eggs per female. In the years 1997 to 1999, I used the mean number of eggs per female of the 1993 to 1996 combined dataset.

Since we began stocking Beaver Creek with adults in 1993, the juvenile age-1 steelhead densities have increased, and the age-2+ densities exceeded the 1993 and 1994 levels in three of the five years that data is available (Figure 5). There was a significant difference in age-1 density among the years in Beaver Creek (ANOVA, $F = 10.388$, $p = <0.001$, $df = 6$). Dunnett's test revealed that the age-1 density in all years except 1998 and 1999 exceeded the age-1 density of 1993. There was a significant difference in the age-2+ density among years (ANOVA, $F = 3.973$, $p = 0.001$, $df = 6$). The contrast of age-2+ mean densities in 1993 and 1994 with the mean densities observed from 1995 to 1999 was significant ($F = 4.739$, $p = 0.03$, $df = 1$), revealing that the age-2+ densities have increased since stocking began.

In Frenchman Creek there was a significant difference in age-1 densities among the years (ANOVA, $F = 8.582$, $p = \leq 0.001$, $df = 6$). Tukey's pairwise comparisons revealed that the age-1 density in 1993 was significantly different from those in 1996 and 1997; the 1994 density differed from 1996, 1997, and 1999; and the 1995 density differed from 1996, 1997, and 1999.

The contrast of age-1 densities in 1993, 1996, and 1997 with age-1 densities in 1994, 1995, and 1998 was significant (F = 22,71, p = <0.001, df = 1), revealing that age-1 density was higher in years that followed an adult outplant (Figure 6).

In the outplant strata of Beaver Creek, the estimated age-1 population ranged from 879 to 284 parr during the five-year period from 1994 to 1998. Assuming all age-1 parr would become smolts after an additional summer of rearing, the number of smolts per female spawner ranged from 6 to 31 and averaged 16 (Table 3). To achieve replacement using the average value of 16 smolts per female, a 12.5% smolt-to-adult return rate (SAR) is required. In Frenchman Creek, using the most optimistic assumptions, the average age-2+ smolt production per female was 10, which requires a 20% smolt-to-adult survival rate to achieve replacement.

Objective 2

We stocked the SF Red River with 50,000 hatchery fingerlings (approximately four to six months old) each fall from 1993 to 1996. The age-1 parr density increased after stocking began; however, the age-2+ parr densities remained nearly constant (Figure 7). There was a significant difference in age-1 density among years (ANOVA, F = 28.277, p = <0.001, df = 6). Using 1993 as the control, Dunnett's test revealed that the age-1 densities were significantly higher from 1994 to 1997. After fingerling stocking ended, the age-1 densities (in 1998 and 1999) were not significantly different from 1993. There was not a significant difference of age-2+ densities among the years (ANOVA, F = 1.458, p = 0.191, df = 6).

Less than 1% of the PIT-tagged fingerlings from each release year have been detected as smolts (Table 4). As of May 15, 2000, no adults were detected at Lower Granite Dam that were PIT tagged and released as fingerlings. We have not trapped any adults at the Red River weir that were released as fingerlings.

We stocked Red River, upstream of the South Fork Red River, with hatchery smolts each spring from 1996 to 1999. The lag between smolt and fingerling stocking was planned so most of the smolts of each group migrated to the ocean the same year(s). All smolts were PIT tagged except in 1996. In 1996, we stocked 8,000 smolts and PIT tagged 3,999. The smolt detection rates have varied from 28% to 42% for the four releases (Table 5). One adult from the 1996 smolt release was detected at Lower Granite Dam in the fall of 1998. There have been no other detections at LGR or adults trapped at the Red River weir that were released as smolts.

Objective 3

Adult Steelhead Weir in Fish Creek

The weir has been operated since 1992 and held during the entire spawning run in four of the eight years. In 1995, we opened the weir on May 2 because otters were killing adults as they passed the weir. In 1996, 1997, and 1999 the weir was breached by high flow and debris (Table 6). The number of adults counted yearly at Fish Creek ranged from 21 to 267 fish (Figure 8). During the eight seasons of trapping, 71% of the fish we handled were females. The average fork length of the females and males was 78 cm ($\pm$ <1 cm, n = 472) and 79 cm ($\pm$ 1 cm, n = 201). There was not a significant difference in length between males and females when data was combined for all years (t-test, t = 1.216, p = 0.224, df = 671). On a yearly basis, the mean length of males was larger than females except in 1992, 1996, and 1997 (Figure 9).

The length frequency of males is more skewed than females as the smallest and largest fish entering the stream tend to be male (Figure 10 and Appendices 1 and 2).

I calculated the adult run timing using the 1993, 1994, 1998, and 1999 data. I omitted 1992, because there were many openings in the weir and the majority of adults we handled that year were recovered as kelts. There was no significant difference in the median arrival date among years (Krustal-Wallis test statistic = 6.391, p = 0.094, df = 3). The median arrival date ranged from April 29 in 1994 to May 7 in 1999. Most adults (>60%) entered Fish Creek during the five-week period from April 17 to May 22 (Figure 11). The earliest date we have trapped an adult was March 21 and the latest was June 11.

We have complete kelt recovery data for 1992 and 1998; however, the 1992 data was based only on unmarked kelt recoveries (Figure 12). In the other six years, the weir was either breached or kelt data was not collected (Table 7). The median date of kelt recoveries was June 2, 1998 (Julian 153) and May 28, 1992 (Julian 149). There was not a significant difference between the median date between these years (Mann-Whitney U = 1262.5, p = 0.177, df = 1).

In 1998, we recovered 56 of the 75 adults we passed upstream of the weir. We recovered 85% of the males and 69% of the females that were passed upstream (Figure 13). A higher proportion of females (70%) than males (35%) were alive when recovered as kelts.

Habitat Survey

We completed habitat surveys in ten tributaries in the Clearwater River drainage and five tributaries of the Salmon River drainage. Pocket water was the most common habitat in the Clearwater River drainage (Table 8), whereas run and riffle habitat were the most prevalent in the Salmon River drainage (Table 9).

Juvenile Fish Densities

Crews snorkeled 11 streams in the Clearwater River drainage and nine streams in the Salmon River drainage (Table 10); however, not all streams were snorkeled each year. The age-1 and age-2+ steelhead parr densities were usually highest in pool and run habitat (Appendices 3 to 9). The weighted steelhead densities in the monitoring streams were highest in 1994 and have remained relatively constant since 1996 (Figures 14 and 15, Tables 11 to 17). The highest steelhead parr densities were observed in the West Fork Gedney Creek and have ranged from 27.76 fish/100 m^2 in 1994 to a low of 13.78 fish/100 m^2 in 1997.

PIT Tagging Juvenile Steelhead

From 1993 to 1999, we collected and PIT tagged 38,052 juvenile steelhead at five to ten screw traps that were fished in tributaries of the Clearwater and Salmon River drainages. The majority of steelhead (73%) were tagged in Clearwater River tributaries. We tagged 20,737 juvenile steelhead in Fish Creek, the most at any location. The screw traps in Crooked Fork Creek, Fish Creek, Red River, Marsh Creek, Pahsimeroi River, and the South Fork Salmon River at Knox bridge have been operated since 1993 and account for most of the steelhead tagged at screw traps (Tables 18 to 24). These six streams were the focus of the fish length and migration characteristics I analyzed.

When data was combined for all years, there was a significant difference in length among streams (ANOVA, $p < 0.001$, $df = 5$). There was not a significant difference between the length of fish from Crooked Fork Creek and Pahsimeroi River; however, all other pairwise comparisons were significant (Tukey HSD multiple comparison, $p < 0.001$). When the mean length is ranked, the largest fish were tagged in the Pahsimeroi River, followed by Crooked Fork Creek, Fish Creek, Red River, South Fork Salmon River, and Marsh Creek (Figure 16). Crooked Fork Creek and Pahsimeroi River ranked first or second each year except 1997, and Fish Creek ranked third every year except 1994 and 1998. Red River had the widest yearly divergence in mean length (Figure 17 and Table 25). The shape of length frequency distribution differed among streams (Figures 18 and 19). Marsh Creek and South Fork Salmon River showed fairly uniform distribution for length <180 mm, whereas Red River and Pahsimeroi River showed a bimodal distribution. Crooked Fork Creek was skewed for length >140 mm. Rapid River and Fish Creek showed a normal distribution. The yearly length frequencies for each site can be found in Appendices 10 to 16.

The migration characteristics at the Red River, Marsh Creek, and South Fork Salmon River traps should be viewed cautiously, because these traps were not fished for extended periods during the years 1996 to 1999 (Tables 26 to 28). The Crooked Fork Creek, Fish Creek, and Pahsimeroi River traps have been operated continuously each year except for periods of high flow in the spring (Tables 29 to 31). Fish Creek had the latest median date of steelhead trapped and tagged each year (Table 32, Figures 20 to 23). The majority of steelhead (25^{th} to 75^{th} percentile) left Fish Creek during a brief period during September and early October. At all other sites, steelhead left the stream earlier and over an extended period in comparison to Fish Creek.

In addition to screw traps, crews have PIT tagged steelhead that were collected fly-fishing during the summer. The location, number tagged, mean length, weight, and condition factor of the steelhead are summarized in Table 33. The yearly length frequencies of steelhead captured fly-fishing and tagged in Rapid River, Fish, Gedney, Three Links, O'Hara, and Lick creeks are plotted in Appendices 17 to 20.

Juvenile Steelhead Migration Estimate in Fish Creek

The trap efficiency during the spring runoff from March to June was usually <10% and rose throughout the summer as stream flow declined. During the fall, trap efficiency was usually >25%. The number of steelhead migrants leaving Fish Creek has ranged from 15,309 to 24,488 since 1996. More than 75% of the migrants have left the stream after August 15 each year since we began running the screw trap throughout the season (Figure 24 and Table 34).

Growth

In Fish Creek, we recaptured 468 steelhead the same year the fish were tagged. The mean growth rate of the fish was 0.1810 mm/day (±0.0100). One hundred eighty-one fish were recaptured in Fish Creek or at downstream sites after one winter had passed since tagging. The mean growth rate of these fish was to 0.1190 mm/day (± 0.0068). The mean growth rate of the nine fish recaptured in Fish Creek after two winters was 0.111 mm/day (±0.0207). In Gedney Creek, the mean growth rate was 0.0987 mm/day (±0.0054) and 0.1155 mm/day (±0.0588) for fish that were recaptured after one or two winters, respectively (Figure 25).

There was a significant difference in growth rate between Fish and Gedney creeks of steelhead recaptured after one winter (t-test, t = 2.99, df = 352, p <0.003) at all locations. If fish that were recaptured at a different location than Fish or Gedney creeks (most were migrating smolts) were reviewed for the analysis, the growth rates remained significantly different (t-test, t = 5.231, df = 297, p <0.001).

In Fish Creek, the fish recaptured the same year of tagging did not have a significant relation between growth rate and temperature units or days between tagging and recapture (Figure 26). Although the relation between growth rate and Julian date of tagging and growth rate and length at tagging were significant, both were weak (r^2 <0.18). However, this suggests that fish tagged earlier in the year and fish that were smaller grew at a faster rate than fish tagged later in the year or fish that were larger when tagged (Figure 26).

In Fish Creek, there was not a significant relation between growth rate and TU (p = 0.074) of fish that were recaptured after one winter (Figure 27). The relation between growth rate and length at tagging was significant (p <0.001) for Fish Creek and Gedney Creek steelhead that were recaptured after one winter. In both streams, fish that were tagged at a smaller size grew faster than larger fish.

Smolt Detections

During smolt MY1994 to MY1999, 12,516 PIT-tagged steelhead smolts were detected at the downriver dams. Most of the detections were from fish tagged in the Clearwater River tributaries of Fish Creek and Crooked Fork Creek. In the Salmon River drainage, the Pahsimeroi River had the most smolt detections (Table 35). In the Clearwater River drainage, the mean smolt length ranged from 155 mm (± <1 mm) in Fish Creek to 189 mm (± 2 mm) in White Sands Creek (Table 36 and Figure 28). Mean smolt length in the Salmon River drainage ranged from 164 mm (± 5 mm) in the SF Salmon River to 184 mm (± 2 mm) in Rapid River (Table 36 and Figure 29). There was a significant difference in smolt length among streams (ANOVA, F = 299.2, p <0.001). The eight pairwise comparisons of smolt length that were not significantly different were: Fish Creek and Marsh Creek, Red River, South Fork Salmon River; Crooked Fork Creek and Lower SF Salmon River; Rapid River and White Sands Creek; Marsh Creek and Pahsimeroi River, Red River. The other 33 pairwise comparisons were significantly different. Yearly length frequency plots of smolts from Crooked Fork Creek, Fish Creek, Red River, Pahsimeroi River, and SF Salmon River, Knox bridge can be found in Appendices 21 to 24.

The median smolt arrival date at Lower Granite Dam during MY1994 to MY1999 from nearly every tagging site was between April 25 (Julian date 115) and May 5 (Julian date 125). Smolts from Rapid River had the earliest median arrival date (or were tied with another stream) in MY1994, 1995, and 1998. In 1997, smolts from Rapid River had a median arrival date of April 22 compared with April 20 for Clear Creek. We did not get any smolt detections for Rapid River in 1999, because tagging in that stream was discontinued in 1998 (Figures 30 to 35, Appendices 25 and 26). Smolts from the Pahsimeroi River had the latest median arrival date every year except 1998. In 1997, the median arrival date of Pahsimeroi River smolts was May 26, 1997, more than one month later than the median arrival date from all other sites. However, 101 of the 108 smolt detections for Pahsimeroi River in 1997 were from fish captured in box traps that began tagging fish on May 12, 1997.

Smolts from the Pahsimeroi River had the fastest travel time (km/day) each year from 1994 to 1999. The number of detections from many release sites was <20 each MY; therefore, travel time comparisons among streams should be viewed cautiously (Table 37). When the data from 1994 to 1999 is combined, the median travel time ranged from 77.6 km/day in the Pahsimeroi River to 25.3 km/day in Red River. There was a significant relation between median smolt travel time and the distance from release site to Lower Granite Dam (Figure 36).

Age of Parr from Scale Analysis

We found three age classes present in Fish and Gedney creeks and four age classes in Lick Creek and Rapid River (Table 38 and Figure 37). The largest mean length at each age was found in Rapid River. The smallest mean length for ages 1, 2, and 4 was from Lick Creek, and the smallest mean length of age-3 fish was from Fish Creek. There were significant differences in length among streams for age-1, age-2, and age-3. All age-1 pairwise length comparisons were significantly different ($p \leq 0.009$). Age-2 fish from Fish and Gedney creeks ($p = 0.15$) and Lick and Gedney creeks ($p = 0.19$) were not significantly different. All other pairwise age-2 length comparisons were significantly different ($p \leq 0.02$). The length of age-3 fish differed between Fish and Gedney creeks ($p = 0.63$), Fish and Lick creeks ($p = 0.87$), and Gedney and Lick creeks ($p = 0.88$). The remaining three pairwise comparisons were not significantly different ($p \leq 0.002$).

Age-4 parr were found only in Lick Creek and Rapid River. There was a significant difference in length between these streams ($t = 2.944$, $df = 45$, $p = 0.005$).

The length distribution curves by age generated by assuming a normal distribution showed a similar pattern in each stream. The distributions became flatter and had longer tails at the older age classes (Figure 38). The age-1 distribution had the least overlap with other age classes. As fish became older, it was more difficult to determine age from length.

Most of the adult and juvenile scales that we collected have not been aged yet (Table 39). We plan to read these scales in the future.

Stream Temperature

We have recorded the temperature of approximately 40 streams each year since 1993 (Appendix 27). The daily mean, maximum, and minimum temperature from each stream has been entered into a database and is available on request. I did not include the temperature graphs in this report to save space; however, an example of a yearly temperature plot can be found in Appendix 28.

DISCUSSION

This research was designed to (1) test supplementation as a tool for reestablishing steelhead in streams where the fish had been extirpated or where the population was no longer managed as a viable stock, and (2) monitor and gather life history characteristics from wild steelhead populations.

At the onset of this study we proposed two experiments for testing supplementation to reestablish steelhead in vacant habitat. The first was to investigate the performance of a wild stock with a hatchery stock, and secondly was testing what life stage should be used. We had proposed to mine wild adults from streams with a viable population and compare their performance in streams and in a hatchery with an established hatchery stock. We wanted to test the performance of each stock so the benefits and risks of removing wild fish from their natal stream could be assessed. If wild fish were much more successful than hatchery stock, then outplanting them into other streams during periods of abundance could be justified; however, if we found that the hatchery stock was successful, then wild fish would be better left in their natal stream. We also wanted to test how the wild stock would perform when raised in a hatchery. The second experiment was to investigate whether fingerlings or smolts should be used for stocking if the goal is to reestablish a self-sustaining population.

In the experimental design (Byrne, 1994) we proposed to collect and use 21 wild females and 21 wild males for the paired watershed and hatchery experiments. As discussed earlier, we did not collect wild adults because of low escapements and eventual ESA listing. We did outplant the Sawtooth hatchery stock into Beaver and Frenchman creeks to evaluate the ability of that stock to reestablish natural steelhead populations in tributaries of the upper Salmon River. Although we have demonstrated that we can increase juvenile steelhead abundance from adult outplants, I estimated that one female spawner produced 8 to 16 smolts, depending on smolt age. Using the 16 smolts/female estimate and a 2% SAR, then six adult steelhead must be outplanted to return two adults. It appears that the Sawtooth hatchery stock will not be successful reestablishing natural populations when outplanted as adults.

The results from our second objective, which evaluated fingerling and smolt stocks for supplementation, are not complete; however, some tentative conclusions can be made. This experiment was planned to return 10 pair of spawning fish from each fingerling and smolt release. Although the adult returns are not complete, there have been no adult returns from the fingerling releases to date. It is apparent that the fingerling releases will not produce 20 adults and may not produce any. The 1994 fingerling release was delayed to treat an outbreak of columnaris. We did not get any smolt detections from that release. There were 89 smolt detections from the 15,000 PIT-tagged fingerlings released the other three years. If we use the 0.59% detection rate we measured from these three release years as an index of survival, then each fingerling release (of 50,000 fish) produced nearly 300 smolts. Ten females were needed to produce the 50,000 fingerlings assuming a fecundity of 6,000 eggs/female and a 90% egg-to-fingerling survival. Assuming a 70% female and 30% male sex ratio of returning adults (as measured at Fish Creek), then a 4.67% SAR is needed for replacement. This SAR is approaching the historical value of 5.6% that was estimated for the pre-1970 smolt years (Marmorek, et. al., 2000) before the completion of the lower Snake River dams. Results from the SF Red River fingerling releases suggest that using fingerlings for supplementation will not succeed.

The smolt releases have only returned one adult from the 1996 release, yielding a SAR of 0.025% (three ocean adults spawned in 2000). To meet our goal of 20 adults per release year, the SAR for the 1997, 1998, and 1999 releases must be 0.4% (or a 1.0% to 1.4% survival rate from the number of detected smolts to adult). Most adults will return to spawn in the years 2000 to 2002, and IDFG will assess spawner success, using age-1 parr abundance, from 2000 to 2003.

Most of our effort has been monitoring and collecting life history data from wild steelhead populations from tributaries of the Lochsa and Selway rivers. Prior to this study there was little stock specific information available on growth of parr, smolt length, smolt age, migration patterns from streams. Much of the data collected for the life history objective is used for management of fisheries and assessing the status of wild steelhead in the state. For example, the steelhead parr densities can serve as an indicator of escapement as it is not possible to accurately count spawning steelhead in most areas. We have found that significant life-history differences can exist between streams in the same drainage. Fish Creek and Crooked Fork Creek are both tributaries of the Lochsa River. Crooked Fork Creek is 74 km upstream of Fish Creek. The mean migrant length was 157 mm in Crooked Fork Creek compared with 146 mm from Fish Creek; however, the median length of the Crooked Fork migrants was 167 mm compared with 145 mm from Fish Creek. The mean length of Crooked Fork migrants differed from the median because of the large number of smaller fish that were trapped (Figure 18 and Table 25). The migration pattern past the screw traps differed. The majority of Fish Creek migrants (the 25% to 75% percentile) left during a brief period from early September to early October and was similar each year. The migration in Crooked Fork Creek extended over several months and had more yearly variation. In two years the 25th percentile in Crooked Fork Creek was attained in the spring (April 23, 1998 and May 9, 1999) and the other two years in July (Figures 20 to 23 and Table 32). Smolts from Crooked Fork Creek were 21 mm larger than smolts from Fish Creek (177 mm compared to 156 mm). We have not done an age or growth analysis on the Crooked Fork migrants; however, based on the Fish Creek results it is likely that smolts from Crooked Fork Creek spent an additional year rearing in the stream.

Two tasks that were identified in the original experimental design may warrant research in the future, requiring a revaluation of priorities of this project. This was prompted by the ESA listing of steelhead in 1997 and proposals put forth to recover these fish. The potential areas of future research are:

1. Researching the feasibility of using kelts as a brood source for supplementation. The benefit from using kelts is that “mining” wild fish would be avoided since the adults would be collected after they had spawned and kelts could be collected from the specific streams or drainages targeted for supplementation.

2. Study the relation between “resident” and anadromous forms of *O. mykiss*. There has been discussion of implementing a captive rearing or captive brood program for recovering wild steelhead populations. Before this approach is undertaken, the relation between anadromous and resident forms of *O. mykiss* should be studied. If resident fish can produce anadromous offspring that are successful, then a captive approach is not needed because the “resident” form would serve the same purpose. Resident fish could be used as a brood source for supplementation should this approach be used to recover steelhead populations.

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Table 1. The number of hatchery adult steelhead that were stocked in Beaver and Frenchman creeks from Sawtooth Hatchery and the weighted juvenile steelhead density (fish/100 m^2) in the outplant strata. The juvenile steelhead densities were obtained from snorkel surveys done in August of each year. NC = not counted. NS = no adults stocked.

Year	Date Stocked	Adults stocked		Redds Counted	Steelhead density	
		Males	Females		Age-1	Age-2+
Beaver Creek						
1993	4/30 and 5/6	19	15	5	0.53	0.76
1994	4/28 and 5/6	14	8	6	10.74	0.84
1995	4/28 and 5/9	12	7	5	4.13	0.17
1996	4/30 and 5/8	20	13	8	6.87	2.20
1997	4/30 and 5/7	16	12	NC	5.43	3.12
1998	5/1 and 5/8	10	10	NC	1.72	0.67
1999	5/6	10	15	NC	3.58	2.19
Frenchman Creek						
1993	4/29	12	10	9	2.13	2.53
1994	4/25	10	10	14	3.88	0.55
1995	NS	0	0	NS	2.93	0
1996	NS	0	0	NS	1.13	0.20
1997	4/30 and 5/7	15	11	NC	0	0.08
1998	NS	0	0	NS	0.67	0.12
1999	5/6	10	10	NC	0	0.17

Table 2. The number of Sawtooth Hatchery female steelhead that were used to determine the relation between length and fecundity from 1993 to 1996.

Year	Females spawned	Mean fecundity (CI)	F ratio	P	r^2
1993	45	3,854 (247)	10.510	0.002	0.196
1994	45	4,861 (315)	1.405	0.242	0.032
1995	116	4,191 (213)	32.769	<0.001	0.223
1996	38	4,819 (334)	11.357	0.002	0.240
All years	244	4,350 (139)	70.242	<0.001	0.225

Table 3. The number of smolts that could be produced from the adult outplants in Beaver and Frenchman creeks using the estimated age-1 population. I assumed a 50% yearly mortality rate to predict the number of age-2+ and age-3+ smolts.

Year Stocked	Female Spawners	Eggs Deposited	Age-1 Population	Survival to Age-1	Estimated smolts		Smolts per female	
					Age-2+	Age-3+	Age-2+	Age-3+
Beaver Creek								
1993[a]	6	23,124	1,134	4.90%	284	142	47	24
1993[b]	15	57,810	1,134	1.96%	284	142	19	9
1994	8	38,888	543	1.40%	136	68	17	8
1995	7	29,337	879	3.00%	220	110	31	16
1996	13	62,647	644	1.03%	161	81	12	6
1997	12	52,200	284	0.54%	71	36	6	3
1998	10	43,500	462	1.06%	116	58	12	6
1999	15	65,250						
				Mean (1994 to 1998):			16	8
Frenchman Creek								
1993	12	46,248	595	1.29%	149	74	12	6
1994[c]	10	48,610	274	0.56%	69	34	7	3
1994[d]	5	24,305	274	1.13%	69	34	14	7
1997	15	65,250	166	0.25%	42	21	3	1
1999	10	43,500						
				Mean (1993, 1994, and 1997): [d]			7	4
				Mean (1993, 1994, and 1997): [c]			10	5

[c] Assumes six females spawned in 1993.
[d] Assumes 15 females spawned in 1993.
[e] Assumes all females spawned in 1994.
[f] Assumes only half the total eggs were deposited before otter kills in 1994.

Table 4. The number of PIT-tagged hatchery fingerling steelhead released in the SF Red River and the number of smolts that were detected from each release at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams.

Release Date	Number Stocked	Smolts detected at dams during year							Total Detections	Percent Detected
		1994	1995	1996	1997	1998	1999	2000[a]		
9/1/93	5,000	8	0	23	1	0	0	0	32	0.64%
10/27/94[b]	5,000		0	0	0	0	0	0	0	0.00%
9/6/95	5,000			0	13	7	0	0	20	0.40%
9/5/96	5,000				0	10	27	0	37	0.74%
All years	**20,000**								**89**	**0.45%**
Omit 1994	**15,000**								**89**	**0.59%**

[a] Detections as of May 22, 2000.
[b] There was a columnaris outbreak at the hatchery during the summer. The stocking date was delayed so the fish could be treated.

Table 5. The number of PIT-tagged hatchery steelhead stocked in Red River and the number of smolts that were detected at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams.

Release Year	Number Stocked	Smolts detected at dams during year					Total Detections	Percent Detected
		1996	1997	1998	1999	2000 [a]		
1996	3,999	1,391	2	0	0	0	1,393	34.83%
1997	4,983		1,948	19	0	0	1,967	39.47%
1998	4,497			1,862	5	0	1,867	41.52%
1999	5,003				1,401	0	1,401	28.00%
All years	**18,482**						**6,628**	**35.86%**

[a] Detections as of May 22, 2000.

Table 6. Summary of the wild adult steelhead escapement at the Fish Creek weir from 1992 to 1999. Adult escapement was calculated as the number of adults trapped plus the number of unmarked kelts recovered. The National Biological Survey, (now Biological Resources Division, U.S. Geological Survey), operated the weir from 1992 to 1994. Idaho Department of Fish and Game has operated the weir since 1995.

Year	Number of females	Number of males	Total escapement	Percent female	Operation notes
1992	78	27	105	74%	Weir had openings and many adults passed upstream unhandled. There were 54 unmarked kelts recovered, and 51 adults passed upstream from the trap box. Weir intact all season.
1993	204	63	267	76%	Weir intact all season.
1994	37	33	66	56%	Weir intact all season.
1995	17	15	32	53%	Weir was opened on May 2 because otters were killing adults.
1996	21	11	32	66%	Weir was breached by high flow and debris on May 18.
1997	10	11	21	48%	Weir damaged on April 20 and had openings until it was repaired April 25. Weir was breached on May 11.
1998	48	27	75	64%	Weir intact all season.
1999	58	14	72	81%	Weir was breached on May 24. Based on the years that the weir was intact, more than 90% of the total adult escapement has entered the stream by May 24.
All years	473	201	670	71%	

Table 7. The number of steelhead kelts that were recovered at the Fish Creek weir from 1992 to 1999.

Year	Number of kelts	Total number of males	Number of live males	Number of dead males	Total number of females	Number of live females	Number of dead females
1992[a]	54	8	-	-	46	-	-
1993[a]	13	0	-	-	13	-	-
1994[a]	4	0	-	-	4	-	-
1995[b]	1	0	0	0	1	0	1
1996[c]	4	3	1	2	1	0	1
1997[d]	4	0	0	0	2	0	2
1998	56	23	8	15	33	23	10
1999[e]	14	2	1	1	12	12	0

[a] Kelts that were recovered that had an opercule punch (fish trapped at the weir and passed upstream) were not recorded from 1992 to 1994. Personnel did not record whether the recovered unmarked kelts were alive or dead from 1992 to 1994.

[b] Weir was opened on May 2, 1995 to prevent otters from killing adults at the weir. Collecting kelts after this date was not possible.

[c] Weir was breached on May 18, 1996. Collecting kelts after this date was not possible.

[d] Weir was breached on May 11, 1997. Collecting kelts after this date was not possible. We were unable to determine the sex of two of the four dead kelts that were recovered. Two kelts were positively identified as female.

[e] Weir was breached on May 24, 1999. Collecting kelts after this date was not possible.

Table 8. The percentage of pool, run, riffle, and pocket water (PW) habitat, based on 10-pace habitat survey, in Clearwater River drainage tributaries. LB = left bank looking downstream; SF = South Fork; WF = West Fork.

Stream	Date	Section Surveyed	Pool	PW	Riffle	Run
SF Red River	7/9/93	Mouth—Trapper Creek	4.1%	20.1%	36.2%	39.6%
		Trapper Creek—WF SF Red River	10.0%	14.1%	30.7%	45.2%
		Mouth—WF SF Red River	7.6%	16.5%	32.9%	43.0%
Gedney Creek	7/25/94	Mouth—WF Gedney Creek	7.4%	59.0%	14.3%	19.3%
	7/23/95	WF Gedney—first LB upstream tributary	7.3%	75.1%	4.0%	13.6%
		Mouth—first tributary upstream WF Gedney	7.4%	62.4%	12.1%	18.1%
WF Gedney Creek	7/22/94	Mouth upstream to waterfall	20.6%	54.5%	5.7%	19.1%
Fish Creek	9/13/95	Mouth—Pagoda Creek	6.5%	63.2%	4.0%	26.4%
	9/13/95	Pagoda Creek—Hungery Creek	3.4%	56.5%	19.1%	20.9%
	9/13/95	Mouth—Hungery Creek	4.9%	59.7%	12.0%	23.5%
Canyon Creek	9/21/97	Mouth—upstream 2.7 km	17.8%	51.7%	10.8%	19.7%
Deadman Creek	10/3/96	Mouth—second LB tributary	5.2%	57.0%	10.4%	27.4%
Weir Creek	9/29/96	Mouth—upstream 2 km	4.5%	26.1%	38.7%	30.7%
Post Office Creek	9/28/96	Mouth—WF Post Office Creek	11.2%	25.6%	38.1%	25.1%
Bald Mountain Creek	8/25/99	Mouth—upstream 2.4 km	4.1%	93.0%	0.8%	2.1%
Boulder Creek	8/15/99	Mouth—upstream 2.6 km	4.9%	86.3%	0.8%	8.0%

Table 9. The percentage of pool, run, riffle, and pocket water (PW) habitat, based on 10-pace habitat survey, in Salmon River drainage tributaries. EF = East Fork.

Stream	Date	Section Surveyed	Pool	PW	Riffle	Run
Basin Creek	8/11/96	Mouth—EF Basin Creek	1.8%	3.1%	65.6%	29.5%
Beaver Creek	7/20/93	Mouth—water diversion pump	5.4%	0.0%	21.5%	73.1%
		Diversion—top supplementation section	8.8%	5.3%	29.8%	56.1%
		Upstream of supplementation section 12 km	32.3%	2.1%	17.7%	47.9%
		All Beaver Creek strata	24.1%	2.6%	20.9%	52.4%
Frenchman Creek	7/20/93	Mouth—top supplementation section	7.1%	2.3%	15.1%	75.5%
		Supplementation section upstream 6km	24.4%	1.0%	9.5%	65.1%
		All Frenchman Creek strata	15.7%	1.6%	12.3%	70.4%
West Pass Creek	6/26/93	Mouth—Roaring Creek	3.4%	10.3%	66.5%	19.7%
		Roaring Creek—Cougar Canyon Creek	4.7%	9.4%	53.0%	32.8%
		Mouth—Cougar Canyon Creek	4.3%	9.7%	57.5%	28.5%
Marsh Creek	8/23/94	Mouth—trailhead	3.3%	8.2%	49.9%	38.8%
		Trailhead—Capehorn Creek	1.1%	2.0%	46.3%	50.9%
		Mouth—Capehorn Creek	2.5%	6.4%	48.9%	42.3%

Table 10. Streams that were snorkeled by steelhead supplementation crews from 1993 to 1999. In streams with more than one strata, the downstream boundary of strata 2 and strata 3 begins at the upstream boundary of the previous strata.

Stream	Strata	Strata boundary		Years snorkeled
		Downstream	Upstream	
Clearwater River drainage				
Fish Creek	1	mouth	Hungery Creek	1993 to 1999
Gedney Creek	1	mouth	West Fork Gedney Creek	1994 to 1999
	2	—	Canteen Creek	1994 to 1999
West Fork Gedney Creek	1	mouth	Waterfall about 2 km upstream	1994 to 1999
South Fork Red River	1	mouth	Trapper Creek	1993 to 1999
	2	—	West Fork South Fork Red River	1993 to 1999
Canyon Creek	1	mouth	Upstream 3 km to 4 km	1996 to 1999
Deadman Creek	1	mouth	Upstream 3 km to 4 km	1996 to 1999
Weir Creek	1	mouth	Upstream about 3 km	1996 to 1999
Post Office Creek	1	mouth	about 2 km upstream of West Fork Post Office Creek	1996 to 1999
Bimerick Creek	1	mouth	Upstream about 2 km	1997
Boulder Creek	1	mouth	Cantalope Creek	1997 and 1999
Bald Mountain Creek	1	mouth	Upstream 3 km to 4 km	1997 and 1999
Salmon River drainage				
Basin Creek	1	mouth	East Fork Basin Creek	1994 to 1996; 1999
	2	—	about 2-3 km upstream of East Fork Basin Creek	1996
Beaver Creek	1	mouth	Irrigation pump about 0.5 km upstream of Highway 75	1993; 1995; 1996
	2	—	Jeep trail crossing about 3 km upstream of irrigation pump	1993 to 1999
	3	—	Upstream about 5 km	1993 to 1996
Frenchman Creek	1	mouth	3 km upstream of mouth in the first meadow section	1993 to 1999
	2	—	Upstream about 3 km	1993 to 1996
SF EF Salmon River	1	mouth	Upstream about 3 km	1993
WF EF Salmon River	1	mouth	Upstream about 3 km	1993
Germania Creek	1	mouth	meadow about 6km upstream of mouth	1993 and 1994
	2	—	Chamberlain Creek	1993 and 1994
Capehorn Creek	1	mouth	Banner Creek	1994
	2	—	Upstream about 2 km	1994
Marsh Creek	1	mouth	Capehorn Creek	1994
Valley Creek	1	USFS road 029 bridge	Upstream about 7 km	1994
West Pass Creek	1	mouth	Roaring Creek	1993 to 1995
	2	—	Cougar Canyon Creek	1993 to 1995

Table 11. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1993. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook = all brook trout; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Clearwater River Drainage											
Fish Creek[a]	1	2.65	7.66	6.58	0.00	0.00	0.65	0.00	0.00	0.00	17.54
SF Red River	1	0.00	1.37	1.27	0.00	0.00	0.72	0.00	0.05	0.07	3.48
	2	0.00	0.62	0.74	0.00	0.00	2.68	0.00	0.34	0.02	4.40
Salmon River Drainage											
Beaver Creek	1	0.00	1.33	0.80	0.00	0.00	0.50	0.00	2.12	0.00	4.75
	2	0.00	0.53	0.76	0.00	0.00	0.12	0.00	3.91	0.00	5.32
	3	0.00	0.27	0.19	0.00	0.00	0.00	0.00	0.98	0.00	1.44
Frenchman Creek	1	0.13	2.13	2.53	0.00	0.35	0.21	0.39	2.59	0.00	8.32
	2	0.00	0.15	0.65	11.51	0.03	0.74	0.00	6.36	0.00	19.45
West Pass Creek	1	0.00	0.04	0.79	0.03	0.00	0.00	0.53	0.00	0.13	1.52
	2	0.00	0.04	0.00	0.00	0.00	0.00	1.81	0.00	0.00	1.85

[a] No riffles were snorkeled in Fish Creek. I assumed riffle density equaled pocket water density

Table 12. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1994. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook = all brook trout; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Clearwater River Drainage											
Fish Creek[a]	1	2.83	16.22	5.96	0.00	0.00	0.33	0.00	0.00	0.00	25.34
Gedney Creek[a]	1	9.77	10.08	6.07	15.41	0.09	0.59	0.02	0.00	0.29	42.31
	2	5.09	14.48	7.08	0.02	0.09	0.14	0.02	0.00	0.00	26.93
WF Gedney Creek[a]	1	11.29	17.97	9.79	0.00	0.03	0.12	0.00	0.00	0.07	39.27
SF Red River	1	1.73	5.22	1.49	7.76	0.00	1.24	0.06	0.30	0.12	17.91
	2	0.08	6.62	0.25	0.00	0.00	1.83	0.12	0.23	0.03	9.16
Salmon River Drainage											
Basin Creek	1	4.91	3.83	1.21	16.88	0.00	0.00	0.12	0.00	1.45	28.40
Beaver Creek[b]	2	22.21	10.74	0.84	16.86	0.74	0.00	0.06	9.47	0.00	60.90
Frenchman Creek	1	35.17	3.88	0.55	36.23	0.04	0.00	0.00	45.47	0.00	121.34
	2	1.97	0.65	0.00	57.31	0.00	0.00	0.00	73.07	0.00	132.99
Marsh Creek	1	1.33	2.11	1.64	25.81	0.04	0.13	0.11	0.06	2.15	33.38
West Pass Creek	1	0.00	0.38	1.03	0.00	0.00	0.14	0.39	0.00	0.00	1.93
	2	0.00	0.00	0.00	0.00	0.00	0.00	2.39	0.00	0.00	2.39

[a] No riffles snorkeled in Fish Creek, Gedney Creek, and WF Gedney; I assumed riffle density equaled PW density.
[b] Beaver Creek strata 1 was dewatered this year.

Table 13. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1995. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage												
Fish Creek—July	1	0.63	7.50	4.10	0.00	0.00	0.22	0.00	0.00	0.00	0.03	12.49
Fish Creek—August	1	5.03	10.03	7.70	0.00	0.00	0.34	0.01	0.00	0.00	0.04	23.15
Gedney Creek	1	6.41	6.36	5.38	0.03	0.03	0.11	0.01	0.00	0.00	0.22	18.55
	2	4.29	8.11	7.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.83
WF Gedney Creek	1	11.02	10.71	8.75	0.00	0.07	0.29	0.04	0.00	0.00	0.08	30.95
SF Red River	1	0.00	3.50	1.25	1.35	0.00	2.16	0.00	0.00	0.27	0.17	8.69
	2	0.09	2.11	0.86	0.00	0.00	0.54	0.00	0.00	0.42	0.10	4.12
Salmon River Drainage												
Basin Creek	1	1.52	1.89	1.47	0.01	0.06	0.06	0.06	0.03	0.00	0.67	5.78
Beaver Creek	1	0.10	2.09	0.17	0.00	0.00	0.00	0.00	0.24	1.07	0.00	3.65
	2	0.32	4.13	0.17	0.58	0.00	0.00	0.00	0.00	1.37	0.00	6.57
	3	0.35	0.03	0.00	1.73	0.00	0.00	0.00	1.08	4.49	0.00	7.68
Frenchman Creek	1	0.94	2.93	0.00	4.42	0.20	0.00	0.00	1.26	6.49	0.04	16.27
	2	0.00	0.04	0.00	13.06	0.47	0.38	0.00	4.22	17.77	0.00	35.94
West Pass Creek[a]	1	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.15	0.71
	2	0.00	0.00	0.00	0.00	0.00	0.00	1.96	0.00	0.00	0.00	1.96
Marsh Creek	1	0.13	0.27	0.48	0.33	0.00	0.09	0.00	0.00	0.04	1.40	2.74

[a] No runs where snorkeled in strata 2 of West Pass Creek. I assumed that run density equaled pool density to calculate the average.

Table 14. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1996. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage												
Fish Creek	1	1.36	5.55	5.04	0.00	0.00	0.37	0.00	0.00	0.00	0.03	12.36
Gedney Creek	1	2.70	5.95	4.14	0.00	0.00	0.23	0.01	0.00	0.00	0.50	13.54
	2	0.90	8.69	4.06	0.00	0.00	0.00	0.00	0.00	0.00	0.12	13.78
WF Gedney Creek	1	3.17	10.83	9.01	0.04	0.00	0.48	0.00	0.00	0.00	0.44	23.97
SF Red River	1	0.00	5.15	1.68	0.00	0.00	0.58	0.07	0.00	0.06	0.07	7.61
	2	0.00	4.52	1.37	0.00	0.00	0.32	0.02	0.00	0.00	0.04	6.27
Canyon Creek	1	0.31	7.62	1.67	0.00	0.00	0.45	0.00	0.00	0.00	0.00	10.05
Deadman Creek	1	0.42	3.17	0.54	0.00	0.05	0.10	0.00	0.00	0.00	0.00	4.28
Weir Creek	1	2.71	4.83	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.09
Post Office Creek	1	2.73	2.29	4.07	0.00	0.00	0.70	0.00	0.00	0.00	0.00	6.65
Salmon River Drainage												
Basin Creek	1	1.28	0.91	0.88	0.03	0.00	0.02	0.02	0.01	0.04	0.39	3.57
Beaver Creek	1	0.26	3.04	0.00	0.00	0.00	0.00	0.45	0.39	5.37	0.00	9.52
	2	11.36	6.87	2.20	0.00	0.00	0.00	0.00	0.00	4.17	0.00	24.60
	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02	3.03	0.00	5.05
Frenchman Creek	1	1.13	0.20	0.07	0.00	0.64	0.00	0.07	0.00	6.27	0.00	8.38
	2	0.00	0.00	0.13	0.00	0.48	0.00	0.00	0.41	23.57	0.00	24.58

Table 15. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1997. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage												
Fish Creek	1	2.55	4.94	4.15	0.00	0.00	0.28	0.01	0.00	0.00	0.06	11.99
Gedney Creek	1	9.01	5.07	4.20	0.44	0.00	0.20	0.00	0.00	0.01	0.57	19.50
	2	4.11	10.86	4.41	0.00	0.00	0.00	0.00	0.00	0.00	0.17	19.54
WF Gedney Creek	1	3.78	6.77	7.01	0.21	0.00	0.32	0.00	0.00	0.00	0.48	18.55
SF Red River	1	0.08	3.21	0.81	0.00	0.00	0.71	0.00	0.00	0.00	0.09	4.88
	2	0.00	1.22	1.17	0.00	0.00	4.18	0.05	0.00	0.11	0.06	6.79
Canyon Creek	1	14.24	7.90	6.73	0.00	0.00	0.37	0.00	0.00	0.00	0.07	29.30
Deadman Creek	1	0.57	4.79	3.39	0.38	0.00	0.00	0.00	0.00	0.00	0.00	9.12
Weir Creek	1	13.87	3.88	0.51	0.01	0.00	0.99	0.12	0.00	0.00	0.00	19.38
Post Office Creek	1	7.92	1.76	0.93	0.00	0.00	1.54	0.08	0.00	0.00	0.03	12.25
Salmon River Drainage												
Beaver Creek	2	4.17	5.43	3.12	0.00	0.00	0.00	0.00	0.35	3.24	0.00	16.31
Frenchman Creek	1	7.75	0.00	0.08	0.00	0.08	0.00	0.00	6.35	1.87	0.00	16.13

Table 16. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1998. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage												
Fish Creek	1	3.74	7.27	3.89	2.48	0.00	0.86	0.00	0.00	0.00	0.01	18.26
Gedney Creek	1	10.29	8.07	3.35	2.85	0.06	0.24	0.00	0.00	0.00	0.71	25.57
	2	5.41	11.88	2.86	0.11	0.00	0.36	0.09	0.00	0.09	0.24	21.04
WF Gedney Creek	1	20.60	12.34	5.38	2.92	0.02	0.22	0.00	0.00	0.07	0.30	41.86
SF Red River	1	0.02	1.19	1.12	0.00	0.00	0.65	0.06	0.00	0.00	0.00	3.03
	2	0.00	0.77	1.53	0.00	0.00	0.44	0.04	0.00	0.05	0.06	2.89
Canyon Creek	1	2.36	11.77	5.36	2.40	0.00	0.23	0.00	0.00	0.00	0.00	22.13
Deadman Creek	1	5.10	6.61	2.14	1.59	0.05	0.35	0.00	0.00	0.00	0.00	15.84
Weir Creek[a]	1	18.66	4.56	0.30	0.00	0.00	3.64	0.00	0.00	0.00	0.00	27.17
Post Office Creek	1	12.95	5.29	0.17	0.00	0.00	1.28	0.00	0.00	0.00	0.00	19.69
Salmon River Drainage												
Beaver Creek	2	1.87	2.11	1.07	0.00	0.04	0.00	0.00	2.06	2.17	0.00	9.33
Frenchman Creek	1	0.00	1.70	0.40	0.00	0.00	0.00	0.00	6.15	4.92	0.00	13.17

[a] No riffles were snorkeled in Weir Creek. I assumed that densities in riffle habitat were equal to pocket water habitat to calculate the weighted mean density.

Table 17. The weighted mean fish densities (fish/100 m^2) obtained from snorkel surveys in 1999. Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Strata	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage												
Fish Creek	1	1.85	5.85	5.08	0.00	0.00	0.56	0.02	0.00	0.00	0.00	13.35
Gedney Creek	1	6.08	7.06	4.63	0.38	0.05	0.08	0.03	0.00	0.00	0.35	18.66
	2	2.09	8.24	3.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.82
WF Gedney Creek	1	4.46	14.03	7.06	0.00	0.10	0.32	0.06	0.00	0.00	0.08	26.11
SF Red River	1	0.07	1.58	1.20	0.08	0.00	1.03	0.04	0.00	0.09	0.13	4.22
	2	0.00	0.16	0.28	0.00	0.00	1.90	0.13	0.00	0.12	0.00	2.59
Bald Mountain Creek	1	0.26	1.97	4.17	0.00	0.00	1.90	0.03	0.00	0.00	0.00	8.33
Boulder Creek	1	0.79	3.98	6.18	0.05	0.03	0.14	0.01	0.00	0.00	0.00	11.18
Canyon Creek	1	8.45	3.55	4.52	0.00	0.00	0.03	0.00	0.00	0.00	0.00	16.56
Deadman Creek	1	28.63	2.62	2.47	0.04	0.00	0.15	0.00	0.00	0.00	0.00	33.91
Weir Creek	1	5.10	5.85	2.64	0.00	0.00	0.27	0.03	0.00	0.00	0.00	13.88
Post Office Creek	1	14.94	2.09	0.20	0.00	0.00	0.79	0.09	0.00	0.00	0.00	18.11
Salmon River Drainage												
Beaver Creek	2	6.78	3.58	2.19	0.81	0.00	0.00	0.00	1.42	5.76	0.00	20.54
Frenchman Creek	1	7.87	0.00	0.17	0.85	0.00	0.00	0.00	1.91	4.25	0.00	15.05

Table 18. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1993. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring screw traps								
Crooked Fork Creek[a]	03/17/93	06/08/93	491	491	166 (34)	0	—	—
Marsh Creek	04/08/93	06/01/93	98	94	113 (44)	74	11.1 (9.8)	1.02726 (0.15040)
SF Salmon River	04/03/93	06/15/93	218	218	94 (31)	217	12.1 (13.5)	1.09449 (0.14758)
Fall screw traps								
Crooked Fork Creek[a]	08/20/93	11/11/93	274	274	156 (40)	0	—	—
Red River	08/20/93	11/14/93	169	169	151 (44)	123	34.2 (18.3)	0.99816 (0.11380)
Marsh Creek	08/19/93	11/04/93	193	190	125 (27)	151	20.5 (14.1)	0.97328 (0.09511)
Rapid River[b]	09/01/93	10/15/93	284	284	174 (20)	250	55.5 (14.0)	1.05927 (0.13751)
SF Salmon River	08/19/93	11/14/93	536	533	143 (41)	416	30.3 (23.1)	0.97081 (0.13521)
Year Totals								
Crooked Fork Creek			765	765	162 (36)	0	—	—
Red River			169	169	150 (44)	123	34.2 (18.3)	0.99816 (0.11380)
Marsh Creek			291	284	121 (34)	225	17.4 (13.6)	0.99103 (0.11897)
Rapid River			284	284	174 (19)	250	55.5 (14.0)	1.05927 (0.13751)
SF Salmon River			754	751	129 (44)	633	24.0 (22.1)	1.01321 (0.15142)

[a] Weights were not recorded from a representative random sample at Crooked Fork Creek.
[b] Rapid River steelhead were trapped in a weir designed to capture bull trout.

Table 19. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1994. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring screw traps								
Crooked Fork Creek	03/16/94	06/01/94	437	437	151 (42)	433	37.6 (21.2)	0.95860 (0.12833)
Clear Creek	04/15/94	06/10/94	98	98	116 (27)	97	18.0 (13.2)	1.00859 (0.09164)
Fish Creek	03/18/94	06/13/94	442	442	110 (21)	442	15.8 (9.2)	1.08227 (0.08268)
Red River	03/29/94	05/24/94	122	122	124 (43)	118	25.4 (19.9)	1.00878 (0.13637)
Marsh Creek	03/16/94	06/01/94	134	123	120 (48)	98	17.5 (18.6)	0.92336 (0.17987)
Pahsimeroi River	03/03/94	06/01/94	236	236	138 (37)	232	30.2 (21.3)	1.00814 (0.09109)
EF Salmon River[a]	03/16/94	05/11/94	69	69	130 (35)	61	23.5 (17.0)	0.91100 (0.09660)
SF Salmon River	03/16/94	06/01/94	98	97	109 (25)	18	12.9 (13.6)	1.02143 (0.13842)
Fall screw traps								
Crooked Fork Creek	08/24/94	11/04/94	117	117	84 (34)			
Fish Creek	09/22/94	11/07/94	1,522	1,522	124 (22)	1,441	19.6 (10.9)	0.93636 (0.05299)
Red River	09/03/94	10/05/94	33	33	134 (34)	28	31.8 (23.0)	1.03413 (0.06971)
EF Salmon River	08/15/94	11/13/94	28	24	113 (40)	22	19.5 (18.0)	1.00340 (0.11822)
Marsh Creek	09/04/94	10/31/94	165	163	111 (22)	142	15.7 (10.7)	1.01167 (0.09114)
Pahsimeroi River	09/10/94	12/10/94	135	135	127 (20)	135	21.6 (10.9)	0.98830 (0.07169)
Rapid River[b]	07/26/94	10/28/94	382	382	178 (23)	381	58.9 (23.0)	0.99642 (0.09468)
SF Salmon River	08/30/94	10/25/94	145	134	137 (38)	88	32.5 (24.1)	1.02962 (0.08954)
Year Totals								
Crooked Fork Creek			554	554	137 (49)	433	37.6 (21.2)	0.95860 (0.12833)
Clear Creek			98	98	115 (26)	97	18.0 (13.2)	1.00859 (0.09164)
Fish Creek			1,964	1,964	121 (22)	1,883	18.7 (10.7)	0.97061 (0.08705)
Red River			155	155	126 (41)	146	26.6 (20.7)	1.01364 (0.12673)
EF Salmon River			97	93	125 (37)	83	22.4 (17.3)	0.93549 (0.11057)
Marsh Creek			299	286	114 (36)	240	16.4 (14.5)	0.97561 (0.14145)
Pahsimeroi River			371	371	133 (32)	367	27.0 (18.6)	1.00084 (0.08501)
Rapid River			382	382	178 (22)	381	58.9 (23.0)	0.99642 (0.09468)
SF Salmon River			243	231	125 (35)	106	29.2 (23.8)	1.02823 (0.09959)

[a] Operated by Shoshone-Bannock Tribe.
[b] Rapid River steelhead were trapped in a weir designed to capture bull trout.

Table 20. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1995. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring screw traps								
Crooked Fork Creek	03/24/95	06/08/95	172	172	174 (29)	159	48.8 (17.2)	0.88309 (0.07844)
Fish Creek	03/15/95	06/14/95	464	464	131 (25)	462	25.2 (14.9)	1.04625 (0.09238)
EF Salmon River	03/07/95	05/31/95	50	50	113 (42)	50	20.6 (23.1)	1.01604 (0.13616)
Marsh Creek	03/24/95	06/08/95	126	126	103 (35)	118	14.8 (17.7)	1.01483 (0.18221)
Pahsimeroi River	03/15/95	06/16/95	213	213	141 (29)	211	31.8 (17.8)	1.03410 (0.09619)
SF Salmon River	03/24/95	06/08/95	101	101	100 (27)	91	11.5 (9.6)	1.12129 (0.16935)
Fall screw traps								
Crooked Fork Creek	08/24/95	11/04/95	326	326	159 (21)	300	41.3 (13.7)	0.97594 (0.04978)
Fish Creek	08/17/95	11/02/95	542	542	148 (17)	505	33.8 (12.1)	0.99691 (0.05348)
EF Salmon River	08/15/95	10/30/95	20	18	134 (23)	16	25.8 (10.5)	1.06220 (0.15389)
Marsh Creek	08/24/95	11/04/95	18	18	151 (24)	0	—	—
Pahsimeroi River	09/20/95	12/05/95	13	13	141 (18)	13	31.7 (12.3)	1.08195 (0.07609)
Rapid River	07/26/95	11/02/95	194	193	179 (21)	180	60.4 (16.4)	1.09282 (0.18787)
SF Salmon River	08/29/95	11/02/95	55	55	142 (22)	12	28.8 (8.9)	0.97175 (0.03759)
Year Totals								
Crooked Fork Creek			498	498	164 (25)	459	43.9 (15.4)	0.94378 (0.07551)
Fish Creek			1,006	1,006	140 (22)	967	29.7 (14.2)	1.02048 (0.07860)
EF Salmon River[a]			70	68	118 (38)	66	21.9 (20.9)	1.02723 (0.14205)
Marsh Creek			144	144	108 (37)	118	14.8 (17.7)	1.01483 (0.18221)
Pahsimeroi River			226	226	140 (28)	224	31.8 (17.5)	1.03688 (0.09579)
Rapid River[b]			194	194	179 (20)	180	60.4 (16.4)	1.09282 (0.18787)
SF Salmon River			156	156	114 (32)	103	13.5 (11.0)	1.10387 (0.16674)

[a] Operated by Shoshone-Bannock Tribe.
[b] Rapid River steelhead were trapped in a weir designed to capture bull trout.

Table 21. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1996. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring screw traps								
Crooked Fork Creek	03/22/96	05/27/96	115	115	124 (52)	109	27.3 (24.5)	0.87195 (0.14637)
Clear Creek	04/04/96	05/14/96	143	143	161 (23)	132	42.7 (16.6)	0.97946 (0.12148)
Fish Creek	04/07/96	05/10/96	19	19	151 (27)	19	34.9 (14.5)	0.92675 (0.04784)
Marsh Creek	03/14/96	05/29/96	51	51	88 (36)	0	—	—
Pahsimeroi River	05/02/96	05/31/96	90	90	197 (26)	90	80.7 (29.9)	1.01479 (0.10638)
Red River	03/12/96	05/31/96	86	86	118 (41)	84	21.8 (17.7)	0.97632 (0.06917)
EF Salmon River	03/11/96	05/25/96	40	40	149 (27)	40	38.2 (17.8)	1.06585 (0.17618)
SF Salmon River	03/16/96	05/13/96	31	31	111 (25)	28	16.0 (13.0)	0.99516 (0.08822)
Summer screw traps								
Crooked Fork Creek	06/01/96	08/31/96	524	524	145 (43)	503	41.4 (27.8)	1.05854 (0.09981)
Clear Creek	06/01/96	06/24/96	12	12	135 (23)	12	25.5 (13.0)	0.95468 (0.21384)
Fish Creek	06/17/96	08/31/96	506	506	148 (23)	496	37.3 (15.6)	1.07584 (0.07609)
Pahsimeroi River	06/01/96	08/31/96	32	32	128 (57)	32	36.2 (37.0)	1.06756 (0.09683)
Red River	07/01/96	08/31/96	90	90	95 (15)	89	9.4 (4.9)	1.02536 (0.10395)
SF Salmon River	07/29/96	08/31/96	57	56	123 (38)			
Fall screw traps								
Crooked Fork Creek	09/01/96	11/14/96	484	484	162 (25)	479	45.5 (18.0)	1.01336 (0.05448)
Clear Creek	09/01/96	10/02/96	59	59	113 (30)	0	—	—
Fish Creek	09/01/96	11/11/96	2,705	2,705	149 (19)	2,702	34.7 (13.3)	1.00283 (0.05137)
Red River	09/01/96	10/30/96	11	11	131 (20)	11	23.9 (10.4)	1.01207 (0.06233)
Pahsimeroi River	09/01/96	11/11/96	29	29	147 (44)	29	43.9 (40.1)	1.07219 (0.09834)
Rapid River	09/14/96	10/29/96	60	59	192 (23)	58	74.4 (31.2)	1.03789 (0.06060)
SF Salmon River	09/01/96	10/22/96	22	22	123 (34)	11	29.3 (18.6)	1.07040 (0.09063)
Year Totals								
Crooked Fork Creek			1,123	1,123	149 (39)	1,091	41.8 (24.2	1.02006 (0.10455)
Clear Creek			214	214	146 (32)	144	41.2 (17.1)	0.97739 (0.13186)
Fish Creek			3,230	3,230	148 (19)	3,217	35.1 (13.7)	1.01364 (0.06214)
Red River			176	176	106 (32)	173	15.4 (14.2)	1.00155 (0.09210)
Marsh Creek			51	51	88 (36)	0	—	—
Pahsimeroi River			151	151	172 (48)	151	64.2 (39.2)	1.03700 (0.10639)
Rapid River			60	59	191 (23)	58	74.4 (31.2)	1.03789 (0.06060)
EF Salmon River[a]			40	40	149 (26)	40	38.2 (17.8)	1.06585 (0.17618)
SF Salmon River			110	109	119 (34)	40	19.8 (15.7)	1.02054 (0.09746)

[a] Operated by Shoshone-Bannock Tribe.

Table 22. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1997. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		
	Start	End	Tagged	Number	Mean	Number	Mean	Condition Factor
Spring screw traps								
Crooked Fork Creek	03/19/97	05/14/97	152	152	173 (27)	151	50.5 (16.3)	0.92556 (0.06268)
Clear Creek[a]	04/02/97	05/23/97	137	136	165 (19)	114	43.4 (13.3)	0.95734 (0.16808)
Fish Creek	03/26/97	05/10/97	32	32	168 (19)	32	45.7 (14.9)	0.92646 (0.05289)
Pahsimeroi River (box)	05/11/97	05/31/97	517	516	164 (28)	10	32.9 (15.9)	0.87059 (0.14701
Pahsimeroi River (screw)	03/11/97	05/30/97	76	76	151 (42)	70	35.8 (25.1)	1.00496 (0.10755)
Red River	04/02/97	05/21/97	71	71	165 (15)	71	44.3 (12.1)	0.97371 (0.09552)
Rapid River	04/01/97	05/11/97	20	20	155 (45)	20	48.5 (28.4)	1.07928 (0.10066)
SF Salmon River	03/17/97	05/13/97	53	51	105 (22)	51	14.3 (11.8)	1.07968 (0.10245)
Summer screw traps								
Crooked Fork Creek	07/02/97	08/31/97	187	187	156 (36)	179	45.4 (23.7)	1.06939 (0.08357)
Fish Creek	06/12/97	08/31/97	509	508	148 (20)	505	35.4 (13.0)	1.05700 (0.07333)
Marsh Creek	07/16/97	08/31/97	68	68	133 (40)	0	—	—
Pahsimeroi River (box)	06/01/97	08/31/97	1,280	1,279	87 (39)	54	22.8 (27.3)	1.17717 (0.09952)
Pahsimeroi River (screw)	06/01/97	08/31/97	65	65	101 (48)	52	19.2 (25.3)	1.07193 (0.08638)
Rapid River	06/25/97	08/31/97	5	5	170 (50)	5	68.5 (33.2)	1.12797 (0.03201)
SF Salmon River	07/10/97	08/31/97	151	151	119 (31)	78	20.6 (16.4)	1.12630 (0.13743)
Fall screw traps								
Crooked Fork Creek	09/01/97	11/05/97	306	306	176 (16)	139	54.5 (14.4)	0.98044 (0.05503)
Clear Creek	10/08/97	11/05/97	163	163	101 (29)	163	23.3 (21.8)	1.79268 (0.10857)
Fish Creek	09/01/97	11/07/97	2,422	2,421	152 (18)	2,418	37.1 (12.7)	1.01137 (0.04848)
Red River	09/01/97	11/04/97	71	71	168 (29)	66	46.3 (18.6)	0.99983 (0.07475)
Lower SF Salmon River	10/15/97	11/12/97	29	29	156 (39)	16	39.9 (17.9)	1.00578 (0.04480)
Marsh Creek	09/01/97	11/15/97	54	54	136 (37)	0	—	—
Pahsimeroi River (box)	09/01/97	10/08/97	758	758	119 (37)	0	—	—
Pahsimeroi River (screw)	09/01/97	12/02/97	63	63	140 (41)	41	29.0 (24.8)	1.04577 (0.08513)
Rapid River	09/01/97	11/09/97	64	64	186 (38)	64	79.2 (43.8)	1.09417 (0.07367)
SF Salmon River	09/01/97	10/20/97	35	35	126 (37)	22	28.5 (19.9)	1.04590 (0.05760)
Year Totals								
Crooked Fork Creek			645	645	169 (27)	469	49.8 (19.4)	0.99672 (0.09248)
Clear Creek			300	300	130 (40)	278	31.6 (21.2)	1.45062 (0.43325)
Fish Creek			2,963	2,961	151 (18)	2,955	36.9 (12.8)	1.01825 (0.05709)
Red River			142	142	166 (23)	137	45.3 (15.6)	0.98630 (0.08712)
Lower SF Salmon River			29	29	156 (39)	16	39.9 (17.9)	1.00578 (0.04480)
Marsh Creek			122	122	134 (38)	0	—	—
Pahsimeroi River (box)			2,555	2,553	112 (47)	64	24.4 (26.2)	1.12926 (0.15532)
Pahsimeroi River (screw)			204	204	131 (48)	163	28.8 (26.1)	1.03659 (0.10010)
Rapid River			89	89	178 (42)	89	71.7 (42.2)	1.09273 (0.07968)
SF Salmon River			239	237	117 (31)	151	19.6 (16.3)	1.09884 (0.12127)

[a] One steelhead tagged at Clear Creek in June was added to spring number tagged. Clear Creek trap was operated by USFWS.

Table 23. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1998. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring Trapping								
Crooked Fork Creek	03/12/98	05/31/98	244	244	177 (31)	237	57.0 (19.8)	0.95437 (0.07577)
Clear Creek	03/23/98	05/31/98	47	47	123 (33)	46	22.1 (15.6)	1.02079 (0.10877)
Fish Creek	03/17/98	05/31/98	51	51	161 (25)	50	43.4 (18.8)	0.97534 (0.05130)
Red River	04/01/98	05/31/98	71	71	167 (18)	70	46.5 (12.2)	0.97154 (0.07846)
Lower SF Salmon River	02/14/98	04/24/98	64	59	130 (51)	28	51.8 (27.9)	1.00973 (0.09814)
Marsh Creek	03/19/98	05/31/98	106	106	99 (47)	73	17.8 (28.0)	1.03492 (0.12466)
Pahsimeroi River	03/13/98	05/31/98	172	172	162 (35)	169	46.2 (28.1)	0.96763 (0.11238)
SF Salmon River	03/12/98	05/09/98	35	35	113 (25)	32	17.9 (14.0)	1.04220 (0.08751)
Summer Trapping								
Crooked Fork Creek	06/01/98	08/31/98	184	183	153 (36)	182	45.5 (29.7)	1.08561 (0.09299)
Clear Creek	06/02/98	07/02/98	44	44	114 (15)	42	15.2 (7.0)	0.99080 (0.08202)
Fish Creek	06/01/98	08/31/98	567	559	145 (25)	558	34.0 (15.7)	1.04225 (0.09577)
Red River	06/01/98	08/31/98	5	5	143 (31)	4	39.0 (21.5)	1.01887 (0.03837)
Marsh Creek	06/01/98	08/31/98	82	82	130 (35)	63	29.9 (24.4)	1.08686 (0.08583)
Pahsimeroi River	06/01/98	08/31/98	105	105	176 (22)	104	61.0 (18.7)	1.06399 (0.07983)
SF Salmon River	06/16/98	08/31/98	146	146	120 (26)	145	22.6 (16.0)	1.12644 (0.09080)
Fall Trapping								
Crooked Fork Creek	09/01/98	11/11/98	35	35	176 (19)	23	56.7 (21.3)	0.96770 (0.04237)
Fish Creek	09/01/98	11/10/98	3,156	3,101	147 (21)	2,831	32.5 (14.4)	0.96598 (0.05092)
Red River	09/01/98	10/27/98	8	8	142 (35)	8	32.7 (19.1)	0.99725 (0.06286)
Lower SF Salmon River	09/01/98	11/08/98	25	25	179 (14)	22	60.0 (14.8)	1.03167 (0.06094)
Marsh Creek	09/01/98	11/08/98	7	7	161 (26)	7	44.5 (23.9)	0.99414 (0.06075)
Pahsimeroi River	09/01/98	11/30/98	261	261	172 (25)	259	55.7 (23.4)	1.03034 (0.09429)
SF Salmon River	09/01/98	10/12/98	37	37	157 (18)	36	42.9 (14.9)	1.05327 (0.09841)
Year Totals								
Crooked Fork Creek			463	462	167 (34)	442	52.2 (25.1)	1.00911 (0.10411)
Clear Creek[a]			91	91	118 (26)	88	18.8 (12.7)	1.00647 (0.09808)
Fish Creek			3,774	3,711	147 (22)	3,439	32.9 (14.8)	0.97849 (0.06670)
Red River			84	84	162 (23)	82	44.8 (14.3)	0.97636 (0.07657)
Lower SF Salmon River			89	84	144 (49)	50	55.4 (23.4)	1.01939 (0.08454)
Marsh Creek			195	195	114 (45)	143	24.5 (27.3)	1.05581 (0.11042)
Pahsimeroi River			538	538	169 (28)	532	53.7 (24.8)	1.01700 (0.10430)
SF Salmon River			218	218	125 (28)	213	25.3 (17.5)	1.10142 (0.09872)

[a] Operated by USFWS.

Table 24. Summary of the number, mean length, mean weight, and mean condition factor (K) of wild steelhead juveniles that were PIT tagged at screw traps in 1999. The standard deviation is in parentheses.

Release Site	Collection Dates		Number	Fork Length		Weight		Condition Factor
	Start	End	Tagged	Number	Mean	Number	Mean	
Spring screw traps								
Crooked Fork Creek	03/11/99	05/21/99	150	150	179 (18)	50	52.4 (14.6)	0.92260 (0.06359)
Clear Creek[a]	04/02/99	05/31/99	234	234	163 (14)	0	—	—
Fish Creek	03/16/99	05/21/99	28	28	164 (24)	28	43.5 (15.5)	0.94271 (0.06825)
White Sands Creek	03/14/99	05/22/99	292	292	188 (15)	132	60.5 (13.5)	0.87922 (0.05176)
Red River	04/07/99	05/08/99	22	22	170 (12)	22	47.9 (10.4)	0.96102 (0.14244)
Johnson Creek			62	62	175 (35)	60	56.3 (28.1)	0.94016 (0.08655)
Lower SF Salmon River	03/11/99	05/21/99	114	114	178 (21)	109	57.2 (23.4)	0.98444 (0.14376)
Marsh Creek	03/19/99	05/31/99	6	6	193 (21)	6	72.1 (19.1)	0.98922 (0.09691)
Pahsimeroi River	03/17/99	05/31/99	634	634	172 (26)	634	54.2 (22.9)	1.00679 (0.06830)
SF Salmon River	03/14/99	05/22/99	3	3	189 (39)	3	79.8 (45.6)	1.03872 (0.03379)
Summer screw traps								
Crooked Fork Creek	06/28/99	08/31/99	137	137	142 (35)	117	39.8 (31.1)	1.09425 (0.08477)
Fish Creek	06/09/99	08/31/99	847	847	144 (21)	831	33.8 (15.3)	1.07725 (0.06861)
White Sands Creek	07/01/99	08/31/99	320	320	167 (31)	15	49.0 (29.3)	1.13095 (0.11407)
Red River	06/01/99	08/31/99	63	63	76 (23)	63	6.4 (8.3)	1.09998 (0.12997)
Johnson Creek	07/01/99	08/31/99	323	323	139 (38)	323	34.1 (27.5)	1.06436 (0.09187)
Lower SF Salmon River	07/16/99	08/31/99	166	166	145 (31)	122	33.6 (18.6)	1.09043 (0.09777)
Marsh Creek	06/01/99	08/31/99	64	64	133 (29)	63	37.0 (24.5)	1.40043 (0.38497)
Pahsimeroi River	06/01/99	08/31/99	131	131	168 (39)	129	57.8 (29.7)	1.09848 (0.09256)
SF Salmon River	07/01/99	08/31/99	172	172	128 (29)	156	26.9 (15.2)	1.17461 (0.11896)
Fall screw traps								
Crooked Fork Creek	09/01/99	11/10/99	139	138	170 (19)	87	51.8 (17.1)	0.99324 (0.07031)
Fish Creek	09/01/99	11/08/99	6,925	6,924	150 (21)	4,868	37.0 (15.8)	1.01096 (0.05351)
White Sands Creek	09/01/99	11/10/99	18	18	185 (16)	17	63.0 (15.4)	0.96978 (0.07203)
Red River	09/02/99	11/01/99	29	29	126 (47)	28	27.3 (25.9)	0.99366 (0.12437)
Johnson Creek			128	128	161 (30)	128	45.7 (25.0)	0.99342 (0.07295)
Lower SF Salmon River	09/01/99	11/18/99	130	130	172 (19)	114	53.6 (15.9)	1.03661 (0.06376)
Marsh Creek	09/06/99	11/03/99	25	25	156 (23)	25	56.8 (31.1)	1.37240 (0.25778)
Pahsimeroi River	09/01/99	11/30/99	227	227	161 (43)	226	53.3 (37.3)	1.06493 (0.10015)
SF Salmon River	09/01/99	10/16/99	46	46	154 (24)	36	38.2 (16.6)	1.07660 (0.08382)
Year Totals								
Crooked Fork Creek			426	425	163 (29)	254	46.4 (25.0)	1.02587 (0.10206)
Clear Creek			234	234	169 (14)	0	—	—
Fish Creek			7,800	7,799	148 (21)	5,727	36.6 (15.8)	1.02024 (0.06094)
White Sands Creek			630	630	177 (26)	164	59.7 (16.2)	0.91163 (0.09737)
Red River			114	114	106 (47)	113	19.7 (22.2)	1.04658 (0.14460)
Johnson Creek[b]			513	513	148 (38)	511	39.6 (28.1)	1.03201 (0.09784)
Lower SF Salmon River			410	410	162 (29)	345	47.7 (22.1)	1.03916 (0.11459)
Marsh Creek			95	95	143 (31)	94	44.5 (28.5)	1.36673 (0.35702)
Pahsimeroi River			992	992	168 (32)	989	54.5 (27.8)	1.03204 (0.08736)
SF Salmon River			221	221	134 (30)	195	29.8 (18.1)	1.15442 (0.11952)

[a] Operated by USFWS. Nine fish were tagged in June.
[b] Operated by Nez Perce Tribe

Table 25. Summary of the mean fork length (mm) and the fork length of the 5%, 25%, 50%, 75%, and 95% quantiles of juvenile steelhead that were PIT-tagged at screw traps from 1994 to 1999.

Trap Site	N	Mean	95% CI (± mm)	Fork length quantiles 5%	25%	50%	75%	95%
1994								
Crooked Fork Creek	554	137	4	62	78	155	180	197
Fish Creek	1,964	121	1	85	105	119	135	163
Marsh Creek	286	115	4	73	95	107	122	187
Pahsimeroi River	371	134	3	90	110	126	159	195
Red River	155	126	7	65	79	139	158	188
SF Salmon River at Knox bridge	231	125	5	84	96	114	153	186
1995								
Crooked Fork Creek	498	164	2	125	151	165	180	200
Fish Creek	1,006	140	1	107	123	139	155	179
Marsh Creek	144	109	6	71	78	97	130	180
Pahsimeroi River	226	141	4	102	117	138	165	185
SF Salmon River at Knox bridge	156	115	5	75	89	106	142	173
1996								
Crooked Fork Creek	1,123	150	2	73	130	161	180	195
Fish Creek	3,230	149	<1	118	135	149	163	180
Marsh Creek	51	88	10	65	68	74	93	185
Pahsimeroi River	151	173	8	74	134	187	207	228
Red River	176	106	5	73	81	93	131	168
SF Salmon River at Knox bridge	109	120	7	79	93	110	143	176
1997								
Crooked Fork Creek	645	170	2	105	163	175	186	201
Fish Creek	2,961	152	<1	122	139	153	165	180
Marsh Creek	122	134	7	80	103	131	165	196
Pahsimeroi River	204	132	7	65	94	126	171	211
Red River	142	166	4	135	154	164	179	203
SF Salmon River at Knox bridge	237	117		74	93	110	142	175
1998								
Crooked Fork Creek	462	168	3	99	149	176	192	210
Fish Creek	3,774	147	<1	114	130	145	164	183
Marsh Creek	195	114	6	66	74	102	146	210
Pahsimeroi River	538	170	2	112	155	172	189	212
Red River	84	163	5	105	157	163	176	194
SF Salmon River at Knox bridge	218	125	4	91	100	119	148	176
1999								
Crooked Fork Creek	425	164	3	107	150	168	185	201
Fish Creek	7,799	149	<1	118	133	146	165	185
Marsh Creek	95	143	6	95	120	137	169	200
Pahsimeroi River	992	169	2	99	156	172	188	215
Red River	114	107	9	61	65	80	157	182
SF Salmon River at Knox bridge	221	134	4	78	119	137	153	183
All years combined								
Crooked Fork Creek	3,707	157	1	74	144	167	183	200
Fish Creek	20,734	146	<1	110	130	145	162	182
Marsh Creek	893	118	3	68	87	109	142	195
Pahsimeroi River	2,482	158	2	91	130	165	184	213
Red River	671	131	3	65	84	145	165	190
SF Salmon River at Knox bridge	1,172	123	2	78	97	120	149	179

Table 26. Summary of the dates the Red River screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	3/15	11/14	6/9 to 8/19, pulled for summer
1994	3/29	10/12	5/25 to 8/25, pulled for summer
1995[a]	3/14	11/1	6/1 to 8/29, pulled for summer
1996[b]	3/12	10/30	8/17 to 8/26, trap repairs
1997	4/2	11/4	5/22 to 9/1, pulled for summer
1998	4/1	10/27	7/2 to 7/7, not manned 7/11 to 7/29, not manned
1999	3/24	11/1	8/25 to 8/31, not manned 9/30 to 10/3, not manned

[a] Steelhead were not PIT tagged this year.
[b] Steelhead were only PIT tagged in September and October.

Table 27. Summary of the dates the Marsh Creek screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	4/8	11/4	6/2 to 8/18, pulled for summer
1994	3/16	11/2	3/30 to 4/5 6/2 to 8/18, pulled for summer
1995	3/30	11/11	5/15 to 5/17 6/9 to 8/21, pulled for summer
1996	3/14	5/29	Not fished after 5/29, no chinook parr in stream
1997	7/16	11/15	None
1998	3/19	11/8	None
1999	3/19	11/3	3/28 to 4/4 4/7 4/10 to 4/12 4/15 5/5 6/29 to 7/14

Table 28. Summary of the dates the SF Salmon River (at Knox bridge) screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	4/3	11/4	6/16 to 8/18, pulled for summer
1994	3/16	10/25	6/2 to 8/29, pulled for summer
1995	4/3	11/2	6/3 to 8/28, pulled for summer
1996	3/16	10/22	5/16 to 7/28
1997	3/16	10/20	5/14 to 7/8
1998	3/12	10/12	5/10 to 6/15 8/28 to 9/3, trap repairs
1999	3/14	10/16	4/6 to 4/12 5/23 to 6/30

Table 29. Summary of the dates the Pahsimeroi River screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	No steelhead were tagged this year.		
1994	3/3	12/12	6/2 to 9/8, pulled for summer 10/15 to 10/17, trap repairs
1995	3/15	12/6	4/8 to 4/18 6/23 to 8/29, pulled for summer 9/17 to 9/20, trap repairs
1996	3/11	11/13	3/21 to 3/24 6/30 to 7/1
1997	3/5	12/2	None
1998	3/13	11/30	11/16 to 11/19, trap repairs
1999	3/17	11/30	None

Table 30. Summary of the dates the Crooked Fork Creek screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	3/17	11/14	6/9 to 8/19, pulled for summer 9/3 to 9/7, trap repairs
1994	3/16	11/7	6/2 to 8/25, pulled for summer
1995	3/21	11/2	5/10 to 5/16 6/2 to 8/23, pulled for summer
1996	3/23	11/14	None
1997	3/18	11/11	5/15 to 7/1
1998	3/11	11/11	5/3 to 5/12 5/22 to 5/24 7/24 to 7/29, trap repairs
1999	3/11	11/10	5/23 to 6/29

Table 31. Summary of the dates the Fish Creek screw trap was operated from 1993 to 1999. We began fishing the trap throughout the summer in 1996. Trap was not fished because of high water flows unless otherwise noted.

Year	Start	End	Dates the trap was not fishing
1993	Not operated		
1994[a]	3/18	11/7	6/14 to 9/21, pulled for summer
1995	3/15	11/2	5/18 to 5/22 6/15 to 8/16, pulled for summer 8/23 to 8/26, not manned
1996	3/20	11/11	4/16 to 4/22 5/18 to 5/19
1997	3/19	11/11	5/10 to 6/11
1998	3/17	11/10	7/14 and 7/15, trap repairs
1999	3/16	11/8	4/26 to 4/30 5/2 to 5/5 5/21 to 6/8 7/27 to 7/29, trap repairs

[a] National Biological Survey (now Biological Resources Division, U.S. Geological Survey), operated the screw trap from March 13 to June 13.

Table 32. Date that the cumulative percentage (quantile) of the yearly total of steelhead were tagged at screw traps from 1996 to 1999.

Trap site	Number Tagged	Date quantile attained				
		10%	25%	50%	75%	90%
1996						
Crooked Fork Creek	1,123	5/26	7/19	8/29	9/16	10/17
Fish Creek	3,230	8/19	9/6	9/16	9/23	10/16
Red River	176	4/25	5/9	6/3	6/17	6/23
Marsh Creek[a]	51	4/13	4/24	5/4	5/12	5/25
Pahsimeroi River	151	5/10	5/18	5/26	8/19	9/18
SF Salmon River	109	4/17	5/13	8/3	8/9	9/20
1997						
Crooked Fork Creek	645	4/21	7/8	8/27	9/17	10/6
Fish Creek	2,961	8/26	9/7	9/16	9/27	10/6
Red River	142	4/17	5/3	5/21	9/28	10/10
Marsh Creek	122	7/19	7/27	8/15	9/18	10/18
Pahsimeroi River	204	5/8	5/15	8/5	9/13	9/26
SF Salmon River	237	4/26	7/13	8/4	8/13	9/13
1998						
Crooked Fork Creek	462	4/22	4/23	5/21	7/31	8/23
Fish Creek	3,774	8/23	9/12	9/20	10/3	10/15
Red River	84	4/23	5/1	5/9	5/17	8/29
Marsh Creek	195	4/21	4/29	5/20	7/10	8/1
Pahsimeroi River	538	4/24	5/19	8/29	9/15	9/19
SF Salmon River	218	4/26	7/2	7/15	8/2	9/10
1999						
Crooked Fork Creek	425	4/18	5/9	8/8	9/30	10/29
Fish Creek	7,799	8/23	9/7	9/27	10/9	10/10
Red River	114	5/3	6/15	8/16	9/2	10/7
Marsh Creek	95	6/13	7/3	8/4	9/8	10/12
Pahsimeroi River	992	4/28	5/12	5/19	8/19	9/8
SF Salmon River	221	7/4	7/11	7/31	8/24	9/29

[a] Marsh Creek trap was only fished until May 29 this year.

Table 33. The number of PIT-tagged juvenile steelhead that were collected fly-fishing or electrofishing from 1993 to 1999. Collection method was fly-fishing with barbless hooks unless noted.

	Collection Dates			Fork Length		Weight		
Release Site	Start	End	Number Tagged	Number	Mean	Number	Mean	Condition Factor
1993								
Fish Creek	08/24/93	08/25/93	394	394	138 (23)	393	28.1 (14.7)	0.97784 (0.08279)
1994								
Fish Creek	07/09/94	07/10/94	350	350	143 (51)	344	35.4 (20.5)	1.12381 (0.07788)
Fish Creek	08/31/94	09/01/94	759	759	133 (27)	727	22.8 (14.6)	0.86971 (0.08277)
Gedney Creek	07/24/94	07/25/94	481	267	132 (25)	244	26.3 (15.3)	1.02732 (0.08122)
Gedney Creek	09/08/94	09/08/94	379	377	137 (25)	374	26.1 (14.7)	0.94284 (0.10428)
1995								
Fish Creek	07/08/95	07/09/95	424	417	142 (25)	367	36.5 (21.8)	1.14747 (0.09024)
Fish Creek	09/03/95	09/04/95	357	350	148 (23)	341	35.5 (17.8)	1.01452 (0.06285)
Gedney Creek	07/23/95	07/24/95	364	364	139 (25)	360	30.3 (18.8)	1.02919 (0.07033)
Gedney Creek	08/19/95	08/19/95	279	279	146 (25)	271	34.0 (19.3)	1.00299 (0.07363)
1996								
Fish Creek	07/14/96	07/15/96	489	489	149 (27)	472	41.1 (22.9)	1.11673 (0.06573)
Fish Creek	08/26/96	08/28/96	656	655	150 (24)	653	38.5 (20.4)	1.04834 (0.07161)
Gedney Creek	07/28/96	07/29/96	582	582	140 (27)	574	32.4 (19.0)	1.05845 (0.06487)
Gedney Creek	08/23/96	08/24/96	422	422	144 (26)	420	33.6 (19.1)	1.03171 (0.06581)
Rapid River	08/11/96	08/20/96	225	225	192 (31)	171	86.2 (40.6)	1.12333 (0.10565)
Rapid River	09/09/96	09/12/96	137	137	193 (29)	137	83.9 (39.7)	1.09171 (0.09871)
1997								
Fish Creek	07/27/97	07/27/97	315	315	146 (26)	306	37.3 (19.8)	1.09271 (0.06220)
Fish Creek	09/11/97	09/11/97	242	242	154 (24)	240	38.8 (18.4)	0.99462 (0.05374)
Gedney Creek	08/11/97	08/11/97	254	254	133 (27)	252	26.7 (16.3)	1.00228 (0.05980)
Gedney Creek	09/09/97	09/09/97	189	189	139 (27)	188	30.1 (18.5)	0.99089 (0.05413)
Rapid River	09/04/97	09/09/97	218	218	204 (38)	0	—	—
Lick Creek	08/21/97	08/26/97	494	461	162 (30)	0	—	—
Secesh River[a]	08/13/97	08/13/97	93	93	95 (19)	93	11.1 (12.5)	1.12368 (0.10541)
Lake Creek[a]	08/14/97	08/14/97	23	23	124 (38)	0	—	—
Bear Valley Creek[a]	08/18/97	08/19/97	96	95	119 (17)	0	—	—
Elk Creek[a]	08/21/97	08/21/97	94	94	121 (22)	0	—	—
1998								
Fish Creek	07/19/98	07/27/98	311	311	158 (19)	294	49.7 (22.5)	1.18628 (0.30651)
Gedney Creek	08/02/98	08/03/98	462	462	131 (28)	444	26.6 (18.7)	1.01771 (0.06345)
Gedney Creek	09/03/98	09/04/98	294	294	137 (27)	290	28.1 (18.4)	0.97976 (0.05349)
Lick Creek	08/20/98	09/15/98	691	691	167 (24)	86	45.3 (18.1)	1.10950 (0.13474)
Three Links Creek	08/20/98	08/22/98	498	498	172 (22)	436	55.7 (20.9)	1.03168 (0.05392)
1999								
Fish Creek	07/25/99	07/26/99	501	501	145 (26)	410	39.5 (22.0)	1.16254 (0.06548)
Gedney Creek	08/08/99	08/09/99	405	405	138 (28)	203	31.6 (21.1)	1.06898 (0.05974)
Gedney Creek	08/27/99	08/28/99	269	269	143 (26)	0	—	—
O'Hara Creek	08/29/99	08/29/99	125	125	135 (26)	84	30.6 (19.0)	1.11689 (0.06984)
Lick Creek	07/18/99	07/31/99	65	65	143 (23)	0	—	—
Lick Creek	08/14/99	08/24/99	556	556	143 (25)	365	35.4 (18.9)	1.11667 (0.12219)
Bear Valley Creek[a]	07/27/99	07/27/99	21	21	111 (25)	0	—	—
Big Creek[a]	08/29/99	08/29/99	110	110	113 (16)	66	16.8 (6.8)	1.11887 (0.10407)
Camas Creek[a]	08/10/99	08/10/99	71	71	98 (17)	47	12.2 (6.4)	1.23879 (0.10206)
Loon Creek[a]	08/06/99	08/07/99	155	154	92 (13)	153	10.9 (4.5)	1.34076 (0.09914)

[a] Collected by electrofishing. Fish were PIT tagged by Steve Achord, NMFS, for IDFG.

Table 34. Maximum likelihood estimates of the number of juvenile steelhead migrants leaving Fish Creek from 1994 to 1999. The fall period was defined from August 15 to the end of the season except 1994 (September 22 to end) and 1995 (August 18 to end). P = trap efficiency estimate.

Trap period							Lower	Upper	Log
Start	End	Catch	Marks	Recaps	P	Migrants	95% CI	95% CI	likelihood
09/22/94	10/20/94	775	530	149	0.28	2,754	2,385	3,212	-7.337
10/21/94	10/25/94	1,430	286	159	0.56	2,567	2,316	2,882	-7.194
10/26/94	11/07/94	703	393	37	0.35	2,014	1,748	2,348	-7.148
	Entire Year					**7,335**	**6,793**	**7,954**	
03/16/95	04/27/95	64	22	5	0.23	275	142	724	-4.482
04/28/95	05/26/95	157	98	8	0.08	1,913	1,044	4,147	-5.331
05/27/95	06/14/95	306	250	41	0.16	1,862	1,404	2,552	-6.38
08/18/95	11/02/95	613	513	41	0.08	7,664	5,745	10,552	-6.823
	Entire Year					**11,713**	**9,399**	**15,027**	
	Fall 1995					**7,664**	**5,745**	**10,552**	
03/23/96	06/16/96	27	19	2	0.11	249	85	1,476	-3.765
06/17/96	08/14/96	343	272	55	0.20	1,693	1,329	2,212	-6.536
08/15/96	09/24/96	2,710	1,395	362	0.26	439	9,519	1,497	-8.436
09/25/96	10/13/96	195	168	24	0.14	1,361	944	2,076	-5.913
10/14/96	11/11/96	814	524	121	0.23	3,521	2,996	4,189	-7.325
	Entire Year					**17,263**	**15,969**	**18,803**	
	Fall 1996					**15,321**	**14,131**	**16,677**	
03/18/97	06/21/97	44	33	2	0.06	715	236	4,267	-4.057
06/22/97	07/07/97	47	37	2	0.05	858	282	5,128	-4.097
07/08/97	08/14/97	156	127	15	0.12	1,315	833	2,270	-5.597
08/15/97	09/21/97	2,275	1,043	284	0.27	8,351	7,537	9,303	-8.21
09/22/97	10/29/97	862	550	141	0.26	3,359	2,896	3,938	-7.396
10/30/97	11/07/97	227	126	40	0.32	712	550	959	-6.015
	Entire Year					**15,309**	**13,740**	**19,693**	
	Fall 1997					**12,421**	**11,445**	**13,527**	
03/18/98	06/08/98	61	53	3	0.06	1,067	415	4,276	-4.413
06/09/98	07/06/98	150	132	9	0.07	2,192	1,222	4,547	-5.381
07/07/98	08/14/98	122	101	22	0.22	557	384	861	-5.544
08/15/98	09/07/98	429	356	61	0.17	2,500	1,980	3,229	-6.738
09/08/98	10/18/98	3,329	1,415	455	0.32	10,349	9,563	11,239	-8.565
10/19/98	11/10/98	483	319	152	0.48	1,012	92	1,161	-6.793
	Entire Year					**17,676**	**15,930**	**21,141**	
	Fall 1998					**13,860**	**12,881**	**14,978**	
03/18/99	07/16/99	89	81	5	0.06	1,433	670	3,984	-4.841
07/17/99	08/14/99	336	149	37	0.25	1,348	1,025	1,849	-6.269
08/15/99	10/08/99	5,514	2,210	852	0.39	14,299	13,527	15,146	-9.032
10/09/99	10/11/99	2,623	150	67	0.45	5,853	4,954	7,108	-7.286
10/12/99	10/26/99	228	153	59	0.39	589	477	748	-6.106
10/27/99	11/08/99	260	179	48	0.27	967	754	1,278	-6.244
	Entire Year					**24,488**	**22,862**	**27,263**	
	Fall 1999					**21,708**	**20,453**	**23,208**	

Table 35. The number of steelhead smolts that were detected at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams each migration year. Smolts that were detected at more than one dam were only counted at the first detection site.

	Smolt Migration Year						
Stream	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**Total**
Clearwater River drainage							
Crooked Fork Creek	293	151	155	544	551	251	1,945
Clear Creek	13	0	96	115	27	192	443
Fish Creek	128	709	635	1,781	2,054	1,888	7,195
Gedney Creek	0	117	122	188	98	115	640
Red River	84	18	2	0	56	23	183
Three Links Creek	0	0	0	0	0	80	80
White Sand Creek	0	0	0	0	0	248	248
Salmon River drainage							
Lick Creek	0	0	0	0	14	22	36
Lower SF Salmon River	0	0	0	0	34	91	125
Marsh Creek	16	31	26	11	33	17	134
Pahsimeroi River	24	45	41	196	239	361	906
Rapid River	0	149	62	28	35	0	274
SF Salmon River	4	25	15	11	48	57	160
Yearly totals	**562**	**1,347**	**1,226**	**2,942**	**3,197**	**3,345**	**12,369**

Table 36. The mean fork length (mm) of steelhead smolts, at the time of tagging, that were detected at the Snake and Columbia river dams from 1994 to 1999. Fish were PIT tagged the same spring they were detected or the previous year in the months of September, October, and November.

Stream	Capture	Number	Median	Mean	95% CI	Minimum	Maximum
Clearwater River drainage							
Crooked Fork Creek	screw trap	1,388	176	177	1	90	247
Clear Creek	screw trap	412	167	167	2	104	240
Fish Creek	fly-fishing	256	160	159	2	113	204
Fish Creek	screw trap	4,771	155	156	<1	104	222
Gedney Creek	fly-fishing	146	155	157	3	121	204
Red River	screw trap	160	163	164	3	70	206
White Sands Creek	screw trap	221	189	189	2	88	227
Salmon River drainage							
Lower SF Salmon River	screw trap	118	180	177	4	118	228
Marsh Creek	screw trap	43	167	165	6	72	193
Pahsimeroi River[a]	screw trap	790	174	173	2	92	257
Rapid River	fly-fishing	144	174.5	175	3	123	250
Rapid River[b]	screw trap	260	182.5	184	2	145	353
Secesh River	screw trap	60	177	178	3	145	206
SF Salmon River, Knox bridge	screw trap	88	165	164	5	72	210

[a] Includes steelhead caught in a box trap in 1997. Some steelhead were tagged in December at this site.
[b] Includes steelhead caught in a weir designed to trap bull trout.

Table 37. The median smolt travel time and 90% CI, in days and km/day from release site to Lower Granite Dam (LGR). All smolts were captured and PIT tagged in the spring prior to being detected at LGR.

Release site	Number	Travel time (days)			Travel time (km/day)		
		Median	Lower	Upper	Median	Lower	Upper
1994							
Crooked Fork Creek	104	12	12	14	27.0	27.0	23.1
Clear Creek	11	7	5	8	25.1	35.2	22.0
Pahsimeroi River	16	13	11	20	49.7	56.5	31.1
Red River	26	14	10	17	19.9	27.8	16.4
1995							
Crooked Fork Creek	66	9	8	9	38.1	40.5	36.0
Fish Creek	33	9	6	11	27.6	41.3	22.5
Pahsimeroi River	14	8	6	9	77.6	103.5	69.0
1996							
Crooked Fork Creek	21	6	5	7	54.0	64.8	46.3
Clear Creek	60	4	3	4	44.0	58.7	44.0
Pahsimeroi River	27	9	7	10	69.0	88.7	62.1
1997							
Crooked Fork Creek	60	5	4	6	64.8	81.0	54.0
Clear Creek	76	5	5	6	35.2	35.2	29.3
Fish Creek	14	19	10	25	13.1	24.8	9.9
Pahsimeroi River	107	8	8	9	77.6	77.6	69.0
1998							
Crooked Fork Creek	130	7	6	8	46.3	54.0	40.5
Clear Creek	12	5	3	7	35.2	58.7	25.1
Fish Creek	19	10	7	28	24.8	35.4	8.9
Lower SF Salmon River	15	7	6	8	57.6	67.2	50.4
Pahsimeroi River	32	8	7	9	77.6	88.7	69.0
Red River	27	8	7	10	34.8	39.7	27.8
1999							
Crooked Fork Creek	49	8	7	9	40.5	46.3	36.0
Clear Creek	59	5	5	6	35.2	35.2	29.3
Johnson Creek	15	10	7	19	40.7	58.1	21.4
Lower SF Salmon River	27	7	6	8	57.6	67.2	50.4
Pahsimeroi River	99	7	7	8	88.7	88.7	77.6
White Sands Creek	83	7	7	8	46.0	46.0	40.3
All years combined							
Crooked Fork Creek	430	8	8	9	40.5	40.5	36.0
Clear Creek	218	5	4	5	35.2	44.0	35.2
Fish Creek	85	9	8	10	27.6	31.0	24.8
Lower SF Salmon River	42	7	6	8	57.6	67.2	50.4
Pahsimeroi River	295	8	8	8	77.6	77.6	77.6
Red River	62	11	9	12	25.3	30.9	23.2
White Sands Creek	83	7	7	8	46.0	46.0	40.3

Table 38. Summary of age class length (mm) statistics of juvenile steelhead from scale analysis. All scales were obtained after August 14 in 1996 and 1997. Age-1 fish were defined as those fish that had lived two summers in the stream; age-2 as those living three summers; age-3 as those living four summers, and age-4 living five summers.

Stream	Age	Number	Median	Mean	95% CI	Minimum	Maximum
1996							
Fish Creek	1	154	130.5	130	2	100	166
	2	130	158.5	160	2	132	195
	3	12	181	182	8	162	203
1997							
Fish Creek	1	83	126	126	3	100	155
	2	169	163	163	2	116	204
	3	26	178.5	179	7	144	207
Gedney Creek	1	50	123	122	3	94	148
	2	75	157	157	3	118	190
	3	15	184	188	11	163	250
Lick Creek	1	31	110	108	4	80	125
	2	84	149	152	4	119	220
	3	63	190	184	5	101	214
	4	10	211	210	11	182	229
Rapid River	1	14	131	132	8	113	169
	2	60	167.5	167	5	119	197
	3	72	206	209	6	143	280
	4	37	238	235	9	176	300
1996 & 1997 combined							
Fish Creek	1	237	129	128	2	100	166
	2	299	162	162	2	116	204
	3	38	179.5	180	5	144	207

Table 39. The streams and the number of adult and juvenile steelhead that IDFG crews collected scales from to age fish in the years 1993 to 1999.

Stream	Drainage	Lifestage	Number of fish
1993			
Clear Creek	MF Clearwater	Adult	24
Rapid River	Little Salmon	Adult	73
Fish Creek	Lochsa	Juvenile	70
1994			
Clear Creek	MF Clearwater	Adult	43
Rapid River	Little Salmon	Adult	32
Fish Creek	Lochsa	Juvenile	192
Gedney Creek	Selway	Juvenile	164
Johnson Creek	SF Salmon	Juvenile	29
Rapid River	Little Salmon	Juvenile	130
White Cap Creek	Selway	Juvenile	63
1995			
Clear Creek	MF Clearwater	Adult	45
Fish Creek	Lochsa	Adult	35
Pahsimeroi River	Salmon	Adult	23
Rapid River	Little Salmon	Adult	42
Fish Creek	Lochsa	Juvenile	105
Running Creek	Selway	Juvenile	148
SF Salmon River	SF Salmon	Juvenile	45
1996			
Fish Creek	Lochsa	Adult	39
Rapid River	Little Salmon	Juvenile	363
Fish Creek	Lochsa	Juvenile	332
1997			
Fish Creek	Lochsa	Adult	22
Rapid River	Little Salmon	Adult	54
Fish Creek	Lochsa	Juvenile	413
Gedney Creek	Selway	Juvenile	150
Lick Creek	SF Salmon	Juvenile	240
Rapid River	Little Salmon	Juvenile	227
1998			
Fish Creek	Lochsa	Adult	74
Rapid River	Little Salmon	Adult	22
Boulder Creek	Lochsa	Juvenile	20
Crooked Fork Creek	Lochsa	Juvenile	13
Fish Creek	Lochsa	Juvenile	610
Gedney Creek	Selway	Juvenile	67
Pahsimeroi River	Salmon	Juvenile	95
1999			
Fish Creek	Lochsa	Adult	72
Boulder Creek	Lochsa	Juvenile	7
Crooked Fork Creek	Lochsa	Juvenile	175
Fish Creek	Lochsa	Juvenile	725
Gedney Creek	Selway	Juvenile	187
Lake Creek	SF Salmon	Juvenile	110
Pahsimeroi River	Salmon	Juvenile	240
Secesh River	SF Salmon	Juvenile	107
White Sands Ck.	Lochsa	Juvenile	127

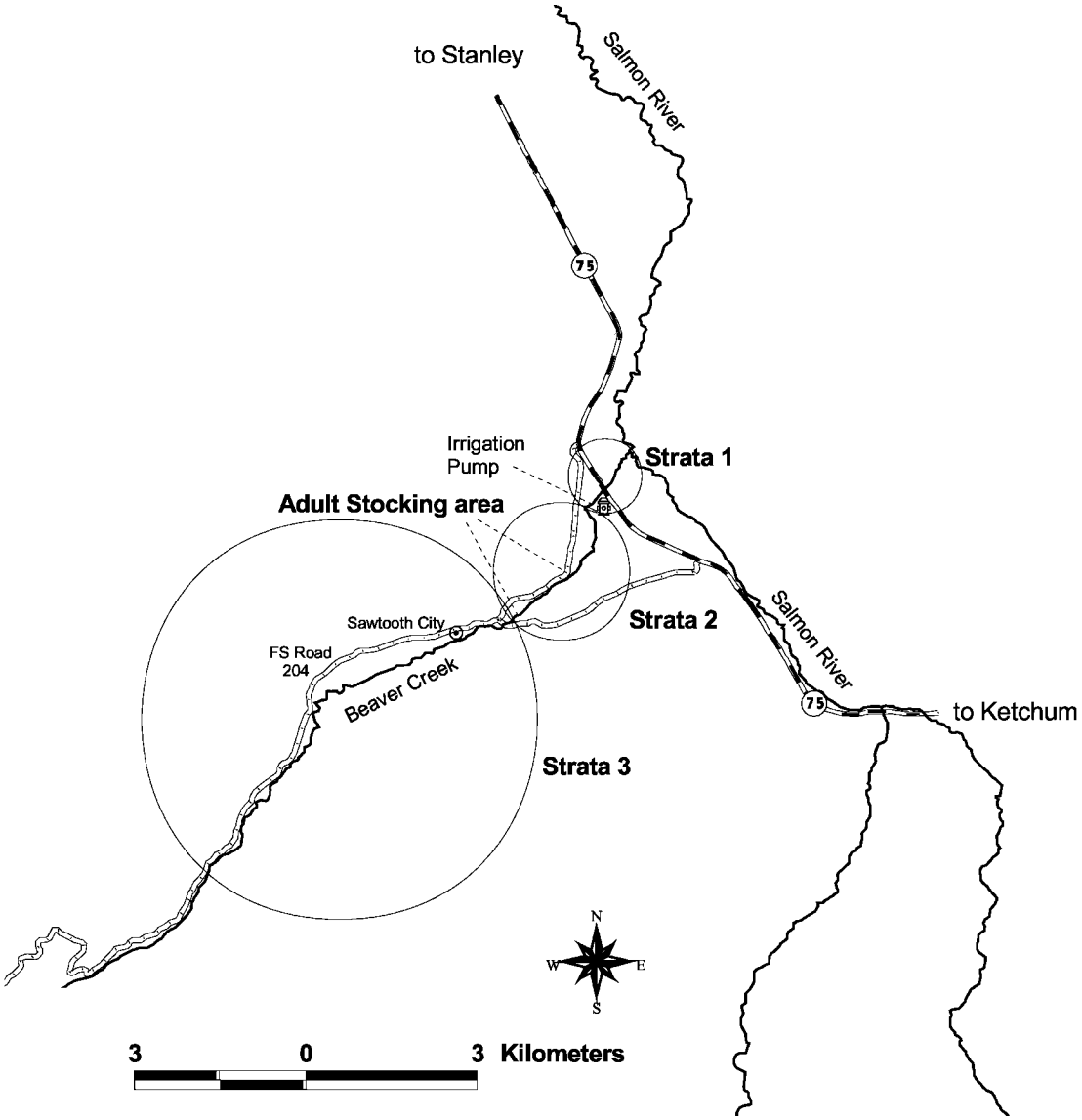


Figure 1. Map of the study area in Beaver Creek showing the three snorkel strata and the adult outplant site.

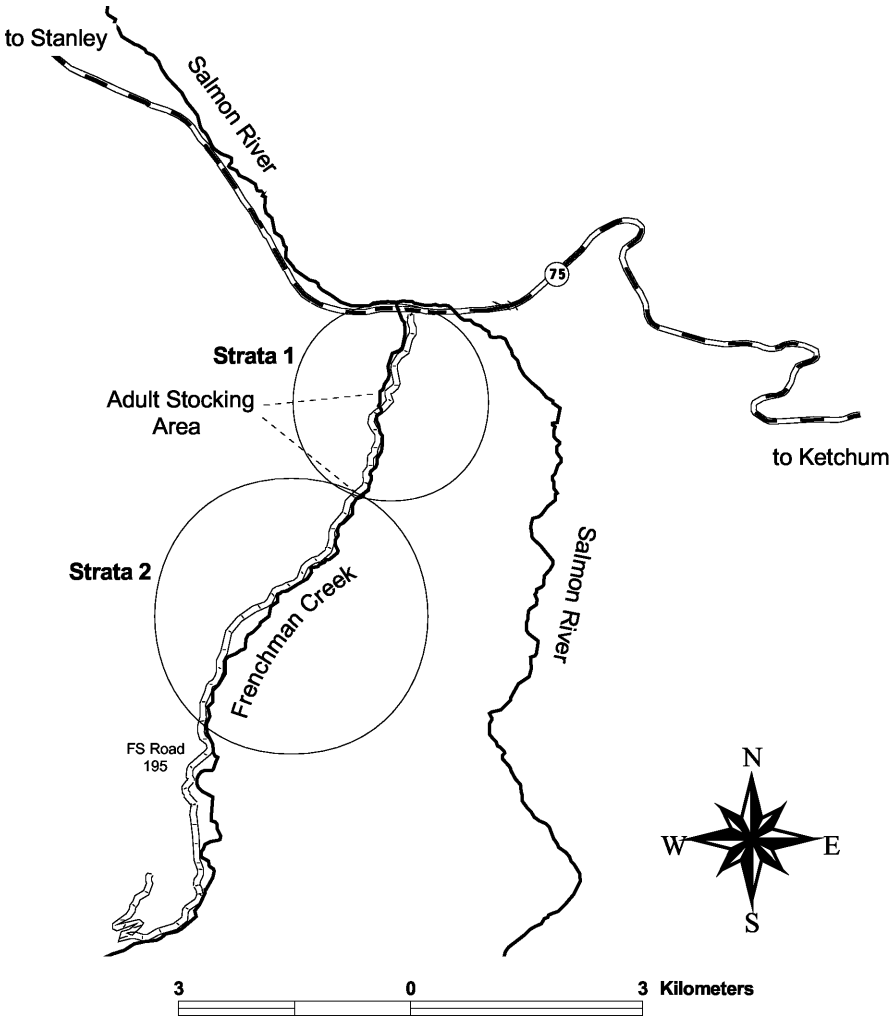


Figure 2. Map of the study area in Frenchman Creek showing the two snorkel strata and the adult outplant site.

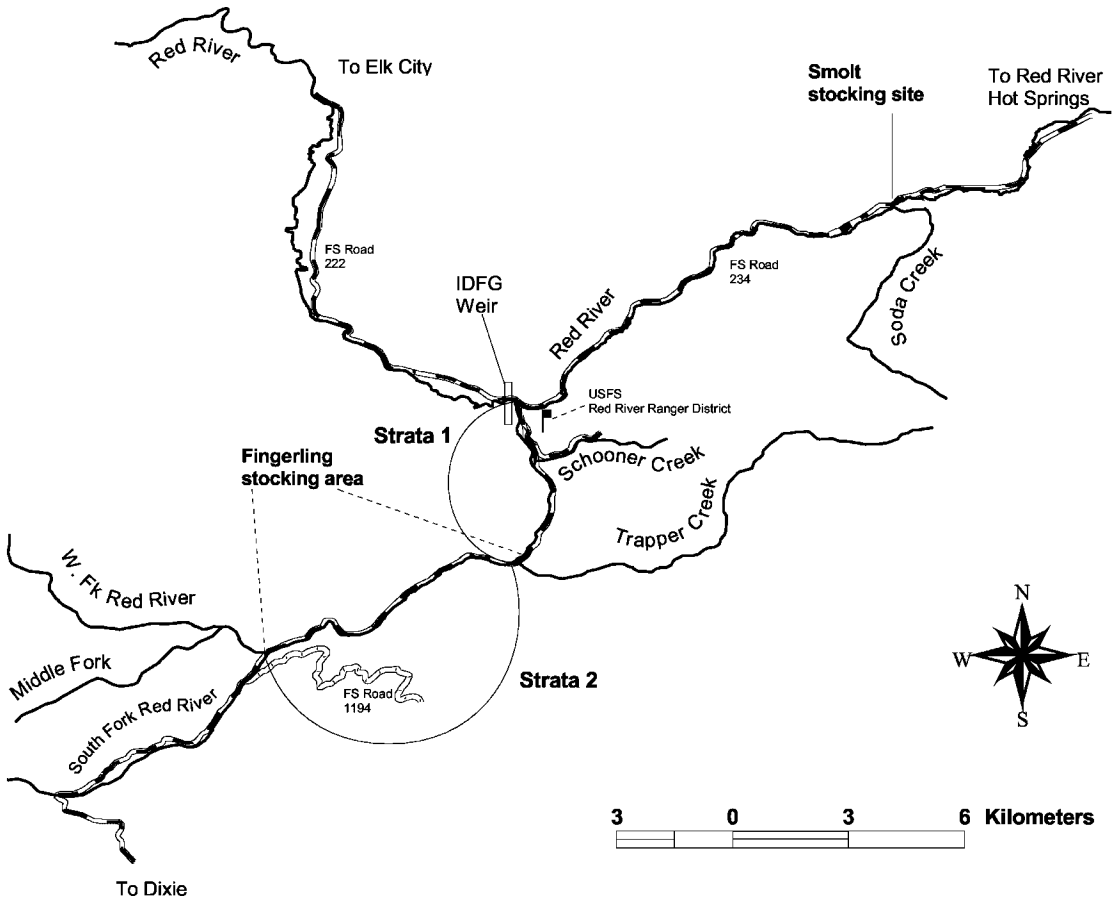


Figure 3. Map of the study area in Red River and the South Fork Red River showing the snorkel strata, fingerling stocking site, and the smolt stocking site. Idaho Fish and Game operates a weir just downstream of the confluence of the South Fork Red River and Red River.

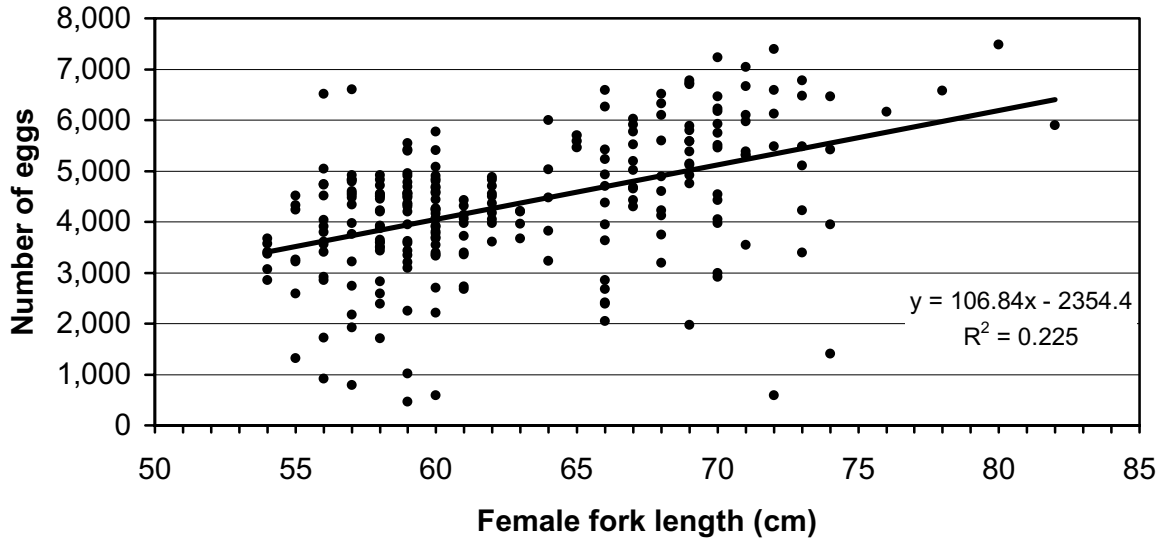


Figure 4. The regression of female fork length and fecundity of adults trapped at the Sawtooth Fish Hatchery from 1993 to 1996. The females used to stock Beaver and Frenchman creeks were sorted from fish that arrived during the time period used to develop this relationship.

Figure 5. The mean density of age-1 and age-2+ steelhead parr in the Beaver Creek supplementation strata.

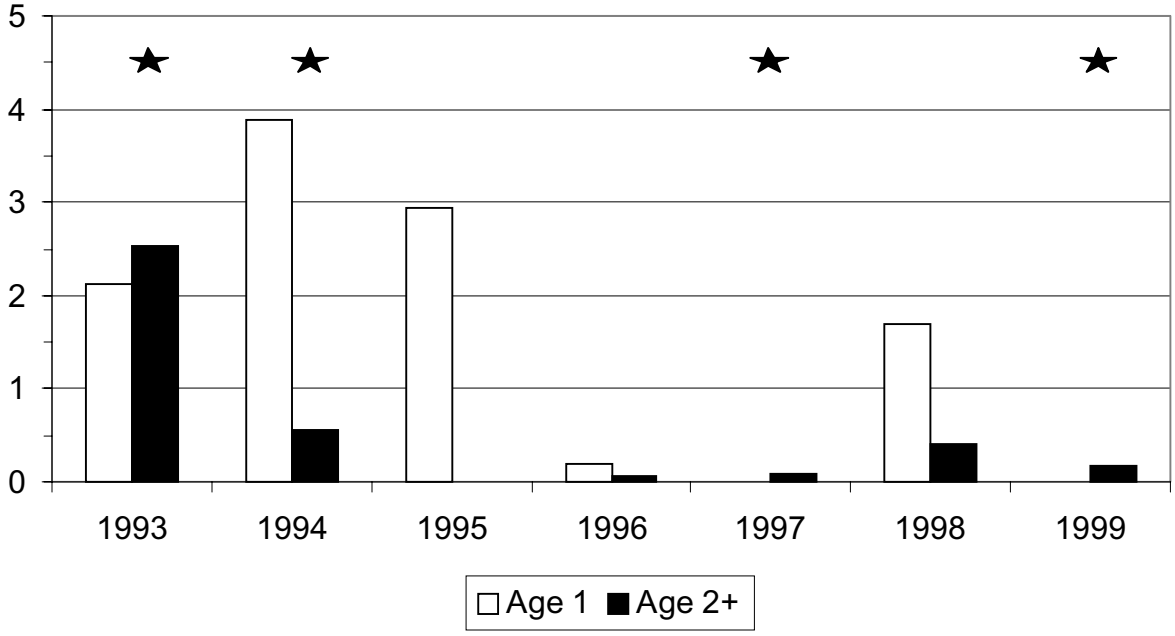


Figure 6. The mean density of age-1 and age-2+ steelhead parr in the Frenchman Creek supplementation strata. Adults were outplanted in the years marked with a star.

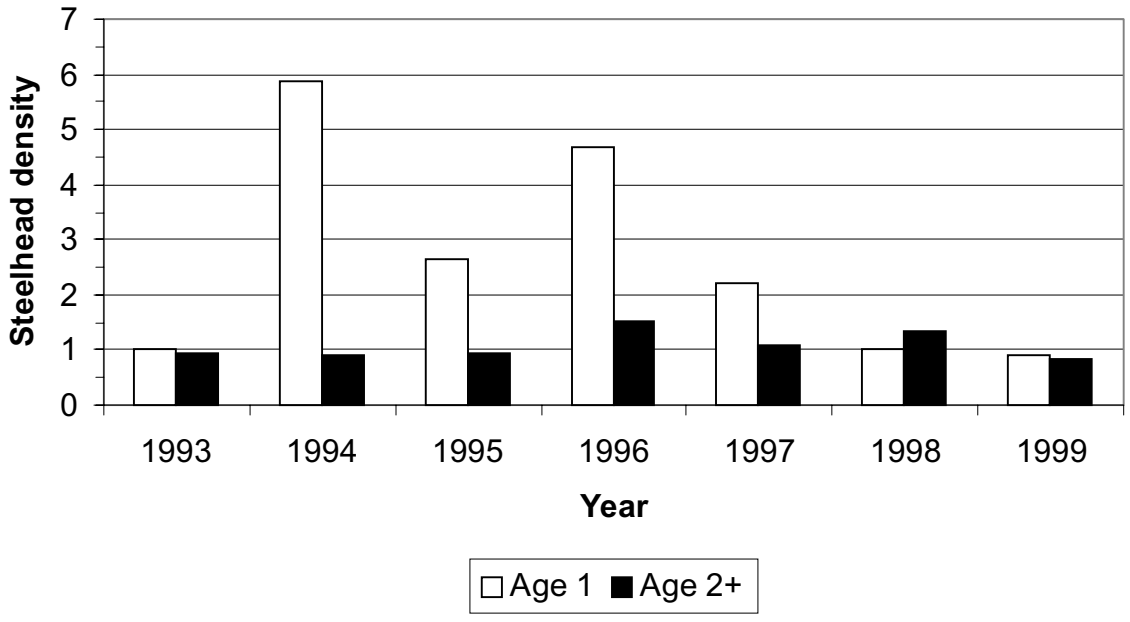


Figure 7. The mean density of age-1 and age-2+ steelhead parr in the South Fork Red River.

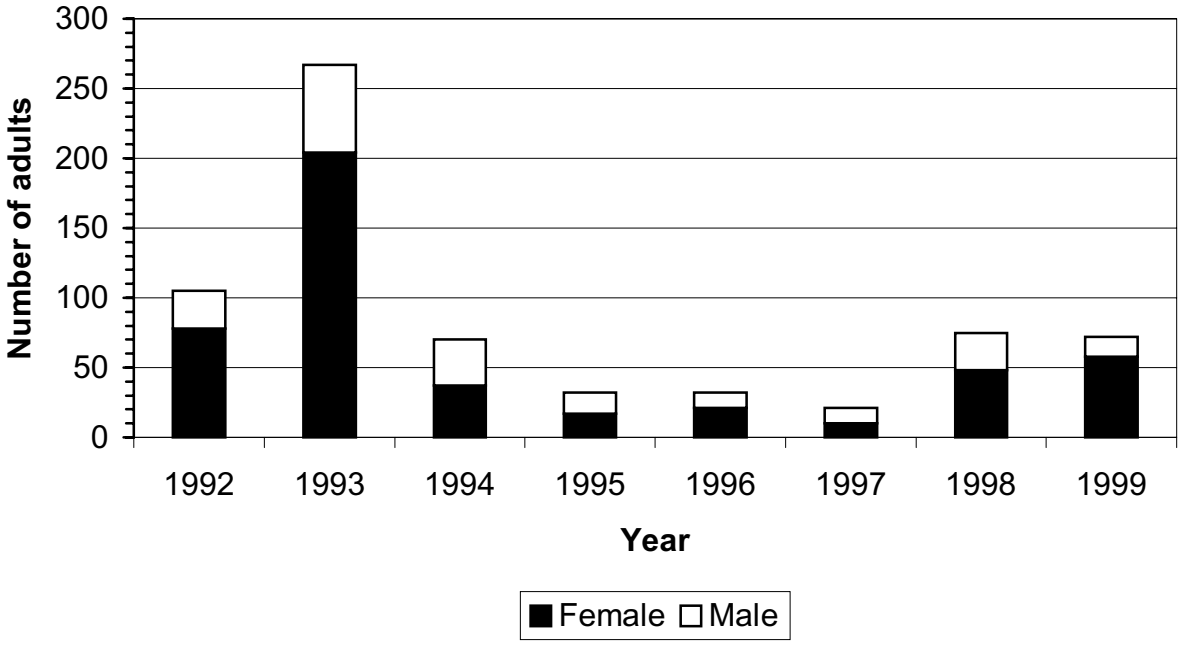


Figure 8. The number of adult female and male steelhead that were trapped at the Fish Creek weir or recovered as unmarked kelts from 1992 to 1999.

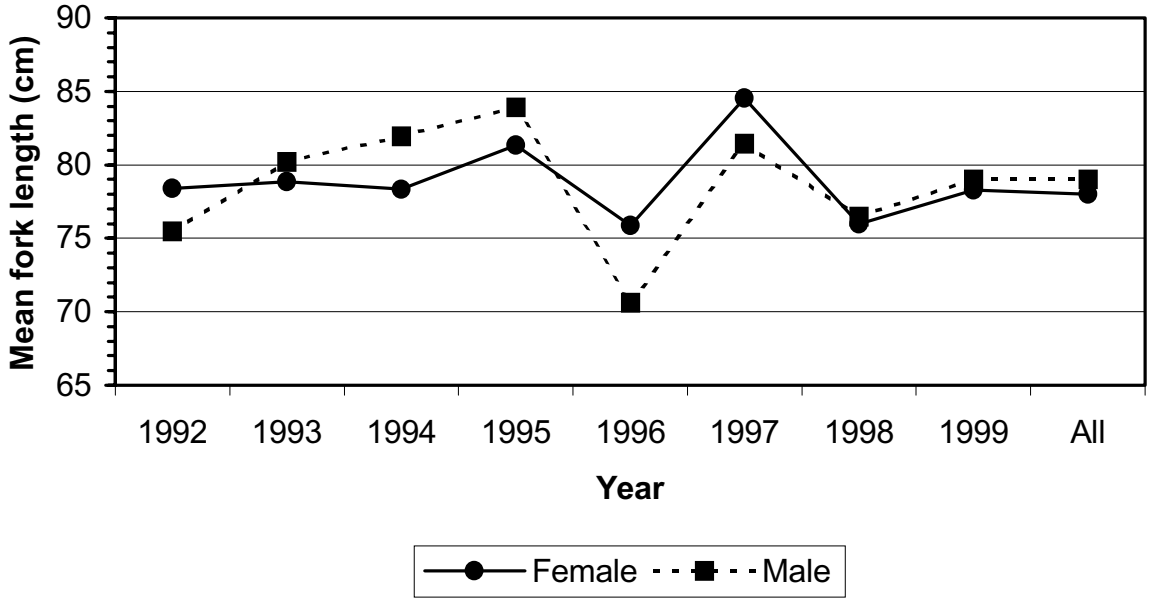


Figure 9. The mean length (cm) of adult female and male steelhead trapped at the Fish Creek weir from 1992 to 1999.

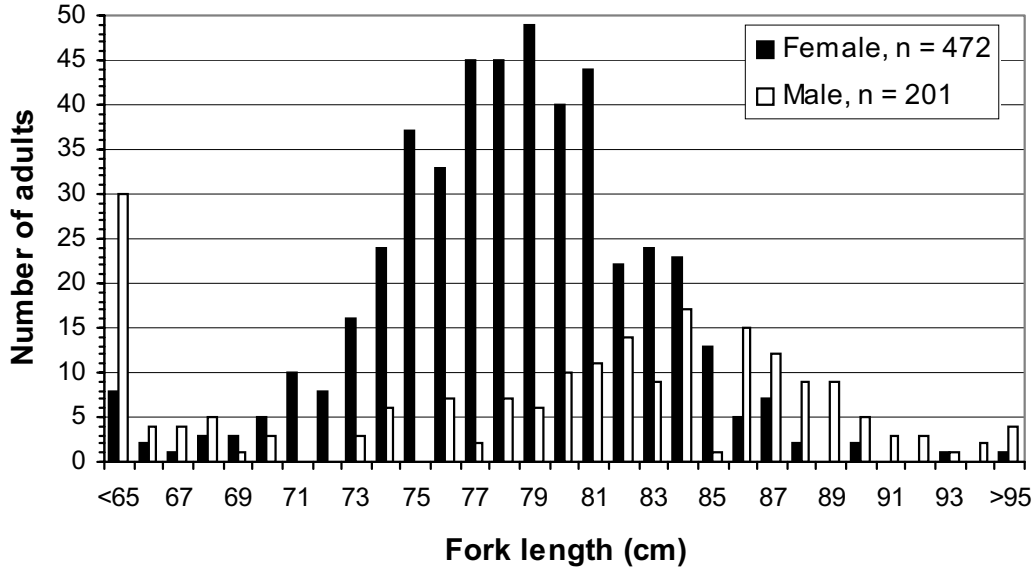


Figure 10. The length frequency of adult steelhead that were trapped at the Fish Creek weir from 1992 to 1999.

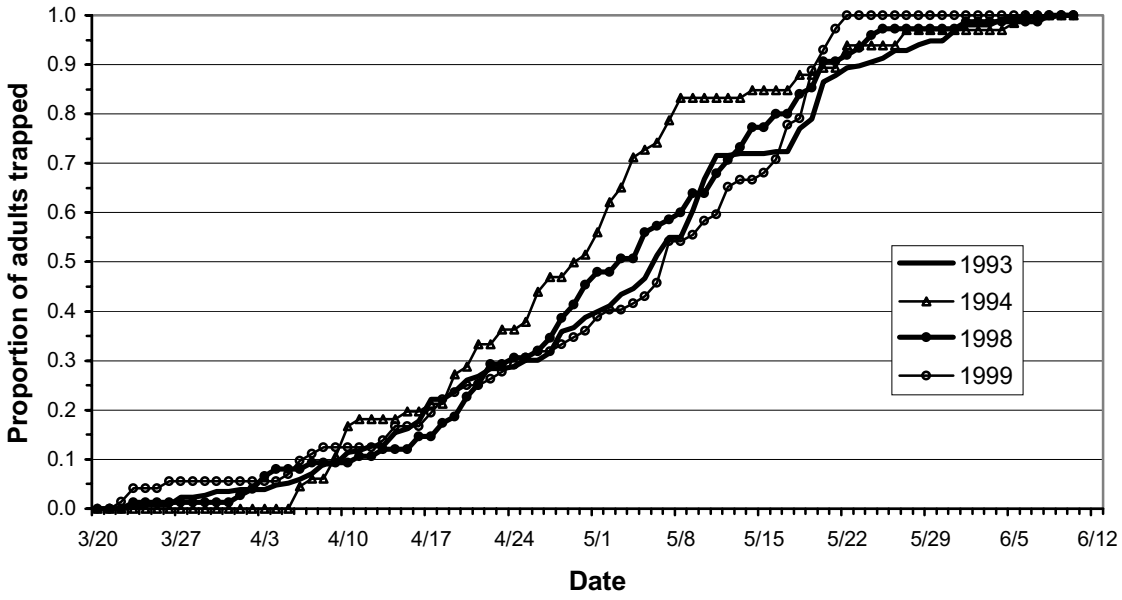


Figure 11. The proportion of adult steelhead that had arrived at the Fish Creek weir in 1993, 1994, 1998, and 1999.

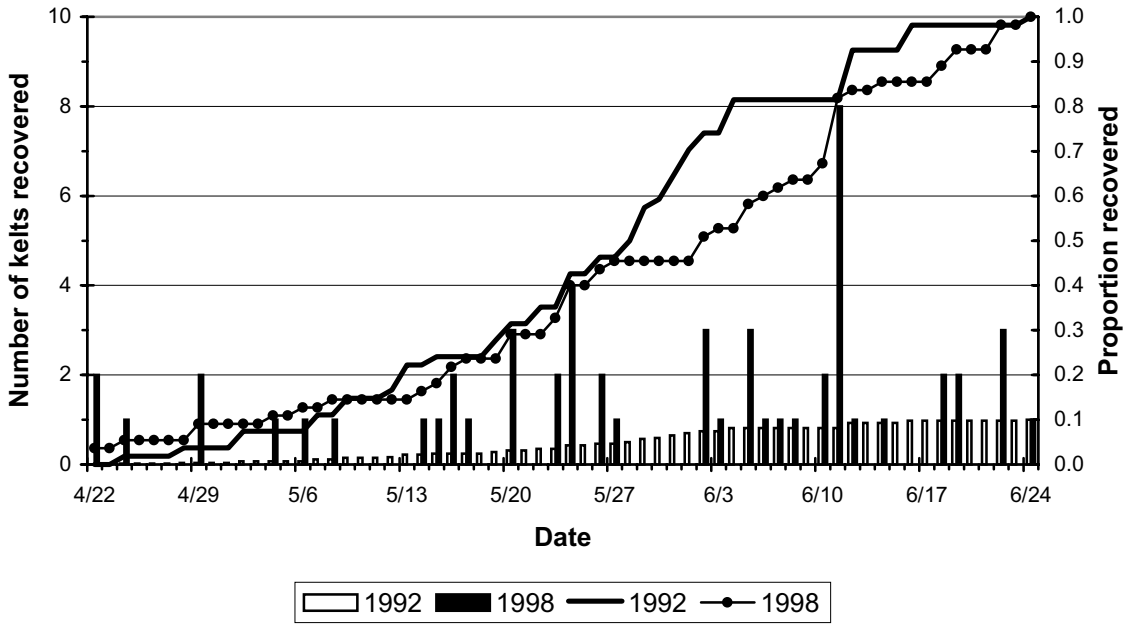


Figure 12. The daily number of kelts that were recovered at the Fish Creek weir in 1992 and 1998 (bars) and the cumulative proportion of the total recoveries by date (lines).

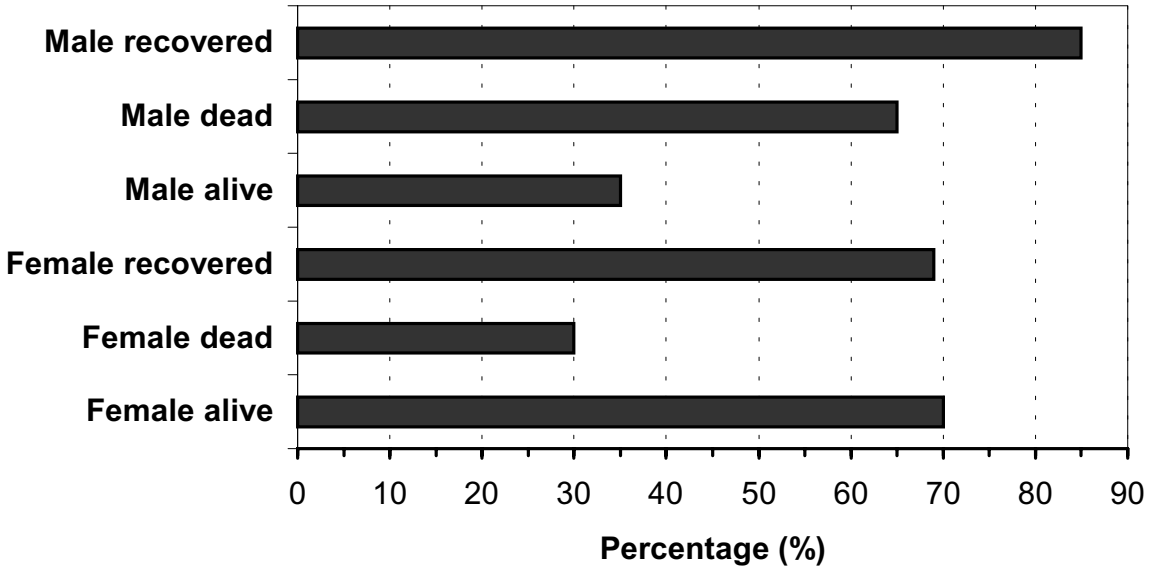


Figure 13. The percentage of steelhead adults that were passed upstream of the Fish Creek weir to spawn in 1998 that were recovered as kelts.

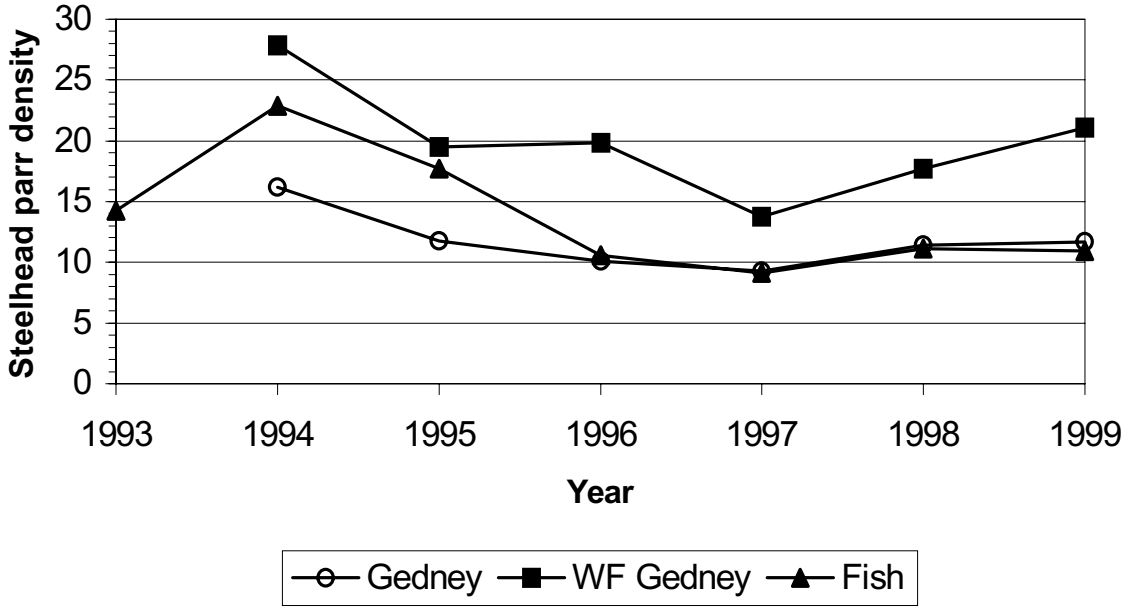


Figure 14. The weighted mean density of all steelhead parr (excluding fry) in the Fish Creek and Gedney Creek drainages from 1993 to 1999.

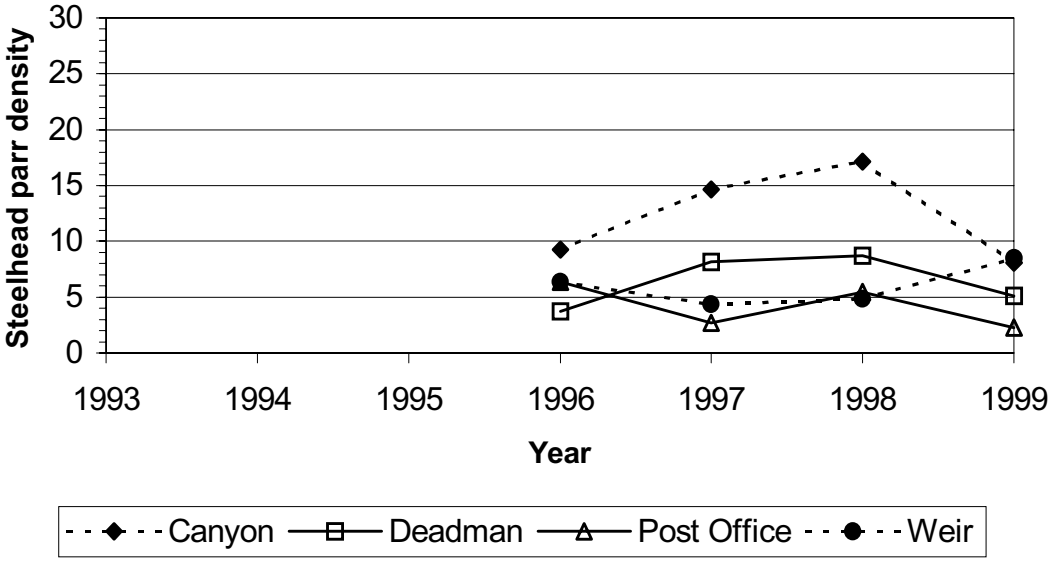


Figure 15. Mean parr density of all steelhead (excluding fry) in Lochsa River tributaries from 1996 to 1999.

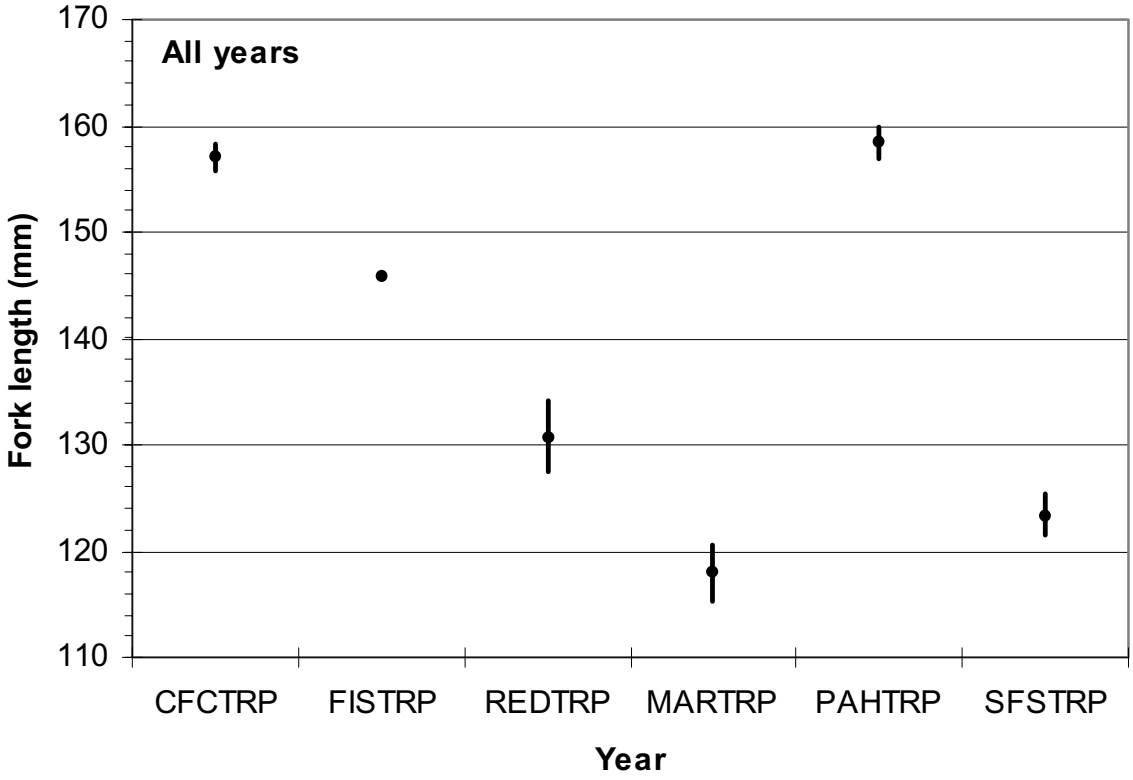


Figure 16. Mean fork length (and 95% CI) of PIT-tagged steelhead that were captured in screw traps. Data at each location was combined for 1994 to 1999. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = SF Salmon River at Knox bridge.

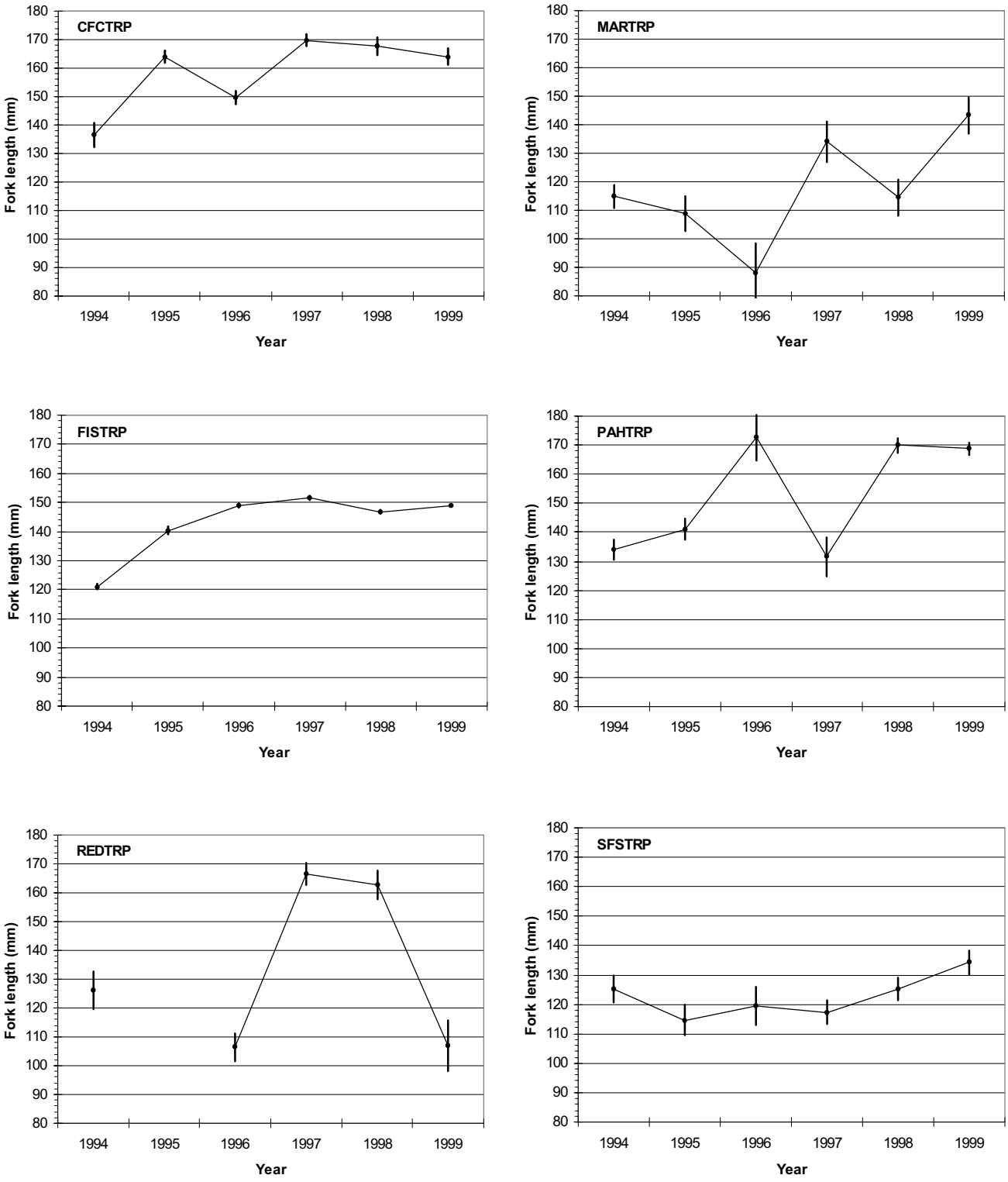
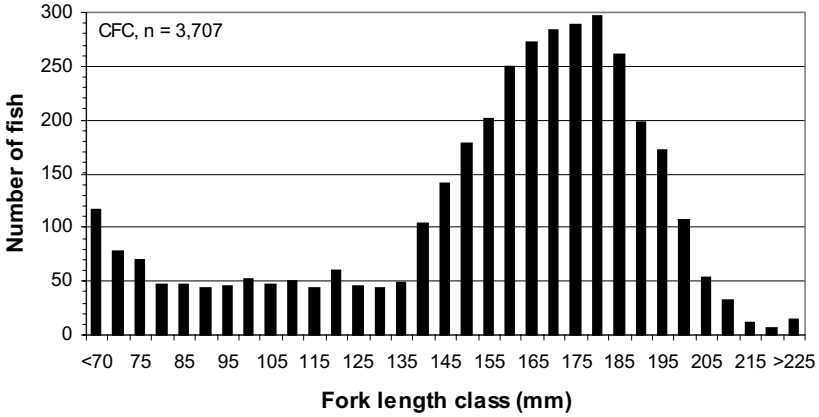
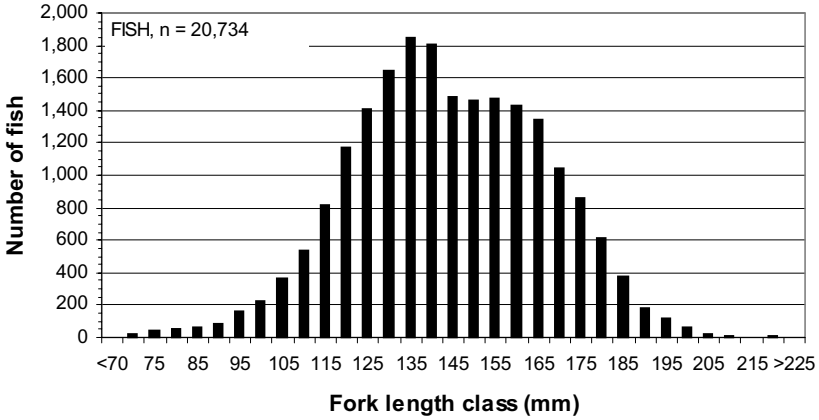


Figure 17. The yearly mean fork length (and 95% CI) of PIT-tagged steelhead captured in screw traps from 1994 to 1999. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = SF Salmon River at Knox bridge.





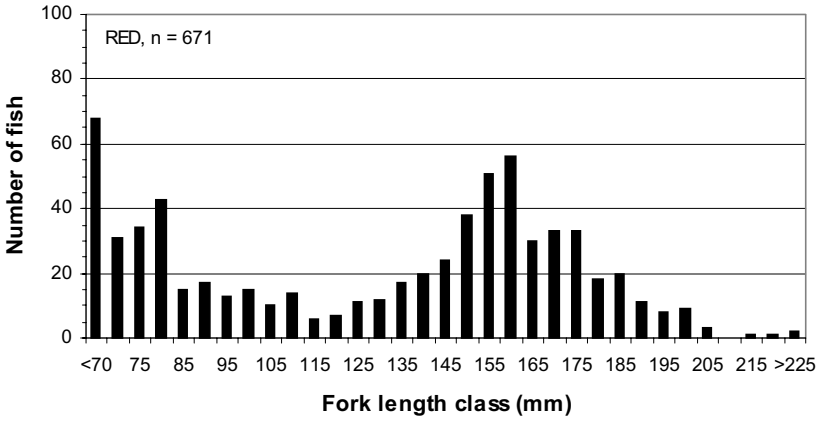


Figure 18. The length frequency distribution of all juvenile steelhead that were PIT tagged at the Crooked Fork Creek (CFC), Fish Creek (FISH), and Red River (RED) screw traps from 1994 to 1999.

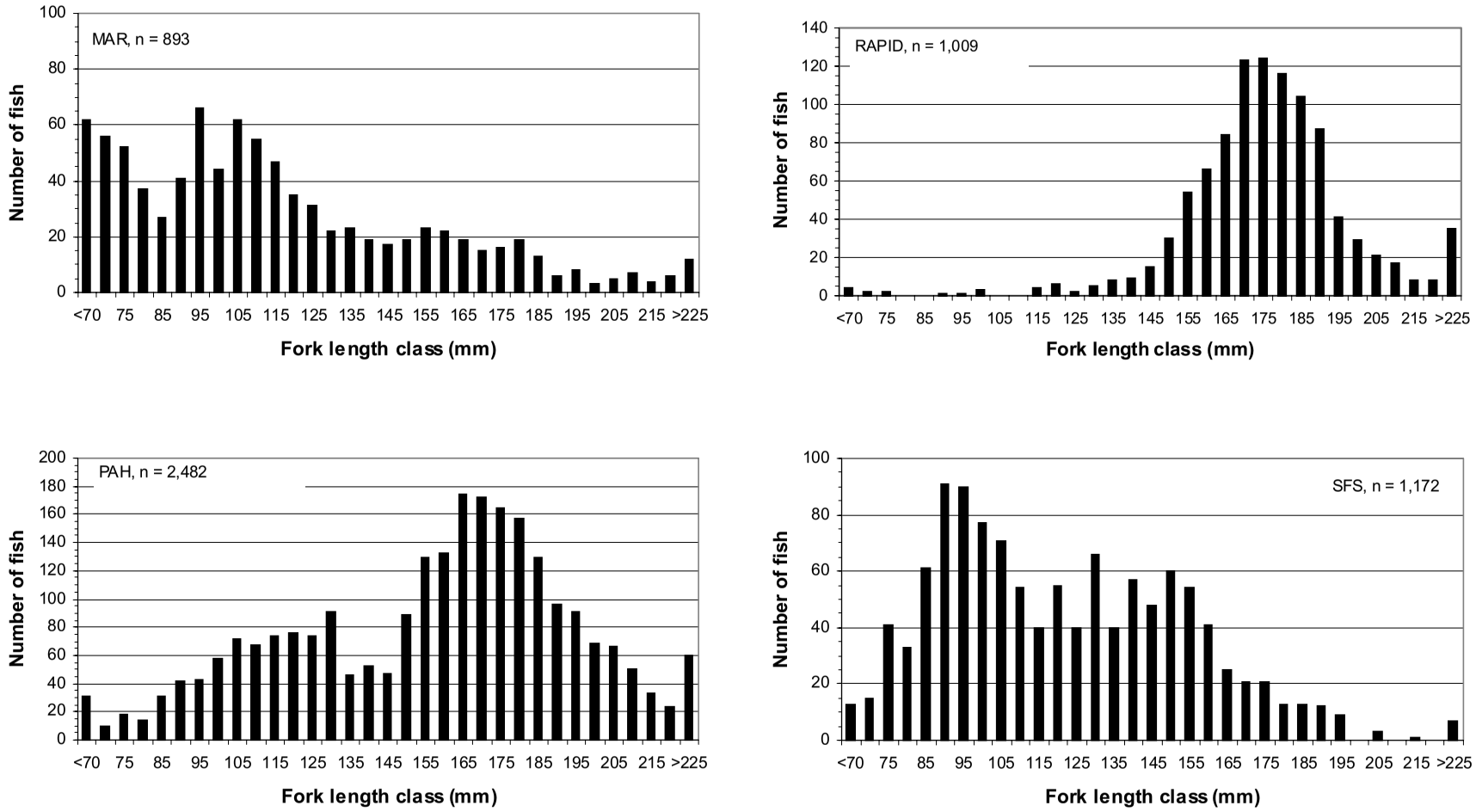


Figure 19. The length frequency of all juvenile steelhead that were PIT tagged at the Marsh Creek (MAR), Pahsimeroi River (PAH), and SF Salmon River, Knox bridge (SFS) screw traps from 1994 to 1999. Steelhead tagged at Rapid River (RAPID) were caught in a weir or screw trap from 1993 to 1997.

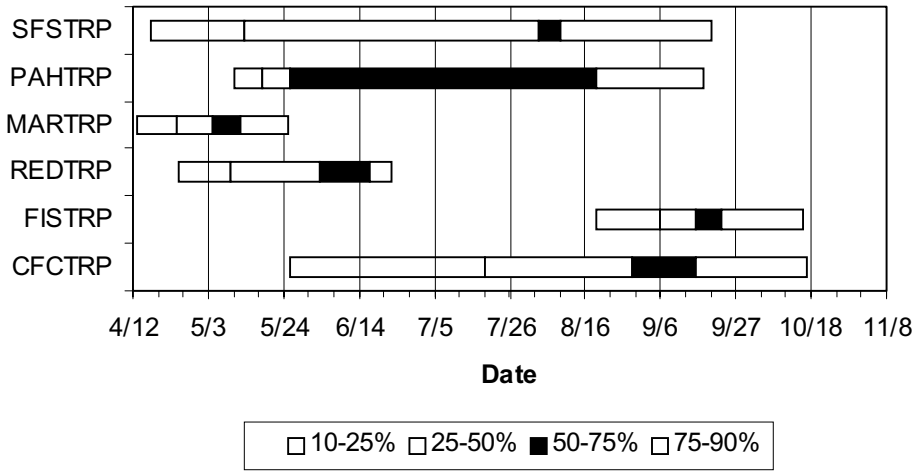


Figure 20. The cumulative proportion of steelhead that were tagged, on a daily basis, at the six screw traps in 1996. The left edge of each block is the date the lower block quantile was attained, and the right edge is the date the upper quantile of the block was attained. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = South Fork Salmon River at Knox bridge. Marsh Creek trap was only fished from March 14 to May 29. South Fork Salmon River trap was not fished from May 16 to July 28.

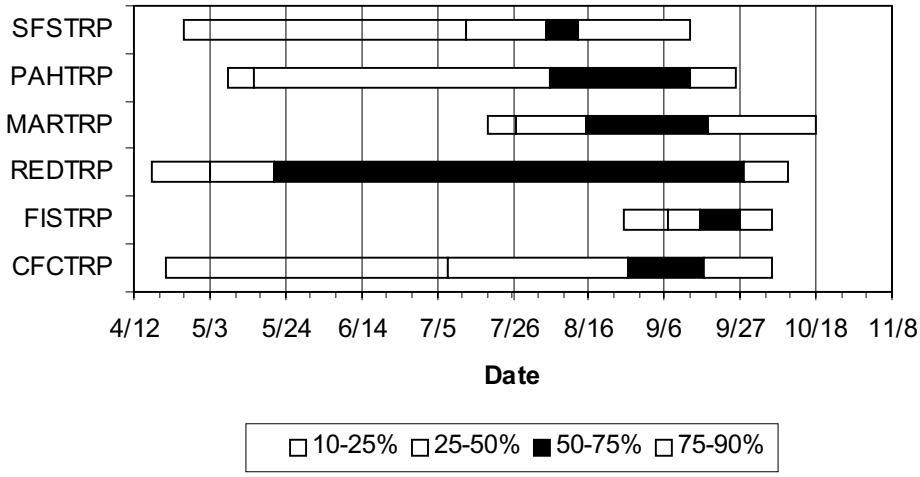


Figure 21. The cumulative proportion of steelhead that were tagged, on a daily basis, at the six screw traps in 1997. The left edge of each block is the date the lower block quantile was attained, and the right edge is the date the upper quantile of the block was attained. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = South Fork Salmon River at Knox bridge. Marsh Creek trap was fished from July 16 to November 15. Red River trap was not fished from May 22 to September 1. South Fork Salmon River trap was not fished from May 14 to July 8.

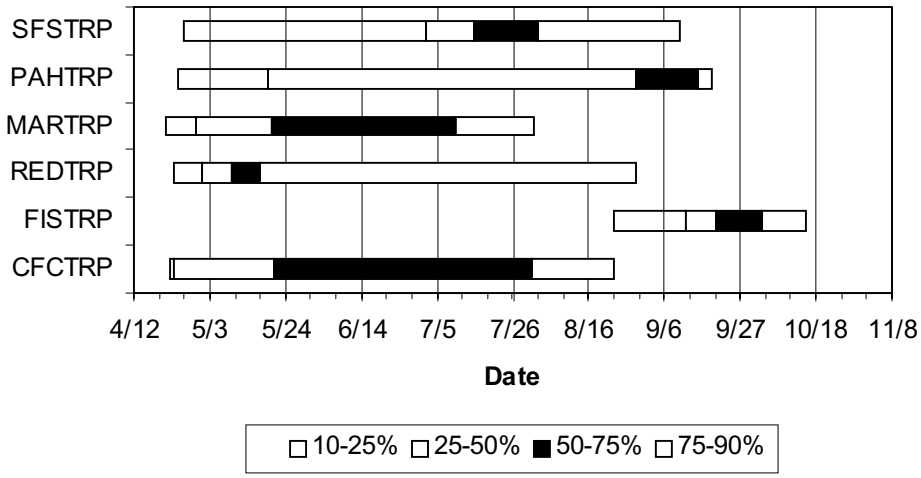


Figure 22. The cumulative proportion of steelhead that were tagged, on a daily basis, at the six screw traps in 1998. The left edge of each block is the date the lower block quantile was attained, and the right edge is the date the upper quantile of the block was attained. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = South Fork Salmon River at Knox bridge. Red River trap only fished six days in July. South Fork Salmon River trap was not fished from May 10 to June 15.

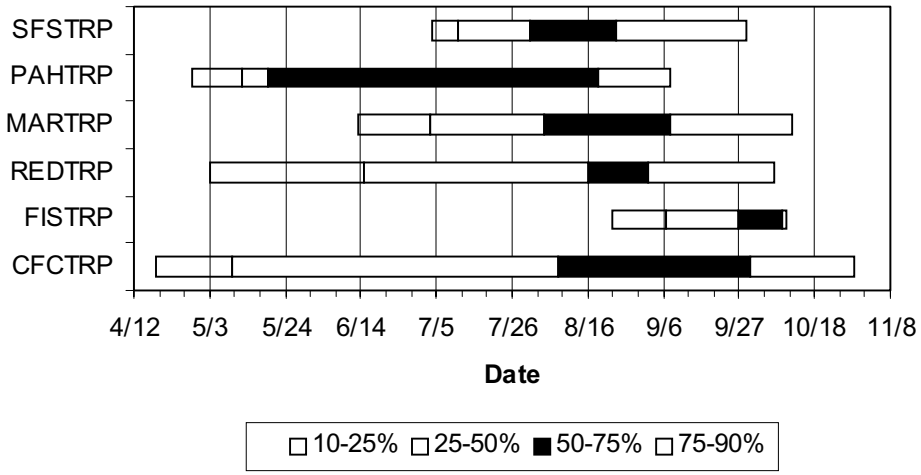


Figure 23. The cumulative proportion of steelhead that were tagged, on a daily basis, at the six screw traps in 1999. The left edge of each block is the date the lower block quantile was attained and the right edge is the date the upper quantile of the block was attained. CFCTRP = Crooked Fork Creek; FISTRP = Fish Creek; REDTRP = Red River; MARTRP = Marsh Creek; PAHTRP = Pahsimeroi River; SFSTRP = South Fork Salmon River at Knox bridge. South Fork Salmon River trap was not fished from May 23 to June 30.

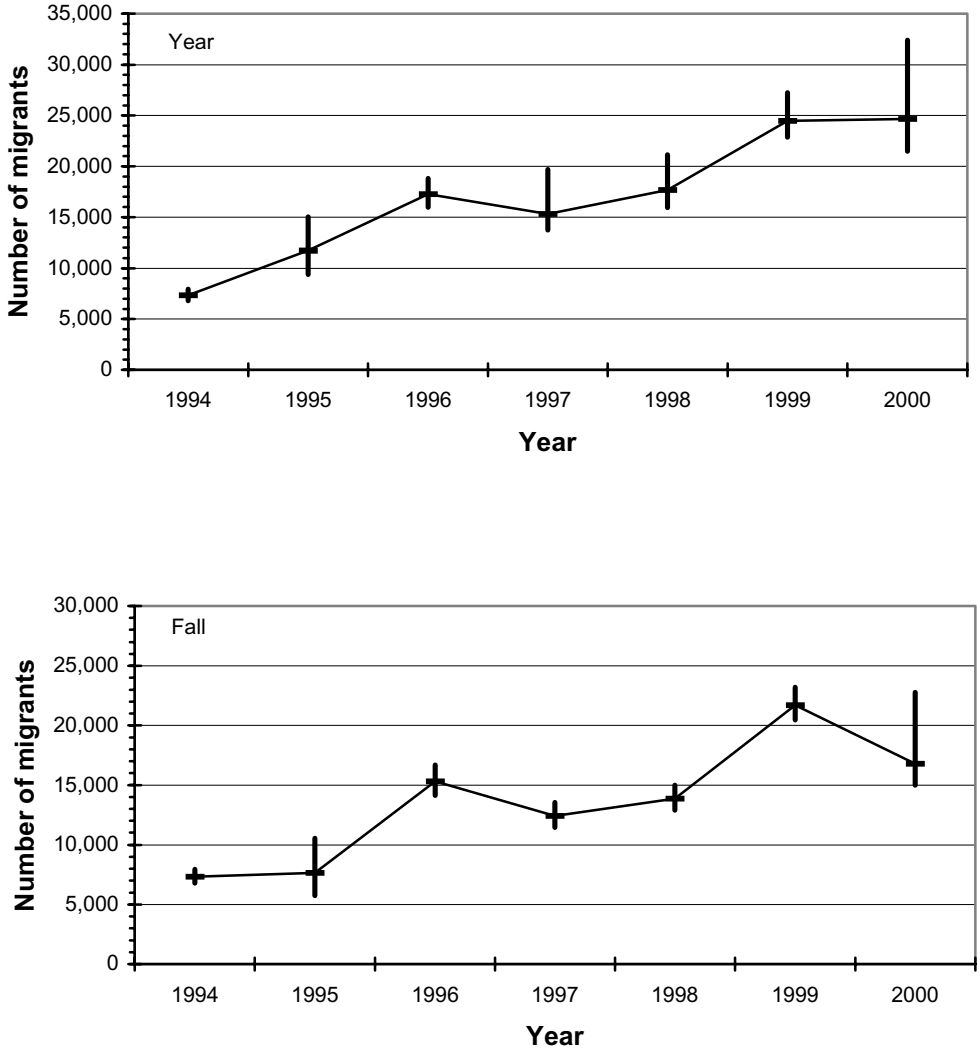
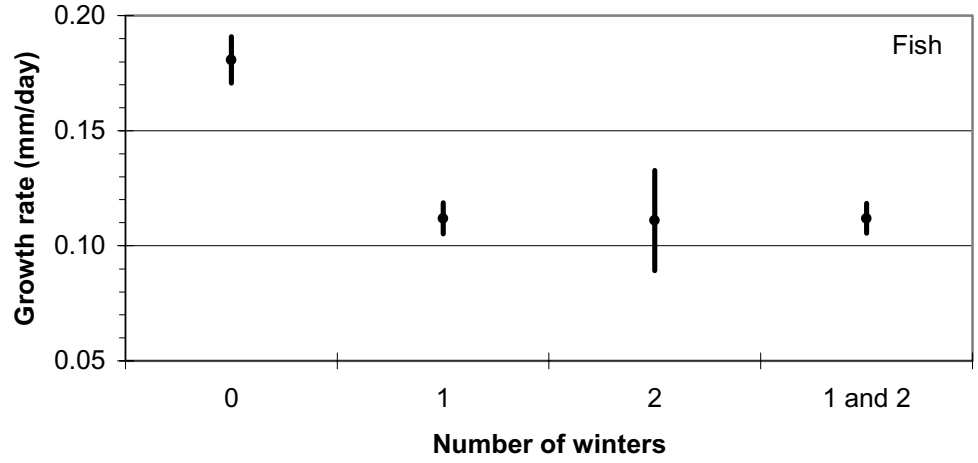


Figure 24. The estimated number of juvenile steelhead migrants and 95% CI that left Fish Creek from 1994 to 1999. The top graph is an estimate of the total number of migrants that left during the entire trapping period, and the lower graph is an estimate of the number of migrants that left from August 15 to the end of the trapping season. 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, we have fished the trap (conditions permitting) from mid-March until early November.



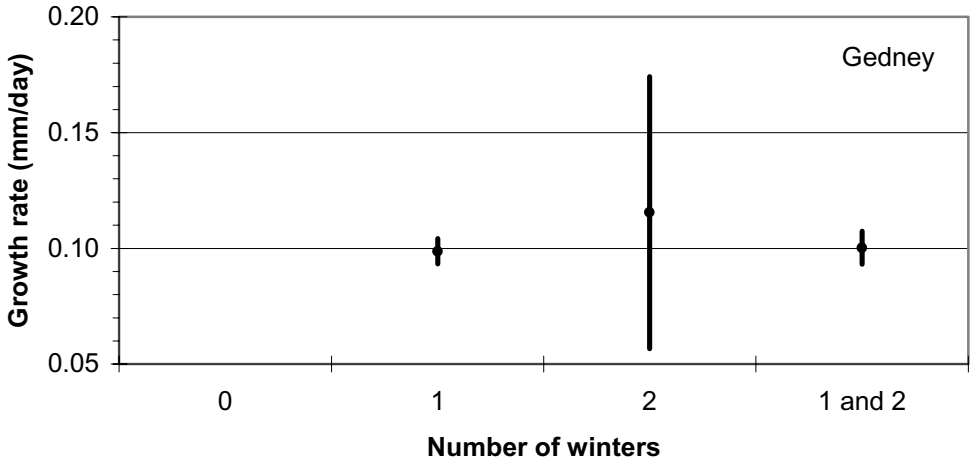


Figure 25. The mean growth rate (mm/day) and 95% CI of juvenile steelhead that were PIT tagged in Fish Creek and Gedney Creek and recaptured after one, two, or three winters.

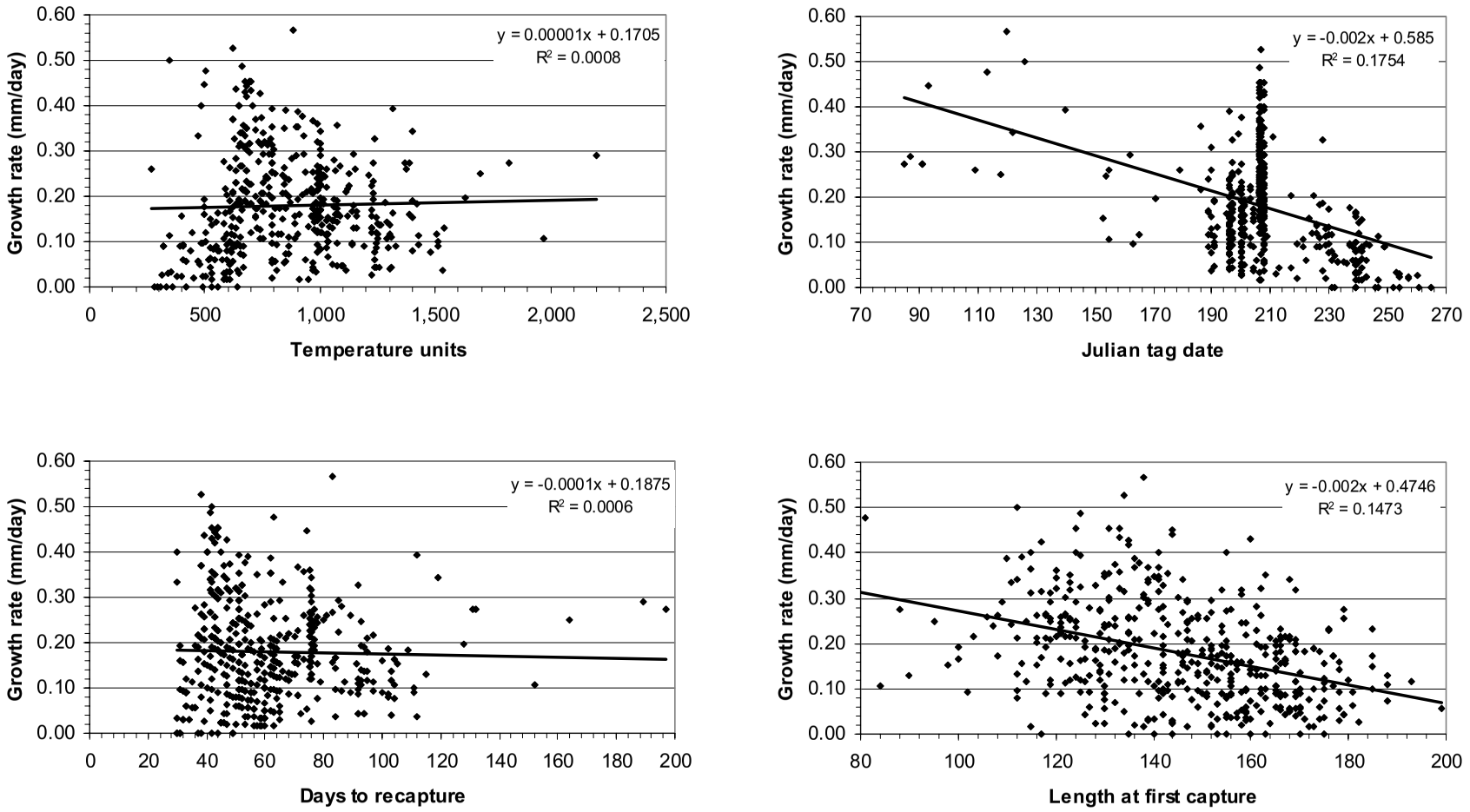
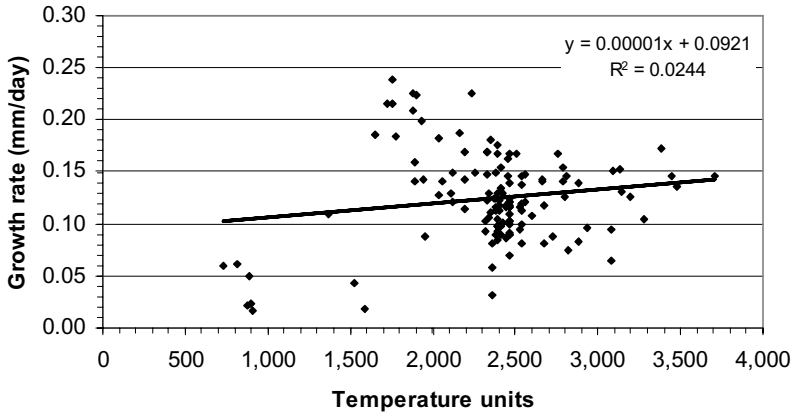
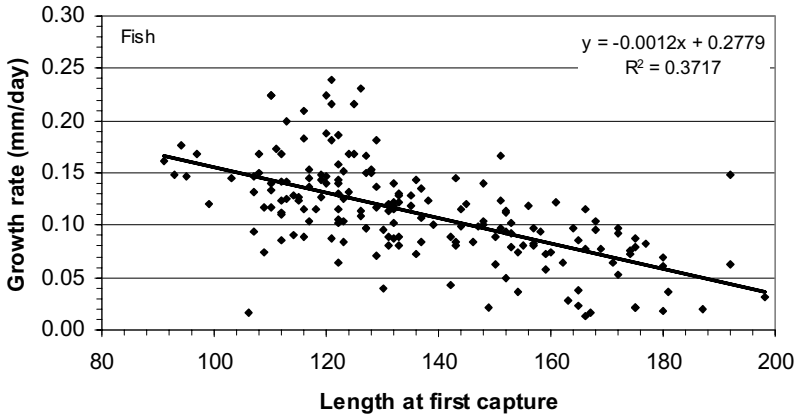


Figure 26. Results of the regressions of growth rate and temperature units, days between tagging and recapture, Julian date of tagging, and length at tagging. All fish (n = 468) were tagged and recapture in Fish Creek the same year. The regression of growth rate and temperature units (p = 0.533) and days to recapture (p = 0.619) were not significant. There was a significant relation between growth rate and Julian tag date (p <0.001) and length at tagging (p <0.001).





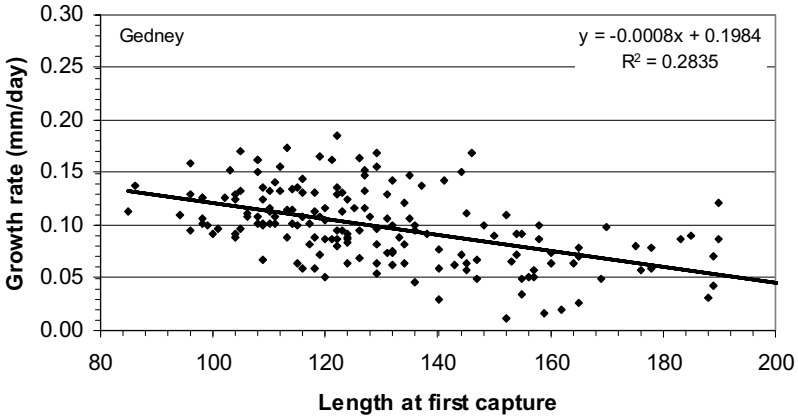


Figure 27. Results of the regression of growth rate and temperature units (n = 132, p <0.074) in Fish Creek (top), growth rate and length at tagging (n = 181, p <0.001) in Fish Creek (middle), and growth rate and length at tagging (n = 173, p <0.001) in Gedney Creek (bottom). All fish were recaptured after one winter.

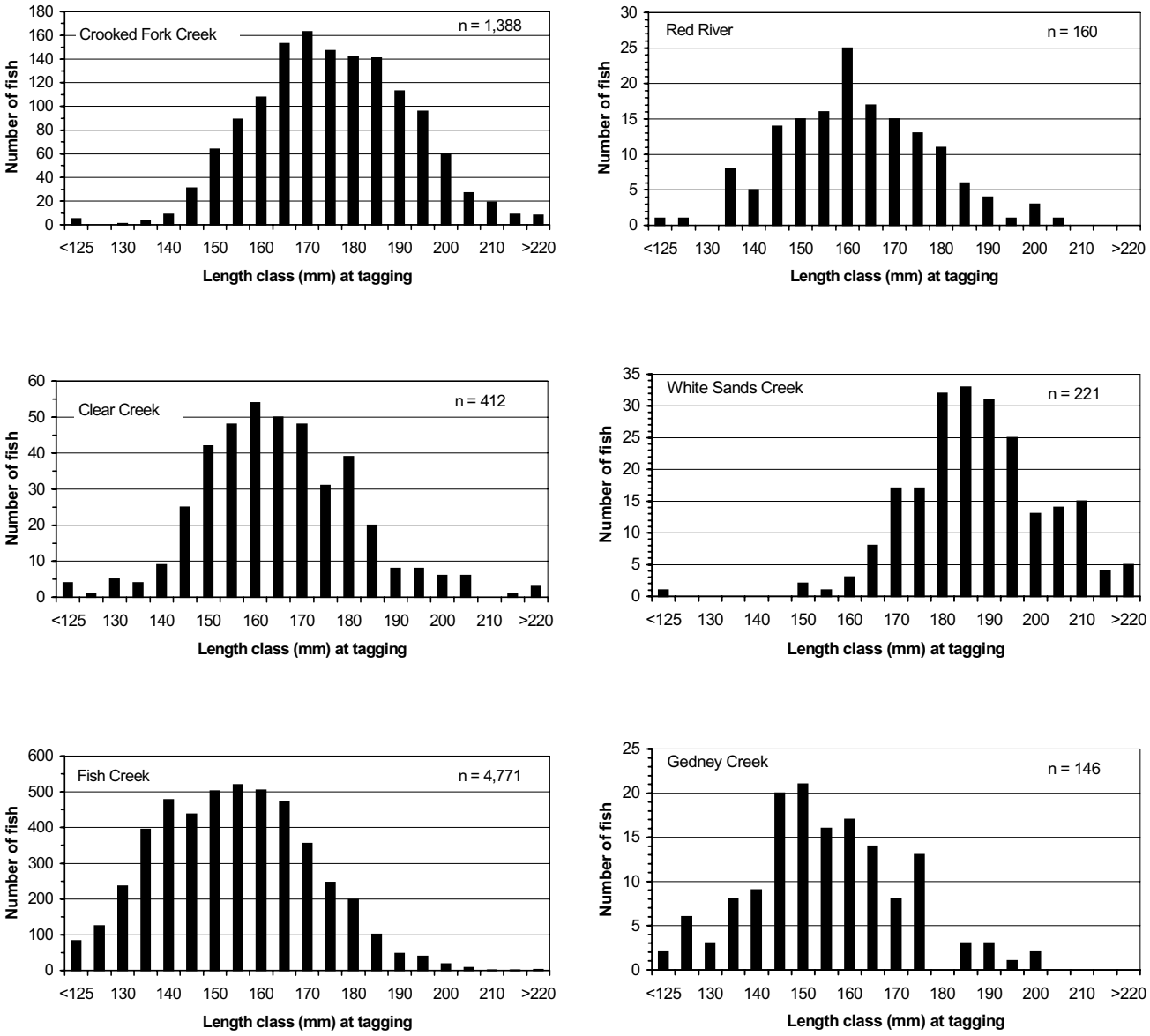


Figure 28. Length frequency (at the time of tagging) of smolts detected at downstream dams from tributaries of the Clearwater River. Fish were tagged the same spring of their detection or the previous year after August 31.

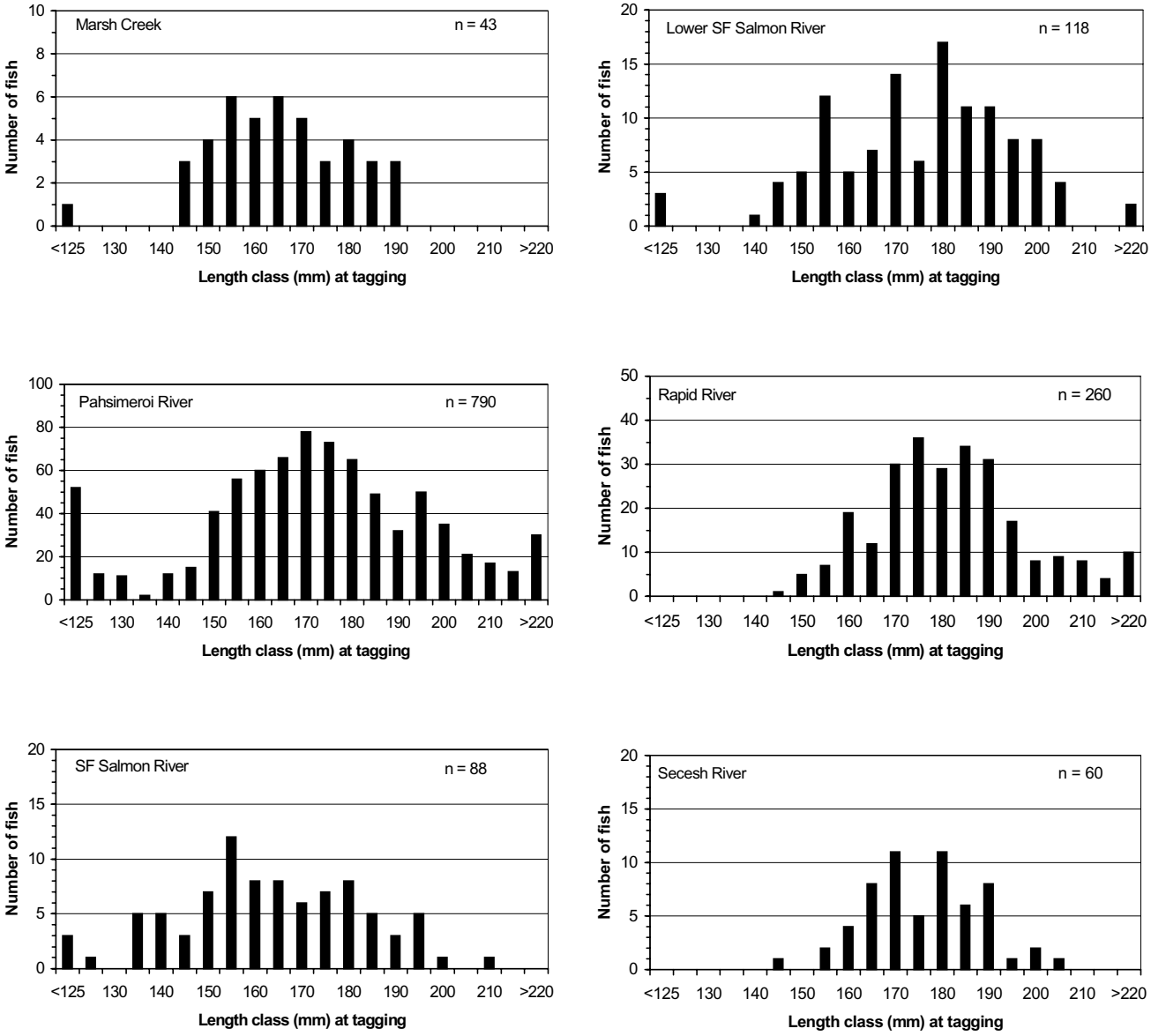


Figure 29. Length frequency (at the time of tagging) of smolts detected at downstream dams from tributaries of the Salmon River. Fish were tagged the same spring of their detection or the previous year after August 31.

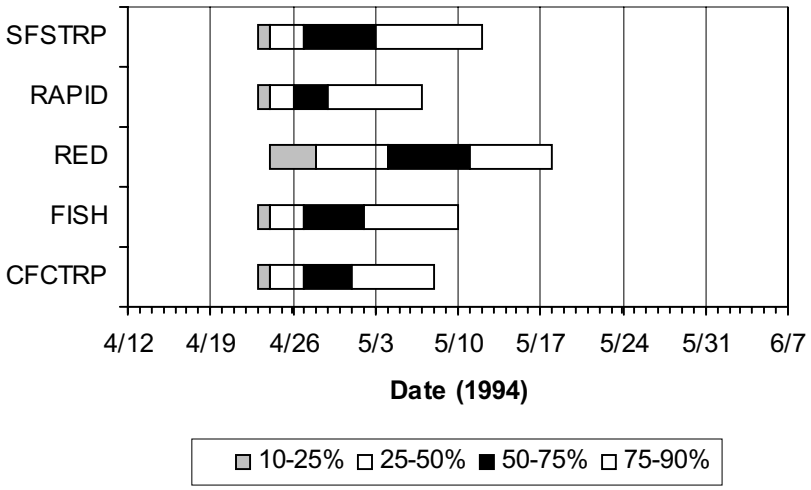


Figure 30. Quantiles of smolt arrival dates at Lower Granite Dam in 1994. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. SFSTRP = SF Salmon River at Knox Bridge (n = 76); RAPID = Rapid River (n = 91); RED = Red River (n = 57); FISH = Fish Creek (n = 97); CFCTRP = Crooked Fork Creek (n = 202).

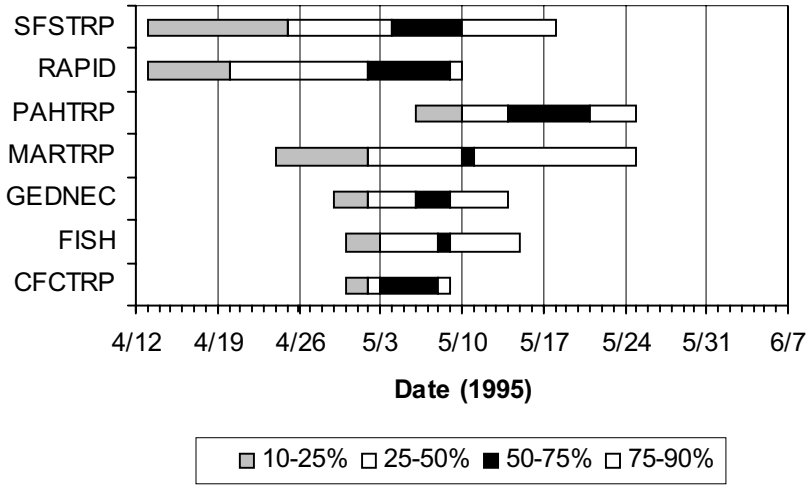


Figure 31. Quantiles of smolt arrival dates at Lower Granite Dam in 1995. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. SFSTRP = SF Salmon River at Knox Bridge (n = 47); RAPID = Rapid River (n = 117); PAHTRP = Pahsimeroi River (n = 23); MARTRP = Marsh Creek (n = 20); GEDNEC = Gedney Creek (n = 73); FISH = Fish Creek (n = 426); CFCTRP = Crooked Fork Creek (n = 89).

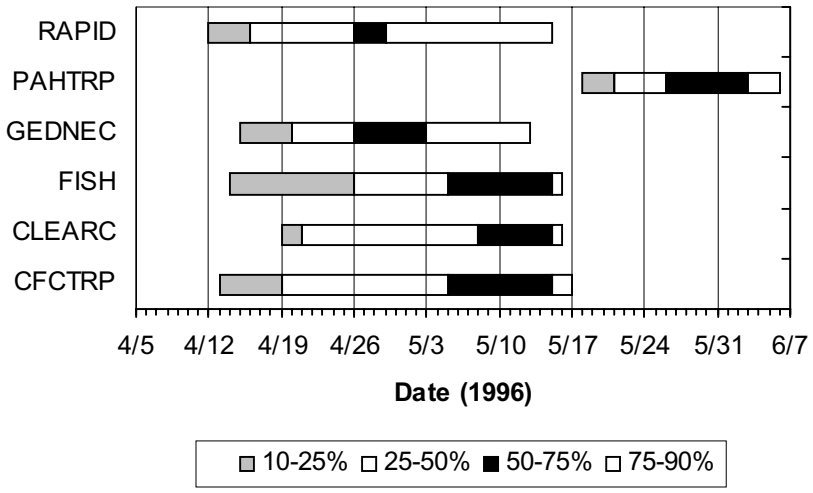


Figure 32. Quantiles of smolt arrival dates at Lower Granite Dam in 1996. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. RAPID = Rapid River (n = 32); PAHTRP = Pahsimeroi River (n = 26); GEDNEC = Gedney Creek (n = 63); FISH = Fish Creek (n = 326); CLEARC = Clear Creek (n = 60); CFCTRP = Crooked Fork Creek (n = 78).

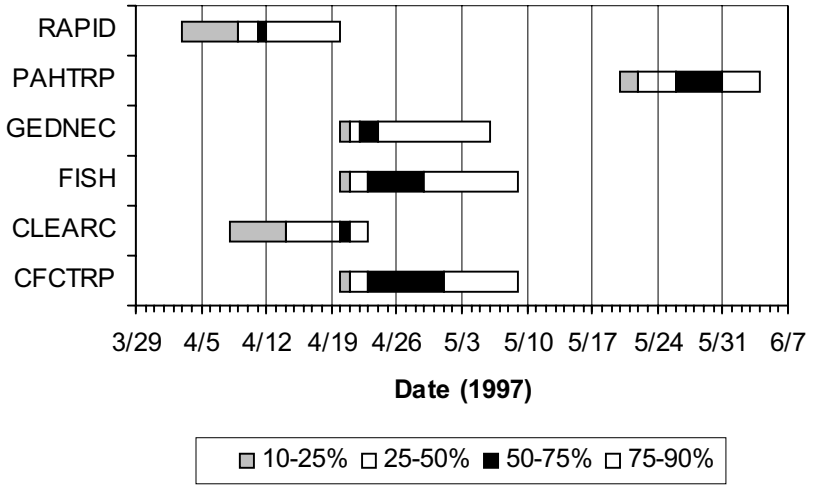
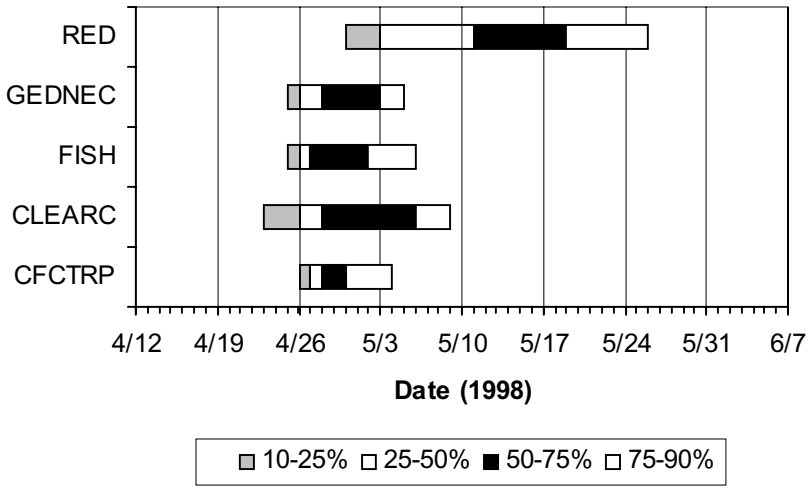


Figure 33. Quantiles of smolt arrival dates at Lower Granite Dam in 1997. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. RAPID = Rapid River (n = 29); PAHTRP = Pahsimeroi River (n = 108); GEDNEC = Gedney Creek (n = 111); FISH = Fish Creek (n = 1,087); CLEARC = Clear Creek (n = 79); CFCTRP = Crooked Fork Creek (n = 290). In the Pahsimeroi River, 101 of the 108 detections were from fish caught in box traps that were installed on May 12, 1997.



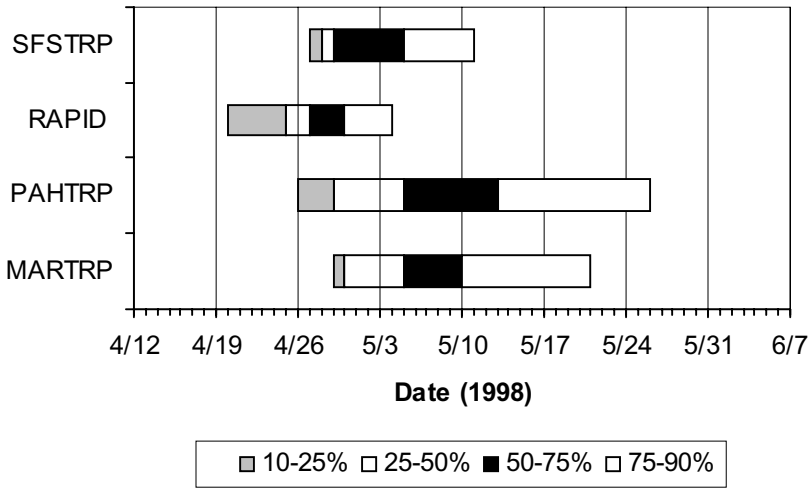
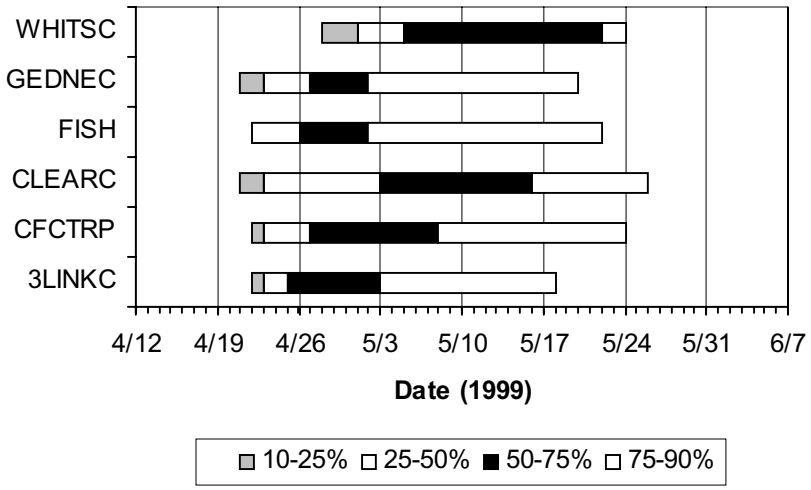


Figure 34. Quantiles of smolt arrival dates at Lower Granite Dam in 1998. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. Streams in the Clearwater River are in the top graph, and streams from the Salmon River drainage are in the lower graph. RED = Red River (n = 27); GEDNEC = Gedney Creek (n = 72); FISH = Fish Creek (n = 1,492); CLEARC = Clear Creek (n = 20); CFCTRP = Crooked Fork Creek (n = 405); SFSTRP = SF Salmon River (n = 40); RAPID = Rapid River (n = 32); PAHTRP = Pahsimeroi River (n = 146); MARTRP = Marsh Creek (n = 25).



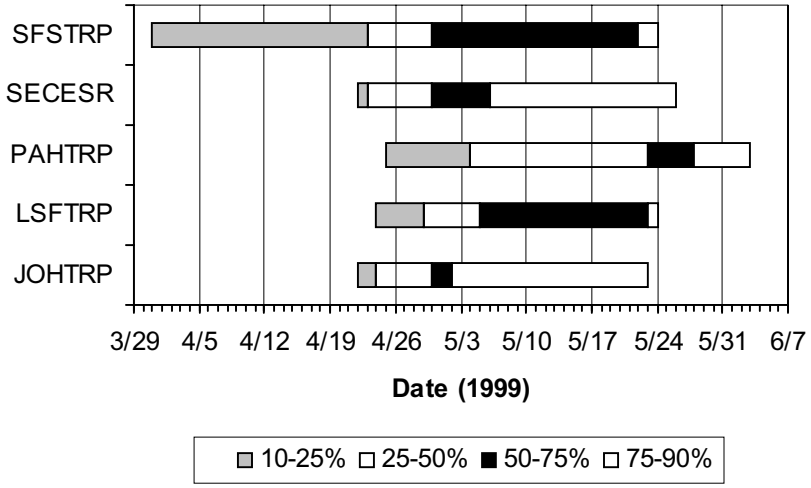


Figure 35. Quantiles of smolt arrival dates at Lower Granite Dam in 1999. The left edge of a block is the date the lower percentile was attained, and the right edge of a block is the date the upper percentile was attained. Streams in the Clearwater River are in the top graph, and streams from the Salmon River drainage are in the lower graph. WHISC = White Sands Creek (n = 99); GEDNEC = Gedney Creek (n = 48); FISH = Fish Creek (n = 812); CLEARC = Clear Creek (n = 66); CFCTRP = Crooked Fork Creek (n = 106); 3LINKC = Three Links Creek (n = 38); SFSTRP = SF Salmon River at Knox bridge (n = 25); SECESR = Secesh River (n = 45); PAHTRP = Pahsimeroi River (n = 132); LSFTRP = Lower SF Salmon River (n = 32); JONTRP = Johnson Creek (n = 32).

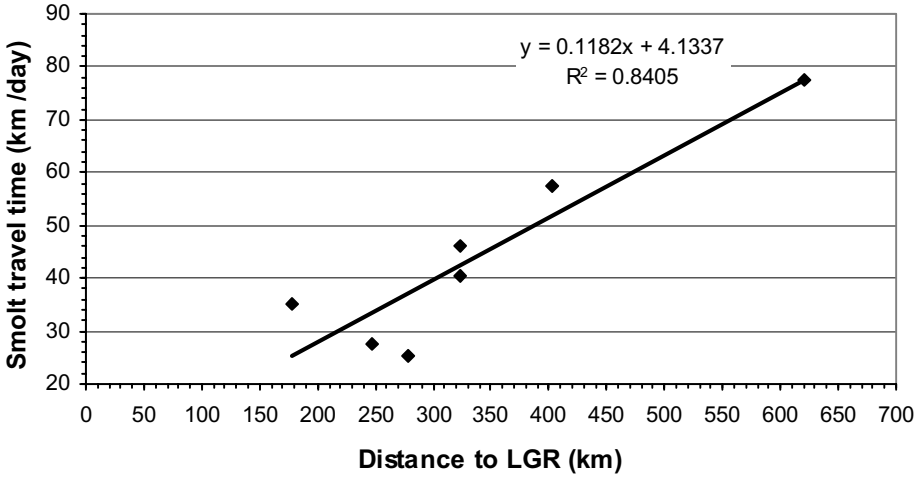


Figure 36. The relation between median smolt travel time (km/day) and distance from release site to Lower Granite Dam. The regression was significant (df = 6, p = 0.004).

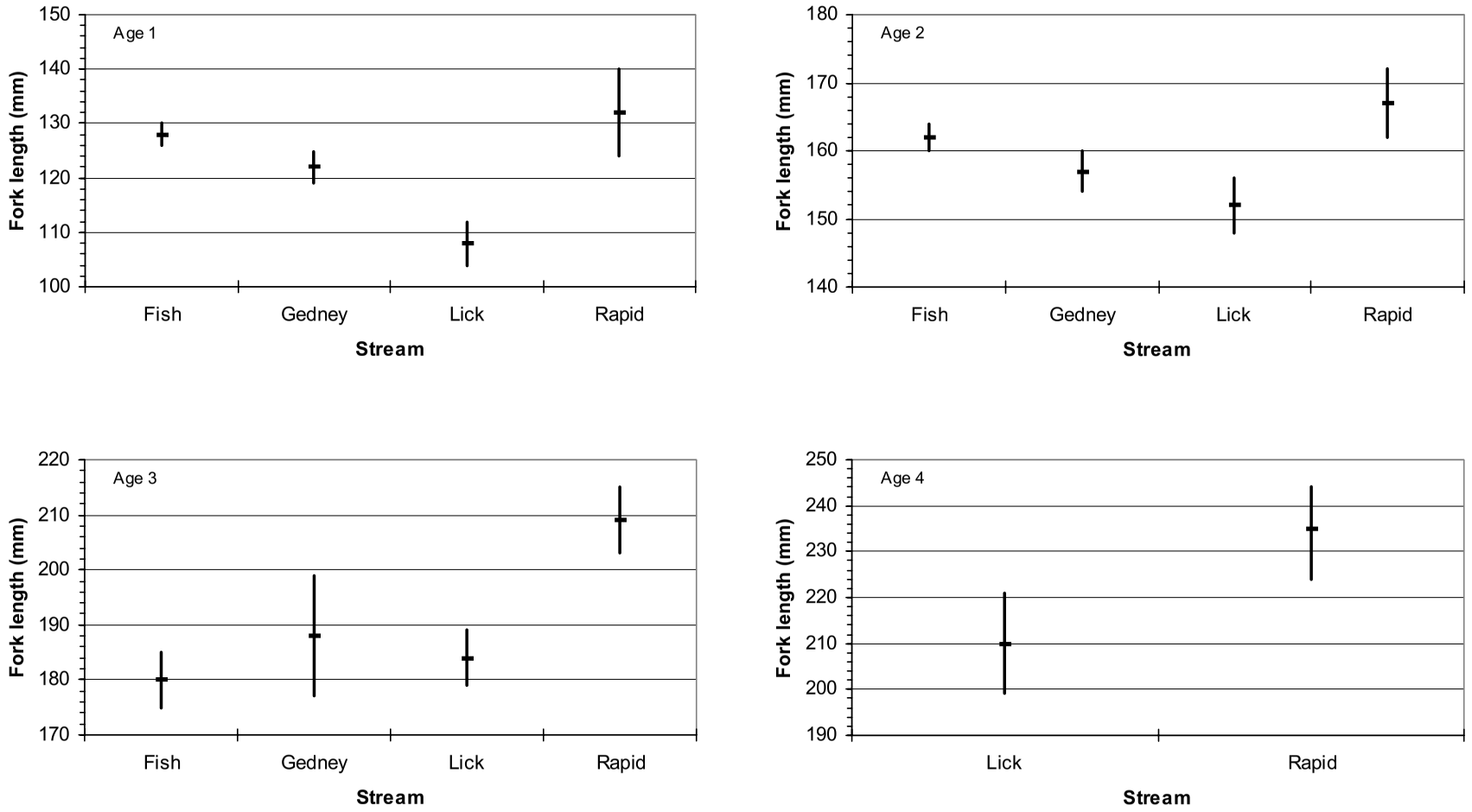


Figure 37. The mean length (mm) and 95% CI of steelhead parr in Fish Creek, Gedney Creek, Lick Creek, and Rapid River based on scale analysis.

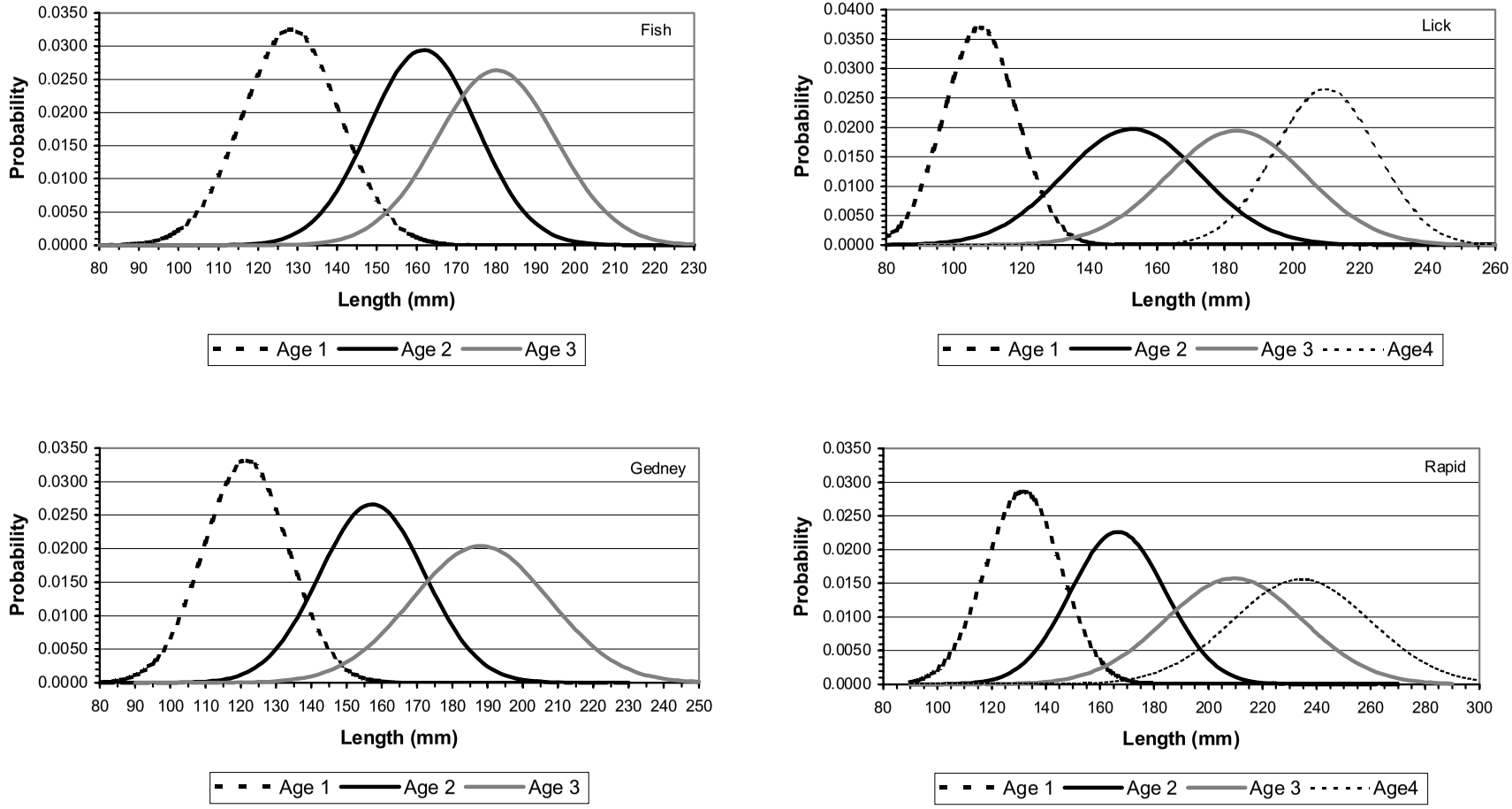
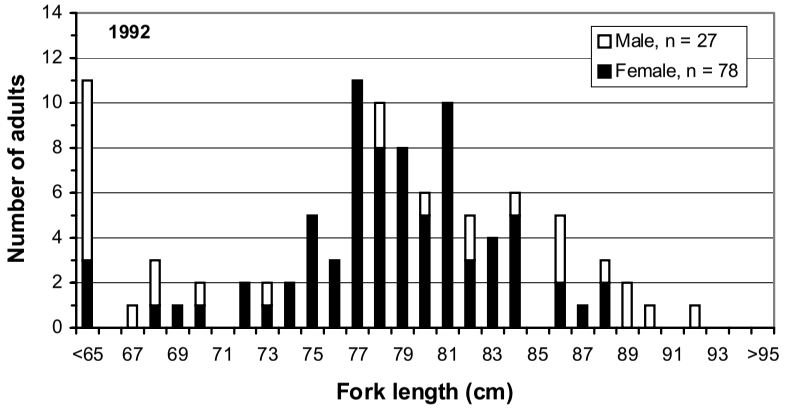
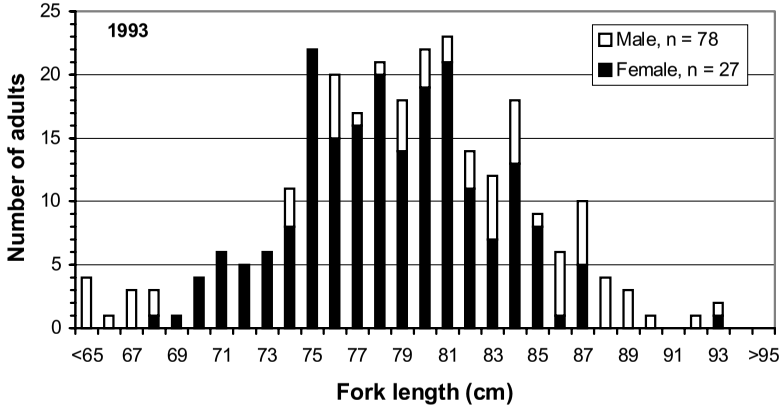


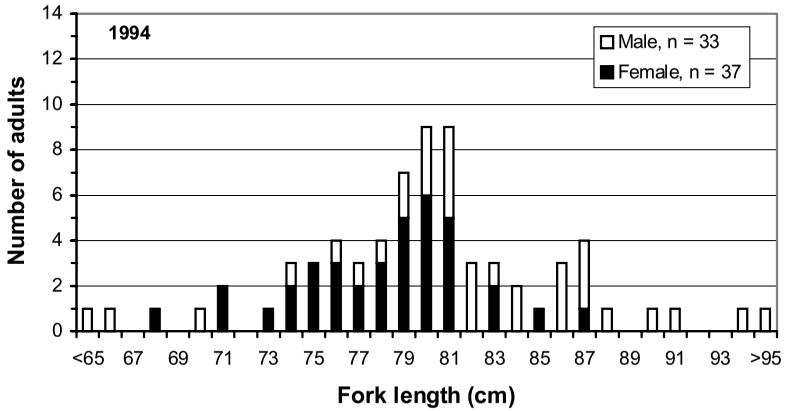
Figure 38. Distribution of length by age in Fish Creek, Gedney Creek, Lick Creek, and Rapid River. Curves were generated assuming a normal distribution using the mean length and standard deviation of each age class in the stream.

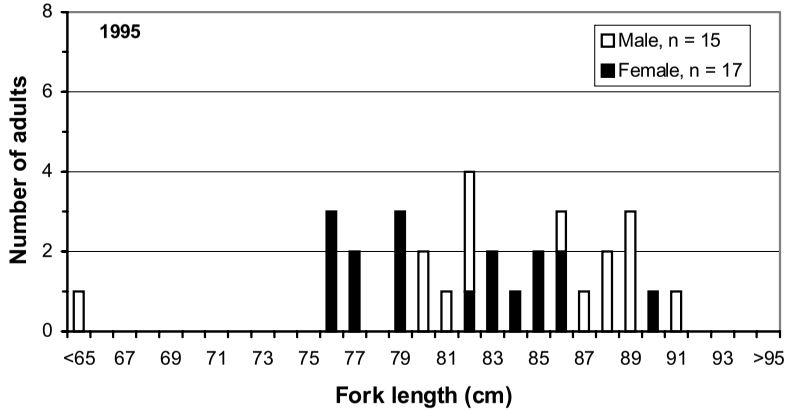
APPENDICES

Appendix 1. The yearly length frequency of adult steelhead in Fish Creek from 1992 to 1995.

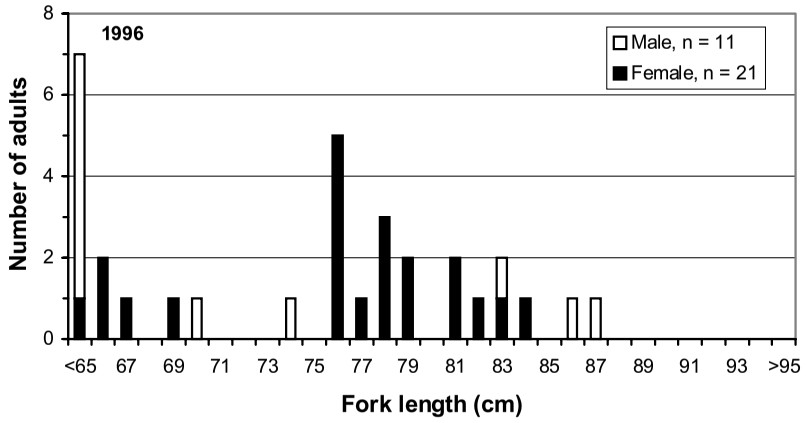


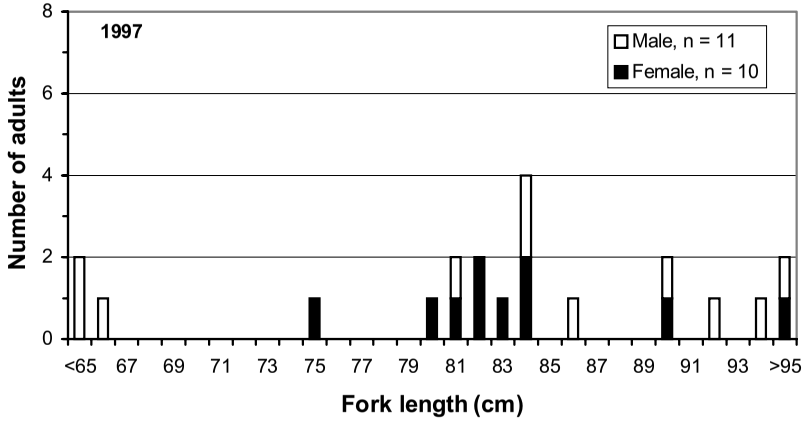


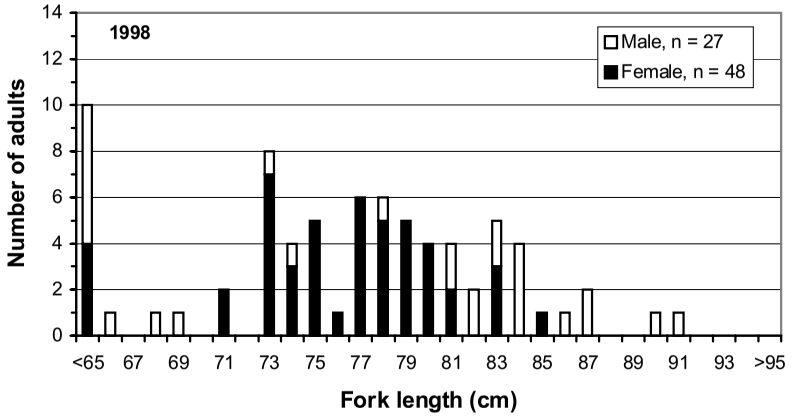


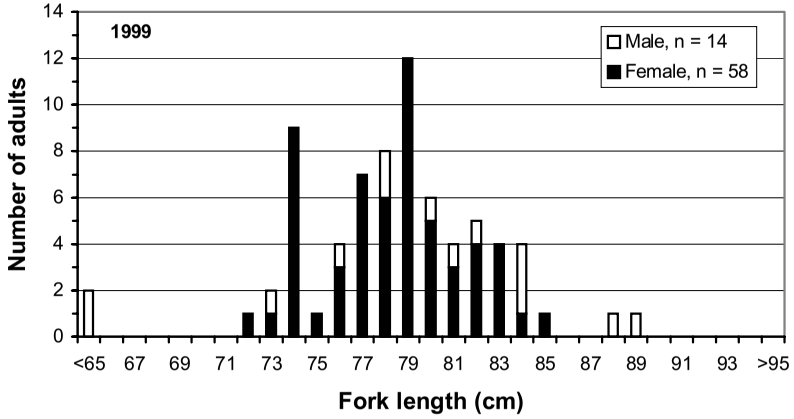


Appendix 2. The yearly length frequency of adult steelhead in Fish Creek from 1996 to 1999.









Appendix 3. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1993. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) <75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook = all brook trout including fry; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Clearwater River Drainage														
Fish Creek	07/10/93	Pool	1	3	3.58	14.03	19.30	0.00	0.00	1.87	0.00	0.00	0.00	38.78
	to	PW	1	17	2.01	6.05	5.00	0.00	0.00	0.35	0.00	0.00	0.00	13.41
	07/13/93	Run	1	9	4.43	11.26	8.75	0.00	0.00	1.30	0.00	0.00	0.00	25.74
Hungery Creek	07/13/93	PW	1	2	0.82	3.63	3.00	0.00	0.00	0.00	0.00	0.00	0.00	7.46
		Run	1	1	0.00	13.83	12.05	0.00	0.00	0.89	0.00	0.00	0.00	26.78
SF Red River	07/08/93	Pool	1	2	0.00	1.83	1.83	0.00	0.00	1.83	0.00	1.10	0.00	6.60
	and	PW	1	5	0.00	1.46	0.97	0.00	0.00	0.67	0.00	0.00	0.00	3.11
	07/09/93	Riffle	1	6	0.00	0.74	0.00	0.00	0.00	0.09	0.00	0.00	0.14	0.97
		Run	1	7	0.00	1.85	2.53	0.00	0.00	1.21	0.00	0.00	0.04	5.64
SF Red River	07/08/93	Pool	2	2	0.00	0.00	5.75	0.00	0.00	7.14	0.00	2.90	0.00	15.79
	and	PW	2	3	0.00	0.79	0.14	0.00	0.00	0.14	0.00	0.00	0.00	1.07
	07/09/93	Riffle	2	9	0.00	0.59	0.09	0.00	0.00	0.86	0.00	0.09	0.08	1.72
		Run	2	10	0.00	0.73	0.25	0.00	0.00	3.73	0.00	0.04	0.00	4.75
Salmon River Drainage														
Beaver Creek	07/23/93	Pool	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	to	Riffle	1	4	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
	07/25/93	Run	1	8	0.00	1.70	1.09	0.00	0.00	0.68	0.00	2.90	0.00	6.37
Beaver Creek	07/23/93	Pool	2	4	0.00	3.81	4.86	0.00	0.00	1.39	0.00	13.65	0.00	23.71
	to	PW	2	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50
	07/25/93	Riffle	2	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Run	2	17	0.00	0.34	0.59	0.00	0.00	0.00	0.00	4.79	0.00	5.72
Beaver Creek	07/23/93	Pool	3	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	2.50
	to	Riffle	3	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33
	07/25/93	Run	3	10	0.00	0.55	0.39	0.00	0.00	0.00	0.00	0.19	0.00	1.13

Appendix 3. (Continued.)

Stream	Date	Habitat Type	S	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Frenchman Creek	07/24/93	Pool	1	6	0.00	4.64	8.21	0.00	0.66	2.14	0.00	11.27	0.00	26.92
	and	PW	1	4	0.00	1.83	5.27	0.00	0.00	0.00	0.00	0.00	0.00	7.10
	07/25/93	Riffle	1	7	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.92
		Run	1	23	0.17	2.22	2.42	0.00	0.40	0.08	0.52	2.29	0.00	8.09
Frenchman Creek	07/24/93	Pool	2	3	0.00	0.00	1.52	13.96	0.00	3.05	0.00	1.52	0.00	20.06
	and	Riffle	2	6	0.00	0.00	0.29	0.00	0.29	0.00	0.00	3.39	0.00	3.97
	07/25/93	Run	2	12	0.00	0.23	0.38	12.45	0.00	0.00	0.00	8.65	0.00	21.72
Germania Creek	08/08/93	Pool	1	6	0.00	0.40	2.49	0.00	0.00	0.00	1.62	0.00	0.23	4.74
	to	PW	1	5	0.00	0.52	0.66	0.00	0.00	0.00	0.97	0.00	0.27	2.43
	08/10/93	Riffle	1	8	0.00	0.62	0.98	0.00	0.00	0.08	0.31	0.10	0.15	2.25
		Run	1	9	0.00	0.11	1.62	0.00	0.00	0.22	0.68	0.00	0.47	3.10
Germania Creek	08/08/93	Pool	2	4	0.00	0.00	0.00	0.00	0.00	0.00	18.11	0.00	0.00	18.11
	to	PW	2	5	0.00	0.00	0.00	0.00	0.00	0.00	2.32	0.00	0.00	2.32
	08/10/93	Riffle	2	10	0.00	0.00	0.00	0.00	0.00	0.00	2.62	0.00	0.00	2.62
		Run	2	6	0.00	0.00	0.00	0.00	0.00	0.00	3.34	0.00	0.00	3.34
SF EF Salmon River	08/10/93	PW	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	9	0.00	0.00	0.00	0.00	0.00	0.00	1.16	0.00	0.12	1.28
		Run	1	7	0.00	0.00	0.00	0.00	0.00	0.00	4.95	0.00	0.34	5.29
West Pass Creek	08/05/93	Pool	1	1	0.00	0.00	3.70	0.00	0.00	0.00	0.00	0.00	0.00	3.70
	and	PW	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	08/04/93	Riffle	1	7	0.00	0.00	0.81	0.00	0.00	0.00	0.81	0.00	0.07	1.69
		Run	1	4	0.00	0.14	0.64	0.09	0.00	0.00	0.00	0.00	0.29	1.16
West Pass Creek	08/05/93	Pool	2	3	0.00	0.00	0.00	0.00	0.00	0.00	4.88	0.00	0.00	4.88
	and	PW	2	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	08/04/93	Riffle	2	17	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.00	0.00	1.46
		Run	2	9	0.00	0.14	0.00	0.00	0.00	0.00	2.60	0.00	0.00	2.74
WF EF Salmon River	08/09/93	Pool	1	1	0.00	0.00	0.00	0.00	0.00	0.00	13.14	0.00	0.00	13.14
		PW	1	6	0.00	0.00	0.24	0.00	0.00	0.00	2.79	0.00	0.00	3.03

Appendix 4. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1994. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) <75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook = all brook trout; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Clearwater River Drainage															
Fish Creek	07/08/94	Pool	1	978	6	3.66	26.51	10.21	0.00	0.00	0.52	0.00	0.00	0.00	40.90
	to	PW	1	11,716	27	2.14	15.06	5.18	0.00	0.00	0.29	0.00	0.00	0.00	22.67
	07/12/94	Run	1	3,888	14	4.77	17.66	7.49	0.00	0.00	0.41	0.00	0.00	0.00	30.33
Gedney Creek	07/22/94	Pool	1	750	6	7.21	15.68	9.34	33.01	0.25	0.71	0.23	0.00	1.30	67.73
	to	PW	1	6,075	21	8.51	8.74	4.70	13.79	0.06	0.31	0.00	0.00	0.17	36.28
	07/26/94	Run	1	1,555	11	15.52	13.02	10.04	14.81	0.16	1.59	0.00	0.00	0.34	55.48
Gedney Creek	07/21/94	Pool	2	223	4	6.93	37.45	18.29	0.31	0.00	0.78	0.31	0.00	0.00	64.07
	and	PW	2	1,208	8	4.77	12.34	5.18	0.00	0.12	0.11	0.00	0.00	0.00	22.52
	07/22/94	Run	2	248	4	5.94	14.61	12.10	0.00	0.00	0.00	0.00	0.00	0.00	32.65
WF Gedney Creek	07/21/94	Pool	1	468	5	16.26	31.91	16.47	0.00	0.00	0.24	0.00	0.00	0.34	65.22
	and	PW	1	1,207	7	8.41	13.32	8.09	0.00	0.00	0.08	0.00	0.00	0.00	29.90
	07/22/94	Run	1	648	5	15.09	17.69	7.98	0.00	0.15	0.12	0.00	0.00	0.00	41.03
SF Red River	06/28/94	Pool	1	215	3	1.01	9.38	4.80	3.72	0.00	2.02	0.00	0.53	1.28	22.74
	and	PW	1	1,015	6	2.15	5.26	0.92	0.11	0.00	2.21	0.00	0.29	0.33	11.27
	06/29/94	Riffle	1	1,312	10	2.89	3.04	0.54	3.42	0.00	0.40	0.00	0.23	0.00	10.52
		Run	1	1,287	10	0.52	6.77	2.30	16.02	0.00	1.44	0.14	0.35	0.00	27.54
SF Red River	06/29/94	Pool	2	114	3	0.00	8.27	0.00	0.00	0.00	7.74	0.00	0.98	0.00	16.99
	and	PW	2	172	2	0.00	11.07	0.00	0.00	0.00	0.52	0.00	0.66	0.00	12.25
	06/30/94	Riffle	2	1,679	18	0.03	4.29	0.10	0.00	0.00	0.58	0.12	0.13	0.00	5.25
		Run	2	1,438	16	0.16	6.44	0.48	0.00	0.00	1.78	0.19	0.00	0.06	9.11
WF Red River	06/29/94	Pool	1	21	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	113	2	0.00	0.00	0.00	0.00	0.00	5.08	0.00	0.72	0.00	5.80
		Run	1	145	3	0.00	0.00	0.00	0.00	0.00	6.03	0.00	0.00	0.00	6.03

Appendix 4. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Salmon River Drainage															
Banner Creek	08/23/94	Pool	1	106	2	0.00	0.00	0.00	74.95	0.00	0.00	0.00	2.92	0.00	77.88
		Riffle	1	40	1	0.00	0.00	0.00	7.52	0.00	0.00	0.00	0.00	0.00	7.52
		Run	1	190	2	0.00	0.00	0.00	17.03	0.00	0.00	0.00	0.46	0.00	17.48
Basin Creek	08/21/94	Pool	1	300	3	3.61	3.04	1.15	43.88	0.00	0.00	0.00	0.00	0.37	52.05
		PW	1	88	1	3.39	3.39	1.13	6.78	0.00	0.00	1.13	0.00	1.13	16.95
		Riffle	1	949	10	5.29	4.15	0.87	10.75	0.00	0.00	0.00	0.00	0.84	21.91
		Run	1	1,577	14	4.32	3.20	1.97	29.93	0.00	0.00	0.29	0.00	2.89	42.59
East Basin Creek	08/21/94	Run	1	36	2	0.00	0.00	0.00	86.12	0.00	0.00	0.00	0.00	0.00	86.12
Beaver Creek	08/04/94	Pool	2	137	4	13.03	21.37	3.23	57.42	6.79	0.00	0.00	15.52	0.00	117.36
		PW	2	129	2	24.70	4.29	0.92	2.02	0.00	0.00	0.00	1.35	0.00	33.27
		Riffle	2	371	7	19.87	6.47	0.00	1.74	0.00	0.00	0.00	5.05	0.00	33.13
		Run	2	815	19	24.65	11.95	0.90	19.93	0.25	0.00	0.11	11.64	0.00	69.41
Beaver Creek	08/05/94	Pool	3	460	10	0.00	0.00	0.00	6.18	0.00	0.00	0.00	25.56	0.00	31.74
		Riffle	3	208	3	0.00	0.38	0.00	26.93	0.00	0.00	0.00	4.50	0.00	31.81
		Run	3	766	13	0.19	0.44	0.05	25.02	0.00	0.00	0.00	21.22	0.00	46.92
Capehorn Creek	08/23/94	Pool	1	545	5	0.00	0.16	0.00	138.32	0.00	0.00	0.66	2.85	0.00	141.98
		Riffle	1	1,061	9	0.00	0.76	0.06	28.01	0.00	0.00	0.00	0.85	0.00	29.68
		Run	1	1,583	11	0.00	0.04	0.04	87.00	0.00	0.00	0.13	0.54	0.00	87.76
Capehorn Creek	08/23/94	Pool	2	58	3	0.00	0.00	0.00	6.27	0.00	0.00	0.00	3.76	0.00	10.03
		PW	2	20	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	2	74	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.90
		Run	2	235	7	0.00	0.50	0.00	0.24	0.00	0.00	0.00	0.99	0.00	1.73
Frenchman Creek	08/04/94	Pool	1	136	6	31.23	10.43	5.51	74.02	0.59	0.00	0.00	59.40	0.00	181.19
		PW	1	111	4	15.94	2.99	0.00	12.07	0.00	0.00	0.00	23.68	0.00	54.67
		Riffle	1	188	7	21.98	3.06	0.00	17.18	0.00	0.00	0.00	12.39	0.00	54.61
		Run	1	639	23	38.76	3.46	0.21	37.22	0.00	0.00	0.00	51.44	0.00	131.09
Frenchman Creek	08/04/94	Pool	2	205	3	0.00	0.00	0.00	14.67	0.00	0.00	0.00	27.80	0.00	42.47
		PW	2	20	1	0.00	0.00	0.00	69.81	0.00	0.00	0.00	19.95	0.00	89.76
		Riffle	2	115	5	0.00	1.79	0.00	47.91	0.00	0.00	0.00	33.82	0.00	83.52
		Run	2	522	14	3.02	0.73	0.00	74.54	0.00	0.00	0.00	96.71	0.00	175.00

Appendix 4. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook	White	Total
Germania Creek	08/09/94	Pool	1	177	4	0.00	0.76	6.03	0.00	0.00	3.24	8.60	0.00	0.00	18.62
		PW	1	126	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	336	4	0.00	0.00	0.42	0.00	0.00	0.00	1.42	0.00	0.00	1.84
		Run	1	1,082	12	0.00	0.64	1.69	1.95	0.00	0.09	2.20	0.00	0.00	6.56
Germania Creek	08/09/94	Pool	2	271	5	0.00	0.00	0.00	0.00	0.00	0.30	12.31	0.00	0.00	12.62
		PW	2	262	4	0.00	0.00	0.00	0.00	0.00	0.00	5.68	0.00	0.00	5.68
		Riffle	2	827	10	0.00	0.00	0.00	0.00	0.00	0.00	1.99	0.00	0.00	1.99
		Run	2	747	11	0.00	0.00	0.00	0.00	0.00	0.00	5.86	0.00	0.00	5.86
Marsh Creek	08/18/94	Pool	1	2,380	7	0.79	0.81	3.32	77.98	0.16	0.63	0.08	0.07	8.37	92.22
	to	PW	1	1,479	4	0.76	4.21	3.30	6.20	0.06	0.10	0.06	0.00	1.30	15.99
	08/20/94	Riffle	1	5,628	17	1.81	2.53	1.35	10.99	0.03	0.01	0.05	0.05	1.49	18.32
		Run	1	8,774	21	0.90	1.37	1.62	42.76	0.04	0.25	0.19	0.07	2.66	49.86
Valley Creek	08/22/94	Pool	1	648	11	0.00	0.00	0.00	26.39	0.00	0.00	0.00	38.47	1.01	65.87
		Riffle	1	689	12	0.00	0.00	0.00	11.56	0.00	0.00	0.51	6.92	0.34	19.34
		Run	1	1,424	19	0.00	0.00	0.00	21.92	0.08	0.00	0.29	23.93	1.34	47.55
West Pass Creek	08/07/94	Pool	1	41	1	0.00	4.91	2.45	0.00	0.00	0.00	4.91	0.00	0.00	12.26
		PW	1	150	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	314	3	0.00	0.00	0.65	0.00	0.00	0.21	0.00	0.00	0.00	0.85
		Run	1	246	4	0.00	1.07	2.63	0.00	0.00	0.00	1.11	0.00	0.00	4.81
West Pass Creek	08/08/94	Pool	2	289	6	0.00	0.00	0.00	0.00	0.00	0.00	3.70	0.00	0.00	3.70
		PW	2	324	4	0.00	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	1.23
		Riffle	2	1,590	20	0.00	0.00	0.00	0.00	0.00	0.00	1.85	0.00	0.00	1.85
		Run	2	729	12	0.00	0.00	0.00	0.00	0.00	0.00	3.42	0.00	0.00	3.42

Appendix 5. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1995. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) <75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout >75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage																
Fish Creek—July	07/06/95	Pool	1	860	4	1.19	14.03	11.40	0.00	0.00	0.69	0.00	0.00	0.00	0.18	27.48
	to	PW	1	8,716	15	0.51	6.83	3.62	0.00	0.00	0.15	0.00	0.00	0.00	0.04	11.15
	07/10/95	Riffle	1	1,603	4	0.29	4.57	2.60	0.00	0.00	0.23	0.00	0.00	0.00	0.00	7.69
		Run	1	1,526	5	1.00	9.32	4.55	0.00	0.00	0.31	0.00	0.00	0.00	0.00	15.17
Fish Creek—August	08/20/95	Pool	1	1,270	7	5.26	22.81	12.23	0.00	0.09	1.17	0.00	0.00	0.00	0.09	41.67
	to	PW	1	9,934	21	3.13	8.06	7.09	0.00	0.00	0.13	0.01	0.00	0.00	0.04	18.46
	08/22/95	Riffle	1	2,584	6	6.44	4.95	2.39	0.00	0.00	0.18	0.00	0.00	0.00	0.00	13.98
		Run	1	3,254	15	9.08	14.91	10.98	0.00	0.00	0.76	0.00	0.00	0.00	0.05	35.80
Gedney Creek	07/21/95	Pool	1	672	5	5.46	10.90	10.20	0.22	0.22	0.32	0.00	0.00	0.00	0.79	28.10
	to	PW	1	8,522	22	5.25	5.88	5.07	0.03	0.00	0.04	0.01	0.00	0.00	0.14	16.42
	07/25/95	Riffle	1	1,407	5	6.23	5.15	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.15	13.32
		Run	1	2,280	13	10.47	6.97	7.11	0.00	0.09	0.32	0.00	0.00	0.00	0.32	25.27
Gedney Creek	07/20/95	Pool	2	119	3	0.69	13.42	20.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.26
	and	PW	2	845	7	4.17	7.06	5.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.04
	07/21/95	Riffle	2	72	1	0.00	5.58	4.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.77
		Run	2	227	3	8.11	11.80	10.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.47
SF Red River	06/27/95	Pool	1	218	3	0.00	3.71	1.60	3.22	0.00	6.05	0.00	0.00	1.90	1.08	17.56
	and	PW	1	779	5	0.00	2.66	0.80	0.00	0.00	1.02	0.00	0.00	0.00	0.00	4.47
	06/28/95	Riffle	1	1,110	8	0.00	1.94	1.04	0.38	0.00	0.54	0.00	0.00	0.42	0.13	4.46
		Run	1	1,129	8	0.00	5.32	1.64	2.72	0.00	3.81	0.00	0.00	0.09	0.21	13.78
SF Red River	06/27/95	Pool	2	226	3	0.00	3.32	2.30	0.00	0.00	0.86	0.00	0.00	2.30	0.00	8.79
	and	PW	2	272	3	0.00	0.71	1.38	0.00	0.00	0.34	0.00	0.00	0.00	0.00	2.43
	06/28/95	Riffle	2	838	11	0.00	1.79	0.33	0.00	0.00	0.00	0.00	0.00	0.11	0.11	2.35
		Run	2	1,276	18	0.20	2.50	0.75	0.00	0.00	0.89	0.00	0.00	0.35	0.14	4.82
SF Red River	06/28/95	Riffle	3	61	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Run	3	26	1	0.00	7.56	3.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.34

Appendix 5. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Trapper Creek	06/28/95	PW	1	45	1	0.00	8.93	0.00	0.00	0.00	6.70	0.00	0.00	0.00	0.00	15.62
		Riffle	1	36	1	0.00	11.24	0.00	0.00	0.00	8.43	0.00	0.00	0.00	0.00	19.68
		Run	1	33	1	0.00	9.03	3.01	0.00	0.00	24.08	0.00	0.00	0.00	0.00	36.12
WF Gedney Creek	07/20/95	Pool	1	389	3	18.11	17.29	13.90	0.00	0.18	1.12	0.18	0.00	0.00	0.18	50.95
	and	PW	1	1,230	6	8.90	8.91	7.38	0.00	0.00	0.11	0.00	0.00	0.00	0.07	25.36
	07/21/95	Riffle	1	549	2	18.16	6.93	4.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.66
		Run	1	479	3	7.34	9.95	8.41	0.00	0.17	0.00	0.00	0.00	0.00	0.00	25.88
WF SF Red River		Riffle	1	37	1	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67
		Run	1	65	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salmon River Drainage																
Basin Creek	08/06/95	Pool	1	267	2	11.42	8.96	2.35	0.60	0.60	0.60	0.87	0.00	0.00	4.19	29.58
	and	PW	1	307	2	5.71	2.58	3.05	0.00	0.00	0.00	0.71	0.00	0.00	0.71	12.75
	08/07/95	Riffle	1	1,932	11	0.87	1.54	0.78	0.00	0.08	0.08	0.04	0.05	0.00	0.59	4.03
		Run	1	1,070	10	1.93	2.17	2.77	0.00	0.00	0.00	0.00	0.00	0.00	0.63	7.50
Beaver Creek	08/03/95	Pool	1	190	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.97	0.00	0.00	1.97
		Riffle	1	452	4	0.21	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.55
		Run	1	850	6	0.07	2.86	0.18	0.00	0.00	0.00	0.00	0.18	1.41	0.00	4.68
Beaver Creek	08/03/95	Pool	2	61	2	0.00	22.19	0.00	1.35	0.00	0.00	0.00	0.00	4.83	0.00	28.37
		PW	2	105	2	0.00	4.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.28
		Riffle	2	91	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Run	2	897	10	0.57	3.48	0.30	0.82	0.00	0.00	0.00	0.00	1.68	0.00	6.85
Beaver Creek	08/03/95	Pool	3	445	5	0.30	0.00	0.00	0.76	0.00	0.00	0.00	0.00	4.77	0.00	5.83
		Riffle	3	630	5	0.22	0.00	0.00	0.66	0.00	0.00	0.00	0.58	0.58	0.00	2.04
		Run	3	790	7	0.43	0.06	0.00	2.78	0.00	0.00	0.00	2.00	5.72	0.00	10.99
EF Basin Creek	08/07/95	PW	1	59	1	0.00	1.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68
		Riffle	1	42	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Frenchman Creek	08/04/95	Pool	1	127	5	0.57	9.10	0.00	41.87	2.85	0.00	0.00	16.43	20.57	0.53	91.92
		PW	1	29	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	163	4	1.90	0.00	0.00	8.26	0.00	0.00	0.00	0.00	0.00	0.00	10.16
		Run	1	747	17	0.81	3.02	0.00	0.26	0.00	0.00	0.00	0.13	6.66	0.00	10.88

Appendix 5. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Frenchman Creek	08/04/95	Pool	2	140	4	0.00	0.00	0.00	11.06	1.93	0.00	0.00	10.49	27.38	0.00	50.85
		Riffle	2	290	6	0.00	0.37	0.00	0.28	0.00	0.00	0.00	0.00	2.79	0.00	3.44
		Run	2	522	10	0.00	0.00	0.00	15.63	0.00	0.58	0.00	2.51	16.38	0.00	35.10
Marsh Creek	08/05/95	Pool	1	381	1	0.26	0.00	1.05	5.25	0.00	0.26	0.00	0.00	0.00	5.51	12.33
		PW	1	797	1	0.00	0.75	0.88	0.38	0.00	0.13	0.00	0.00	0.00	0.00	2.13
		Riffle	1	1,334	2	0.00	0.33	0.29	0.09	0.00	0.00	0.00	0.00	0.00	0.66	1.35
		Run	1	915	2	0.30	0.15	0.60	0.32	0.00	0.17	0.00	0.00	0.09	2.23	3.86
West Pass Creek	08/08/95	Pool	1	120	2	0.00	0.00	0.00	0.00	0.00	0.00	3.15	0.00	0.00	0.00	3.15
		PW	1	613	4	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.58
		Riffle	1	684	5	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.13
		Run	1	314	4	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.78	2.30
West Pass Creek	08/08/95	Pool	2	43	1	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	0.00	0.00	4.67
		PW	2	102	1	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.98
		Riffle	2	432	4	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.22

Appendix 6. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1996. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) <75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout >75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage																
Canyon Creek	09/09/96	Pool	1	178	5	0.52	10.13	4.90	0.00	0.00	1.00	0.00	0.00	0.00	0.00	16.54
		PW	1	482	5	0.18	6.84	0.30	0.00	0.00	0.41	0.00	0.00	0.00	0.00	7.74
		Riffle	1	145	2	0.47	7.31	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70
		Run	1	209	5	0.54	8.62	4.38	0.00	0.00	0.37	0.00	0.00	0.00	0.00	13.90
Deadman Creek	09/10/96	Pool	1	91	4	0.00	15.21	2.52	0.00	0.98	0.00	0.00	0.00	0.00	0.00	18.71
		PW	1	635	8	0.18	2.37	0.39	0.00	0.00	0.18	0.00	0.00	0.00	0.00	3.11
		Riffle	1	86	1	1.16	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31
		Run	1	503	8	0.70	3.32	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.71
Fish Creek	07/11/96	Pool	1	983	5	0.94	9.55	10.88	0.00	0.00	1.06	0.00	0.00	0.00	0.00	22.43
	to	PW	1	12,551	25	1.15	4.99	4.75	0.00	0.00	0.26	0.00	0.00	0.00	0.01	11.17
	07/16/96	Riffle	1	2,516	4	0.33	3.26	1.48	0.00	0.00	0.32	0.00	0.00	0.00	0.00	5.41
		Run	1	5,789	17	2.50	7.29	6.35	0.00	0.00	0.52	0.02	0.00	0.00	0.09	16.79
Gedney Creek	07/26/96	Pool	1	620	5	0.58	7.72	9.65	0.00	0.00	0.96	0.20	0.00	0.00	1.39	20.50
	to	PW	1	8,952	22	1.87	5.27	3.70	0.00	0.00	0.10	0.00	0.00	0.00	0.42	11.36
	07/30/96	Riffle	1	1,660	4	5.67	3.43	1.38	0.00	0.00	0.22	0.00	0.00	0.00	0.30	11.01
		Run	1	2,349	11	3.87	9.24	5.42	0.00	0.00	0.34	0.00	0.00	0.00	0.53	19.40
Gedney Creek	07/25/96	Pool	2	151	3	2.20	12.95	15.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.42
	and	PW	2	1,189	9	0.41	7.22	2.59	0.00	0.00	0.00	0.00	0.00	0.00	0.16	10.38
	07/27/96	Riffle	2	74	1	9.45	17.56	5.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.42
		Run	2	217	3	0.42	11.94	5.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.13
WF Gedney Creek	07/25/96	Pool	1	451	4	1.98	18.46	14.48	0.00	0.00	0.80	0.00	0.00	0.00	0.86	36.58
	and	PW	1	2,346	8	3.09	8.73	7.12	0.07	0.00	0.31	0.00	0.00	0.00	0.23	19.54
	07/27/96	Riffle	1	552	3	2.91	6.06	2.70	0.00	0.00	0.31	0.00	0.00	0.00	0.47	12.45
		Run	1	352	3	4.78	10.09	10.44	0.00	0.00	0.66	0.00	0.00	0.00	0.58	26.55

Appendix 6. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Post Office Creek	09/11/96	Pool	1	209	5	4.51	5.62	4.47	0.00	0.00	1.16	0.00	0.00	0.00	0.00	14.92
	and	PW	1	278	6	0.00	3.37	2.61	0.00	0.00	1.18	0.00	0.00	0.00	0.00	4.54
	09/14/96	Riffle	1	331	6	2.48	1.10	1.51	0.00	0.00	0.14	0.00	0.00	0.00	0.00	3.94
		Run	1	215	5	5.09	1.51	9.27	0.00	0.00	0.85	0.00	0.00	0.00	0.00	9.22
SF Red River	06/30/96	Pool	1	201	3	0.00	9.27	6.34	0.00	0.00	4.50	0.00	0.00	0.00	0.37	20.48
	and	PW	1	1,245	5	0.00	2.91	0.44	0.00	0.00	0.14	0.00	0.00	0.00	0.00	3.49
	07/01/96	Riffle	1	1,427	8	0.00	2.93	1.16	0.00	0.00	0.38	0.00	0.00	0.10	0.14	4.70
		Run	1	1,293	8	0.00	7.90	2.31	0.00	0.00	0.59	0.17	0.00	0.05	0.00	11.02
SF Red River	06/30/96	Pool	2	243	5	0.00	10.36	2.59	0.00	0.00	0.58	0.00	0.00	0.00	0.00	13.53
	and	PW	2	896	5	0.00	2.32	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90
	07/01/96	Riffle	2	1,483	14	0.00	2.44	0.48	0.00	0.00	0.28	0.07	0.00	0.00	0.00	3.28
		Run	2	1,510	18	0.00	5.33	1.96	0.00	0.00	0.39	0.00	0.00	0.00	0.08	7.75
SF WF Red River	07/01/96	Pool	1	105	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Riffle	1	52	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Run	1	121	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trapper Creek	07/01/96	PW	1	106	1	0.00	6.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.59
		Riffle	1	58	1	0.00	5.19	0.00	0.00	0.00	1.73	0.00	0.00	0.00	0.00	6.92
Weir Creek	09/12/96	Pool	1	112	4	1.20	13.35	5.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.56
		PW	1	442	7	0.00	3.40	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.95
		Riffle	1	162	4	2.13	3.97	1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.48
		Run	1	411	7	5.97	5.89	2.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.94
Salmon River Drainage																
Basin Creek	08/10/96	Pool	1	269	3	0.50	2.48	4.46	0.00	0.00	0.50	0.00	0.35	0.00	2.41	10.70
	and	PW	1	420	2	0.92	0.75	0.48	0.00	0.00	0.00	0.00	0.00	0.00	1.02	3.17
	08/11/96	Riffle	1	1,348	6	1.29	0.80	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.32
		Run	1	1,958	11	1.35	1.08	2.36	0.09	0.00	0.04	0.06	0.00	0.12	0.85	5.96
Basin Creek	08/11/96	Pool	2	79	1	0.00	0.00	1.26	0.00	0.00	0.00	1.26	0.00	0.00	0.00	2.52
		PW	2	174	1	0.00	1.15	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.57	2.87
		Riffle	2	261	3	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		Run	2	735	6	0.11	0.59	0.29	0.00	0.00	0.10	0.00	0.00	0.00	0.00	1.10

Appendix 6. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
EF Basin Creek	08/11/96	Pool	1	34	2	0.00	2.96	2.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.92
		PW	1	107	2	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.26
		Riffle	1	191	3	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80
		Run	1	52	1	9.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.59
Beaver Creek	08/09/96	Pool	1	57	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.59	0.00	10.59
		Riffle	1	157	3	0.00	3.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78
		Run	1	489	9	0.36	3.05	0.00	0.00	0.00	0.00	0.61	0.54	6.57	0.00	11.13
Beaver Creek	08/09/96	Pool	2	78	2	0.00	14.75	9.85	0.00	0.00	0.00	0.00	0.00	16.77	0.00	41.37
		PW	2	217	2	10.32	2.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.64
		Riffle	2	559	6	7.90	5.35	1.28	0.00	0.00	0.00	0.00	0.00	1.97	0.00	16.51
		Run	2	1,201	15	15.08	6.87	1.70	0.00	0.00	0.00	0.00	0.00	3.75	0.00	27.39
Beaver Creek	08/09/96	Pool	3	312	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	5.64	0.00	5.89
	and	Riffle	3	85	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	08/10/96	Run	3	571	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.96	2.35	0.00	6.31
Frenchman Creek	08/08/96	Pool	1	137	5	6.86	2.75	0.00	0.00	3.92	0.00	0.95	0.00	20.19	0.00	34.67
		PW	1	111	2	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	2.67
		Riffle	1	261	5	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00	2.13
		Run	1	856	18	0.75	0.00	0.09	0.00	0.48	0.00	0.00	0.00	6.00	0.00	7.33
Frenchman Creek	08/08/96	Pool	2	171	5	0.00	0.00	0.00	0.00	1.55	0.00	0.00	0.83	15.26	0.00	17.64
	and	Riffle	2	206	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	7.42	0.00	8.26
	08/09/96	Run	2	466	10	0.00	0.00	0.19	0.00	0.15	0.00	0.00	0.19	28.96	0.00	29.49

Appendix 7. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1997. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) <75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout >75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage																
Bald Mountain Creek	08/26/97	Pool	1	73	3	0.00	0.87	5.83	0.00	0.00	7.05	0.87	0.00	0.00	0.00	14.64
		PW	1	888	8	0.47	1.46	3.01	0.00	0.00	2.62	0.00	0.00	0.00	0.00	7.56
		Run	1	291	7	0.24	3.75	4.26	0.00	0.00	12.30	0.00	0.00	0.00	0.00	20.55
Bimerick Creek	07/15/97	Pool	1	30	1	0.00	9.90	6.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.50
		PW	1	233	3	0.00	4.75	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45
		Run	1	217	5	0.00	5.16	2.22	0.00	0.00	0.00	0.00	0.00	1.10	0.00	8.48
Boulder Creek	08/24/97	Pool	1	429	5	2.23	12.39	15.61	0.00	0.00	0.23	0.00	0.00	0.00	0.00	30.47
		PW	1	1,850	9	1.47	4.22	5.76	0.00	0.00	0.10	0.00	0.00	0.00	0.00	11.55
		Run	1	830	5	1.60	5.44	7.49	0.00	0.00	0.18	0.00	0.00	0.00	0.00	14.70
Canyon Creek	08/26/97	Pool	1	203	5	14.47	7.43	9.48	0.00	0.00	1.38	0.00	0.00	0.00	0.00	32.75
		PW	1	397	6	12.09	6.96	5.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.83
		Riffle	1	160	2	17.50	9.44	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.48
		Run	1	300	6	17.91	9.94	8.99	0.00	0.00	0.64	0.00	0.00	0.00	0.36	37.83
Deadman Creek	07/15/97	Pool	1	379	5	0.00	0.43	5.48	0.00	0.00	3.08	0.00	0.00	0.00	0.00	8.99
		PW	1	1,663	10	0.11	1.07	1.04	0.00	0.00	1.27	0.00	0.00	0.00	0.00	3.51
		Riffle	1	247	2	0.00	3.45	2.73	0.00	0.00	1.38	0.00	0.00	0.00	0.00	7.55
		Run	1	485	4	0.38	0.46	2.87	0.00	0.00	1.51	0.00	0.00	0.00	0.00	5.20
Deadman Creek	09/04/97	Pool	1	214	5	0.42	8.24	5.20	0.89	0.00	0.00	0.00	0.00	0.00	0.00	14.75
		PW	1	729	8	0.55	3.70	3.25	0.24	0.00	0.00	0.00	0.00	0.00	0.00	7.73
		Riffle	1	182	2	0.00	6.23	1.60	0.47	0.00	0.00	0.00	0.00	0.00	0.00	8.29
		Run	1	516	8	0.84	5.85	4.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	11.25
Fish Creek	07/24/97	Pool	1	1,667	7	2.17	11.05	11.19	0.00	0.00	0.73	0.00	0.00	0.00	0.16	25.30
	to	PW	1	13,867	27	2.76	4.35	3.84	0.00	0.00	0.18	0.00	0.00	0.00	0.04	11.17
	07/29/97	Riffle	1	3,210	6	0.12	2.72	1.53	0.00	0.00	0.22	0.00	0.00	0.00	0.00	4.58
		Run	1	4,288	13	3.33	6.28	4.79	0.00	0.00	0.47	0.03	0.00	0.00	0.12	15.01

Appendix 7. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Gedney Creek	08/07	Pool	1	882	6	5.84	6.84	8.61	0.00	0.00	1.55	0.00	0.00	0.00	2.19	25.04
	to	PW	1	9,865	24	7.60	5.04	3.48	0.27	0.00	0.07	0.00	0.00	0.01	0.38	16.85
	08/13	Riffle	1	1,848	5	11.50	3.48	2.48	0.32	0.00	0.00	0.00	0.00	0.00	0.39	18.17
		Run	1	2,358	10	12.69	5.65	6.00	1.24	0.00	0.21	0.00	0.00	0.00	0.67	26.44
Gedney Creek	08/09	Pool	2	191	3	2.54	13.83	8.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.19
		PW	2	1,062	8	4.13	9.35	3.19	0.00	0.00	0.00	0.00	0.00	0.00	0.20	16.86
		Riffle	2	264	3	5.27	15.86	3.91	0.00	0.00	0.00	0.00	0.00	0.00	0.46	25.50
		Run	2	112	2	4.47	16.15	8.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.56
WF Gedney Creek	08/09/97	Pool	1	468	4	1.38	6.73	11.37	0.39	0.00	1.06	0.00	0.00	0.00	1.37	22.29
		PW	1	1,734	8	3.58	5.57	4.39	0.06	0.00	0.06	0.00	0.00	0.00	0.29	13.94
		Riffle	1	440	2	11.11	7.27	2.35	0.00	0.00	0.00	0.00	0.00	0.00	0.21	20.94
		Run	1	462	4	4.76	10.13	11.19	0.50	0.00	0.34	0.00	0.00	0.00	0.12	27.04
Post Office Creek	08/25/97	Pool	1	167	6	6.87	5.67	1.25	0.00	0.00	7.80	0.40	0.00	0.00	0.00	21.99
	and	PW	1	563	8	10.89	1.40	0.30	0.00	0.00	0.81	0.15	0.00	0.00	0.00	13.55
	09/06/97	Riffle	1	297	6	6.08	1.08	1.57	0.00	0.00	0.20	0.00	0.00	0.00	0.00	8.91
		Run	1	579	8	8.14	1.40	0.46	0.00	0.00	1.52	0.00	0.00	0.00	0.12	11.64
SF Red River	07/11/97	Pool	1	169	3	0.00	6.15	7.38	0.00	0.00	2.90	0.00	0.00	0.00	0.68	17.11
	and	PW	1	982	6	0.00	2.98	0.29	0.00	0.00	0.91	0.00	0.00	0.00	0.19	4.36
	07/12/97	Riffle	1	1,634	11	0.07	2.60	0.33	0.00	0.00	0.34	0.00	0.00	0.00	0.00	3.34
		Run	1	1,536	11	0.13	3.58	0.82	0.00	0.00	0.71	0.00	0.00	0.00	0.06	5.29
SF Red River	07/11/97	Pool	2	207	3	0.00	2.48	2.07	0.00	0.00	10.74	0.00	0.00	0.00	0.43	15.72
	and	PW	2	785	6	0.00	0.50	0.28	0.00	0.00	1.81	0.00	0.00	0.00	0.00	2.59
	07/12/97	Riffle	2	1,220	10	0.00	0.69	0.39	0.00	0.00	1.71	0.09	0.00	0.00	0.07	2.95
		Run	2	1,438	13	0.00	1.53	1.77	0.00	0.00	5.14	0.05	0.00	0.24	0.00	8.73
SF Red River	07/12/97	Pool	3	40	2	0.00	3.13	0.00	0.00	0.00	34.42	0.00	0.00	0.00	0.00	37.55
		PW	3	61	1	0.00	4.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.91
		Riffle	3	91	2	0.00	4.56	1.36	0.00	0.00	0.92	0.00	0.00	0.92	0.00	7.77
		Run	3	189	4	0.48	1.37	0.90	0.00	0.00	10.28	2.02	0.00	0.00	0.00	15.04
WF SF Red River	07/10/97	Pool	1	113	3	0.00	9.64	4.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.01
		Riffle	1	215	3	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17
		Run	1	367	6	0.00	2.73	1.37	0.00	0.00	0.00	0.18	0.00	0.00	0.00	4.27

Appendix 7. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Weir Creek	08/25/97	Pool	1	206	6	6.75	12.11	2.45	0.33	0.00	6.13	0.00	0.00	0.00	0.00	27.76
		PW	1	586	5	8.94	4.34	1.02	0.00	0.00	0.78	0.30	0.00	0.00	0.00	15.38
		Riffle	1	252	3	9.07	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.78
		Run	1	530	7	25.14	3.76	0.43	0.00	0.00	1.66	0.13	0.00	0.00	0.00	31.12
Salmon River Drainage																
Beaver Creek	08/21/97	Pool	2	248	5	1.46	9.79	6.63	0.00	0.00	0.00	0.00	0.26	9.41	0.00	27.55
		PW	2	151	2	9.47	6.50	2.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.96
		Riffle	2	408	6	2.42	4.42	1.78	0.00	0.00	0.00	0.00	0.00	0.37	0.00	8.98
		Run	2	971	12	5.03	5.18	3.30	0.00	0.00	0.00	0.00	0.59	4.11	0.00	18.19
Frenchman Creek	08/22/97	Pool	1	119	5	9.19	0.00	0.00	0.00	0.00	0.00	0.00	21.65	3.55	0.00	34.39
		PW	1	107	2	3.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	4.34
		Riffle	1	181	5	6.83	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	8.00
		Run	1	686	15	7.93	0.00	0.11	0.00	0.11	0.00	0.00	6.14	2.12	0.00	16.40

Appendix 8. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1998. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage																
Canyon Creek	09/06/98	Pool	1	93	4	4.38	22.26	5.91	8.47	0.00	0.00	0.00	0.00	0.00	0.00	41.01
		PW	1	786	11	1.07	8.85	6.35	0.56	0.00	0.14	0.00	0.00	0.00	0.00	16.97
		Riffle	1	108	2	4.99	9.42	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.89
		Run	1	230	5	2.47	11.26	4.38	3.07	0.00	0.82	0.00	0.00	0.00	0.00	22.01
Deadman Creek	09/05/98	Pool	1	94	5	8.41	6.64	5.80	12.04	0.90	1.84	0.00	0.00	0.00	0.00	35.64
		PW	1	783	10	5.26	7.46	1.39	0.83	0.00	0.45	0.00	0.00	0.00	0.00	15.39
		Riffle	1	26	1	3.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81
		Run	1	282	5	4.63	7.33	3.80	1.80	0.00	0.00	0.00	0.00	0.00	0.00	17.57
Fish Creek	07/16/98	Pool	1	1,325	7	1.14	13.69	9.10	1.37	0.00	2.79	0.00	0.00	0.00	0.00	28.10
	to	PW	1	10,052	25	3.79	6.54	3.30	2.02	0.00	0.64	0.00	0.00	0.00	0.02	16.32
	07/21/98	Riffle	1	3,190	7	3.03	5.90	2.64	1.53	0.00	0.71	0.00	0.00	0.00	0.00	13.80
		Run	1	5,644	19	4.51	8.45	4.94	4.34	0.00	1.11	0.00	0.00	0.00	0.00	23.35
Gedney Creek	07/30/98	Pool	1	750	6	8.80	11.66	10.25	5.47	0.46	1.95	0.00	0.00	0.00	0.97	39.55
	to	PW	1	6,705	22	8.43	6.80	2.55	1.41	0.02	0.10	0.00	0.00	0.00	0.70	20.01
	08/04/98	Riffle	1	1,461	5	12.31	8.42	2.25	1.88	0.00	0.17	0.00	0.00	0.00	0.51	25.54
		Run	1	2,762	11	15.04	10.32	3.97	6.98	0.07	0.08	0.00	0.00	0.00	0.77	37.23
Gedney Creek	07/31/98	Pool	2	172	3	8.49	22.97	9.64	0.00	0.00	0.58	1.22	0.00	0.00	0.58	43.48
	and	PW	2	950	9	4.48	10.27	2.17	0.09	0.00	0.22	0.00	0.00	0.12	0.14	17.50
	08/01/98	Riffle	2	217	3	5.79	14.55	4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.84	25.48
		Run	2	257	4	8.76	14.01	2.58	0.32	0.00	1.14	0.00	0.00	0.00	0.41	27.21
WF Gedney Creek	07/31/98	Pool	1	497	5	12.51	14.16	5.89	5.98	0.00	0.50	0.00	0.00	0.00	0.44	39.47
	and	PW	1	1,331	8	22.87	11.13	3.59	0.96	0.00	0.07	0.00	0.00	0.00	0.28	38.90
	08/01/98	Riffle	1	579	3	23.54	8.78	2.24	4.58	0.00	0.41	0.00	0.00	0.00	0.00	39.56
		Run	1	481	4	22.09	14.98	10.90	4.75	0.12	0.31	0.00	0.00	0.37	0.31	53.80

Appendix 8. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Post Office Creek	09/07/98	Pool	1	117	5	14.66	15.58	0.00	0.00	0.00	4.55	0.00	0.00	0.00	0.00	34.78
		PW	1	497	6	13.58	4.07	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	18.04
		Riffle	1	248	5	8.70	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.30
		Run	1	387	8	18.01	7.53	0.66	0.00	0.00	2.69	0.00	0.00	0.00	0.00	28.89
SF Red River	07/07/98	Pool	1	282	5	0.00	3.32	3.95	0.00	0.00	2.63	0.00	0.00	0.00	0.00	9.90
	and	PW	1	778	5	0.00	1.06	0.88	0.00	0.00	0.12	0.00	0.00	0.00	0.00	2.05
	07/08/98	Riffle	1	1,680	10	0.00	0.84	0.86	0.00	0.00	0.30	0.07	0.00	0.00	0.00	2.08
		Run	1	1,623	11	0.06	1.35	1.18	0.00	0.00	1.03	0.08	0.00	0.00	0.00	3.69
SF Red River	07/07/98	Pool	2	383	6	0.00	0.64	1.78	0.00	0.00	0.94	0.00	0.00	0.51	0.00	3.87
	and	PW	2	546	3	0.00	1.03	0.81	0.00	0.00	0.13	0.00	0.00	0.00	0.43	2.39
	07/08/98	Riffle	2	1,282	8	0.00	0.79	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16
		Run	2	1,000	10	0.00	0.70	2.49	0.00	0.00	0.73	0.09	0.00	0.00	0.00	4.00
SF Red River	07/07/98	Pool	3	25	1	4.00	4.00	0.00	0.00	0.00	12.01	0.00	0.00	0.00	0.00	20.02
	and	Riffle	3	108	2	0.00	1.47	0.00	0.00	0.00	2.01	0.00	0.00	0.00	0.00	3.47
	07/08/98	Run	3	144	2	0.71	2.07	1.42	0.00	0.00	6.27	0.00	0.00	0.00	0.00	10.48
Trapper Creek	07/08/98	Pool	1	17	1	0.00	0.00	6.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	12.00
		PW	1	211	3	1.07	1.89	1.52	0.00	0.00	1.52	0.00	0.00	0.00	0.00	6.00
		Riffle	1	68	1	1.48	4.43	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.38
		Run	1	70	1	0.00	10.03	8.59	0.00	0.00	1.43	0.00	0.00	0.00	0.00	20.05
WF SF Red River	07/08/98	Pool	1	52	2	0.00	5.70	5.70	0.00	0.00	8.57	0.00	0.00	0.00	0.00	19.96
		Riffle	1	134	2	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87
		Run	1	107	2	0.00	0.91	0.91	0.00	0.00	0.91	0.00	0.00	0.00	0.00	2.72
Weir Creek	09/08/98	Pool	1	106	6	36.49	15.06	0.00	0.00	0.00	9.50	0.00	0.00	0.00	0.00	61.03
		PW	1	368	5	14.64	3.41	0.00	0.00	0.00	2.56	0.00	0.00	0.00	0.00	20.62
		Run	1	341	7	24.54	5.45	0.98	0.00	0.00	5.05	0.00	0.00	0.00	0.00	36.03
Salmon River Drainage																
Beaver Creek[a]	08/11/98	Pool	2	212	4	0.74	3.29	1.00	0.00	0.00	0.00	0.00	0.52	5.88	0.00	11.42
	and	PW	2	226	3	5.24	1.38	0.36	0.00	0.00	0.00	0.00	0.71	0.36	0.00	8.04
	08/12/98	Riffle	2	623	9	2.06	0.68	0.16	0.00	0.00	0.00	0.00	2.79	0.32	0.00	6.01
		Run	2	1,018	14	1.62	2.76	1.64	0.00	0.07	0.00	0.00	2.04	2.75	0.00	10.88

Appendix 8. (Continued.)

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Frenchman Creek	08/11/98	Pool	1	130	6	0.00	2.82	0.00	0.00	0.00	0.00	0.00	22.60	2.15	0.00	27.56
	and	PW	1	103	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.00	1.01
	08/12/98	Riffle	1	199	5	0.00	0.84	0.00	0.00	0.00	0.00	0.00	1.88	0.60	0.00	3.32
		Run	1	663	15	0.00	1.82	0.53	0.00	0.00	0.00	0.00	5.64	6.17	0.00	14.16
All strata combined																
Gedney Creek	07/30/98	Pool	0	921	9	8.69	15.43	10.05	3.65	0.30	1.49	0.41	0.00	0.00	0.84	40.86
	to	PW	0	7,655	31	7.28	7.81	2.43	1.03	0.02	0.14	0.00	0.00	0.04	0.54	19.28
	08/04/98	Riffle	0	1,678	8	9.86	10.72	3.02	1.18	0.00	0.11	0.00	0.00	0.00	0.64	25.52
		Run	0	3,019	15	13.37	11.30	3.61	5.20	0.05	0.36	0.00	0.00	0.00	0.67	34.56
SF Red River	07/07/98	Pool	0	691	12	0.33	2.04	2.53	0.00	0.00	2.57	0.00	0.00	0.25	0.00	7.73
	and	PW	0	1,324	8	0.00	1.05	0.85	0.00	0.00	0.12	0.00	0.00	0.00	0.16	2.18
	07/08/98	Riffle	0	3,070	20	0.00	0.88	0.58	0.00	0.00	0.35	0.04	0.00	0.00	0.00	1.85
		Run	0	2,766	23	0.09	1.13	1.77	0.00	0.00	1.36	0.08	0.00	0.00	0.00	4.42

[a] Beaver Creek strata 1 was dewatered when crews were snorkeling the stream.

Appendix 9. Mean fish densities (fish/100 m^2) by habitat type in tributaries snorkeled in 1999. S = stream strata; Area = total surface area of all sites in m^2; N = number of sites snorkeled of each habitat type; Trout fry = all trout (except brook trout) ≤75 mm; SH 1 = juvenile steelhead 76 mm to 127 mm; SH 2+ = juvenile steelhead >127 mm; CH 0 = age-0 chinook salmon; CH 1 = age-1 chinook salmon; Cutt = all cutthroat trout; Bull = all bull trout; Brook fry = all brook trout <75 mm; Brook = all brook trout ≥75 mm; White = all mountain whitefish; Total = total salmonid density.

Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Clearwater River Drainage																
Bald Mountain Creek	08/31/99	Pool	1	91	3	0.00	5.81	8.88	0.00	0.00	7.47	0.81	0.00	0.00	0.00	22.98
		PW	1	1,283	12	0.23	1.76	3.95	0.00	0.00	1.61	0.00	0.00	0.00	0.00	7.55
		Run	1	131	3	2.05	3.92	4.64	0.00	0.00	3.99	0.00	0.00	0.00	0.00	14.60
Boulder Creek	08/17/99	Pool	1	615	6	1.20	12.91	14.49	0.45	0.60	0.60	0.00	0.00	0.00	0.00	30.23
	and	PW	1	5,325	22	0.75	3.47	5.62	0.02	0.00	0.08	0.00	0.00	0.00	0.00	9.94
	08/18/99	Riffle	1	392	2	1.49	0.92	1.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16
		Run	1	784	5	0.90	4.32	7.54	0.09	0.00	0.49	0.09	0.00	0.00	0.00	13.43
Canyon Creek	08/19/99	Pool	1	154	5	4.98	2.64	12.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.31
		PW	1	1,564	15	7.42	2.80	2.82	0.00	0.00	0.06	0.00	0.00	0.00	0.00	13.10
		Riffle	1	104	1	3.86	1.93	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.76
		Run	1	259	4	16.80	7.24	3.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.60
Deadman Creek	08/31/99	Pool	1	131	4	52.95	8.20	10.00	0.79	0.00	0.68	0.00	0.00	0.00	0.00	72.61
		PW	1	929	10	23.85	2.11	1.63	0.00	0.00	0.20	0.00	0.00	0.00	0.00	27.79
		Riffle	1	198	3	23.37	1.97	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.27
		Run	1	334	5	35.95	2.86	3.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.18
Fish Creek	07/22/99	Pool	1	901	6	0.35	10.99	15.32	0.00	0.00	1.67	0.00	0.00	0.00	0.00	28.32
	to	PW	1	11,846	24	1.68	5.02	4.39	0.00	0.00	0.33	0.01	0.00	0.00	0.00	11.42
	07/27/99	Riffle	1	3,782	6	1.82	3.82	1.40	0.00	0.00	0.44	0.00	0.00	0.00	0.00	7.48
		Run	1	5,769	20	2.60	7.88	6.56	0.00	0.02	0.97	0.04	0.00	0.00	0.00	18.06
Gedney Creek	08/05/99	Pool	1	863	6	1.49	8.10	9.15	1.50	0.16	0.57	0.00	0.00	0.00	1.07	22.02
	to	PW	1	7,449	23	5.15	6.80	3.97	0.22	0.03	0.02	0.02	0.00	0.00	0.29	16.51
	08/10/99	Riffle	1	1,566	5	5.40	5.80	2.89	0.00	0.00	0.00	0.00	0.00	0.00	0.27	14.36
		Run	1	2,408	12	11.20	8.38	6.21	0.71	0.13	0.12	0.07	0.00	0.00	0.34	27.15

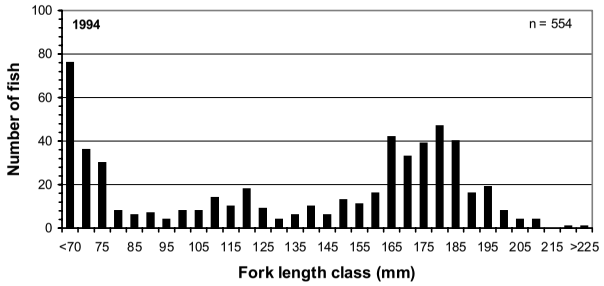
Appendix 9. (Continued.)

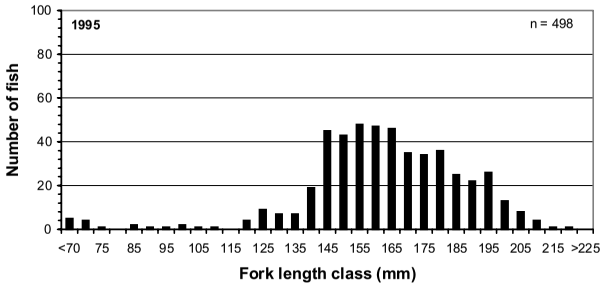
Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Gedney Creek	08/07/99	Pool	2	174	3	1.12	11.75	8.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.02
		PW	2	1,222	8	2.05	7.50	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.23
		Riffle	2	241	2	4.79	8.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.49
		Run	2	242	3	2.06	10.49	6.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.81
WF Gedney Creek	08/07/99	Pool	1	459	4	2.82	17.98	13.54	0.00	0.00	0.18	0.18	0.00	0.00	0.39	35.09
		PW	1	1,661	7	3.48	12.74	5.46	0.00	0.00	0.26	0.00	0.00	0.00	0.00	21.95
		Riffle	1	740	3	2.90	13.11	4.19	0.00	0.00	0.15	0.00	0.00	0.00	0.00	20.36
		Run	1	535	3	9.50	13.80	5.53	0.00	0.52	0.67	0.13	0.00	0.00	0.00	30.15
Post Office Creek	08/30/99	Pool	1	100	3	12.86	4.48	0.00	0.00	0.00	1.12	0.00	0.00	0.00	0.00	18.45
		PW	1	737	9	15.11	2.66	0.56	0.00	0.00	0.66	0.37	0.00	0.00	0.00	19.38
		Riffle	1	221	4	15.24	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.69
		Run	1	346	5	15.22	2.91	0.23	0.00	0.00	1.96	0.00	0.00	0.00	0.00	20.33
SF Red River	07/07/99	Pool	1	231	5	0.00	4.24	4.54	0.00	0.00	4.71	0.00	0.00	1.51	0.42	15.43
	and	PW	1	724	5	0.13	1.74	0.43	0.00	0.00	0.42	0.00	0.00	0.00	0.43	3.14
	07/08/99	Riffle	1	1,066	9	0.00	1.37	0.42	0.00	0.00	0.47	0.11	0.00	0.00	0.00	2.37
		Run	1	1,150	11	0.10	1.42	1.96	0.20	0.00	1.47	0.00	0.00	0.08	0.07	5.30
SF Red River	07/07/99	Pool	2	168	5	0.00	0.00	0.85	0.00	0.00	5.46	0.76	0.00	0.00	0.00	7.07
	and	PW	2	640	5	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.37
	07/08/99	Riffle	2	1,312	11	0.00	0.12	0.05	0.00	0.00	1.68	0.00	0.00	0.18	0.00	2.04
		Run	2	978	9	0.00	0.28	0.39	0.00	0.00	1.73	0.12	0.00	0.15	0.00	2.67
Trapper Creek	07/08/99	Pool	1	18	1	0.00	0.00	5.48	0.00	0.00	38.36	0.00	0.00	0.00	0.00	43.84
		PW	1	242	4	0.00	0.00	0.00	0.00	0.00	8.86	0.00	0.00	0.00	0.00	8.86
		Riffle	1	46	1	0.00	0.00	0.00	0.00	0.00	15.35	0.00	0.00	0.00	0.00	15.35
WF Red River	07/08/99	Pool	1	45	2	0.00	2.90	6.44	0.00	0.00	11.59	0.00	0.00	0.00	0.00	20.92
		Run	1	194	4	0.00	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	2.60
Weir Creek	08/30/99	Pool	1	74	3	5.57	18.57	6.88	0.00	0.00	3.78	0.00	0.00	0.00	0.00	34.81
		PW	1	1,066	11	2.99	4.62	2.09	0.00	0.00	0.11	0.12	0.00	0.00	0.00	9.93
		Riffle	1	343	3	2.63	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.23
		Run	1	331	5	9.95	10.38	5.80	0.00	0.00	0.23	0.00	0.00	0.00	0.00	26.35

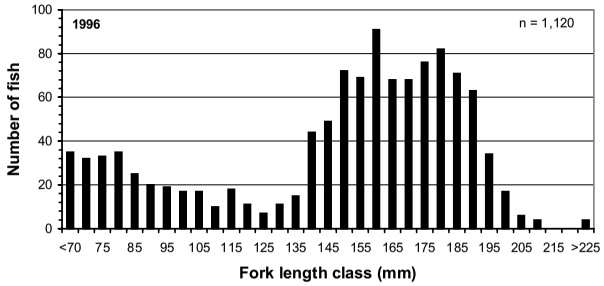
Appendix 9. (Continued.)

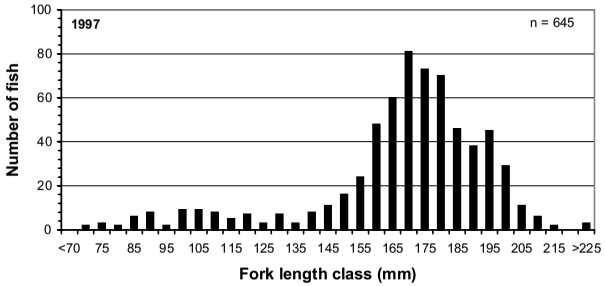
Stream	Date	Habitat Type	S	Area	N	Trout Fry	SH 1	SH 2+	CH 0	CH 1	Cutt	Bull	Brook Fry	Brook	White	Total
Salmon River Drainage																
Basin Creek	08/18/99	Pool	1	154	1	13.60	4.53	1.94	0.65	0.00	0.00	0.00	0.00	0.00	0.00	20.73
		PW	1	161	1	0.62	0.62	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.87
		Riffle	1	422	2	2.59	0.71	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.26
		Run	1	230	2	9.81	6.85	3.74	1.99	0.00	0.00	0.00	0.00	0.00	0.00	22.39
Beaver Creek	08/17/99	Pool	2	267	5	1.27	5.49	4.83	2.67	0.00	0.00	0.00	0.95	13.12	0.00	28.33
	and	PW	2	207	3	1.90	4.99	1.65	0.00	0.00	0.00	0.00	1.50	1.56	0.00	11.61
	08/18/99	Riffle	2	501	8	6.02	3.94	0.38	0.00	0.00	0.00	0.00	0.73	1.27	0.00	12.33
		Run	2	958	14	8.51	2.96	2.79	1.02	0.00	0.00	0.00	1.85	7.38	0.00	24.52
Frenchman Creek	08/16/99	Pool	1	191	5	5.14	0.00	0.00	0.38	0.00	0.00	0.00	1.31	6.01	0.00	12.84
	and	PW	1	174	3	14.40	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	14.92
	08/17/99	Riffle	1	267	6	6.86	0.00	0.35	0.00	0.00	0.00	0.00	2.28	0.59	0.00	10.09
		Run	1	675	13	8.13	0.00	0.16	1.08	0.00	0.00	0.00	1.95	4.94	0.00	16.26

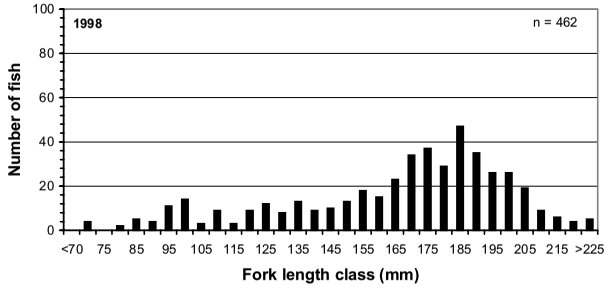
Appendix 10. Length frequency of PIT-tagged steelhead juveniles captured at the Crooked Fork Creek screw trap from 1994 to 1999.

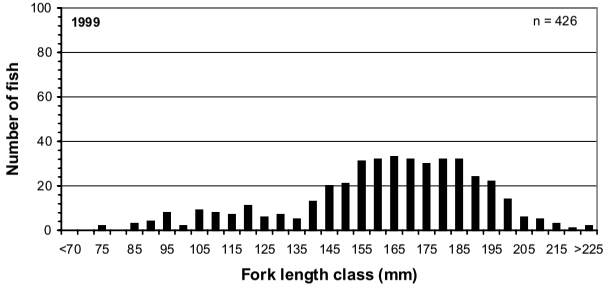




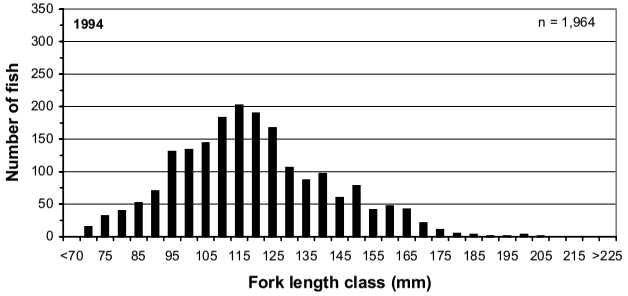


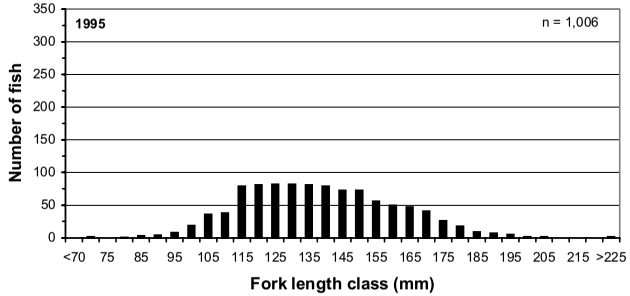


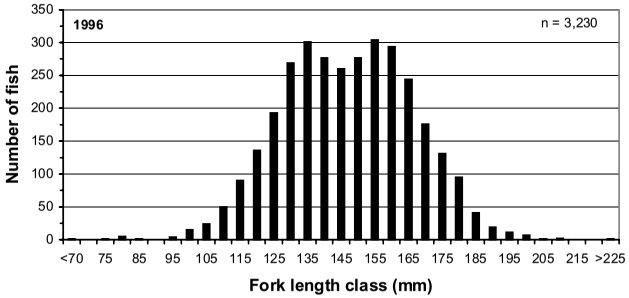


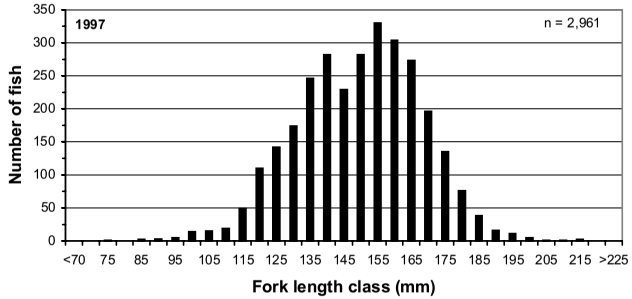


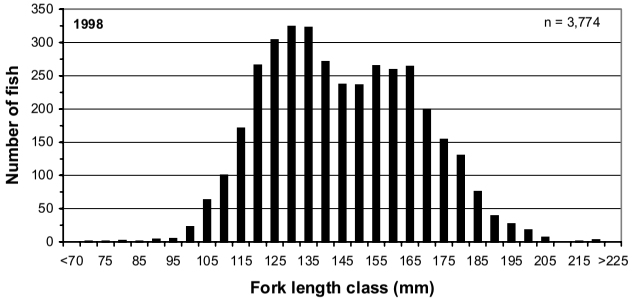
Appendix 11. Length frequency of PIT-tagged steelhead juveniles captured at the Fish Creek screw trap from 1994 to 1999.

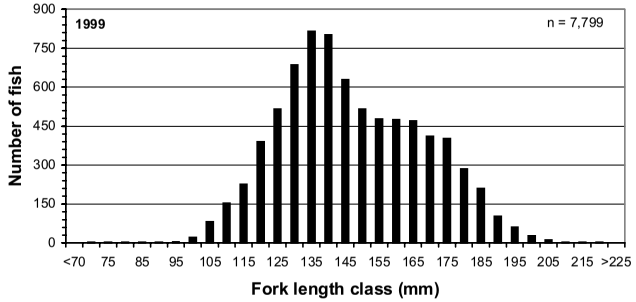




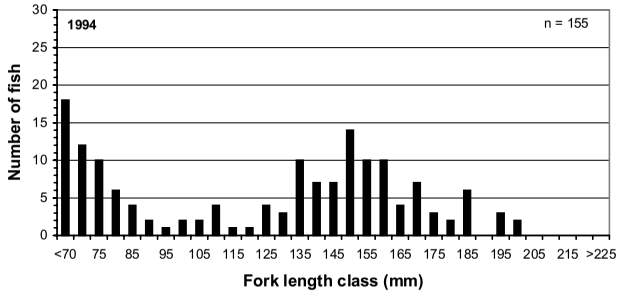


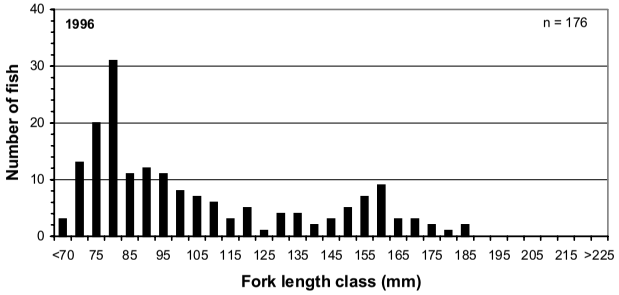


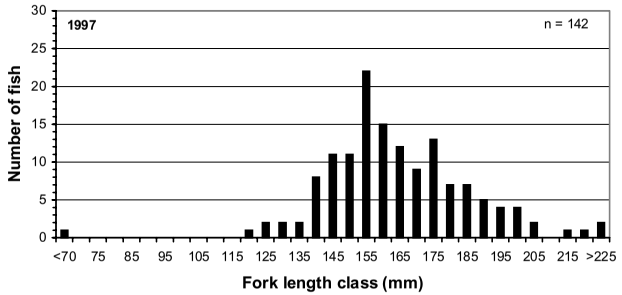


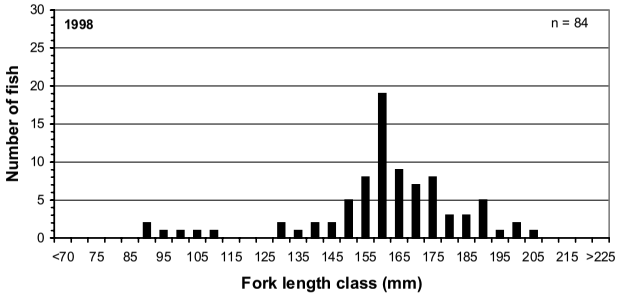


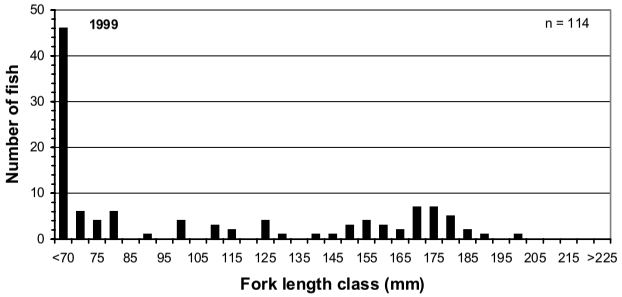
Appendix 12. Length frequency of PIT-tagged steelhead juveniles captured at the Red River screw trap from 1994 to 1999. We did not tag steelhead juveniles in 1995.



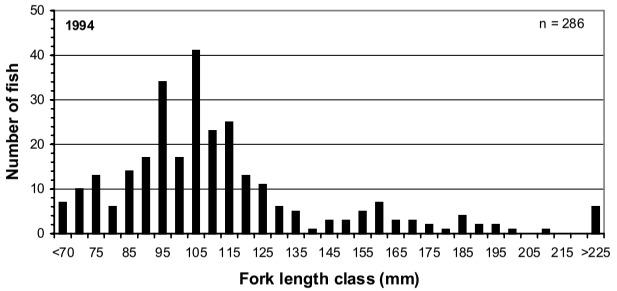


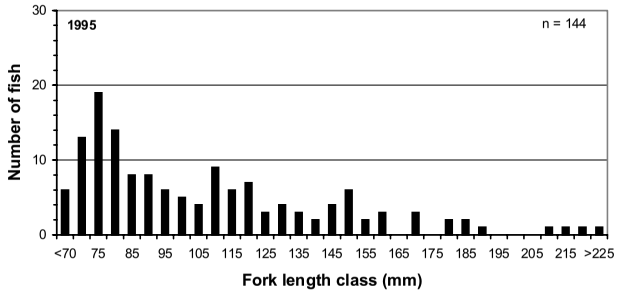


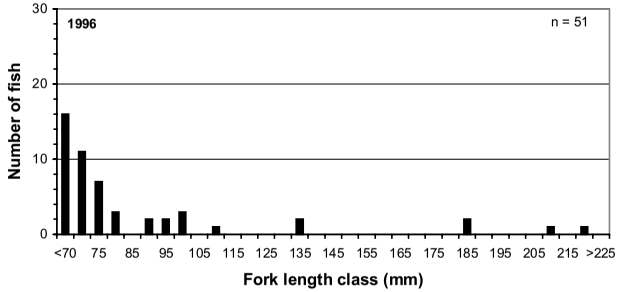


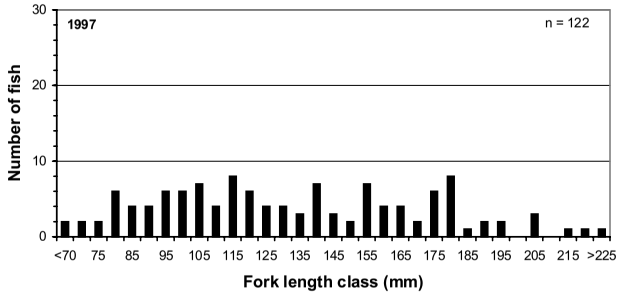


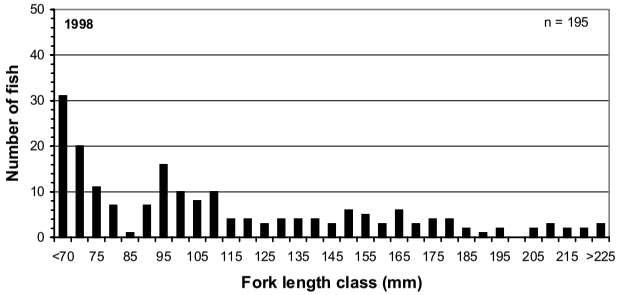
Appendix 13. Length frequency of PIT-tagged steelhead juveniles captured at the Marsh Creek screw trap from 1994 to 1999.

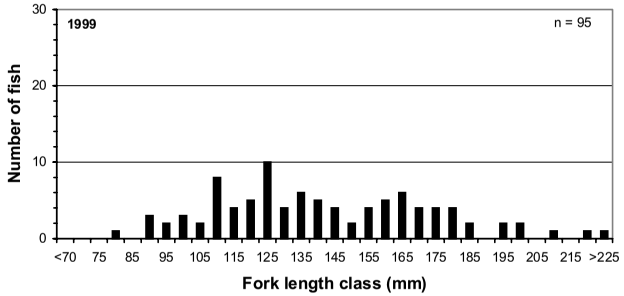




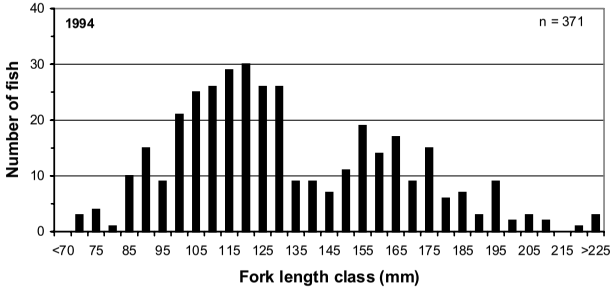


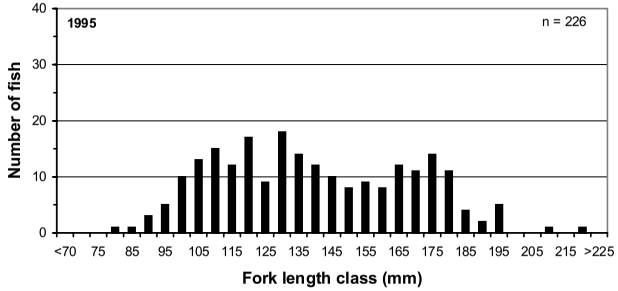


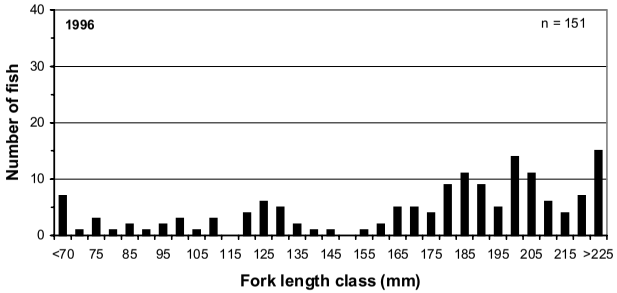


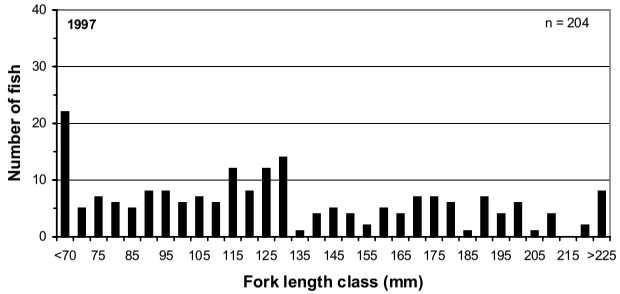


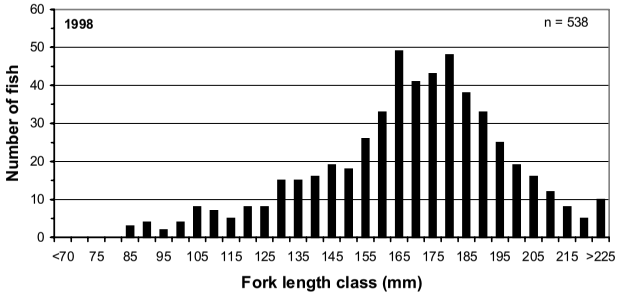
Appendix 14. Length frequency of PIT-tagged steelhead juveniles captured at the Pahsimeroi River screw trap from 1994 to 1999.

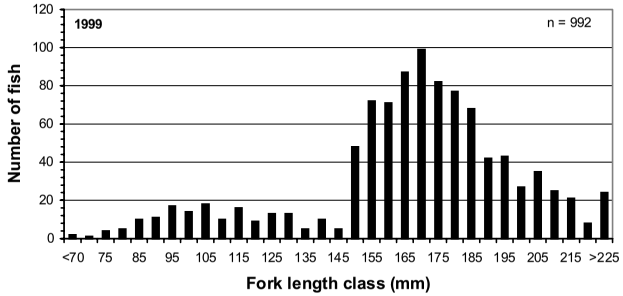




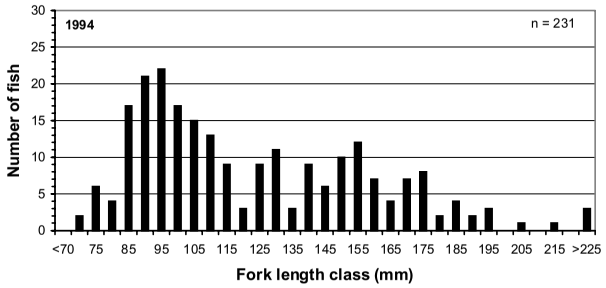


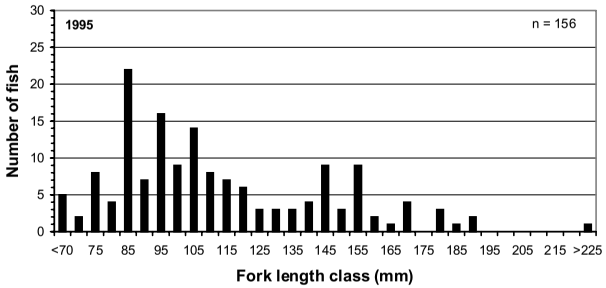


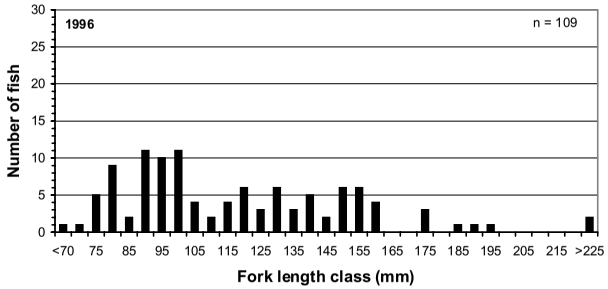


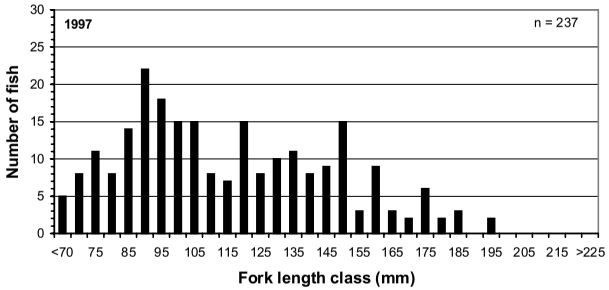


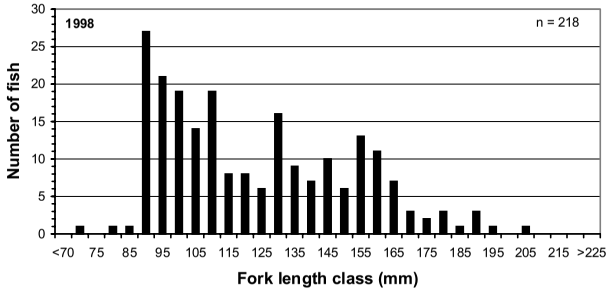
Appendix 15. Length frequency of PIT-tagged steelhead juveniles captured at the South Fork Salmon River, Knox bridge screw trap from 1994 to 1999.

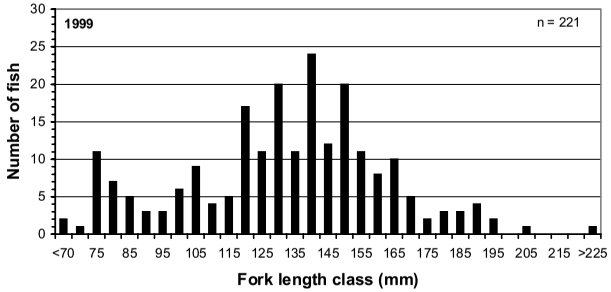




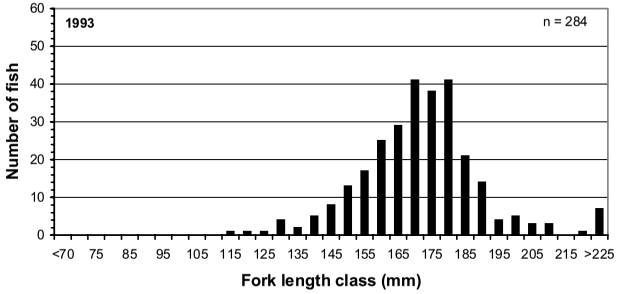


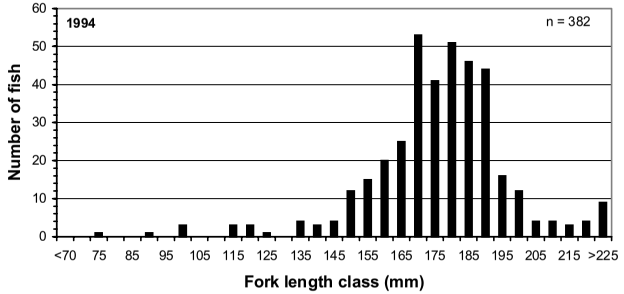


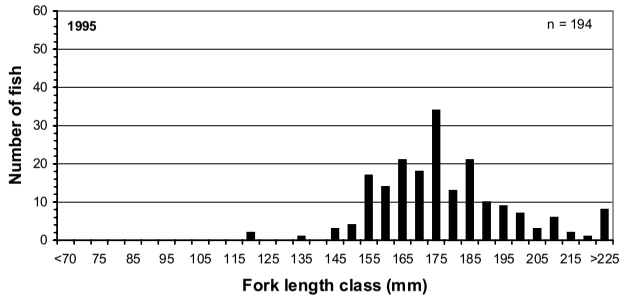


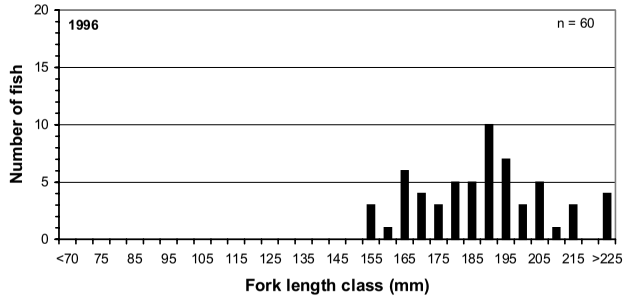


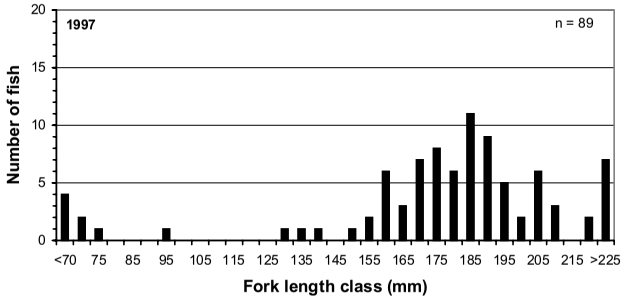
Appendix 16. Length frequency of PIT-tagged steelhead juveniles captured at the Rapid River screw trap from 1993 to 1997.



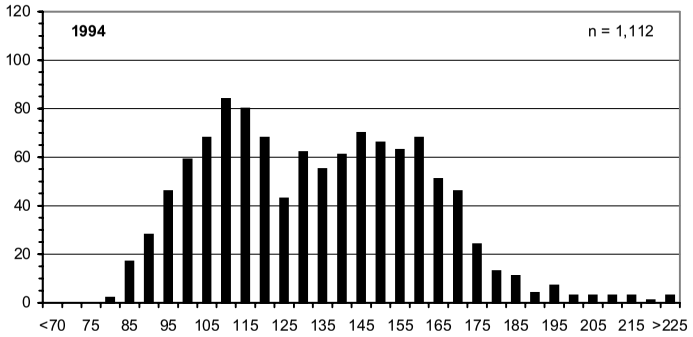


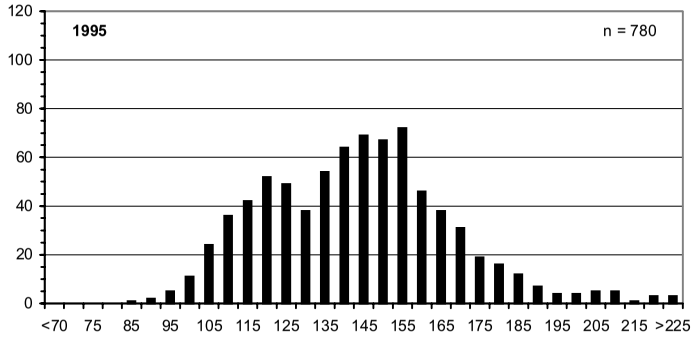


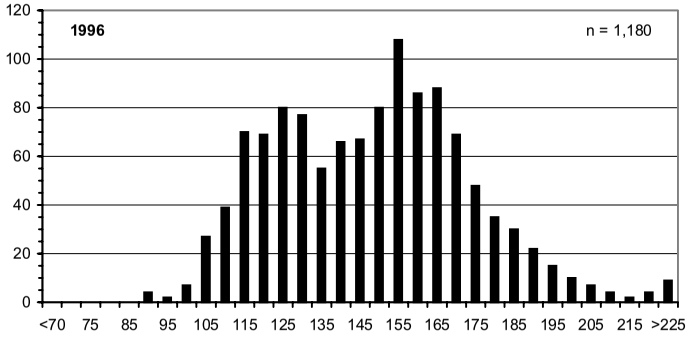


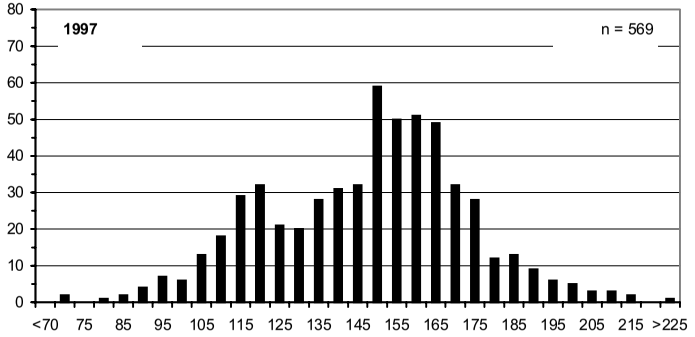


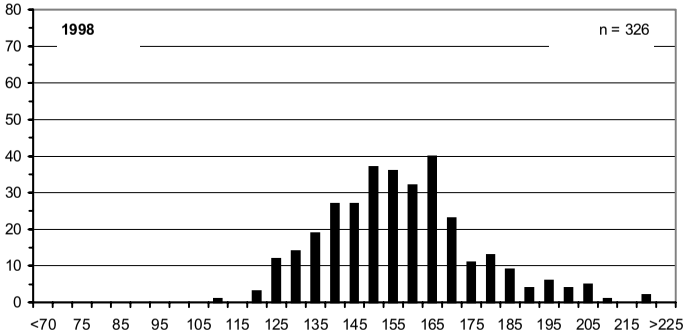
Appendix 17. Yearly length frequency distribution of wild steelhead captured by fly-fishing in Fish Creek from 1994 to 1999.

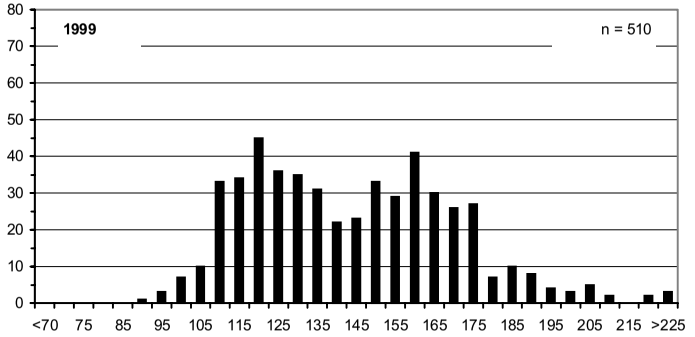




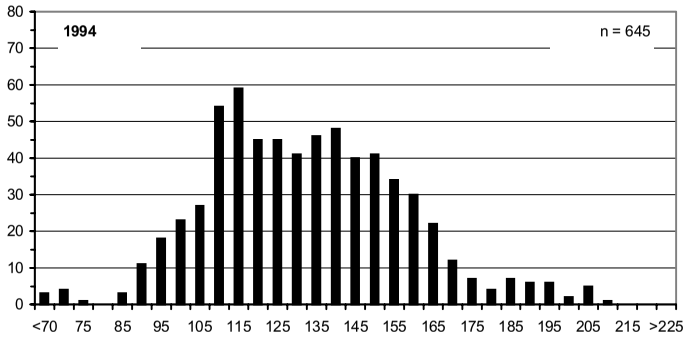


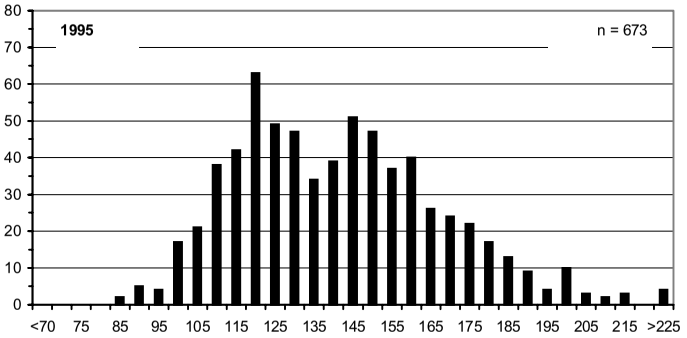


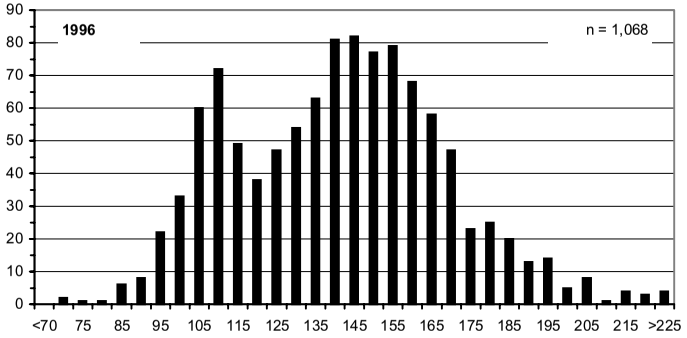


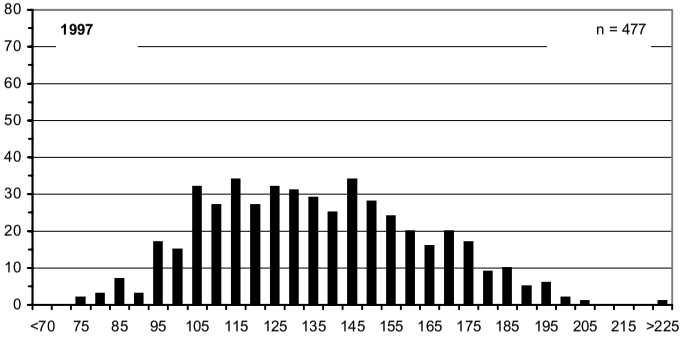


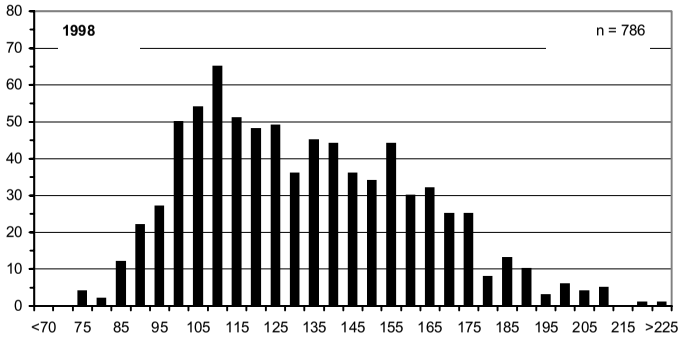
Appendix 18. Yearly length frequency distribution of wild steelhead captured by fly-fishing in Gedney Creek from 1994 to 1999.

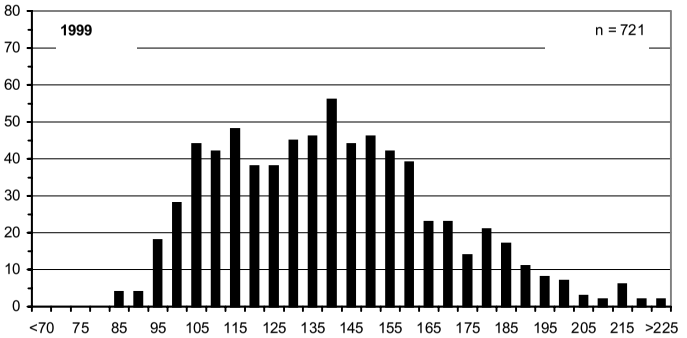




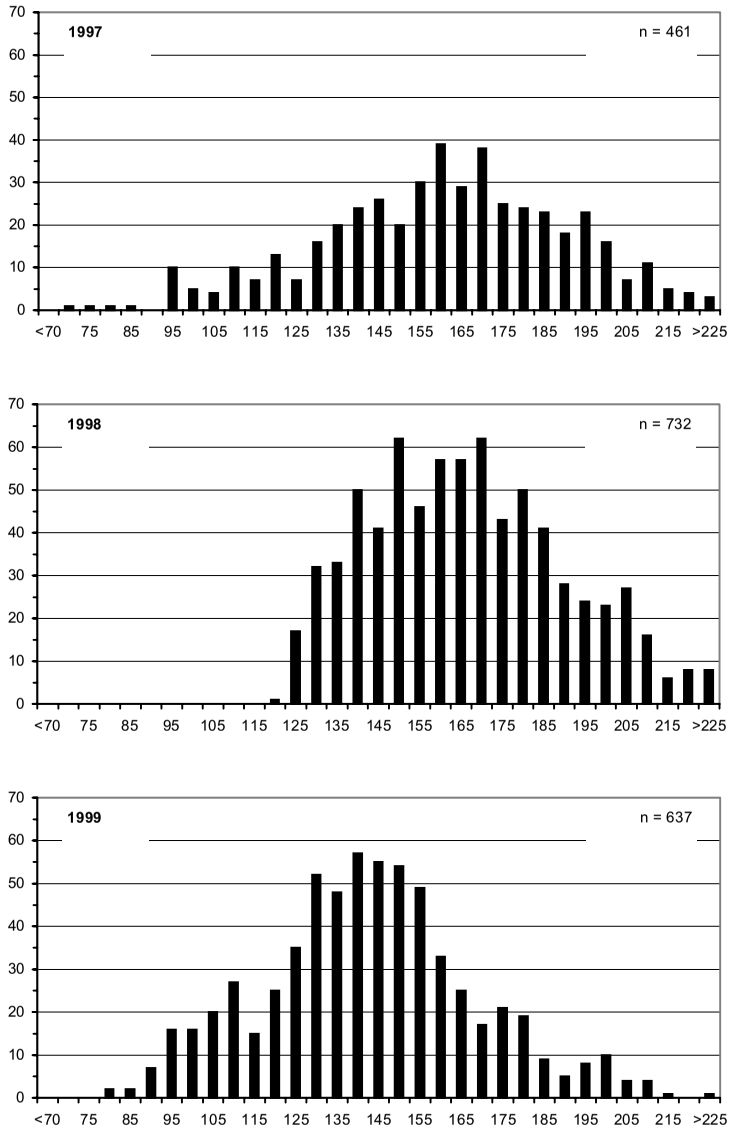




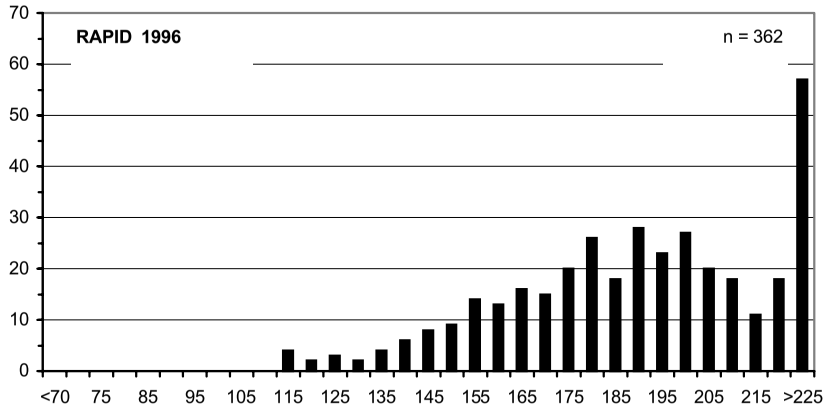


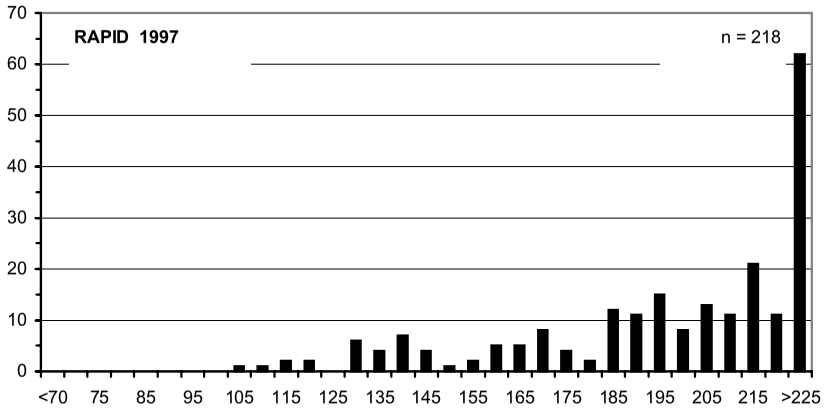


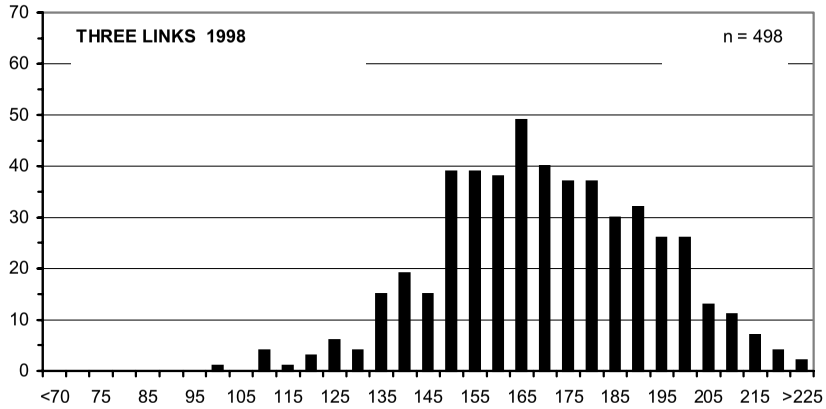
Appendix 19. Yearly length frequency of wild steelhead captured by fly-fishing in Lick Creek from 1997 to 1999.

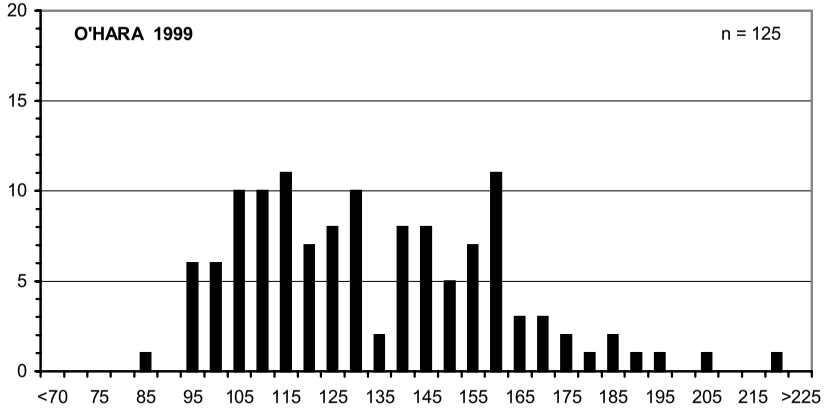


Appendix 20. Yearly length frequency of wild steelhead captured by fly-fishing in Rapid River in 1996 and 1997, Three Links Creek in 1998, and O'Hara Creek in 1999.

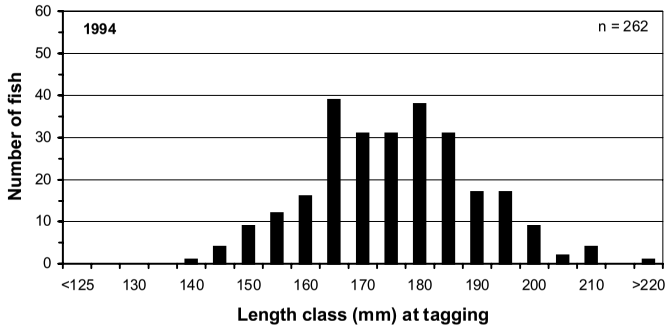


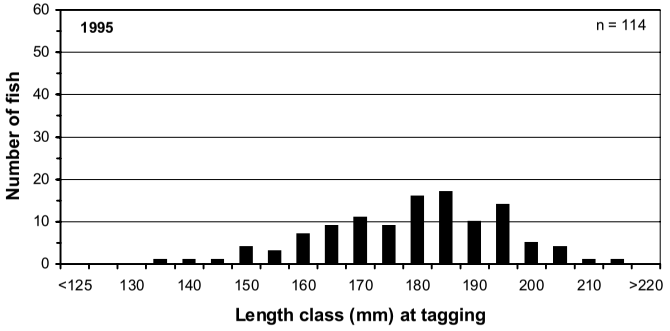


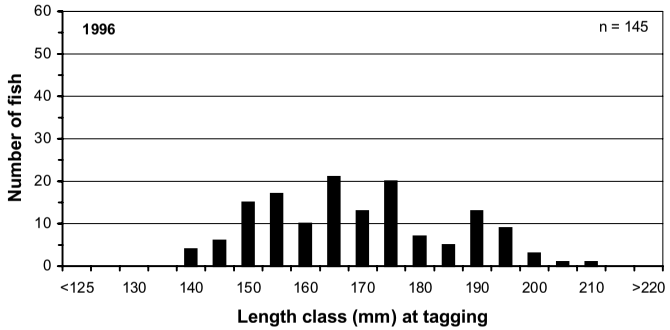


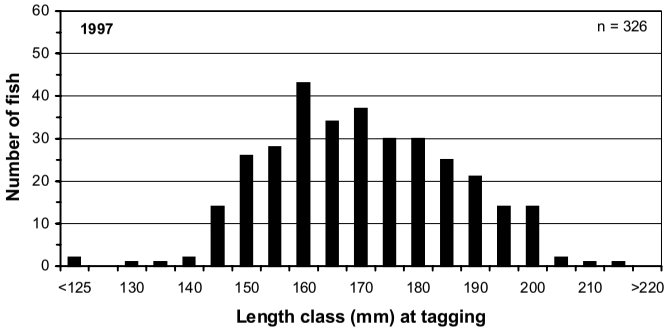


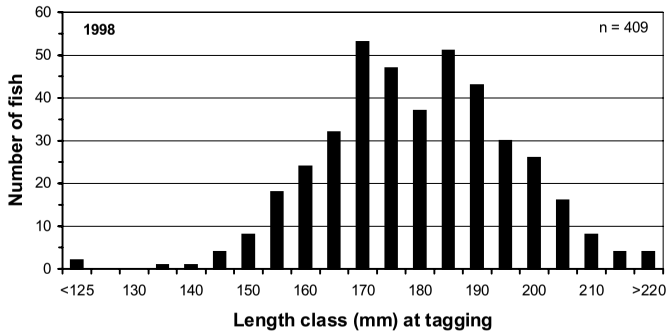
Appendix 21. Yearly length frequency distribution of steelhead smolts PIT tagged at the Crooked Fork Creek screw trap that were detected at the Snake River dams during migration years 1994 to 1999. These fish were tagged the same spring of their detection or the previous year after August 31.

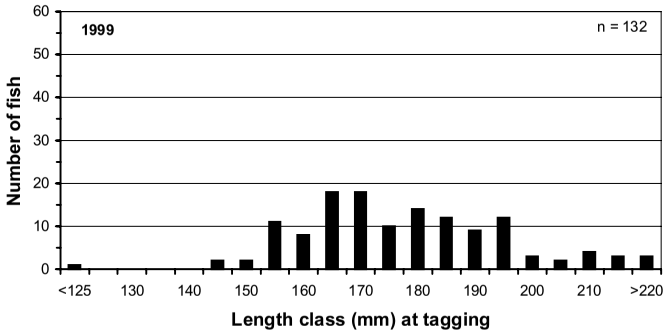




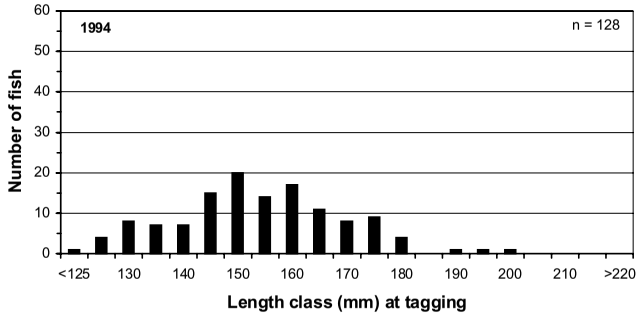


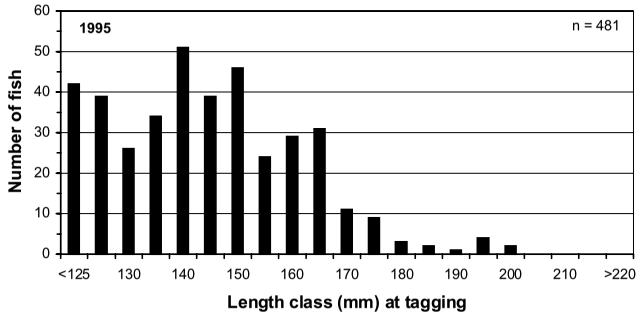


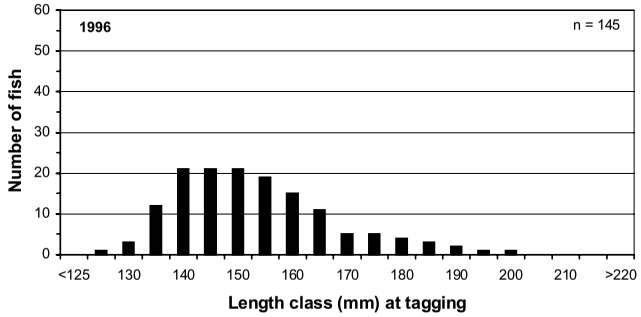


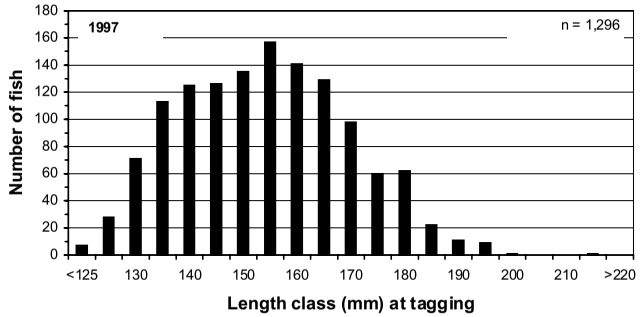


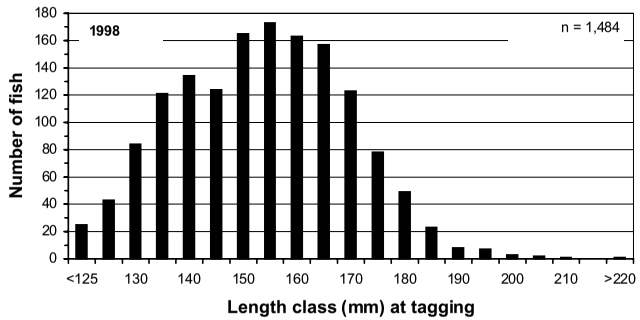
Appendix 22. Yearly length frequency distribution of steelhead smolts PIT tagged at the Fish Creek screw trap that were detected at the Snake River dams during migration years 1994 to 1999. These fish were tagged the same spring of their detection or the previous year after August 31.

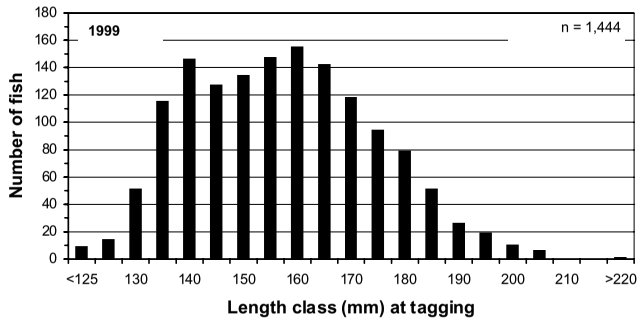




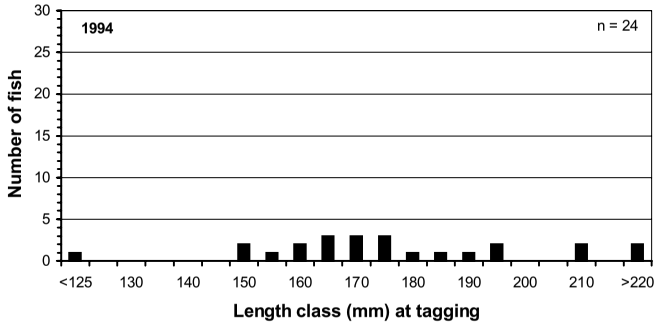


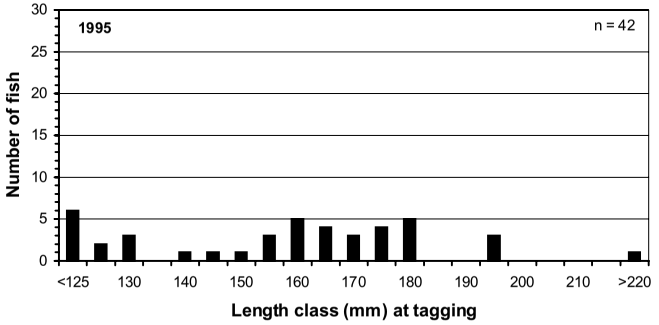


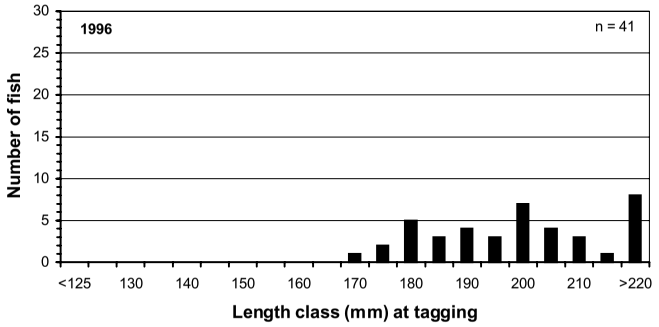


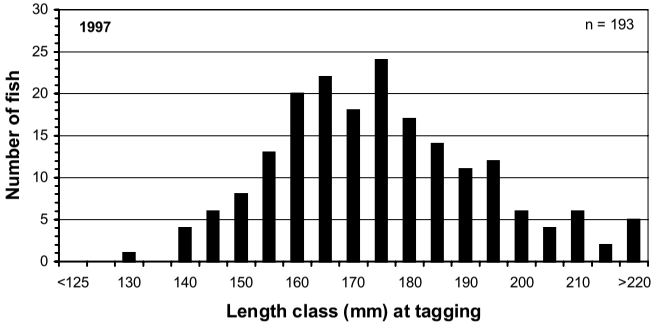


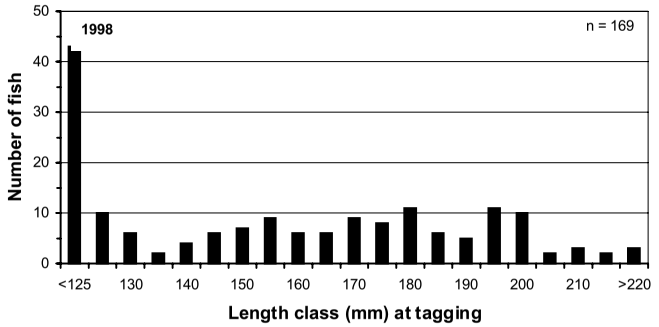
Appendix 23. Yearly length frequency distribution of steelhead smolts PIT tagged at the Pahsimeroi River screw trap that were detected at the Snake River dams during migration years 1994 to 1999. These fish were tagged the same spring of their detection or the previous year after August 31.

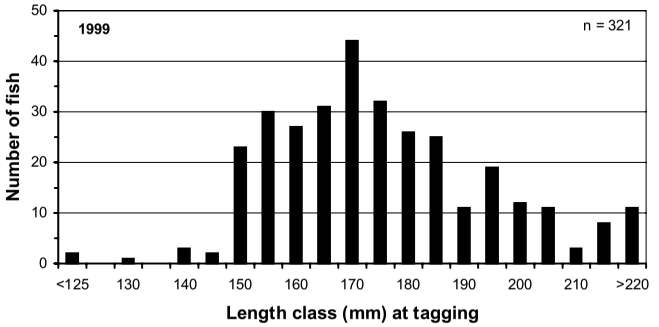




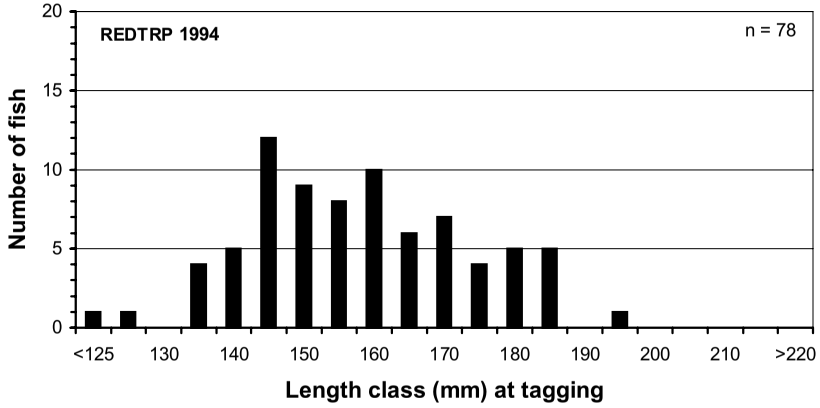


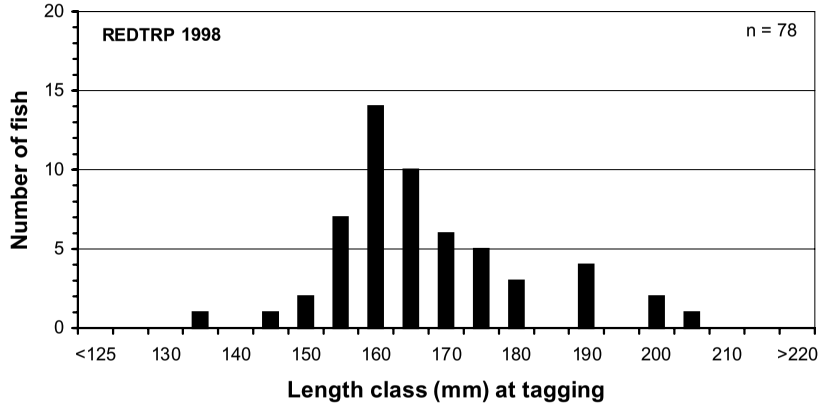


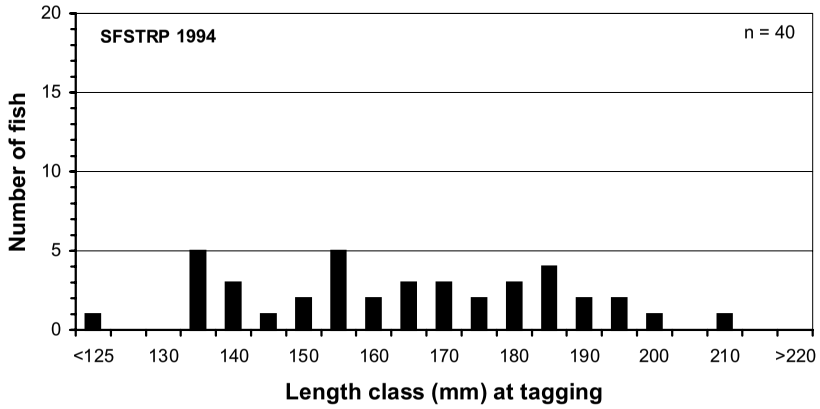


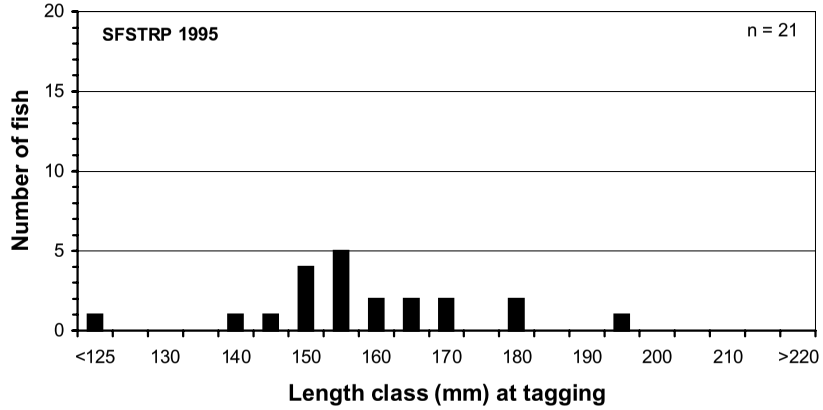


Appendix 24. Yearly length frequency distribution of steelhead smolts PIT tagged at the Red River (REDTRP) and South Fork Salmon River, Knox bridge (SFSTRP) screw traps that were detected at the Snake River dams during migration years 1994 to 1999. These fish were tagged the same spring of their detection or the previous year after August 31.









Appendix 25. The date the 5%, 10%, 25%, 50%, 75%, and 90% quantile of smolt arrival was attained at Lower Granite Dam during migration years 1993 to 1996.

Release site	Code	Number	Date quantile was attained						Duration (in days) of quantile			
			5%	10%	25%	50%	75%	90%	10-25%	25-50%	50-75%	75-90%
1994												
Crooked Fork Creek	CFCTRP	202	4/22/94	4/23/94	4/24/94	4/27/94	5/1/94	5/8/94	1	3	4	7
Fish Creek	FISH	97	4/22/94	4/23/94	4/24/94	4/27/94	5/2/94	5/10/94	1	3	5	8
Red River	RED	57	4/21/94	4/24/94	4/28/94	5/4/94	5/11/94	5/18/94	4	6	7	7
Rapid River	RAPID	91	4/21/94	4/23/94	4/24/94	4/26/94	4/29/94	5/7/94	1	2	3	8
SF Salmon River, Knox bridge	SFSTRP	76	4/22/94	4/23/94	4/24/94	4/27/94	5/3/94	5/12/94	1	3	6	9
Clear Creek	CLEARC	11	4/21/94	4/22/94	4/23/94	4/27/94	4/30/94	5/7/94	1	4	3	7
Marsh Creek	MARTRP	11	4/24/94	4/26/94	4/26/94	4/29/94	4/30/94	5/10/94	0	3	1	10
Pahsimeroi River	PAHTRP	16	4/15/94	4/26/94	4/29/94	5/9/94	5/14/94	5/19/94	3	10	5	5
1995												
Crooked Fork Creek	CFCTRP	89	4/23/95	4/30/95	5/2/95	5/3/95	5/8/95	5/9/95	2	1	5	1
Fish Creek	FISH	426	4/26/95	4/30/95	5/3/95	5/8/95	5/9/95	5/15/95	3	5	1	6
Gedney Creek	GEDNEC	73	4/25/95	4/29/95	5/2/95	5/6/95	5/9/95	5/14/95	3	4	3	5
Marsh Creek	MARTRP	20	4/20/95	4/24/95	5/2/95	5/10/95	5/11/95	5/25/95	8	8	1	14
Pahsimeroi River	PAHTRP	23	4/26/95	5/6/95	5/10/95	5/14/95	5/21/95	5/25/95	4	4	7	4
Rapid River	RAPID	117	4/13/95	4/13/95	4/20/95	5/2/95	5/9/95	5/10/95	7	12	7	1
SF Salmon River, Knox bridge	SFSTRP	47	4/13/95	4/13/95	4/25/95	5/4/95	5/10/95	5/18/95	12	9	6	8
Red River	RED	11	4/17/95	4/30/95	5/1/95	5/5/95	5/12/95	5/15/95	1	4	7	3
Clear Creek	CLEARC	0										
1996												
Crooked Fork Creek	CFCTRP	78	4/11/96	4/13/96	4/19/96	5/5/96	5/15/96	5/17/96	6	16	10	2
Clear Creek	CLEARC	60	4/12/96	4/19/96	4/21/96	5/8/96	5/15/96	5/16/96	2	17	7	1
Fish Creek	FISH	326	4/12/96	4/14/96	4/26/96	5/5/96	5/15/96	5/16/96	12	9	10	1
Gedney Creek	GEDNEC	63	4/12/96	4/15/96	4/20/96	4/26/96	5/3/96	5/13/96	5	6	7	10
Pahsimeroi River	PAHTRP	26	5/18/96	5/18/96	5/21/96	5/26/96	6/3/96	6/6/96	3	5	8	3
Rapid River	RAPID	32	4/10/96	4/12/96	4/16/96	4/26/96	4/29/96	5/15/96	4	10	3	16
Marsh Creek	MARTRP	16	4/14/96	4/15/96	4/17/96	5/13/96	5/16/96	5/18/96	2	26	3	2
SF Salmon River, Knox bridge	SFSTRP	12	4/10/96	4/12/96	4/16/96	4/26/96	4/30/96	5/6/96	4	10	4	6
Red River	RED	0										

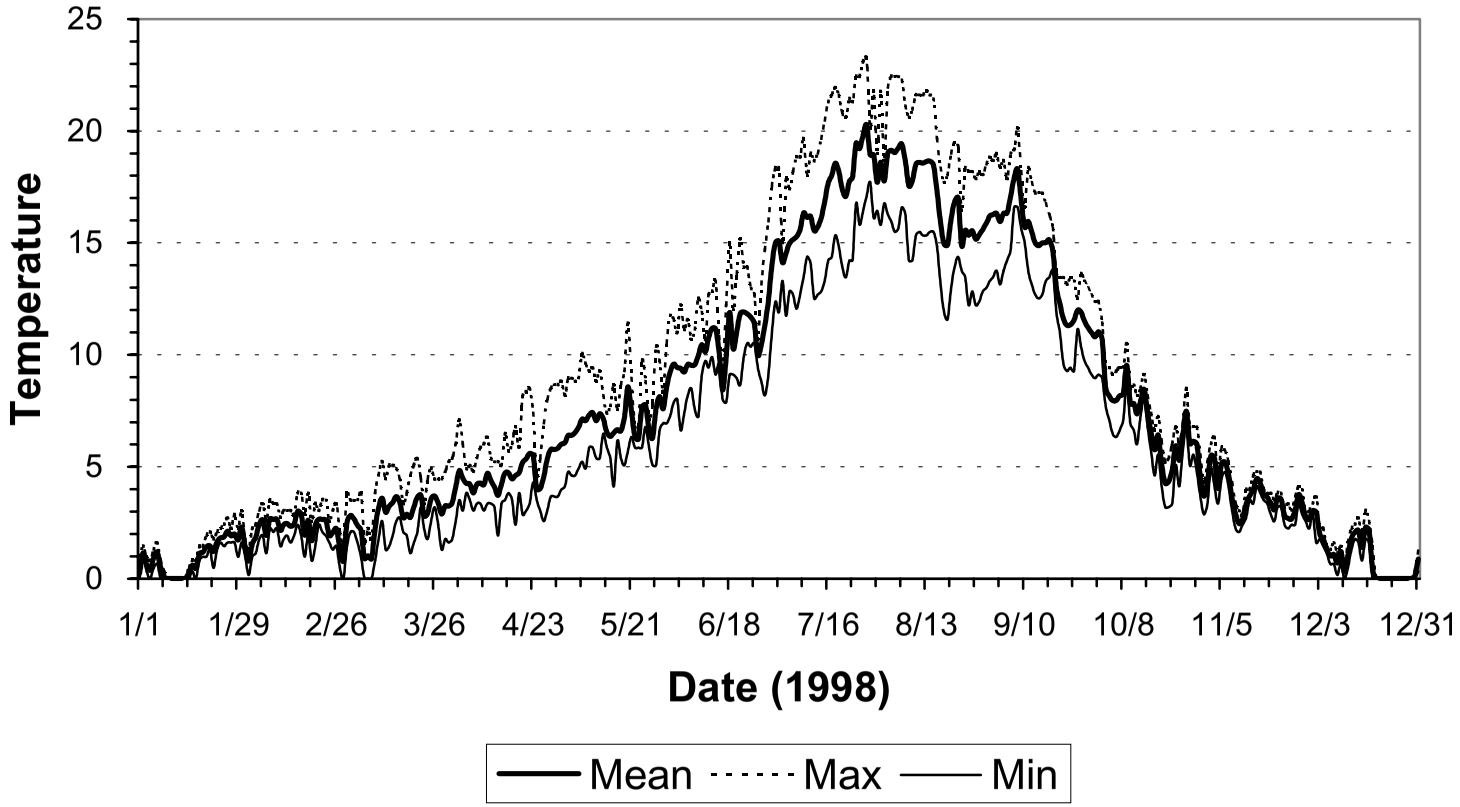
Appendix 26. The date the 5%, 10%, 25%, 50%, 75%, and 90% quantile of smolt arrival was attained at Lower Granite Dam during migration years 1997 to 1999.

Release site	Code	Number	Date quantile was attained						Duration (in days) of quantile			
			5%	10%	25%	50%	75%	90%	10-25%	25-50%	50-75%	75-90%
1997												
Crooked Fork Creek	CFCTRP	290	4/19/97	4/20/97	4/21/97	4/23/97	5/1/97	5/9/97	1	2	8	8
Clear Creek	CLEARC	79	4/8/97	4/8/97	4/14/97	4/20/97	4/21/97	4/23/97	6	6	1	2
Fish Creek	FISH	1,087	4/19/97	4/20/97	4/21/97	4/23/97	4/29/97	5/9/97	1	2	6	10
Gedney Creek	GEDNEC	111	4/19/97	4/20/97	4/21/97	4/22/97	4/24/97	5/6/97	1	1	2	12
Pahsimeroi River	PAHTRP	108	5/18/97	5/20/97	5/22/97	5/26/97	5/31/97	6/4/97	2	4	5	4
Rapid River	RAPID	29	4/2/97	4/3/97	4/20/97	4/22/97	4/27/97	5/8/97	6	2	1	8
Marsh Creek	MARTRP	4	3/31/97	3/31/97	3/31/97	4/6/97	4/24/97	4/27/97	0	6	18	3
SF Salmon River, Knox bridge	SFSTRP	7	4/1/97	4/1/97	4/21/97	4/24/97	5/1/97	5/4/97	20	3	7	3
Red River	RED	0										
1998												
Crooked Fork Creek	CFCTRP	405	4/24/98	4/26/98	4/27/98	4/28/98	4/30/98	5/4/98	1	1	2	4
Clear Creek	CLEARC	20	4/12/98	4/23/98	4/26/98	4/28/98	5/6/98	5/9/98	3	2	8	3
Fish Creek	FISH	1492	4/24/98	4/25/98	4/26/98	4/27/98	5/2/98	5/6/98	1	1	5	4
Gedney Creek	GEDNEC	72	4/25/98	4/25/98	4/26/98	4/28/98	5/3/98	5/5/98	1	2	5	2
Red River	RED	27	4/30/98	4/30/98	5/3/98	5/11/98	5/19/98	5/26/98	3	8	8	7
Marsh Creek	MARTRP	25	4/28/98	4/29/98	4/30/98	5/5/98	5/10/98	5/21/98	1	5	5	11
Pahsimeroi River	PAHTRP	146	4/25/98	4/26/98	4/29/98	5/5/98	5/13/98	5/26/98	3	6	8	13
Rapid River	RAPID	32	4/19/98	4/20/98	4/25/98	4/27/98	4/30/98	5/4/98	5	2	3	4
SF Salmon River, Knox bridge	SFSTRP	40	4/22/98	4/27/98	4/28/98	4/29/98	5/5/98	5/11/98	1	1	6	6
1999												
Three Links Creek	3LINKC	38	4/22/99	4/22/99	4/23/99	4/25/99	5/3/99	5/18/99	1	2	8	15
Crooked Fork Creek	CFCTRP	106	4/21/99	4/22/99	4/23/99	4/27/99	5/8/99	5/24/99	1	4	11	16
Clear Creek	CLEARC	66	4/21/99	4/21/99	4/23/99	5/3/99	5/16/99	5/26/99	2	10	13	10
Fish Creek	FISH	812	4/21/99	4/22/99	4/22/99	4/26/99	5/2/99	5/22/99	0	4	6	20
Gedney Creek	GEDNEC	48	4/21/99	4/21/99	4/23/99	4/27/99	5/2/99	5/20/99	2	4	5	18
White Sands Creek	WHITSC	99	4/24/99	4/28/99	5/1/99	5/5/99	5/22/99	5/24/99	3	4	17	2
Red River	RED	11	4/22/99	5/2/99	5/10/99	5/22/99	5/25/99	5/27/99	8	12	3	2
Johnson Creek	JOHTRP	32	4/20/99	4/22/99	4/24/99	4/30/99	5/2/99	5/23/99	2	6	2	21
Lower SF Salmon River	LSFTRP	32	4/22/99	4/24/99	4/29/99	5/5/99	5/23/99	5/24/99	5	6	18	1
Pahsimeroi River	PAHTRP	132	4/23/99	4/25/99	5/4/99	5/23/99	5/28/99	6/3/99	9	19	5	6
Secesh River	SECESR	45	4/2/99	4/22/99	4/23/99	4/30/99	5/6/99	5/26/99	1	7	6	20
SF Salmon River, Knox bridge	SFSTRP	25	3/31/99	3/31/99	4/23/99	4/30/99	5/22/99	5/24/99	23	7	22	2
Marsh Creek	MARTRP	6	4/29/99	4/29/99	5/5/99	5/7/99	5/24/99	5/24/99	6	2	17	0

Appendix 27. The location of temperature recorders and the date temperature recording began. The date recording ended column was left blank in streams that temperature is currently measured.

Stream	Date Recording Began	Date Recording Ended	Location
Salmon River drainage			
Basin Creek	9/22/94		200 m upstream of hot spring
Beaver Creek	6/7/93		3 km upstream of mouth
Big Boulder Creek	9/22/94	4/27/99	200 m upstream of mouth
Capehorn Creek	9/22/94	4/10/96	30 m upstream of Highway 21 bridge.
East Fork Salmon River 1	1/29/94		100 m upstream of mouth
East Fork Salmon River 3	10/19/94	4/27/99	100 downstream of Fisher Creek.
East Fork Salmon River 4	6/8/93		Upstream of Bowery hot springs
Frenchman Creek	6/7/93		3 km upstream of mouth
Fourth of July Creek	6/21/94	10/29/98	50 m upstream of USFS boundary
Germania Creek	6/8/93		20 m upstream of irrigation diversion
Herd Creek	10/25/95	4/22/97	1 km upstream of mouth
Marsh Creek	6/7/93		20 m downstream of adult weir site
Pole Creek	6/21/94		2 km upstream of irrigation diversion
Redfish Lake Creek	5/5/94		at weir site
Salmon River 1	1/29/94	4/11/96	200 m upstream of EF Salmon River
Salmon River 2	3/29/94		at Sawtooth Hatchery
South Fork Salmon River	3/8/94		at hatchery weir site
Smiley Creek	6/7/93		4 km upstream of mouth
Valley Creek	6/8/93		70 m upstream of Meadow Creek
West Pass Creek	6/8/93		20 m upstream of irrigation diversion
Clearwater River drainage			
Bald Mountain Creek	10/2/94		20 m downstream of Highway 12 bridge
Bimerick Creek	4/10/97		300 m upstream of mouth
Boulder Creek	7/2/98		30 m upstream of road bridge in campground
Brushy Fork Creek	11/4/97		500 m upstream of mouth
Canyon Creek	6/10/93		300 m upstream of mouth
Crooked Fork Creek	6/9/93		70 m upstream of Brushy Fork Creek
Deadman Creek	11/1/96		200 m upstream of mouth
Fish Creek 1	6/9/93		1 km upstream of mouth
Fish Creek 2	7/12/94	7/15/96	50 m upstream of Pagoda Creek
Fish Creek 3	11/3/96		1 km upstream of mouth
Fish Creek 4	9/22/98		2 km upstream of Hungery Creek
Fish Creek (air)	6/8/95		at trailhead
Fish Creek (humidity)	6/8/95		at trailhead
Fish Creek (barometric pressure)	6/8/95		at trailhead
Gedney Creek 1	9/9/94		200 m upstream of mouth
Gedney Creek 2	7/22/99		2 km upstream of mouth
Hungery Creek	9/22/98		100 m upstream of Obia Cabin
Lost Creek	10/2/94		20 m downstream of Highway 12 bridge
O'Hara Creek	11/9/99		2 km downstream of Hanby Fork
Post Office Creek	6/9/93		100 m upstream of mouth
Red River	6/10/93		1 km upstream of SF Red River
South Fork Red River 1	6/10/93		50 m upstream of Schooner Creek
South Fork Red River 2	10/27/94		1.5 km upstream of Trapper Creek
Trapper Creek	6/29/94		100 m upstream of mouth
Walton Creek	6/9/93	3/12/98	50 m upstream of hatchery intake
Weir Creek	6/9/93		300 m upstream of mouth
Wendover Creek	7/13/94		200 m upstream of Highway 12 bridge
West Fork Gedney Creek	7/24/94		20 m upstream of mouth
Willow Creek	10/24/97		200 m upstream of mouth

Appendix 28. The daily mean, maximum, and minimum stream temperature in Fish Creek in 1998.



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