

**Fishery Data Series No. 91-31**

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**Peterson Creek and Lake System Steelhead  
Evaluation, 1990**

by

**Roger Harding  
and  
Doug Jones**

August 1991

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Alaska Department of Fish and Game

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## ABSTRACT

Peterson Creek, approximately 40 kilometers north of downtown Juneau, has the most heavily targeted steelhead *Oncorhynchus mykiss* sport fishery on the Juneau roadside. Efforts to enhance and monitor this fishery date from 1961, but little information on catch and escapements is available. This study is a continuation of a study initiated in 1989 to enumerate escapement, estimate angler harvests, and collect basic biological information for this fishery.

Escapement of steelhead at Peterson Creek in 1990 began on April 29, peaked on May 18, and totaled 179 fish. Escapement past the weir was down 43 fish (25 percent) from the 222 fish counted in 1989. Sex composition in the escapement was 52 percent female and 48 percent male. First-time spawners (age 3.2) were most prevalent in 1990, in contrast to 1989 when second-time spawners (age 3.2S1) dominated. Repeat spawners from 21 different age classes were observed in 1990, with ages 3.2S1 and 4.2S1 accounting for 43 percent of the repeat spawners. Average length of the females (757 millimeters, standard error = 8.0) was larger than the males (706 millimeters, standard error = 8.4). A total of 114 steelhead kelts left Peterson Creek before our weir was removed on June 3, 1990.

An estimated 2,865 angler hours (standard error = 434) were expended to harvest 18 steelhead (standard error = 9) and to catch and release another 16 steelhead in 1990. An estimated 2,242 Dolly Varden *Salvelinus malma* were caught (standard error = 1,023), while only 81 of these were harvested (standard error = 49). A total of 167 cutthroat trout *Oncorhynchus clarki* were caught in the fishery (standard error = 92), while 62 of these were harvested (standard error = 31).

KEY WORDS: Peterson Creek, Steelhead, *Oncorhynchus mykiss*, escapement, weir, Dolly Varden, *Salvelinus malma*, cutthroat trout, *Oncorhynchus clarki*, creel survey, Juneau, Southeast Alaska, AWL, age-weight-length, rainbow trout, harvest.

## INTRODUCTION

The Peterson Creek and Lake system (Figure 1) presently supports the most heavily fished steelhead *Oncorhynchus mykiss* and resident rainbow trout *O. mykiss* fishery on the Juneau roadside (Schwan 1990). The lake was treated in 1961 with rotenone in an attempt to eliminate the resident population of Dolly Varden *Salvelinus malma*. After the 1961 treatment, 14,300 steelhead fry from Eva Lake were stocked in Peterson Lake, followed by annual stocking from 1962 through 1968 with steelhead fry from a variety of sources (Table 1). The rotenone treatment was deemed only a partial success when, in 1964, sampling revealed that Dolly Varden comprised 50% of the Peterson Lake fish population. Peterson Creek was used as a source of steelhead eggs for the Snettisham Hatchery from 1983 to 1987 (Table 2).

A U.S. Forest Service recreational cabin at Peterson Lake supports hikers and fishermen and is accessed via a recently improved 4-mile trail. State land acquisitions at the mouth of Peterson Creek are also expected to further improve access and increase angler effort.

In 1989, 222 steelhead were counted moving upstream through the weir between May 2 and June 4, and 165 kelts were counted moving downstream. Anglers spent an estimated 2,121 angler hours to harvest 22 steelhead and to catch and release an additional 17 steelhead. The objectives of the 1990 research efforts were to:

1. count the escapement of steelhead into Peterson Creek between April 11 and June 10, 1990;
2. describe the length and age distributions for adult steelhead returning to Peterson Creek between April 11 and June 10, 1990; and
3. estimate angler effort, catch, and harvest of steelhead in Peterson Creek between April 2 and June 10, 1990.

## METHODS

### Adult Escapement

Steelhead were counted as they passed upstream or downstream through an aluminum channel and picket weir erected 100 m above a salt lagoon at the mouth of Peterson Creek (Figure 1). Water temperature and depth were taken 5 m upstream of the weir each morning and at other times when steelhead were passed through the weir. Water depth was recorded to the nearest 0.5 cm and water temperature to the nearest °C. Steelhead were sampled for length, weight, and scales (ages). Fish were immobilized before sampling with an electroshocking basket (Gunstrom and Bethers 1985). All sampled steelhead were measured to the nearest 1 mm of fork length (tip of snout to fork of tail), and weighed to the nearest gm. Date, time of passage through weir, sample number, sex (if possible), condition, and comments, were also recorded. Four scales were collected from each side of the fish from an area two scale rows above the lateral line on a diagonal line from the posterior end of the dorsal fin to the anterior end of the anal fin. Scale samples were mounted on gum cards, and triacetate impressions of the scales (7,000 kg/cm<sup>2</sup> pressure at a temperature of 97°C for 30 seconds) were prepared for use in determining age. Both scales and otoliths were collected from all steelhead mortalities observed in the stream or in the creel survey, so that ages determined from otoliths could be compared to ages obtained from scale samples.

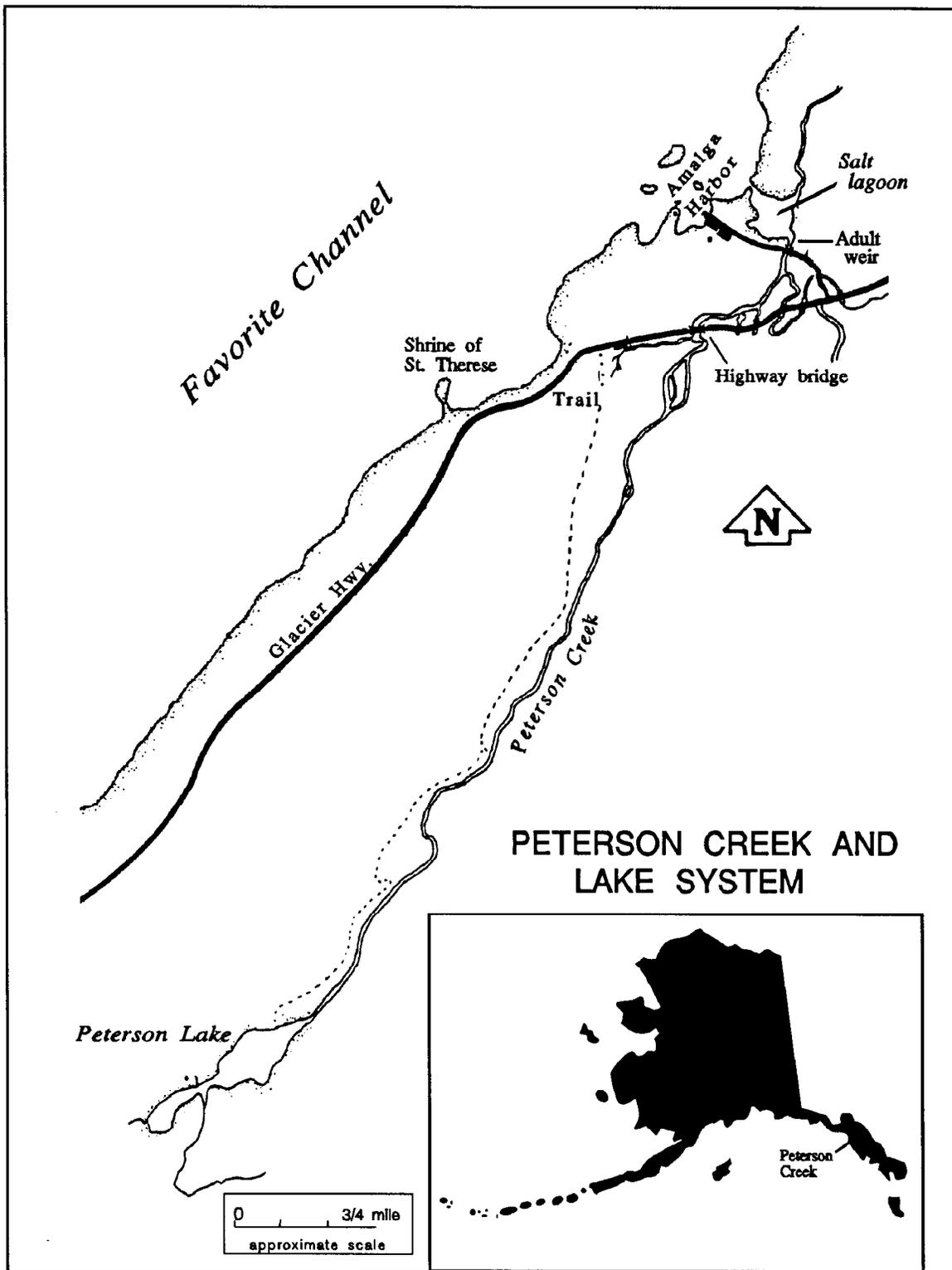


Figure 1. The Peterson Creek and Lake system near Juneau, Alaska.

Table 1. Numbers of fish stocked into the Peterson Creek/Lake system.<sup>a</sup>

Date	Species	Number	Size/Stage	Source
1919	pink salmon	3,300,000	eyed eggs	NA <sup>b</sup>
6/17/41	steelhead	8,600	eyed eggs	Ward Lake
6/17/41	steelhead	10,000	eyed eggs	Ward Lake
1960-62	grayling	NA	eyed eggs	NA
8/10/61	steelhead	14,300	Fry	Lake Eva
8/12/61	steelhead	4,615	Fry	Lake Eva
8/08/62	steelhead	16,500 <sup>c</sup>	1,100/lb	NA
7/30/63	steelhead	21,028	1,865/lb	NA
8/07/64	steelhead	17,388	700/lb	Pleasant Bay
8/??/65 <sup>d</sup>	steelhead	17,000	1,20/lb	NA
8/??/66	steelhead	17,000	700/lb	NA
8/??/67	steelhead	12,000	800/lb	NA
1968	steelhead	15,000 <sup>e</sup>	NA	NA

<sup>a</sup> Source unpublished data in ADFG, Division of Sport Fish, Region I Catalog and Inventory files, Juneau Alaska.

<sup>b</sup> Not Available.

<sup>c</sup> Incorrectly reported as 6,500 in Harding and Jones (1990).

<sup>d</sup> Incorrectly reported as 8/??/66 in Harding and Jones (1990).

<sup>e</sup> Incorrectly reported as 12,000 in Harding and Jones (1990).

Table 2. Number and sex of steelhead removed from Peterson Creek to be used as a brood source for Snettisham Hatchery 1983 to 1987.<sup>a</sup>

Sex	Year				
	1983	1984	1985	1986	1987 <sup>b</sup>
Male	3	4	10	121	8
Female	5	4	10	11	8
Total	8	8	20	22	16

<sup>a</sup> Source unpublished data in ADFG, Division of Sport Fish, Region I Catalog and Inventory files, Juneau Alaska.

<sup>b</sup> All but 1 male were live spawned in 1987.

Scales collected from steelhead were aged using methods described by Narver and Withler (1977). Repeat spawners are classified with an "S" after the ocean age to denote a successful spawning run and survival. A steelhead with an age designation of 3.2S1 was 6 years old. It spent 3 years (winters) in fresh water before smolt emigration and 2 years (winters) in salt water, then returned to fresh water, spawned ("S"), and survived another year in salt water before returning to fresh water on its second spawning run. Initial spawning steelhead were those fish without an "S" in their total age designation.

The mean and standard error for the length and weight estimates were calculated using standard procedures for normal variates (SAS 1985).

### Harvest Studies

A stratified three-stage "direct expansion" type survey was used to estimate angler effort, catch, and harvest of steelhead in Peterson Creek. The design has days as primary sampling units, periods within days as secondary units, and anglers within periods as tertiary units (Cochran 1977). Stratification was based on seasonal time periods, areas of the river (upper and lower), and types of day (weekday vs. weekend-holidays). We assumed that parking areas near the Glacier Highway bridge were close enough together to be treated as one access point (the upper area), that parking areas in the lower section of the creek could be treated as another access point (the lower area), and that all anglers leaving an area could be intercepted by personnel watching that particular area (Figure 1). During busy weekend-holiday sampling periods, more than one technician was required to count and interview anglers completing their trips in the lower area.

Seasonal strata were planned using harvest patterns observed in 1989 (Harding and Jones 1990). The first seasonal strata began on April 2 and ended on the day the fifth steelhead passed through the weir (May 2). Sampling during this period was confined to access locations below the highway bridge, since steelhead are concentrated below the weir (near the salt lake) during this period. A peak sampling period began on the day following passage of the fifth steelhead through the weir and lasted for four weeks. A final post-peak period was conducted from May 29 through June 5. Sampling during the second and third seasonal strata occurred at both access areas. Based on 1989 harvest data (Harding and Jones 1990), total sampling effort was assigned to the three seasonal strata using a 20%, 60%, 20% allocation, effort within seasonal strata was allocated to areas by allocating about 60% to the upper area, and about 60% of sampling effort at an area was allocated to weekdays.

Days and periods to sample in each strata were randomly selected under the multistage design. Two of 8 possible periods in each sampling day were randomly selected, except in the upper area between 5/2 and 5/28, when 2 of 7 possible periods were selected. Available sampling periods were equal in length and fixed at between 102 and 136 minutes, depending on the strata. The available periods in a day together equal the length of time from one hour past sunrise to one-half hour past sunset on the average day in the strata.

During each sampling period, a technician recorded the number of anglers who completed their fishing trip and left Peterson Creek through the sample area. An attempt was made to interview each angler who completed a trip and was counted during the sample period. Data recorded during each interview included the

number of fish caught and kept by species, the number of fish caught and released by species, angler effort to the nearest 0.25 hours, and fishing gear used.

When possible, all steelhead present in the creels of interviewed anglers were measured for length, scale sampled, and sexed.

The effort in each stratum was estimated by:

$$\hat{E}_h = D_h \bar{E}_h \quad (1)$$

$$\bar{E}_h = \frac{\sum_{i=1}^{d_h} \hat{E}_{hi}}{d_h} \quad (2)$$

$$\hat{E}_{hi} = P_{hi} \bar{E}_{hi} \quad (3)$$

$$\bar{E}_{hi} = \frac{\sum_{j=1}^{P_{hi}} E_{hij}}{P_{hi}} \quad (4)$$

$$\hat{E}_{hij} = M_{hij} \bar{e}_{hij} \quad (5)$$

$$\bar{e}_{hij} = \frac{\sum_{t=1}^{m_{hij}} e_{hij t}}{m_{hij}} \quad (6)$$

where  $e_{hij t}$  is effort (hours) expended by angler  $t$ , sample period  $j$ , day  $i$ ;  $m_{hij}$  is the number of completed angler interviews in sample period  $j$ , day  $i$ ;  $E_{hij}$  is the total number of angler hours expended in sample period  $j$ , day  $i$ ;  $M_{hij}$  is the number of anglers completing trips during the same period;  $p_h$  is the number of periods sampled during each day;  $P_h$  is the total number of periods in each day;  $d_h$  is the number of days sampled in stratum  $h$ ; and  $D_h$  is the number of days in stratum  $h$ .

The variance of effort by stratum was estimated:

$$\begin{aligned} \hat{V}[\hat{E}_h] = & (1-f_{1h}) D_h^2 \frac{S_{1h}^2}{d_h} + D_h P_h^2 \sum_{i=1}^{d_h} (1-f_{2h}) \frac{S_{2hi}^2}{d_h P_h} \\ & + D_h P_h \sum_{i=1}^{d_h} \sum_{j=1}^{P_h} M_{hij}^2 (1-f_{3hij}) \frac{S_{3hij}^2}{d_h P_h m_{hij}} \end{aligned} \quad (7)$$

where  $f_{1h} = d_h/D_h$ ,  $f_{2h} = P_h/P_h$ ,  $f_{3hij} = m_{hij}/M_{hij}$ , and

$$S_{1h}^2 = \frac{\sum_{i=1}^{d_h} (\hat{E}_{hi} - \bar{E}_h)^2}{d_h - 1} \quad (8)$$

$$S_{2hi}^2 = \frac{\sum_{j=1}^{p_h} (\hat{E}_{hij} - \bar{E}_{hi})^2}{p_h - 1} \quad (9)$$

$$S_{3hij}^2 = \frac{\sum_{t=1}^{m_{hij}} (e_{hijt} - \bar{e}_{hij})^2}{m_{hij} - 1} \quad (10)$$

During the estimation of harvest H (or catch C) we used these same formula with H or C substituted for E. Effort, catch, and harvest estimates for the various strata were totaled to provide estimates for the entire season. The variance of the estimated sums is the sum of the variances.

## RESULTS

### Adult Escapement

The adult steelhead weir was fish-tight on April 8, 1990. A foot and dive survey of the stream above the weir was conducted shortly afterward, and no fish were observed. A total of 179 steelhead was counted upstream through the weir between April 29 and June 4, with the peak of the escapement occurring on May 18 (Figures 2 and 3 and Appendix A1).

A total of 114 steelhead kelts was also counted swimming downstream past the weir after spawning (Appendix A2). The first 3 fish passed through the weir on May 14, and the peak of downstream migration occurred on June 1, when 48 fish were counted. The downstream count was 64% of the upstream count, but steelhead were still leaving the system when the weir was removed on June 4.

Water temperatures ranged from 2.5°C on April 13 to 14.0°C on June 4 and averaged 9.2°C (SE = 1.0) during the week of peak escapement (May 14-May 21). Stream height measurements were made upstream of the weir, but the water levels recorded were influenced by the weir, especially early in the season, as noted in the discussion.

Ninety three percent of the 179 steelhead escapement passing the weir (167 fish) were sampled for age, weight, length and sex (Appendix A3). Three of the (167) sampled fish were not sexed; the remainder yielded a sample of 86 females and 78 males (or 164 fish). Six of these 164 fish (3 males and 3 females) could not be aged. Of the 158 remaining fish, saltwater age was not determined for 1 fish and freshwater age was not determined for 10 fish (Table 3). The predominant age class in the 1990 escapement was aged 3.2 (31 fish); age-4.2 (22 fish) and 3.2S1 (20 fish) steelhead were next most common (Table 3, Figure 4). Female steelhead sampled averaged 757 mm (SE = 8.0 mm) in length; males averaged 706 mm (SE = 8.4 mm) in length.

We also aged 90 fish sampled at Peterson Creek during 1989 (Appendix A4, data not reported in Harding and Jones 1990). Forty-nine percent of the 222 steelhead escapement passing the weir (108 fish) was sampled for age, weight, length and sex (Appendix A4). One of the 108 sampled fish was not sexed; the remaining

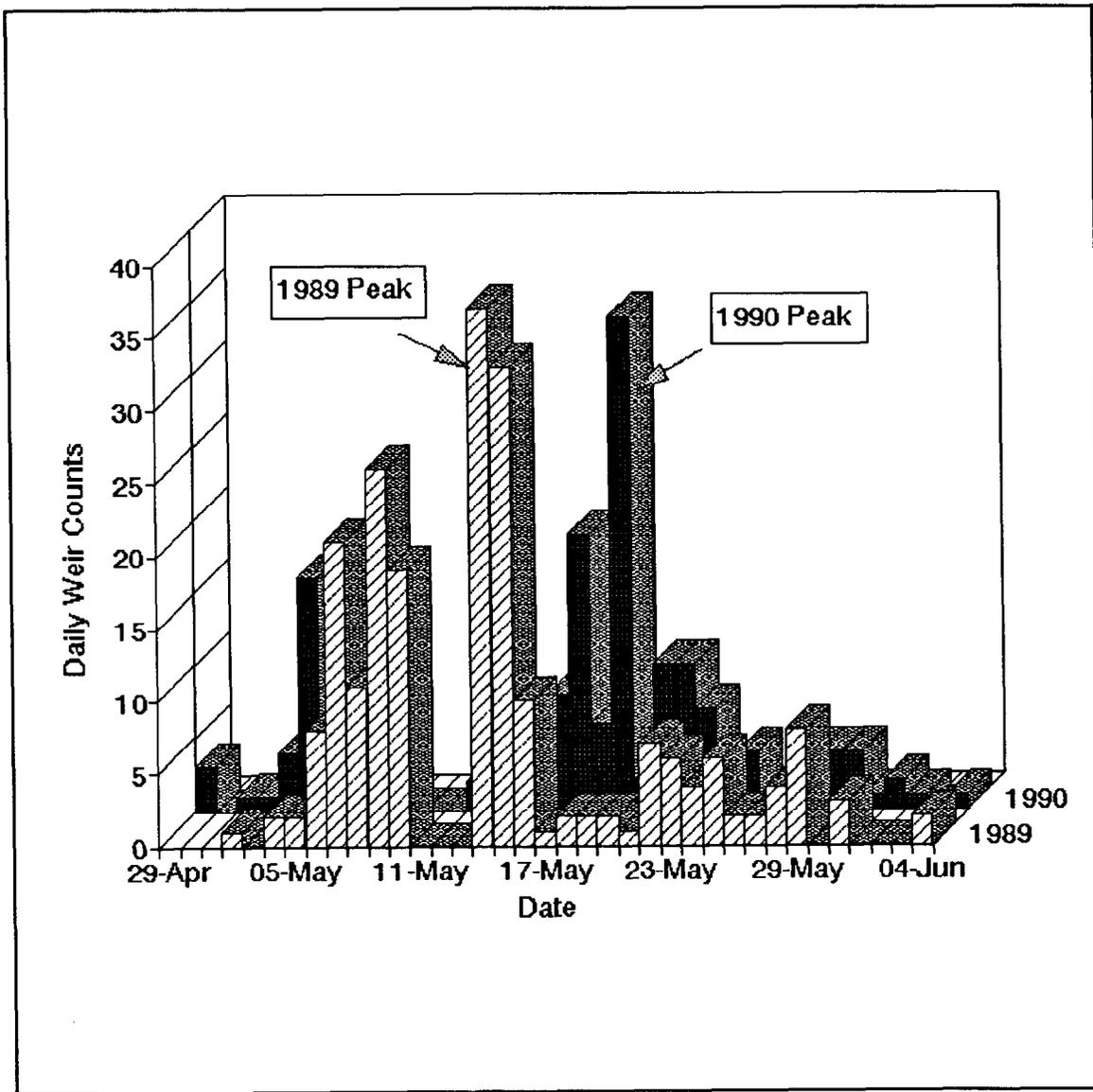


Figure 2. Escapement timing for steelhead at the Peterson Creek weir, 1989 and 1990.

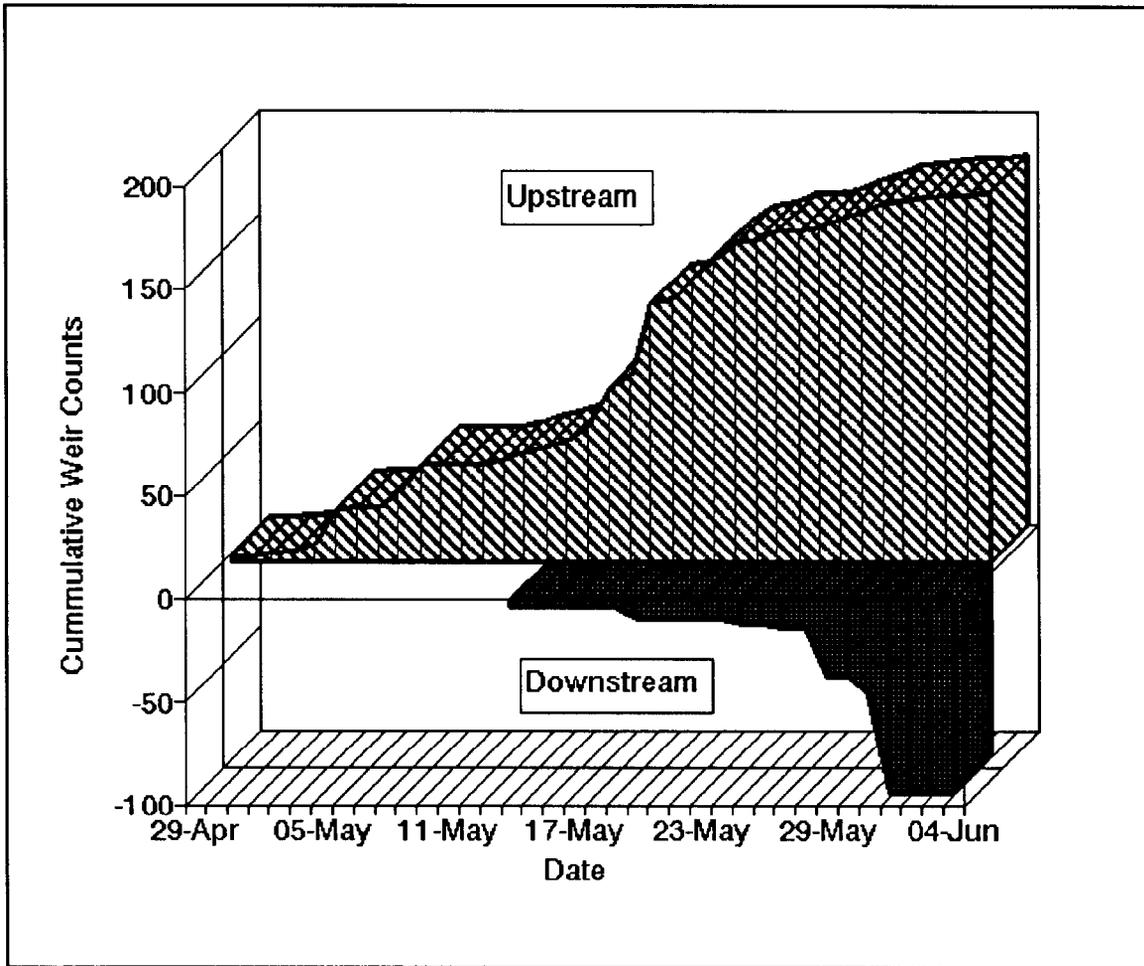


Figure 3. Cumulative upstream and downstream counts for steelhead at the Peterson Creek weir, 1990.

Table 3. Estimated age composition and mean length at age of steelhead escapement at Peterson Creek, 1990.

Age Class	Females			Males			Combined
	n	Length	SE	n	Length	SE	n
? .2	2	642	7.5	2	608	17.5	4
? .2S1				1	780		1
? .2S1S1	1	840					1
? .3	2	745	35.0	1	850		3
? .3S1	1	835					1
2 .2				1	575		3
2 .2S1				3	800	0.0	5
2 .2S1S1	1	785					1
3 .1S1				1	575		4
3 .1S1S1	1	760					1
3 .2	9	631	12.6	22	665	11.3	31
3 .2S1	13	767	14.1	7	725	23.3	20
3 .2S1S1	9	818	10.4				9
3 .2S1S1S1	1	775					1
3 .2S1S1S1S1	1	890					1
3 .3	9	740	20.5	6	777	11.8	15
3 .3S1	6	784	12.7				6
3 .3S1S1	2	828	37.5				2
3 .3S1S1S1	1	855					1
4 .X				1	740		5
4 .1S1	2	672	12.5	1	610		3
4 .1S1S1	1	745					1
4 .2	3	680	10.0	19	698	12.0	22
4 .2S1	8	771	16.4	5	768	17.2	13
4 .2S1S1	4	821	24.4	1	870		5
4 .2S1S1S1	1	680					1
4 .3	3	822	30.9	3	765	56.2	6
4 .3S1	2	818	17.5	1	735		3
5 .2S1	1	715					1
Total	84			75			159

? = Scales regenerated; freshwater ages undetermined.

X = Unable to determine saltwater age.

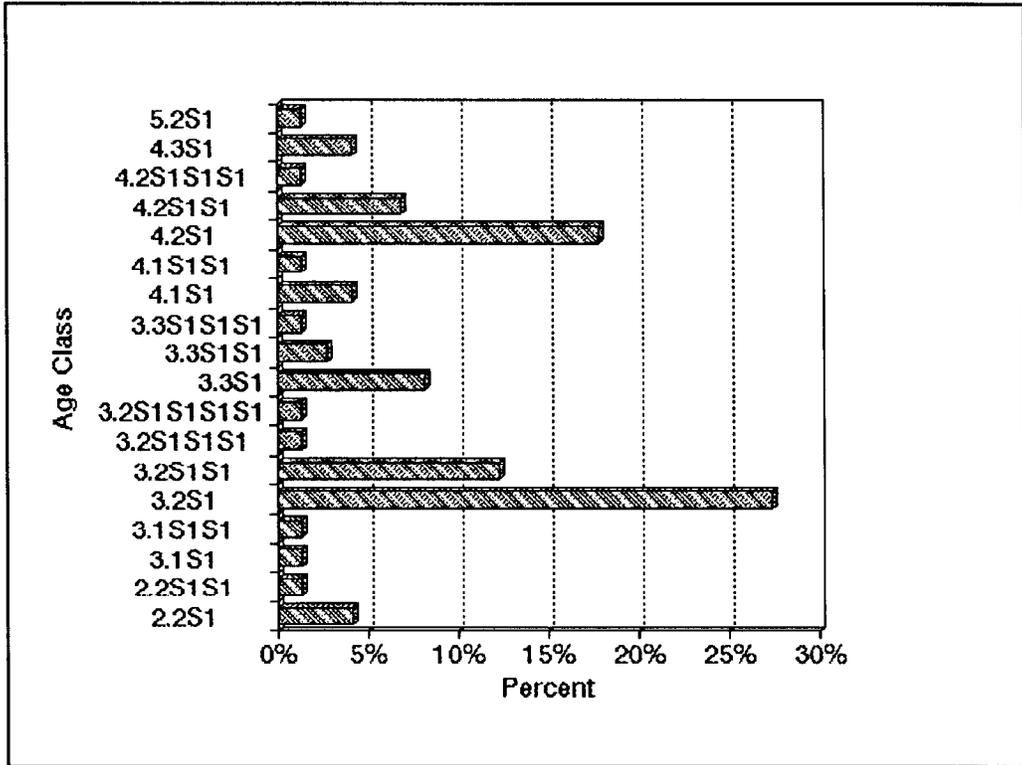
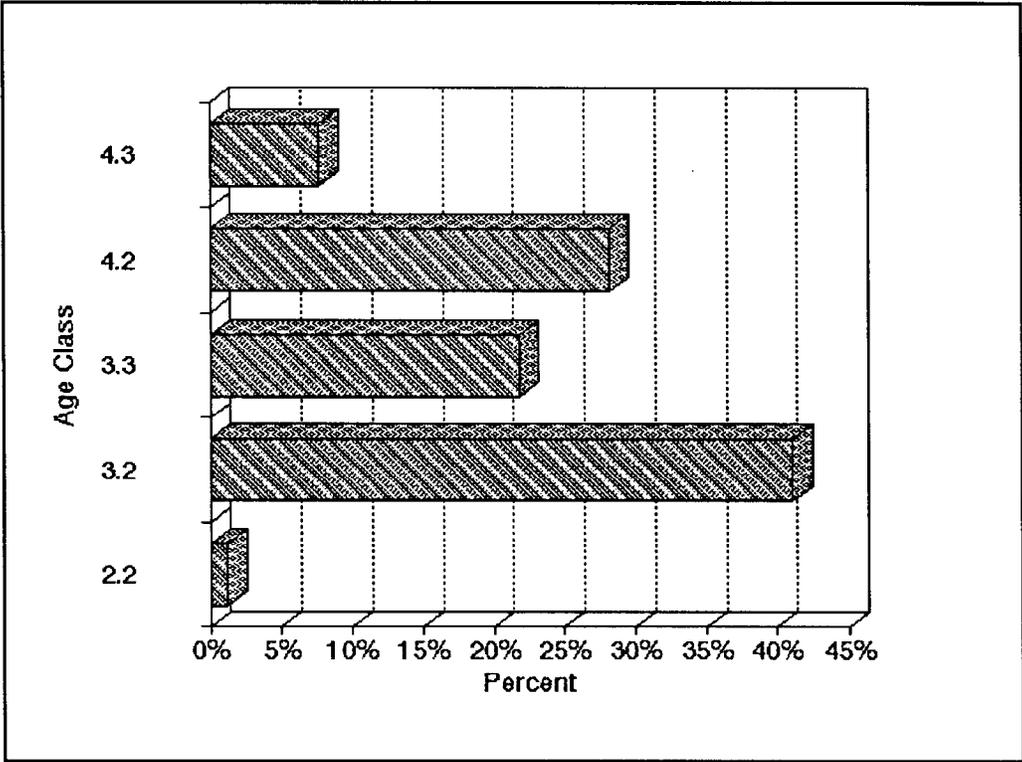


Figure 4. Age composition of first-time (above) and repeat (below) spawning steelhead in Peterson Creek, 1990. Only completely determined age classes are shown.

sample yielded 74 females and 33 males. Eighteen of these 108 fish (5 males, 12 females, and 1 unsexed) could not be aged. In the remaining sample of 90 fish, freshwater age was not determined for 13 fish (Table 4). The predominant age class in the 1989 escapement was aged 3.2S1 (16 fish); age-4.2S1 (14 fish) and 3.3 (10 fish) steelhead were next most common (Table 4, Figure 5). Female steelhead sampled averaged 776.1 mm (SE = 1.0 mm) in length, while males averaged 762.8 mm (SE = 2.2 mm) in length.

### Harvest Studies

Three hundred and two angler-hours of effort and a catch of 7 steelhead were observed during the creel survey at Peterson Creek in 1990 (Table 5). An estimated total of 2,865 angler hours (SE = 434) was spent in the Peterson Creek system during the survey (Table 6). The total estimated catch of steelhead was 34 fish, or 19% of the escapement. An estimated 18 (SE = 2) steelhead were harvested in 1990 and an estimated 16 steelhead were released.

Other fish caught in the angler creel include Dolly Varden, cutthroat trout *O. clarki* and rainbow trout. Dolly Varden were the most numerous fish observed (Table 5) with an estimated catch of 2,242 (SE = 1,023) fish, of which only 81 (SE = 49) were kept (Table 6). The cutthroat trout catch totaled 167 (SE = 92) fish; 62 (SE = 31) of these were kept (Table 6). Estimated variances for effort, catch, and harvest of steelhead by season, sampling stage, and type of day, which are useful for designing future surveys, are shown in Appendix A5.

The most common fishing gear used for steelhead at Peterson Creek in 1990 was spinning gear (37.1% of angler-hours), followed by fly-fishing gear (17.6%) and spinning gear with eggs attached to the lure (17.2%)(Table 7). Salmon eggs were used by 11.3% of anglers; 4.5% of anglers used various combinations of spin/fly/bait gear (gear used during 12.3% of angler effort was unknown or not recorded).

### DISCUSSION

The 179 steelhead that returned to Peterson Creek in 1990 was 19.4% (43 fish) less than the 1989 weir escapement of 222 adults. The 1990 upstream movement of steelhead into Peterson Creek began 3 days earlier than in 1989, and the peak escapement occurred on May 18, 4 days later than in 1989 (Figures 2 and 3). Low water levels in Peterson Creek in early May probably delayed the escapement in 1990, relative to 1989. From May 8 through May 15, steelhead were observed holding below the weir and not moving upstream (into the weir live trap), in part because of the low water levels. On May 16 we triggered an upstream movement of these fish by artificially increasing the current through a restricted portion of the weir (the live trap). This was accomplished by placing clear plastic sheeting (visquene) along the front of the weir, except at the live trap; this significantly increased the current through the trap and triggered an upstream movement of the holding fish into the weir live-box.

While the numbers of steelhead returning to Peterson Creek decreased in 1990, the angler effort increased about 26% to 2,865 angler hours. This effort produced an estimated 34 steelhead (an average 0.012 steelhead/hour or 1 steelhead for 84 hours of fishing), which is the lowest catch rate for steelhead in Southeast Alaska (Table 8). Other streams in Southeast Alaska range from a high of 0.40 steelhead/hour (Situk River) to 0.07 steelhead/hour (Thorne River).

Table 4. Estimated age composition and mean length at age of steelhead escapement at Peterson Creek, 1989.

Age Class	Female			Male			Combined
	n	Length	SE	n	Length	SE	n
2.3	1	688					1
3.1S1S1	2	772	12.5	1	670		3
3.2	2	622	13.0	2	635	3.0	4
3.2S1	8	777	29.2	8	759	25.3	16
3.2S1S1	4	801	18.0	1	776		5
3.2S1S1S1	3	850	19.6	1	716		4
3.3	8	747	16.4	2	808	27.5	10
4.1S1				1	728		1
4.2	3	669	4.1	1	645		4
4.2S1	8	788	15.9	6	736	11.7	14
4.2S1S1	5	811	14.5	2	839	19.0	7
4.3	3	761	32.8	1	794		4
4.3S1	2	794	46.5				2
5.2S1	1	764					1
5.3	1	745					1
? .1S1S1	1	750					1
? .2	1	663					1
? .2S1	2	739	39.0	1	694		3
? .2S1S1	2	862	12.5	1	869		3
? .3	2	838	17.5				2
? .3S1	1	857					1
? .3S1S1	1	880					1
? .3S1S1S1	1	847					1
<b>Total</b>	<b>62</b>			<b>28</b>			<b>90</b>

? = Scales regenerated; freshwater ages undetermined.

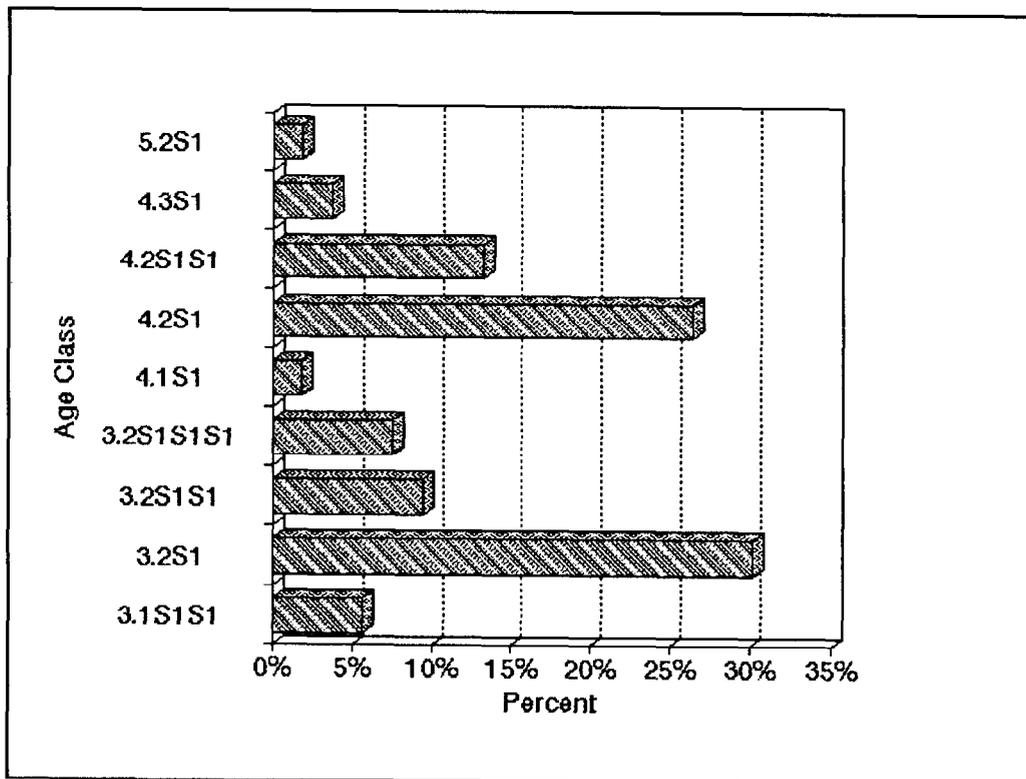
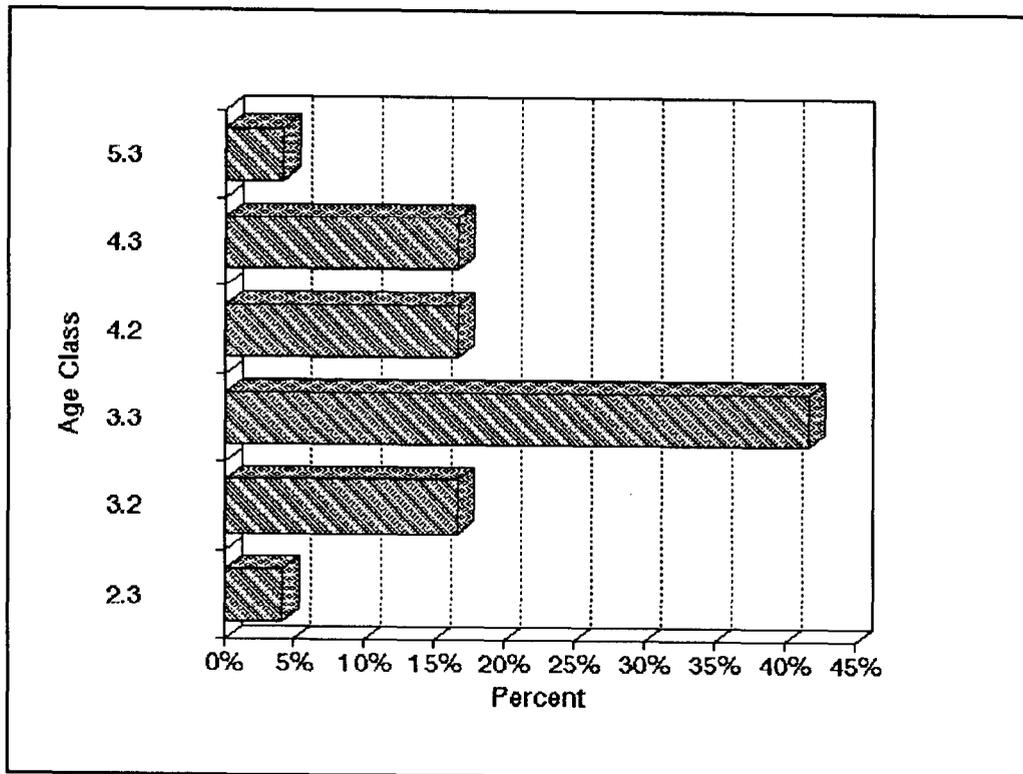


Figure 5. Age composition of first-time (above) and repeat (below) spawning steelhead in Peterson Creek, 1989. Only completely determined age classes are shown.

Table 5. Observed angler effort (hours), number of interviews, number of periods sampled, number of possible sampling periods, and observed harvest and catch by species, site, and sampling period, Peterson Creek, 1990.

Sampling period	Angler effort	Anglers interviewed	Periods sampled	Samples possible	Harvest and catch <sup>a</sup>					
					SHk	SHc	DVk	DVc	CTk	CTc
LOWER RIVER SITE										
Weekends										
4/02-5/01	41.2	17	4	64	0	0	0	35	1	4
5/02-5/28	48.0	25	8	72	0	0	2	100	1	2
5/29-6/05	- <sup>b</sup>	-	-	-	-	-	-	-	-	-
Weekdays										
4/02-5/01	62.5	33	14	176	0	0	5	47	1	1
5/02-5/28	17.3	10	12	144	0	0	0	16	2	6
5/29-6/05	3.0	3	4	48	0	0	0	0	0	0
HIGHWAY BRIDGE SITE										
Weekends										
4/02-5/01	-	-	-	-	-	-	-	-	-	-
5/02-5/28	54.0	33	16	63	1	5	0	0	0	0
5/29-6/05	-	-	-	-	-	-	-	-	-	-
Weekdays										
4/02-5/01	-	-	-	-	-	-	-	-	-	-
5/02-5/28	76.0	31	18	126	2	2	0	0	0	0
5/29-6/05	0	0	10	48	0	0	0	0	0	0

<sup>a</sup> SH = steelhead, DV = Dolly Varden, CT = cutthroat, k = kept, c = caught.

<sup>b</sup> No survey conducted.

Table 6. Estimated angler effort (hours), harvest, and catch of steelhead, Dolly Varden, and cutthroat trout by sampling period, Peterson Creek, April 2 through June 5, 1990.

	April 2- May 1	May 2- May 28	May 29- June 5	Total
<b>Angler hours</b>				
Estimate	1,446	1,384	36	2,865
Variance	93,829	93,693	1188	188,710
SE <sup>a</sup>	306	306	34	434
Rel. prec. <sup>b</sup>	42%	44%	190%	30%
<b>Steelhead kept</b>				
Estimate	0	18	0	18
Variance	0	89	0	89
SE	0	9	0	9
Rel. prec.	0%	110%	0%	110%
<b>Steelhead catch</b>				
Estimate	0	34	0	34
Variance	0	202	0	202
SE	0	14	0	14
Rel. prec.	0%	84%	0%	84%
<b>Dolly Varden kept</b>				
Estimate	63	18	0	81
Variance	2,329	114	0	2,443
SE	48	11	0	49
Rel. prec.	150%	120%	0%	120%
<b>Dolly Varden catch</b>				
Estimate	1,151	1,092	0	2,242
Variance	332,000	715,200	0	1,047,000
SE	576	846	0	1,023
Rel. prec.	98%	152%	0%	89%
<b>Cutthroat trout kept</b>				
Estimate	29	33	0	62
Variance	386	600	0	986
SE	20	24	0	31
Rel. prec.	140%	150%	0%	100%
<b>Cutthroat trout catch</b>				
Estimate	77	90	0	167
Variance	3,410	5,040	0	8,450
SE	58	71	0	92
Rel. prec.	150%	160%	0%	110%

<sup>a</sup> SE = Standard error.

<sup>b</sup> Relative precision =  $100 * 1.96 \text{ SE/estimate}$ .

Table 7. Summary of angler effort by method for steelhead in Peterson Creek, 1990.

Angling Method	No. of anglers	Sum of effort	Percent of total	Steelhead		Mean effort	SE of effort
				Kept	Released		
Bait	16	34.0	11.3	1	1	2.1	0.2
Bait/Spinner and Fly Combination	1	3.5	1.2	0	0	3.5	
Fly	25	52.8	17.6	0	1	2.1	0.3
Fly/spin	4	9.8	3.3	0	0	2.4	0.5
Spinning	74	111.2	37.1	1	2	1.5	0.1
Spin/bait	15	51.5	17.2	1 <sup>a</sup>	0	3.4	0.5
Unknown	17	37.0	12.3	0	0	2.2	0.3
Total	152	299.7	100.0	3	4	17.3	1.9

<sup>a</sup> Spinner with eggs attached.

Table 8. Steelhead catch rates in selected Alaska streams, 1982-1990.

Year	Location	Effort	Steelhead		CPUE	Ratio released to kept
			Kept	Released		
1982 <sup>a</sup>	Anchor	29,079	375	667	0.04	1.8
1985 <sup>b</sup>	Situk	10,434	362	2,695	0.29	7.4
1986 <sup>c</sup>	Situk	12,283	287	2,094	0.19	7.3
1987 <sup>d</sup>	Situk	10,542	391	3,797	0.40	9.7
1988 <sup>e</sup>	Situk	16,379	423	4,991	0.33	11.8
1989 <sup>f</sup>	Situk	12,953	361	2,055	0.19	5.7
1990 <sup>f</sup>	Situk	15,661	321	1,139	0.09	3.5
1988 <sup>g</sup>	Thorne	2,331	67	93	0.07	1.4
1988 <sup>h</sup>	Ward	3,638	359	971	0.37	2.7
1989 <sup>i</sup>	Ward	4,778	384	293	0.14	0.8
1989 <sup>j</sup>	Karta	1,568	50	124	0.11	2.5
1988 <sup>k</sup>	Klawock	3,711	367	384	0.20	1.0
1989 <sup>l</sup>	Peterson	2,121	22	17	0.02	0.8
1990	Peterson	2,582	18	16	0.01	0.9
1990 <sup>m</sup>	Sitkoh	1,206	35	243	0.23	6.9

<sup>a</sup> Wallis and Balland (1984).

<sup>b</sup> Mecum and Suchanek (1986). Survey missed the early part of the run. Informal surveys indicated that at least 2,230 hours of effort were expended to harvest 66 steelhead and release another 1,889 steelhead between 4/15 and 4/29 (Bob Johnson, ADFG, Division of Sport Fish, Yakutat).

<sup>c</sup> Mecum and Suchanek (1987).

<sup>d</sup> Bingham, Suchanek, Sonnichsen, and Mecum (1988).

<sup>e</sup> Suchanek and Bingham (1989).

<sup>f</sup> Johnson and Marshall (*In press*).

<sup>g</sup> Freeman and Hoffman (1990)(September 26, 1988 through June 4, 1989).

<sup>h</sup> Hubartt (1989)(February 29 through June 19, 1989).

<sup>i</sup> Hubartt (1990)(October 10, 1988 through May 21, 1989).

<sup>j</sup> Hoffman et al. (1990).

<sup>k</sup> Freeman and Hoffman (1989)(December 21, 1987 through June 19, 1988).

<sup>l</sup> Harding and Jones (1990).

<sup>m</sup> Jones et al. (*In press*).

The distribution of angling effort in Peterson Creek does not coincide well with the presence of steelhead in Peterson Creek: an estimated 1,344 angler hours (52% of the total 1990 angler effort) occurred before the passage of the fifth steelhead through the weir. Should this level of effort occur when fish are present in the stream, more fish might be harvested. If the angler effort which occurred prior to the steelhead arriving is subtracted from the estimated total effort, the CPUE would increase from 0.01 to 0.03 steelhead/hour. Some of this early season effort is targeted on migrating Dolly Varden and cutthroat. If the effort was redirected and targeted on steelhead, it could significantly impact the steelhead run. Also, early in the year some anglers intending to fish for steelhead may have redirected their effort toward cutthroat and Dolly Varden after reading our signs notifying the public of the (low) weir count.

We also suspect that the low catch rate at Peterson Creek is partly due to a high percentage of inexperienced steelhead anglers in this fishery. Higher catch rates will probably occur as their collective experience increases.

Management proposals in the next few years should consider catch-and-release regulations for Peterson Creek. We are concerned by the variable escapements (down  $\approx$ 20% in 1990) and increasing angler effort (up  $\approx$ 25% in 1990) and a harvest which currently could total 20% of the escapement (Table 9). One option currently being explored (Schwan 1990) is a steelhead stocking program on the Juneau roadside to provide additional fishing opportunities for steelhead anglers. This would provide a harvest area should Peterson Creek be restricted to catch-and-release fishing. However, past steelhead enhancement on the Juneau roadside has not proven effective. Should an enhancement program occur, even as early as spring 1991, another adult steelhead harvest area will not be available until 1996.

Since all major categories of gear are used to catch steelhead at Peterson Creek, we suspect that management proposals which are based on gear-type restrictions will ultimately result in a redistribution of effort by gear-type, rather than a reduction in the catch rate. However, with our small sample sizes, we did not try to quantify how effective different angling methods are for steelhead at Peterson Creek. Similarly, unless a few anglers are taking many steelhead from Peterson Creek, bag limits would not effectively reduce harvests.

#### ACKNOWLEDGMENTS

We thank local property owners Walter E. Butts, Jr. and Mrs. Jeannie B. Moulds, who allowed us to place part of our weir on their property. We also thank the City and Borough of Juneau for allowing us to locate part of our weir and a tent camp on their property. Invaluable assistance was provided by project technicians Kurt Kondzela, Brad Gruening, and Chris Vanderford. Bob Marshall provided help with design and analysis of the creel survey and provided helpful suggestions on the manuscript.

Table 9. Summary and comparison of 1989 and 1990 estimates for angler effort (hours), harvest, and escapement of steelhead in Peterson Creek.

	1989 <sup>a</sup>			1990 <sup>b</sup>		
	Approx. 95% CI (lower)	Point estimate	Approx. 95% CI (upper)	Approx. 95% CI (lower)	Point estimate	Approx. 95% CI (upper)
Angler effort (Angler-hours)	1,722	2,121	2,521	1,842	2,865	3,716
Weir escapement						
Upstream		222			179	
Downstream		165			114	
Catch	11	39	85	7	34	61
Harvest	7	22	37	3	18	36
Percent escapement harvested	3.2%	10.0%	16.7%	1.7%	10.1%	20.1%

<sup>a</sup> Weir operational from April 22 - June 4, 1989.

<sup>b</sup> Weir operational from April 8 - June 4, 1989.

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APPENDIX A



Appendix A1. Daily steelhead weir count, cumulative count, and mean water temperature and level for Peterson Creek, 1990.

Date	Number of Observations	Daily Count	Cumulative Count	Mean Water Temperature (°C)	Mean Water Level (cm)
13 April	1	0	0	2.5	NA
15 April	1	0	0	3.7	27.5
16 April	2	0	0	2.8	27.9
17 April	2	0	0	2.9	46.0
18 April	2	0	0	2.6	48.8
19 April	2	0	0	2.6	46.0
20 April	2	0	0	2.7	48.5
21 April	2	0	0	2.8	53.0
22 April	2	0	0	4.0	36.5
23 April	2	0	0	3.8	29.0
24 April	2	0	0	4.3	23.5
25 April	2	0	0	4.8	24.0
26 April	1	0	0	5.5	21.5
27 April	2	0	0	5.4	25.0
28 April	2	0	0	4.8	26.5
29 April	4	3	3	5.3	24.3
30 April	2	0	3	5.8	26.5
01 May	2	1	4	5.5	19.0
02 May	3	1	5	5.8	20.3
03 May	2	4	9	6.0	23.0
04 May	4	16	25	5.8	38.3
05 May	2	1	26	6.0	38.0
06 May	1	0	26	5.0	26.0
07 May	2	7	33	6.0	23.8
08 May	4	14	47	6.5	33.5
09 May	2	0	47	7.3	25.0
10 May	2	0	47	7.5	19.0
11 May	2	0	47	7.8	17.0
12 May	2	2	49	10.0	15.0
13 May	2	4	53	8.3	17.5
14 May	2	3	56	8.5	13.5
15 May	3	2	58	8.3	12.7
16 May	2	8	66	8.8	16.5
17 May	2	19	85	8.3	24.5
18 May	1	6	91	9.5	22.0
19 May	2	34	125	11.0	31.0
20 May	1	2	127	10.0	33.0
21 May	3	10	137	10.0	29.3
22 May	3	10	147	10.0	40.3
23 May	1	7	154	10.0	34.0
24 May	1	2	156	12.0	16.0
25 May	1	4	160	11.0	15.0
26 May	1	0	160	10.0	10.0
27 May	2	2	162	12.5	14.0
28 May	3	4	166	13.0	19.7
29 May	3	4	170	13.3	20.7
30 May	2	4	174	13.0	19.0
31 May	1	1	175	14.0	5.5
01 June	2	2	177	12.0	27.5
02 June	1	1	178	14.0	26.0
04 June	1	1	179	14.0	11.0

Appendix A2. Peterson Creek downstream steelhead weir counts, 1990.

Date	Time	Downstream Count	Cumulative Count	Water Temperature (°C)	Water Level (cm)
05/14/91	1000	3	3		
05/20/91	1100	1	4		
05/20/91	1500	6	10		
05/25/91	1200	2	12		
05/27/91	1100	2	14	11	13
05/29/91	0630	4	18	12	21
05/29/91	1030	19	37	12	22
05/30/91	1130	9	46	13	19
06/01/91	1030	48	94	12	31
06/02/91	1130	0	94	15	28
06/03/91	1100	20	114	15	28

Appendix A3. Length, age, and sex of Peterson Creek steelhead sampled at the weir in 1990.

DATE	LENGTH	AGE	SEX	COMMENTS
04/14/90	710	5.5S1		SAMPLED IN INFORMAL CREEL
04/29/90	725	3.3S1	F	BRIGHT
04/29/90	738	3.2	M	DARK RIPE MALE, NET MARKED
04/29/90	738	3.3	M	SEMI-BRIGHT RIPE MALE
05/01/90	820	4.2	M	SEMI-BRIGHT, TRAP SCAR ON UPPER NOSE
05/02/90	680	4.2S1S1S1	F	SEMI BRIGHT RIPE
05/03/90	735	4.3S1	M	SEMI-BRIGHT RIPE
05/03/90	650	3.2	M	SEMI-BRIGHT RIPE
05/03/90	780	4.2S1	M	SEMI-BRIGHT RIPE
05/03/90	640	3.2	M	SEMI-BRIGHT RIPE, SNAG MARK RT. BELLY
05/03/90	675	3.2S1	M	DARK RIPE
05/04/90	780	? .2S1	M	DARK RIPE
05/04/90	800	3.3	M	SEMI-BRIGHT RIPE
05/04/90	770	3.2S1	F	SEMI-BRIGHT RIPE
05/04/90	810	4.2S1S1	F	SEMI-BRIGHT RIPE
05/04/90	760	4.2S1	F	BRIGHT RIPE, LOST 1 SCALE ON ROW 9
05/04/90	655	4.2	M	SEMI-BRIGHT RIPE
05/04/90	670	3.2S1	M	DARK RIPE
05/04/90	745	3.3	M	SEMI-BRIGHT RIPE
05/04/90	685	3.2	M	SEMI-BRIGHT RIPE
05/04/90	810	3.3S1	F	BRIGHT RIPE
05/04/90	615	3.2	M	SEMI-BRIGHT RIPE
05/04/90	640	3.3		BRIGHT, PROTRUSION AT ANAL
05/04/90	750	3.2	M	SEMI-BRIGHT RIPE
05/04/90	715	3.3		BRIGHT, PROTRUSION AT ANAL
05/04/90	670	3.2		BRIGHT, PROTRUSION AT ANAL
05/05/90	595	UNREADABLE	M	BRIGHT, SEMI-RIPE
05/07/90	870	4.2S1S1	M	SEMI-BRIGHT
05/07/90	700	4.2S1	F	SEMI-BRIGHT
05/07/90	805	3.2S1	F	BRIGHT
05/07/90	660	3.2	M	BRIGHT
05/07/90	740	4.2	M	SEMI-BRIGHT RIPE
05/07/90	800	3.2S1	F	SEMI-BRIGHT
05/07/90	810	4.2S1S1	F	SEMI-BRIGHT
05/08/90	795	3.3	M	SEMI-DARK
05/08/90	590	3.2	M	DARK
05/08/90	765	4.2	M	BRIGHT, NO SCARS
05/08/90	670	4.2	F	BRIGHT RIPE
05/08/90	540	3.2	F	BRIGHT
05/08/90	710	? .3	F	BRIGHT RIPE
05/08/90	875	3.2S1	F	BRIGHT
05/08/90	810	3.2	M	SEMI-BRIGHT
05/08/90	825	3.3	F	BRIGHT RIPE, NET MARKS
05/08/90	680	UNREADABLE	F	BRIGHT RIPE

-continued-

## Appendix A3. (Page 2 of 4).

DATE	LENGTH	AGE	SEX	COMMENTS
05/08/90	890	3.2S1S1S1S1	F	BRIGHT RIPE, ONLY 7 SCALES
05/08/90	820	3.2S1S1	F	BRIGHT
05/08/90	800	UNREADABLE	F	SEMI-BRIGHT RIPE
05/08/90	890	4.2S1S1	F	BRIGHT
05/12/90	625	? .2	M	SEMI-DARK, RIPE
05/12/90	810	UNREADABLE	F	BRIGHT RIPE
05/13/90	735	4.2S1	M	DARK RIPE
05/13/90	780	3.3	M	DARK, RIPE, ONLY 7 SCALES TAKEN
05/13/90	575	3.1S1	M	DARK RIPE, NET MARKS
05/13/90	775	4.2S1	F	BRIGHT RIPE, SNAG MARK TOP OF HEAD
05/14/90	760	3.3	F	BRIGHT RIPE
05/14/90	820	4.2S1	M	DARK RIPE
05/14/90	800	2.2S1	M	DARK RIPE, ONLY 4 SCALES TAKEN
05/15/90	755	3.2S1	F	DARK RIPE
05/15/90	780	3.2S1	F	DARK RIPE, ONLY 7 SCALES TAKEN
05/16/90	715	4.2	M	DARK RIPE
05/16/90	705	4.2	M	DARK RIPE, CUT ON NOSE
05/16/90	780	4.2S1	M	DARK
05/16/90	700	3.2S1	F	SEMI-BRIGHT RIPE
05/16/90	730	4.2S1	F	SEMI-BRIGHT, ADIPOSE CLIP
05/16/90	690	4.3	M	SEMI-BRIGHT
05/16/90	880	4.3	F	BRIGHT RIPE
05/16/90	590	? .2	M	SEMI-BRIGHT RIPE, SNAG MARK BEHIND ADIPOSE
05/17/90	730	3.2S1	F	BRIGHT RIPE
05/17/90	740	4.2	M	DARK RIPE
05/17/90	815	4.2S1	F	BRIGHT RIPE
05/17/90	805	3.3	M	DARK RIPE
05/17/90	785	3.2S1	M	DARK RIPE
05/17/90	805	3.2S1S1	F	SEMI-BRIGHT RIPE
05/17/90	670	4.2	F	BRIGHT
05/17/90	770	3.2S1S1	F	BRIGHT
05/17/90	655	3.2S1	M	DARK RIPE
05/17/90	655	3.2	F	BRIGHT RIPE
05/17/90	780	3.3S1	F	BRIGHT RIPE
05/17/90	650	4.2	M	DARK RIPE, BITE TAKEN OUT OF DORSAL
05/17/90	650	3.2	M	DARK RIPE
05/17/90	675	4.2	M	DARK RIPE
05/17/90	720	4.2	M	DARK RIPE
05/17/90	760	3.3	F	BRIGHT RIPE
05/17/90	720	3.3	F	DARK RIPE
05/17/90	715	4.2	M	SEMI-BRIGHT RIPE
05/17/90	850	4.2S1	F	BRIGHT RIPE
05/18/90	680	3.2	M	SEMI-BRIGHT, ERODED LOWER CAUDAL
05/18/90	690	4.2	M	SEMI-BRIGHT

-continued-

Appendix A3. (Page 3 of 4).

DATE	LENGTH	AGE	SEX	COMMENTS
05/19/90	840	? .2S1S1	F	DARK
05/19/90	745	3.3	F	DARK
05/19/90	750	3.2S1	M	DARK RIPE
05/19/90	600	3.2	M	SEMI-BRIGHT RIPE
05/19/90	715	4.2	M	DARK RIPE
05/19/90	715	5.2S1	F	SEMI-BRIGHT RIPE
05/19/90	700	4.2	F	BRIGHT RIPE
05/19/90	725	4.2S1	M	SEMI-BRIGHT RIPE, ONLY 7 SCALE TAKEN
05/19/90	655	3.2	F	SEMI-BRIGHT RIPE
05/19/90	835	? .3S1	F	BRIGHT RIPE
05/19/90	745	4.1S1S1	F	BRIGHT RIPE
05/19/90	740	4.	M	DARK RIPE
05/19/90	855	3.2S1S1	F	BRIGHT RIPE, ON 7 SCALES TAKEN, SNAG MARKS
05/19/90	770	4.2S1	F	BRIGHT RIPE, HEALED SNAG MARKS LEFT SIDE
05/19/90	670	3.2	M	DARK RIPE
05/19/90	660	4.1S1	F	BRIGHT RIPE
05/19/90	675	3.2S1	F	SEMI-BRIGHT RIPE
05/19/90	630	3.3	F	BRIGHT RIPE
05/19/90	625	4.2	M	DARK RIPE
05/19/90	760	3.1S1S1	F	BRIGHT RIPE, GILL NET MARKS BOTH SIDES
05/19/90	655	4.2	M	DARK RIPE
05/19/90	635	UNREADABLE	M	DARK RIPE, SNAG HOOK IN FISH AND WRAPPED AROUND
05/19/90	790	3.3	F	SEMI-BRIGHT RIPE
05/19/90	590	3.2	M	SEMI-BRIGHT RIPE
05/19/90	660	3.3	F	SEMI-BRIGHT RIPE
05/19/90	810	4.3	F	BRIGHT RIPE
05/19/90	620	3.2	M	DARK RIPE
05/19/90	775	3.2S1S1S1	F	BRIGHT RIPE
05/19/90	785	3.3S1	F	SEMI-BRIGHT RIPE
05/19/90	635	? .2	F	SEMI-BRIGHT
05/19/90	780	? .3	F	BRIGHT RIPE
05/19/90	655	3.2	M	DARK RIPE
05/20/90	790	3.2S1S1	F	BRIGHT RIPE
05/21/90	575	2.2	M	DARK RIPE
05/21/90	640	3.2	F	BRIGHT RIPE
05/21/90	645	3.2	F	BRIGHT NOT RIPE
05/21/90	635	3.2	M	DARK RIPE
05/21/90	800	3.3S1	F	SEMI-BRIGHT
05/21/90	715	UNREADABLE	M	DARK RIPE
05/21/90	800	2.2S1	M	BRIGHT
05/21/90	685	4.1S1	F	BRIGHT

-continued-

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DATE	LENGTH	AGE	SEX	COMMENTS
05/21/90	800	4.3S1	F	BRIGHT
05/21/90	680	3.2	M	DARK RIPE
05/22/90	670	4.2	M	DARK RIPE
05/22/90	860	3.2S1S1	F	BRIGHT AND RIPE
05/22/90	705	4.2	M	DARK
05/22/90	875	4.3	M	DARK
05/22/90	710	3.2	M	SEMI-DARK RIPE, HOOK IN SIDE NEAR ADIPOSE
05/22/90	815	3.2S1	M	DARK RIPE
05/22/90	655	3.2	F	BRIGHT RIPE
05/22/90	610	4.1S1	M	DARK
05/22/90	760	3.2S1	F	BRIGHT RIPE
05/22/90	835	4.3S1	F	BRIGHT
05/23/90	790	3.2S1S1	F	SEMI-BRIGHT
05/23/90	780	3.2S1	F	BRIGHT
05/23/90	675	3.2	M	DARK
05/23/90	650	3.2	F	BRIGHT
05/23/90	740	3.2S1	F	SEMI-BRIGHT
05/23/90	785	2.2S1S1	F	DARK
05/23/90	840	3.2S1S1	F	BRIGHT
05/24/90	590	4.2	M	DARK RIPE
05/24/90	830	3.2S1S1	F	BRIGHT REAL BRIGHT
05/25/90	605	3.2	F	BRIGHT AND RIPE
05/25/90	650	? .2	F	BRIGHT
05/25/90	670	3.2	M	SEMI-BRIGHT
05/25/90	725	3.2S1	M	DARK
05/27/90	775	4.2S1S1	F	BRIGHT
05/28/90	765	4.2S1	F	BRIGHT RIPE
05/28/90	805	3.3S1	F	BRIGHT RIPE
05/28/90	730	4.3	M	SEMI-BRIGHT RIPE
05/28/90	855	3.3S1S1S1	F	BRIGHT RIPE, ONLY 7 SCALES TAKEN
05/29/90	635	3.2	F	BRIGHT RIPE, SCARS ON BACK AND BELLY
05/29/90	865	3.3S1S1	F	DARK RIPE
05/30/90	720	4.2	M	BRIGHT RIPE
05/30/90	770	3.3	F	BRIGHT RIPE
05/30/90	800	3.2S1	F	BRIGHT RIPE
05/30/90	800	2.2S1	M	SEMI-BRIGHT RIPE, ONLY 7 SCALES TAKEN
05/31/90	660	3.2	M	DARK RIPE
06/01/90	775	4.3	F	BRIGHT NOT RIPE
06/01/90				NOT SAMPLED PASSED UP AS FISH WERE BEING LET DOWN
06/02/90				NOT SAMPLED, PASSED UPSTREAM
06/04/90	850	? .3	M	SEMI-BRIGHT RIPE, 6 SCALE TAKEN

Appendix A4. Length, age, and sex of Peterson Creek steelhead sampled at the weir in 1989.

DATE	LENGTH	AGE	SEX	COMMENTS
05/04/89	787	3.2S1	M	FISH ALREADY CUTTED WHEN SAMPLED
05/01/89	788	3.3	F	BRIGHT
05/02/89	875	? .2S1S1	F	FIRST FISH THRU WEIR
05/03/89	705	3.2S1	M	Dark Fish
05/04/89	750	4.2S1	M	Dark; 2nd FISH THRU WEIR
05/04/89	635	3.2	F	BRIGHT
05/05/89	765	UNREADABLE		NET SCARRED
05/05/89	765	3.2S1	F	BRIGHT
05/07/89	770	UNREADABLE	F	SILVER, DRIPPING EGGS
05/07/89	870	UNREADABLE	M	SEMI-BRIGHT
05/07/89	820	4.2S1S1	M	DARK
05/07/89	780	3.2S1	M	DARK, DRIPPING MILT
05/07/89	858	4.2S1S1	M	DARK, DRIPPING MILT
05/07/89	805	4.2S1S1	F	SEMI-BRIGHT, DRIPPING EGGS
05/07/89	728	4.2S1	M	DARK, DRIPPING MILT
05/07/89	778	? .2S1	F	DARK
05/07/89	632	3.2	M	BRIGHT
05/07/89	811	3.2S1S1S1	F	
05/07/89	740	3.3	F	BRIGHT
05/07/89	694	? .2S1	M	DARK WITH SNAG MARKS ON ITS BACK
05/07/89	881	3.2S1	M	DARK
05/08/89	794	4.3	M	DARK
05/08/89	776	3.2S1S1	M	DARK
05/08/89	855	? .3	M	DARK
05/08/89	880	? .3S1S1	F	DARK
05/08/89	724	4.3	F	DARK
05/08/89	785	3.1S1S1	F	GILLNET MARKS, SEMI-DARK
05/08/89	724	3.2S1	M	DARK
05/09/89	745	5.3	F	SOME SCARING, BRIGHT
05/09/89	760	3.2S1	F	BRIGHT, DRIPPING EGGS
05/09/89	700	? .2S1	F	BRIGHT
05/09/89	800	UNREADABLE	F	SEMI-BRIGHT DRIPPING EGGS
05/09/89	880	UNREADABLE	F	SEMI-DARK
05/09/89	820	? .3	M	DARK
05/09/89	867	3.2S1S1S1	F	DARK
05/09/89	790	3.2S1S1	F	SEMI-BRIGHT
05/09/89	638	3.2	M	DARK
05/09/89	715	UNREADABLE	F	DARK
05/10/89	830	UNREADABLE	M	DARK WITH SOME SNAGGING SCARS
05/10/89	860	UNREADABLE	M	SEMI-DARK
05/10/89	760	3.1S1S1	F	BRIGHT WITH SCAR ON SIDE
05/10/89	670	3.1S1S1	M	DARK
05/10/89	829	4.2S1S1	F	DARK, TREBLE HOOK STUCK IN SIDE
05/10/89	809	3.2S1S1	F	SEMI-BRIGHT
05/10/89	775	UNREADABLE	F	BRIGHT
05/10/89	662	4.2	F	BRIGHT
05/10/89	742	4.2S1	M	DARK
05/10/89	705	4.2S1	F	DARK
05/10/89	850	? .2S1S1	F	SEMI-BRIGHT DRIPPING EGGS
05/10/89	738	3.2S1	F	BRIGHT
05/10/89	757	3.2S1	M	DARK
05/10/89	770	UNREADABLE	F	DARK
05/14/89	760	3.2S1S1	F	REAL BRIGHT
05/14/89	687	3.2S1	F	REAL BRIGHT
05/14/89	750	? .1S1S1	M	BRIGHT
05/14/89	641	3.2S1	M	DARK DRIPPING MILT
05/14/89	869	? .2S1S1	M	SEMI-DARK

-continued-

## Appendix A4. (Page 2 of 2).

DATE	LENGTH	AGE	SEX	COMMENTS
05/14/89	810	4.2S1S1	F	SEMI-BRIGHT
05/14/89	773	4.2S1	F	BRIGHT
05/14/89	709	3.2S1	F	BRIGHT
05/14/89	850	4.2S1S1	F	BRIGHT
05/14/89	714	3.3	F	SEMI-BRIGHT DRIPPING EGGS
05/14/89	848	UNREADABLE	M	DARK
05/14/89	756	UNREADABLE	F	DARK DRIPPING EGGS
05/14/89	828	4.2S1	F	BRIGHT DRIPPING EGGS
05/14/89	800	3.2S1	M	SEMI-BRIGHT DRIPPING EGGS
05/14/89	668	4.2	F	BRIGHT DRIPPING EGGS
05/21/89	764	5.2S1	F	REAL BRIGHT
05/15/89	840	4.2S1	F	BRIGHT DRIPPING EGGS
05/15/89	861	UNREADABLE	F	BRIGHT
05/15/89	769	3.3	F	BRIGHT WITH CUTS ON HEAD
05/15/89	788	UNREADABLE	F	SEMI-BRIGHT
05/15/89	857	? .3S1	F	BRIGHT
05/15/89	716	3.2S1S1S1	M	DARK
05/15/89	746	4.2S1	F	BRIGHT WITH CUTS ON HEAD
05/15/89	792	3.3	F	BRIGHT WITH CUTS ON HEAD
05/15/89	728	4.1S1	M	DARK
05/15/89	691	4.2S1	M	DARK
05/15/89	789	3.2S1	F	SEMI-BRIGHT WITH CUTS ON HEAD
05/15/89	774	3.3	F	BRIGHT
05/15/89	780	3.3	M	DARK
05/15/89	826	4.3	F	BRIGHT WITH CUTS ON HEAD
05/15/89	780	UNREADABLE	F	SEMI-BRIGHT
05/16/89	810	4.2S1	F	SEMI-BRIGHT
05/16/89	747	4.3S1	F	BRIGHT
05/16/89	835	3.3	M	SEMI-BRIGHT
05/16/89	840	4.3S1	F	DARK
05/16/89	817	3.2S1	F	BRIGHT
05/17/89	687	UNREADABLE	F	BRIGHT
05/20/89	800	4.2S1	F	SEMI-DARK
05/20/89	846	3.2S1S1	F	SEMI-DARK
05/25/89	796	UNREADABLE	F	SEMI-DARK SPAWNED OUT
05/25/89	676	4.2	F	BRIGHT WITH FULL TIGHT BELLY
05/25/89	732	4.3	F	SEMI-BRIGHT
05/25/89	847	? .3S1S1S1	F	SEMI-BRIGHT
05/25/89	652	3.3	F	BRIGHT WITH FULL TIGHT BELLY
05/25/89	777	4.2S1	M	BRIGHT
05/26/89	954	3.2S1	F	SEMI-DARK
05/26/89	763	4.2S1S1	F	DARK WITH SCAR JUST ABOVE VENT
05/27/89	688	2.3	F	BRIGHT
05/27/89	805	4.2S1	F	SEMI-DARK, GOUGED NOSE FROM TRAP
05/28/89	632	UNREADABLE	M	DARK
05/28/89	725	4.2S1	M	DARK, CUT UNDER LOWER JAW
05/28/89	609	3.2	F	BRIGHT
05/29/89	872	3.2S1S1S1	F	DARK, SPAWNED OUT, LOTS OF SCARS
05/29/89	663	? .2	M	BRIGHT
05/29/89	746	3.3	F	DARK, CUT BACK LEFT OF MOUTH
05/22/89	645	4.2	M	BRIGHT

Appendix A5. Estimated variances for angler effort (hours), catch, and harvest of steelhead, by stratum, sampling stage<sup>a</sup>, and site, Peterson Creek, 1990.

Sampling Stratum	Effort			Harvest			Catch		
	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage
<b>LOWER RIVER SITE</b>									
<b>Weekends</b>									
4/02-5/01	10,092	29,859	0	0	0	0	0	0	0
5/02-5/28	19,890	4,091	0	0	0	0	0	0	0
5/29-6/05	- <sup>b</sup>	-	-	-	-	-	-	-	-
<b>Weekdays</b>									
4/02-5/01	39,674	14,204	0	0	0	0	0	0	0
5/02-5/28	9,644	4,673	0	0	0	0	0	0	0
5/29-6/05	864	324	0	0	0	0	0	0	0
<b>HIGHWAY BRIDGE SITE</b>									
<b>Weekends</b>									
4/02-5/01	-	-	-	-	-	-	-	-	-
5/02-5/28	688	6,044	14	1.7	9.8	0	16	108	0
5/29-6/05	-	-	-	-	-	-	-	-	-
<b>Weekdays</b>									
4/02-5/01	-	-	-	-	-	-	-	-	-
5/02-5/28	23,079	25,569	0	43	35	0	43	35	0
5/29-6/05	-	-	-	-	-	-	-	-	-

<sup>a</sup> Stage: 1) days within seasons; 2) sample periods within days; 3) anglers within sample periods.

<sup>b</sup> - No survey conducted.