

FISHERY DATA SERIES NO. 51

EFFORT AND CATCH STATISTICS FOR THE  
SPORT FISHERY FOR COHO SALMON (*Oncorhynchus kisutch*)  
IN THE LITTLE SUSITNA RIVER WITH ESTIMATES  
OF ESCAPEMENT, 1987 <sup>1</sup>

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#### ABSTRACT

Creel surveys were conducted at three major access points to the Little Susitna River from 11 July through 7 September to estimate the effort for and the harvest and catch of coho salmon by the sport fishery. An estimated 13,202 coho salmon were harvested and an additional 2,138 coho salmon were caught and released during 68,881 angler-hours of effort. The majority of the estimated effort (57,521 hours) and coho salmon harvest (11,088) were at the Burma Road survey site. The estimated contribution of hatchery-produced coho salmon to the sport harvest was 26.2 percent.

KEY WORDS: coho salmon, creel survey, effort, harvest, enhancement contribution, escapement.

## INTRODUCTION

The Little Susitna River (Figure 1) supports the largest sport fishery for coho salmon *Oncorhynchus kisutch* in the Matanuska-Susitna Valley (Mills 1979-1987). Bentz (1983) described the river and the sport fishery in detail. The Alaska Department of Fish and Game (ADFG), Division of Sport Fish began an annual creel survey of the sport fishery for coho salmon in the Little Susitna River in 1981. An annual life-history study of coho salmon in the Little Susitna River was begun in 1982 (Bentz 1987).

There was a 339% increase in angler-effort in this fishery from 1977 through 1984 (Mills 1979-1985). In response to this large increase in angler-effort, the Little Susitna River was selected for enhancement of coho salmon (ADFG 1981); it has been stocked annually since 1982 (Chlupach 1987).

As part of the life-history study, a weir was constructed in 1986 to estimate the escapement of coho salmon. Sampling at the weir was designed to recover tagged fish needed to estimate hook-and-release mortality of coho salmon in the sport fishery and to estimate the age, length, and sex compositions of the coho salmon escapement (Bentz 1987). The weir was temporarily washed out by flood waters in 1986. A weir was constructed again in 1987 to continue these studies but was washed out during a flood on 1 August 1987.

The objectives of this report are to present:

1. estimates of angler-effort, coho salmon harvest, and coho salmon catch (number of coho salmon kept plus those released), by the sport fishery;
2. estimates of hook-and-release mortality, the contribution of hatchery-reared fish to the sport harvest, and the age, sex, and length compositions of the harvest and escapement for coho salmon in the Little Susitna River; and,
3. estimates of the minimum escapements of coho salmon for the Little Susitna River and other northern Cook Inlet index streams.

Not all of these objectives were realized because of the loss of the weir.

## METHODS

Approximately 113 km of the Little Susitna River were open to salmon fishing in 1987 by regulation (ADFG 1987). Within this area there are three major points of access to the fishery: (1) the boat launch at Ship Creek in Anchorage; (2) the boat launch at Burma Road on river kilometer 45.1; and (3) the boat launch at Miller's Landing in the city of Houston on river kilometer 111.7 (Figure 1). During 1987, daily bag and possession limits for coho salmon were three fish of 406 mm (16 inches) or greater total length. Fishing time was not restricted (ADFG 1987). Creel surveys were

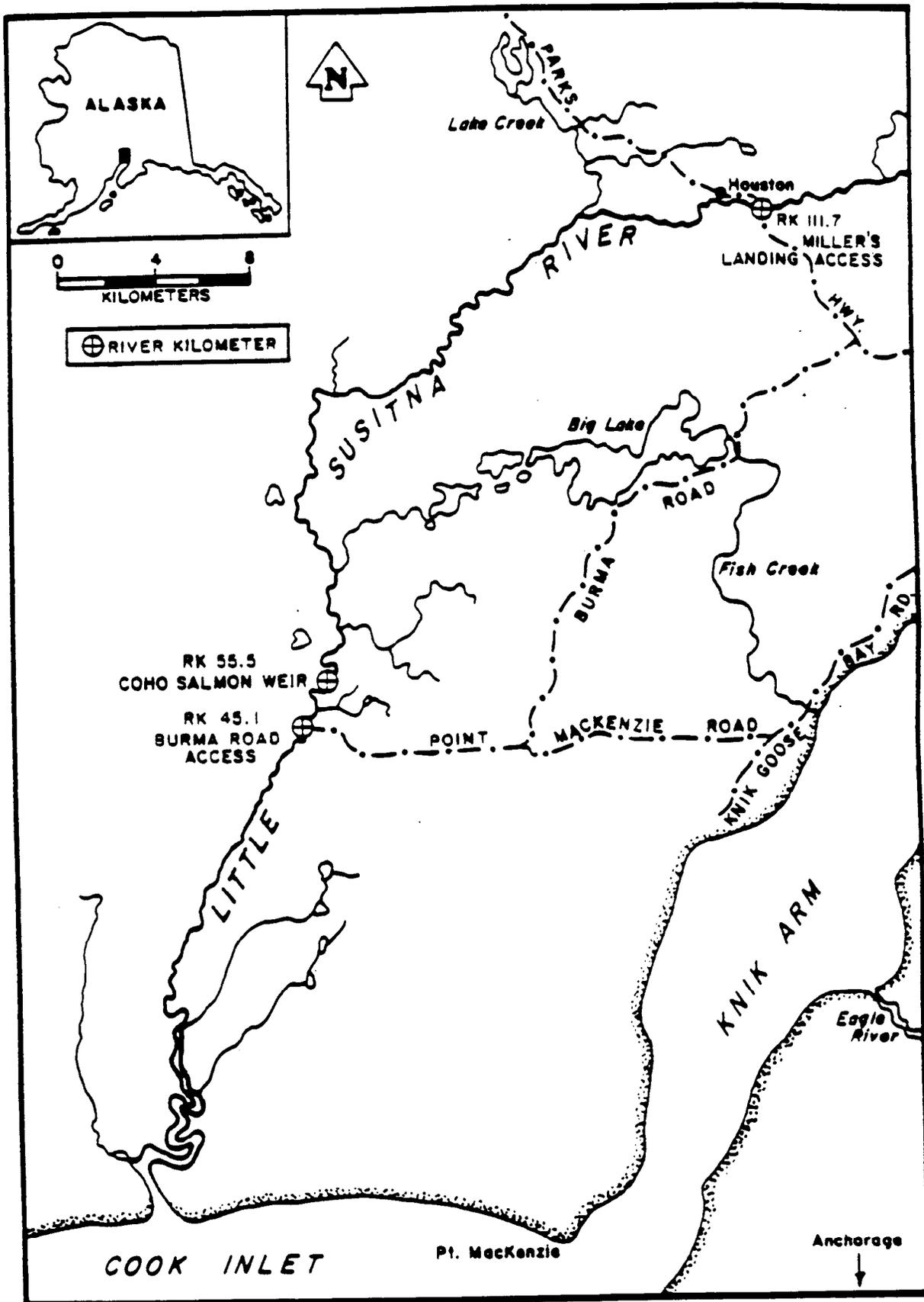


Figure 1. Map of the Little Susitna River.

used to estimate angler-effort (in hours), coho salmon harvest, and coho salmon catch at each of the major access points.

### Direct Expansion Creel Surveys

Direct expansion creel surveys were conducted at each of the three access sites to the fishery. These surveys census all anglers exiting an access site during a specific temporal period and the information is then expanded to include time not surveyed. The direct expansion survey at Burma Road was augmented with a roving creel survey (Neuhold and Lu 1957) to include shore anglers not exiting the fishery through the access points surveyed.

#### Study Design:

The direct expansion surveys at Burma Road and Miller's Landing were initially designed for a 16-hour fishing day (0600-2200 hours). The survey at Ship Creek was designed for an 8-hour day; the hours censused each day were determined by the high tides as these are the only times this site is accessible by boat. The Burma Road and Miller's Landing surveys were reduced to 13-hour days (0800-2100 hours) from 31 August through 7 September because of the decreased number of daylight hours.

A stratified, random sample design was used for the direct expansion creel surveys. Each fishing day at Burma Road was stratified into four 4-hour survey periods (A, B, C, and D). Fishing days at Miller's Landing were stratified into two 8-hour survey periods (A and B). From 31 August through 7 September at both Burma Road and Miller's Landing, each day was stratified into two 6.5-hour periods (A and B). The Ship Creek survey contained two 4-hour periods each day (A and B) which bracketed the high-slow tide by 2 hours.

The creel surveys were conducted from: 11 July through 7 September at Burma Road; 8 August through 7 September at Miller's Landing; and 11 July through 23 August at Ship Creek. Each location was surveyed 5 days each week; the 2 days not surveyed were randomly selected without replacement from the weekdays. All Saturdays, Sundays, and holidays were surveyed. Each period (A, B, C, and D) was sampled on a day selected for survey. Effort, harvest, and catch were estimated separately for the weekdays and weekend/holidays in each week.

On a day selected for sampling, a time to begin sampling in each period was randomly selected from those whole hours in the period (0500, 0600, etc.) which allowed the entire sample unit to fall within the defined period. Burma Road was surveyed for 3 hours during each 4-hour period; 0.5 hour was dedicated to the roving survey. Miller's Landing was surveyed for 3.5 hours during each period and Ship Creek for 4 hours during each period. A creel survey clerk was stationed at an access site to the fishery during a selected sample period. All anglers departing the fishery through the access site during the sample period were interviewed by the survey clerk. If the survey clerk was unable to contact all anglers (usually due to large numbers of anglers leaving the fishery at the same time), a tally of all anglers who were not interviewed was kept.

## Data Collection:

The following effort and harvest information were collected from each angler interviewed: completed-trip or incomplete trip angler; number of hours spent fishing; number of fish harvested (kept) and number of fish released by species; shore or boat angler; guided or unguided angler; and fishing methods (lure, bait, or both). In addition, the following information on the locations fished by the angler was collected: angler fished upstream and/or downstream of the boat launch at Burma Road; and, angler fished upstream and/or downstream of the weir.

## Analysis:

We are not aware of any previous documentation of methods for estimating effort, harvest, and catch in direct expansion creel surveys that include estimates of variance for these quantities. Therefore, a detailed description of our methods and the rationale behind them will be presented. Definitions of the notation used to describe the direct expansion surveys are presented in Table 1. The estimation of angler effort by a direct expansion creel survey can be considered as a problem in estimating a rate. Effort was estimated in units of angler-hours. The rate estimated was the number of angler-hours leaving an access site during each hour the fishery was in progress. Only completed-trip angler interviews were used in the analyses. The product of this rate and the total number of possible fishing hours in the fishery was an estimate of angler effort. This was expressed as:

$$\hat{E} = \sum_{j=1}^P H_j (\bar{e}_j / \bar{h}_j) \quad [1]$$

The variance of effort was estimated as:

$$V(\hat{E}) = \sum_{j=1}^P H_j^2 V(\bar{e}_j / \bar{h}_j) \quad [2]$$

The variance of the rate,  $\bar{e}_j / \bar{h}_j$ , was approximated by the variance for the quotient of the mean of two random variables (Jessen 1978):

$$V(\bar{e}_j / \bar{h}_j) \approx (\bar{e}_j / \bar{h}_j)^2 (1/d_j) (s_e^2 / \bar{e}_j^2 + s_h^2 / \bar{h}_j^2 - 2rs_e s_h / \bar{e}_j \bar{h}_j) (1 - h_j / H_j) \quad [3]$$

The time spent surveying on day  $i$  of period  $j$  ( $h_{ij}$ ) was usually relatively constant on each sampling occasion. In some instances, however,  $h_{ij}$  varied considerably due to logistical problems and the  $h_{ij}$  were considered random variables. This variation is represented by the variance of the sample unit

length in Equation 3 ( $s_h^2$ ). The coefficient of variation was used to determine if the  $h_{ij}$  were treated as random variables. If the coefficient of variation exceeded 20%, the  $h_{ij}$  were treated as random variables, otherwise the  $h_{ij}$  were treated as constant.

Table 1. Definitions for the notation used in the equations for the direct expansion creel surveys.

Notation	Definition
D	the number of days the fishery was open during a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$d_j$	the number of days censused during period j of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$\hat{E}$	the estimate of effort in angler-hours <sup>2</sup> for a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$\bar{e}_j$	the mean number of angler-hours <sup>2</sup> leaving a census site during a sample unit in period j of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$e_{ij}$	the number of angler-hours <sup>2</sup> leaving a census site during period j on day i of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$\bar{f}_{ij}$	the mean number of hours fished by anglers censused during period j on day i of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$H_j$	the number of hours of possible fishing time during period j of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$\bar{h}_j$	the mean number of hours censused on days sampled during period j of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$h_j$	the number of hours censused during period j of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$h_{ij}$	the number of hours censused during period j on day i of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$M_{ij}$	the number of completed-trip anglers leaving the fishery during period j of day i during a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
$m_{ij}$	the number of completed-trip anglers leaving the fishery who are interviewed during period j of day i during a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
p	the number of daily time periods (A, B, C, etc.) in a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .

-continued-

Table 1. Definitions for the notation used in the equations for the direct expansion creel surveys (continued).

Notation	Definition
r	the correlation between the $e_{ij}$ and $h_{ij}$ for sample units collected during a specific weekday or weekend/holiday component of a fishery <sup>1</sup> .
2	
$s_e$	the sample variance for the mean number of angler-hours leaving a census site on a sample day during a period of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> ( $\bar{e}_j$ ).
2	
$s_{eij}$	the estimated sample variance for the mean number of angler-hours leaving a census site during period j on day i of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> ( $\bar{e}_{ij}$ ).
2	
$s_{fij}$	the sample variance for the mean effort by anglers departing a fishery during period j on day i of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> ( $\bar{f}_{ij}$ ).
2	
$s_h$	the sample variance for the mean number of hours censused on a sample day during a period of a specific weekday or weekend/holiday component of a fishery <sup>1</sup> ( $\bar{h}_j$ ).

<sup>1</sup> Fishery refers to an access site that is censused to estimate effort and catch for a particular fishery.

<sup>2</sup> All angler-hours referred to are for completed-trip anglers.

For  $h_{ij}$  constant,  $s_h^2$  equals 0 and the variance of the estimate of angler effort simplifies to:

$$V(\hat{E}) = \sum_{j=1}^p d_j (H_j/h_j)^2 s_e^2 (1 - h_j/H_j) \quad [4]$$

When it was not possible to interview all anglers leaving an access site, the effort by the anglers who were not interviewed was estimated. In contrast to the previous situation, where the effort leaving the fishery during period  $j$  on day  $i$  ( $e_{ij}$ ) was considered to be measured without error, error is now associated with  $e_{ij}$ . Effort leaving the fishery during a given sample unit was estimated for period  $j$  on day  $i$  by:

$$\hat{e}_{ij} = M_{ij} \bar{f}_{ij} \quad [5]$$

and

$$V(\hat{e}_{ij}) = M_{ij}^2 (s_{fij}/m_{ij})^2 (1 - m_{ij}/M_{ij}) \quad [6]$$

Effort for period  $j$  was estimated by:

$$\hat{E}_j = H_j (\hat{e}_j/h_j) \quad [7]$$

The variance of  $\hat{E}_j$  was estimated using equations 2 and 3 with the exception that the variance of the mean number of completed-trip angler-hours censused during each sampling event now has two components, the within-day variance due to missed anglers and the between-day variance. Letting

$$s_e^2 = s_{Be}^2 + h_j/[d_j(H_j - h_j)] (\sum_{i=1}^D s_{eij}^2) \quad [8]$$

estimate the variance of  $\hat{e}_j$  with the between-day variance ( $s_{Be}^2$ ) equal to:

$$s_{Be}^2 = [\sum_{i=1}^D (e_{ij} - \bar{e}_j)^2] / (d_j - 1), \quad [9]$$

the variance of  $E_j$  was estimated by substituting  $s_e^2$  for  $s_e^2$  in equation 3 (Sukhatme et al. 1984).

By replacing  $s_e^2$  with  $s_e^2$ , the variance of the angler effort estimate simplifies to equation 4 when the  $h_j$  are constant.

The harvest and catch of a species and their variances were estimated with the same procedures used to estimate effort by simply substituting the corresponding quantities for harvest or catch in place of effort.

Assumptions necessary for the direct expansion creel survey design are:

1. No significant fishing effort occurs during the hours not included in the fishing day.
2. All anglers participating in the fishery exit the fishery through a surveyed access site.
3. All anglers who are not interviewed are counted and all non-interviewed anglers are completed-trip anglers.

### Roving Creel Survey

There are shore anglers who fish the Little Susitna River near the Burma Road access site and do not exit the fishery through the survey location. The effort, harvest, and catch by these anglers were estimated using a roving creel survey (Neuhold and Lu 1957).

#### Study Design:

The roving creel survey at Burma Road was incorporated into the direct expansion survey schedule. Within the periods and survey times for the direct expansion survey, 0.5 hour was randomly selected for conducting the roving survey. One angler count was conducted during each survey period of the direct expansion survey. A count of all shore anglers within 1.6 km upstream and 1.6 km downstream of the Burma Road survey location was conducted from a riverboat. Angler counts were considered instantaneous (Neuhold and Lu 1957). The harvest and catch rates from the shore anglers exiting the fishery at Burma Road during the direct expansion survey were applied to these anglers.

#### Analysis:

Angler effort and its variance were estimated separately for the weekdays and weekend/holiday days each week. Effort was estimated as follows (Scheaffer et al. 1979):

$$\hat{E} = \sum_{j=1}^P \bar{x}_j H_j \quad [10]$$

Definitions of the notation for the roving creel survey are presented in Table 2. The variance of  $\hat{E}_j$  was estimated by (Scheaffer et al. 1979):

$$V(\hat{E}) = \sum_{j=1}^P [H_j^2 (s_j^2/n_j)] \quad [11]$$

Table 2. Definitions for the notation used in the equations for the roving creel survey.

Notation	Definition
$\hat{C}$	the estimate of catch <sup>1</sup> during a specific weekday or weekend/holiday component of a fishery.
$\bar{c}$	the mean catch <sup>1</sup> per angler by all anglers interviewed during a specific weekday or weekend/holiday component of a fishery.
$\bar{c}_i$	the mean catch <sup>1</sup> per angler by all anglers interviewed on day i during a specific weekday or weekend/holiday component of a fishery.
$c_{ik}$	the catch <sup>1</sup> by angler k interviewed on day i during a specific weekday or weekend/holiday component of a fishery.
D	the number of days the fishery was open during a specific weekday or weekend/holiday component of a fishery.
d	the number of days on which angler interviews were conducted during a specific weekday or weekend/holiday component of a fishery.
$\hat{E}$	the estimate of effort in angler-hours for a specific weekday or weekend/holiday component of a fishery.
$\bar{f}$	the mean number of hours fished by all anglers interviewed during a specific weekday or weekend/holiday component of a fishery.
$f_{ik}$	the number of hours spent fishing by angler k interviewed on day i during a specific weekday or weekend/holiday component of a fishery.
H	the number of hours of possible fishing time during a specific weekday or weekend/holiday component of a fishery.
$H_j$	the number of hours of possible fishing time during period j of a specific weekday or weekend/holiday component of a fishery.
$m_i$	the number of anglers interviewed on day i during a specific weekday or weekend/holiday component of a fishery.
n	the number of angler counts conducted during a specific weekday or weekend/holiday component of a fishery.
$n_j$	the number of angler counts conducted during period j of a specific weekday or weekend/holiday component of a fishery.

-continued-

Table 2. Definitions for the notation used in the equations for the roving creel survey (continued).

Notation	Definition
$p$	the number of daily time periods (A, B, C, etc.) in a specific weekday or weekend/holiday component of a fishery.
$r$	the correlation between the $c_{ik}$ and $f_{ik}$ for anglers interviewed during a specific weekday or weekend/holiday component of a fishery.
$s^2$	the sample variance for the mean angler count during a specific weekday or weekend/holiday component of a fishery ( $\bar{x}$ ).
$s_c^2$	the two-stage estimate of variance for the mean catch by anglers interviewed during a specific weekday or weekend/holiday component of a fishery ( $\bar{c}$ ).
$s_f^2$	the two-stage estimate of variance for the mean effort by anglers interviewed during a specific weekday or weekend/holiday component of a fishery ( $\bar{f}$ ).
$s_i^2$	the sample variance for the mean catch by anglers interviewed on day $i$ of a specific weekday or weekend/holiday component of a fishery ( $\bar{c}_i$ ).
$s_j^2$	the sample variance for the mean angler count during period $j$ of a specific weekday or weekend/holiday component of a fishery ( $\bar{x}_j$ ).
$\bar{x}$	the mean angler count for a specific weekday or weekend/holiday component of a fishery.
$\bar{x}_j$	the mean angler count for period $j$ during a specific weekday or weekend/holiday component of a fishery.

<sup>1</sup> Catch refers to either the catch of a single species (fish kept plus those released) or to harvest of a single species (fish kept) depending on the quantity being estimated.

Total effort was estimated by summing all the weekday and weekend/holiday estimates. Since these are considered independent estimates, the estimated variance of the total was the sum of the variances.

Rates of catch (fish kept plus those released) and harvest (fish kept only) of coho salmon were estimated using a two-stage sampling design with a finite number of primary sample units (days) and an unknown number of secondary units (anglers). Only completed-trip interviews were used to estimate catch and harvest rates. Catch rates were estimated for each sampled day and for each weekday and weekend/holiday component. Catch per unit of effort (CPUE) was estimated for each of the weekday and weekend/holiday components of the fishery as:

$$CPUE = \bar{c}/\bar{f} = \left[ \sum_{i=1}^D \sum_{k=1}^{m_i} c_{ik} \right] / \left[ \sum_{i=1}^D \sum_{k=1}^{m_i} f_{ik} \right] \quad [12]$$

The variance of CPUE was approximated using the formula for the quotient of the mean of two random variables (Jessen 1978) as:

$$V(CPUE) \approx [\bar{c}/\bar{f}]^2 [s_c^2/\bar{c}^2 + s_f^2/\bar{f}^2 - (2rs_c s_f/\bar{c}\bar{f})] \quad [13]$$

The two-stage variance estimate for  $\bar{c}$  was (Sukhatme et al. 1984, Von Geldern and Tomlinson 1973):

$$s_c^2 = [1 - (d/D)] s_B^2/d + \left[ \sum_{i=1}^D (s_i^2/m_i) \right] / (dD) \quad [14]$$

where:

$$s_B^2 = \left[ \sum_{i=1}^D (\bar{c}_i - \bar{c})^2 \right] / (d-1) \quad [15]$$

The variance for  $\bar{f}$  was estimated identically as for  $\bar{c}$  by substituting the necessary quantities for effort into equations 14 and 15.

Total catch for any weekday or weekend/holiday component was estimated as:

$$\hat{C} = \hat{E} CPUE \quad [16]$$

The variance of this estimate was calculated using the formula for the product of two independent random variables (Goodman 1960):

$$V(\hat{C}) = [\hat{E}^2 V(CPUE)] + [CPUE^2 V(\hat{E})] - [V(\hat{E}) V(CPUE)] \quad [17]$$

Harvest rates, total harvest of coho salmon, and associated variances were estimated following the above procedures with the exception that HPUE and mean harvest per angler of coho salmon estimated from interviewed anglers were used.

The total harvest and catch were estimated by summing the estimates for all the weekday and weekend/holiday components. Since these are considered independent estimates, the estimated variance of the total was the sum of the variances.

Several necessary assumptions are:

1. Angler counts made during the same day and on consecutive days are independent.
2. Anglers counted during the survey do not exit at the Burma Road access site.
3. Catch and harvest rates of shore anglers exiting the fishery at Burma Road are representative of those for shore anglers counted during the roving creel survey.
4. The number of anglers interviewed during any day is proportional to the effort on that day.
5. No significant fishing effort occurs during the hours not surveyed.

#### Gear Type

Catch and effort at each site was calculated separately for anglers using bait, anglers using lures, and anglers using both bait and lures. Estimates for the missed anglers at Burma Road were not included in these calculations, nor were estimates for shore anglers interviewed during the roving creel survey at Burma Road.

#### Escapement

A weir, described by Bentz (1987), was constructed across the Little Susitna River at river kilometer 55.5. Daily and cumulative totals of five salmon species were recorded from 20 July through 30 July as the salmon passed through the weir and over a white flash panel. The salmon were counted during daylight hours when the angle of the sun on the water did not interfere with species identification. On overcast days, salmon were counted when the light intensity was sufficient to identify the fish to species. On 31 July the water became too turbid to accurately identify salmon to species and counting was suspended. On 1 August the weir washed out in a flood and was not replaced.

#### Age, Sex, and Length Compositions

Coho salmon were randomly sampled from the harvest during the creel survey at Burma Road. Three scales were collected from each fish and mounted on adhesive-coated cards (Clutter and Whitesel 1956). Impressions of scales were thermo-hydraulically made in cellulose acetate and the impressions were examined using a microfiche reader. Age was recorded using the European method (Koo 1962). The mid-eye to fork-of-tail length of sampled fish was

recorded to the nearest 0.5 centimeter. Sex was recorded as male or female if visually discernible to the creel survey clerk.

The proportional age composition of the sampled portion of the sport harvest was estimated. Letting  $\hat{p}_h$  equal the estimated proportion of age group  $h$  in the sample, the variance of  $\hat{p}_h$  was estimated using the normal approximation to the binomial (Scheaffer et al. 1979):

$$V(\hat{p}_h) = \hat{p}_h(1-\hat{p}_h)/(n_T-1), \quad [18]$$

where  $n_T$  is the total number of legible scales collected from coho salmon.

Mean length at age by sex and its variance were estimated using standard normal procedures.

#### Escapement Surveys of Index Streams

Coho salmon spawning in index areas of selected Matanuska-Susitna Valley streams were counted during either foot, helicopter, or canoe surveys during peak spawning periods. Peak periods were identified through periodic inspections of spawning activity in streams which are easily monitored. Surveyors wore polaroid glasses while taking surveys. Live and dead fish were counted separately and recorded in field notebooks.

#### Hatchery Enhancement

Coho salmon harvested by the sport fishery were examined for clipped adipose fins at the three survey locations: Burma Road, Miller's Landing, and Ship Creek. Coho salmon having clipped adipose fins potentially contained a coded-wire tag (CWT) implanted at a hatchery. Adult coho salmon were expected to return to the Little Susitna River in 1987 from a stocking of smolts during 1986 and a stocking of fingerling during 1983. The heads of fish having clipped adipose fins were bagged, labeled, frozen and transferred to the Fisheries Rehabilitation, Enhancement, and Development (FRED) Division for decoding of the CWT.

#### Analysis:

The contributions to the harvest of coho salmon from hatchery stockings in the Little Susitna River were calculated using the procedures of Clark and Bernard (1987). The numbers of unmarked fish and fish having a clipped adipose fin collected at each creel survey location were compared with a chi-square statistic to determine if the proportions of finclipped coho salmon observed at the survey locations were equal.

The estimated contribution of a release,  $(\hat{C})$ , was calculated as:

$$\hat{C} = (m^1/m^2) (a^1/a^2) (\hat{C}^T/n^2) (\hat{m}^c/\theta) \quad [19]$$

where:

$\hat{C}^T$  - total estimated harvest of coho salmon by the fishery,

$n^2$  - number of coho salmon examined from the harvest,

$a^1$  - number of coho salmon with an adipose finclip that were observed in the harvest,

$a^2$  - number of heads from coho salmon with an adipose finclip collected from the harvest and sent to the tag lab,

$m^1$  - number of CWTs that are detected in the heads at the tag lab,

$m^2$  - number of CWTs decoded at the tag lab,

$m^c$  - number of CWTs having a unique code, and

$\theta$  - for each code, the proportion of the total number of coho salmon smolts released that were tagged with CWTs.

The variance of  $\hat{C}$  was calculated as the variance of a product divided by a constant.

$$V(\hat{C}) = [\hat{C}_T^2 V(\hat{m}_c) + \hat{m}_c^2 V(\hat{C}_T) - V(\hat{m}_c) V(\hat{C}_T)] [(m_1 a_1)/(m_2 a_2 n_2 \theta)]^2 \quad [20]$$

and the variance of  $\hat{m}_c$  (Clark and Bernard 1987) was calculated as follows:

$$V[m_c] = \left[ \frac{m_2 [m_2-1] a_2 [a_2-1] n_2 [n_2 - 1] \hat{C} [\hat{C} - 1] \theta^2}{m_1 [m_1-1] a_1 [a_1-1] \hat{C}_T [\hat{C}_T-1]} \right] + \left[ \frac{m_2 a_2 n_2 \hat{C} \theta}{m_1 a_1 \hat{C}_T} \right] - \left[ \frac{(m_2 a_2 n_2 \hat{C} \theta)^2}{(m_1 a_1 \hat{C}_T)^2} \right] \quad [21]$$

## RESULTS

### Creel Surveys

#### Burma Road:

The direct expansion creel survey at the Burma Road access site was conducted from 11 July to 7 September.

Effort. The number of anglers exiting the fishery in the Little Susitna River at Burma Road during a surveyed period ranged from 0 to 190 (Appendix Table 1). The busiest parts of the day with respect to the number of anglers departing the fishery were periods C (1400 to 1759 hours) and D (1800 to 2200 hours). Estimated angler-effort during the survey was 38,805 angler-hours, 16,540 angler-hours (43%) during the weekend/holiday component and 22,265 angler-hours (57%) during the weekday component (Table 3).

Rates of Harvest and Catch. Daily harvest rates of coho salmon for anglers exiting the fishery at Burma Road ranged from 0.000 to 0.521 fish per hour (Appendix Table 2). The weekday component from 3 August to 7 August had the highest coho salmon harvest rate, 0.367 fish per hour (Table 4). Catch rates of coho salmon peaked from 3 August to 7 August, also (Figure 2).

Harvest and Catch. The estimated harvest of coho salmon by anglers exiting the fishery at Burma Road was 8,588 fish; 2,695 coho salmon (31%) were harvested during the weekend/holiday component and 5,893 coho salmon (69%) were harvested during the weekday component (Table 5). Anglers exiting the sport fishery in the Little Susitna River at Burma Road released about 12% of the coho salmon they had caught.

#### Shore Anglers Near Burma Road:

The roving creel survey of the shore anglers near Burma Road was conducted from 11 July to 7 September.

Effort. Counts of shore anglers in the area near Burma Road ranged from 0 to 103 (Appendix Table 3). Estimated angler-effort during the survey was 18,715 angler-hours, 6,583 angler-hours (35%) during the weekend/holiday component and 12,132 angler-hours (65%) during the weekday component (Table 6). About 30% of the weekday effort occurred from 10 August to 14 August.

Rates of Harvest and Catch. Daily harvest rates of coho salmon for shore anglers ranged from 0.000 to 0.468 fish per hour (Appendix Table 4). The weekday component from 20 July to 24 July had the highest coho salmon harvest rate, 0.314 fish per hour (Table 7). Catch rates of coho salmon peaked during the same period (Figure 2).

Harvest and Catch. The estimated harvest of coho salmon by shore anglers fishing near the Burma Road access site was 2,500 fish; 685 coho salmon (27%) were harvested during the weekend/holiday component and 1,815 coho salmon (73%) were harvested during the weekday component (Table 8). Shore anglers released only 9% of the coho salmon they had caught.

#### Miller's Landing:

The direct expansion creel survey at access site at Miller's Landing was conducted from 8 August to 7 September.

Table 3. Estimated effort by anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Component <sup>1</sup>	Effort in angler-hours	Standard Error	Relative Precision <sup>2</sup>
WE 7/11-7/12	514.7	84.4	32.1%
WD 7/13-7/17	430.0	124.0	56.5%
WE 7/18-7/19	1,135.7	166.9	28.8%
WD 7/20-7/24	2,898.9	257.5	17.4%
WE 7/25-7/26	4,102.8	479.3	22.9%
WD 7/27-7/31	4,673.8	742.0	31.1%
WE 8/01-8/02	1,962.7	334.5	33.4%
WD 8/03-8/07	4,546.1	420.6	18.1%
WE 8/08-8/09	3,580.7	318.3	17.4%
WD 8/10-8/14	5,360.6	443.5	16.2%
WE 8/15-8/16	3,428.6	192.1	11.0%
WD 8/17-8/21	2,917.2	389.4	26.2%
WE 8/22-8/23	1,506.1	20.2	2.6%
WD 8/24-8/28	1,046.7	277.9	52.0%
WE 8/29-8/30	269.9	44.0	32.0%
WD 8/31-9/04	392.0	46.4	23.2%
WE 9/05-9/07	39.0	28.6	143.7%
WE Total	16,540.2	719.7	8.5%
WD Total	22,265.3	1,112.1	9.8%
GRAND TOTAL	38,805.5	1,324.7	6.7%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Table 4. Estimated rates of harvest and catch (fish per hour) of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Component <sup>1</sup>	Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE 7/11-7/12	95	0.0181	0.00916	0.0207	0.00970
WD 7/13-7/17	44	0.0724	0.01517	0.0724	0.01518
WE 7/18-7/19	184	0.0704	0.00866	0.0939	0.01580
WD 7/20-7/24	273	0.3519	0.07739	0.4117	0.09446
WE 7/25-7/26	576	0.2253	0.00949	0.2574	0.01232
WD 7/27-7/31	457	0.1983	0.02687	0.2211	0.02639
WE 8/01-8/02	335	0.1379	0.01071	0.1787	0.01324
WD 8/03-8/07	458	0.3671	0.01962	0.4350	0.02577
WE 8/08-8/09	566	0.2525	0.01073	0.2875	0.01330
WD 8/10-8/14	483	0.2923	0.01837	0.3146	0.02287
WE 8/15-8/16	545	0.0883	0.00804	0.0922	0.00906
WD 8/17-8/21	324	0.1729	0.01478	0.1790	0.01693
WE 8/22-8/23	238	0.1098	0.01185	0.1328	0.01534
WD 8/24-8/28	121	0.1104	0.01567	0.1359	0.01905
WE 8/29-8/30	67	0.0543	0.01717	0.0543	0.01717
WD 8/31-9/04	25	0.1567	0.06422	0.2581	0.07355
WE 9/05-9/07	6	0.3333	0.06415	0.3333	0.06415

<sup>1</sup> WD - weekday; WE - weekend/holiday.

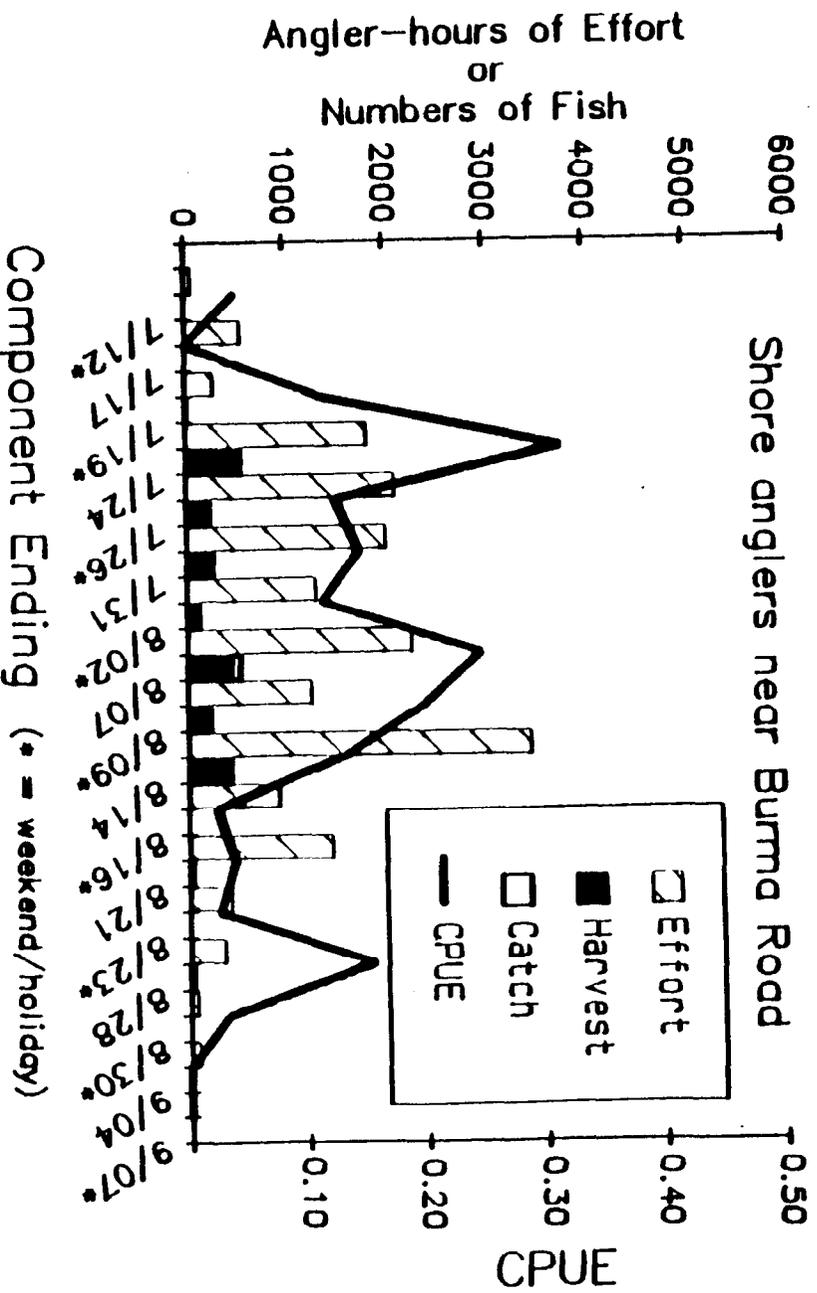
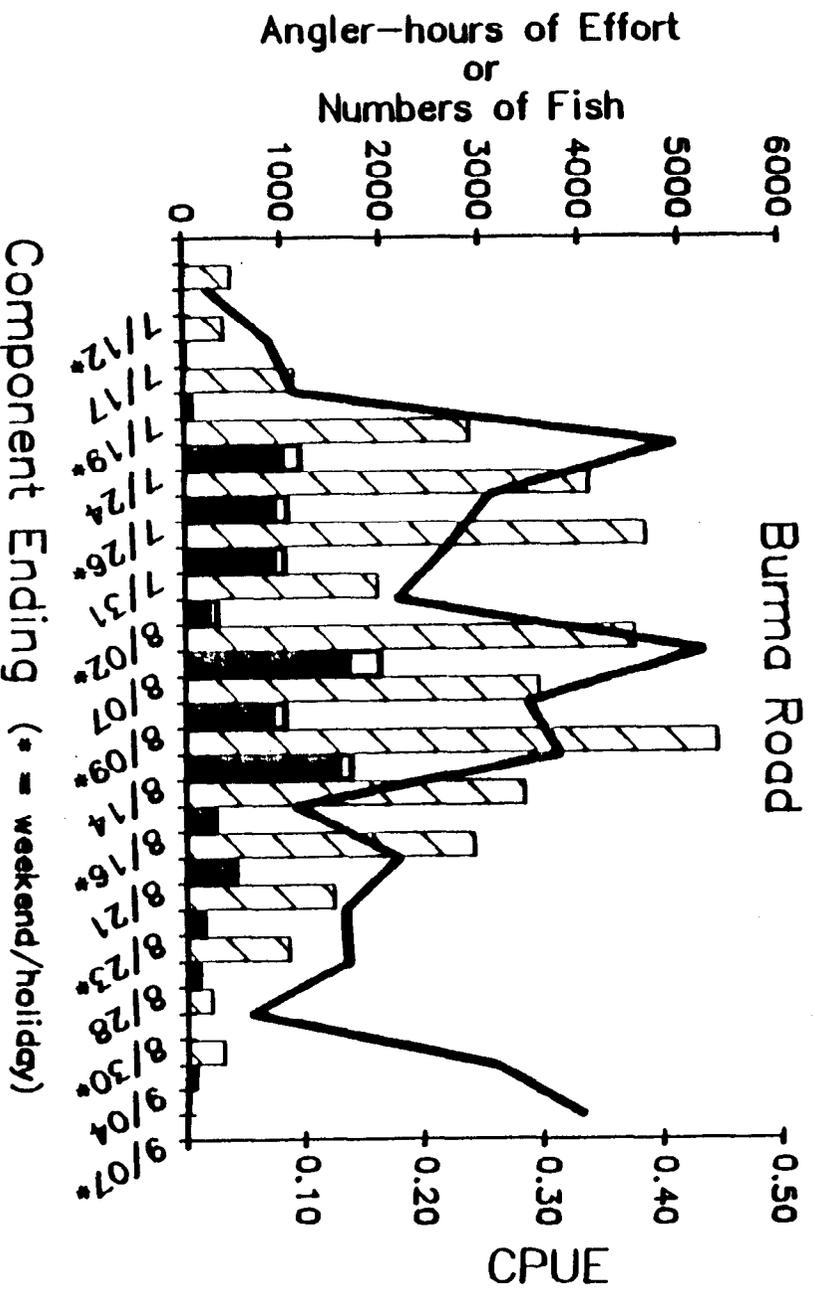


Figure 2. Angler-effort, coho salmon harvest and catch, and catch per unit effort (CPUE) of coho salmon for the temporal components of the creel survey of anglers exiting the sport fishery in the Little Susitna River at Burma Road and for shore anglers fishing near Burma Road, 1987.

Table 5. Estimated harvest and catch of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Component <sup>1</sup>	Harvest	Standard Error	Rel. Pre. <sup>2</sup>	Catch	Standard Error	Rel. Pre. <sup>2</sup>
WE 7/11-7/12	9	1.5	32.7%	10	0.9	17.6%
WD 7/13-7/17	31	11.2	70.8%	31	11.2	70.8%
WE 7/18-7/19	80	13.9	34.1%	106	15.0	27.7%
WD 7/20-7/24	1,019	179.9	34.6%	1,193	205.4	33.7%
WE 7/25-7/26	936	121.1	25.4%	1,064	124.3	22.9%
WD 7/27-7/31	927	143.6	30.4%	1,032	161.9	30.7%
WE 8/01-8/02	271	87.4	63.2%	351	111.6	62.3%
WD 8/03-8/07	1,668	189.9	22.3%	1,978	198.9	19.7%
WE 8/08-8/09	904	60.6	13.1%	1,029	63.7	12.1%
WD 8/10-8/14	1,567	172.3	21.6%	1,687	187.5	21.8%
WE 8/15-8/16	303	28.2	18.2%	316	32.3	20.0%
WD 8/17-8/21	505	81.3	31.6%	522	90.0	33.8%
WE 8/22-8/23	165	22.6	26.8%	200	14.1	13.8%
WD 8/24-8/28	115	28.8	49.1%	143	35.2	48.2%
WE 8/29-8/30	14	4.3	60.2%	14	4.3	60.2%
WD 8/31-9/04	61	32.1	103.1%	101	39.2	76.1%
WE 9/05-9/07	13	9.5	143.2%	13	9.5	143.2%
WE Total	2,695	166.1	12.1%	3,103	183.1	11.6%
WD Total	5,893	356.8	11.9%	6,687	392.6	11.5%
GRAND TOTAL	8,588	393.6	9.0%	9,790	433.2	8.7%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Table 6. Estimated effort by shore anglers near the Burma Road access site for the sport fishery in the Little Susitna River, 1987.

Component <sup>1</sup>	Effort in angler-hours	Standard Error	Relative Precision <sup>2</sup>
WE 7/11-7/12	88.0	29.4	65.5%
WD 7/13-7/17	580.0	125.5	42.4%
WE 7/18-7/19	306.3	89.4	57.2%
WD 7/20-7/24	1,840.0	517.7	55.1%
WE 7/25-7/26	2,116.0	280.7	26.0%
WD 7/27-7/31	2,020.0	380.4	36.9%
WE 8/01-8/02	1,322.7	397.9	59.0%
WD 8/03-8/07	2,273.3	240.1	20.7%
WE 8/08-8/09	1,272.0	51.5	7.9%
WD 8/10-8/14	3,470.0	196.8	11.1%
WE 8/15-8/16	936.0	62.7	13.1%
WD 8/17-8/21	1,466.7	177.4	23.7%
WE 8/22-8/23	444.0	55.6	24.5%
WD 8/24-8/28	373.3	123.6	64.9%
WE 8/29-8/30	92.0	23.7	50.5%
WD 8/31-9/04	108.3	57.3	103.7%
WE 9/05-9/07	6.5	6.5	196.1%
WE Total	6,583.5	506.2	15.1%
WD Total	12,131.6	758.2	12.2%
GRAND TOTAL	18,715.1	911.7	9.5%

<sup>1</sup> WD - weekday; WE - weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Table 7. Estimated rates of harvest and catch (fish per hour) of coho salmon by shore anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Component <sup>1</sup>	Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE 7/11-7/12	36	0.0356	0.01620	0.0427	0.02318
WD 7/13-7/17	19	0.0000	0.00000	0.0000	0.00000
WE 7/18-7/19	52	0.0624	0.01938	0.1123	0.08256
WD 7/20-7/24	66	0.3137	0.07099	0.3137	0.07099
WE 7/25-7/26	119	0.1116	0.01783	0.1251	0.01907
WD 7/27-7/31	112	0.1172	0.03923	0.1453	0.03462
WE 8/01-8/02	63	0.1138	0.02542	0.1138	0.02542
WD 8/03-8/07	134	0.2091	0.03691	0.2463	0.04931
WE 8/08-8/09	101	0.1877	0.02855	0.1988	0.02985
WD 8/10-8/14	130	0.1259	0.02496	0.1311	0.02482
WE 8/15-8/16	210	0.0240	0.00920	0.0240	0.00920
WD 8/17-8/21	111	0.0398	0.01358	0.0398	0.01358
WE 8/22-8/23	73	0.0260	0.01153	0.0260	0.01153
WD 8/24-8/28	38	0.0838	0.03389	0.1557	0.06885
WE 8/29-8/30	30	0.0323	0.02683	0.0323	0.02683
WD 8/31-9/04	5	0.0000	0.00000	0.0000	0.00000
WE 9/05-9/07	0	0.0000	0.00000	0.0000	0.00000

<sup>1</sup> WD = weekday; WE = weekend/holiday.

Table 8. Estimated harvest and catch of coho salmon by shore anglers fishing near the Burma Road access site in the Little Susitna River, 1987.

Component <sup>1</sup>	Harvest	Standard Error	Rel. Pre. <sup>2</sup>	Catch	Standard Error	Rel. Pre. <sup>2</sup>
WE 7/11-7/12	3	1.7	111.3%	4	2.3	112.5%
WD 7/13-7/17	0	0.0		0	0.0	
WE 7/18-7/19	19	8.0	82.1%	34	26.2	151.0%
WD 7/20-7/24	577	205.1	69.7%	577	205.1	69.7%
WE 7/25-7/26	236	48.8	40.5%	265	53.2	39.4%
WD 7/27-7/31	237	89.7	74.2%	294	88.2	58.8%
WE 8/01-8/02	151	55.5	72.0%	151	55.5	72.0%
WD 8/03-8/07	475	97.4	40.2%	560	126.2	44.2%
WE 8/08-8/09	239	37.6	30.8%	253	39.3	30.4%
WD 8/10-8/14	437	90.0	40.3%	455	89.8	38.7%
WE 8/15-8/16	22	8.7	77.7%	22	8.7	77.7%
WD 8/17-8/21	58	21.0	70.9%	58	21.0	70.9%
WE 8/22-8/23	12	5.3	86.3%	12	5.3	86.3%
WD 8/24-8/28	31	15.8	99.9%	58	31.0	104.6%
WE 8/29-8/30	3	2.5	163.5%	3	2.5	163.5%
WD 8/31-9/04	0	0.0		0	0.0	
WE 9/05-9/07	0	0.0		0	0.0	
WE Total	685	83.9	24.0%	744	90.9	23.9%
WD Total	1,815	261.5	28.2%	2,002	274.3	26.9%
GRAND TOTAL	2,500	274.7	21.5%	2,746	289.0	20.6%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Effort. The number of anglers exiting the fishery in the Little Susitna River at Miller's Landing during a surveyed period ranged from 0 to 75 (Appendix Table 5). Most anglers exited the fishery through Miller's Landing during period B. Estimated angler-effort during the survey was 6,373 angler-hours, 3,868 angler-hours (61%) during the weekend/holiday component and 2,505 angler-hours (39%) during the weekday component (Table 9).

Rates of Harvest and Catch. Daily harvest rates of coho salmon for anglers exiting the fishery at Miller's Landing ranged from 0.000 to 0.535 fish per hour (Appendix Table 6). The weekday component from 31 August to 4 September had the highest coho salmon harvest rate, 0.369 fish per hour (Table 10). Catch rates of coho salmon peaked during the same period (Figure 3).

Harvest and Catch. The estimated harvest of coho salmon by anglers exiting the fishery at Miller's Landing was 1,008 fish; 537 coho salmon (53%) were harvested during the weekend/holiday component and 471 coho salmon (47%) were harvested during the weekday component (Table 11). Anglers exiting the sport fishery in the Little Susitna River at Miller's Landing had released about 40% of the coho salmon they had caught.

#### Ship Creek:

The direct expansion creel survey at the Ship Creek access site was conducted from 11 July to 23 August.

Effort. The number of anglers exiting the fishery in the Little Susitna River at Ship Creek during a surveyed period ranged from 0 to 58 (Appendix Table 7). Estimated angler-effort during the survey was 4,986 angler-hours, 2,366 angler-hours (47%) during the weekend/holiday component and 2,620 angler-hours (53%) during the weekday component (Table 12).

Rates of Harvest and Catch. Daily harvest rates of coho salmon for anglers exiting the fishery at Ship Creek ranged from 0.000 to 0.600 fish per hour (Appendix Table 8). The weekday component from 10 August to 14 August had the highest coho salmon harvest rate, 0.600 fish per hour (Table 13). Catch rates of coho salmon peaked from 20 July to 24 July (Figure 3).

Harvest and Catch. The estimated harvest of coho salmon by anglers exiting the fishery at Ship Creek was 1,106 fish; 445 coho salmon (40%) were harvested during the weekend/holiday component and 661 coho salmon (60%) were harvested during the weekday component (Table 14). Anglers exiting the sport fishery in the Little Susitna River at Miller's Landing had released about 14% of the coho salmon they had caught.

#### Summary:

When the estimates from all creel surveys are totaled, there were an estimated 68,881 angler-hours of effort by the sport fishery in the Little Susitna River during the creel survey period; 13,202 coho salmon were harvested and 15,340 coho salmon were caught (Table 15). Anglers exiting the fishery through the Burma Road access site were responsible for the majority

Table 9. Estimated effort by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1987.

Component <sup>1</sup>	Effort in angler-hours	Standard Error	Relative Precision <sup>2</sup>
WE 8/08-8/09	1,082.3	609.4	110.4%
WD 8/10-8/14	986.7	203.8	40.5%
WE 8/15-8/16	1,006.9	301.4	58.7%
WD 8/17-8/21	1,047.7	303.8	56.8%
WE 8/22-8/23	1,501.7	261.3	34.1%
WD 8/24-8/28	365.7	192.7	103.3%
WE 8/29-8/30	196.6	72.0	71.8%
WD 8/31-9/04	105.2	80.9	150.7%
WE 9/05-9/07	80.4	47.8	116.5%
WE Total	3,867.9	733.5	37.2%
WD Total	2,505.3	421.3	33.0%
GRAND TOTAL	6,373.2	845.9	26.0%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Table 10. Estimated rates of harvest and catch (fish per hour) of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1987.

Component <sup>1</sup>	Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE 8/08-8/09	83	0.0950	0.01564	0.1331	0.04407
WD 8/10-8/14	55	0.2819	0.08734	0.3822	0.12310
WE 8/15-8/16	81	0.2633	0.02920	0.3473	0.04445
WD 8/17-8/21	39	0.1236	0.02215	0.1636	0.03239
WE 8/22-8/23	110	0.0791	0.01421	0.0898	0.01685
WD 8/24-8/28	21	0.0625	0.07947	0.1042	0.12790
WE 8/29-8/30	11	0.1977	0.04044	0.3605	0.07567
WD 8/31-9/04	6	0.3692	0.02178	2.0308	0.12804
WE 9/05-9/07	10	0.1395	0.09740	0.3721	0.09143

<sup>1</sup> WD - weekday; WE - weekend/holiday.

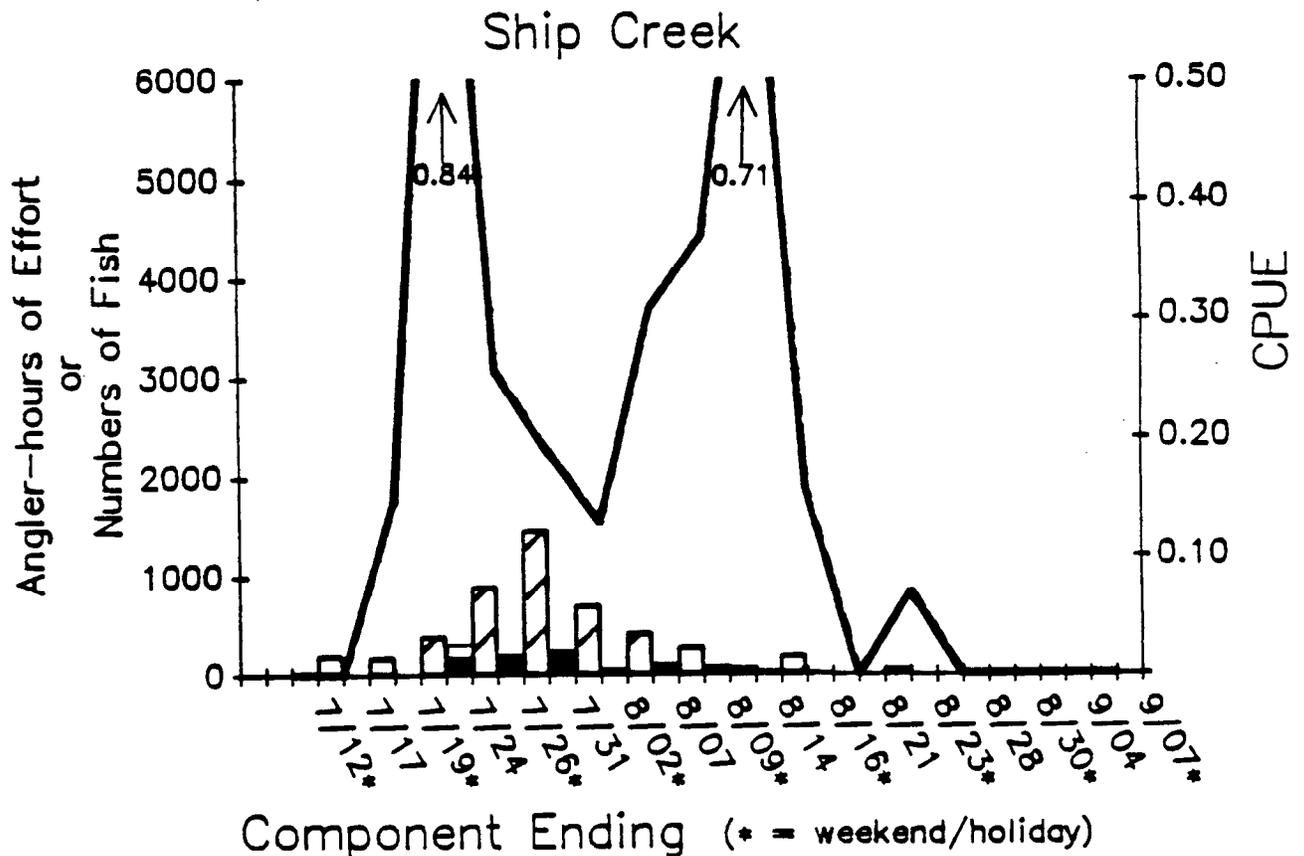
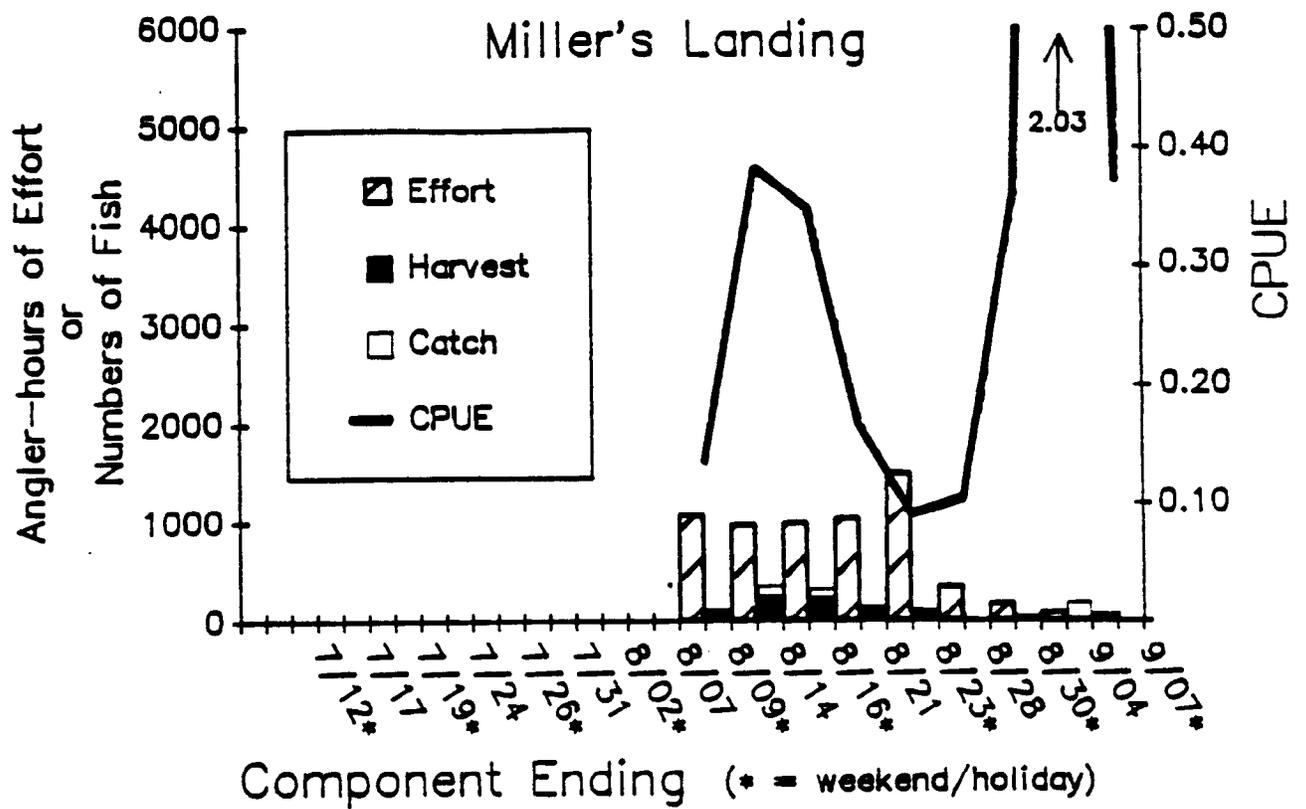


Figure 3. Angler-effort, coho salmon harvest and catch, and catch per unit effort (CPUE) of coho salmon for the temporal components of the creel survey of anglers exiting the sport fishery in the Little Susitna River at Miller's Landing and at Ship Creek, 1987.

Table 11. Estimated harvest and catch of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1987.

Component <sup>1</sup>	Harvest	Standard Error	Rel. Pre. <sup>2</sup>	Catch	Standard Error	Rel. Pre. <sup>2</sup>
WE 8/08-8/09	103	73.7	140.2%	144	84.0	114.3%
WD 8/10-8/14	278	69.1	48.7%	377	93.2	48.5%
WE 8/15-8/16	265	84.2	62.3%	350	121.8	68.2%
WD 8/17-8/21	130	19.9	30.0%	171	19.6	22.5%
WE 8/22-8/23	119	20.9	34.4%	135	27.5	39.9%
WD 8/24-8/28	23	10.9	92.9%	38	19.9	102.6%
WE 8/29-8/30	39	22.3	112.1%	71	46.3	127.8%
WD 8/31-9/04	40	29.4	144.1%	207	166.8	157.9%
WE 9/05-9/07	11	7.6	135.4%	30	18.7	122.5%
WE Total	537	116.2	42.4%	730	158.6	42.6%
WD Total	471	78.5	32.7%	793	193.1	47.7%
GRAND TOTAL	1,008	140.2	27.3%	1,523	249.9	32.2%

<sup>1</sup> WD - weekday; WE - weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

Table 12. Estimated effort by anglers exiting the sport fishery in the Little Susitna River at the Ship Creek access site, 1987.

Component <sup>1</sup>	Effort in angler-hours	Standard Error	Relative Precision <sup>2</sup>
WE 7/11-7/12	0.0	0.0 <sup>3</sup>	
WD 7/13-7/17	210.0	132.8	123.9%
WE 7/18-7/19	192.0	0.0 <sup>3</sup>	
WD 7/20-7/24	404.2	144.9	70.3%
WE 7/25-7/26	907.5	0.0 <sup>3</sup>	
WD 7/27-7/31	1,475.8	154.1	20.5%
WE 8/01-8/02	717.5	0.0 <sup>3</sup>	
WD 8/03-8/07	435.0	389.1	175.3%
WE 8/08-8/09	294.5	0.0 <sup>3</sup>	
WD 8/10-8/14	75.0	35.4	92.5%
WE 8/15-8/16	198.0	0.0 <sup>3</sup>	
WD 8/17-8/21	20.0	12.6	123.5%
WE 8/22-8/23	57.0	0.0 <sup>3</sup>	
<hr/>			
WE Total	2,366.5	0.0	
WD Total	2,620.0	463.9	34.7%
<hr/>			
GRAND TOTAL	4,986.5	463.9	18.2%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

<sup>3</sup> Standard error equals 0.0 because all hours possible were censused.

Table 13. Estimated rates of harvest and catch (fish per hour) of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Ship Creek access site, 1987.

Component <sup>1</sup>	Number of Interviews	Harvest Rate	Standard Error	Catch Rate	Standard Error
WE 7/11-7/12	0	0.0000		0.0000	
WD 7/13-7/17	10	0.0000	0.00000	0.0000	0.00000
WE 7/18-7/19	32	0.1458	0.02320	0.1458	0.02320
WD 7/20-7/24	48	0.5140	0.05761	0.8380	0.11783
WE 7/25-7/26	139	0.2303	0.01729	0.2545	0.02189
WD 7/27-7/31	84	0.1887	0.02230	0.1887	0.02230
WE 8/01-8/02	99	0.1121	0.01724	0.1294	0.02360
WD 8/03-8/07	18	0.3103	0.01597	0.3103	0.01597
WE 8/08-8/09	59	0.3463	0.03224	0.3701	0.03664
WD 8/10-8/14	9	0.6000	0.06708	0.7111	0.06344
WE 8/15-8/16	30	0.1515	0.02387	0.1566	0.02551
WD 8/17-8/21	4	0.0000	0.00000	0.0000	0.00000
WE 8/22-8/23	10	0.0702	0.02153	0.0702	0.02153

<sup>1</sup> WD - weekday; WE - weekend/holiday.

Table 14. Estimated harvest and catch of coho salmon by anglers exiting the sport fishery in the Little Susitna River at the Ship Creek access site, 1987.

Component <sup>1</sup>	Harvest	Standard Error	Rel. Pre. <sup>2</sup>	Catch	Standard Error	Rel. Pre. <sup>2</sup>
WE 7/11-7/12	0	0.0		0	0.0	
WD 7/13-7/17	0	0.0		0	0.0	
WE 7/18-7/19	28	0.0 <sup>3</sup>		28	0.03	
WD 7/20-7/24	208	71.6	67.5%	333	142.1	83.6%
WE 7/25-7/26	209	0.0 <sup>3</sup>		231	0.03	
WD 7/27-7/31	273	27.7	19.9%	273	27.7	19.9%
WE 8/01-8/02	72	0.0 <sup>3</sup>		83	0.03	
WD 8/03-8/07	135	120.7	175.2%	135	120.7	175.2%
WE 8/08-8/09	102	0.0 <sup>3</sup>		109	0.03	
WD 8/10-8/14	45	21.2	92.3%	54	24.3	88.2%
WE 8/15-8/16	30	0.0 <sup>3</sup>		31	0.03	
WD 8/17-8/21	0	0.0		0	0.0	
WE 8/22-8/23	4	0.0 <sup>3</sup>		4	0.03	
WE Total	445	0.0		486	0.0	
WD Total	661	144.6	42.9%	795	190.0	46.9%
GRAND TOTAL	1,106	144.6	25.6%	1,281	190.0	29.1%

<sup>1</sup> WD = weekday; WE = weekend/holiday.

<sup>2</sup> Relative precision of 95% confidence interval.

<sup>3</sup> Standard error equals 0.0 because all hours possible were censused.

Table 15. Summary of estimated angler-effort (angler-hours), coho salmon harvest, and coho salmon catch for the creel surveys of the sport fishery in the Little Susitna River, 1987.

Location	Effort	95% Confidence Interval	Harvest	95% Confidence Interval	Catch	95% Confidence Interval
Burma Road	38,806	36,209 - 41,402	8,588	7,816 - 9,359	9,790	8,941 - 10,639
Shore anglers near Burma Road	18,715	16,928 - 20,502	2,500	1,961 - 3,038	2,746	2,179 - 3,312
Miller's Landing	6,373	4,715 - 8,031	1,008	733 - 1,283	1,523	1,033 - 2,013
Ship Creek	4,987	4,077 - 5,896	1,106	822 - 1,389	1,281	908 - 1,653
<b>Total</b>	<b>68,881</b>	<b>65,205 - 72,557</b>	<b>13,202</b>	<b>12,181 - 14,222</b>	<b>15,340</b>	<b>14,148 - 16,532</b>

of the angler-effort (57%), coho salmon harvest (65%), and coho salmon catch (64%) (Figure 4). Shore anglers fishing near Burma Road but not exiting at the Burma Road site were the next largest component of the fishery. These shore anglers were responsible for 27% of the angler-effort, 19% of the coho salmon harvest, and 18% of the coho salmon catch. Anglers exiting the fishery at either the Miller's Landing or Ship Creek access sites were responsible for less than 10% of the effort and coho salmon catch. For the entire fishery, 15% of the coho salmon caught by anglers (2,286 fish) were released.

Angler-effort, coho salmon harvest, and coho salmon catch by unguided boat anglers, guided boat anglers, and shore anglers exiting at the Burma Road access site were estimated. Nearly all guided anglers participating in the sport fishery in the Little Susitna River use this site; only two guided anglers were interviewed during the creel survey at Miller's Landing and none were interviewed at Ship Creek. Guided boat anglers exiting the fishery at Burma Road were responsible for less than 2,000 angler-hours of effort (Table 16). This represents only 4% of the total effort at the Burma Road access site (Figure 5). Guided boat anglers were responsible for only 6% of the total harvest of coho salmon at Burma Road and only 7% of the total coho salmon catch. Guided boat anglers generally had higher catch rates of coho salmon than either unguided boat anglers or shore anglers (Figure 6).

#### Gear Type

Ninety-seven percent of the catch of anglers exiting the fishery at Ship Creek had been taken using bait (Figure 7). Anglers using bait also accounted for 87% of the total estimated effort by anglers exiting at Ship Creek. The percent of the total effort expended by bait anglers decreased to 68% at Burma Road and 31% at Miller's Landing. The percent of the catch taken by bait anglers also decreased upstream to 82% at Burma Road and 37% at Miller's Landing (Figure 7).

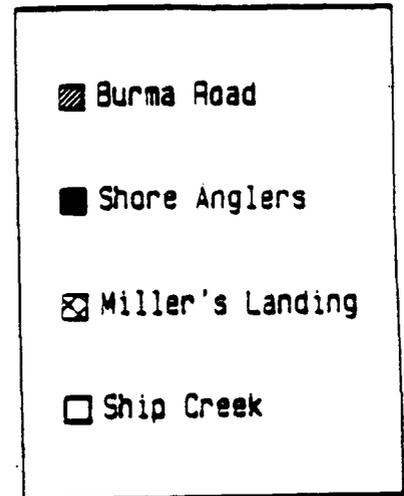
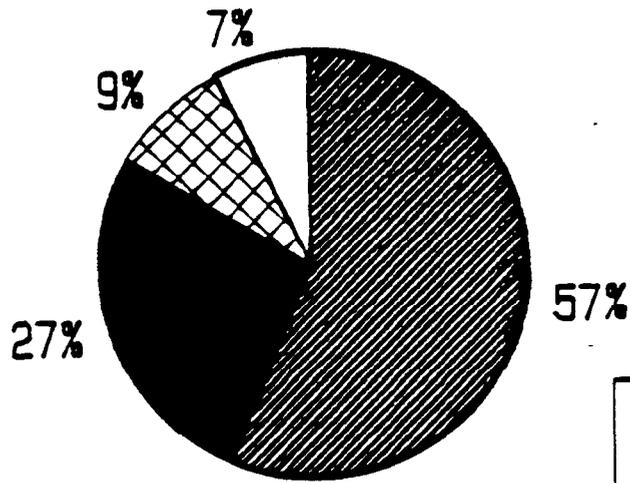
#### Escapement

Salmon were counted at the weir for only 11 days before the weir was washed out by flood waters. During this period, the counts by species were: 4,006 chum salmon; 1,300 sockeye salmon; 1,184 coho salmon; 112 chinook salmon; and 10 pink salmon (Appendix Table 9).

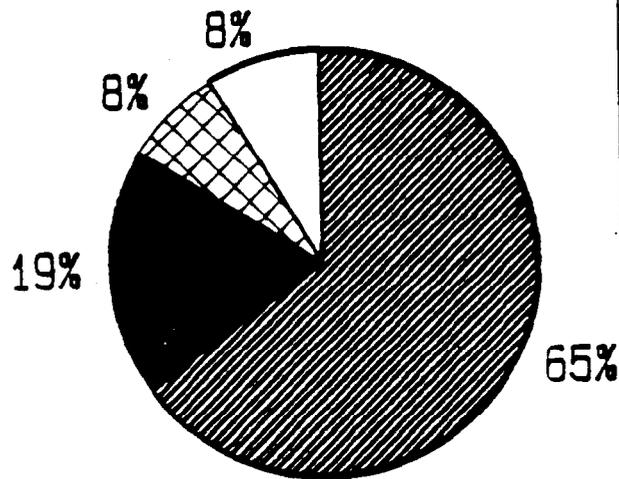
#### Escapement Surveys of Index Streams

A total of 4,865 coho salmon were counted in index spawning areas of the Little Susitna River (Appendix Table 10). This survey was conducted from a helicopter under ideal survey conditions with low, clear water and excellent visibility. An additional 4,000 hatchery-stocked coho salmon were estimated in the Lake Creek drainage (Figure 1) (Bob Chlupach personal communication). Counts of coho salmon in other index areas ranged from 10 to 667 fish (Appendix Table 10).

# Effort



# Harvest



# Catch

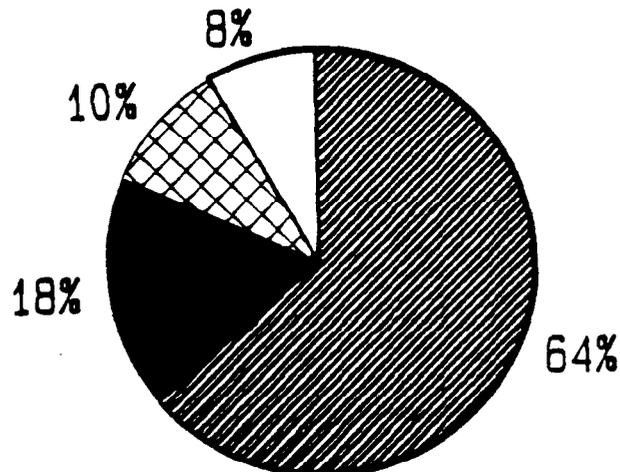
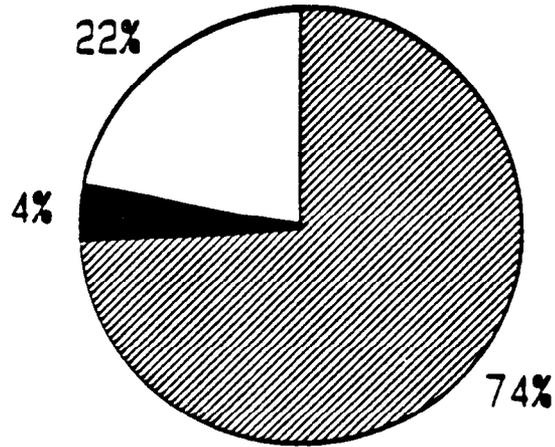


Figure 4. Percent of angler-effort, coho salmon harvest, and coho salmon catch by anglers exiting the sport fishery in the Little Susitna River at Burma Road, Miller's Landing, and Ship Creek and by shore anglers fishing near Burma Road, 1987.

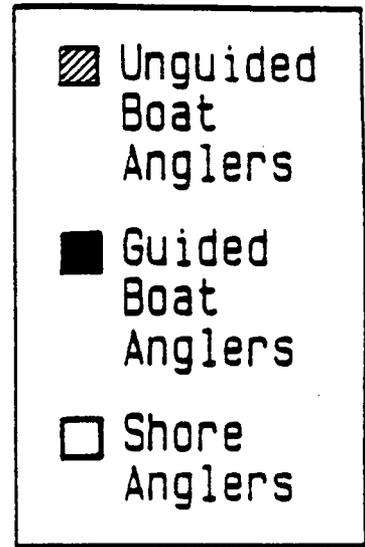
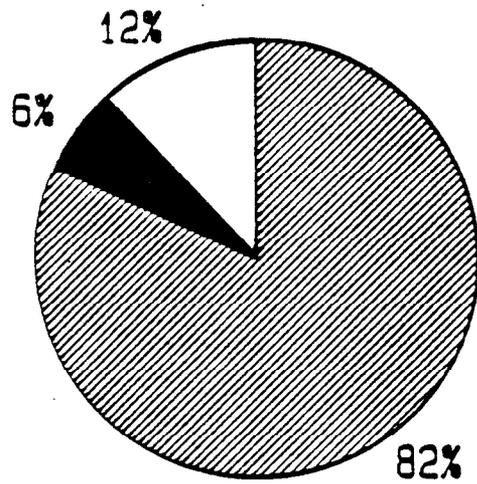
Table 16. Estimated effort (angler-hours), coho salmon harvest, and coho salmon catch by unguided boat anglers, guided boat, and shore anglers exiting the sport fishery in the Little Susitna River at Burma Road.

Group	Standard		Standard		Standard	
	Effort	Error	Harvest	Error	Catch	Error
Unguided boat anglers	28,840	1,138.0	7,040	323.7	7,992	322.8
Guided boat anglers	1,547	553.3	527	206.9	659	272.5
Shore anglers	8,419	392.0	1,021	85.7	1,139	96.1
<b>Total</b>	<b>38,806</b>	<b>1,324.7</b>	<b>8,588</b>	<b>393.6</b>	<b>9,790</b>	<b>433.2</b>

Effort



Harvest



Catch

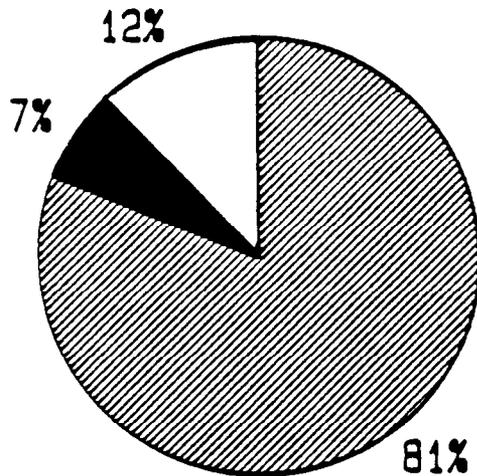


Figure 5. Percent of angler-effort, coho salmon harvest, and coho salmon catch by unguided boat anglers, guided boat anglers, and shore anglers exiting the sport fishery in the Little Susitna River at Burma Road, 1987.

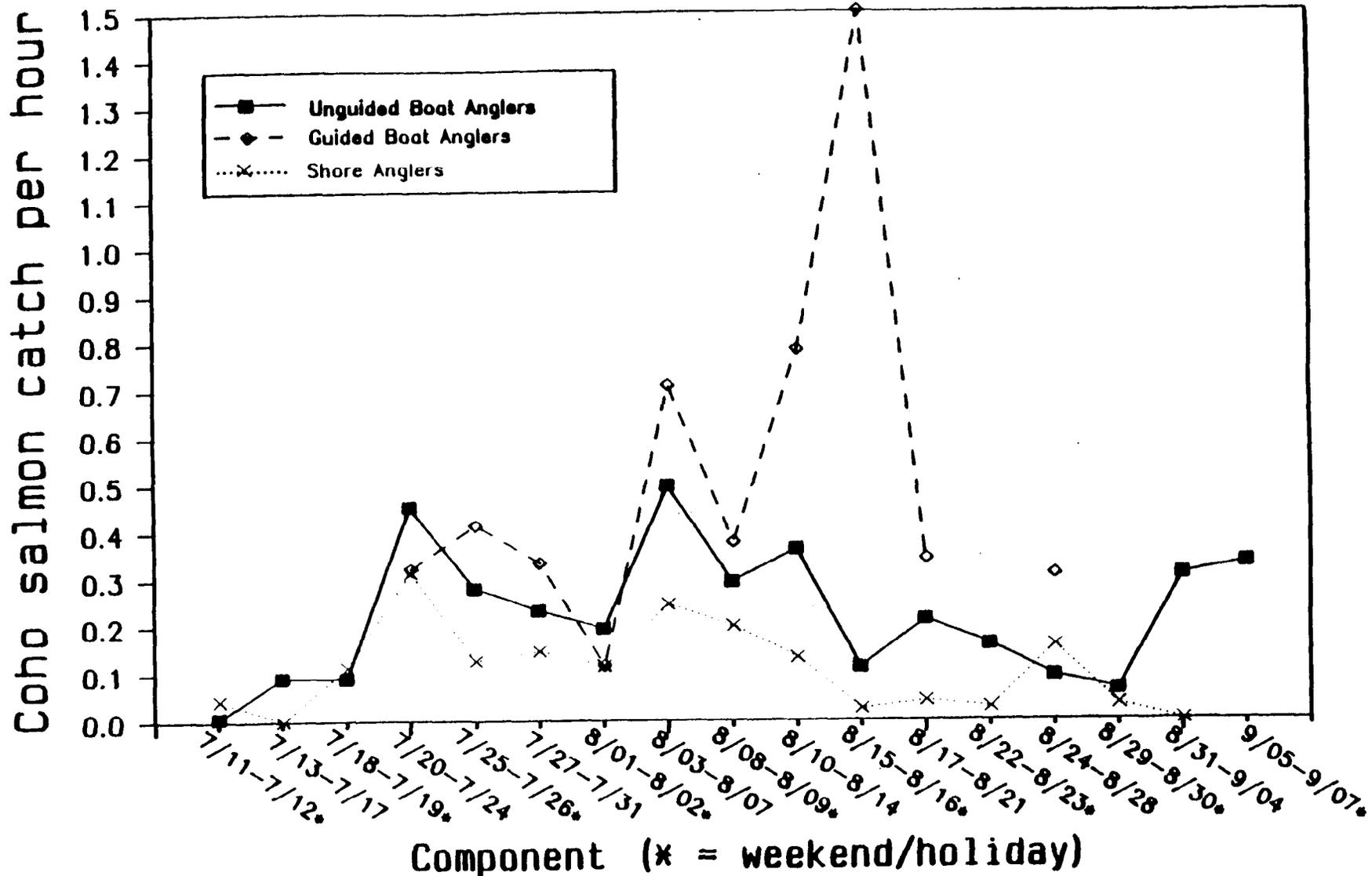


Figure 6. Comparison of catch per hour of coho salmon by unguided boat anglers, guided boat anglers, and shore anglers exiting the sport fishery in the Little Susitna River at Burma Road during each of the weekday and weekend/holiday components, 1987.

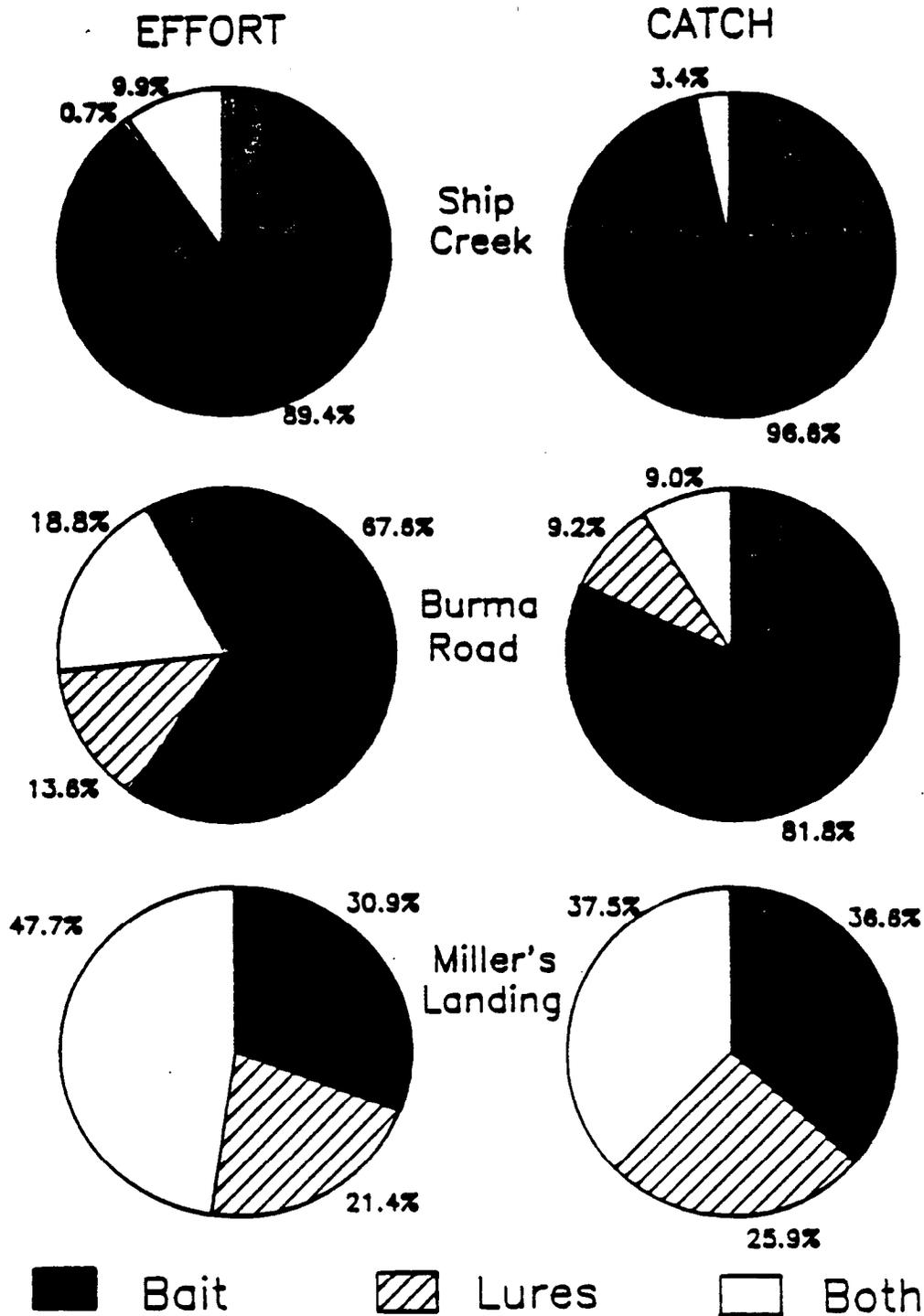


Figure 7. Percent of total estimated effort and catch by anglers using bait, lures, and both bait and lures at Ship Creek, Burma Road, and Miller's Landing. This figure includes effort and catch estimates for only the direct expansion creel surveys. Not included are the estimated effort and catch by the few anglers missed during the direct expansion creel survey at Burma Road, or the effort and catch estimates from the roving creel survey at Burma Road.

### Age, Sex, and Length Compositions

A total of 397 coho salmon were sampled from the sport harvest, identified to sex, and their scales aged. Males and females were about equally represented, 53.4% and 46.6% of the sample, respectively (Table 17). Age 2.1 coho salmon were the most abundant age group as they comprised 88.4% of the sample. Age groups 1.1 and 3.1 comprised the remainder of the sample.

As a result of the weir washing out, the escapement was not sampled, therefore the age and sex composition of the escapement could not be estimated.

Mean lengths at age of male and female coho salmon sampled from the sport harvest were similar (Table 18). No significant differences ( $P > 0.10$ ) were found when the mean lengths of males and females in each age group were compared with a t-test.

### Hatchery Enhancement

A total of 3,790 coho salmon were examined for a clipped adipose fin. Sixty-one heads were recovered from 63 coho salmon observed with a clipped adipose fin. Forty-nine of the fish had coded-wire tags which were decoded and 12 fish with a clipped adipose fin had no tag. The chi-square test of the tag recovery rates (number of fish with adipose finclips observed) at the three survey locations (Burma Road, Miller's Landing, and Ship Creek) was not significant ( $P > 0.25$ ), therefore, the data from the locations were pooled for the estimates. Two unique tag codes were present in the 49 fish with coded-wire tags; 47 were from a smolt plant in the Little Susitna River in 1986 and 2 were from a smolt release at Eklutna hatchery near Anchorage in 1986. The data necessary for estimating the contribution of each of these releases to the sport harvest in the Little Susitna River are summarized in Appendix Table 11.

The estimated contribution of hatchery-produced coho salmon to the sport harvest in the Little Susitna River was 3,460 fish (standard error = 509.7). This represents 26.2% of the total harvest of coho salmon. The smolt release in the Little Susitna River in 1986 contributed 3,453 fish (standard error = 509.7). Straying coho salmon from the smolt release at Eklutna hatchery in 1986 contributed only 7 fish (standard error = 4.3). No coho salmon with coded-wire tags from the fingerling release in 1983 were recovered from the sport fishery. These fish were present in the return (see DISCUSSION), but were not found in the harvest. This was probably due to a combination of low abundance and the low marking rate of the initial release (Appendix Table 11).

## DISCUSSION

### Effort and Harvest

Estimated angler-effort and coho salmon harvest were the second largest since 1981 (Figure 8). There was a large increase in both effort and

Table 17. Sex and age composition of coho salmon sampled from the sport fishery in the Little Susitna River, 1987.

	Age Group			Total
	1.1	2.1	3.1	
<b>Females:</b>				
Number in Sample	12	159	14	185
Percentage	3.0	40.1	3.5	46.6
Standard Error <sup>1</sup>	0.86	2.46	0.93	2.51
<b>Males:</b>				
Number in Sample	7	192	13	212
Percentage	1.8	48.3	3.3	53.4
Standard Error <sup>1</sup>	0.66	2.51	0.89	2.51
<b>Sexes Combined:</b>				
Number in Sample	19	351	27	397
Percentage	4.8	88.4	6.8	100.0
Standard Error <sup>1</sup>	1.07	1.61	1.27	

<sup>1</sup> Standard error of proportional estimate X 100.

Table 18. Mean length (in cm) by sex and age group of coho salmon sampled from the sport fishery in the Little Susitna River, 1987.

	Age Group		
	1.1	2.1	3.1
<b>Females:</b>			
Mean	53.0	57.0	58.0
Standard Error	12.8	2.9	8.7
Sample Size	12	136	13
Minimum	46.0	46.0	53.0
Maximum	58.0	65.0	63.0
<b>Males:</b>			
Mean	54.0	57.5	58.5
Standard Error	21.3	3.7	14.1
Sample Size	7	165	11
Minimum	46.0	40.0	48.0
Maximum	61.0	67.0	64.0

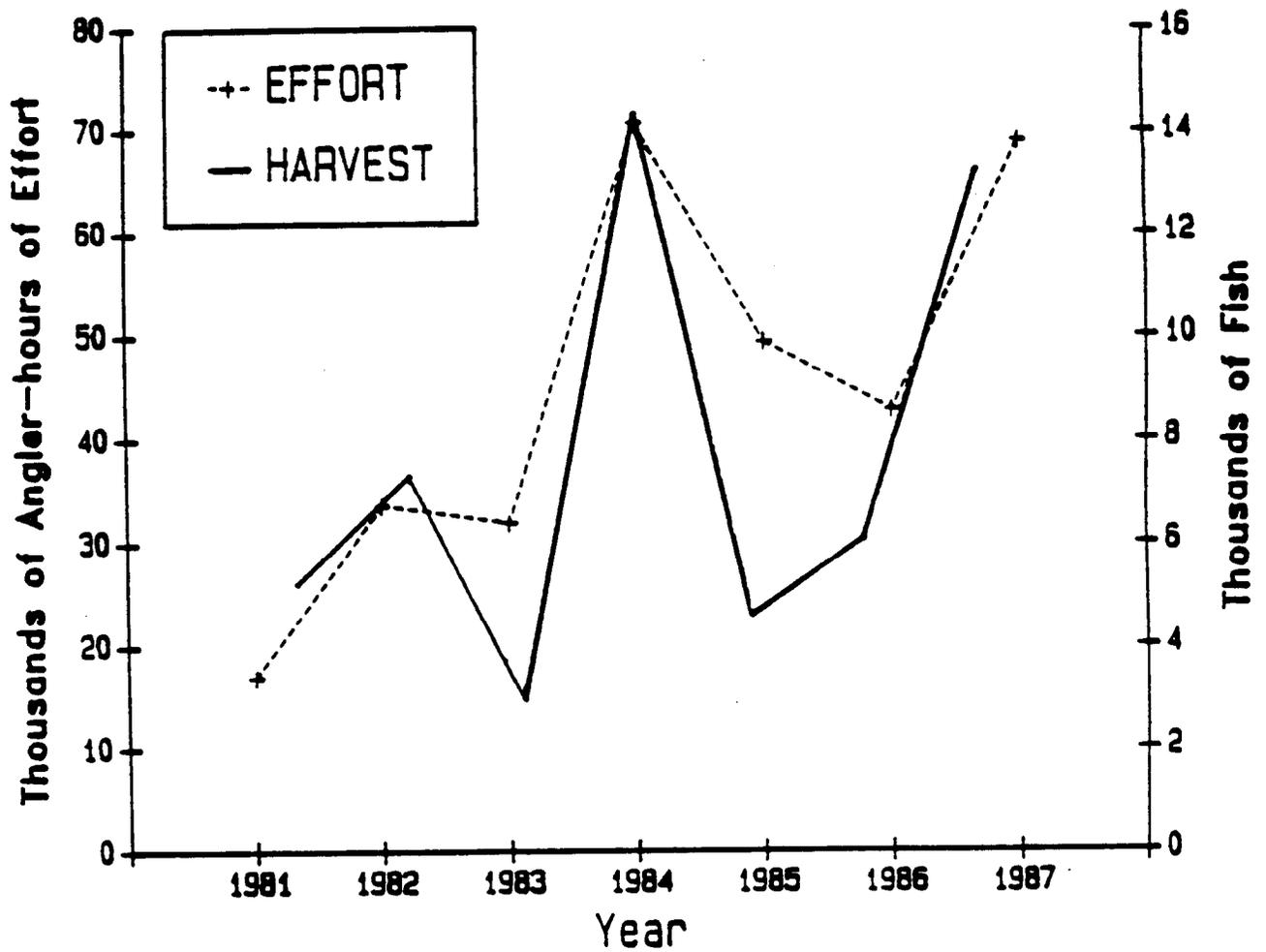


Figure 8. Estimated effort in angler-hours and harvest of coho salmon for the sport fishery in the Little Susitna River, 1981-1987 (from Bentz 1986, 1987).

harvest from 1986 but the fishery in 1986 was closed by emergency order before the peak of the coho salmon migration because of a small return.

#### Hatchery Enhancement

We feel the estimated contribution of hatchery-produced coho salmon to the sport harvest (26.2% of the total harvest) in the Little Susitna River is a minimal estimate for the following reasons. The proportions of the release groups in the Little Susitna River group that were coded-wire tagged that were used for the estimates are probably too high as there was obviously some tag loss. Twelve fish with adipose finclips but no coded-wire tags were recovered during creel surveys (or 19.7% of the heads recovered). There is additional evidence of this tag loss from spawning coho salmon examined from the escapement to the Nancy Lake tributary of the Little Susitna River. A total of 1,920 coho salmon were examined at this location from which 54 heads of fish with adipose finclips were recovered. Of these 54 heads, 41 had tags decoded as the smolt release in 1986, six were from the fingerling release in 1983, and seven (13.0% of the heads recovered) had no coded-wire tag (Bob Chlupach personal communication). This tag loss lowers the actual proportion of each release group marked. If the lower proportion marked was used the estimated contribution to the sport fishery would increase. Unfortunately, we cannot estimate the true proportion of each release group marked at time of return because we cannot allocate adipose finclipped fish with no CWTs to their release groups.

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APPENDIX TABLES

Appendix Table 1. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, C, and D, 1987.

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period A (0600-0959 hours)</u>						
7/11	3.0	0	0.0	0	0	0
7/12	3.0	16	80.0	0	0	0
7/14	3.0	0	0.0	0	0	0
7/15	3.0	0	0.0	0	0	0
7/18	3.0	0	0.0	0	0	0
7/19	3.0	4	4.5	0	0	0
7/20	3.0	5	17.0	1	1	0
7/23	3.0	9	35.0	21	21	0
7/24	3.0	10	26.5	28	32	0
7/25	3.0	12	41.0	27	27	0
7/26	3.0	9	44.0	16	16	0
7/27	3.0	7	23.3	2	2	0
7/30	3.0	32	92.0	19	36	0
7/31	3.0	0	0.0	0	0	0
8/01	3.0	25	112.0	19	19	0
8/02	3.0	11	30.0	2	2	0
8/03	3.0	3	4.0	4	4	0
8/04	3.0	0	0.0	0	0	0
8/07	3.0	0	0.0	0	0	0
8/08	3.0	16	40.5	0	0	0
8/09	3.0	6	18.0	3	3	0
8/10	3.0	2	2.0	1	1	0
8/11	3.0	2	2.0	0	0	0
8/14	3.0	0	0.0	0	0	0
8/15	3.0	4	16.5	0	0	0
8/16	3.0	3	11.0	0	0	0
8/18	3.0	2	2.0	2	2	0
8/19	3.0	3	7.5	1	1	0
8/21	3.0	1	2.0	0	0	0
8/22	3.0	2	5.0	0	0	0
8/23	3.0	0	0.0	0	0	0
8/24	3.0	8	13.0	0	0	0
8/27	3.0	2	6.0	0	0	0
8/28	3.0	0	0.0	0	0	0
8/29	3.0	2	7.0	0	0	0
8/30	3.0	0	0.0	0	0	0
<u>Period A (0800-1429 hours)</u>						
8/31	3.0	2	4.0	0	0	0
9/01	3.0	1	5.0	0	0	0
9/04	3.0	0	0.0	0	0	0
9/05	3.0	0	0.0	0	0	0
9/06	3.0	0	0.0	0	0	0
9/07	3.0	6	18.0	6	6	0

-continued-

Appendix Table 1. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, C, and D, 1987 (continued).

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period B (1000-1359 hours)</u>						
7/11	3.0	9	30.5	0	0	0
7/12	3.0	10	45.0	1	1	0
7/14	3.0	0	0.0	0	0	0
7/15	3.0	0	0.0	0	0	0
7/18	3.0	1	2.5	0	0	0
7/19	3.0	20	71.0	8	19	0
7/20	3.0	10	46.0	0	0	0
7/23	3.0	10	26.0	18	29	0
7/24	3.0	23	110.5	55	67	0
7/25	3.0	45	231.0	107	150	0
7/26	3.0	74	389.5	110	116	23
7/27	3.0	44	207.5	51	55	0
7/30	3.0	59	213.0	29	32	0
7/31	3.0	15	58.0	20	21	0
8/01	3.0	24	115.0	5	5	0
8/02	3.0	17	37.0	0	0	0
8/03	3.0	7	32.0	12	15	0
8/04	3.0	37	102.0	101	111	0
8/07	3.0	53	258.0	108	121	0
8/08	3.0	38	198.5	46	51	0
8/09	3.0	38	145.5	49	49	0
8/10	3.0	44	236.5	76	82	0
8/11	3.0	41	150.0	84	84	0
8/14	3.0	0	0.0	0	0	0
8/15	3.0	45	165.5	33	36	0
8/16	3.0	59	212.0	10	10	0
8/18	3.0	14	47.0	14	14	0
8/19	3.0	28	87.0	13	13	0
8/21	3.0	10	52.5	12	12	0
8/22	3.0	19	75.5	13	13	0
8/23	3.0	26	90.0	5	8	0
8/24	3.0	5	13.0	5	5	0
8/27	3.0	32	92.5	2	2	0
8/28	3.0	4	24.0	5	5	0
8/29	3.0	9	18.0	1	1	0
8/30	3.0	15	30.0	0	0	0
<u>Period B (1430-2100 hours)</u>						
8/31	3.0	6	25.5	0	1	0
9/01	3.0	8	32.0	12	12	0
9/04	3.0	8	42.0	5	15	0
9/05	3.0	0	0.0	0	0	0
9/06	3.0	0	0.0	0	0	0
9/07	3.0	6	18.0	6	6	0

-continued-

Appendix Table 1. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, C, and D, 1987 (continued).

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period C (1400-1759 hours)</u>						
7/11	3.0	7	12.0	0	0	0
7/12	3.0	29	102.0	0	0	0
7/14	3.0	11	37.0	0	0	0
7/15	3.0	0	0.0	0	0	0
7/17	3.0	18	58.0	5	5	0
7/18	3.0	35	157.0	10	18	0
7/19	3.0	53	254.8	27	27	0
7/20	3.0	21	128.5	10	10	0
7/23	3.0	31	156.0	88	89	0
7/24	3.0	58	237.5	106	117	0
7/25	3.0	61	308.5	52	64	0
7/26	3.0	176	936.5	217	234	0
7/27	3.0	31	163.0	31	37	0
7/30	3.0	65	320.5	68	72	0
7/31	3.0	53	265.5	77	82	0
8/01	3.0	32	131.0	3	3	0
8/02	3.0	94	543.8	122	141	0
8/03	3.0	49	246.8	72	105	0
8/04	3.0	54	275.3	105	119	0
8/07	3.0	80	377.5	104	110	0
8/08	3.0	67	322.5	102	115	0
8/09	3.0	120	488.5	139	182	0
8/10	3.0	76	449.8	121	130	0
8/11	3.0	76	382.5	125	155	0
8/14	3.0	79	415.0	109	110	0
8/15	3.0	57	253.5	43	49	0
8/16	3.0	116	443.5	10	10	0
8/18	3.0	40	189.0	25	25	0
8/19	3.0	33	103.5	20	20	0
8/21	3.0	52	244.5	58	65	0
8/22	3.0	35	173.0	4	4	0
8/23	3.0	36	178.5	23	24	0
8/24	3.0	30	149.0	14	18	0
8/27	3.0	11	43.0	6	12	0
8/28	3.0	8	9.5	0	0	0
8/29	3.0	9	24.5	0	0	0
8/30	3.0	17	57.5	6	6	0

-continued-

Appendix Table 1. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Burma Road access site during periods A, B, C, and D, 1987 (continued).

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period D (1800-2200 hours)</u>						
7/11	3.0	16	76.5	4	4	0
7/12	3.0	8	40.0	2	3	0
7/14	3.0	6	64.0	5	5	0
7/15	3.0	0	0.0	0	0	0
7/17	3.0	9	34.5	4	4	0
7/18	3.0	17	71.0	3	4	0
7/19	3.0	54	291.0	12	12	0
7/20	3.0	30	224.0	23	26	0
7/23	3.0	36	117.0	47	73	0
7/24	3.0	30	180.5	62	72	0
7/25	3.0	126	604.3	101	115	0
7/26	3.0	73	406.0	37	40	0
7/27	3.0	91	512.5	84	92	0
7/30	3.0	31	95.0	7	7	0
7/31	3.0	29	153.0	29	29	0
8/01	3.0	35	120.8	0	0	0
8/02	3.0	97	382.5	52	93	0
8/03	3.0	64	299.0	114	140	0
8/04	3.0	74	268.0	86	99	0
8/07	3.0	37	183.3	45	66	0
8/08	3.0	91	514.0	128	152	0
8/09	3.0	190	958.0	211	220	0
8/10	3.0	38	160.0	23	23	0
8/11	3.0	61	345.5	98	99	0
8/14	3.0	64	269.0	68	75	0
8/15	3.0	105	629.0	59	60	0
8/16	3.0	156	840.5	72	72	0
8/18	3.0	65	316.8	46	46	0
8/19	3.0	47	169.5	29	30	0
8/21	3.0	29	91.5	7	7	0
8/22	3.0	54	316.5	53	53	0
8/23	3.0	66	291.0	26	48	0
8/24	3.0	6	28.0	6	6	0
8/27	3.0	15	93.0	14	16	0
8/28	3.0	0	0.0	0	0	0
8/29	3.0	12	60.5	3	3	0
8/30	3.0	3	5.0	1	1	0

Appendix Table 2. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Date	We/ Wd	Effort (hrs)			Harvest			Catch		
		SS <sup>1</sup>	Mean	SE <sup>2</sup>	Mean	SE <sup>2</sup>	HPUE <sup>3</sup>	Mean	SE <sup>2</sup>	CPUE <sup>4</sup>
7/11	We	32	3.7	0.62	0.13	0.074	0.034	0.13	0.074	0.034
7/12	We	63	4.2	0.30	0.05	0.027	0.011	0.06	0.038	0.015
7/14	Wd	17	5.9	0.96	0.29	0.114	0.050	0.29	0.114	0.050
7/17	Wd	27	3.4	0.52	0.33	0.141	0.097	0.33	0.141	0.097
7/18	We	53	4.3	0.29	0.25	0.065	0.056	0.42	0.136	0.095
7/19	We	131	4.7	0.23	0.36	0.058	0.076	0.44	0.065	0.093
7/20	Wd	66	6.3	0.35	0.52	0.100	0.082	0.56	0.110	0.089
7/23	Wd	86	3.9	0.21	2.02	0.135	0.521	2.47	0.248	0.635
7/24	Wd	121	4.6	0.19	2.07	0.108	0.452	2.38	0.157	0.519
7/25	We	244	4.9	0.13	1.18	0.080	0.242	1.46	0.110	0.300
7/26	We	332	5.3	0.13	1.14	0.060	0.214	1.22	0.067	0.229
7/27	Wd	173	5.2	0.17	0.97	0.088	0.185	1.08	0.106	0.205
7/30	Wd	187	3.9	0.16	0.66	0.073	0.171	0.79	0.093	0.204
7/31	Wd	97	4.9	0.26	1.30	0.124	0.264	1.36	0.135	0.277
8/01	We	116	4.1	0.21	0.23	0.072	0.056	0.23	0.072	0.056
8/02	We	219	4.5	0.20	0.80	0.080	0.177	1.08	0.109	0.238
8/03	Wd	123	4.7	0.20	1.64	0.112	0.347	2.15	0.159	0.454
8/04	Wd	165	3.9	0.17	1.77	0.102	0.453	1.99	0.126	0.510
8/07	Wd	170	4.8	0.21	1.51	0.103	0.314	1.75	0.133	0.363
8/08	We	212	5.1	0.16	1.30	0.089	0.257	1.50	0.108	0.296
8/09	We	354	4.5	0.12	1.14	0.067	0.250	1.28	0.081	0.282
8/10	Wd	160	5.3	0.22	1.38	0.098	0.261	1.48	0.105	0.278
8/11	Wd	180	4.9	0.17	1.71	0.090	0.349	1.88	0.120	0.384
8/14	Wd	143	4.8	0.18	1.24	0.109	0.259	1.29	0.117	0.270
8/15	We	211	5.0	0.17	0.64	0.071	0.127	0.69	0.081	0.136
8/16	We	334	4.5	0.13	0.28	0.037	0.061	0.28	0.037	0.061
8/18	Wd	121	4.6	0.22	0.72	0.082	0.157	0.72	0.082	0.157
8/19	Wd	111	3.3	0.19	0.57	0.095	0.171	0.58	0.095	0.174
8/21	Wd	92	4.2	0.26	0.84	0.118	0.197	0.91	0.131	0.215
8/22	We	110	5.2	0.25	0.64	0.096	0.123	0.64	0.096	0.123
8/23	We	128	4.4	0.23	0.42	0.071	0.097	0.63	0.118	0.143
8/24	Wd	49	4.1	0.40	0.51	0.124	0.123	0.59	0.140	0.143
8/27	Wd	60	3.9	0.31	0.37	0.111	0.094	0.50	0.171	0.128
8/28	Wd	12	2.8	0.69	0.42	0.193	0.149	0.42	0.193	0.149
8/29	We	32	3.4	0.42	0.13	0.059	0.036	0.13	0.059	0.036
8/30	We	35	2.6	0.19	0.20	0.090	0.076	0.20	0.090	0.076
8/31	Wd	8	3.7	0.55	0.00	0.000	0.000	0.13	0.125	0.034
9/01	Wd	9	4.1	0.11	1.33	0.333	0.324	1.33	0.333	0.324
9/04	Wd	8	5.3	0.49	0.63	0.420	0.119	1.88	0.398	0.357
9/07	We	6	3.0	0.45	1.00	0.365	0.333	1.00	0.365	0.333

1 Sample size (number of anglers interviewed).

2 Standard error.

3 Harvest per unit of effort.

4 Catch per unit of effort.

Appendix Table 3. Counts of shore anglers fishing near the Burma Road access site to the Little Susitna River, 1987.

Date	We/ Wd	Period			
		A	B	C	D
7/11	We	2	4	7	5
7/12	We	0	0	4	0
7/13	Wd				
7/14	Wd			8	3
7/15	Wd				
7/16	Wd				
7/17	Wd			9	9
7/18	We		2	13	6
7/19	We	2	6	22	16
7/20	Wd	7	5	3	6
7/21	Wd				
7/22	Wd				
7/23	Wd	12	11	14	50
7/24	Wd	31	31	66	40
7/25	We	44	103	76	81
7/26	We	67	68	64	26
7/27	Wd	39	39	34	24
7/28	Wd				
7/29	Wd				
7/30	Wd			27	32
7/31	Wd	12	20	9	12
8/01	We		13	12	71
8/02	We	20		69	63
8/03	Wd	12	12	37	39
8/04	Wd	32	23	55	34
8/05	Wd				
8/06	Wd				
8/07	Wd	11	29	39	18
8/08	We	29	45	48	30
8/09	We	31	56	44	35
8/10	Wd	37	42	52	46
8/11	Wd	35	55	51	49
8/12	Wd				
8/13	Wd				
8/14	Wd			40	29
8/15	We	21	54	31	14
8/16	We	17	44	42	11
8/17	Wd				
8/18	Wd		17	29	22
8/19	Wd	18	15	31	26
8/20	Wd				
8/21	Wd	6	17	16	11
8/22	We	7	33	24	3
8/23	We	1	21	22	0
8/24	Wd	5	6	4	4
8/25	Wd				
8/26	Wd				
8/27	Wd	20	4	2	4
8/28	Wd	0	2	3	2
8/29	We	3	7	3	4
8/30	We	0	4	2	0
8/31	Wd	2	3		
9/01	Wd	5	0		
9/02	Wd				
9/03	Wd				
9/04	Wd	0	0		
9/05	We	1	0		
9/06	We	0	0		
9/07	We	0	0		

Appendix Table 4. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by shore anglers exiting the sport fishery in the Little Susitna River at the Burma Road access site, 1987.

Date	We/ Wd	SS <sup>1</sup>	Effort (hrs)		Harvest			Catch		
			Mean	SE <sup>2</sup>	Mean	SE <sup>2</sup>	HPUE <sup>3</sup>	Mean	SE <sup>2</sup>	CPUE <sup>4</sup>
7/11	We	24	3.9	0.79	0.13	0.092	0.032	0.13	0.092	0.032
7/12	We	12	3.9	0.58	0.17	0.112	0.043	0.25	0.179	0.064
7/14	Wd	8	3.1	0.64	0.00	0.000	0.000	0.00	0.000	0.000
7/17	Wd	11	1.6	0.30	0.00	0.000	0.000	0.00	0.000	0.000
7/18	We	12	2.2	0.07	0.08	0.083	0.038	0.75	0.509	0.346
7/19	We	40	3.4	0.34	0.23	0.104	0.067	0.23	0.104	0.067
7/20	Wd	19	3.6	0.45	0.21	0.096	0.058	0.21	0.096	0.058
7/23	Wd	24	3.3	0.37	1.54	0.269	0.468	1.54	0.269	0.468
7/24	Wd	23	4.7	0.66	1.70	0.213	0.363	1.70	0.213	0.363
7/25	We	63	3.7	0.20	0.44	0.108	0.119	0.51	0.113	0.136
7/26	We	56	5.1	0.26	0.54	0.122	0.105	0.59	0.134	0.116
7/27	Wd	47	4.3	0.32	0.49	0.117	0.114	0.49	0.117	0.114
7/30	Wd	52	3.3	0.22	0.29	0.074	0.087	0.52	0.164	0.157
7/31	Wd	13	4.2	0.39	0.92	0.329	0.222	0.92	0.329	0.222
8/01	We	22	3.3	0.66	0.23	0.160	0.070	0.23	0.160	0.070
8/02	We	41	3.6	0.33	0.49	0.136	0.135	0.49	0.136	0.135
8/03	Wd	48	4.3	0.30	1.19	0.180	0.274	1.35	0.218	0.313
8/04	Wd	36	4.6	0.39	1.11	0.206	0.244	1.42	0.304	0.311
8/07	Wd	50	3.9	0.33	0.42	0.103	0.109	0.46	0.108	0.119
8/08	We	32	3.3	0.25	0.44	0.174	0.135	0.44	0.174	0.135
8/09	We	69	3.7	0.18	0.78	0.138	0.209	0.84	0.154	0.225
8/10	Wd	40	5.9	0.47	0.90	0.175	0.154	0.90	0.175	0.154
8/11	Wd	44	4.1	0.36	0.59	0.150	0.144	0.66	0.156	0.161
8/14	Wd	46	3.6	0.33	0.24	0.089	0.067	0.24	0.089	0.067
8/15	We	75	3.6	0.21	0.17	0.058	0.048	0.17	0.058	0.048
8/16	We	135	2.9	0.13	0.02	0.013	0.008	0.02	0.013	0.008
8/18	Wd	30	3.1	0.41	0.10	0.056	0.033	0.10	0.056	0.033
8/19	Wd	41	2.8	0.27	0.05	0.034	0.017	0.05	0.034	0.017
8/21	Wd	40	3.0	0.28	0.20	0.096	0.067	0.20	0.096	0.067
8/22	We	42	3.4	0.18	0.10	0.057	0.028	0.10	0.057	0.028
8/23	We	31	2.8	0.25	0.06	0.045	0.023	0.06	0.045	0.023
8/24	Wd	13	1.3	0.27	0.08	0.077	0.057	0.08	0.077	0.057
8/27	Wd	18	3.2	0.34	0.33	0.229	0.105	0.67	0.457	0.211
8/28	Wd	7	1.3	0.18	0.00	0.000	0.000	0.00	0.000	0.000
8/29	We	20	2.3	0.18	0.05	0.050	0.022	0.05	0.050	0.022
8/30	We	10	1.6	0.15	0.10	0.100	0.063	0.10	0.100	0.063
8/31	Wd	5	2.6	0.24	0.00	0.000	0.000	0.00	0.000	0.000

1 Sample size (number of anglers interviewed).

2 Standard error.

3 Harvest per unit of effort.

4 Catch per unit of effort.

Appendix Table 5. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Miller's Landing access site during periods A and B, 1987.

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period A (0600-1359 hours)</u>						
8/08	3.5	0	0.0	0	0	0
8/09	3.5	0	0.0	0	0	0
8/12	3.5	0	0.0	0	0	0
8/13	3.5	8	42.0	12	20	0
8/14	3.5	9	30.0	23	27	0
8/15	3.5	10	35.5	27	41	0
8/16	3.5	1	4.0	0	0	0
8/19	3.5	2	6.0	0	0	0
8/20	3.5	0	0.0	0	0	0
8/21	3.5	0	0.0	0	0	0
8/22	3.5	4	12.0	4	4	0
8/23	3.5	31	164.0	16	20	0
8/24	3.5	0	0.0	0	0	0
8/27	3.5	2	3.0	2	4	0
8/28	3.5	0	0.0	0	0	0
8/29	3.5	0	0.0	0	0	0
8/30	3.5	0	0.0	0	0	0
<u>Period A (0800-1429 hours)</u>						
8/31	3.5	0	0.0	0	0	0
9/01	3.5	0	0.0	0	0	0
9/02	3.5	0	0.0	0	0	0
9/05	3.5	0	0.0	0	0	0
9/06	3.5	0	0.0	0	0	0
9/07	3.5	4	5.0	0	0	0
<u>Period B (1400-2200 hours)</u>						
8/08	3.5	8	59.0	1	7	0
8/09	3.5	75	414.5	44	56	0
8/12	3.5	11	51.0	8	8	0
8/13	3.5	22	95.0	15	19	0
8/14	3.5	5	41.0	15	25	0
8/15	3.5	13	114.0	24	27	0
8/16	3.5	57	287.0	65	85	0
8/19	3.5	8	48.0	8	11	0
8/20	3.5	12	71.0	11	17	0
8/21	3.5	17	150.0	15	17	0
8/22	3.5	36	235.0	15	18	0
8/23	3.5	39	246.0	17	17	0
8/24	3.5	14	70.0	1	1	0
8/27	3.5	3	15.0	0	0	0
8/28	3.5	2	8.0	3	5	0
8/29	3.5	7	64.0	15	29	0
8/30	3.5	4	22.0	2	2	0
<u>Period B (1430-2100 hours)</u>						
8/31	3.5	6	32.5	12	66	0
9/01	3.5	0	0.0	0	0	0
9/02	3.5	1	1.5	1	1	0
9/05	3.5	6	38.0	6	16	0
9/06	3.5	1	0.5	0	0	0
9/07	3.5	0	0.0	0	0	0

Appendix Table 6. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by anglers exiting the sport fishery in the Little Susitna River at the Miller's Landing access site, 1987.

Date	We/ Wd	SS <sup>1</sup>	Effort (hrs)		Harvest			Catch		
			Mean	SE <sup>2</sup>	Mean	SE <sup>2</sup>	HPUE <sup>3</sup>	Mean	SE <sup>2</sup>	CPUE <sup>4</sup>
8/08	We	8	7.4	1.15	0.13	0.125	0.017	0.88	0.515	0.119
8/09	We	75	5.5	0.28	0.59	0.114	0.106	0.75	0.153	0.135
8/12	Wd	11	4.6	0.53	0.73	0.237	0.157	0.73	0.237	0.157
8/13	Wd	30	4.6	0.26	0.90	0.188	0.197	1.30	0.353	0.285
8/14	Wd	14	5.1	0.92	2.71	0.125	0.535	3.71	0.354	0.732
8/15	We	23	6.5	0.71	2.22	0.251	0.341	2.96	0.395	0.455
8/16	We	58	5.0	0.28	1.12	0.160	0.223	1.47	0.222	0.292
8/19	Wd	10	5.4	0.54	0.80	0.359	0.148	1.10	0.407	0.204
8/20	Wd	12	5.9	0.31	0.92	0.313	0.155	1.42	0.570	0.239
8/21	Wd	17	8.8	0.28	0.88	0.189	0.100	1.00	0.210	0.113
8/22	We	40	6.2	0.41	0.47	0.148	0.077	0.55	0.179	0.089
8/23	We	70	5.9	0.34	0.47	0.090	0.080	0.53	0.097	0.090
8/24	Wd	14	5.0	0.91	0.07	0.071	0.014	0.07	0.071	0.014
8/27	Wd	5	3.6	0.86	0.40	0.400	0.111	0.80	0.583	0.222
8/28	Wd	2	4.0	0.00	1.50	0.500	0.375	2.50	0.500	0.625
8/29	We	7	9.1	0.54	2.14	0.553	0.234	4.14	1.184	0.453
8/30	We	4	5.5	0.87	0.50	0.289	0.091	0.50	0.289	0.091
8/31	Wd	6	5.4	1.00	2.00	0.632	0.369	11.00	3.521	2.031
9/05	We	6	6.3	0.42	1.00	0.632	0.158	2.67	0.211	0.421
9/07	We	4	1.3	0.14	0.00	0.000	0.000	0.00	0.000	0.000

- 1 Sample size (number of anglers interviewed).
- 2 Standard error.
- 3 Harvest per unit of effort.
- 4 Catch per unit of effort.

Appendix Table 7. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Ship Creek access site during periods A and B, 1987.

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
<u>Period A (first high tide of the day, 4 hours in length)</u>						
7/11	4.0	0	0.0	0	0	0
7/12	4.0	0	0.0	0	0	0
7/13	4.0	0	0.0	0	0	0
7/14	4.0	10	126.0	0	0	0
7/17	4.0	0	0.0	0	0	0
7/18	4.0	0	0.0	0	0	0
7/19	4.0	4	24.0	1	1	0
7/20	4.0	0	0.0	0	0	0
7/24	4.0	7	22.0	12	12	0
7/25	4.0	11	27.0	12	23	0
7/26	4.0	27	185.0	26	26	0
7/27	4.0	13	69.5	23	23	0
7/28	4.0	12	51.0	7	7	0
7/29	4.0	0	0.0	0	0	0
8/01	4.0	50	210.5	29	30	0
8/02	4.0	41	339.0	41	51	0
8/08	4.0	0	0.0	0	0	0
8/09	4.0	5	20.0	7	7	0
8/11	4.0	6	15.0	18	19	0
8/12	4.0	0	0.0	0	0	0
8/14	4.0	0	0.0	0	0	0
8/15	4.0	14	91.0	21	22	0
8/16	4.0	10	59.0	6	6	0
8/21	4.0	0	0.0	0	0	0
8/22	4.0	0	0.0	0	0	0
8/23	4.0	2	2.0	0	0	0
<u>Period B (second high tide of the day, 4 hours in length)</u>						
7/11	4.0	0	0.0	0	0	0
7/12	4.0	0	0.0	0	0	0
7/13	4.0	0	0.0	0	0	0
7/14	4.0	0	0.0	0	0	0
7/17	4.0	0	0.0	0	0	0
7/18	4.0	24	152.0	27	27	0
7/19	4.0	4	16.0	0	0	0
7/20	4.0	0	0.0	0	0	0

-continued-

Appendix Table 7. Daily totals for fishing effort, coho salmon harvest, and coho salmon catch by completed-trip anglers exiting the Little Susitna River at the Ship Creek access site during periods A and B, 1987 (continued).

Date	Hours Censused	Number of Interviews	Angler Hours	Coho Salmon		Missed Anglers
				Harvest	Catch	
7/23	4.0	11	59.0	33	35	0
7/24	4.0	30	150.5	74	147	0
7/25	4.0	43	218.5	83	94	0
7/26	4.0	58	477.0	88	88	0
7/27	4.0	32	291.0	49	49	0
7/28	4.0	27	219.0	40	40	0
8/01	4.0	8	84.0	1	1	0
8/05	4.0	18	87.0	27	27	0
8/06	4.0	0	0.0	0	0	0
8/08	4.0	42	190.0	71	78	0
8/09	4.0	12	84.5	24	24	0
8/11	4.0	3	30.0	9	13	0
8/12	4.0	0	0.0	0	0	0
8/14	4.0	0	0.0	0	0	0
8/15	4.0	0	0.0	0	0	0
8/16	4.0	6	48.0	3	3	0
8/17	4.0	0	0.0	0	0	0
8/20	4.0	4	12.0	0	0	0
8/21	4.0	0	0.0	0	0	0
8/22	4.0	8	55.0	4	4	0
8/23	4.0	0	0.0	0	0	0

Appendix Table 8. Daily summary statistics for fishing effort, coho salmon harvest, and coho salmon catch by anglers exiting the sport fishery in the Little Susitna River at the Ship Creek access site, 1987.

Date	We/ Wd	SS <sup>1</sup>	Effort (hrs)		Harvest			Catch		
			Mean	SE <sup>2</sup>	Mean	SE <sup>2</sup>	HPUE <sup>3</sup>	Mean	SE <sup>2</sup>	CPUE <sup>4</sup>
7/14	Wd	10	12.6	0.16	0.00	0.000	0.000	0.00	0.000	0.000
7/18	We	24	6.3	0.36	1.13	0.228	0.178	1.13	0.228	0.178
7/19	We	8	5.0	0.38	0.13	0.125	0.025	0.13	0.125	0.025
7/23	Wd	11	5.4	0.15	3.00	0.000	0.559	3.18	0.122	0.593
7/24	Wd	37	4.7	0.23	2.32	0.155	0.499	4.30	0.465	0.922
7/25	We	54	4.5	0.30	1.76	0.181	0.387	2.17	0.245	0.477
7/26	We	85	7.8	0.52	1.34	0.145	0.172	1.34	0.145	0.172
7/27	Wd	45	8.0	0.75	1.60	0.172	0.200	1.60	0.172	0.200
7/28	Wd	39	6.9	0.56	1.21	0.157	0.174	1.21	0.157	0.174
8/01	We	58	5.1	0.43	0.52	0.128	0.102	0.53	0.131	0.105
8/02	We	41	8.3	0.96	1.00	0.148	0.121	1.24	0.239	0.150
8/05	Wd	18	4.8	0.33	1.50	0.202	0.310	1.50	0.202	0.310
8/08	We	42	4.5	0.39	1.69	0.110	0.374	1.86	0.126	0.411
8/09	We	17	6.1	0.85	1.82	0.261	0.297	1.82	0.261	0.297
8/11	Wd	9	5.0	1.25	3.00	0.000	0.600	3.56	0.242	0.711
8/15	We	14	6.5	0.42	1.50	0.139	0.231	1.57	0.173	0.242
8/16	We	16	6.7	0.59	0.56	0.223	0.084	0.56	0.223	0.084
8/20	Wd	4	3.0	0.58	0.00	0.000	0.000	0.00	0.000	0.000
8/22	We	8	6.9	0.64	0.50	0.267	0.073	0.50	0.267	0.073
8/23	We	2	1.0	0.00	0.00	0.000	0.000	0.00	0.000	0.000

<sup>1</sup> Sample size (number of anglers interviewed).

<sup>2</sup> Standard error.

<sup>3</sup> Harvest per unit of effort.

<sup>4</sup> Catch per unit of effort.

Appendix Table 9. Daily and cumulative counts of salmon, by species, at the weir on the Little Susitna River, 1987.

Species: Date	Coho		Chinook		Pink		Sockeye		Chum	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
7/20	0	0	3	3	0	0	6	6	8	8
7/21	0	0	19	22	0	0	21	27	18	26
7/22	8	8	32	54	2	2	59	86	145	171
7/23	3	11	2	56	0	2	9	95	40	211
7/24	77	88	17	73	0	2	182	277	750	961
7/25	301	389	18	91	0	2	550	827	1,337	2,298
7/26	97	486	7	98	0	2	115	942	831	3,129
7/27	61	547	4	102	0	2	64	1,006	243	3,372
7/28	46	593	2	104	1	3	87	1,093	170	3,542
7/29	251	844	4	108	4	7	110	1,203	142	3,684
7/30	340	1,184	4	112	3	10	97	1,300	322	4,006
7/31 <sup>1</sup>										
8/01 <sup>2</sup>										
<b>Total</b>		<b>1,184</b>		<b>112</b>		<b>10</b>		<b>1,300</b>		<b>4,006</b>

<sup>1</sup> River at flood stage, unable to count.

<sup>2</sup> Weir washed out at about 0400 hours.

Appendix Table 10. Escapement counts of coho salmon for selected index areas in Matanuska-Susitna Valley streams, 1983-1987.

Stream	Year				
	1987	1986	1985	1984	1983
Little Susitna River	4,865	1,038 <sup>1</sup>	3,540	20,991 <sup>2</sup>	2,666
Spring (Wasilla) Creek	110	141	150	NS <sup>2</sup>	NS
Yellow Creek	58	20	65	0	NS
McRoberts Creek	667	439	662	NS	NS
Spring (Flats) Creek	42	147	81	90	28
Cottonwood Creek	360	121	334	935	766
Wasilla Creek	251 <sup>3</sup>	NS	248	628	4 <sup>1</sup>
Rabideux Creek	50 <sup>3</sup>	NS	82	480	NS
Birch Creek	46	25	30	236	NS
Question Creek	149	NS	89	60	NS
Answer Creek	10	NS	9	57	NS
<b>Total</b>	<b>6,608</b>	<b>1,931</b>	<b>5,290</b>	<b>23,477</b>	<b>3,464</b>

<sup>1</sup> Incomplete survey.

<sup>2</sup> Not surveyed.

<sup>3</sup> Poor survey conditions.

Appendix Table 11. Release and recovery information for the hatchery-reared releases of juvenile coho salmon which contributed to the sport fishery in the Little Susitna River in 1987.

RELEASES:

Group	Number of Coho Smolts Released	Number of Coho Smolts Tagged <sup>1</sup>	Proportion of Release Tagged	Number of Tags Recovered <sup>2</sup>
Little Susitna smolts	474,106	23,217	0.04897	47
Eklutna smolts	101,000	101,000	1.00000	2
Little Susitna fingerling	436,216	10,000	0.02292	0

RECOVERIES:

Location	Number of Coho Salmon Examined	Number of Adipose Finclips Observed	Number of Heads Collected
Burma Road	3,331	53	53
Miller's Landing	337	9	8
Ship Creek	122	1	0
Total	3,790	63	61

<sup>1</sup> Number of fish marked with a coded-wire tag and an adipose finclip.

<sup>2</sup> Recovered during creel surveys of the sport fishery in the Little Susitna River.