

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF THE SPORT FISH  
AND SPORT FISH WATERS IN UPPER COOK INLET

by

Robert W. Bentz, Jr.

ALASKA DEPARTMENT OF FISH AND GAME  
Ronald O. Skoog, Commissioner

SPORT FISH DIVISION  
Richard Logan, Director



## RESEARCH PROJECT SEGMENT

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of Alaska

Project No.: F-9-14

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-D Job Title: Inventory and Cataloging  
of the Sport Fish and  
Sport Fish Waters in  
Upper Cook Inlet

Cooperator: Robert W. Bentz, Jr.

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## ABSTRACT

Relative growth and survival rates, determined by fall gill-netting, are presented for coho salmon, Oncorhynchus kisutch (Walbaum), and chinook salmon, Oncorhynchus tshawytscha (Walbaum), captured in Matanuska-Susitna Valley managed lakes. This was the first year chinook salmon were stocked in landlocked lakes in this area. Pertinent historical data regarding stocking size, time, densities and catch rates are examined for various stocked lakes. Comparisons of relative growth and survival of coho and chinook salmon are presented. Salmon stocking guidelines are being formulated but need further assessment.

A creel census was conducted for the third consecutive year on five streams open to chinook salmon fishing. Total harvest and effort estimates were 2,175 fish and 14,665 man-days, respectively. The cumulative harvest quota was exceeded this year for the first time. Two streams were closed by emergency order before the season ended.

Examination of 552 chinook salmon scales revealed a change from predominately Age 1.4 fish to Age 1.2 and 1.3 fish in Montana and Willow Creeks and the Little Susitna River. This change in age structure was generated by strong returns from the 1976 and 1977 parent years; the first 2 years substantial increases in Susitna River chinook salmon escapements were recorded.

A coho salmon creel census was initiated on Cottonwood Creek and the Little Susitna River. An estimated 5,222 coho salmon were harvested in 4,380 man-days of effort at the Little Susitna River, with a catch rate of 0.31 fish per hour. At Cottonwood Creek, a weekend-only fishery, 1,396 coho and 1,945 sockeye salmon, Oncorhynchus nerka (Walbaum), were harvested in 3,344 man-days of effort, with catch rates of 0.136 and 0.189 fish per hour, respectively. Age determination of 189 coho salmon scales identified 92

percent as Age 2.1 fish. Little Susitna River coho salmon averaged 10.4 centimeters and 2.9 pounds larger in length and weight respectively than Cottonwood Creek coho salmon.

Escapement counts for chinook salmon were conducted by aerial surveys, while coho salmon were enumerated through foot surveys in established index areas. Escapement counts were comparable to recent year totals for both species.

#### KEY WORDS

Southcentral Alaska, chinook, coho, sport fishery, management, harvest, effort, escapement, stocked lakes.

#### BACKGROUND

##### Stocked Lake Evaluation

A fish stocking program was initiated in 1960 to provide angling opportunities in waters originally devoid of natural game fish populations. Presently, 12 Matanuska-Susitna Valley lakes are stocked annually with approximately 245,000 coho salmon and four lakes are stocked with 51,300 Arctic grayling, Thmallus articus (Pallas), on a yearly basis. Stocking rates and densities vary according to characteristics of each lake.

Three lakes were stocked with both chinook and coho salmon fingerlings in May 1981. Victor, Rocky and Memory Lakes received equal numbers of both species at stocking densities of 1,400, 2,950 and 8,300 fish per lake, respectively. Chinook salmon were stocked at 33 fish/lb and coho salmon at 26 fish/lb. This was the first time that chinook salmon had been stocked in landlocked systems in the Matanuska-Susitna Valley. These chinook and coho salmon were also the largest ever stocked in this area. At the time the fish were stocked, the chinook salmon exhibited the opaque "window" in the interior portion of their adipose fin which is an external identification characteristic frequently used to differentiate the juvenile stages of two species (Dalhberg and Phinney, 1967). As a result, no fin clips for subsequent identification were considered necessary prior to stocking.

After 5 months residency, a total of 150 fish were collected from the three lakes. Upon examination for species identification, not a single fish exhibited the adipose fin characteristic observed in the chinook salmon fingerlings at stocking. Either the external characteristic had disappeared, the chinook salmon could not be captured by gill or fyke nets, or the chinook salmon fingerlings had experienced a very high mortality rate while the coho salmon did not. Since all internal characteristics such as numbers of pyloric caeca and gill rakers had too great a range of overlap for positive identification, electrophoretic analysis was conducted to identify the two species.

Seven of the stocked lakes were rehabilitated to remove threespine sticklebacks which resulted in marked increases in growth and survival rates for

salmon. Four of these lakes have since been reinfested by threespine sticklebacks with a concomitant reduction of coho salmon growth and survival.

Stocked game fish population sampling is conducted each fall to evaluate survival, growth and stocking densities. During winter months, chemical parameters are monitored in lakes having a history of low dissolved oxygen. The results of these evaluations are used to determine future management procedures to maintain or improve the quantity and quality of sport fishing.

#### Chinook Salmon Studies

The early run of chinook salmon to the Susitna River, which comprises the largest component of the total Cook Inlet chinook salmon run, was reduced to a remnant condition due to overharvest during the 1940's and 1950's. Intensive management of these stocks was initiated in the early 1960's by means of extensive closures of both sport and commercial fisheries. Further protection of these stocks was enacted in 1973 when the Alaska Board of Fish and Game issued complete closures on both sport and commercial fisheries.

Results of these management strategies were first realized in 1976 when escapement counts in the Susitna River drainage revealed the largest recorded chinook salmon escapement. These high escapements were also recorded in 1977 and 1978.

In response to this population increase, the Board of Fisheries again provided for a limited sport fishery in 1979 on five streams in the Matanuska-Susitna Valley. A maximum catch quota was established for the five streams as follows: Willow, Montana and Chunilna Creeks--300 each, Little Susitna River--1,000, and Caswell Creek--200. A non-transferable harvest card was a mandatory requirement for participation in these fisheries. The daily bag and possession limit was one chinook salmon and five per season over 20 inches in length. This seasonal limit applied to all waters of the Cook Inlet area. In 1980, the open stream and seasonal catch quotas were the same as in 1979. The daily bag and possession limit was two chinook salmon over 20 inches in length, one of which could exceed 28 inches. For the 1980 fishery, the harvest ticket was again required and a chinook salmon/steelhead trout permit was also mandatory.

In 1981, five east side streams were open to the taking of chinook salmon 20 inches or over in length. No additional areas within these streams were opened, and quotas and scheduled seasons also remained identical to past years. The harvest ticket and permit were once again mandatory requirements for participation in these fisheries. A five-fish yearly bag limit also continued to govern the individual harvest. A reduced daily bag limit in 1981 coupled with a more liberal possession limit was a significant regulatory departure from previous years. This year the daily limit was one chinook salmon 20 inches or more in length and two in possession.

During these three seasons, this fishery was monitored closely on a day-to-day basis as instructed by the Board of Fisheries, for enforcement

purposes, to ensure that individual stream quotas were not exceeded and adequate escapement was attained, and to collect biological data such as angling effort, harvest, sex and age composition information. Data from previous years were relied heavily upon to design more effective and efficient creel census programs.

### Coho Salmon Studies

Coho stocks of the upper Cook Inlet area experienced declines to very low levels in the early 1970's. Habitat degradation or loss, environmental conditions and an intense commercial fishery in Cook Inlet are probable factors associated with this decline. Since coho salmon run timing through the commercial fishery in Cook Inlet coincides with that of all other species except chinook salmon, it is difficult to specifically manage coho salmon by manipulation of the mixed stock commercial fishery.

Therefore, management techniques have been conducted primarily through regulation of the sport fisheries. Various techniques that are used include: protection of known spawning areas; restriction to weekend-only fishing; regulation of methods and means; and emergency closures when runs appear below average.

As a result of these stringent regulations and favorable environmental conditions, the upper Cook Inlet coho salmon populations began to increase substantially in 1975. Escapement counts in 1980 were the highest since the counts were initiated in the early 1960's. As the Upper Cook Inlet coho stocks increased, so too did sport fishing effort in the many freshwater streams of the Matanuska-Susitna Valley. Data from the Statewide Harvest Study (Mills, 1978-1981), an annual publication of sport fishing effort and harvest by area, indicate fishing effort increased 43% from 1977 to 1980 for upper Cook Inlet as a whole. Within this area the Knik Arm and east side drainages of the Susitna River had effort increases of 25% and 61%, respectively. The east side increase represents the largest increase of effort in any area throughout the entire state.

There are approximately 25 streams within the management area of this project that currently sustain a sport fishery for coho salmon. The most important stream within this area and probably within the whole upper Cook Inlet area is the Little Susitna River. According to data in the Statewide Harvest Study, the Little Susitna is the second largest producer of freshwater caught coho salmon in the state. Only the Kenai River has a larger coho salmon harvest. The river provides an exceptional opportunity to harvest coho salmon in an aesthetically pleasing manner, and the waterway's physical features would accommodate substantial recreational use without excessive congestion. More than 75 miles of river are available for boat fishing.

The importance of the Little Susitna River and its potential for recreation and fishing opportunities was acknowledged by the Department of Natural Resources when they included and granted it special protective status in the Land Use Plan for Public Lands in the Willow Sub-Basin (Dept. of Natural Resources, 1981).

The Statewide Harvest Study data show that fishing effort on the Little Susitna River has increased 103% over 4 years from 11,063 man-days in 1977 to 22,420 man-days in 1980. Increased harvests of coho salmon also occurred with 3,415 coho salmon taken in 1977, rising to 6,302 in 1980. The Little Susitna River coho salmon are among the largest in upper Cook Inlet and are, therefore, highly prized by sport fishermen. The recorded increases in fishing effort over the last several years are expected to immediately double when the lower river access road improvements are completed in 1982 and several other planned facilities such as waysides and campgrounds are constructed.

The importance of this system as a high quality, productive sport fishery is reflected in that a coho salmon stock enhancement program on the Little Susitna River is the number one priority in the Plan for Supplemental Production of Salmon and Steelhead for Cook Inlet Recreational Fisheries, 1981.

A statistically designed creel census conducted during the coho salmon fishery was initiated in 1981 to determine harvest and effort estimates on the Little Susitna.

The second coho salmon creel census that was initiated in 1981 was conducted on Cottonwood Creek. This system's coho salmon population had been reduced to remnant conditions similar to the majority of coho salmon populations of upper Cook Inlet. To protect these remaining stocks in Cottonwood Creek, the Board of Fisheries tightened sport fishing regulations in 1971 with a single-hook-only stipulation, coupled with a weekend-only-fishing period in the lower section of stream open to fishing. These regulatory changes served to reduce the catching efficiency of the anglers' gear and also reduced the available fishing time.

An enhancement program developed by the Fisheries Rehabilitation, Enhancement and Development (FRED) Division was initiated in 1977 to augment natural production in the Cottonwood system. Eggs were taken from Fish Creek coho salmon and incubated at the Alaska Department of Fish and Game (ADF&G), Big Lake Hatchery complex. The resulting fry were released throughout the system in favorable lentic rearing areas. The fry releases have continued on an annual basis since 1977 to the present, with an average number of 320,000 fry released each year.

Escapement counts conducted annually indicate that the strict regulations coupled with the enhancement effort are increasing coho salmon populations in Cottonwood Creek.

Table 1 lists all of the species mentioned in this report and Figure 1 is a map of the study area.

#### RECOMMENDATIONS

1. A creel census should be continued on the five streams open to chinook salmon fishing to determine angler effort and harvest and to ensure harvest quotas are not exceeded.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name	Abbreviation
Arctic grayling	<u>Thymallus</u> <u>articus</u> (Pallas)	GR
Chinook salmon	<u>Oncorhynchus</u> <u>tshawytscha</u> (Walbaum)	KS
Coho salmon	<u>Oncorhynchus</u> <u>kisutch</u> (Walbaum)	SS
Threespine stickleback	<u>Gasterosteus</u> <u>aculeatus</u> Linnaeus	TST

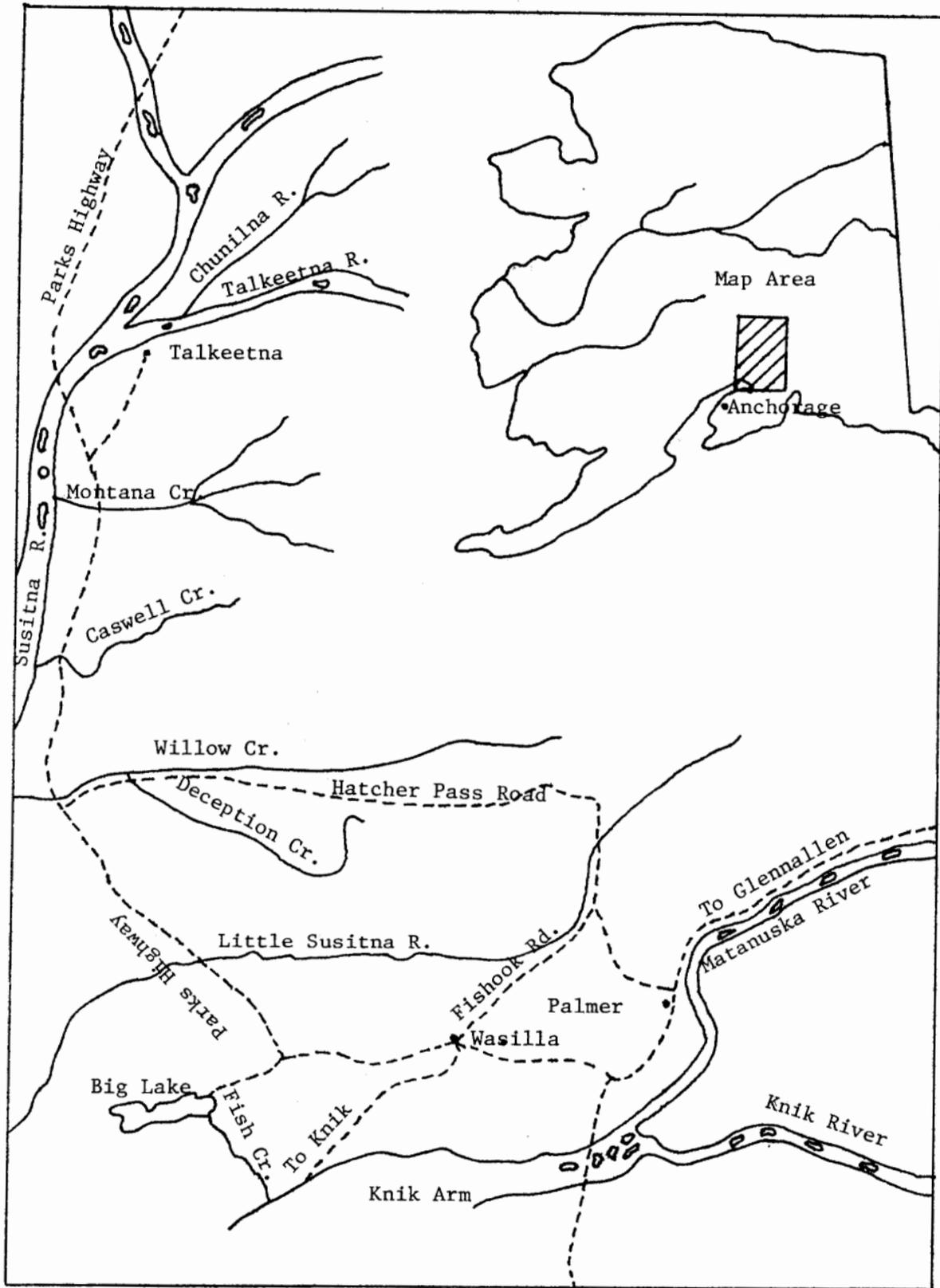


Figure 1. Study Area in Matanuska-Susitna Valleys.

2. The two coho salmon creel censuses should be continued to determine angler effort and harvest.
3. Studies on the Little Susitna River coho salmon should be initiated to determine run timing, migration rate through the fishery and detailed escapement counts for development of future enhancement programs.
4. Escapement surveys for coho and chinook salmon in selected streams should continue to evaluate results of current management practices.
5. Catalog and inventory of waters in the rapidly developing Point McKenzie area should be initiated to aid in development management guidelines.

#### OBJECTIVES

1. To determine levels of abundance of anadromous and resident fish stocks and to evaluate densities to determine optimum levels necessary for maintenance of these stocks.
2. To determine anadromous fish harvest levels and fishing effort on selected streams in the job area.
3. To determine and record environmental characteristics existing and potential fishery waters of the job area.
4. To make recommendations for the proper management of various sport fish waters in the area and to direct future studies.

#### TECHNIQUES USED

##### Stocked Lake Evaluation

Monofilament gill nets 6 ft x 125 ft, having five mesh sizes ranging from 1/2-in to 2-in bar measure, were used to collect fish specimens from stocked lakes. Nets were set for approximately 24 hours in each lake. All captured fish were weighed to the nearest gram and snout to fork lengths were recorded to the nearest millimeter.

Electrophoretic analysis was utilized to differentiate between chinook and coho salmon which were stocked in three lakes. The analysis was conducted at the Alaska Fish and Wildlife Protection Crime Laboratory located in Palmer. Fresh samples were collected in late December by gill net and conventional hook and line ice fishing techniques when netting efforts were unsuccessful.

Eye extracts were phenotyped for two enzymes: phosphoglucomutase and phosphoglucose isomerase. Previous studies have shown that both enzymes can differentiate between chinook and coho salmon with less than 5% chance of

error (May, 1975). Use of the two enzyme systems decreased the probability of an incorrect identification to less than .0025%.

### Chinook Salmon Studies

The chinook salmon creel census was statistically designed to estimate harvest and effort on five streams. On the two streams open to fishing on both weekdays and weekends, the sampling day was divided into five 4-hour periods between the hours of 4:00 a.m. and 12:00 midnight. Two random, preselected periods were sampled on 4 weekdays of each week. On weekend days and holidays, all five periods were sampled. Weekday and weekend estimates were developed separately and then summed for the total estimate. On the three streams open to fishing on weekends only, the entire 24-hour period was sampled each day.

During sampling periods, angler counts were conducted on those areas of the stream that received the greatest fishing intensity. Frequency of the counts varied on each stream depending on the length of time required to complete a count.

During sampling periods, only completed anglers were interviewed. Information collected from anglers included the number of hours fished, number and species of fish caught, punch card numbers, previous day's catch and location, if the angler had not been interviewed, and whether they were boat or shore anglers. Chinook salmon over 20 inches in length were weighed to the nearest pound and measured from the tip of snout to fork and from mid-eye to fork. Both measurements were recorded to the nearest 0.1 cm. All lengths in this report are from tip of snout to fork of tail measurements.

Scales were collected for age determinations from fish with lengths of 86 to 110 cm and placed in coin envelopes with appropriate biological data recorded on each envelope. The scales were mounted on gum paper and then pressed onto plastic acetate. Age determinations were accomplished using a Bruning Model 200 microfiche reader.

The European method was used to denote anadromous salmon age classes. This method uses a decimal mark to separate the number of years spent in fresh-water from the number of years spent in the area.

Chinook salmon escapement counts were conducted by aerial surveys.

### Coho Salmon Studies

The statistically designed coho salmon creel census to estimate harvest and effort on two streams was similar to the chinook salmon census except for sampling periods. On the Little Susitna River, which was open to fishing on both weekdays and weekends, the sampling day was divided into two periods from 6:00 a.m. through 2:00 p.m. and 2:00 p.m. through 10:00 p.m. One randomly selected period was sampled on 3 weekdays of each week. Every weekend day and holiday was sampled during one of the sampling periods.

Since the area open to coho salmon fishing on the Little Susitna River extends more than 70 stream miles, it was necessary to conduct a census at

the two major access points which are approximately 40 stream miles apart. These access points are referred to throughout this report as the Burma Road and Parks Highway which access the lower river and upper river fishing areas, respectively. Catch and effort estimates were calculated separately for each access point and then summed.

The Cottonwood Creek coho salmon fishery was open only on weekends. The sampling period was from 4:00 a.m. through 10:00 p.m. every weekend day.

Angler counts were conducted at both streams on those areas which received the greatest fishing intensity. Angler interviews were identical to those conducted during the chinook salmon creel census. However, all coho salmon were weighed and measured according to standard methods. Scales were taken from every fourth coho salmon and examined for age determinations.

Coho salmon spawning populations were enumerated by foot surveys within established index areas on each system.

## FINDINGS

### Stocked Lake Evaluations

Seven stocked lakes containing landlocked salmon were sampled in 1981 with variable mesh gill nets to determine relative growth and survival rates (Table 2). All lakes except Finger and Lucille Lakes were initially netted during ice-free periods. Three of these seven lakes were stocked with equal numbers of both chinook and coho salmon, which were the largest fingerlings ever planted in this area. All three lakes were rehabilitated with rotenone. Memory and Victor Lakes have remained free of sticklebacks, but Rocky Lake has been reinfested.

Gill net catch rates of these large Age 0+ chinook and coho salmon ranged from 1.32 fish/hour in Rocky Lake to 4.47 fish/hour in Memory Lake with an average of 2.47 fish/hour. In comparison, catch rates of Age 0+ coho salmon fry that were stocked in the remaining three lakes at a much smaller size ranged from 0.11 fish/hour in Finger Lake to 0.22 fish/hour in Lucille Lake with an average of 0.18 fish/hour. These catch rates exhibited a slight decrease from those recorded during the 2 previous years by Watsjold (1980 and 1981).

The large variance in catch rates between the two sizes of Age 0+ coho salmon is a result of two factors. First, the larger fingerlings undoubtedly experienced a somewhat higher survival rate than the smaller fish during their first 5 months of lake residency. Secondly, the larger fingerlings, because of their size, are captured much more effectively by gill nets than smaller fish which can pass through more of the mesh sizes without being captured. Catch rates of Age I+ coho salmon from three lakes ranged from 0.32 fish/hour in Victor Lake to 1.35 fish/hour in Finger Lake while catch rates of Age II+ coho salmon from six lakes ranged from 0.05 fish/hour in Victor Lake to 0.61 fish/hour in Rocky Lake.

Age 0+ coho salmon were stocked in Finger, Lucille and South Rolly Lakes at 310 to 354 fish/lb. After 5 months residency in the lakes these fish

Table 2. Summary of Recent Stocking History and Gill Net Results of Matanuska-Susitna Valley Lakes Sampled in 1981.

Lake	Date Sampled	Species	Age Class	n	Length (mm)		Catch/Net Hr.	Date Stocked	Total Number	Per Lb.	Per Acre		
					$\bar{x}$	+SD						Range	
Echo	10/20/81	SS	0+	15	175	20.95	136-211	0.7	6/ 4/81	4,600	26	200	
			II+	16	241	9.30	227-258	0.79	9/19/79	4,606	59	200	
Finger	11/24/81	SS	0+	5	116	4.83	112-124	0.11	5/13/81	72,952	330	202	
			I+	63	230	22.99	169-277	1.35	5/ 7/81	44,177	140	120	
			II+	3	339	30.51	318-374	0.06	5/21/79	73,030	670	200	
			III+	1	452	...	...	0.02	5/23/78	75,527	627	200	
Lucille	11/24/81	SS	0+	10	135	30.65	105-190	0.22	5/13/81	72,838	310	201	
			II+	7	334	40.92	249-370	0.16	5/21/79	72,500	670	200	
			III+	9	416	23.75	382-460	0.20	5/23/78	72,527	627	200	
Memory	10/15/81	SS,KS t	0+	88	156	11.99	130-194	4.47	...	...	...	...	
			I+	11	224	11.25	211-242	0.56	5/ 7/80	8,285	254	100	
			SS	III+	1	321	...	...	0.05	7/11/78	12,500	277	150
	12/18/81	SS,KS*,SS*	0+	6	157	8.83	147-167	...	5/29/81	8,300	26	100	
			KS*	0+	15	156	6.19	148-171	...	5/26/81	8,300	33	100
			SS*	I+	10	196	10.80	181-220	...	...	...	...	...
Rocky	10/15/81	KS,SS t	0+	26	141	12.56	117-16	1.32	...	...	...	...	
			SS	II+	12	230	26.78	174-256	0.61	5/23/79	5,900	650	100
			SS	III+	8	300	17.65	272-324	0.41	7/11/78	8,900	277	152
	12/23/81	KS*,SS*	0+	15	170	11.88	158-204	...	5/26/81	2,950	33	50	
SS*	0+		18	150	27.85	113-213	...	5/29/81	2,950	26	50		
South Rolly	10/16/81	SS	0+	10	110	5.74	104-118	0.22	5/20/81	16,430	354	145	
			II+	26	166	44.06	130-293	0.56	9/ 7/79	22,378	67	198	
			IV+	3	369	29.87	347-403	0.06	6/ 8/77	11,300	623	100	
Victor	10/6/81	KS,SS t	0+	30	209	21.77	165-247	1.62	...	...	...	...	
			SS	I+	6	259	9.77	250-275	0.32	6/19/80	2,800	231	208
			SS	II+	1	310	...	...	0.05	5/23/79	2,800	650	208
	12/18/81	SS*,KS*	0+	5	210	19.39	182-232	0.21	5/29/81	1,400	26	104	
			KS*	0+	23	216	8.39	195-233	0.96	5/26/81	1,400	33	104

\* Species identification determined by electrophoretic analysis. Fish from Memory and Rocky Lakes were collected by hook and line.

t Species identification not possible.

The creel census site where anglers were interviewed at Willow Creek was moved from its traditional location at the Parks Highway bridge downstream to the confluence of Willow Creek and the Susitna River where the fishing occurred. This move resulted from extremely low water in Willow Creek at the time the fishery was to begin, which severely restricted boating up and down the creek and forced anglers to utilize other access points to reach the Willow Creek fishing area. Also, it was felt that as Willow Creek became more congested with boat traffic, an increasing number of anglers would use alternate access points for safety reasons.

As the fishery progressed, creel census data verified these hypotheses. It was determined that 60% of the total angling effort at the Willow Creek confluence originated at the Willow Creek bridge access point. The remaining 40% of the anglers utilized the Susitna Landing and Little Willow Creek access points. This effort would have gone unrecorded had the census site remained at the Willow Creek bridge.

Another advantage of the new location was a more accurate record of when each chinook salmon was actually harvested rather than the time that the angler returned to the upstream access point with their fish.

Angler effort and catch estimates were derived from 3,211 completed angler interviews which represented 21.9% of the total estimated effort. The most complete interview coverage occurred at Willow Creek where 50.7% of the total estimated number of anglers were interviewed, while the lowest number checked was at Caswell Creek (7.2%), which did not receive a complete census. Interviewed anglers harvested 669 chinook salmon which represents 30.8% of the total estimated catch. On the two weekend-fishing-only streams which were censused 24 hours daily, 56% of the total estimated harvest was checked.

Total chinook salmon harvest for the five east side Susitna River streams was estimated at 2,175, with 14,665 man-days of effort and an average catch per hour and catch per man-day of 0.038 and 0.15, respectively (Table 3). Catch rates on the five streams ranged from 0.07 chinook salmon per man-day at Montana Creek to 0.64 per man-day on Willow Creek.

The total catch quota of 2,100 chinook salmon was exceeded for the five east side Susitna River streams for the first time since the fisheries were reopened in 1979 by the Alaska Board of Fisheries. Individual stream quotas were reached on Montana and Willow Creeks prior to the end of the scheduled fishery. Emergency orders were issued closing Willow Creek for the last weekend of the scheduled season, while Montana Creek was closed the last 3 days of the original season. The quota of chinook salmon at Chunilna Creek was also attained but it was not closed prematurely by emergency order as its quota was not achieved until the final weekend of the scheduled fishery.

Angling effort and catch by weekly period on the five streams are shown in Tables 4 and 5. Catch and effort are traditionally monitored only on the Little Susitna River, Burma Road fishery during the first 2 weeks of the season for two reasons. The weekend-only fisheries are not open until the weekend of the third week and the chinook salmon are not available during this period at the Chunilna Creek fishery. In 1981, catch and effort on

averaged from 110 mm to 135 mm in length. Age 0+ coho salmon stocked in Victor, Rocky and Memory Lakes at 26 fish/lb averaged from 141 mm to 209 mm in length.

Results from the electrophoretic analysis indicate that the Age 0+ chinook salmon fingerlings experienced relatively higher survival and growth rates than the Age 0+ coho salmon stocked in the same lakes. The Age 0+ chinook fry comprised 82%, 71% and 45% of the sample populations from Victor, Memory and Rocky Lakes, respectively, and averaged from 156 mm to 210 mm in length. In consolidating the data from all three lakes, Age 0+ chinook salmon comprised 65% of the total sample and averaged 186 mm in length, while Age 0+ coho salmon comprised 35% of the sample and averaged 163 mm in length. These chinook salmon will be evaluated throughout their life cycle to determine if they have a greater longevity and reach a larger size than coho salmon. If these preliminary results showing chinook salmon survival and growth to be relatively higher than that of coho salmon are confirmed in subsequent years' gill-netting results, additional lakes may be stocked with chinook salmon on an experimental basis.

After 17 months' residency in three lakes, lengths of Age I+ coho salmon averaged from 224 mm in Memory Lake to 259 mm in Victor Lake--above average for lakes in the area (Watsjold, 1981). Mean lengths of Age II+ coho salmon after 29 months of lake residency in six lakes ranged from 166 mm in South Rolly Lake to 339 mm in Finger Lake. This year's data lend support to the theory that size and stocking densities may be the most important factor influencing growth and survival rates of coho salmon in Matanuska-Susitna Valley lakes.

#### Chinook Salmon Studies

##### Creel Census:

A creel census was conducted during the chinook salmon fisheries on the Little Susitna River, Burma Road site from May 30 through July 6, and at Chunilna Creek from June 14 through July 6. Two weekend-only streams, Montana and Willow Creeks, were censused only during the last 3 weekends. Run timing of chinook salmon at these streams during the previous 2 years indicated that few fish were available at the beginning of these fisheries which enabled this year's census schedule to be shortened to coincide with the arrival of the fish. Since the census covered only those periods when chinook salmon were available to anglers, estimated angling effort is somewhat less than what actually occurred during the entire fishery.

A statistically valid creel census was not conducted on Caswell Creek or the Little Susitna River, Parks Highway site as had been done the previous 2 years due to budgetary restraints. Partial day censuses were conducted during the first half of the fishery and the last weekend was completely censused at Caswell Creek. Effort and harvest estimates at the Parks Highway Site on the Little Susitna River were calculated by comparing creel census estimates from the Burma Road site with the Parks Highway site during the previous 2 years. A proportion was established from this comparison and the Parks Highway estimates were determined from harvest and effort creel census estimates at the Burma Road chinook salmon fishery.

Table 3. Effort and Harvest Data of the Chinook Salmon Sport Fisheries, East Side Susitna River Streams, 1981.

Stream	Quota	Harvest	Sex Ratio		Effort Man-Days	Catch/Hour	Catch Per Man-Day
			Male	Female			
Caswell Creek	200	185	0.9	1.0	1,320	.037	0.14
Chunilna Creek	300	340	4.5	1.0	1,300	.076	0.26
Little Susitna River	1,000	945	0.7	1.0	6,660	.031	0.14
Montana Creek	300	360	2.1	1.0	4,845	.021	0.07
Willow Creek	300	345	1.0	1.0	540	.116	0.64
Total	2,100	2,175	1.5	1.0	14,665	.038	0.15

Table 4. Eastside Seasonal Chinook Salmon Fishing Effort Trends, 1981.

Date	Chunilna		Little Susitna		Willow		Caswell		Montana		Total	
	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%
5/23-5/31	0	...	983	14.7	...	...	...	...	...	...	983	6.7
6/1-6/7	0	...	1,006	15.1	...	...	...	...	...	...	1,006	6.9
6/8-6/14	19	1.5	1,281	19.2	86	15.9	94	7.1	1,981	40.9	3,461	23.6
6/15-6/21	475	36.5	957	14.4	220	40.7	377	28.6	1,864	38.5	3,893	26.5
6/22-6/28	410	31.5	1,196	18.0	234	43.4	523	40.3	1,000	20.6	3,372	23.0
6/29-7/6	396	30.5	1,237	18.6	Closed	...	317	24.0	Closed	...	1,950	13.3
TOTAL:	1,300		6,660		540		1,311		4,845		14,665	

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Table 5. Eastside Seasonal Chinook Salmon Catch Trends, 1981.

<u>Date</u>	<u>Chunilna</u>		<u>Little Susitna</u>		<u>Willow</u>		<u>Caswell</u>		<u>Montana</u>		<u>Total</u>	
	<u>Catch</u>	<u>%</u>	<u>Catch</u>	<u>%</u>	<u>Catch</u>	<u>%</u>	<u>Catch</u>	<u>%</u>	<u>Catch</u>	<u>%</u>	<u>Catch</u>	<u>%</u>
5/23-5/31	0	...	70	7.4	...	...	...	...	...	...	70	3.2
6/1-6/7	0	...	125	13.2	...	...	...	...	...	...	125	5.7
6/8-6/14	5	1.5	188	19.9	30	8.7	5	2.7	35	9.7	263	12.1
6/15-6/21	82	24.2	192	20.3	160	46.4	35	18.9	205	57.0	674	31.0
6/22-6/28	154	45.3	172	18.2	155	44.9	95	51.4	120	33.3	696	32.0
6/29-7/16	99	29.0	198	21.0	Closed	...	50	27.0	Closed	...	347	16.0
	340		945		345		185		360		2,175	

the Little Susitna River during the first 2 weeks were 20.6% and 29.8% of the respective seasonal totals. This is the highest percentage of both catch and effort during this 2-week period since the fishery was reopened in 1979, and is a result of the early returns of chinook salmon to upper Cook Inlet streams which occurred in 1981. Effort for all five streams peaked the week of June 15 through June 21, when 26.5% of the seasonal effort was expended while the catch peaked 1 week later; 32.0% of the seasonal catch was taken. The area wide reduction of effort and catch during the final 2 weeks resulted from the stream closures as quotas were reached. If all the streams had remained open, the highest effort and catch would have occurred during this period. The effects of the stream closures on effort and catch trends are shown in Figure 2.

On the two streams open to fishing throughout the week, 65.1% of the angling effort, as measured by random angler counts, and 71% of the observed catch occurred from noon to midnight. This represents a decrease of 22% and 16% of effort and catch, respectively, recorded for the same period during the 1980 fishery (Watsjold, 1981). At the two weekend-fishing-only streams, which had valid creel censuses conducted throughout the fishery, effort and catch trends were very similar. At Montana Creek 56.3% of the angling effort, as determined by angler counts, and 60% of the observed catch occurred from midnight to noon, while at Willow Creek 55.4 and 62.3% of angling effort and catch, respectively, were recorded during the same period. Within this 12-hour period, effort and catch were most intense between midnight and 4:00 a.m. These data are just the reverse of that recorded at these two streams during the 1980 fishery when the majority of effort and catch was between noon and midnight (Watsjold, 1981).

The average length of the angler day at the five streams appeared to be dependent on accessibility, availability of fish and local weather conditions. On the Little Susitna River fishery, anglers in boats fished 2.5 hours per day longer than anglers from shore on both weekdays and weekends. Weekend anglers, comprised of both boat and shore anglers, fished an average of 4.7 hours per day while weekday anglers fished 4.2 hours. Boat anglers, both weekend and weekday, fished 5.8 hours per day and shore anglers fished 3.3 hours per day. The length of an angler-day at the remaining four streams was similar and averaged 3.6 hours per day.

The catch per hour of all five streams combined was 0.038 for the 1981 season. This represents a slight decrease from the 0.041 catch per hour rate recorded in 1980. Catch rates on individual streams varied drastically between 1980 and 1981 on all streams except the Little Susitna River which exhibited a small increase. Catch rates at Caswell and Montana Creeks in 1981 were only half of those recorded in 1980 while Chunilna and Willow Creeks catch rates were twice as high as in 1980. Combined effort on the five streams in 1981 increased by 103% over the 1980 effort.

Figure 3 illustrates chinook salmon harvest by weekly period from 1979 to 1981 for the five east side Susitna River streams. The relatively higher harvest during the first half of the season in 1981 is a result of the early return of chinook salmon to upper Cook Inlet streams this year. Chinook salmon were available to anglers at the various fisheries an average of 10 days earlier in 1981. The sharp decline in harvest during

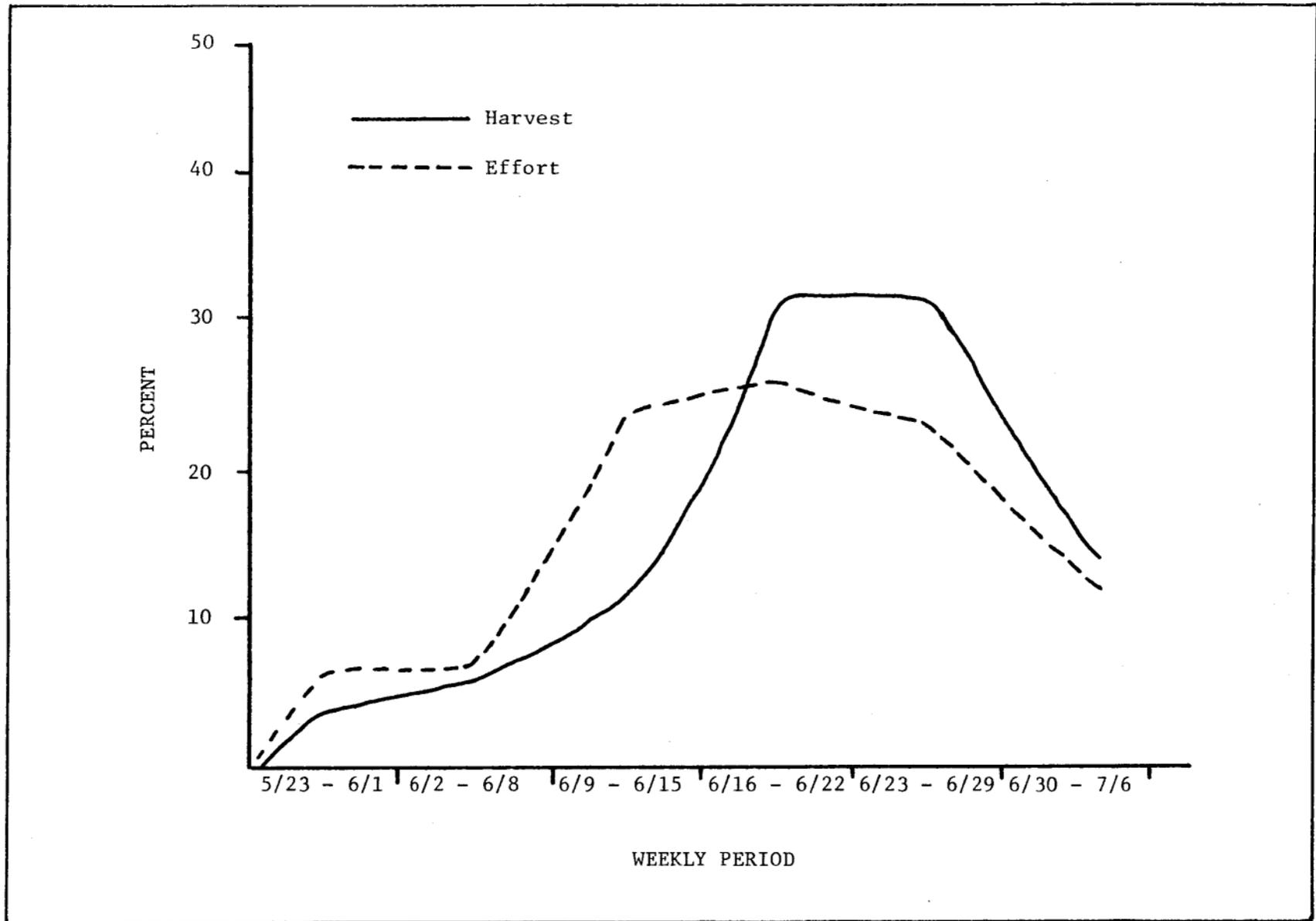


Figure 2. Chinook Salmon Harvest and Effort by Weekly Period, 1981.

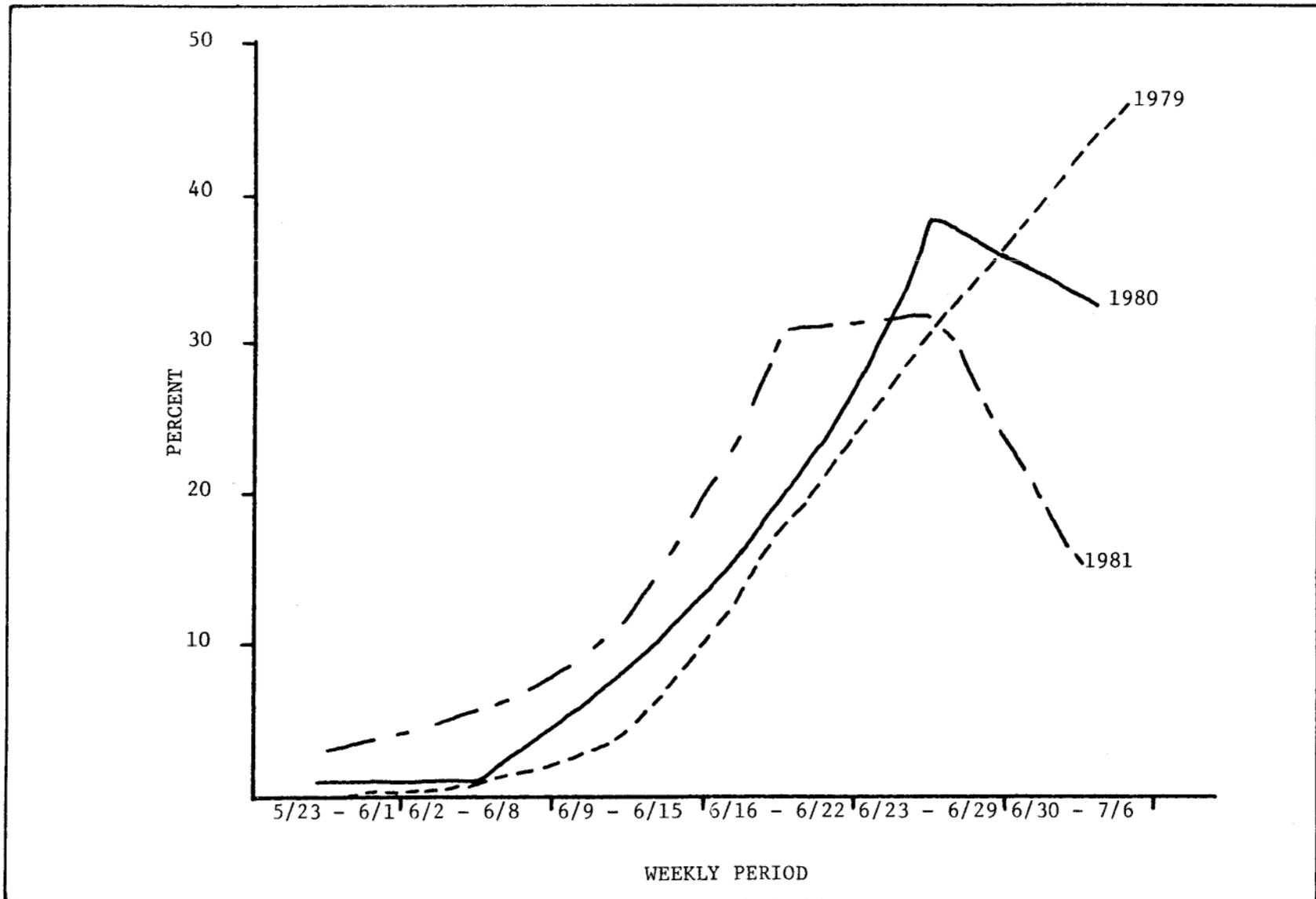


Figure 3. Chinook Salmon Harvest by Weekly Period, 1979 - 1981.

the last 2 weeks of the 1980 and 1981 seasons was due to emergency closures of three streams and two streams in 1980 and 1981, respectively, which reduced total effort.

#### Population Structure:

Age structure of spawning populations was determined from length measurements of chinook salmon carcasses. Length frequency classes were developed from scale-aged west side tributary chinook salmon since no chinook salmon scales were available for aging from east side Susitna River tributaries prior to 1979. These classes have been used throughout the Susitna River system. A chinook salmon fishery from 1979 through 1981 on four east side Susitna River tributaries has enabled collection of scales from these streams to analyze the accuracy of assessing age by length frequency distribution only. While scale analysis is the most accurate aging method, it is also very time consuming and costly in comparison with recording lengths. The Little Susitna River was included in the analysis because it is an Upper Cook Inlet stream although it is not a tributary of the Susitna River.

The length frequency classes used to determine age classes are as follows: Age 1.2 (51-75 cm), Age 1.3 (76-95 cm) and Age 1.4 (96 cm and over). These are the dominant age groups of Susitna River chinook salmon. However, there are occasionally other age groups encountered with an additional year in saltwater or freshwater which will introduce minor errors in the analysis because these uncommon age groups cannot be accounted for when using the length frequency method.

During 1979 and 1980, scales were collected from chinook salmon over 20 inches in length and age was determined by scale analysis to assess the accuracy of the length frequency age class method. From this comparison it became apparent the length frequency method was very accurate in predicting the occurrence of Age 1.2 chinook salmon. The average difference between the two methods in this age group was only 0.7% for these 2 years. However, the accuracy of the length frequency method decreased substantially in predicting Age 1.3 and Age 1.4 chinook salmon. Errors up to 7.5% were identified by subsequent scale analysis during the 2 years of comparison (Watsjold, 1981). Therefore, during the 1981 creel census, scales were collected from chinook salmon with lengths from 86 cm to 110 cm only and aged by the scale analysis method. This was the length range where most of the errors occurred in the length frequency method. Any chinook salmon between 76 cm and 85 cm was assumed to be Age 1.3, and all chinook over 110 cm were assumed to be Age 1.4.

Results of the comparison of the two methods used in determining age composition of 1981 chinook salmon populations are presented in Table 6. The length frequency method predicted 1.7% fewer Age 1.3 and 3.9% more Age 1.4 chinook salmon than actually occurred. In 1980, this method predicted 2.5% fewer Age 1.3 and 3.9% more Age 1.4 chinook salmon. In 1981, the largest differences occurred at the Little Susitna River as was the case in 1980.

From the 3 years of data, it appears that the largest source of error when using the length frequency distribution method occurs within the Age 1.3 age class. This method is most accurate when assessing populations

Table 6. Comparison of Scale Analysis and Length Frequency Distributions to Determine Chinook Salmon Age Composition, 1981.

Age	Willow Creek				Little Susitna River				Chunilna Creek			
	Length Frequency		Scale Analysis		Length Frequency		Scale Analysis		Length Frequency		Scale Analysis	
	n	%	n	%	n	%	n	%	n	&	n	%
1.2	29	12.7	29	12.7	9	7.0	9	7.0	56	44.5	56	44.5
1.3	84	36.7	101	44.1	56	43.4	37	28.7	42	33.3	52	41.3
1.4	116	50.6	95	41.4	64	49.6	80	62.0	28	22.2	15	11.9
1.5	...	...	...	...	...	...	...	...	...	...	...	...
2.2	...	...	...	...	...	...	...	...	...	...	...	...
2.3	...	...	2	0.9	...	...	2	1.6	...	...	3	2.4
2.4	...	...	2	0.9	...	...	1	0.7	...	...	...	...
Total	229		229		129		129		126		126	

Age	Caswell Creek				Montana Creek				Total			
	Length Frequency		Scale Analysis		Length Frequency		Scale Analysis		Length Frequency		Scale Analysis	
	n	%	n	%	n	%	n	%	n	%	n	%
1.2	13	27.7	13	27.7	114	47.1	114	47.1	221*	28.6	221	28.6
1.3	24	51.1	24	51.1	62	25.6	67	27.7	268	34.7	281	36.4
1.4	10	21.2	10	21.2	66	27.2	54	22.3	284	36.7	254	32.8
1.5	...	...	...	...	...	...	1	0.4	...	...	1	0.1
2.2	...	...	...	...	...	...	...	...	...	...	...	...
2.3	...	...	...	...	...	...	5	2.1	...	...	12	1.6
2.4	...	...	...	...	...	...	1	0.4	...	...	4	0.5
Total	47		47		242		242		773		773	

\* This age class was determined by the length frequency method only.

composed predominately of Age 1.4 chinook salmon. It has been noted during scale analysis that those Age 1.3 chinook salmon exceeding 95 cm in length have atypical growth patterns. The pattern of widely spaced circuli indicates that these chinook salmon were exposed to favorable saltwater growing conditions that were not encountered by the majority of Age 1.3 fish.

Analysis of the age structure of 1981 salmon spawning populations by measurements of carcasses was not possible due to persistent high water conditions. The 1981 age structure was determined solely from chinook salmon harvested in the various sport fisheries. Data results collected from either carcasses or sport harvested chinook salmon may result in slightly biased age determinations. Carcass recoveries reflect a higher percentage of Age 1.4 chinook salmon than were caught by anglers, while the sport catch reflects a larger number of Age 1.2 and Age 1.3 fish. Both methods identify general age structure characteristics of spawning populations.

Age composition of the chinook salmon sport harvest in the five streams during 1981 indicated that Age 1.3 fish were the largest age class with 36.4% of the total. The strong showing of this age class was expected because these fish are offspring from the 1976 parent escapement of 20,000, which was 125% higher than the previous high escapement of 8,900 fish recorded in 1973. This large return from the 1976 parent escapement was also documented in the 1980 fishery when 36.0% of the total chinook salmon harvested were from the Age 1.2 group (Watsjold, 1981).

The changes in chinook salmon age structure from 1979 to 1981 are depicted in Figures 4 and 5. In 1979, Montana and Willow Creeks and the Little Susitna River were strongly dominated by Age 1.4 fish. In 1980, the first year of adult returns from the 1976 parent escapement as 4-year-old fish, this strong dominance of Age 1.4 fish began to diminish due to the return of large numbers of Age 1.2 chinook salmon. This trend continued in the 1981 fishery when the two age classes returning from large parent escapements (Age 1.2 and Age 1.3 fish) composed 65.0% of the chinook salmon harvested.

The 1982 season will be the first year when all three major age classes will be returning from large parent escapements. The dominance of the Age 1.4 fish may be reestablished as variation in parent escapement decreases.

Watsjold (1981) noted that the Little Susitna River did not experience a large increase of Age 1.2 chinook salmon in 1980 and questioned if the large 1976 parent escapement had really occurred or if there had been poor survival of the offspring for some reason. Data from the 1981 fishery indicate that returns of 5-year-old fish, from the 1976 parent escapement, did increase substantially. This year's Age 1.2 chinook salmon return to the Little Susitna River, which were also presumably from a large parent escapement, were very similar to that of 1980.

#### Escapement:

In 1981, chinook salmon escapement surveys on east side Susitna River tributaries, tributaries of the Talkeetna and Chulitna Rivers and the

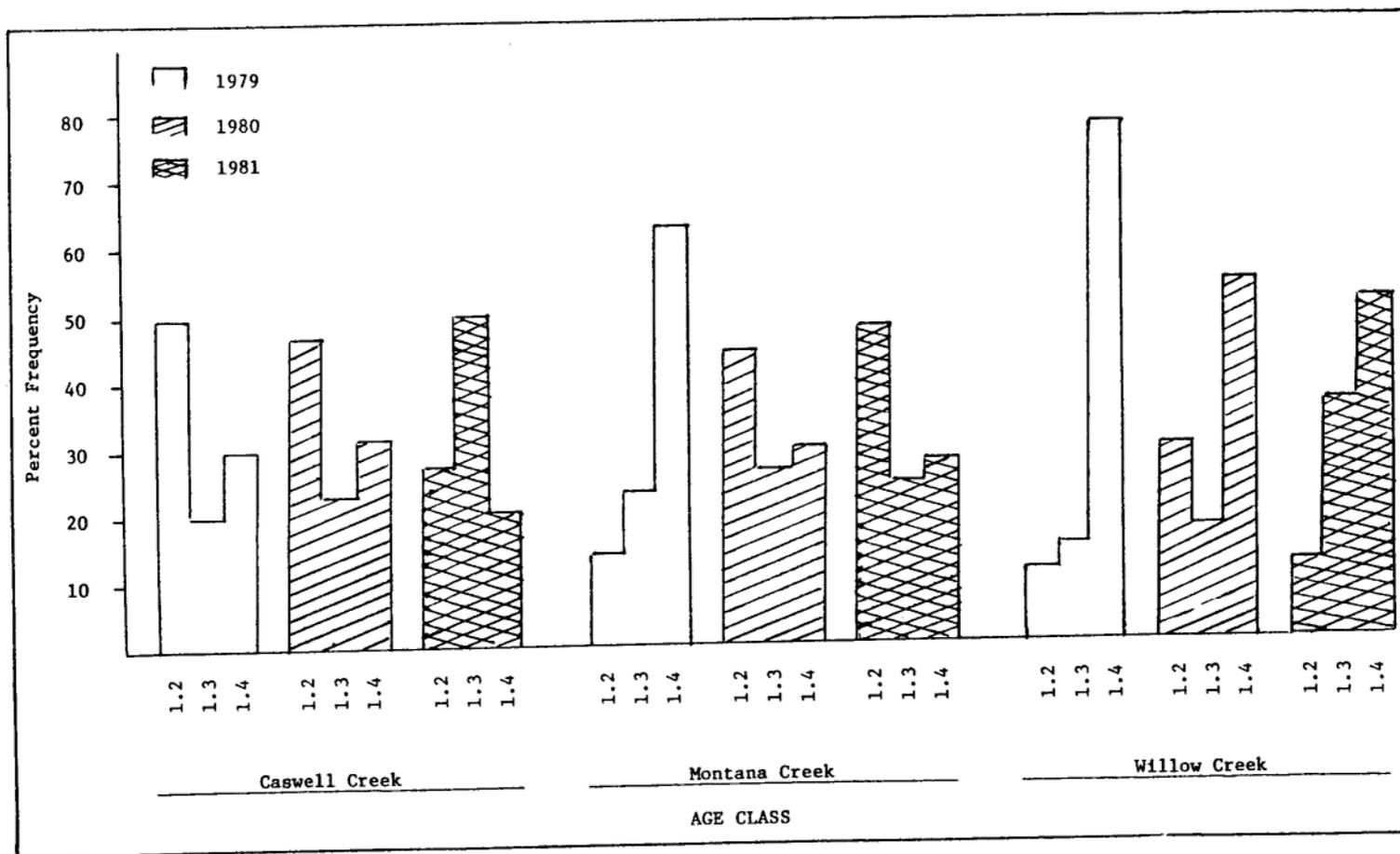


Figure 4. Comparison of Chinook Salmon Age Composition, as Determined by Length Frequency Analysis, of the 1979, 1980 and 1981 Sport Harvest.

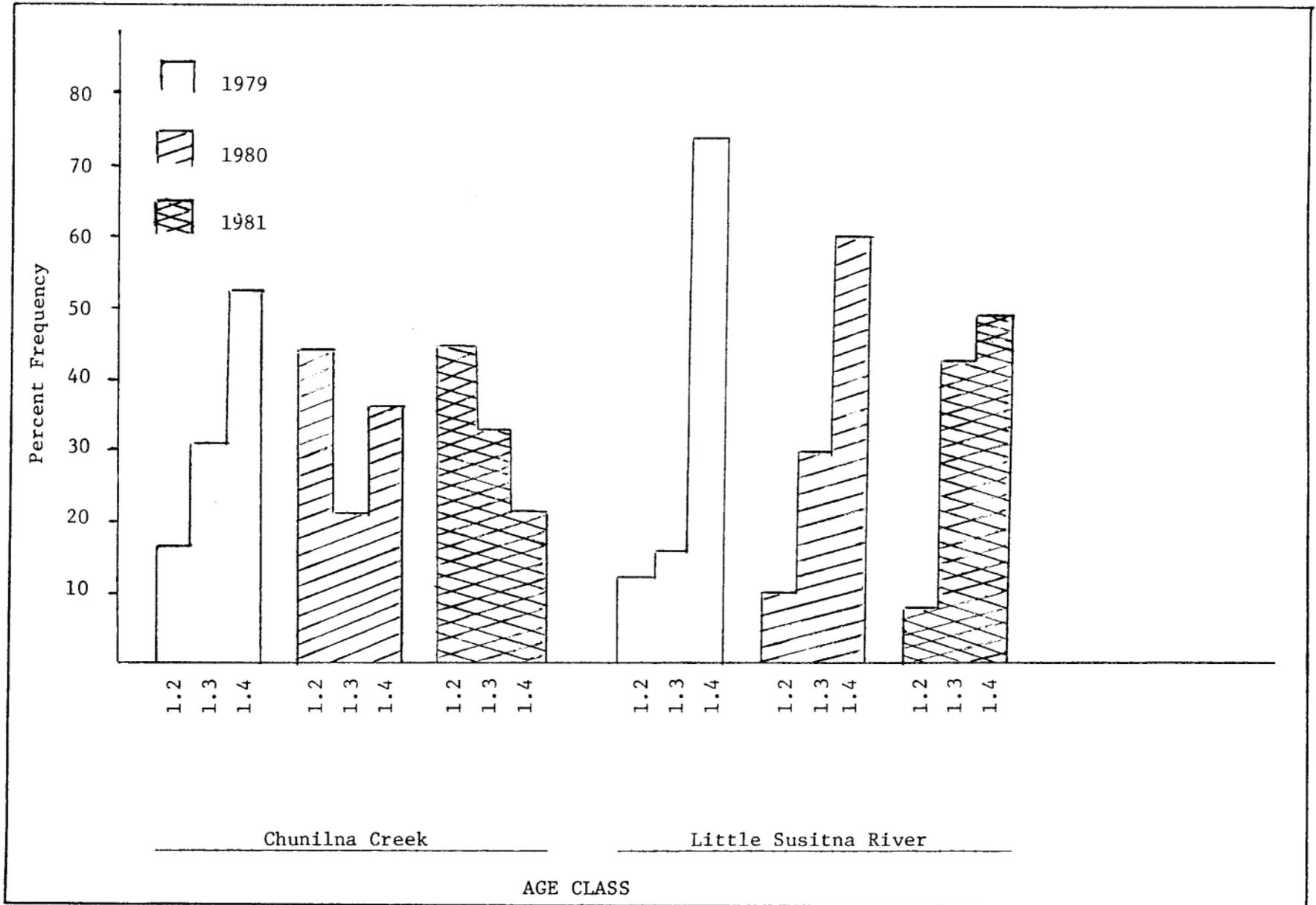


Figure 5. Comparison of Chinook Salmon Age Composition, as Determined by Length Frequency Analysis, of the 1979, 1980 and 1981 Sport Harvest.

Little Susitna River, were conducted from July 27 to July 31. Counts were restricted to this short time period due to heavy rains which resulted in high discharges in most streams. Due to the limited time available for accurate counts, aerial surveys were utilized exclusively. Watsjold (1974) found, during aerial surveys, chinook salmon were observed at 70.0% efficiency in alpine streams with little or no canopy cover, while in heavily wooded areas the efficiency dropped to 55.0%. Based on these findings and the fact that seven streams which were not counted represented 14.0% of the observed escapement over the past 4 years, it was estimated that the 1981 chinook salmon escapement was 13,300. An additional 2,175 fish were taken by anglers which, if added to the escapement number would be 15,475 total return. Estimated escapement counts for all eastside Susitna River streams from 1973 are given in Table 7.

Individual stream counts are presented in Table 8. The north fork of the Kashwitna River had a record escapement and Moose and Goose Creeks achieved the second highest counts since 1973. If counting conditions had been ideal escapement counts might have revealed near-record escapement levels in many of the streams.

#### Coho Salmon Studies

##### Creel Census:

A creel census program was initiated in 1981 for the coho salmon fisheries on the Little Susitna River and Cottonwood Creek. The coho salmon census on the Little Susitna River was scheduled at both the Burma Road and Parks Highway access points. The Burma Road census was conducted from July 18 through September 7. The Parks Highway census was scheduled to run from August 1 through September 7. However, due to a lack of census personnel, this census was terminated on August 24. The Cottonwood Creek census was conducted during 5 consecutive weekends beginning July 25.

The total coho salmon harvest at the Little Susitna River was estimated from angler interviews at 5,222 fish with 4,380 man-days of effort (Table 9). Catch per hour and per man-day averaged 0.31 and 1.19, respectively. These catch rates compare favorably with other coho salmon fisheries in southcentral Alaska. Hammarstrom (1981) reported 0.251 coho salmon per hour as the highest catch rate recorded on the Kenai River from 1975 through 1980. Catch rates of coho salmon on the Deshka River averaged 0.05 and 0.19 per hour in 1977 and 1978 respectively (Kubik and Wadman, 1979).

Creel census personnel at the Burma Road access site discovered, during their angler counts, that a large number of anglers fishing in the lower river downstream from the access site originated from Anchorage. These anglers boated across Knik Arm at high tide, fished in the lower river and would return to Anchorage on a later high tide. These anglers harvested 3,100 coho salmon with 1,673 man-days of effort which is 60% and 38% of the respective totals.

The average length of the angler day on the Little Susitna River appeared to be dependent on accessibility and availability of fish. Length of the average angler day, including both shore and boat anglers, at the Burma Road access site averaged 4.5 hours while a Parks Highway angler averaged

Table 7. Chinook Salmon Escapement Counts and Population Estimates,  
East Side Susitna River Tributaries, 1973-1981.

Year	Observed Counts	Estimated Counts
1973	8,086	8,900
1974	3,356	4,100
1975	1,247	1,500
1976	16,753	19,900
1977	14,199	17,028
1978	12,853	15,365
1979	5,454*	15,000
1980	**	
1981	7,826***	13,300

\* Count does not include six streams which in the past three years represented 53% of the escapement.

\*\* No counts were made due to poor conditions.

\*\*\* Count does not include seven streams which in the last three years of good counts represented 14% of the escapement.

Table 8. Chinook Salmon Escapement Counts, Eastside Susitna River Tributaries, 1973-1981.

<u>Stream</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980**</u>	<u>1981</u>
Willow Creek	1,074	402	177	1,660	1,065	1,166*	848*	...	991
Upper Deception Creek	...	...	...	...	...	495	238	...	366
Montana Creek	527	280	229	1,445	1,443	881*	1,094*	...	814
Moose Creek	36	32	55	116	153	237	253	...	238
Prairie Creek	4,190	1,498	369	6,513	5,790	5,154	...**	...	1,875
Chunilna Creek	292	283	101	1,237	769	997	864*	...	169*
Kashwitna River (NF)	183	103	33	203	336	362	457	...	558
Little Willow Creek	371	139	103	833	598	436	324*	...	459
Sheep Creek	482	202	42	455	630	1,209	778	...	1,013
Indian River	122	102	31	537	393	114	285	...	422
Portage Creek	174	260	32	702	374	140	190	...	659
Chulitna River (EF)	42	41	7	112	168	59	...**	...	...**
Chulitna River (MF)	219	159	55	1,870	900	...**	...**	...	...**
Chulitna River (MS)	...	...	...	124	229	62	...**	...	...**
Goose Creek	...	41	13	160	133	283	...**	...	262
Honolulu Creek	...	...	...	24	36	13	37	...	...**
Byers Creek	...	...	...	53	69	...	28	...	...**
Troublesome Creek	...	...	...	92	95	...	58	...	...**
Bunco Creek	...	...	...	112	136	153	...**	...	...**

\* Poor counting conditions.

\*\* Streams uncountable due to high turbid water.

Table 9. Harvest and Effort Data of the Little Susitna River Sport Fishery for Coho Salmon in 1981.

	<u>Burma Road</u>				<u>Anchorage*</u>			<u>Parks Highway</u>				<u>TOTAL</u>
	WD**	<u>Shore</u> WE	WD	<u>Boat</u> WE	WD	WE	WD	<u>Shore</u> WE	WD	<u>Boat</u> WE		
Expanded Catch	123	13	797	446	2,520	580	49	58	325	311	5,222	
Man-Days	167	101	382	343	1,214	459	445	644	283	342	4,380	
$\bar{x}$ Hours Fished	3.0	2.6	4.5	5.7	4.5	5.7	1.5	1.4	4.4	4.8	4.3	
Catch/Hour	0.25	0.05	0.47	0.23	0.47	0.23	0.07	0.07	0.26	0.19	.31	
Fish/Man-Day	.74	.13	2.09	1.31	2.08	1.26	0.11	0.09	1.15	0.91	1.19	

\* Anglers from Anchorage that boated across Knik Arm during high tide to fish in the lower portion of the river.

\*\* WD = Weekday  
WE = Weekend

2.6 hours per day. Boat anglers fished 2.2 hours and 3.2 hours per day longer than their shore-based counterparts at the Burma Road and Parks Highway access sites, respectively. Average length of the shore angler-day was shorter on weekends than on weekdays at the Burma Road and Parks Highway sites, while boat anglers at the two sites fished longer on weekend days.

Catch rates ranged from 0.47 coho salmon per hour by boat anglers at the Burma Road site to 0.07 fish per hour by shore anglers at the Parks Highway. Boat anglers had consistently higher catch rates than shore anglers at both sites. This was expected on such a large river system where boat anglers are much more mobile than anglers on foot and can seek those areas where fish tend to concentrate. Both shore and boat anglers experienced higher catch rates during weekdays than on weekends.

Salmon harvest by the weekend-only fishery at Cottonwood Creek was estimated at 1,396 coho salmon and 1,945 sockeye salmon with 3,344 man-days of effort (Table 10). Catch rates averaged 0.136 and 0.189 fish per hour for coho and sockeye salmon respectively.

Creel census data, together with escapement information from the FRED Division weir located upstream from the fishing area indicated that the sport fishery harvested 31% of the total coho salmon run returning to the stream. The contribution of hatchery fish to the total run of 1981 was estimated at 27%, based on returns of fin-clipped fish.

Average catch rates were highest during early Saturday morning hours. This trend had been observed the past 2 years at the three weekend-only chinook salmon fisheries. It is probably due to a gradual concentration of fish built up during the week when there is no fishing pressure; thus relatively more fish are available on Saturday morning than at any other time during the weekend.

Extreme high tides caused a temporary decrease in fishing effort and harvest at Cottonwood Creek. The entire intertidal flood plain through which the stream runs becomes flooded and anglers cannot reach the stream bank. Also, the stream becomes turbid with the influx of glacial water from Knik Arm and salmon cannot see the lure as readily.

Age composition of coho salmon harvested in the two sport fisheries was strongly dominated by Age 2.1 or 4-year-old fish. At the Little Susitna River, 92.6% of the 94 aged by the scale analysis method were Age 2.1 with 3.2% of Age 1.1 fish and 2.1% Age 2.2 fish. At Cottonwood Creek, Age 2.1 and Age 1.1 coho salmon comprised 95.8 and 4.2%, respectively, of the 95 fish aged.

Sex determination data from angler interviews during the creel census indicate that the sport fisheries are more selective toward harvesting females than males in the lower sections of the streams. At Cottonwood Creek the male to female sex ratio of fish harvested during the sport fishery was 0.80:1. A representative sample of 516 coho salmon were sexed at the FRED Division's adult weir approximately 2 miles upstream from the fishing area and the sex ratio was 1.22:1.

Table 10. Harvest and Effort Data of the Cottonwood Creek Sport Fishery for Coho and Sockeye Salmon in 1981.

	1st Weekend		2nd Weekend		3rd Weekend		4th Weekend		5th Weekend		Total	
	7/25,26		8/1,2		8/9,10		8/15,16		8/22,23			
	SS*	RS	SS	RS	SS	RS	SS	RS	SS	RS	SS	RS
Expanded Catch	10 861	71 542	560	536 647	0	108	6	1,396	1,945			
Man-Days	674	743	773	672			482	3,344				
$\bar{x}$ Hours Fished	3.7	3.2	3.2	2.8	2.5		3.1					
Catch/ Hour	0.004 0.35	0.03 0.23	0.23	0.22 0.35	0	.09	0.005	0.136	0.189			
Fish/ Man-Day	.015 1.278	0.095 0.729	0.725	0.693 0.963	0	0.224	0.013	0.418	0.582			

\*SS = Coho Salmon

RS = Sockeye Salmon

The sex ratio of coho salmon harvested at the Burma Road site on the Little Susitna River was 0.59:1, while the sex ratio of coho salmon harvested at the Parks Highway area, approximately 40 river miles upstream, was 2.30:1. Reasons for this selective harvest are still unknown. If this tendency continues in the future years, it will be utilized in the formulation of management plans during years of low adult returns.

A comparison of average length and weight data of coho salmon harvested at the two streams is presented in Table 11. At Cottonwood Creek, female coho salmon exhibited larger length and weight measurements than the males, while the opposite occurred with Little Susitna River coho salmon. Little Susitna River fish were substantially larger than those in Cottonwood Creek. Average combined length and weight of Little Susitna River coho salmon were 10.4 cm and 2.9 lb, respectively, greater than that of Cottonwood Creek coho salmon.

Coho and sockeye salmon sport fish harvests by weekly period at the Little Susitna River and Cottonwood Creek are illustrated in Figure 6. Harvest estimates for coho and sockeye salmon at Cottonwood Creek were derived from weir counts for the time periods prior to and after the scheduled creel census was conducted. Harvest estimates were not fully computed for the Parks Highway site of the Little Susitna River as the coho salmon were just becoming accessible to anglers when the census was terminated prematurely. The sport fish harvest at the Burma Road site peaked during the week of July 25 when 48.0% of the total catch was taken while the peak harvest at Cottonwood Creek was 1 week later during the August 8 weekend.

#### Escapement:

Coho salmon spawning populations were enumerated by foot surveys in established escapement index areas on five streams during late September. A summary of escapement counts by index area is presented in Table 12. The 1981 coho salmon returns were from the 1977 parent escapement and were, in most cases, slightly lower than the record setting returns of 1980. However, the 1981 returns were the second highest since 1971.

Six escapement index areas within the Little Susitna River were surveyed in 1981 and coho salmon counts totaled 6,750. This represents a 9.7% increase from the same six index areas last surveyed in 1978.

Coho salmon counted through the weir operated on Fish Creek by the FRED Division totaled 2,444 fish in 1981 (Table 13). This is a decrease of over 6,000 coho salmon from the 1980 returns, but compares favorably with returns from 1978 and 1979.

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Alaska Department of Natural Resources, 1981. Land use plan for public lands in the Willow sub-basin, 366 pp.

Table 11. Comparison of Length and Weight Data of Coho Salmon harvested by the Little Susitna, Burma Road and Cottonwood Creek Sport Fishery in 1981.

<u>STREAM</u>	<u>LENGTH (cm)</u>				<u>WEIGHT (lb)</u>			
	n	$\bar{x}$	$\pm$ SD	RANGE	n	$\bar{x}$	$\pm$ SD	RANGE
Little Susitna River								
Burma Road								
Females	109	64.1	3.67	49.5-70.0	109	7.26	1.24	3.0-10.5
Males	92	66.8	4.27	51.0-77.0	92	8.45	1.64	3.5-12.5
Combined	201	65.3	4.18	49.5-77.0	201	7.81	1.55	3.0-12.5
Cottonwood Creek								
Females	55	55.7	5.97	42.0-70.0	55	5.13	1.85	2.5- 9.5
Males	37	53.8	5.29	42.0-67.5	37	4.59	1.39	2.0- 7.5
Combined	92	54.9	5.76	42.0-70.0	92	4.91	1.69	2.0- 9.5

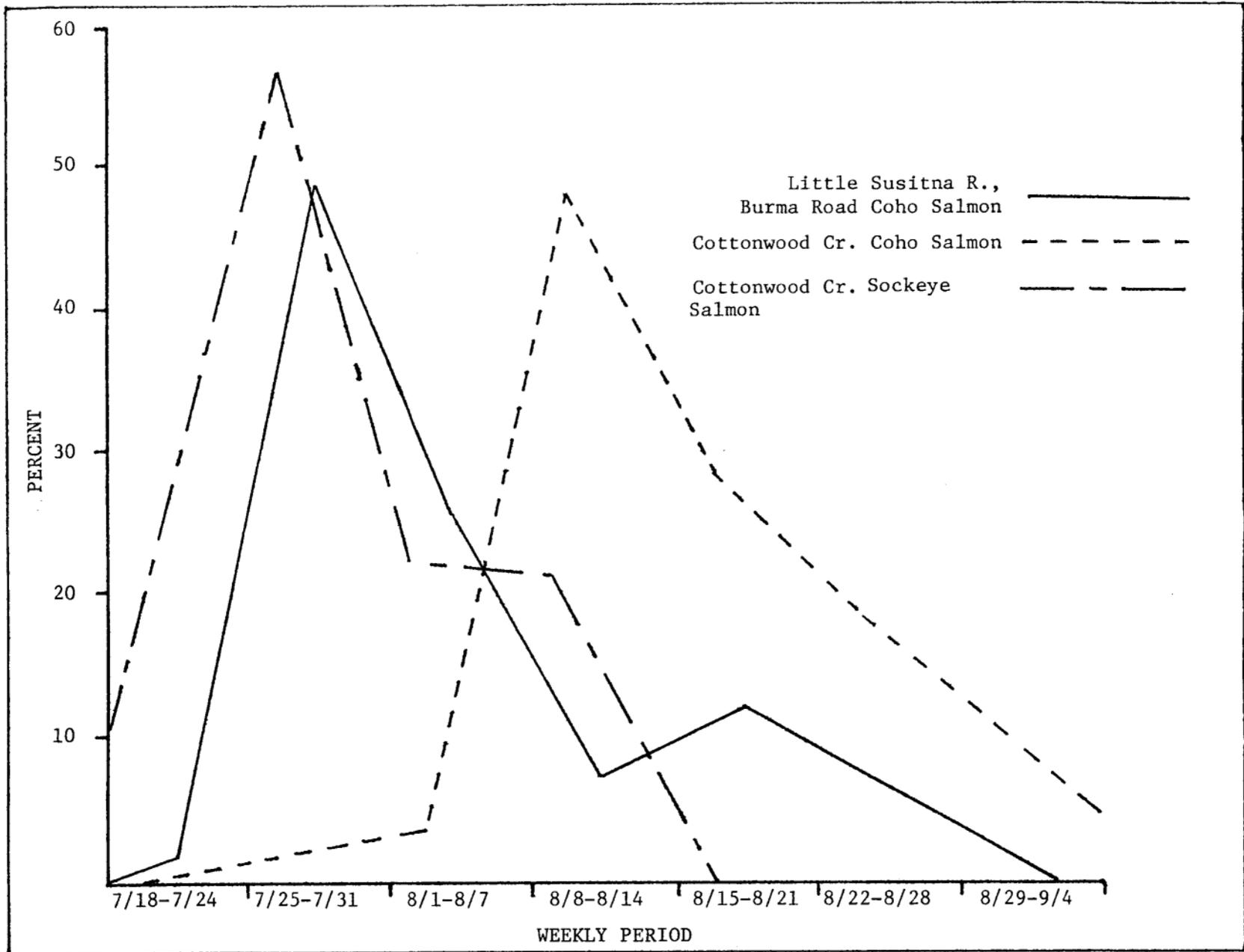


Figure 6. Coho and Sockeye Salmon Sport Fish Harvest by Weekly Period from the Little Susitna River and Cottonwood Creek in 1981.

Table 12. Number of Coho Salmon in Escapement Index Areas (foot counts), Upper Cook Inlet, 1971-1981.

Stream	1971	1972	1973	1974	1975	1976	1977*	1978	1979	1980*	1981
Wasilla (a)	104	19	28	30	49	151	...	74	61	...	58
Wasilla (b)	...	...	...	...	158	162	...	76	187	...	180
Cottonwood (a)	29	21	10	2	73	100	25	100	64	340	175
Cottonwood (b)	...	...	...	19	163	104	90	164	...	530	195
Birch	138	69	106	49	92	27	96	103	120	121	121
Question	...	...	59	3	111	126	87	45	384	321	230
Rabideaux	...	...	...	...	67	91	...	88	...	...	...
Total	271	109	203	103	713	761	298	650	816	1,312	959

\* High water conditions made several index area uncountable.

Table 13. Adult Coho Salmon Escapement Counts, Fish Creek, 1969-1981.

Year	Dates of Operation	Weir Counts
1969	July 31 - September 2	4,253
1970	July 19 - August 8	1,048
1971	July 8 - August 7	583
1972	July 2 - September 10	710
1973	July 1 - September 6	210
1974	July 8 - September 6	1,154
1975	July 3 - September 11	1,601
1976	July 5 - September 11	765
1977	July 6 - August 15	930
1978	July 7 - September 30	3,121
1979	July 8 - August 30	2,511
1980	July 4 - September 1	8,832
1981	July 9 - August 23	2,444

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Prepared by:

Robert W. Bentz, Jr.  
Fishery Biologist

Approved by:

Richard Logan, Ph.D.  
Director, Sport Fish Division

Mark C. Warner, Ph.D.  
Sport Fish Research Chief

