Fishery Data Series No. 99-17

Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 1998

by

Keith A. Pahlke

August 1999

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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TABLE OF CONTENTS

Page

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

LIST OF APPENDICES

Appendix **Page**

ABSTRACT

As part of a continuing stock assessment program in Southeast Alaska, the Division of Sport Fish obtained indices of escapement for chinook salmon *Oncorhynchus tshawytscha* in designated streams and transboundary rivers. The estimated total escapement in 1998 was 65,353 large (age .3 and older) chinook, a 64% decrease from the escapement of 179,968 fish estimated in 1997. The 1998 estimate was 152% of the 1975–1980 base period average of 42,437 chinook salmon, 103% of the 1981–1985 average of 62,591 and 72% of the 1986–1990 average of 89,249. The estimated total was the lowest since 1984.

Eight out of eleven escapement indices declined from 1997; however, indices exceeded goals in the Alsek, Situk, Chilkat, Unuk, and King Salmon rivers and Andrew Creek, and were near goal in the Stikine River. Escapement to Chickamin River increased from 1997 but remained below goal.

Key words: chinook, *Oncorhynchus tshawytscha*, escapement, Taku River, Stikine River, Alsek River, Chilkat River, Unuk River, Chickamin River, Blossom River, Keta River, Marten River, Wilson River, King Salmon River, Situk River, Andrew Creek, Behm Canal, Southeast Alaska, U.S./Canada Treaty, transboundary rivers.

INTRODUCTION

Chinook salmon *Oncorhynchus tshawytscha* are known to occur in 34 rivers in, or draining into, the Southeast region of Alaska from British Columbia or Yukon Territory, Canada, (Kissner 1977). In the mid-1970s it became apparent that many of the chinook salmon stocks in this region were depressed, relative to historical levels of production (Kissner 1974), and a fisheries management program was implemented to rebuild stocks in Southeast Alaska streams and in transboundary rivers (rivers that originate in Canada and flow into Southeast Alaska coastal waters; ADF&G 1981). Initially, this management program closed commercial and recreational fisheries in terminal and near-terminal areas in U.S. waters.

In 1981, this program was formalized and expanded to a 15-year (roughly 3 life-cycles) rebuilding program for the transboundary Taku, Stikine, Alsek, Unuk, Chickamin, and Chilkat rivers and the non-transboundary Blossom, Keta, Situk, and King Salmon rivers (ADF&G 1981) (Figure 1). The program used region-wide, all-gear catch ceilings for chinook salmon, designed to rebuild spawning escapements by 1995 (ADF&G 1981). In 1985, the Alaskan program was incorporated into a comprehensive coastwide rebuilding program for all wild stocks of chinook salmon, under the auspices of the U.S./Canada Pacific Salmon Treaty (PST).

To track the rate of rebuilding, the Alaska Department of Fish and Game (ADF&G), the Canadian Department of Fisheries and Oceans (DFO), and the Taku River Tlingit First Nation (TRTFN) count spawning chinook salmon in a designated set of watersheds (Appendix A1). These streams were selected on the basis of their historical importance to fisheries, size of the population, geographic distribution, extent of the historical database, and ease of data collection. Counts from each of these streams are considered to be indicators of relative abundance, based on the assumption that counts are a relatively constant proportion of the annual escapement in an index area or watershed. These data are provided annually to the Joint Chinook Technical Committee (CTC) of the Pacific Salmon Commission (PSC), who use them to evaluate rebuilding progress of escapement indicator stocks (PSC 1996). Judgments as to rebuilding progress provide a basis for regulations to restrict or expand fisheries to achieve rebuilding goals.

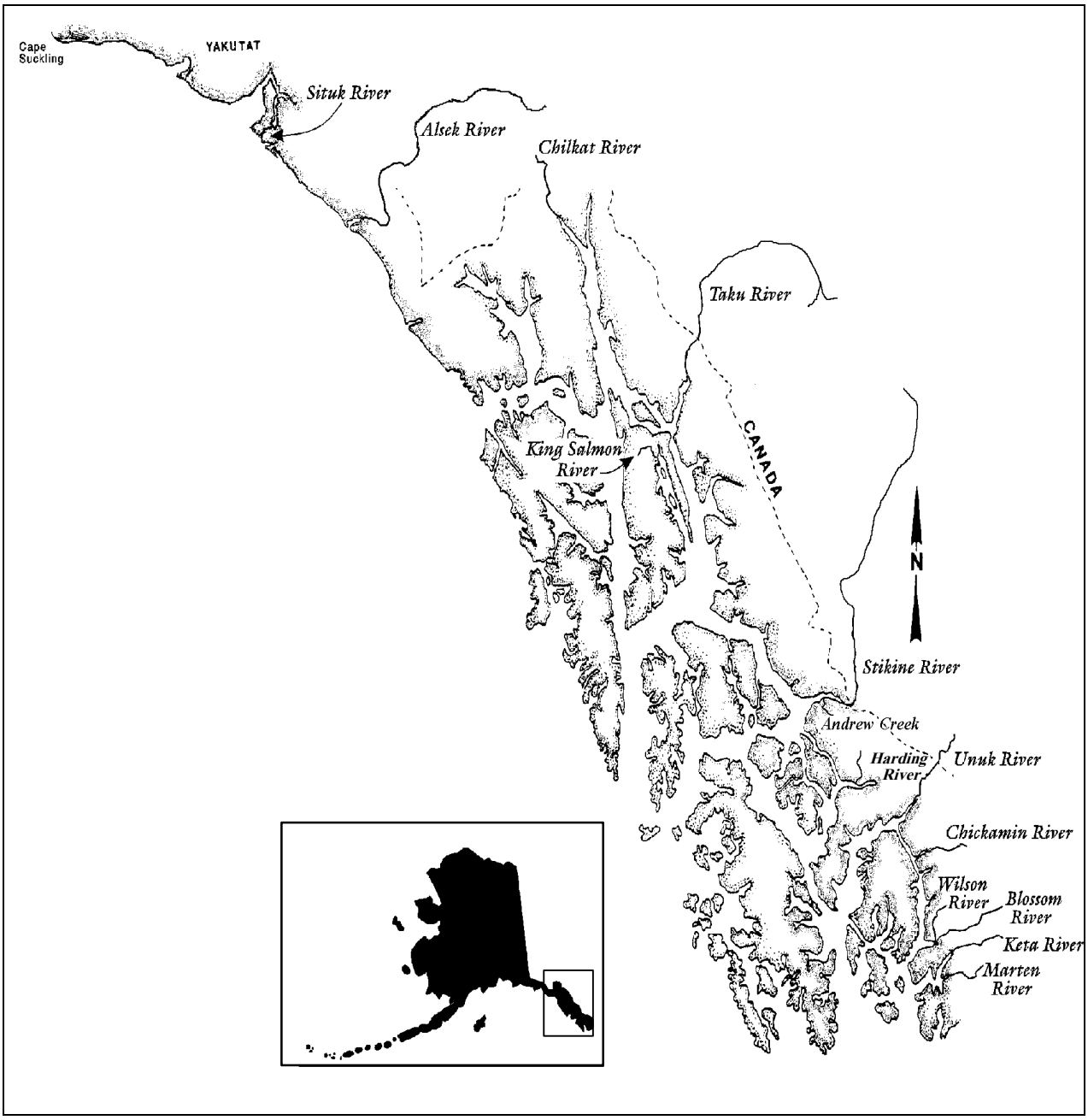

Figure 1.–Location of selected chinook salmon systems in Southeast Alaska, Yakutat, and transboundary rivers.

As part of a continuing program by the Division of Sport Fish to improve wild chinook stocks, this project obtained indices of spawner abundance for major chinook salmon stocks in Southeast Alaska. Objectives for 1997 were to count large (≥660 mm mid-eye to fork length, or ocean-age 3 and older) spawning chinook salmon during the time of peak abundance in tributaries and mainstem areas of the Stikine, Taku, Alsek, Situk, Unuk, Chickamin, Keta, Blossom, King Salmon rivers and in Andrew Creek, and to compile and compare the indices to those from past years.

DESCRIPTION OF STUDY SITES

Many individual spawning areas are surveyed annually in a designated set of watersheds. Detailed descriptions and maps of these areas are found in Mecum and Kissner (1989), and general descriptions of the watersheds are below.

The Taku River originates in northern British Columbia and flows into the ocean 48 km east of Juneau, Alaska. The Taku River drainage covers over 17,000 km^2; average monthly flows range from 60 m^3/sec in February to 1,097 m^3/sec in June (Bigelow et al. 1995). Principal tributaries are the Sloko, Nakina, Sheslay, Inklin, and Nahlin rivers. The clearwater Nakina and Nahlin rivers contribute less than 25% of the total drainage discharge; most is from glacier-fed streams on the eastern slope of the Coast Range of British Columbia. Upstream of the abandoned mining community of Tulsequah, British Columbia, the drainage remains in pristine condition, with very few mining, logging, or other development activities. The upper Taku River area is extremely remote, with no road access and few year-round residents. All of the important chinook salmon spawning areas are in tributaries in the upper drainage in British Columbia.

Stock assessment of chinook salmon has been conducted intermittently on the Taku River since the 1950s, and standardized helicopter surveys of the index areas have been conducted annually since 1973. Survey index areas include portions of the Nakina, Nahlin, Dudidontu, Tatsamenie, and Kowatua rivers and Tseta Creek. In addition, the DFO, TRTFN, and ADF&G have operated a carcass collection weir since 1973 below the major spawning area on the Nakina river which provides an estimate of the age and size composition of the escapement. Annual mark-recapture experiments are providing independent estimates of total escapement (McPherson et al. 1996, 1997, 1998).

The Stikine River originates in British Columbia and flows to the sea approximately 32 km south of Petersburg, Alaska. Its drainage covers about 52,000 km^2, much of which is inaccessible to anadromous fish because of natural barriers and velocity blocks. The Stikine River's principal tributaries include the Tahltan, Chutine, Scud, Iskut, and Tuya rivers. The lower river and most tributaries are glacially occluded (e.g., the Chutine, Scud, and Iskut rivers).

Only 2% of the Stikine River drainage is in Alaska (Beak Consultants Limited 1981), and the majority of the chinook salmon spawning areas in the Stikine River are located in British Columbia, Canada, in the mainstem Tahltan and Little Tahltan rivers (including Beatty Creek). However, Andrew Creek, in the U.S. portion of the lower Stikine River, supports a significant run of chinook salmon. The upper drainage of the Stikine is accessible via the Telegraph Creek Road. Development includes several active mines in the Canadian portion of the Stikine drainage and proposals for major hydroelectric projects.

Helicopter surveys of the Little Tahltan River index area have been conducted annually since 1975, and the DFO has operated a fish counting weir at the mouth of the Little Tahltan River since 1985. Counts from the weir represent the total escapement to that tributary. Since 1996, mark-recapture experiments have provided independent estimates of total escapement to the Stikine River (Pahlke and Etherton 1998).

Andrew Creek flows into the lower Stikine River in Alaska, not far from the limit of tidal influence. From 1976 to 1984, a weir was operated on Andrew Creek to provide brood stock for hatcheries. Foot, aerial and helicopter surveys to count chinook salmon have been conducted annually since 1985. A new weir was installed on Andrew Creek in 1997 and operated again in 1998.

The Alsek River originates in Yukon Territory, Canada, and flows in a southerly direction into the Gulf of Alaska approximately 75 km south-east of Yakutat, Alaska. Its largest tributaries are the Dezadeash and Tatshenshini rivers. The

Alsek River drainage covers about 28,000 km^2 (Bigelow et al. 1995), but much of it, including the mainstem of the Alsek itself, is inaccessible to anadromous salmonids because of velocity barriers. The significant spawning areas for chinook salmon are found mostly in tributaries of the Tatshenshini River, including the Klukshu, Blanchard, and Takhanne rivers and in Village and Goat creeks. The Klukshu and upper Tatshenshini rivers are accessible by road near Dalton Post, Yukon Territory.

Counts of chinook salmon have been collected on the Alsek River since 1962. Beginning in 1976, the DFO has operated a weir at the mouth of the Klukshu to count chinook, sockeye *O. nerka*, and coho salmon O. *kisutch*. The count of chinook salmon through the Klukshu River weir is used as the index for the Alsek River. Some aboriginal harvest takes place above the weir. Aerial surveys to count spawning chinook salmon have been conducted by ADF&G with a helicopter since 1981. Prior to 1981, surveys were made from fixed-wing aircraft. The escapement to the Klukshu River is difficult to count by aerial, boat or foot surveys because of deep pools and overhanging vegetation. However, surveys of the Klukshu River are conducted annually to provide some continuity in estimates in the event that funding for the weir is discontinued. The Blanchard and Takhanne Rivers and Goat Creek, three smaller tributaries of the Tatshenshini River, are also surveyed annually, but are not used to index escapements.

In 1998, a mark-recapture and radio telemetry study was conducted to estimate the escapement and distribution of spawning chinook salmon in the Alsek River (Pahlke and Etherton *in prep*).

The Unuk, Chickamin, Blossom, and Keta river drainages all feed into Behm Canal—a narrow passage of water east of Ketchikan, Alaska. Misty Fiords National Monument/ Wilderness Area surrounds the eastern or "back" Behm Canal and includes the Boca de Quadra fjords. Many mainland rivers in the area support chinook salmon; the Unuk, Chickamin, Blossom and Keta rivers are designated chinook salmon escapement index systems.

The Unuk River originates in a glaciated area of British Columbia and flows 129 km to Burroughs Bay, 85 km northeast of Ketchikan, Alaska; only the lower 39 km of the river are in Alaska. The Unuk is a large braided, glacially occluded river with a drainage of approximately 3,885 km^2. Most (~85%) spawning occurs in tributaries of the Alaska portion of the river (Pahlke et al. 1996). The escapement index areas are all small clear-water tributaries: Eulachon River and Cripple, Genes Lake, Clear, Lake, and Kerr creeks. Cripple Creek and Genes Lake Creek cannot be surveyed by air because of heavy vegetation, so fish are counted by foot survey. Chinook salmon have been counted annually by foot or helicopter surveys in these areas since 1977. Chinook salmon have been periodically counted in Boundary Creek, but survey conditions there are often poor and the counts are not included in the index. Total escapement was estimated by a mark-recapture project in 1994 (Pahlke et al. 1996) and repeated in 1997 and 1998 (Jones et al. 1998; Jones and McPherson *in prep*).

The Chickamin River is a large, glacial river that originates in British Columbia, and flows into Behm Canal approximately 32 km southeast of Burroughs Bay and 65 km northeast of Ketchikan. Although technically a transboundary river, the Chickamin has no chinook spawning areas upstream from the Canadian border (Pahlke 1997a). Important spawning tributaries are the South Fork of the Chickamin and Barrier, Butler, Indian, Leduc, Humpy, King, and Clear Falls creeks. Chinook salmon have been counted by foot or helicopter surveys in index areas of the Chickamin River each year since 1975. Total escapement was estimated by mark-recapture projects in 1995 and 1996 and spawning distribution was estimated by radio telemetry in 1996 (Pahlke 1996; Pahlke 1997a).

The Blossom, Keta, Wilson, and Marten rivers are non-transboundary rivers that flow into Behm Canal approximately 45 km east of

Ketchikan. These rivers lie inside the boundaries of the Misty Fiords National Monument in southern Behm Canal but are within an area that has been specifically excluded from Wilderness designation, because of the potential development of a large-scale molybdenum mine (Quartz Hill) near the divide of the Blossom and Keta rivers. The mine is presently undeveloped, but an access road has been completed; it terminates at salt water near the mouth of the Blossom River.

The Keta River drainage covers about 192 km^2 and the Blossom about 176 km^2 (Bigelow et al. 1995) and have been surveyed by helicopter annually since 1975. Chinook salmon escapements to the Wilson and Marten rivers have been monitored on an intermittent basis in recent years. Mark-recapture experiments were conducted in 1998 to estimate the escapement of chinook salmon in the Blossom and Keta rivers (Brownlee et al. 1999).

The King Salmon River drains an area of approximately 100 km^2 on Admiralty Island, flowing into King Salmon Bay on the eastern side of Stephens Passage about 48 km south of Juneau. The King Salmon River is the only island river system in Southeast Alaska to support more than 100 spawning chinook salmon. ADF&G operated a weir on the King Salmon River from 1983 through 1992 to count chinook salmon and collect broodstock for Snettisham Hatchery.

The Chilkat River is a large glacial river which originates in Yukon Territory, Canada, and flows into Chilkat Inlet at the head of northern Lynn Canal near Haines, Alaska. Helicopter and foot surveys are an ineffective index of abundance for this system (Johnson et al. 1992) and were suspended in 1993, in favor of annual estimates of escapement using mark-recapture methods. Total escapement has been estimated annually since 1991 (Ericksen 1998).

The Situk River is located about 16 km east of Yakutat, Alaska. The Situk supports a large run of sockeye salmon which are harvested in commercial and subsistence set gillnet fisheries concentrated at the mouth of the Situk River. Situk River chinook salmon are harvested both incidentally and targeted in the set gillnet fisheries, depending on run strength, and in a recreational fishery in the river. A weir was operated on the Situk River at the upper limit of the intertidal area from 1928 to 1955 to count all five species of Pacific salmon spawning in the river. Since 1976, a weir has been operated primarily to count chinook and sockeye salmon. The proportion of the recreational harvest above the weir varies from year to year (Howe et al. 1998).

METHODS

There are 34 river systems in the region (Figure 1) with populations of wild chinook salmon. Three transboundary rivers, the Taku, Stikine, and Alsek, are classed as major producers—each with potential production (harvest plus escapement) greater than 10,000 fish. Nine rivers are classed as medium producers, each with production of 1,500 to 10,000 fish. The remaining 22 rivers are minor producers, with production less than 1,500 fish. Small numbers of chinook salmon occur in other streams of the region but they are not included in the above because successful spawning has not been documented. Chinook salmon are counted via aerial surveys or at weirs each year in all three major producing systems, in six of the medium producers, and in one minor producer (Appendix A1). These index systems, along with the Chilkat River, are believed to account for up to 90% of the total chinook salmon escapement in Southeast Alaska and transboundary rivers.

Escapement Goals

The initial rebuilding program established interim escapement goals in 1981 for nine systems: the Alsek, Taku, Stikine, Situk, King Salmon, Unuk, Chickamin, Keta and Blossom/Wilson Rivers. Although the aim was to have escapement goals that provided the optimal level of harvest, little data was available to produce such estimates. As a result, escapement goals were originally set based on the highest observed escapement count prior to 1981 (Pahlke 1997). Goals for the

Chilkat River and Andrew Creek were added in 1985. Escapement goals have been revised when sufficient new information warrants. Most of the revised escapement goals have been developed as ranges of optimum escapement rather than a single point estimate (Appendix A1). Pahlke (1997b) provides detailed descriptions of the escapement goals and their origins.

INDICES OF ESCAPEMENT

Spawning chinook salmon are counted at 26 designated index areas in nine of the systems; complete counts of chinook salmon are obtained at the Situk River weir. Counts are made during aerial or foot surveys during periods of peak spawning, or at weirs. Peak spawning times, defined as the period when the largest number of adult chinook salmon actively spawn in a particular stream or river, are well-documented from surveys of these index areas conducted over the past 23 years (Kissner 1982; Pahlke 1997b). The proportion of fish in pre-spawning, spawning and post-spawning condition is used to judge whether the survey timing is correct to encompass peak spawning. Index areas are surveyed at least twice unless turbid water or unsafe flying conditions preclude the second survey.

Only large (typically age-.3, -.4, and -.5) chinook salmon, $\geq$660 mm mideye-to-fork length (MEF), are counted during aerial or foot surveys. No attempt is made to accurately count small (typically age-.1 and -.2) chinook salmon <660 mm (MEF) (Mecum 1990). These small chinook salmon, also called jacks, are early maturing, precocious males considered to be surplus to spawning escapement needs. They are easy to separate visually from their older age counterparts under most conditions, because of their short, compact bodies and lighter color. They are, however, difficult to distinguish from other smaller species such as pink *O. gorbuscha* and sockeye salmon.

Aerial surveys are conducted from a Bell 206 or Hughes 500D helicopter. Pilots are directed to fly the helicopter from 6 to 15 meters above the river bed at a speed of 6–16 km/h. The helicopter door on the side of the observer is removed, and the helicopter is flown sideways while observations of spawning chinook salmon are made from the open space. Foot surveys are conducted by at least two people walking in the creek bed or on the riverbank.

Counts and other observations from the 1998 surveys (Appendix A3) are entered into the ADF&G CFMD Integrated Fisheries Database (IFDB) in Juneau for archiving and general distribution.

Estimates of total escapement are needed to model total production, exploitation rates and other population parameters. To estimate escapement (since indices are only a partial count of spawning abundance), counts from index areas are increased by an expansion factor (Table 1). An expansion factor is a judgment as to the proportion of the total season's escapement counted in the specific area during the peak spawning period and a judgment as to the proportion of spawners observed in index areas relative to the escapement to the entire drainage (i.e., not all tributaries or spawning areas were surveyed). Expansion factors are based on comparisons with weir counts, mark-recapture estimates, and spawning distribution studies or by professional judgment. They vary among index areas according to the difficulties encountered in observing spawners, such as overhanging vegetation, turbid water conditions, presence of other salmon species (i.e., pink and chum *O. keta* salmon), or protraction of run timing. Expansion factors range from 1.5 for the King Salmon River to 4 for most other index areas (Table 1).

Escapement counts are obtained from a fish-counting weir on the Situk River and a mark-recapture program on the Chilkat River. Survey expansions are not necessary for those streams where weirs or other estimation programs are used to count all migrating chinook salmon.

Finally, to estimate total regional escapement, counts are additionally expanded to account for the unsurveyed systems. (Appendix A1). Presently, we believe the total estimated escapement in the index areas represents

approximately 90% of the region total. Escapement estimates for the Chilkat River are not available prior to 1991. From 1991 to 1997 the estimated escapement to the Chilkat River averaged 6% of the estimated regionwide total. Therefore, prior to 1991 the expanded index counts represent approximately 84% of the estimated Southeast Alaska total escapement.

Expansion factors for individual rivers have been revised, based on results from experiments to estimate total escapement and spawner distribution. For example, estimated total escapement and radio-tracking distribution data were used to revise tributary expansion factors for the Taku and Unuk rivers (Pahlke et al. 1996; McPherson et al. 1996 and McPherson et al. 1997). Mark-recapture studies to estimate spawning abundance on the Unuk River in 1994 (Pahlke et al. 1996) and on the Chickamin River in 1995 and 1996 (Pahlke 1996, Pahlke 1997a) were used to revise expansion factors for those two rivers in 1996; results were also applied to the nearby Blossom and Keta rivers. On Andrew Creek, a weir was operated in four years (1979, 1981, 1982, and 1984), during which index counts were also made, establishing a new expansion factor for that system in 1995. Also in 1997, ten years (1983–1992) of matched weir and index counts were used to revise the expansion factor for the King Salmon River (McPherson and Clark 1999). The expansion factors for the Taku River were revised in 1996 based on the results of four years of mark-recapture studies (Pahlke and Bernard 1996, McPherson et al. 1998). No adjustments to expansion factors were made in 1998.

These studies have helped to estimate total escapement in the region and have shown that, in most cases, the surveyed index areas provide reasonably accurate trends in escapements. However, Johnson et al. (1992) demonstrated that expansion factors used prior to 1991 on the Chilkat River system were highly inaccurate, because the index areas received less than 5% of the escapement. Consequently, since 1991, escapement to the Chilkat River has been estimated annually by mark-recapture experiments (Ericksen 1997). Studies on the Taku, Unuk, Chickamin, and King Salmon rivers, as well as on Andrew Creek, have shown that the index expansion factors used on those systems were much more accurate than those used on the Chilkat (PSC 1991, Pahlke 1996, Pahlke 1997a). Expansion factors will continue to be revised as additional data become available.

Ongoing research projects should provide more information on the expansion factors for the Taku, Stikine, Unuk, Blossom, Keta, and Alsek rivers, and Andrew Creek. Estimates of escapement from expanded counts are included in this document to provide gross figures of spawner abundance, with the caveat that expansion factors may produce incorrect estimates in some cases.

RESULTS

From 1984 to 1993, the estimated escapement of chinook salmon in Southeast Alaska increased steadily for 10 years, peaking in 1993 (Appendix A2). This was due primarily to strong returns to the Taku, Stikine, and Chilkat rivers, which together make up over 75% of the regional escapement goal. Escapements declined in 1994 and 1995 and then peaked again in 1996 and 1997 as a result of record high escapements in the Taku River.

In 1998, 43 locations, 25 of which were designated index areas, were surveyed specifically for chinook salmon escapement (Appendix A3). Surveys generally progressed as planned, but the Klukshu River helicopter survey was not conducted.

The estimated escapement (expanded) of chinook salmon for all Southeast Alaska and transboundary rivers in 1998 was 65,353 (Table 1), a 64% decrease from the estimated 179,968 fish in 1997. The estimate for 1997 and prior years was revised from previous reports using updated estimates. The estimated total for the region declined for the first time in 3 years, primarily due to a large decline in escapement to the Taku River, which had an extremely high escapement in 1997. The 1998 escapement is 152% of the 1975–1980 base period average of

Table 1.–Estimated escapement of chinook salmon to Southeast Alaska and transboundary rivers in 1998.

	Survey area	Number counted	Survey expansion factor	Estimated escapement
Major producers				
Alsek River	Klukshu	1,347 [a]	1.5625	1,879 [b]
Taku River	6 tributaries	6,329	4.0 [c]	25,316
Stikine River	Little Tahltan	4,873	4.0	19,492
Category subtotal				46,687
Medium producers				
Situk River	all	1,353	1.0	1,153 [d]
Chilkat River	all	3,337	[e]	3,337
Andrew Cr.	all	487	2.0	974
Unuk River	6 tributaries	840	4.0	4,132 [f]
Chickamin River	8 tributaries	391	4.0	1,564
Blossom River	all	91	2.5	393 [f]
Keta River	all	180	2.5	446 [f]
Category subtotal		6,682		11,999
Minor producers				
King Salmon R.	all	88	1.5	132
Index system total				58,818
Region total			[g]	65,353

[a] Klukshu weir count of 1,364 minus aboriginal fishery harvest above weir (17).

[b] Estimated escapement reduced by 137 aboriginal fishery and 89 sport fish harvest below weir.

[c] Revised in 1997 (McPherson et al. 1997), 1998 mark-recapture estimate incomplete.

[d] Situk River weir count minus estimated sport harvest above weir (200).

[e] Mark-recapture estimates used instead of expansion factors.

[f] Mark-recapture estimate available in 1998.

[g] Regional expansion factor (90%) developed in 1998.

42,437 chinook salmon, 103% of the 1981–1985 average of 62,591, 72% of the 1986–1990 average of 89,249, and 66% of the 1991-1995 average of 97,674 fish (Appendix A2).

TAKU RIVER

The count of 6,329 large chinook salmon in the six index areas of the Taku River was the lowest since 1987 (Table 2) with counts in five of six tributaries below average (Table 3). Counts increased steadily from 1983 to 1993, meeting the revised six-tributary escapement goal (PSC 1991) of 13,210 fish for the first time in 1993 and exceeding the goal in 1996 and again in 1997 (Figure 2).

Counts were expanded by a survey expansion factor of 4.0. The expansion factor was revised in 1997 based on four years of mark-recapture experiments on the Taku River (Table 4) (Pahlke and Bernard 1996; McPherson et al. 1997). These changes were not adopted by the Transboundary River Technical Committee (TBTC) of the PSC, who in 1991 revised the index escapement goal to be composed of the sum of counts from all six index tributaries (PSC 1991). The PSC goal uses no expansion factors but refers to chinook salmon actually counted during surveys. Expansion of the survey counts by 4.0 results in an escapement estimate of 25,316 large chinook salmon. A mark-recapture experiment conducted in 1997, resulted in a much higher escapement estimate (114,938 large fish; McPherson et al. 1998) than the expanded count of 55,396 reported in the 1997 escapement report (Pahlke 1998).

Table 2.–Counts of spawning chinook salmon in index areas of the Taku River, 1951–1998.

Year[a]	Nakina River	Nahlin River	Kowatua River	Tatsamenie River	Dudidontu River	Tseta Creek	Total
1951	5,000 (F) [b]	1,000	–	–	400 (F)	100 (F)	6,500
1952	9,000 (F)	–	–	–	–	–	9,000
1953	7,500 (F)	–	–	–	–	–	7,500
1954	6,000 (F)	– (F)	–	–	–	–	6,000
1955	3,000 (F)	–	–	–	–	–	3,000
1956	1,380 (F)	–	–	–	–	–	1,380
1957	1,500 (F/W)	–	–	–	–	–	1,500 [c]
1958	2,500 (F/W)	2,500 (A)	–	–	4,500 (A)	–	9,500 [c]
1959	4,000 (F/W)	–	–	–	–	–	4,000 [c]
1962	–	216 (A)	–	–	25 (A)	81 (A)	322
1965	3,050 (H)	35 (A)	200 P(A)	50 P(A)	110 (A)	18 (A)	3,463
1966	3,700 P(A)	300 (A)	14 P(A)	100 P(A)	252 (A)	150 (A)	4,516
1967	700 (A)	300 P(A)	250 P(A)	–	600 (A)	350 (A)	2,200
1968	300 P(A)	450 (A)	1,100 (A)	800 E(A)	590 (A)	230 (A)	3,470
1969	3,500 (A)	–	3,300 (A)	800 E(A)	–	–	7,600
1970	–	26 (A)	1,200 P(A)	530 E(A)	10 (A)	25 (A)	1,791
1971	500 (A)	473 (A)	1,400 E(A)	360 E(A)	165 (A)	– (A)	2,898
1972	1,000 (F)	280 (A)	170 (A)	132 (A)	102 (A)	80 P(A)	1,764
1973	2,000 N(H)	300 E(H)	100 N(H)	200 E(H)	200 E(H)	4 (A)	2,804
1974	1,800 E(H)	900 E(H)	235 (A)	120 (A)	24 (A)	4 (A)	3,083
1975	1,800 E(H)	274 E(H)	–	–	15 N(H)	–	2,089
1976	3,000 E(H)	725 E(H)	341 P(A)	620 E(H)	40 (H)	–	4,726
1977	3,850 E(H)	650 E(H)	580 E(A)	573 E(H)	18 (H)	–	5,671
1978	1,620 E(H)	624 E(H)	490 N(H)	550 E(H)	–	21 E(H)	3,305
1979	2,110 E(H)	857 E(H)	430 N(H)	750 E(H)	9 E(H)	–	4,156
1980	4,500 E(H)	1,531 E(H)	450 N(H)	905 E(H)	158 E(H)	–	7,544
1981	5,110 E(H)	2,945 E(H)	560 N(H)	839 E(H)	74 N(H)	258 N(H)	9,786
1982	2,533 E(H)	1,246 E(H)	289 N(H)	387 N(H)	130 N(H)	228 N(H)	4,813
1983	968 E(H)	391 N(H)	171 E(H)	236 E(H)	117 E(H)	179 N(H)	2,062
1984	1,887 (H)	951 (H)	279 E(H)	616 E(H)	–	176 (H)	3,909
1985	2,647 N(H)	2,236 E(H)	699 E(H)	848 E(H)	475 (H)	303 E(H)	7,208
1986	3,868 (H)	1,612 E(H)	548 E(H)	886 E(H)	413 E(H)	193 E(H)	7,520 [d]
1987	2,906 E(H)	1,122 E(H)	570 E(H)	678 E(H)	287 E(H)	180 E(H)	5,743
1988	4,500 E(H)	1,535 E(H)	1,010 E(H)	1,272 E(H)	243 E(H)	66 E(H)	8,626
1989	5,141 E(H)	1,812 E(H)	601 (W)	1,228 E(H)	204 E(H)	494 E(H)	9,480
1990	7,917 E(H)	1,658 E(H)	614 (W)	1,068 N(H)	820 E(H)	172 N(H)	12,249
1991	5,610 E(H)	1,781 E(H)	570 N(H)	1,164 E(H)	804 E(H)	224 N(H)	10,153 [e]
1992	5,750 E(H)	1,821 E(H)	782 E(H)	1,624 N(H)	768 N(H)	313 N(H)	11,058 [e]
1993	6,490 E(H)	2,128 N(H)	1,584 E(H)	1,491 E(H)	1,020 E(H)	491 N(H)	13,204
1994	4,792 N(H)	2,418 E(H)	410 P(H)	1,106 N(H)	573 N(H)	614 E(H)	9,913
1995	3,943 E(H)	2,069 E(H)	550 N(H)	678 N(H)	731 E(H)	786 E(H)	8,757
1996	7,720 E(H)	5,415 E(H)	1,620 N(H)	2,011 N(H)	1,810 N(H)	1,201 N(H)	19,777
1997	6,095 E(H)	3,655 E(H)	1,360 N(H)	1,148 N(H)	943 N(H)	648 N(H)	13,849
1998	2,720 E(H)	1,294 N(H)	473 N(H)	675 E(H)	807 E(H)	360 E(H)	6,329
88-97 Average	5,796	2,429	910	1,279	792	501	11,707

[a] Counts before 1975 may not be comparable due to changes in survey dates and methods, foot surveys may include jacks.

[b] (F) = foot survey; — = no survey conducted; (A) = fixed-wing aircraft; (H) = helicopter; P = survey conditions hampered by glacial or turbid waters; N = normal water flows and turbidity–average survey conditions; E = survey conditions excellent.

[c] Partial survey of Nakina River in 1957–59; comparisons made from carcass weir counts.

[d] Surveys in 1984 conducted by DFO; partial survey of Tseta Creek and Nahlin.

[e] Carcass weir at Kowatua River used to partially count escapement due to unfavorable water conditions.

Table 3.–Distribution of spawning chinook salmon among index areas of the Taku River during years when all index areas were surveyed.

Year	Nakina River	%	Nahlin River	%	Kowatua River	%	Tatsamenie River	%	Dudidontu River	%	Tseta Creek	%	Total
1981	5,110	52	2,945	30	560	6	839	9	74	1	258	3	9,786
1982	2,533	53	1,246	26	289	6	387	8	130	3	228	5	4,813
1983	968	47	391	19	171	8	236	11	117	6	179	9	2,062
1985	2,647	37	2,236	31	699	10	848	12	475	7	303	4	7,208
1986	3,868	51	1,612	21	548	7	886	12	413	5	193	3	7,520
1987	2,906	51	1,122	20	570	10	678	12	287	5	180	3	5,743
1988	4,500	52	1,535	18	1,010	12	1,272	15	243	3	66	1	8,626
1989	5,141	54	1,812	19	601	6	1,228	13	204	2	494	5	9,480
1990	7,917	65	1,658	14	614	5	1,068	9	820	7	172	1	12,249
1991	5,610	55	1,781	18	570	6	1,164	11	804	8	224	2	10,153
1992	5,750	52	1,821	16	782	7	1,624	15	768	7	313	3	11,058
1993	6,490	49	2,128	16	1,584	12	1,491	11	1,020	8	497	4	13,210
1994	4,792	48	2,418	24	410	4	1,106	11	573	6	614	6	9,913
1995	3,943	45	2,069	24	550	6	678	8	731	8	786	9	8,757
1996	7,720	39	5,415	27	1,620	8	2,011	10	1,810	9	1,201	6	19,777
1997	6,095	44	3,655	26	1,360	10	1,148	8	943	7	648	5	13,849
Average	4,749	50	2,115	22	746	8	1,042	11	588	6	397	4	9,638
1998	2,720	43	1,294	20	473	7	675	11	807	13	360	6	6,329

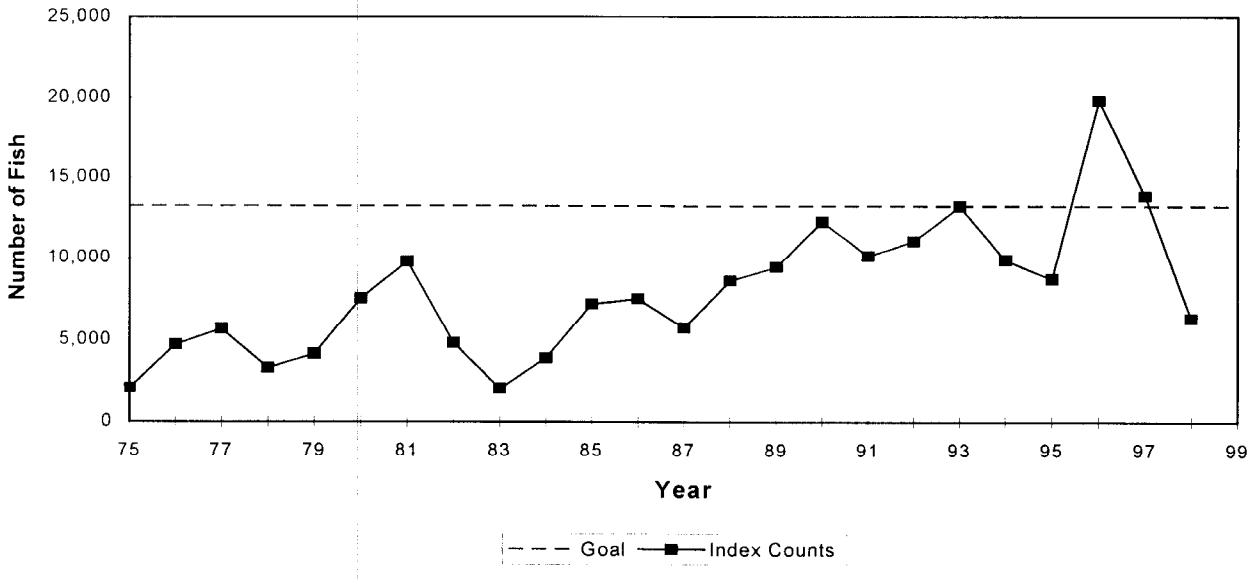

Figure 2.–Counts of chinook salmon in index areas of the Taku River, 1975–1998.

Table 4.–Taku River index counts and mark-recapture estimates of escapement.

Year	Counts	M-R	SE	% Observed
1989	9,480	40,329	5,646	23.5%
1990	12,249	52,142	9,326	23.5%
1995	8,757	33,805	5,060	25.9%
1996	19,777	79,019	9,048	25.0%
1997	13,849	114,938	17,888	12.0%
Average	12,822	64,047		22.0%
1998	6,329			

STIKINE RIVER

At the Little Tahltan River weir 4,879 chinook salmon were counted in 1998. Six fish were removed for broodstock, leaving an escapement of 4,873 fish. The weir count was 12% lower than the count of 5,547 in 1997 and below the 1988 - 1997 average of 5,878 (Table 5). An aerial survey of Beatty Creek counted 125 large chinook salmon, below the 1997 count of 218 (Table 5). Poor conditions in the glacially occluded mainstem Tahltan River resulted in a count of only 587 fish, considerably below the 1988–97 average of 1,854.

Two aerial surveys flown in 1998 obtained counts of 1,385 and 1,312 large chinook salmon above the Little Tahltan River weir. The peak survey count was 28.4% of the total escapement through the weir. From 1985 to 1998, the proportion of the total escapement of chinook salmon counted during peak aerial surveys has ranged from 34.3% to 56.6% and averaged 42.9% (Table 6). The proportion of the total escapement observed in a single survey often declined after the peak of spawning as fish died or were removed by predators. In 1998, survey conditions were not unusual and there is no explanation for the lower than average proportion of escapement observed .

The escapement goal for the Little Tahltan River weir is 5,300 fish (PSC 1991). The 1998 weir count was 92% of the goal, which has been exceeded four times since 1992 (Figure 3). Expansion of the 1998 Little Tahltan weir count of 4,873 large chinook salmon by the survey expansion factor (4.0) produced a total Stikine River escapement estimate of 19,492 large chinook salmon. The preliminary estimate of total escapement to the Stikine River from a mark-recapture experiment conducted in 1998 is about 34,700 (SE = 5,747)(Pahlke and Etherton, *In prep.*). A stock-recruit model now under review estimated an optimum escapement goal of about 3,000 large chinook at the Little Tahltan weir (Bernard et al. 1999).

Table 5.–Counts of spawning chinook salmon in index areas of the Stikine River, 1975–1998.

	Little Tahltan River				Mainstem		
Year[a]	Survey count	Weir count	Above weir[c]	Escape-ment	Tahltan River [b]	Beatty Creek	
1975	700	–			2,908 E(H)	–	
1976	400	–			120 P(H)	–	
1977	800	–			25 (A)	–	
1978	632	–			756 P(H)	–	
1979	1,166	–			2,118 N(H)	–	
1980	2,137	–			960 P(H)	122	E(H)
1981	3,334	–			1,852 P(H)	558	E(H)
1982	2,830	–			1,690 N(F)	567	E(H)
1983	594	–			453 N(H)	83	E(H)
1984	1,294	–			–	126	(H)
1985	1,598	3,114	0	3,114	1,490 N(H)	147	N(H)
1986	1,201	2,891	0	2,891	1,400 P(H)	183	N(H)
1987	2,706	4,783	0	4,783	1,390 P(H)	312	E(H)
1988	3,796	7,292	0	7,292	4,384 N(H)	593	E(H)
1989	2,527	4,715	0	4,715	–	362	E(H)
1990	1,755	4,392	0	4,392	2,134 N(H)	271	E(H)
1991	1,768	4,506	0	4,506	2,445 N(H)	193	N(H)
1992	3,607	6,627	0	6,627	1,891 N(H)	362	N(H)
1993	4,010	11,449	12	11,437	2,249 P(H)	757	E(H)
1994	2,422	6,387	14	6,373	–	184	N(H)
1995	1,117	3,072	0	3,072	696 E(H)	152	N(H)
1996	1,920	4,821	0	4,821	772 N(H)	218	N(H)
1997	1,907	5,557	10	5,547	260 P(H)	218	E(H)
88-97 Avg.	2,483	5,882		5,878	1,854	331	
1998	1,385	4,879	6	4,873	587 P(H)	125	E(H)

[a] Counts prior to 1975 may not be comparable because of differences in survey dates and counting methods.

[b] (F) = foot survey; N = normal survey conditions; (A) = survey conducted by fixed-wing aircraft; (H) = helicopter survey; P = survey conditions hampered by glacial or turbid waters; E = excellent survey conditions; — = no survey conducted .

[c] Above weir harvest includes broodstock collection and Aboriginal fishery.

ANDREW CREEK

The 1998 survey count of chinook salmon in Andrew Creek was 487 fish, compared to 293 in 1997 (Table 7). This was the first year since 1994 that the Andrew Creek escapement exceeded the index goal of 470 fish (Figure 4). Prior to 1995, Andrew Creek escapements had exceeded the goal in 8 of 10 years.

From 1976 to 1984 a weir was operated on Andrew Creek to provide brood stock for hatcheries. Total spawners removed from the creek ranged from 12 in 1978 to 275 in 1982 (Pahlke 1995). Surveys were also conducted on the system four of those years and, on the basis of those paired counts, the survey expansion factor was revised in 1995 from 1.6 (1/.625) to 2.0 (see Table 1). No survey expansion was necessary for the years when the weir provided total escapement counts (Appendix A2). The new weir operated in 1998 washed out under high water before the majority of the chinook migration had passed.

In 1998, a spawner recruit analysis was completed, and a revised escapement goal range of 650 to 1,500 total (~325-750 index count) large spawners was adopted (Clark et al. 1998).

Table 6.–Comparison of peak aerial survey counts of chinook salmon to final counts at the Little Tahltan River weir, 1985–1998.

Year	Weir count[a]	Count from aerial survey[b]	Survey conditions[c]	Percent counted in survey
1985	3,114	1,598	E(H)	51.3
1986	2,891	1,201	E(H)	41.5
1987	4,783	2,706	E(H)	56.6
1988	7,292	3,796	E(H)	52.1
1989	4,715	2,527	E(H)	53.6
1990	4,392	1,755	E(H)	40.0
1991	4,506	1,768	E(H)	39.2
1992	6,627	3,607	E(H)	54.4
1993	11,437	4,010	P(H)	35.1
1994	6,373	2,422	N(H)	38.0
1995	3,072	1,117	N(H)	36.4
1996	4,821	1,920	N(H)	39.8
1997	5,547	1,907	N(H)	34.4
1998	4,873	1,385	N(H)	28.4
Avg.	5,373	2,333		42.9

[a] Weir count minus above weir harvest and broodstock.

[b] Final count equals peak survey above weir plus count below weir on that date.

[c] E = excellent; P = poor; N = normal; (H) = helicopter.

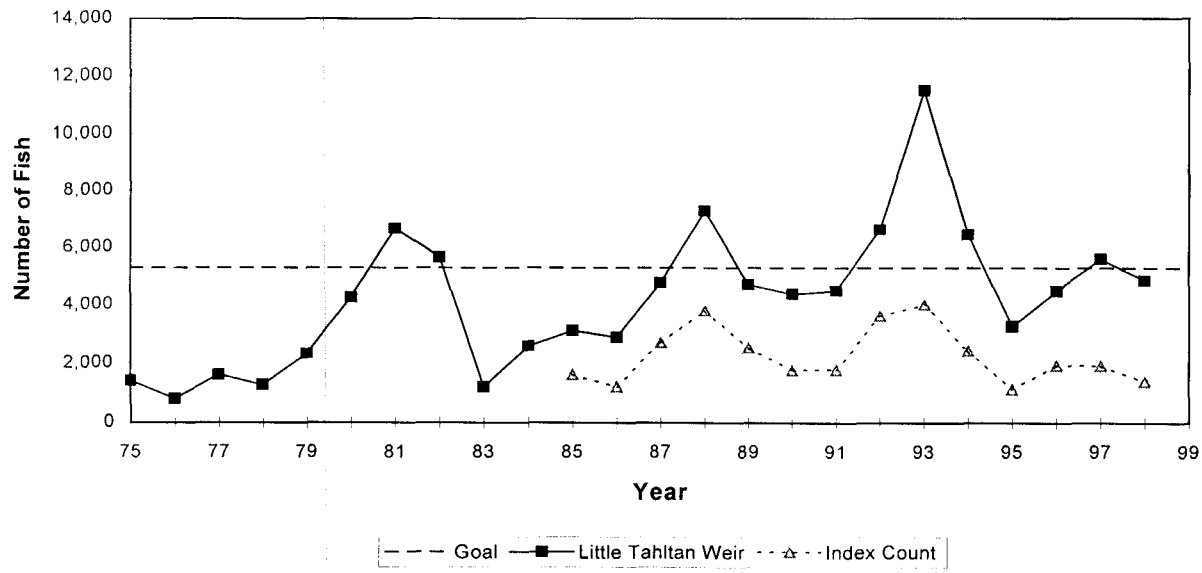

Figure 3.–Counts of chinook salmon at the Little Tahltan River weir, Stikine River, 1975–1998 (1985–1997 weir counts and 1975–1984 Little Tahltan escapement estimated by doubling index count).

Table 7.–Counts of spawning chinook salmon in selected rivers in central Southeast Alaska, 1956–1998.

Year	Andrew Cr.[a]		North Arm		Clear Creek		Harding River		Aaron Creek		Bradfield River N. Fork		Bradfield River E. Fork	
1956	4,500	(A)[b]	–		–		–		–		–		–	
1957	3,000	(F/A)	–		–		–		–		–		–	
1958	2,500	(F/A)	–		–		–		–		–		–	
1959	150	(F/A)	–		–		–		–		–		–	
1960	287	(F)	200	(F)N	–		–		–		–		–	
1961	103	(F)	138	(F)	–		–		–		–		–	
1962	300	(A)	80	(A)N	–		–		–		–		–	
1963	500	(A/H	187	(F)	–		–		–		–		–	
1964	400	(H)	–		–				–		–		–	
1965	100	(A)	–		–		25		–		–		–	
1966	75	(A)	–		–		–		–		–		–	
1967	30	(A)	–		–		–		–		–		–	
1968	15	–	–		–		–		–		–		–	
1969	12	(A)	–		–		–		–		–		–	
1970	0	–	–		–		–		–		–		–	
1971	305	(A)	–		–		–		–		–		–	
1972	0	–	–		–		–		–		–		–	
1973	40	(A)	–		–		10		–		–		–	
1974	129	(A)	–		–		35		–		–		–	
1975	260	(F)	–		–		–		–		–		–	P(A)
1976	404	(W/F	–		–		12	(A)N	24		–		13	
1977	456	(W/F	–		–		410	(A)E			–			
1978	388	(W/F	24	(F)E	–		12	(H)N	–		–		63	P(A)
1979	327	(W/F	16	(F)E	–		–		–		–		10	P(A)
1980	282	(W/F	68	(F)N	–		–		–		30	P(H)	–	
1981	536	(W/F	84	(F)E	4	(F)P	28	(H)P	12		84	P(H)	–	
1982	672	(W/F	138	(F)N	188	(F)N	8	(A)E	–				–	
1983	366	(W/F	15	(F)N	–		15	(A)P	–		55	N(H)	–	
1984	389	(W/F	31	(F)N	–		35	(B)N	–		–		–	
1985	320	E(F)	44	(F)E	–		243	(F)N	179		58	N(A)	85	N(A)
1986	708	N(F)	73	(F)N	45	(A)E	240	(B)N	178		104	E(A)	215	E(A)
1987	788	E(H)	71	(F)E	122	(F)N	40	(A)E	51		186	P(A)	175	P(A)
1988	564	N(F)	125	(F)N	167	(F)N	70	(A)P	325		680	N(A)	410	N(A)
1989	530	E(F)	150	(A)N	49	(H)N	80	(A)P	135		193	P(A)	132	P(A)
1990	664	E(F)	83	(F)N	33	(H)P	24	(A)P	–		–		–	
1991	400	N(A)	38	(A)N	46	(A)N	42	(F)N	–		81	P(A)	320	P(A)
1992	778	E(H)	40	(F)E	31	(A)N	48	(A)P	30	P(A)	–		–	
1993	1,060	E(F)	53	(F)E	–		40	(A)N	–		33	P(A)	118	P(A)
1994	572	E(H)	58	(F)E	10	(A)N	87	(H)N	27	P(H)	15	P(H)	–	
1995	343	P(A)	28	(A)P	1	(A)E	38	(H)N	65	N(H)	16	P(A)	43	P(A)
1996	335	N(F)	35	F(N)	21	A(N)	75	(A)N	15	N(H)	78	N(A)	48	P(A)
1997	293	N(F)	–		–		–		55	N(H)	-		30	A(P)
1998	487	E(F)	35	N(A)	28	N(A)	75	N(A)	69	P(A)	-		66	P(A)

[a] Andrew Creek total return equals sum of weir count, counts below weir, and on North Fork, minus egg take, 1976–1984.

[b] (A) = survey conducted by fixed-wing aircraft; — = no survey conducted or data not comparable; (F/A) = combined foot and aerial count; (F) = survey conducted by walking; (H) = survey conducted by helicopter; (W/F) = weir and foot count; N = normal survey conditions; E = excellent survey conditions; P = poor survey conditions; (B) = escapement surveyed from boat.

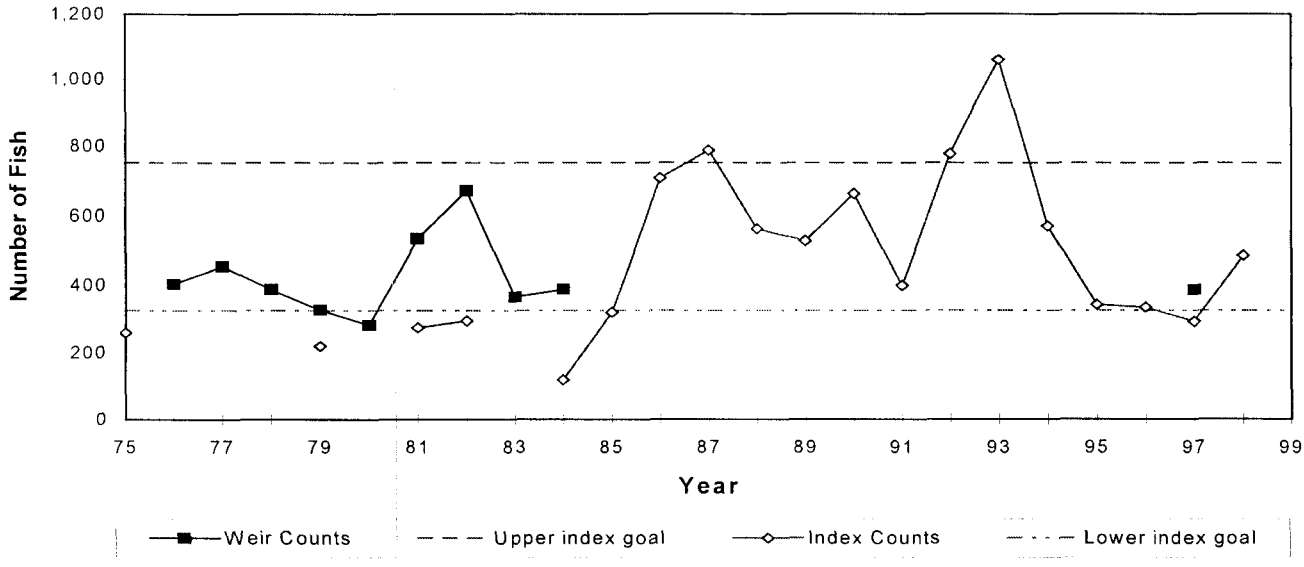

Figure 4.–Counts of chinook salmon at the Andrew Creek Weir, 1976–1984, 1997, and in aerial/foot surveys, 1975, 1985–1998.

ALSEK RIVER

The count of large chinook salmon through the Klukshu River weir in 1998 was 1,364 fish, 46% of the escapement of 2,989 in 1997 (Table 8). The escapement to the Klukshu, estimated by subtracting the Aboriginal Fishery (AF) harvest above the weir (17) from the weir count, was 1,347 fish, within the escapement goal range of 1,100 to 2,300, adopted in 1998 (McPherson et al. 1998b). All of the sport harvest (175 fish) was below the weir.

The 1998 aerial survey of the Klukshu was canceled due to logistic problems associated with a radiotelemetry study on the same system. In the Takhanne River 136 large chinook salmon were counted, 71 in the Blanchard River, and 39 on Goat Creek.

There is no agreement in the PSC on use of expansion factors; therefore the total escapement was estimated using the following methods. The estimated escapement for the entire Alsek River drainage, calculated by multiplying the count from the Klukshu River weir (minus the aboriginal fishery harvest above the weir) by the expansion factor of 1.5625 and then subtracting recreational harvest (137) and AF harvest (132) below the weir, was 1,879 large chinook salmon.

Average escapements of chinook salmon to the Alsek River during the first two cycles of the rebuilding program (1981–1985 and 1986–1990) actually declined, relative to the 1975–1980 base period (Figure 5). In 1991, the TBTC revised the Alsek River chinook escapement goal to 4,700 fish through the Klukshu River weir (PSC 1991).

In 1997, a revised stock-recruitment analysis by ADF&G and DFO staff recommended that the Klukshu stock should be managed for an escapement goal range of 1,100 to 2,300 spawners (McPherson et al. 1998b). Results from the 1998 tagging study to estimate distribution and escapement of Alsek River chinook salmon are not complete.

Table 8.–Escapement of chinook salmon to the Klukshu River and counts of spawning adults in other tributaries of the Alsek River, 1962–1998.

	Klukshu River													
	Aerial		Weir	Above-weir harvest			Escape-	Blanchard		Takhanne		Goat		
Year[a]	count		count	AF	Sport	Brood	ment[b]	River		River		Creek		Total[c]
1962	86	(A)[d]	–	–	–		86	–		–		–		86
1963	–		–	–	–		–	–		–		–		0
1964	20	(A)	–	–	–		20	–		–		–		20
1965	100		–	–	–		100	100		250		–		450
1966	1,000		–	–	–		1,000	100		200		–		1,300
1967	1,500		–	–	–		1,500	200		275		–		1,975
1968	1,700		–	–	–		1,700	425		225		–		2,350
1969	700		–	–	–		700	250		250		–		1,200
1970	500		–	–	–		500	100		100		–		700
1971	300	(A)	–	–	–		300	–		–		–		300
1972	1,100		–	–	–		1,100	12	(A)	250		–		1,362
1973	–		–	–	–		–	–		49	(A)	–		49
1974	62		–	–	–		62	52	(A)	132		–		246
1975	58		–	–	–		58	81	(A)	177	(A)	–		316
1976	–		1,278	150	64		1,064	–		–		–		1,064
1977	–		3,144	350	96		2,698	–		–		–		2,698
1978	–		2,976	350	96		2,530	–		–		–		2,530
1979	–		4,404	1,300	0		3,104	–		–		–		3,104
1980	–		2,673	150	0		2,487	–		–		–		2,487
1981	–		2,113	150	0		1,963	35	(H)	11	(H)	–		2,009
1982	633	N(H)	2,369	400	0		1,969	59	(H)	241	(H)	13	(H)	2,282
1983	917	N(H)	2,537	300	0		2,237	108	(H)	185	(H)	–		2,530
1984	–		1,672	100	0		1,572	304	(H)	158	(H)	28	(H)	2,062
1985	–		1,458	175	0		1,283	232	(H)	184	(H)	–		1,699
1986	738	P(H)	2,709	102	0		2,607	556	(H)	358	(H)	142	(H)	3,663
1987	933	E(H)	2,616	125	0		2,491	624	(H)	395	(H)	85	(H)	3,595
1988	–		2,037	43	0		1,994	437	E(H)	169	E(H)	54	E(H)	2,654
1989	893	E(H)	2,456	234	0	20	2,202	–		158	E(H)	34	E(H)	2,394
1990	1,381	E(H)	1,915	202	0	15	1,698	–		325	E(H)	32	E(H)	2,055
1991	–		2,489	241	0	25	2,223	121	N(H)	86	E(H)	63	E(H)	2,493
1992	261	P(H)	1,367	88	0	36	1,243	86	P(H)	77	N(H)	16	N(H)	1,422
1993	1,058	N(H)	3,303	64	0	18	3,221	326	N(H)	351	E(H)	50	N(H)	3,948
1994	1,558	N(H)	3,727	99	0	8	3,620	349	N(H)	342	E(H)	67	N(H)	4,378
1995	1,053	E(H)	5,678	260	0	21	5,397	338	P(H)	260	P(H)	–		5,995
1996	788	N(H)	3,599	215	0	2	3,382	132	N(H)	230	N(H)	12	N(H	3,756
1997	718	P(H)	2,989	160	0	0	2,829	109	P(H)	190	P(H)	–		3,128
88–97 average	964		2,956	161	0	16	2,779	237		219		41		3,222
1998	–		1,364	17	0	0	1,347	71	P(H)	136	N(H)	39	N(H)	1,593

[a] Escapement counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[b] Klukshu River escapement = weir count minus Aboriginal Fishery (AF) and broodstock.

[c] Total = Klukshu escapement plus aerial counts of other systems.

[d] (A) = aerial survey from fixed wing aircraft; (H) = helicopter survey; E = excellent survey conditions; N = normal conditions; P = poor conditions; --- = no survey.

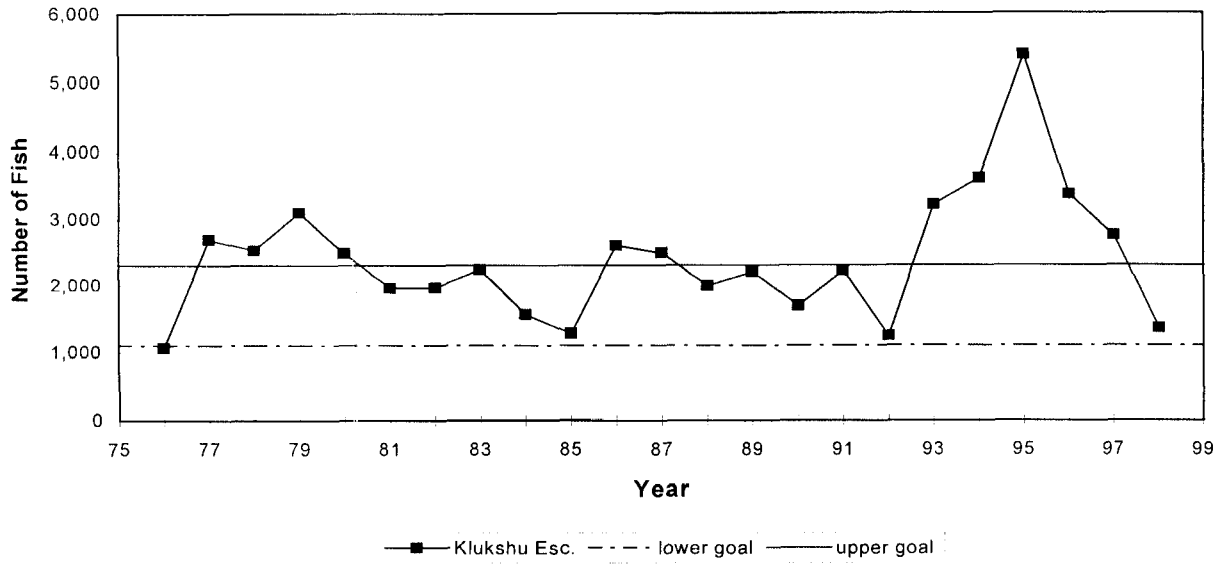

Figure 5.–Escapement of chinook salmon to the Klukshu River tributary of the Alsek River, 1975–1998. Upper and lower limits of revised escapement goal range are shown.

UNUK RIVER

In 1998, 840 large chinook salmon were counted in all index areas of the Unuk River (Table 9), a count that was below the recent 10-year average in 4 out of 6 index areas (Table 10). The total count was close to the survey goal of 875 fish, and above the low end of the goal range of 650 to 1,400 (McPherson and Carlile 1997). Index counts have been below the lower end of the escapement goal range only three times since the start of the rebuilding program (Figure 6).

Thirty-seven (37) large chinook salmon were counted in Boundary Creek in 1998. A change in the river between 1991 and 1994, which had revealed more spawning area than previously observed in that tributary, has again changed, resulting in lower counts. Boundary Creek is not part of the Unuk River index area and was not included in summed counts for the watershed nor in the expanded count.

Based on results of mark-recapture and radio-tracking studies, the expansion factors were revised in 1996 from 1.6 to 4.0 times the summed tributary counts on the Unuk and Chickamin, and 2.5 for the Blossom and Keta rivers (Pahlke et al. 1996, Pahlke 1997b). The new expansion factor produced an estimated escapement of 3,360 large chinook salmon to the Unuk River in 1998, an increase of 32% from 1997. A mark-recapture program estimated an escapement of 4,132 large chinook salmon (SE = 413) in 1998 (Jones and McPherson 1999).

CHICKAMIN RIVER

In 1998, 391 large chinook salmon were counted in index areas on eight tributaries of the Chickamin River, compared to 272 in 1997 (Table 11). Counts in 1998 were below the ten year average in 5 out of 8 Chickamin River tributaries (Table 12). The 1998 count was 25% below the revised survey escapement goal of 525, (range 450 to 900 fish; McPherson and Carlile 1997) (Figure 7).

The summed counts for 1998 were multiplied by a survey expansion factor of 4.0 to produce a total escapement estimate of 1,564 fish to the system.

Table 9.–Peak escapement counts of chinook salmon to index areas of the Unuk River, 1960–1998.

Year [a]	Cripple Creek	Genes Lake Creek	Eulachon Creek	Clear Creek	Lake Creek	Kerr Creek	Total
1960	– [b]	–	250 (A)	–	–	–	250
1961	3 (F)	200 (F)	270 (F)	65 (F)	–	53 (F)	591
1962	–	150 (A)	145 (A)	100 (A)	30 (A)	–	425
1963	100 (A)	750 (A)	150 (A)	25 (A)	–	–	1,025
1964	–	–	25 (A)	–	–	–	25
1965	–	–	–	–	–	–	0
1966	–	–	–	–	–	–	0
1967	–	–	60 (H)	–	–	–	60
1968	–	–	75 (H)	–	–	–	75
1969	–	–	150 (H)	–	–	–	150
1970	–	–	–	–	–	–	0
1971	–	–	30 (A)	–	–	–	30
1972	95 (A)	35 (A)	450 (A)	90 (A)	55 (A)	–	725
1973	–	–	64 (H)	–	–	–	64
1974	–	–	68 (H)	–	–	–	68
1975	–	–	17 (H)	–	–	–	17
1976	– [c]	–	3 (A)	–	–	–	3
1977	529 [c] (F)	339 (F)	57 (H)	34 (H)		15 (H)	974
1978	394 [c] (F)	374 (F)	218 (H)	85 (H)	20 (H)	15 (H)	1,106
1979	363 (F)	101 (F)	48 (H)	14 (H)	30 (H)	20 (H)	576
1980	748 (F)	122 (F)	95 (H)	28 (H)	5 (H)	18 (H)	1,016
1981	324 (F)	112 (F)	196 (H)	54 (H)	20 (H)	25 (H)	731
1982	538 (F)	329 (F)	384 (H)	24 (H)	48 (H)	28 (H)	1,351
1983	459 (F)	338 (F)	288 (H)	24 (H)	12 (H)	4 (H)	1,125
1984	644 (F)	647 (F)	350 (H)	113 (H)	32 (H)	51 (H)	1,837
1985	284 (F)	553 (F)	275 (H)	37 (H)	22 (H)	13 (H)	1,184
1986	532 (F)	838 (F)	486 (H)	183 (F)	25 (H)	62 (H)	2,126
1987	860 (F)	398 (F)	520 (H)	107 (H)	37 (H)	51 (H)	1,973
1988	1,068 (F)	154 (F)	146 (F)	292 (H)	60 (H)	26 (H)	1,746
1989	351 (F)	302 (F)	298 (H)	128 (H)	27 (F)	43 (H)	1,149
1990	86 (F)	284 (F)	81 (H)	103 (F)	26 (F)	11 (H)	591
1991	358 (W/F)	123 (F)	43 (H)	96 (F)	23 (F)	12 (H)	655 [d]
1992	327 (W/F)	360 (F)	57 (F)	69 (F)	31 (H)	30 (H)	874 [e]
1993	448 N(F)	330 N(F)	132 E(F)	137 N(F)	8 N(F)	13 P(H)	1,068 [f]
1994	161 P(F)	300 N(F)	52 N(H)	128 E(F)	18 N(F)	52 N(F)	711 [g,h]
1995	211 N(F)	347 N(F)	74 N(H)	66 E(H)	35 E(H)	39 N(H)	772
1996	417 N(F)	400 N(F)	79 N(F)	148 E(F)	25 E(H)	98 E(F)	1,167
1997	244 P(F)	154 N(F/H)	53 N(F)	113 N(F)	13 N(H)	59 E(F)	636 [i]
88–97 Average	367	275 N(F)	102	128	27	38	937
1998	311 N(F)	283 N(F)	39 N(H)	81 N(F)	22 N(F)	104 N(F)	840 [j]

[a] Counts prior to 1975 may not be comparable because of differences in survey dates and counting methods.

[b] — = no survey conducted or data not comparable; (F) = escapement survey conducted by walking river; (A) = escapement survey conducted from fixed-wing aircraft; (H) = escapement survey conducted from helicopter; (W/F) = weir and foot count; N = survey conditions normal; E = excellent; P = poor.

[c] Not including 35 fish for egg take in 1976; 132 in 1977; 85 in 1978.

[d] Total does not include 108 from Boundary Cr.; Cripple Cr. weir count reduced by /0.625 to be comparable with foot surveys.

[e] Total does not include 123 from Boundary Cr.; Cripple Cr. weir count reduced by /0.625 to be comparable with foot surveys.

[f] 1993 total does not include 143 from Boundary Creek.

[g] 1994 total does not include 42 fish from Boundary Creek.

[h] Mark-recapture estimate of escapement 4,623 (SE = 1,266; Pahlke et al. 1996).

[i] Mark-recapture estimate of escapement 2,970 (SE = 277; Jones et al. 1998).

[j] Mark-recapture estimate of escapement 4,132 (SE = 413; Jones and McPherson 1999).

Table 10.–Distribution of spawning chinook salmon among index areas of the Unuk River for years when all index areas were surveyed.

Year	Cripple Creek	%	Genes Lake Creek	%	Eulachon Creek	%	Clear Creek	%	Lake Creek	%	Kerr Creek	%	Total
1978	394	36	374	34	218	20	85	8	20	2	15	1	1,106
1979	363	63	101	18	48	8	14	2	30	5	20	3	576
1980	748	74	122	12	95	9	28	3	5	0	18	2	1,016
1981	324	44	112	15	196	27	54	7	20	3	25	3	731
1982	538	40	329	24	384	28	24	2	48	4	28	2	1,351
1983	459	41	338	30	288	26	24	2	12	1	4	0	1,125
1984	644	35	647	35	350	19	113	6	32	2	51	3	1,837
1985	284	24	553	47	275	23	37	3	22	2	13	1	1,184
1986	532	25	838	39	486	23	183	9	25	1	62	3	2,126
1987	860	44	398	20	520	26	107	5	37	2	51	3	1,973
1988	1,068	61	154	9	146	8	292	17	60	3	26	1	1,746
1989	351	31	302	26	298	26	128	11	27	2	43	4	1,149
1990	86	15	284	48	81	14	103	17	26	4	11	2	591
1991	358	55	123	19	43	7	96	15	23	4	12	2	655
1992	327	37	360	41	57	7	69	8	31	4	30	3	874
1993	448	42	330	31	132	12	137	13	8	0	13	1	1,068
1994	161	23	300	42	52	7	128	18	18	3	52	7	711
1995	211	27	347	45	74	10	66	9	35	5	39	5	772
1996	417	36	400	34	79	7	148	13	25	2	98	8	1,167
1997	244	38	154	24	53	8	113	18	13	2	59	9	636
Avg.	441	39	328	30	194	16	97	9	26	3	34	3	1,120
1998	311	37	283	34	39	5	81	10	22	3	104	12	840

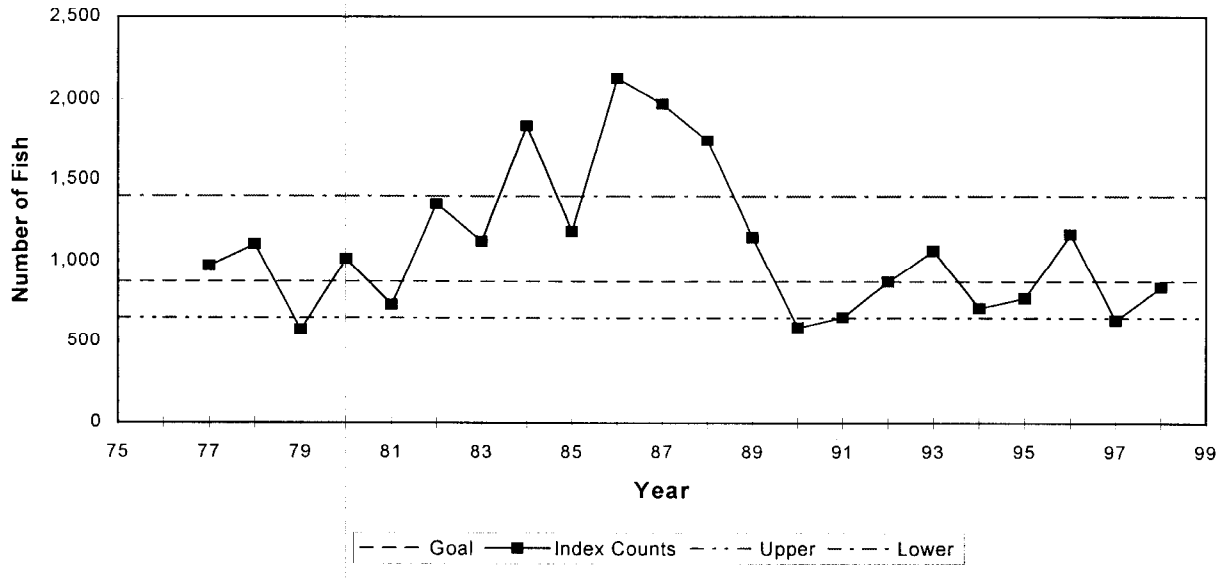

Figure 6.–Counts of large chinook salmon in index areas of the Unuk River, 1975–1998.

Table 11.–Counts of chinook salmon in index areas of the Chickamin River, 1960–1998.

Year[a]	South Fork Creek	Barrier Creek	Butler Creek	Leduc Creek	Indian Creek	Humpy Creek	King Creek	Clear Falls Creek	Total[c]
1960	–[b]	–	–	–	–	3 (A)	–	–	3
1961	–	36 (A)	77 (A)	42 (A)	5 (A)	120 (A)	48 (A)	–	328
1962	400 (A)	35 (A)	–	–	–	150 (A)	–	–	585
1963	350 (A)	115 (A)	–	–	–	3 (A)	200 (A)	–	668
1964	–	–	–	–	–	–	–	–	–
1965	–	–	–	–	–	–	75 (A)	–	75
1966	–	–	–	–	–	50 (F)	–		50
1967	–	–	–	–	–	-	45 (H)	–	45
1968	–	–	–	–	–	30 (H)	20 (H)	–	50
1969	–	–	–	–	–	10 (H)	45 (H)	–	55
1970	–	–	–	–	–	–	–	–	–
1971	–	–	–	–	–	–	–	–	–
1972	350 (A)	25 (A)	–	85 (A)	–	65 (A)	510 (A)	–	1,035
1973	–	–	–	–	–	14 (A)	65 (A)	–	79
1974	144 (H)	–	–	–	–	–	11 (H)	–	155
1975	141 (H)	9 (H)	66 (H)	6 (H)	90 (H)	7 (H)	30 (H)	–	370
1976	46 (H)	10 (H)	15 (H)	12 (H)	9 (H)	–	–	–	157
1977	52 (H)	66 (H)	30 (H)	26 (H)	53 (H)	0 (H)	–	–	363
1978	21 (H)	94 (H)	4 (H)	42 (H)	20 (H)	–	–	–	308
1979	63 (H)	17 (H)	29 (H)	0 (H)	31 (H)	–	–	–	239
1980	56 (H)	62 (H)	104 (H)	17 (H)	22 (H)	–	–	–	445
1981	51 (H)	105 (H)	51 (H)	25 (H)	12 (H)	4 (F)	105 (F)	31 (H)	384
1982	84 (H)	149 (H)	37 (H)	36 (H)	30 (F)	37 (F)	165 (F)	33 (H)	571
1983	28 (H)	138 (H)	91 (H)	30 (H)	47 (H)	–	212 (F)	30 (H)	599
1984	185 (H)	171 (H)	124 (H)	15 (H)	103 (H)	88 (F)	388 (F)	28 (H)	1,102
1985	163 (H)	129 (H)	92 (H)	8 (H)	125 (H)	50 (H)	377 (H)	12 (H)	956
1986	562 (H)	168 (H)	203 (H)	20 (H)	120 (H)	–	564 (H)	40 (H)	1,745
1987	261 (H)	76 (H)	120 (H)	19 (H)	115 (H)	26 (H)	310 (H)	48 (H)	975
1988	280 (H/F)	82 (H/F)	159 (H)	25 (H/F)	32 (H)	19 (H/F)	164 (H)	25 (H/F)	786
1989	226 (H/F)	90 (H)	137 (H)	57 (H)	84 (H)	22 (H/F)	224 (H)	94 (H)	934
1990	135 (F)	107 (H)	27 (H)	20 (H)	24 (H)	35 (H)	163 (H)	53 (H)	564
1991	125 (H)	18 (H)	49 (H)	14 (H)	38 (H)	13 (H)	185 (H)	45 (H)	487
1992	87 (H)	4 (H)	68 (H)	4 (H)	20 (H)	8 (H)	131 (H)	24 (H)	346
1993	67 N(H)	46 E(H)	68 N(H)	11 N(H)	29 N(H)	13 N(H)	80 N(H)	75 N(H)	389
1994	31 N(H)	29 E(H)	64 E(H)	18 E(H)	16 N(H)	44 N(H)	129 E(H)	57 E(H)	388
1995	87 E(H)	12 E(F)	59 E(F)	60 E(H)	36 N(F)	13 N(F)	62 N(H)	27 E(H)	356 d
1996	72 N(H)	13 N(F)	74 E(H)	23 E(H)	48 N(F)	30 N(F)	106 E(F)	56 E(H)	422 d
1997	28 P(H)	10 N(H)	43 N(H)	7 N(H)	24 N(H)	15 N(H)	95 N(H)	50 N(H)	272
1988-1997 Avg.	114	41	75	24	35	21	134	51	494
1998	46 N(H)	0 N(H)	124 E(H)	16 P(H)	46 N(H)	28 N(H)	123 N(H)	8 P(H)	391

[a] Escapement counts conducted prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[b] — = no survey conducted or data not comparable; (A) = escapement surveyed by fixed-wing aircraft; (F) = escapement surveyed by walking stream; (H) = escapement surveyed by helicopter; (H/F) = escapement surveyed by combination of walking and helicopter; N = survey conditions normal; E = excellent.

[c] Totals for 1975–1980, 1983 and 1986 expanded for unsurveyed index areas by 1981–1992 average % observed to those indices.

[d] Mark-recapture estimates of escapement 1995: 2,309 large fish (SE 723); 1996 1,587 (SE 199).

Table 12.–Distribution of spawning chinook salmon among index areas of the Chickamin River for years when all index areas were surveyed.

Year	South Fork Creek	%	Barrier Creek	%	Butler Creek	%	Leduc Creek	%	Indian Creek	%	Humpy Creek	%	King Creek	%	Clear Falls Creek	%	Total
1981	51	13	105	27	51	13	25	7	12	3	4	1	105	27	31	8	384
1982	84	15	149	26	37	6	36	6	30	5	37	6	165	29	33	6	571
1984	185	17	171	16	124	11	15	1	103	9	88	8	388	35	28	3	1,102
1985	136	14	156	16	93	10	8	0	125	13	50	5	377	39	12	1	957
1987	261	27	76	8	120	12	19	2	115	12	26	3	310	32	48	5	975
1988	280	36	82	10	159	20	25	3	32	4	19	2	164	21	25	3	786
1989	226	24	90	10	137	15	57	6	84	9	22	2	224	24	94	10	934
1990	135	24	107	19	27	5	20	4	24	4	35	6	163	29	53	9	564
1991	125	26	18	4	49	10	14	3	38	8	13	3	185	38	45	9	487
1992	87	25	4	1	68	20	4	1	20	6	8	2	131	38	24	7	346
1993	67	17	46	12	68	17	11	3	29	7	13	3	80	21	75	19	389
1994	31	8	29	7	64	16	18	5	16	4	44	11	129	33	57	15	388
1995	87	24	12	3	59	17	60	17	36	10	13	4	62	17	27	8	356
1996	72	17	13	3	74	18	23	5	48	11	30	7	106	25	56	13	422
1997	28	10	10	4	43	16	7	3	24	9	15	6	95	35	50	18	272
Avg.	144	22	81	12	86	13	23	3	53	8	28	4	204	31	43	6	661
1998	46	12	0	0	124	32	16	4	46	12	28	7	123	31	8	2	391

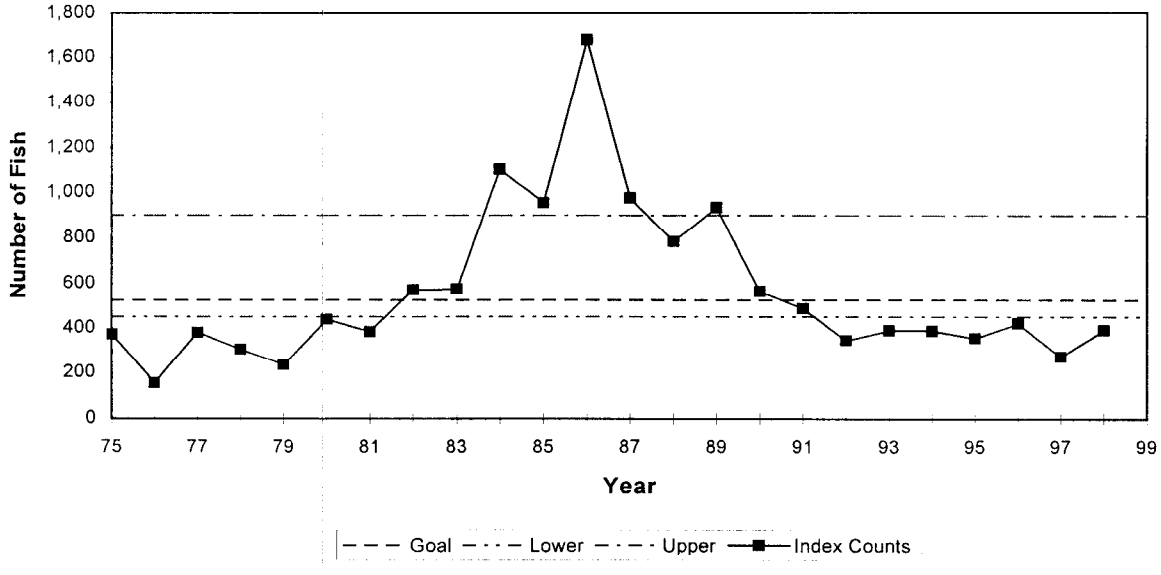

Figure 7.–Counts of chinook salmon in index areas of the Chickamin River, 1975–1998.

Blossom River

Ninety-one (91) large chinook salmon were counted in index areas of the Blossom River in 1998, down from 132 fish counted in 1997 (Table 13). The 1998 count was approximately 30% of the revised survey goal of 300 (range 250 to 500; McPherson and Carlile 1997). Counts had exceeded the goal from 1982–1989, but since 1991, they have generally been below the escapement goal range (Figure 8). The summed counts for 1998 were multiplied by a survey expansion factor of 2.5 to produce a total escapement estimate of 228 fish. A mark-recapture experiment conducted in 1998 estimated an escapement of 393 (SE = 72) (Brownlee et al. 1999).

Keta River

In 1998, 180 chinook salmon were counted in the Keta River, down from 246 counted in 1997 (Table 13), and 40% below the 1996 revised goal of 300 (range 250–500) large fish (McPherson and Carlile 1997). Prior to 1990, counts of chinook salmon in the Keta River increased steadily since implementation of the 1980 rebuilding program, and had exceeded the escapement goal range every year since 1981 (Figure 9). The summed counts for 1998 were multiplied by a survey expansion factor of 2.5 to produce a total escapement estimate of 450 fish. A mark-recapture experiment conducted in 1998 estimated an escapement of 446 (SE = 49) (Brownlee et al. 1999).

King Salmon River

Two helicopter surveys and a foot survey were conducted on King Salmon River in 1998. The peak count during the helicopter surveys was 59 large chinook salmon and 88 were counted during the foot survey. This was only 37% of the 238 fish counted in 1997. (Table 14; Figure 10). The escapement goal was revised in 1997 to a range of 120 to 240 total large fish, point estimate 150 (McPherson and Clark, *in prep*). The resulting index goal is 100 fish observed, with a range of 80-160. Counts exceeded the revised index goal of 100 fish from 1993-1997 and the 1998 count remained above the lower range of the escapement goal.

The peak count of 88 was multiplied by the revised survey expansion factor of 1.5 to produce a total escapement estimate of 132 large fish to the system.

Situk River

The count of large chinook salmon through the Situk River weir in 1998 was 1,353 fish. The final escapement estimate of large fish (3-5 ocean age) will be revised when age composition of scale samples collected at the weir is completed (Scott McPherson, ADFG, personal communication). Subtracting the preliminary estimate of sport harvest above the weir of 200 large fish results in an escapement estimate of 1,153 fish, an decrease of 37% from the 1997 escapement of 1,837 fish, but above the escapement goal of 600 large spawners (range of 500–1,000) (Table 15). Escapements have exceeded the escapement goal each year since 1984 (Figure 11). The proportion of the recreational harvest that is caught above the weir varies from year to year and is estimated by the local management biologists and from the statewide harvest survey (Howe et al. 1998). The escapement counts from the base period all exceeded the revised escapement goal, indicating the Situk chinook salmon stock was not depressed and never needed rebuilding.

Chilkat River

The 1998 escapement to the Chilkat River was estimated by mark-recapture experiment to be 3,337 large chinook salmon, the lowest estimate since the start of the mark-recapture program in 1991 (Ericksen 1998; Appendix A2). Since Johnson et al. (1992) demonstrated that expansion factors used on the Chilkat River system were inaccurate, the escapement goal of 2,000 large fish needs to be assessed.

Table 13.–Counts of chinook salmon for selected rivers in Behm Canal, 1948–1998.

Year[a]	Keta River	Blossom River	Wilson River	Marten River	Grant River	Klahini River	Total
1948	500 (F)[b]	–	–	–	–	–	500
1949	–	–	–	–	–	–	–
1950	210 (F)	–	–	–	–	–	210
1951	120 (F)	–	–	–	–	–	120
1952	462 (F)	–	–	–	–	–	462
1953	156 (F)	–	–	–	–	–	156
1954	300 (A)	–	–	–	–	–	300
1955	1,000 (A)	–	–	–	–	–	1,000
1956	1,500 (A)	–	–	–	–	–	1,500
1957	500 (A)	–	–	–	–	–	500
1958	–	–	–	–	–	–	–
1959	–	–	–	–	–	–	–
1960	–	–	–	–	–	–	
1961	44 (F)	68 (F)	–	22 (F)	40 (A)	-	174
1962	–	–	–	–	6 (A)	100 (A)	106
1963	–	450 (A)	375 (A)	–	15 (A)	–	840
1964	–	–	–	–	–	–	–
1965	–	–	50 (A)	43 (H)	–	–	93
1966	75 (A)	200 (A)	60 (A)	10 (A)	100 (A)	3 (A)	448
1967	86 (H)	–	8 (H)	7 (H)	15 (H)	–	116
1968	–	–	–	–	4 (H)	–	4
1969	200 (A)	–	10 (A)	10 (A)	69 (H)	3 (H)	292
1970	–	100 (H)	–	–	–	–	100
1971	–	–	–	–	–	–	–
1972	255 (A)	225 (A)	275 (A)	–	25 (A)	150 (A)	930
1973	–	–	30 (A)	–	38 (A)	7 (H)	75
1974	25 (H)	166 (H)	–	–	–	–	191
1975	203 (H)	146 (H)	7 (H)	15 (H)	–	–	371
1976	84 (H)	68 (H)	–	–	–	–	152
1977	230 (H)	112 (H)	–	–	–	–	342
1978	392 (H)	143 (H)	–	2 (A)	–	–	537
1979	426 (H)	54 (H)	36 (H)	–	–	–	516
1980	192 (H)	89 (H)	–	–	–	–	281
1981	329 (H)	159 (H)	76 (F)	–	25 (H)	42 (F)	631
1982	754 (H)	345 (H)	300 (B)	75 (F)	33 (F)	79 (F)	1,586
1983	822 (H)	589 (H)	178 (B)	138 (B)	8 (A)	10 (H)	1,745
1984	610 (H)	508 (H)	133 (F)	12 (B)	124 (F)	54 (F)	1,441
1985	624 (H)	709 (H)	420 (H)	69 (F)	55 (F)	20 (F)	1,897
1986	690 (H)	1,278 (H)	–	–	–	–	1,968
1987	768 (H)	1,349 (H)	–	270 (H)	33 (A)		2,420
1988	575 (H)	384 (H)	–	543 (H)	–	40 (H)	1,542
1989	1,155 (H)	344 (H)	–	133 (H)	–	–	1,632
1990	606 (H)	257 (H)	–	283 (H)	–	–	1,146
1991	272 (H)	239 (H)	–	135 (H)	–	–	646
1992	217 (H)	150 (H)	109 (H)	76 (H)	25 (H)	19 (H)	596
1993	362 E(H)	303 N(H)	63 P(H)	229 E(H)	–	–	957
1994	306 E(H)	161 N(H)	–	178 E(H)	–	–	645
1995	175 E(H)	217 N(H)	58 N(H)	171 E(H)	–	–	621
1996	297 N(H)	220 E(H)	23 P(H)	62 N(H)	–	–	602
1997	246 N(H)	132 N(H)	16 N(H)	56 N(H)	9 N(H)	–	459
1988-97 Average	421	241	54	187	17	30	885
1998	180 N(H)	91 N(H)	–	–	–	–	271

[a] Escapement counts prior to 1975 may not be comparable due to differences in survey dates or methods.

[b] (F) = escapement surveyed by walking stream; — = no survey conducted; (A) = escapement surveyed by fixed-wing aircraft; (H) = escapement surveyed by helicopter; (B) = escapement surveyed from boat; E = survey conditions excellent; N = survey conditions normal; P = survey conditions poor.

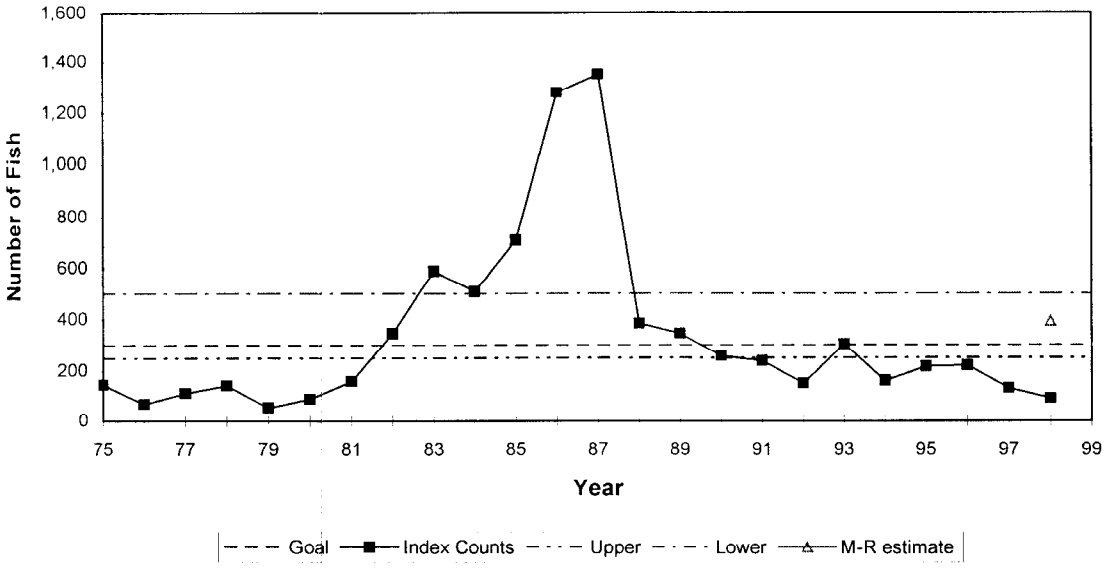

Figure 8.–Counts of chinook salmon into the Blossom River, 1975–1998.

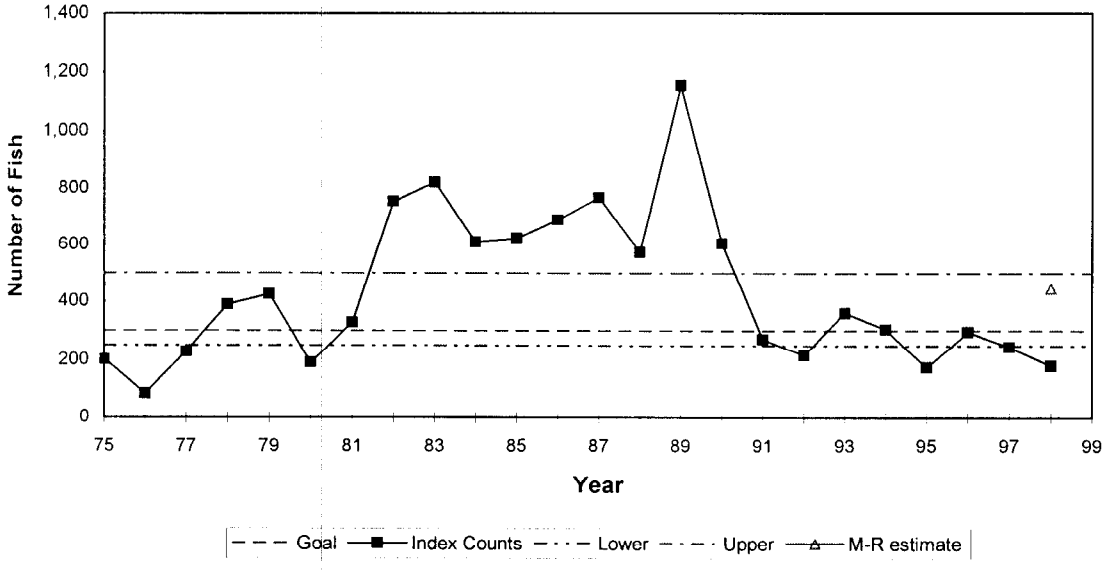

Figure 9.–Counts of chinook salmon to the Keta River, 1975–1998.

Table 14.–Peak escapement counts and weir counts of spawning chinook salmon in the King Salmon River, 1957–1998.

	Survey count			Survey as percent of weir count	Total egg take (adults)	Total weir count (adults)	Total weir count (jacks)[b]	Adults below weir (foot ct)	Total inriver (adults)	Total natural spawning
	Below weir	Above weir								
Year	A	B		B/(D-C)	C	D	E	F	D+F	D+F-C
1957	–[a]	200	(F)	–	–	–	–	–	–	200
1960	–	20	(F)	–	–	–	–	–	–	20
1961	–	117	(F)	–	–	–	–	–	–	117
1971	–	94	(F)	–	–	–	–	–	–	94
1972	–	90	(F)	–	–	–	–	–	–	90
1973	–	211	(F)		–	–	–	–	–	211
1974	–	104	(F)	–	–	–	–	–	–	104
1975	–	42	(H)	–	–	–	–	–	–	42
1976	–	65	(H)	–	–	–	–	–	–	65
1977	–	134	(H)	–	–	–	–	–	–	134
1978	–	57	(H)	–	–	–	–	–	–	57
1979	–	88	(H)	–	17	–	–	–	–	71
1980	–	70	(H)	–	–	–	–	–	–	70
1981	–	101	(H)	–	11	–	–	–	101	90
1982	–	259	(H)	–	30	–	–	–	259	229
1983	25	183	(H)	85%	37	252	20	30	282	245[c]
1984	14	184	(H)	71%	46	299	82	12	311	265[c]
1985	12	105	(H)	64%	29	194	45	10	204	175[c]
1986	9	190	(H)	80%	26	264	72	17	281	255[c]
1987	19	128	(H)	73%	31	207	62	20	227	196[c]
1988	5	94	(H)	50%[d]	35	231	54	12	243	208[c]
1989	34	133	(H)	63%	38[e]	249	71	29	278	240[c]
1990	34	98	(H)	57%	29	190	32	8	198	179[c]
1991	6	91	(H)	72%	20	146	89	8	154	134[c]
1992	–	58	(H)	59%[f]	18	47	16	70	117	99[c]
1993	–	175	E(H)	----------no weir or egg take----------						175
1994	–	140	N(F)	----------no weir or egg take----------						140
1995	–	97	P(H)	----------no weir or egg take----------						97
1996	–	192	E(F)	----------no weir or egg take----------						192
1997		238	N(F)	----------no weir or egg take----------						238
1983–92 Avg.	17	126		67%	31	209	56	22	231	188
1998		88	E(F)	----------no weir or egg take----------						88

[a] — = no survey conducted or data not comparable; (F) = escapement surveyed by walking stream; (H) = escapement surveyed from helicopter; N = survey conditions normal; E = excellent; P = poor.

[b] Minimum count as jacks could pass through weir.

[c] Natural spawning (adults) = (total inriver - egg take; 1983-1992).

[d] Four females and two males were held but not spawned for egg take; % = 94/(231-37-6) = 50%.

[e] Includes holding mortality of 4 males and 6 females for egg take.

[f] Peak survey was after weir was removed 58/99 = 59%.

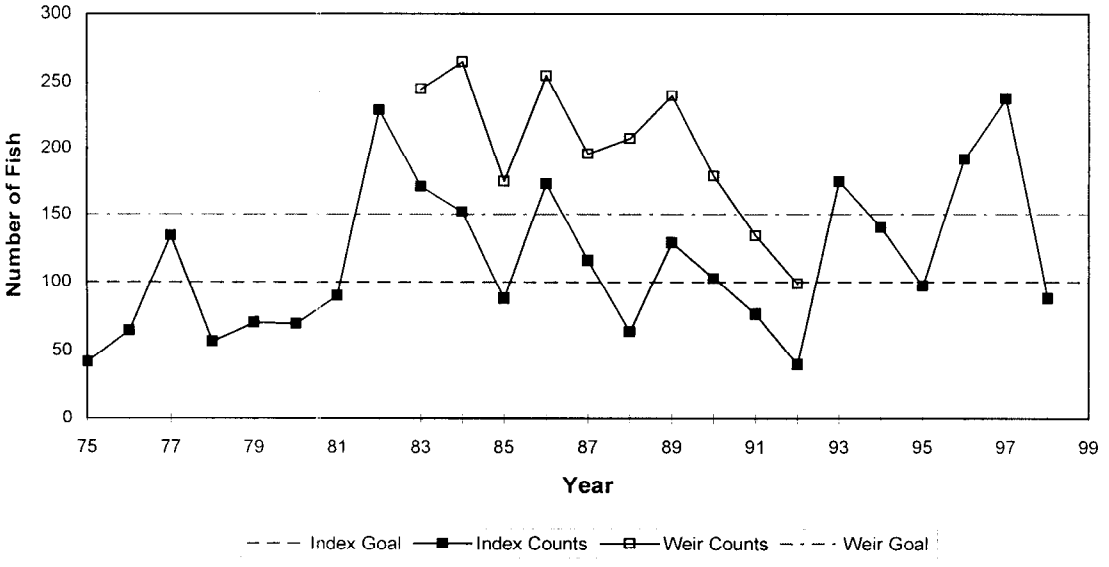

Figure 10.–Counts of chinook salmon at a weir and in the index area of the King Salmon River, 1975-1998. Fish removed for broodstock are subtracted from counts.

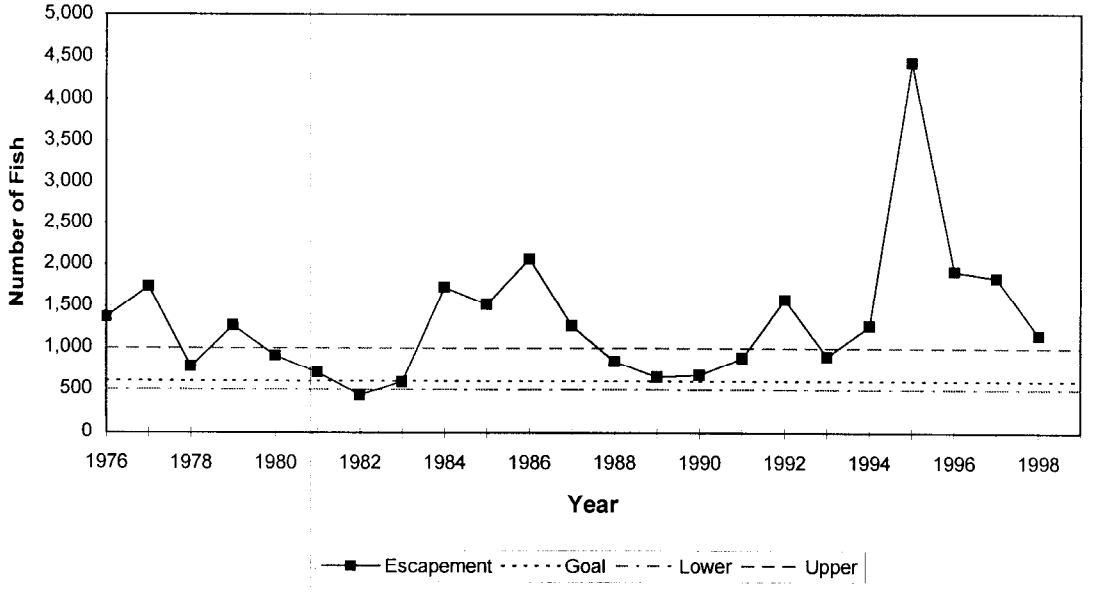

Figure 11.–Counts of large chinook salmon at the Situk River weir, 1975–1998.

Table 15.–Harvest, escapement, and minimum total run of Situk River chinook salmon, 1976–1998.

Year	Harvests below weir				Abundance above weir						Estimated total run inriver [b]			
	182-70 Gillnet	Subsis-tence	Sport	Total	Total weir count	Harvest above weir	Estimated escapement [a]							
							Large	Medium	Small	Total	Large	Medium	Small	Total
1976	1,002	41	200	1,243	1,941	0	1,365	576		1,941				3,184
1977	833	24	244	1,101	1,880	0	1,732	148		1,880				2,981
1978	382	50	210	642	1,103	0	776	327		1,103				1,745
1979	1,028	25	282	1,335	1,800	0	1,266	534		1,800				3,135
1980	969	57	233	1,259	1,125	0	905	220		1,125				2,384
1981	858	62	130	1,050	807	0	702	105		807	1,270	543	44	1,857
1982	248	27	63	338	611	0	434	177		611	672	261	16	949
1983	349	50	52	451	849	0	592	257		849	866	406	28	1,300
1984	512	89	151	752	2,201	0	1,726	475		2,201	2,427	521	5	2,953
1985	484	156	511	1,151	1,982	0	1,521	461		1,982	2,233	683	217	3,133
1986	202	99	37	338	2,572	0	2,067	505		2,572	2,290	583	37	2,910
1987	891	24	395	1,310	1,799	0	1,265	534		1,799	2,215	575	319	3,109
1988	299	90	132	521	1,078	56	837	185		1,022	1,337	259	3	1,599
1989	1	496 [c]	0	497	1,871	0	653	122	1,096	1,871	1,073	198	1,096	2,367
1990	0	516 [c]	0	516	1,363	0	676	532	155 [d]	1,363	969	755	155 [d]	1,879
1991	786	220 [c]	67	1,073	1,613	29	878	125	582	1,585	1,678	413	595	2,686
1992	1,504	341	127	1,972	1,985	54	1,579	224	128	1,931	3,103	699	155	3,957
1993	790	202	50	1,042	4,200	202	899	461	2,638	3,998	1,718	753	2,772	5,243
1994	2,656	367	397	3,420	4,416	170	1,263	1,399	1,584	4,246	2,974	3,098	1,764	7,836
1995	8,106	528	1,180	9,814	8,231	506	4,429	466	2,830	7,725	13,349	1,566	3,131	18,046
1996	3,717	478	1,270	5,465	4,151	795	1,915	410	1,031	3,356	6,557	1,381	1,678	9,616
1997	2,339	352	802	3,493	5,001	1,168	1,837	496	1,501	3,834	5,075	1,321	1,920	8,316
88-97	2,020	359	403	2,781	3,391	298	1,497	442	1,283	3,093	3,783	1,044	1,327	6,155
1998	2,101	238	800	3,139	5,329	200 [e]	1,153	851	3,125	5,129	pending age composition			NA

[a] Escapement from Scott McPherson, ADF&G Sport Fish, Douglas, personal communication, based on age composition.

[b] Total run inriver = chinook escapement + Situk commercial, sport, and subsistence harvests. An unknown portion of the Yakutat Bay catch is Situk fish. Large chinook are 3 to 5-ocean-age and small are 1 and 2-ocean age. Commercial and subsistence catches include some small chinook (Scott McPherson, unpublished report).

[c] Non-retention regulation in effect for commercial fisheries in 1989 and 1990; estimated personal use harvest of 400 large chinook in 1990, 415 in 1990, and 109 in 1991.

[d] Prior to 1990, 1-ocean fish were not counted.

[e] Preliminary estimate of recreational harvest above weir.

NA = not available yet.

OTHER SYSTEMS

Counts of chinook salmon in the Marten and Wilson Rivers are not included in the regional index program, and no official escapement goals have been set for these systems. However, regular counts have been made in the Marten River since 1982 because of its proximity to other surveyed systems. In 1998, efforts were concentrated on the Blossom and Keta rivers, and no chinook salmon surveys were conducted on the Marten or Wilson rivers.

Grant and Klahini rivers, small chinook systems in Behm Canal which have been surveyed sporadically, were not surveyed in 1998. Since 1995 surveys occasional surveys have been flown on the Harding River and Aaron Creek to determine the feasibility of adding these medium and small systems to the

program (Table 7). The remaining systems are too remote, and funds are not currently available for these surveys.

DISCUSSION

The utility of the index method as a measure of escapement is based on the assumption that the number of fish counted in an index area is a constant proportion of the escapement in the index area or watershed. Therefore, a change in the escapement causes a proportional change in the index count. Consequently, even though index counts are not estimates of total escapement, multi-year trends in escapement are correct. Implicit in this method are sources of error that fall into two categories:

Factors that are constant sources of error: (1) interference with the ability to count fish; conditions such as heavily shaded areas or topography that prevent close approach with a helicopter, presence of other species that could be confused with chinook salmon, overhanging brush, or deep or occluded water; and (2) estimates of distribution among tributaries. These two factors are accounted for by survey expansion factors.

Factors that are not constants: (1) changes in migratory timing will produce a reduced count; (2) a very large number of spawners may cause reduced counts relative to the number of fish in the index area; (3) changes in the distribution of spawners among the tributaries of a watershed among years; and (4) inclement weather, turbidity events, or changes in pilot and/or observer experience.

Expanded counts are needed when comparing indices among watersheds or for estimating exploitation rates and spawner/recruit relationships. Though survey and tributary expansion factors have been endorsed by the Pacific Salmon Commission (PSC) since 1981, the original expansion factors were developed on the basis of judgment rather than on empirical data (Appendix B *in* Pahlke 1997b), and error associated with these expansions could be large. Johnson et al. (1992) showed that expansion factors for the Chilkat River greatly underestimated escapement to that watershed. ADF&G recognized the need to develop better expansions throughout the region, and has estimated distribution and escapement for chinook salmon in the Unuk (Pahlke et al. 1996; Jones and McPherson 1998), Chickamin (Pahlke 1996; 1997a), Stikine (Pahlke and Etherton 1998) and Taku rivers (Pahlke and Bernard 1996, McPherson et al. 1997). Projects are continuing on those rivers, along with the Blossom, Keta and Alsek rivers and Andrew Creek. On the basis of information collected on the Unuk and Chickamin rivers, expansion factors for the four Behm Canal systems were revised in 1996. The expansion factor for the King Salmon River was based on 10 years of weir counts compared with aerial surveys, and the expansion factor for Andrew Creek was based on 4 years of paired weir and survey counts.

The expansion factor for the Taku River was revised in 1997 after 4 years of mark-recapture data indicated that the sum of the six tributaries counted was consistently close to 25% of the total escapement to the drainage (McPherson et al. 1997). In 1997 the proportion of the mark-recapture estimate observed in the index counts dropped to 12%. Survey conditions and pilot and surveyor experience levels in 1997 were all similar to previous years with no remarkable changes to explain the large change in observed proportions.

Changing the escapement goals, however, requires a formal review by ADF&G, and the Chinook Technical Committee of the PSC, as was done for the Situk River in 1991, the Behm Canal systems in 1994, and King Salmon River in 1997. The Canadian Department of Fisheries and Oceans and the Transboundary Technical Committees are included in any review of Taku, Stikine or Alsek River goals. In 1998, a revised stock-recruitment analysis by ADF&G and DFO staff estimated that the escapement goal for the Klukshu River should range between 1,100-2,300 spawners (McPherson et al. 1998b). The Andrew Creek escapement goal was also revised in 1998 to a range of 650 to 1,500 total large spawners (Clark et al. 1998). Revised

escapement goals for the Taku and Stikine rivers are under review.

Expansion factors and escapement goals will continue to be revised as we complete more studies which include both index counts and estimates of total escapement. Any change in survey methods or observers must take into account the comparability of historical data with new data. Year-to-year consistency and repeatability of index counts may be more important than their absolute accuracy to agencies that compare escapement estimates between years.

Currently, only one of the 22 minor producers in the region and six of nine medium (seven with Chilkat) producing watersheds are included in the index survey program. Prior to 1997, counts from these streams were expanded to represent the escapement of all streams in minor and medium producing categories. The King Salmon River is unique among Southeast Alaska chinook populations as the only island system, and using it to represent the other 21 small systems most likely produced inaccurate estimates of total escapement. However, because escapement to small and medium systems are a small proportion of the total region escapement, errors in those estimates would have little effect on estimates of regional escapement. In 1997, the method used to expand the index counts to a total region escapement estimate was revised based on over 20 years of systematic escapement surveys in Southeast Alaska and the transboundary rivers. The revised method assumes the sum of the expanded indices accounts for approximately 90% of the total escapement and that number is expanded to account for the remaining 10%. This method more accurately reflects the geographic distribution of the unsurveyed systems.

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APPENDIX A

Appendix A1.–Survey escapement goals and expanded system goals for Southeast Alaska and transboundary rivers.

River system	Index tributaries surveyed	Survey escapement goal [a]	Lower range of escapement goal	Upper range escapement goal	System[d] escapement goal
Major production systems (Total = 3)					
Alsek	Klukshu		1,100g	2,300 g	2,656 [f]
Taku	6 tributaries	13,210 (A)[b]	c	c	52,840 [f]
Stikine	Little Tahltan	5,300 (W)[b]	c	c	21,200 [f]
	Major category subtotal	23,210			81,384
Medium production systems (Total = 9)					
Situk	All	600 (W)[g]	500[i]	1,000[i]	600 [g]
Chilkat	All	2,000 (M)	c	c	2,000 [c]
Andrew Cr.	All	e (A)	325j	750j	750 [e]
Unuk	6 tributaries	875 (A)[g]	650[i]	1,400 [i]	3,500 [f]
Chickamin	8 tributaries	525 (A)[g]	450[i]	900[i]	2,100 [f]
Blossom	All	300 (A)[g]	250[i]	500[i]	750 [f]
Keta	All	300 (A)[g]	250[i]	500[i]	750 [f]
	Medium category subtotal	5,070			10,450
Minor production systems (Total = 22)					
King Salmon	All	100 (F/A)	80[j]	160[j]	150 [g]
	Minor category subtotal	100			150
All systems total		28,447			91,984

[a] (W) = weir count; (A) = aerial survey peak count; (F) foot survey; (M) = mark/recapture estimate. Survey escapement goal = number of fish actually counted on survey, or through weir.

[b] Index goals jointly agreed between U.S. and Canada and presently used by Chinook Technical Committee (CTC) of Pacific Salmon Commission (PSC), but which have not been scientifically reviewed.

[c] Under review.

[d] See Table 1 for expansion factors.

[e] Escapement goals defined as ranges, no point estimate defined.

[f] Expanded estimates from index goals which have not been scientifically reviewed or agreed to by U.S. and Canada and are not used by CTC .

[g] Escapement goals which have been scientifically analyzed through spawner-recruit analysis and are used by ADF&G, DFO and the CTC .

[h] Expanded estimates which have not been scientifically reviewed, but are presently used by CTC and ADF&G.

[i] Biological escapement goal ranges used by ADF&G management.

[j] Biological escapement goal ranges used by ADF&G management, new in 1998.

Appendix A2.–Estimated total escapements of chinook salmon to escapement indicator systems and to Southeast Alaska and transboundary rivers, 1975–1998. Numbers are revised annually as data is collected. Index escapements are expanded for survey counting rates and unsurveyed tributaries, numbers in **bold type** are weir counts or mark-recapture estimates and are not expanded [region total expanded for 84% w/o Chilkat River, 90% with Chilkat escapement included].

	MAJOR SYSTEMS				MEDIUM SYSTEMS										
Year	Alsek[a]	Taku	Stikine	Major subtotal	Situk	Chilkat	Andrew	Unuk	Chick-amin	Blos-som	Keta	Medium subtotal	King Salmon	Total all systems	Expanded region total
1975		8,356	5,800	14,156			520		1,481	365	508	2,873	62	17,091	20,346
1976	1,672	18,904	3,300	23,876	**1,365**		**404**		627	170	210	2,776	96	26,748	31,843
1977	4,363	22,684	6,600	33,647	**1,732**		**456**	3,896	1,450	280	575	8,389	199	42,235	50,280
1978	4,050	13,220	5,200	22,470	**776**		**388**	4,424	1,234	358	980	8,159	84	30,713	36,563
1979	6,101	16,624	9,328	32,053	**1,266**		**327**	2,304	954	135	1,065	6,051	113	38,217	45,497
1980	3,770	30,176	17,096	51,042	**905**		**282**	4,064	1,779	223	480	7,732	104	58,878	70,093
Average	3,991	18,327	7,887	29,541	**1,209**		**396**	3,672	1,254	255	636	5,997	110	35,647	42,437
1981	2,837	39,144	26,672	68,653	**702**		**536**	2,924	1,536	398	823	6,918	139	75,710	90,131
1982	3,078	19,252	22,640	44,970	**434**		**672**	5,404	2,284	863	1,885	11,542	**354**	56,866	67,697
1983	3,352	8,248	4,752	16,352	**592**		**366**	4,500	2,398	1,473	2,055	11,383	**245**	27,980	33,310
1984	2,038	15,636	10,352	28,026	**1,726**		**389**	7,348	4,408	1,270	1,525	16,666	**265**	44,957	53,520
1985	1,853	28,832	12,456	43,141	**1,521**		640	4,736	3,824	1,773	1,560	14,054	**175**	57,370	68,297
Average	2,632	22,222	15,374	40,228	**995**		521	4,982	2,890	1,155	1,570	12,112	**236**	52,576	62,591
1986	3,966	30,080	11,564	45,610	**2,067**		1,414	8,504	6,980	3,195	1,725	23,885	**255**	69,750	83,036
1987	3,598	22,972	19,132	45,702	**1,265**		1,576	7,892	3,900	3,373	1,920	19,926	**196**	65,824	78,362
1988	2,891	34,504	29,168	66,563	**837**		1,128	6,984	3,144	960	1,438	14,491	**208**	81,262	96,740
1989	3,399	**40,329**	18,860	62,588	**653**		1,060	4,596	3,736	860	2,888	13,793	**240**	76,621	91,215
1990	2,722	**52,142**	17,568	72,432	**676**		1,328	2,364	2,256	643	1,515	8,781	**179**	81,392	96,895
Average	3,315	36,005	19,258	58,579	**1,100**		1,301	6,068	4,003	1,806	1,897	16,175	**216**	74,970	89,249
1991	3,165	40,612	18,024	61,801	**878**	**5,897**	800	2,620	1,948	598	680	13,421	**134**	75,356	83,728
1992	1,950	44,232	26,508	72,690	**1,579**	**5,284**	1,556	3,496	1,384	375	543	14,217	**99**	87,006	96,673
1993	4,811	52,816	45,796	103,423	**899**	**4,472**	2,120	4,272	1,556	758	905	14,982	259	118,664	131,848
1994	5,532	39,652	25,800	70,984	**1,263**	**6,795**	1,144	**4,623**	1,552	403	765	16,545	207	87,736	97,484
1995	8,579	**33,805**	13,036	55,420	**4,355**	**3,790**	686	3,088	**2,309**	543	438	15,208	144	70,772	78,636
Average	4,807	42,223	25,833	72,864	**1,795**	**5,248**	1,261	3,264	1,573	535	666	14,874	169	87,906	97,674
1996	4,401	**79,019**	28,949	112,369	**1,913**	**4,920**	670	4,668	**1,587**	550	743	15,051	288	127,708	141,898
1997	4,173	**114,938**	26,996	146,107	**1,837**	**7,728**	586	**2,970**	1,088	330	615	15,507	357	161,971	179,968
1998	1,879	25,316	19,492	46,687	**1,153**	**3,337**	974	**4,132**	1,564	**393**	**446**	11,999	132	58,818	65,353
1998 CHANGE FROM 1997															
Number	(2,294)	(89,622)	(7,504)	(99,420)	(684)	(4,391)	388	1,162	476	63	(169)	(3,505)	(225)	(103,150)	(114,611)
Percent	-55%	-78%	-28%	-68%	-37%	-57%	66%	39%	44%	19%	-27%	-23%	-63%	-64%	-64%
Goals															
Lower	1,719	Under review	Under review		500	Under review	650	2,800	1,680	600	600		120		
Point	2,656	52,840	21,200	76,696	600	2,000	750	3,500	2,100	750	750	10,450	150	87,296	96,996
Upper	3,594				1000		1,500	5,600	3,360	1,200	1,200		240		
Average percent of goal															
75-80	150%	35%	37%	39%	201%		53%	105%	60%	34%	85%	57%	73%	41%	
81-85	99%	42%	73%	52%	166%		69%	142%	138%	154%	209%	116%	157%	60%	
86-90	125%	68%	91%	76%	183%		173%	173%	191%	241%	253%	155%	144%	86%	
91-95	181%	80%	122%	95%	299%	262%	168%	103%	83%	71%	89%	142%	112%	101%	
96-97	131%	138%	119%	133%	292%	266%	99%	112%	67%	57%	80%	136%	173%	133%	

a Alsek Escapement = (weir count/0.64)-sport and aboriginal fishery harvest.

Appendix A3.–Detailed 1998 Southeast Alaska chinook salmon escapement surveys as entered into Commercial Fisheries Division Integrated Fisheries Database (IFDB). Includes all surveys where chinook salmon were observed, many are not used to estimate escapement.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments			Other comments
101-30-030	Keta River	1998	19-Aug	H			180		180	KAP	22	33		2 up high, 77 below Hill Cr.
			3-Sep	H			105	1	106	KAP	22	32		80 above Hill Cr., 4 up high, poor surv
101-30-060	Marten River	1998	14-Jul	A			5		5	EDH	22	32	43	
101-45-007	Herring Cove	1998	28-Jul	A		500			500	PSD	22	33	43	
101-45-078	Carroll Creek	1998	8-Jul	A		300			300	PSD	21	32	43	
			16-Jul	A		300			300	PSD	22	32	43	
			26-Jul	A			200		200	PSD	22	33	43	
			28-Jul	A		500	200		700	PSD	22	33	43	
101-45-081	Falls Creek	1998	30-Jun	A		500			500	PSD	21	32	43	
			8-Jul	A			600		600	PSD	21	32	43	
			16-Jul	A		50	500		550	PSD	22	32	43	
			26-Jul	A		100			100	PSD	22	33	43	
101-47-015	Ward Creek	1998	25-Aug	F			7	2	9	TPZ	22	32		
101-47-025	Ketchikan Creek	1998	3-Sep	F				2	2	SBW	22	32	41	sbw,sch,leslie woods
101-55-040	Blossom River	1998	19-Aug	H			76		76	KAP	22	33		
			3-Sep	H			91		91	KAP	22	32		13 up top
101-71-04A	Barrier Creek	1998	6-Aug	H						KAP	22	33		zip
101-71-04B	Butler Creek	1998	6-Aug	H			124		124	KAP	21	33		

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Appendix A3.–Page 2 of 6.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments		Other comments
101-71-04C	Clear Creek	1998	6-Aug	H			8		8	KAP	23	31	
			13-Aug	H			4		4	KAP	23	31	murky
101-71-04H	Humpy Creek	1998	24-Aug	H			28		28	KAP	22	33	
			3-Sep	H			8		8	KAP	23	32	
101-71-04I	Indian Creek	1998	6-Aug	H			46		46	KAP	22	33	
101-71-04K	King Creek	1998	24-Aug	H			105		105	KAP	22	33	schooled up
			3-Sep	H			123		123	KAP	22	32	scattered to top
101-71-04L	Leduc River	1998	6-Aug	H			13		13	KAP	23	33	bottom end murky
			13-Aug	H			16		16	KAP	22	33	bottom murky
101-71-04S	South Fork Chickamin	1998	6-Aug	H			45	1	46	KAP	22	33	
101-75-015	Eulachon River	1998	4-Aug	F			9	2	11	DLM	21		+ 4 jacks
			6-Aug	H			39		39	KAP	22		37 in pool
			11-Aug	F			4		4	KAP	22		partial
			24-Aug	H			28	5	33	KAP	22	33	27 high right fork
			26-Aug	F			5		5	KAP	22		to the forks only
101-75-03B	Boundary Cr Unuk R	1998	6-Aug	H			9		9	KAP	99		
			9-Aug	F			36	1	37	KAP	22		
101-75-30C	Clear Creek-Unuk R	1998	6-Aug	H						KAP	22		early
			15-Aug	F			81		81	KAP	22		
			20-Aug	F			70	1	71	KAP	22		
			24-Aug	H			27		27	KAP	22	33	partial survey
			24-Aug	F			200	83	283	KAP	22		

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Appendix A3.–Page 3 of 6.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments			Other comments
101-75-30G	Genes Lake Creek-Unuk	1998	4-Aug	F			255		255	SAM	21			at mouth
			6-Aug	H			172		172	KAP	22			in lake
101-75-30K	Kerr Creek-Unuk R	1998	4-Aug	F			68		68	KAP	22			
			6-Aug	H			43		43	KAP	23			murky
			16-Aug	F			104		104	KAP	22			
101-75-30L	Lake Creek-Unuk R	1998	6-Aug	H			7	1	8	KAP	23			4 on riffles
			19-Aug	F			22		22	KAP	22			
101-75-30Q	Cripple Ck-Unuk R	1998	4-Aug	F			90	4	94	KAP	22			
			11-Aug	F			281	30	311	KAP	22			
101-80-070	Hatchery Ck-Yes Bay	1998	25-Aug	F			5		5	SCH	22	32		Steve C Heinl and Andrew W Piston
			1-Sep	F			4		4	SCH	23	31		Steven C Heinl and Andrew W Piston
			9-Sep	F			2		2	SCH	23	31		Steven C Heinl with Andrew W Piston and Kim A Vicey
106-44-031	Crystal Creek	1998	9-Jul	A		180		5	185	WRB	23	33	42	100 BLW RAPIDS, 20 FLOATING RCKS
			21-Jul	A		35			35	WRB	23	32	43	ONLY FISH IN FLOATING RCKS
			3-Aug	A		300	200		500	WRB	21	33	42	100 @ RAPIDS, 200 BLW STREAM
			5-Aug	A		500			500	WRB	22	33	42	330 BELOW HATCHERY, 170 @ RAPIDS
			18-Aug	A		200	500		700	WRB	22	32	43	PLUS 150 IN HOLDING POND
107-40-024	Aaron Creek	1998	28-Jul	A			6		6	WRB	23	32	41	VERY GLACIAL
			21-Aug	A			69		69	WRB	23	32	42	GLACIAL, ONLY INC FISH ON RIFFLES

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Appendix A3.–Page 4 of 6.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments			Other comments
107-40-049	Harding River	1998	21-Jul	A			25		25	WRB	22	32	41	
			28-Jul	A			72		72	WRB	22	32	41	
			5-Aug	H			3	7	10	KAP	23			poor vis
			21-Aug	A			65	10	75	WRB	22	32	42	
107-40-053	Bradfield River E Fork.	1998	21-Aug	A			63	3	66	WRB	23	32	42	GLACIAL
107-40-055	Eagle R Bradfield	1998	28-Jul	A			11		11	WRB	22	32	41	
108-40-020	Andrews Creek	1998	28-Jul	A	240		70		310	WRB	22	32		240 BLW FKS, 50 N. FK, 20 MAIN FK
			19-Aug	H			284		284	KAP	21	33		33 north fork
			19-Aug	F			477	10	487	BLL	21	32		425 ABV WEIR, 40 IN N. ARM
			21-Aug	A			260	20	280	WRB	22	32		GET BETTER COUNTS WHEN SCHLED
108-40-13A	W of Hot Springs	1998	21-Aug	A			28		28	WRB	22	32		
108-41-010	North Arm Creek	1998	28-Jul	A			6		6	WRB	23	32		8 A.M. SURVEY
			21-Aug	A			25	10	35	WRB	22	32		TO MANY PINKS FOR GOOD COUNT
108-80-100	Tahltan River	1998	5-Aug	H			411	176	587	KAP	22			bridge to canyon
108-80-115	Beatty Ck Tahltan	1998	30-Jul	H			121	4	125	KAP	21	33		
			5-Aug	H			86	14	100	KAP	21	33		
108-80-120	Little Tahltan River	1998	30-Jul	H			1,255	130	1,385	KAP	22	33		38 below weir
			5-Aug	H			804	508	1,312	KAP	21	33		41 below weir
110-14-007	Farragut River	1998	4-Aug	A			9		9	WRB	23	33	42	TO GLACIAL TO SEE FISH ON RIFFLES
110-32-009	Chuck R Windham Bay	1998	31-Jul	A			27		27	WRB	22	32	43	ALL ABV GORGE

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Appendix A3.–Page 5 of 6.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments			Other comments
110-34-008	Sanborn Creek	1998	5-Aug	F				1	1	RPG	22	32	42	FEMALE
111-17-010	King Salmon River	1998	23-Jul	H			77		77	KAP	23			
			27-Jul	H			59		59	KAP	22			lots chums
			27-Jul	F			88		88	KAP	21	33		23 jacks
111-32-220	Nakina River	1998	29-Jul	H			860		860	KAP	21	33	61	IA1
			29-Jul	H			580		580	KAP	21	33	62	IA2
			29-Jul	H			880		880	KAP	21	33	63	IA3
			29-Jul	H			400		400	KAP	21	33	64	IA4
			29-Jul	11			2,720		2,720	KAP	99			total peak count
111-32-240	Kowatua Creek	1998	12-Aug	H			465		465	KAP	22	33		
			20-Aug	H			410	59	469	KAP	22	31		
			26-Aug	H			379	94	473	KAP	22	33		
111-32-255	Tatsamenie River	1998	20-Aug	H			332	10	342	KAP	23			poor vis
			26-Aug	H			650	25	675	KAP	21			134 outlet to big lake
111-32-270	Nahlin River	1998	21-Jul	H			920		920	KAP	22	33	61	IA1 below weir
			21-Jul	H			340		340	KAP	22	33	62	IA2, beaver dam across
			21-Jul	H			34		34	KAP	22	33	63	IA3
			29-Jul	H			290	30	320	KAP	21	33	63	IA3
			29-Jul	H			432		432	KAP	21	33	62	IA2,90 below dam
			29-Jul	H			299		299	KAP	21	33	61	IA1, 200 right below weir
111-32-275	Tseta Creek	1998	29-Jul	H			360		360	KAP	21	33		excellent vis

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Appendix A3.–Page 6 of 6.

Stream number	Stream name	Year	Date	Survey type	Mouth	Tidal	Live	Dead	Total count	Obs.	Coded comments			Other comments
111-32-280	Dudidontu River	1998	30-Jul	H			807		807	KAP	21	33		180 above dams
			5-Aug	H			679	55	734	KAP	22	33		139 above dams
111-50-052	Montana Creek	1998	4-Aug	F			1		1	RRW	21	33		
111-50-069	Fish Creek-Douglas I	1998	14-Aug	F			10	1	11	LED	21	32	42	
			26-Aug	F		11	36	21	68	LED	22	31	42	
			10-Sep	F			2	33	35	LED	22	32	42	
115-32-054	Big Boulder Creek	1998	6-Aug	F			15		15	RPE	21	32		1 JACK
			13-Aug	F			24		24	RPE	21	33		5 JACKS
182-30-043	Takhanne River (CAN)	1998	2-Aug	H			129	7	136	KAP	21			excellent vis
182-30-045	Goat Creek	1998	2-Aug	H			30	9	39	KAP	22	32		
182-30-050	Blanchard Ck (CAN)	1998	1-Aug	H			51	20	71	KAP	23	31		poor vis

[a] Comment codes: 21= visibility excellent, 22 = normal, 23 = poor; 31 = water high, 32 = water normal, 33 = water low.

Appendix A4.–Computer files used to complete this report.

FILE NAME	DESCRIPTION
ESC98_DOC.DOC	Word Document containing final text of document.
TOTALCHTS.XLW	Excel workbook with tables and charts with annual counts for each index area.
SUMVER98.XLS	Appendix table A2, with expanded escapement totals for Southeast Alaska
ESC98.XLS	Table 1. Estimated chinook escapement in 1998.
GOALS.XLS	Appendix Table A1. Expanded goals for Southeast Alaska.