Fishery Data Series No. 00-34

Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 1999

by

Keith A. Pahlke

December 2000

Alaska Department of Fish and Game

Division of Sport Fish

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

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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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 1999 was 68,841 large (age .3 and older) chinook, a 17% decrease from the escapement of 82,966 fish estimated in 1998. The 1999 estimate was 17% of the 1977–1979 average of 64,296 chinook salmon, 72% of the 1980–1989 average of 96,089 and 54% of the 1990–1998 average of 128,613. The estimated total was the lowest since 1984.

Seven out of eleven escapement indices increased from 1998, however indices were below escapement goal ranges in the Taku and Blossom rivers. Estimated age and sex composition of all stocks sampled in 1999 are presented.

Key words: Chinook, *Oncorhynchus tshawytscha*, escapement, escapement goals, 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 coast-wide rebuilding program for all wild stocks of chinook salmon, under the auspices of the U.S./Canada Pacific Salmon Treaty (PST).

To track the spawning escapement, 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 status of escapement indicator stocks (PSC 1996). Biological Escapement Goals (BEGs) have been established for 11 systems and fisheries are managed to achieve those escapement goal ranges. Escapement estimates provide a basis for regulations to restrict or expand fisheries to achieve goals.

As part of a continuing program by the Division of Sport Fish to improve wild chinook stocks, this project obtained indices of spawner

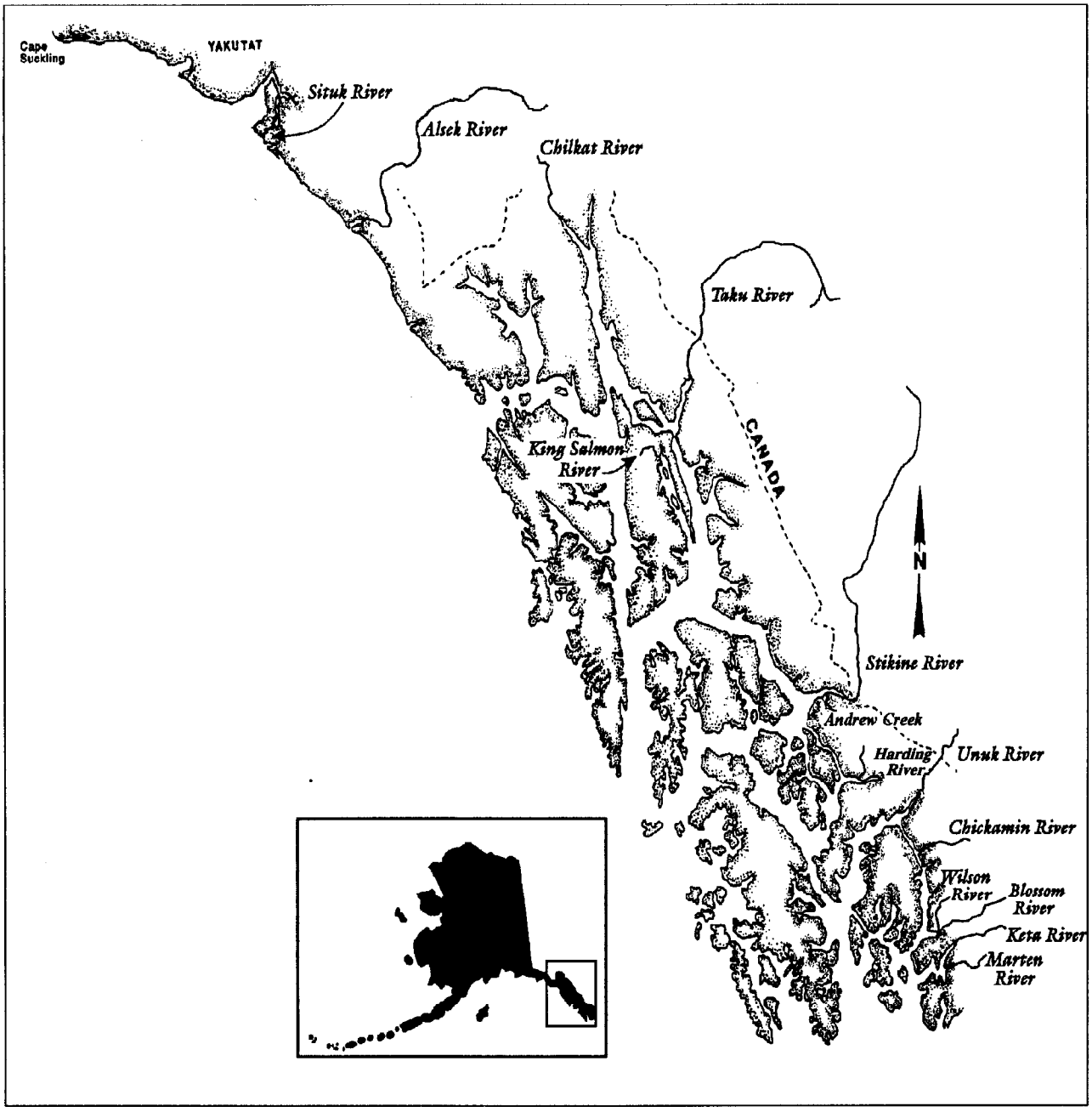

Figure 1.–Location of selected chinook salmon systems in Southeast Alaska, Yakutat, and transboundary rivers.

abundance for major chinook salmon stocks in Southeast Alaska. Objectives for 1999 were to count large (≥660 mm mideye 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, since 1973 the DFO, TRTFN, and ADF&G have operated a carcass collection weir below the major spawning area on the Nakina river, which provides an estimate of the age and size composition of the escapement. Mark-recapture experiments are providing annual independent estimates of total escapement (McPherson et al. 1996, 1997, 1998, 1999).

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., 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, operated again in 1998, and removed in 1999.

The Alsek River originates in Yukon Territory, Canada, and flows in a southerly direction into the Gulf of Alaska approximately 75 km southeast 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 radiotelemetry study was conducted to estimate the escapement and distribution of spawning chinook salmon in the Alsek River (Pahlke and Etherton 2000), and the mark-recapture experiment was continued in 1999.

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 of the 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 annually since 1997 (Jones et al. 1998a; Jones and McPherson 1999, Jones et al. *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 contains 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 radiotelemetry in 1996 (Pahlke 1996, 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 specifically excluded from Wilderness designation, because of 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. 2000) and repeated on the Keta River in 1999 (Freeman et al. *In press*).

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 1999).

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 with populations of wild chinook salmon (Figure 1). 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 A2). These index systems, along with the Chilkat River, are believed to account for about 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, bringing the total number of regularly monitored river systems to eleven. Pahlke (1997b) provides detailed descriptions of the escapement goals and their origins. Escapement goals have been revised when sufficient new information warrants. Most of the revised escapement goals have been developed with spawner-recruit analysis, as ranges of optimum escapement rather than a single point estimate (Appendix A1). Spawner-recruit analysis requires not only a long series of escapement estimates, but also annual age and sex-specific estimates of escapement (McPherson and Carlile 1997). The United States Section of the CTC (USCTC) developed data standards

desirable for stock specific assessments of escapement, terminal runs, and forecasts of abundance against which existing stock assessment programs could be evaluated (USCTC 1997). These data have been collected routinely at weirs and during mark-recapture studies, and, recently, specific programs have been implemented to collect age, sex and length data for chinook salmon in the Blossom, Chickamin, and King Salmon rivers and Andrew Creek.

INDICES OF ESCAPEMENT

Spawning chinook salmon are counted at 26 designated index areas in nine of the systems; total escapement in the other two systems are estimated by complete counts of chinook salmon at the Situk River weir and by annual mark-recapture estimates on the Chilkat River. 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 since 1976 (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 conditions preclude the second survey.

Only large (typically age-.3, -.4, and -.5) chinook salmon, ≥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 1999 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 an estimate of the proportion of the total season's escapement counted in a river system during the peak spawning period. Expansion factors are based on comparisons with weir counts, mark-recapture estimates, spawning distribution studies or by professional judgment. They vary among rivers according to how complete the coverage of spawning areas is and 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 5.2 for the Taku River (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, escapement estimates from the 11 index systems are expanded to account for the unsurveyed systems. (Appendix A2). 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 before 1991. From 1991 to 1997 the estimated escapement to the Chilkat River

Table 1.–Estimated escapement of chinook salmon to Southeast Alaska and transboundary rivers in 1999.

	Survey area	Number counted	Survey expansion factor	Estimated escapement
Major producers				
Alsek River	Klukshu	2,193	4.0 [a]	8,745 [b]
Taku River	5 tributaries	3,951	5.2 [c]	20,545
Stikine River	Little Tahltan	4,926	5.15[e]	19,947 [f]
Category subtotal				49,237
Medium producers				
Situk River	all	2,011	1.0	1,523 [d]
Chilkat River	all	2,298	[e]	2,271
Andrew Cr.	all	605	2.0	1,210
Unuk River	6 tributaries	680	4.0	3,914 [f]
Chickamin River	8 tributaries	501	4.0	2,004
Blossom River	all	212	2.5	530
Keta River	all	276	2.5	968 [f]
Category subtotal				12,420
Minor producers				
King Salmon R.	all	200	1.5	300
Index system total				61,957
Region total			[g]	68,841

[a] Revised 2000.

[b] Klukshu weir count of 2,193 X4 minus aboriginal fishery harvest above weir (27).

[c] Revised in 1999 (McPherson et al. 2000), 1999 mark-recapture estimate incomplete.

[d] Situk River weir count minus estimated sport harvest of large fish above weir (488).

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

[f] Mark-recapture estimate available in 1999.

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

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 spawning distribution. For example, estimated total escapement and radio-tracking distribution data were used to revise tributary expansion factors for the Taku and Unuk rivers (McPherson et al. 1996, Pahlke et al. 1996, 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 and again in 1999 based on the results of mark-recapture studies (Pahlke and Bernard 1996, McPherson et al. 2000).

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, Stikine, Alsek, Unuk, Chickamin, Blossom, Keta 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, Keta, and Alsek rivers. Estimates of escapement from expanded counts are included in this document to provide relative estimates of total spawner abundance over time, with the caveat that expansion factors may produce incorrect estimates, or be revised in the future.

RESULTS

In 1999, 41 locations, 25 of which were designated index areas, were surveyed specifically for chinook salmon escapement (Appendix A3). Surveys generally progressed as planned.

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 summed escapement goals in the region. 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.

The estimated escapement (expanded) of chinook salmon for all Southeast Alaska and transboundary rivers in 1999 was 68,841 (Table 1), a 17% decrease from the estimated 82,966 fish in 1998. Estimates for 1998 and prior years were revised from previous reports using updated estimates. The estimated total for the region declined for the second year in a row, primarily due to a large decline in escapement to the Taku River, which had an extremely high escapement in 1997. The 1999 escapement is 107% of the 1977–1979 average of 64,296 chinook salmon, 72% of the 1980–1989 average of 96,089, and 54% of the 1990–1998 average of 128,613 fish (Appendix A2).

TAKU RIVER

The count of 4,172 large chinook salmon in the six index areas of the Taku River was the lowest since 1984 (Table 2) with counts in all six tributaries below average (Table 3). Counts increased steadily from 1983 to 1993, and escapements exceeded the upper limit of the BEG four times in the 90s (Figure 2).

Counts were expanded by a survey expansion factor of 5.2 and excluding the Tseta Creek counts. The expansion factor was revised in 1999 based on five years of mark-recapture experiments on the Taku River (Table 4) (McPherson et al. 2000). McPherson et al. recommend an escapement goal range of 30,000 to 55,000 large spawners. These changes were adopted by the Transboundary River Technical Committee (TBTC) and the Chinook Technical Committee (CTC) of the PSC. The revised PSC goal uses counts in five index areas expanded by 5.2, which corresponds to an index goal range of 5,800 to 10,600 fish. Expansion of the survey counts of 3,951 by 5.2 results in an escapement estimate of 20,545 large chinook salmon in 1999. A mark-recapture experiment was also conducted in 1999, but analysis is not complete yet (McPherson et al. *In Prep*).

Age, sex and length data was collected from carcasses at the Nakina River and at Tatsamenie River from live fish sampled with angling gear and carcasses (Appendix A4h, A5h).

STIKINE RIVER

At the Little Tahltan River weir 4,738 chinook salmon were counted in 1999. The weir count was 3% lower than the count of 4,879 in 1998 and below the 1989–1998 average of 5,641 (Table 5). Aerial surveys of Beatty Creek and the glacially occluded mainstem Tahltan River were discontinued as recommended in Bernard et al., (2000).

Table 2.–Counts of spawning chinook salmon in index areas of the Taku River, 1951–1999.

Year[a]	Nakina River		Nahlin River		Kowatua River		Tatsamenie River		Dudidontu River		5-trib. total	Tseta Creek[f]	
1951	5,000	(F)[b]	1,000	(F)	–		–		400	(F)	6,400	100	(F)
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[c]	(F/W)	–		–		–		–		1,500		
1958	2,500[c]	(F/W)	2,500	(A)	–		–		4,500	(A)	9,500		
1959	4,000[c]	(F/W)	–		–		–		–		4,000		
1962	–		216	(A)	–		–		25	(A)	241	81	(A)
1965	3,050	(H)	35	(A)	200	P(A)	50	P(A)	110	(A)	3,445	18	(A)
1966	3,700	P(A)	300	(A)	14	P(A)	100	P(A)	252	(A)	4,366	151	(A)
1967	700	(A)	300	P(A)	250	P(A)	–		600	(A)	1,850	350	(A)
1968	300	P(A)	450	(A)	1,100	(A)	800	E(A)	590	(A)	3,240	230	(A)
1969	3,500	(A)	–		3,300	(A)	800	E(A)	–		7,600	–	
1970	–		26	(A)	1,200	P(A)	530	E(A)	10	(A)	1,766	25	(A)
1971	500	(A)	473	(A)	1,400	E(A)	360	E(A)	165	(A)	2,898	–	(A)
1972	1,000	(F)	280	(A)	170	(A)	132	(A)	102	(A)	1,684	80	P(A)
1973	2,000	N(H)	300	E(H)	100	N(H)	200	E(H)	200	E(H)	2,800	4	(A)
1974	1,800	E(H)	900	E(H)	235	(A)	120	(A)	24	(A)	3,079	4	(A)
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)	–		3,284	21	E(H)
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)	9,528	258	N(H)
1982	2,533	E(H)	1,246	E(H)	289	N(H)	387	N(H)	130	N(H)	4,585	228	N(H)
1983	968	E(H)	391	N(H)	171	E(H)	236	E(H)	117	E(H)	1,883	179	N(H)
1984[d]	1,887	(H)	951	(H)	279	E(H)	616	E(H)	–		3,733	176	(H)
1985	2,647	N(H)	2,236	E(H)	699	E(H)	848	E(H)	475	(H)	6,905	303	E(H)
1986	3,868	(H)	1,612	E(H)	548	E(H)	886	E(H)	413	E(H)	7,327	193	E(H)
1987	2,906	E(H)	1,122	E(H)	570	E(H)	678	E(H)	287	E(H)	5,563	180	E(H)
1988	4,500	E(H)	1,535	E(H)	1,010	E(H)	1,272	E(H)	243	E(H)	8,560	66	E(H)
1989	5,141	E(H)	1,812	E(H)	601[e]	(W)	1,228	E(H)	204	E(H)	8,986	494	E(H)
1990	7,917	E(H)	1,658	E(H)	614[e]	(W)	1,068	N(H)	820	E(H)	12,077	172	N(H)
1991	5,610	E(H)	1,781	E(H)	570	N(H)	1,164	E(H)	804	E(H)	9,929	224	N(H)
1992	5,750	E(H)	1,821	E(H)	782	E(H)	1,624	N(H)	768	N(H)	10,745	313	N(H)
1993	6,490	E(H)	2,128	N(H)	1,584	E(H)	1,491	E(H)	1,020	E(H)	12,713	491	N(H)
1994	4,792	N(H)	2,418	E(H)	410	P(H)	1,106	N(H)	573	N(H)	9,299	614	E(H)
1995	3,943	E(H)	2,069	E(H)	550	N(H)	678	N(H)	731	E(H)	7,971	786	E(H)
1996	7,720	E(H)	5,415	E(H)	1,620	N(H)	2,011	N(H)	1,810	N(H)	18,576	1,201	N(H)
1997	6,095	E(H)	3,655	E(H)	1,360	N(H)	1,148	N(H)	943	N(H)	13,201	648	N(H)
1998	2,720	E(H)	1,294	N(H)	473	N(H)	675	E(H)	807	E(H)	5,969	360	E(H)
1999	1,900	N(H)	532	N(H)	561	E(H)	431	N(H)	527	E(H)	3,951	221	N(H)
89-98 Average	5,618		2,405		856		1,219		848		10,947	530	

[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, 1989, 1990.

[f] Tseta Creek removed from index areas in 1999.

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
1998	2,720	43	1,294	20	473	7	675	11	807	13	360	6	6,329
Average	4,478	49	1,982	21	721	8	987	11	597	7	385	4	9,150
1999	1,900	46	532	13	561	13	431	10	527	13	221	5	4,172

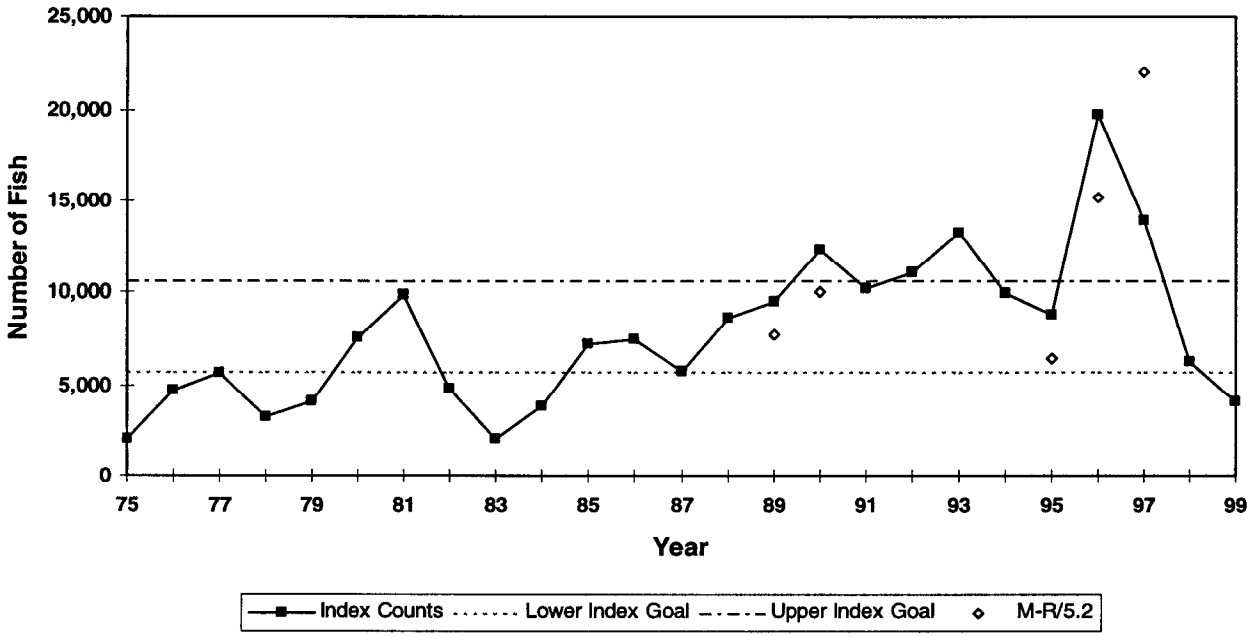

Figure 2.–Counts of chinook salmon in index areas of the Taku River, 1975–1999 and mark-recapture estimates divided by expansion factor of 5.2. Lines show upper and lower limits of index escapement goal range,

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

Year	Counts[a]	M-R	SE	% Observed
1989	8,986	40,329	5,646	22.3
1990	12,077	52,142	9,326	23.2
1995	7,971	33,805	5,060	23.6
1996	18,576	79,019	9,048	23.5
1997	13,201	114,938	17,888	11.5
Average	12,162	64,047		19.0
1998	6,329	not available		
1999	4,172	not available		

[a] Sum of 5 tributaries (not 6, as prior to 1999).

One aerial survey flown in 1999 obtained a count of 1,379 large chinook salmon above the Little Tahltan River weir. The peak survey count was 29.1% of the total escapement through the weir. From 1985 to 1999, the proportion of the total escapement of chinook salmon counted during peak aerial surveys has ranged from 28.4% to 56.6% and averaged 42.0% (Table 5). 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 and 1999, survey conditions were not unusual and there is no explanation for the lower than average proportion of escapement observed. A second survey was not completed in 1999 because of fuel shortage.

Age, sex and length data was collected from 681 live fish and 71 carcasses sampled at the Little Tahltan River weir and from 100 post-spawning and dead fish sampled at Verrett Creek (Appendix A4e, A5e).

Based on a stock-recruit model, the BEG was revised in 1999 to a range of 14,000 to 28,000 large chinook total in the Stikine River drainage or 2,700 to 5,300 at the Little Tahltan weir (Bernard et al. 2000). The 1999 weir count was within the revised escapement goal range, which has been met or exceeded every year since the weir was installed in 1985 (Figure 3). Expansion of the 1999 Little Tahltan weir count of 4,738 large chinook salmon by the survey expansion factor (5.15) produced a total Stikine River escapement estimate of 24,401 large chinook salmon. The preliminary estimate of total escapement to the Stikine River from a mark-recapture experiment conducted in 1999 is about 19,947 (SE = 3,240, Pahlke et al., 2000.).

Table 5.–Counts of spawning chinook salmon in the Little Tahltan River, Stikine River, 1975–1999.

				Aerial survey		
Year	Weir count	Above-weir catch[a]	Escapement	Peak count[b, c]		Percent counted
1975	–			700	E(H)	
1976	–			400	N(H)	
1977	–			800	P(H)	
1978	–			632	E(H)	
1979	–			1,166	E(H)	
1980	–			2,137	N(H)	
1981	–			3,334	E(H)	
1982	–			2,830	N(H)	
1983	–			594	E(H)	
1984	–			1,294	(H)	
1985	3,114	0	3,114	1,598	E(H)	51.3
1986	2,891	0	2,891	1,201	E(H)	41.5
1987	4,783	0	4,783	2,706	E(H)	56.6
1988	7,292	0	7,292	3,796	E(H)	52.1
1989	4,715	0	4,715	2,527	E(H)	53.6
1990	4,392	0	4,392	1,755	E(H)	40.0
1991	4,506	0	4,506	1,768	E(H)	39.2
1992	6,627	0	6,627	3,607	E(H)	54.4
1993	11,449	12	11,437	4,010	P(H)	35.1
1994	6,387	14	6,373	2,422	N(H)	38.0
1995	3,072	0	3,072	1,117	N(H)	36.4
1996	4,821	0	4,821	1,920	N(H)	39.8
1997	5,557	10	5,547	1,907	N(H)	34.4
1998	4,879	6	4,873	1,385	N(H)	28.4
89-98 Avg.	5,641	4	5,636	2,242		39.8
1999	4,738	0	4,738	1,379	N(H)	29.1

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

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

[c] Peak count equals peak survey above weir plus count below weir on that date.

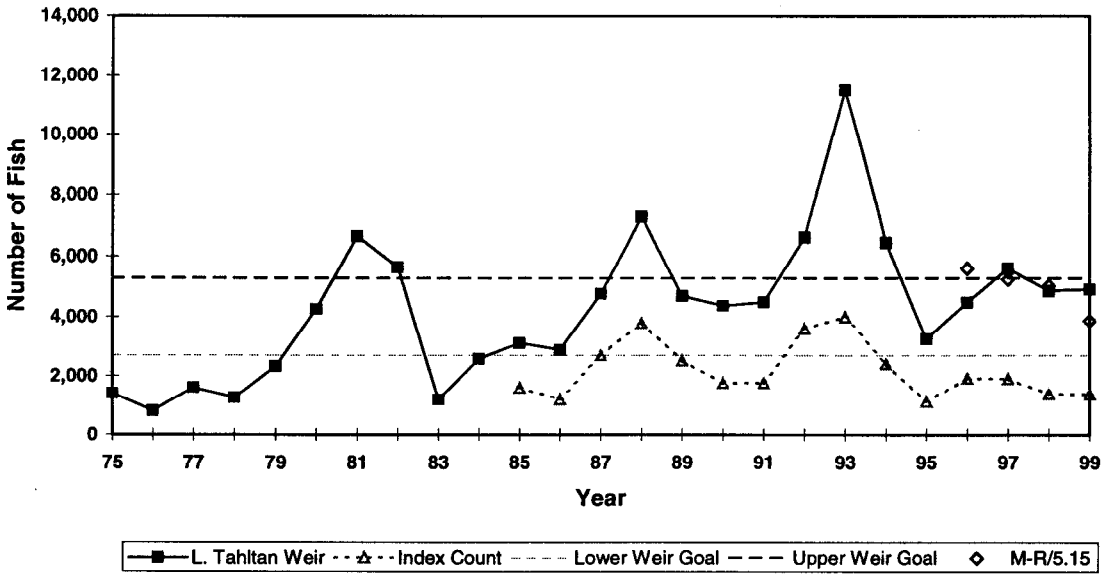

Figure 3.–Counts of chinook salmon at the Little Tahltan River weir, Stikine River, 1975–1999. Mark-recapture estimates divided by expansion factor of 5.15. Data for 1985–1997 weir counts, 1975–1984 estimated by doubling index count. Lines show upper and lower limits of escapement goal range.

ANDREW CREEK

The 1999 survey count of chinook salmon in Andrew Creek was 605 fish, compared to 487 in 1998 (Table 6). In 1998, a spawner recruit analysis was completed and a biological escapement goal range of 650 to 1,500 total (~325-750 index count) large spawners was adopted (Clark et al. 1998). This was the second year since 1994 that the Andrew Creek escapement exceeded the lower limit of the goal (Figure 4). Prior to 1995, Andrew Creek escapements had exceeded the lower limit of the goal for 9 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 during 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). A new weir installed in 1997 washed out under high water before the majority of the chinook migration had passed in 1998, and was discontinued in 1999.

Age, sex, and length data was collected from 135 pre-spawning fish using angling gear and dip nets (Appendix A4f, A5f).

ALSEK RIVER

The count of large chinook salmon through the Klukshu River weir in 1999 was 2,193 fish, a 70% increase over the count of 1,347 in 1998 (Table 7; Figure 5). The escapement to the Klukshu, estimated by subtracting the Aboriginal Fishery (AF) harvest (27) and sport harvest (0) above the weir from the weir count, was 2,166 fish, within the escapement goal range of 1,100 to 2,300, adopted in 1998 (McPherson et al. 1998b). All of the sport and most of the AF harvest was below the weir.

An aerial survey of the Klukshu River counted 500 large chinook salmon. In addition we counted 194 large chinook salmon in the Takhanne River, 371 in the Blanchard River, and 51 in Goat Creek.

Table 6.–Counts of spawning chinook salmon in selected rivers in central Southeast Alaska, 1956–1999.

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		–	–		–		–		–		–		–	
1971	305	(A)	–		–		–		–		–		–	
1972		–	–		–		–		–		–		–	
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)
89-98	546		58		27		57		57		69		108	
1999	605	E(A)	22	N(A)	–		–		550	N(A)	–		5	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.

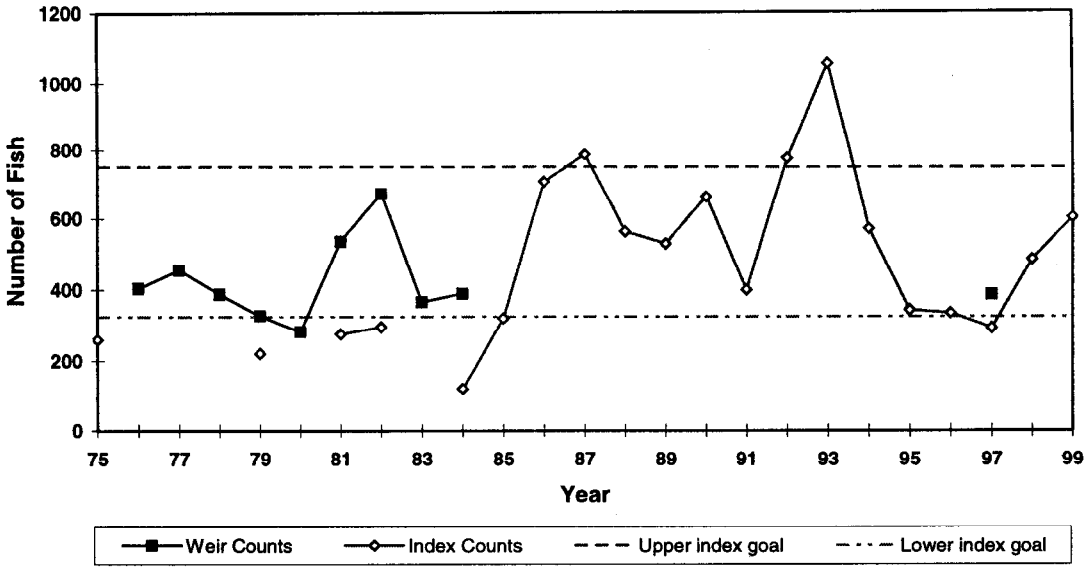

Figure 4.–Counts of chinook salmon at the Andrew Creek Weir, 1976–1984, 1997 and in aerial/foot surveys, 1975, 1985–1999. Lines show upper and lower bounds of index escapement goal range.

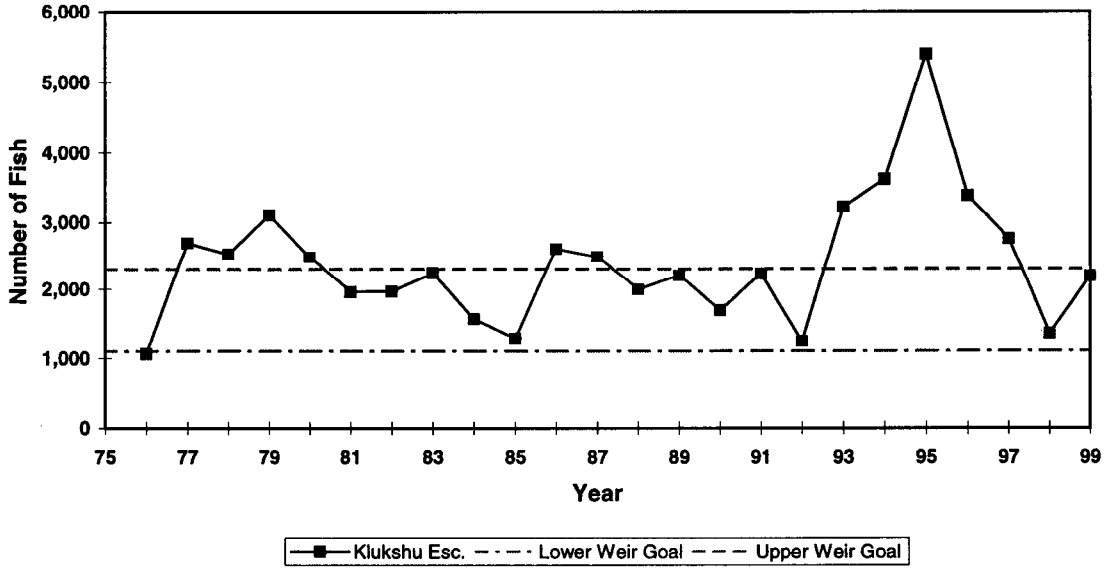

Figure 5.–Escapement of chinook salmon to the Klukshu River tributary of the Alsek River, 1975–1999. Lines show upper and lower limits of revised escapement goal range.

Table 7.–Escapement of chinook salmon to the Klukshu River and counts of spawning adults in other tributaries of the Alsek River, 1962–1999.

	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
1998	–		1,364	17	0	0	1,347	71	P(H)	136	N(H)	39	N(H) 1,593
88–98 average	964		2,889	158	0	15	2,716	192		216		39	3,116
1999	500	P(H)	2,193	27	0	0	2,166	371	N(H)	194	N(H)	51	N(H) 2,782

[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 above-weir 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.

There is no agreement in the PSC on use of expansion factors for the Alsek River; expansion factors used in the past have ranged from 1.56 to 2.5 based on assumptions that the Klukshu River represented 40 to 64 percent of the escapement to the entire drainage (Pahlke 1997). Results from the 1998 tagging study to estimate distribution and escapement of Alsek River chinook salmon indicated that the Klukshu River accounts for about 16 to 24% of the chinook salmon escapement to the Alsek River drainage (Pahlke and Etherton 2000). Preliminary results from the 1999 study also indicate less than 25% of the escapement to the Alsek drainage is accounted for in the Klukshu (Pahlke and Etherton *In prep*). Based on the results of those two studies, the expansion factor was revised to 4.0. The escapement to the entire drainage was then estimated by expanding the weir count by 4.0 and subtracting the above-weir (27) harvest, for an estimated escapement of 8,745 fish.

Age, sex and length data was collected from 172 live fish sampled at the Klukshu River weir (Appendix A4j, A5j).

UNUK RIVER

In 1999, 680 large chinook salmon were counted in all index areas of the Unuk River (Table 8), a count that was below the recent ten year average in 5 out of 6 index areas (Table 9). The total count was within the index 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-nine (39) large chinook salmon were counted in Boundary Creek in 1999. A change in the river between 1991 and 1994, which had revealed more spawning area than previously observed in Boundary Creek, 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 or 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 rivers (Pahlke et al. 1996; Pahlke 1997a, b). The expansion factor produced an estimated escapement of 2,720 large chinook salmon to the Unuk River in 1999, a decrease of 19% from 1998. In contrast, the ongoing mark-recapture program estimated an escapement of 3,914 large chinook salmon (SE = 490) in 1999 (Jones and McPherson 2000). That program also sampled 703 fish for age, sex, and size; live fish were sampled with angling gear and carcasses collected by spear (Appendix A4d, A5d).

CHICKAMIN RIVER

In 1999, 501 large chinook salmon were counted in index areas on eight tributaries of the Chickamin River, compared to 391 in 1998 (Table 10). Counts in 1999 were below the 10-year average in four out of eight Chickamin River tributaries (Table 11). The 1999 count was within the index survey escapement goal range of 450 to 900 fish; McPherson and Carlile 1997) (Figure 7). The summed counts for 1999 were multiplied by a survey expansion factor of 4.0 to produce a total escapement estimate of 2,004 fish to the system. Angling and spears were used to collect age, sex and size data from 172 fish in 1999 (Appendix A4c, A5c).

BLOSSOM RIVER

Two hundred twelve (212) large chinook salmon were counted in index areas of the Blossom River in 1999, up from only 91 fish counted in 1998 (Table 12). The 1999 count was below lower limit of the index survey goal range of 250 to 500; McPherson and Carlile 1997). Counts had exceeded the goal from 1982–1989, but since 1991, they have frequently been below the escapement goal range (Figure 8). Based on results of mark-recapture and radio-tracking studies, the expansion factors for the Blossom and Keta rivers were revised in 1996 from 1.6 to 2.5 (Pahlke 1997b). The count for 1999 was multiplied by the expansion factor of 2.5 to produce a total escapement estimate of 530 fish.

Angling was used to sample age, sex and size data and only 13 samples were collected in 1999 (Appendix A4a, A5a).

KETA RIVER

In 1999, 276 chinook salmon were counted in the Keta River, up from 180 counted in 1998 (Table 12) and within the 1996 revised index goal range of 250 to 500 large fish (McPherson and Carlile

Table 8.–Peak escapement counts of chinook salmon to index areas of the Unuk River, 1960–1999.

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[d]
1993	448 N(F)	330 N(F)	132 E(F)	137 N(F)	8 N(F)	13 P(H)	1,068
1994	161 P(F)	300 N(F)	52 N(H)	128 E(F)	18 N(F)	52 N(F)	711[e]
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[f]
1998	311 N(F)	283 N(F)	39 N(H)	81 N(F)	22 N(F)	104 N(F)	840[g]
89–98 Average	291	288 N(F)	91	107	23	46	846
1999	202 N(F)	307 N(F)	54 N(H)	67 N(F)	9 N(F)	41 N(F)	680[h]

[a] Counts prior to 1975 may not be comparable due to 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] Cripple Cr. weir count reduced by /0.625 to be comparable with foot surveys.

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

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

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

[h] Mark-recapture estimate of escapement 3,914 (SE 490; Jones and McPherson 2000).

Table 9.–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
1998	311	37	283	34	39	5	81	10	22	3	104	12	840
Avg.	435	39	326	30	186	15	97	9	26	3	37	4	1,106
1999	202	30	307	45	54	8	67	10	9	1	41	6	680

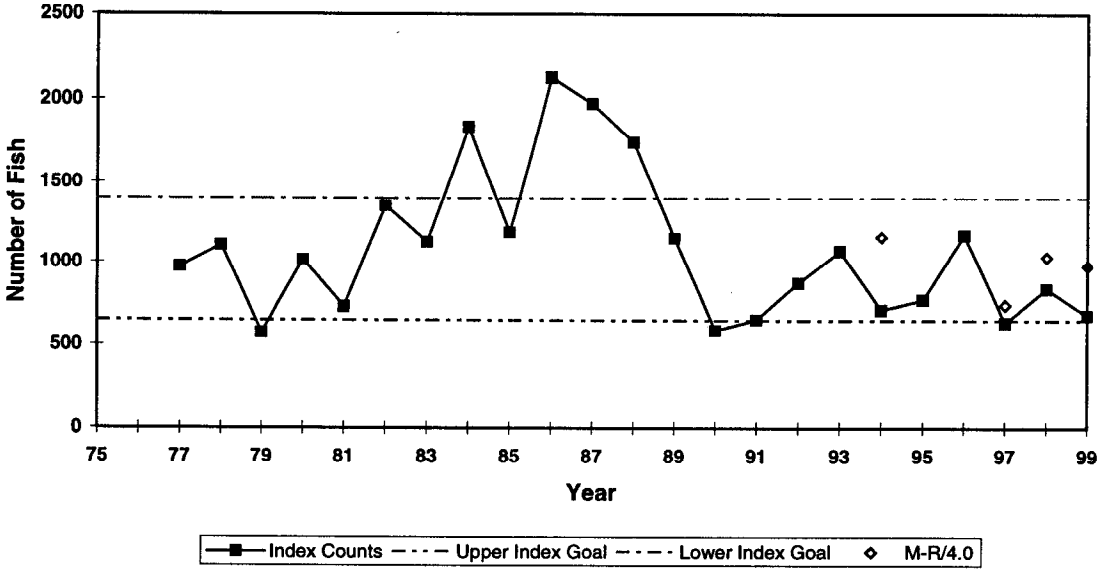

Figure 6.–Counts of large chinook salmon in index areas of the Unuk River, 1975–1999, and mark-recapture estimates divided by expansion factor (4.0). Lines show upper and lower limits of index escapement goal range.

Table 10.–Counts of chinook salmon in index areas of the Chickamin River, 1960–1999.

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
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
89-98 Avg.	90	33	71	23	37	22	130	49	455
1999	54 N(H)	18 N(H)	106 N(H)	33 N(H)	52 N(F)	16 N(F)	200 N(H)	22 N(H)	501

[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 11.–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
1998	46	12	0	0	124	32	16	4	46	12	28	7	123	31	8	2	391
Avg.	138	21	76	12	88	14	23	4	53	8	28	4	199	31	41	6	646
1999	54	11	18	4	106	21	33	7	52	10	16	3	200	40	22	4	501

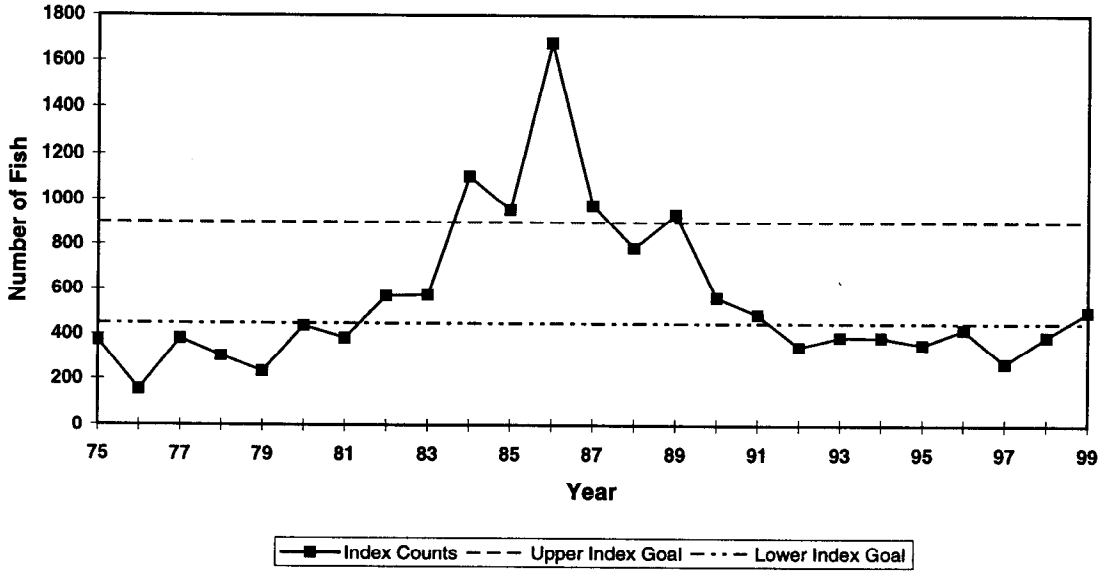

Figure 7.–Counts of chinook salmon in index areas of the Chickamin River, 1975–1999. Lines show upper and lower limits of index escapement goal range.

Table 12.–Counts of chinook salmon for selected rivers in Behm Canal, 1948–1999.

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
1998	180 N(H)	91 N(H)	–	–	–	–	271
1989-98 Avg.	382	211	54	187	17	30	758
1999	276 E(H)	212 N(H)	–	–	–	–	488

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

[b] - = no survey; F= foot, A= airplane, H= helicopter, Conditions P = poor, N = normal, E = excellent.

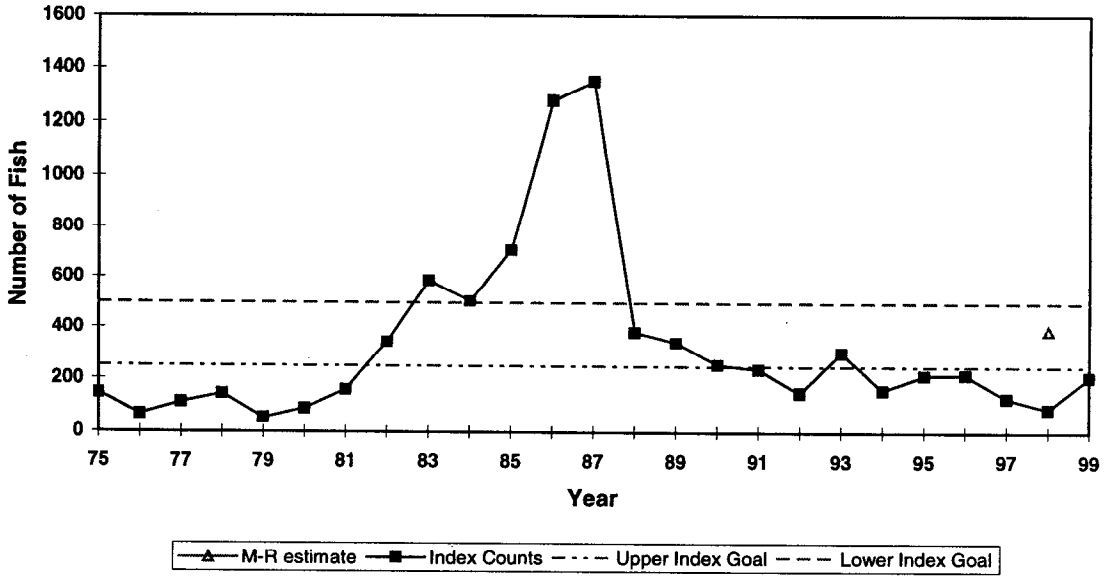

Figure 8.–Counts of chinook salmon into the Blossom River, 1975–1999. Lines show upper and lower limits of index escapement goal range.

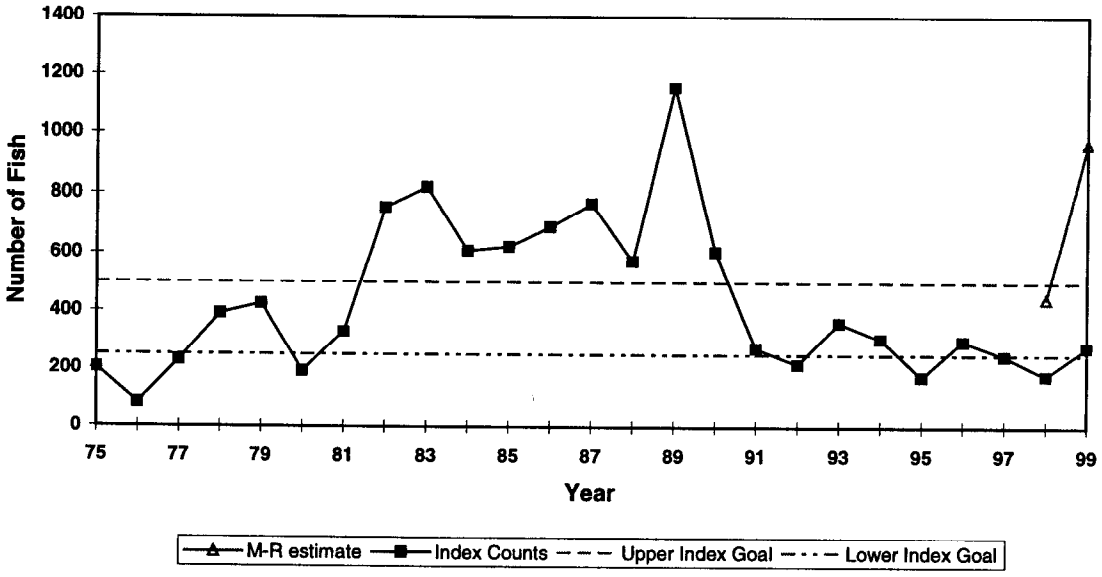

Figure 9.–Counts of chinook salmon to the Keta River, 1975–1999 and mark-recapture estimates for 1998–1999. Lines show upper and lower limits of index escapement goal range.

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 peak count for 1999 was multiplied by a survey expansion factor of 2.5 to produce a total escapement estimate of 690 fish. A mark-recapture experiment conducted in 1999 estimated an escapement of 968 (SE = 116) large spawners (Freeman et al. *In press*). In the course of that project 336 age, sex and size samples were collected using angling gear on live fish and spears on dead and dying fish (Appendix A4b, A5b).

KING SALMON RIVER

Two helicopter surveys and a foot survey were conducted on King Salmon River in 1999. The peak count during the helicopter surveys was 190 large chinook salmon while 200 were counted during the foot survey. This was over twice the 88 fish counted in 1998. (Table 13; Figure 10). The escapement goal was revised in 1997 to a range of 120 to 240 total large fish, (McPherson and Clark, *in prep*). The resulting index goal range is 80-160 large fish observed. Counts exceeded the lower bound of the index goal range from 1993-1998 and the 1999 count exceeded the upper range of the escapement goal.

The peak count of 200 was multiplied by the survey expansion factor of 1.5 to produce a total escapement estimate of 300 large fish to the system. Angling gear was used to collect age, sex and size data from 58 chinook salmon in 1999 (Appendix A4g, A5g).

SITUK RIVER

The count of all chinook salmon through the Situk River weir in 1999 was 2,786 fish. The final escapement estimate of large fish (3-5 ocean age) is 1,523 (Table 14; Scott McPherson, ADFG, personal communication). Escapements have exceeded the escapement goal of 600 large spawners (range of 500–1,000) 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.

Age, sex and size data was collected from 231 live fish sampled at the weir (Appendix A4k, A5k).

CHILKAT RIVER

The 1999 escapement to the Chilkat River was estimated by mark-recapture experiment to be 2,298 large chinook salmon, the lowest estimate since the start of the mark-recapture program in 1991 (Ericksen 1998; Appendix A2). The escapement goal of 2,000 large fish has remained unchanged since Johnson et al. (1992) demonstrated that expansion factors used on the Chilkat River system were inaccurate. The escapement goal is scheduled to be reviewed in 2000. The mark-recapture experiment also provided age, sex, and size data from 286 fish sampled with nets and spears on the spawning grounds (Appendix A4I, A5I).

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 1999, 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 1999 (Table 12). 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 6). The remaining systems are too remote, and funds are not currently available for these surveys.

Table 13.–Peak escapement counts and weir counts of spawning chinook salmon in the King Salmon River, 1957–1999.

	Survey count		Survey as percent	Total	Total weir	Total weir	Adults below	Total	Total
	Below weir	Above weir	of weir Count	egg take (adults)	count (adults)	count (jacks)[b]	weir (foot ct)	inriver (adults)	natural spawning
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
1998		88 E(F)	----------no weir or egg take----------						88
1983–92 Avg.	17	126	67%	31	209	56	22	231	188
1999		200 E(F)	----------no weir or egg take----------						200

[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%.

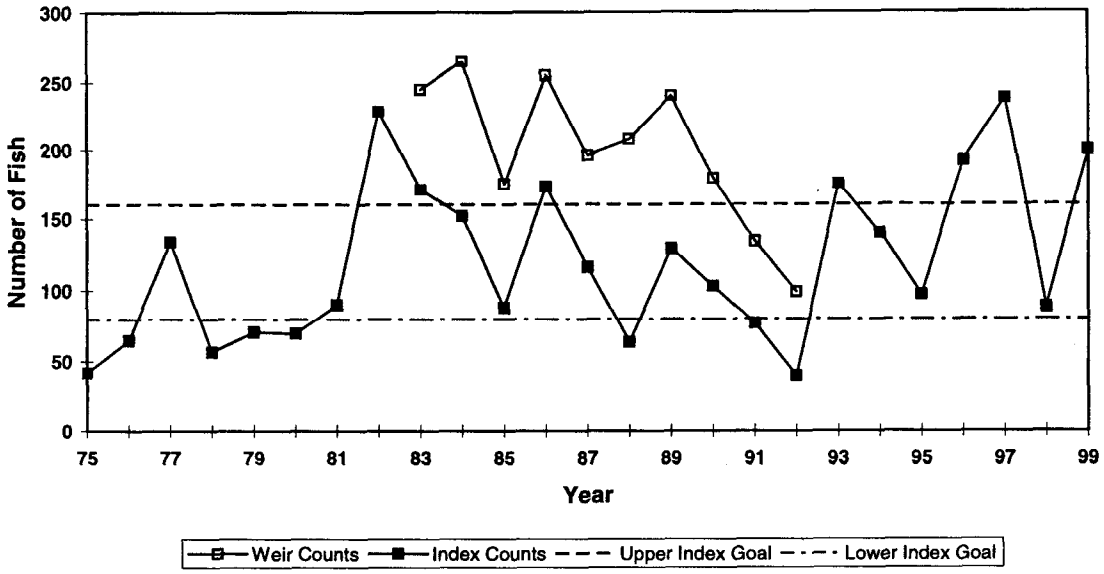

Figure 10.–Counts of chinook salmon at a weir and in survey counts in the index area of the King Salmon River, 1975–1999. Lines show upper and lower limits of index escapement goal range.

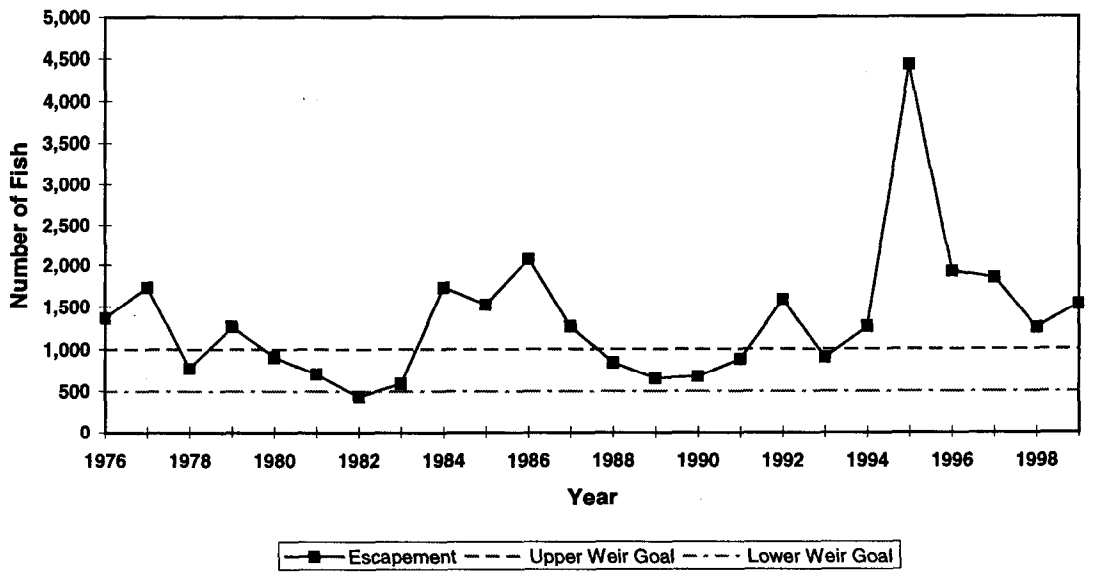

Figure 11.–Counts of large chinook salmon at the Situk River weir, 1975–1999. Lines show upper and lower limits of escapement goal range.

Table 14.–Harvest, escapement, and minimum total run of Situk River chinook salmon, 1976–1999.

Year	Harvests below weir				Abundance above weir									
							Estimated escapement [a]				Estimated total run inriver [b]			
	182-70 Gillnet	Subsis-tence	Sport	Total	Total weir count	Harvest above weir	Large	Medium	Small [c]	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 [d]	0	497	1,871	0	653	122	1,096	1,871	1,073	198	1,096	2,367
1990	0	516 [d]	0	516	1,363	0	676	532	155	1,363	969	755	155	1,879
1991	786	220 [d]	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
1998	2,101	594	494	3,189	5,329	857	1,245	544	2,683	4,472	3,479	1,733	3,306	8,518
89-98	2,200	409	439	3,048	3,816	378	1,537	478	1,423	3,438	4,012	1,195	1,657	6,864
1999	3,810	510	605	4,925	2,786	740	1,523	227	296	2,046	5,453	1,614	644	7,711

[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] Small chinook escapement includes 1 and 2-ocean jacks from 1990 to 1996; prior to 1990 1-ocean fish were not counted.

[d] 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.

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. Two types of error affect the accuracy of the survey counts.

First, factors intrinsic to each area interfere with the ability to count fish. Examples include heavily shaded areas or topography that prevent close approach with a helicopter, presence of other species that could be confused with

chinook salmon, and overhanging brush, or deep or occluded water. Also, not all spawning areas in a tributary or drainage are surveyed. These factors are accounted for by survey expansion factors.

Second, factors that affect counting efficiency may vary greatly from year to year and survey to survey. These include annual changes in migratory timing; large changes in abundance that may cause reduced counts relative to the number of fish in the index area; changes in the distribution of spawners among the tributaries of a watershed among years; and inclement weather, turbidity events, or changes in pilot and/or observer experience.

Weather, logistics, run timing, etc., can make it difficult for a single surveyor to complete all the index surveys annually under good or excellent conditions. Thus, alternate surveyors are selected to conduct the counts when the primary surveyor can not. Also, new surveyors take on primary responsibilities at infrequent intervals. Since between observer variability and bias can be significant (Jones et al. 1998b), new surveyors must be trained and calibrated against the primary surveyor to provide consistency and continuity in the data.

Estimates of total escapement (direct estimates or expanded counts) are needed when comparing escapements 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 can be large. Johnson et al. (1992) showed that expansion factors for the Chilkat River, for example, 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; Bernard et al. 2000), Taku (Pahlke and Bernard 1996, McPherson et al. 1997), Keta (Brownlee et al. 1999) and Alsek rivers (Pahlke et al. 1999). Projects are continuing on many of those rivers.

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 1999 after 5 years of mark-recapture data (McPherson et al. 2000). The expansion factor for the Alsek River was revised in 2000 based on 2 years of mark-recapture studies.

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 Andrew Creek escapement goal was also revised in 1998 to a range of 650 to 1,500 total large spawners (Clark et al. 1998). The Canadian Department of Fisheries and Oceans and the Transboundary Technical Committee 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). Escapement goals for the Taku and Stikine rivers were approved in 1999 (McPherson et al. 2000; Bernard et al. 2000).

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%. We think this method more accurately reflects the geographic distribution of the unsurveyed systems.

Escapement goal revisions based on spawner-recruit analysis require a long time series of age and sex composition data along with total escapement estimates. Age and sex composition estimates for all sampled chinook stocks in Southeast Alaska and transboundary rivers are presented in Appendix tables A4-A12. Some interesting trends are apparent in 1999, with the largest fish occurring in the southern systems and average size decreasing towards the north. The age-.2 (2-ocean-age jacks) component was relatively strong which may indicate good survival rates on the 1995 brood year. The age, sex, and length data must be used cautiously, especially when comparing systems, as there are potential bias associated with the different sampling techniques and small sample size is often a problem.

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APPENDIX A

Appendix A1.–Survey escapement goals and system goals for large chinook salmon, Southeast Alaska and transboundary rivers, as accepted by ADF&G, DFO, CTC and TTC, 2000.

		Index Survey Goal[a]			System Goal[b]		
			Range			Range	
River	Index Areas	Point Est.	Lower	Upper	Point Est.	Lower	Upper
Alsek[c]	Klukshu		1,100	2,300			
Taku[d]	5 tributaries	7,000	5,800	10,600	36,000	30,000	55,000
Stikine[e]	Little Tahltan	3,300	2,700	5,300	17,368	14,000	28,000
Situk[f]	All				600	500	1,000
Chilkat	All				2,000	under review	
Andrew Cr.[g]	All	425	325	750	850	650	1,500
Unuk[h]	6 tributaries	800	650	1,400			
Chickamin[h]	8 tributaries	525	450	900			
Blossom[h]	All	300	250	500			
Keta[h]	All	300	250	500			
King Salmon R.[I]	All	100	80	160	150	120	240

[a] Index survey goal corresponds to the peak or highest single day count of large spawners in annual survey counts.

[b] System goal corresponds to the estimated total escapement of large spawners in the river system, estimated from mark-recapture studies, weir counts or expanded survey counts.

[c] McPherson et al. 1998.

[d] McPherson et al. 2000.

[e] Bernard et al. 2000.

[f] McPherson 1991.

[g] Clark et al. 1998.

[h] McPherson and Carlile, 1997.

[I] McPherson and Clark, *In prep.*

Appendix A2.–Estimated total escapements of chinook salmon to escapement indicator systems and to Southeast Alaska and transboundary rivers, 1975–1999. Numbers may be 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 subt.	Situk	Chilkat	Andrew	Unuk	Chickamin	Blossom	Keta	Med subt.	King Salmon	**Total all systems**	**Expanded region total**
1975		12,920	7,571				520		1,481	365	508		62		
1976	4,898	24,582	5,723	35,203	**1,365**		**404**		627	170	210		96		
1977	12,130	29,496	11,445	53,071	**1,732**		**456**	3,896	1,450	280	575	8,389	199	61,659	73,404
1978	11,458	17,124	6,835	35,417	**776**		**388**	4,424	1,234	358	980	8,159	84	43,660	51,976
1979	16,316	21,617	12,610	50,543	**1,266**		**327**	2,304	954	135	1,065	6,051	113	56,707	67,508
77-79 Avg.	13,301	22,746	10,297	46,344	1,258		390	3,541	1,213	258	873	7,533	132	54,009	64,296
1980	10,398	39,239	30,573	80,210	**905**		**282**	4,064	1,779	223	480	7,732	104	88,046	104,817
1981	8,302	49,559	36,057	93,918	**702**		**536**	2,924	1,536	398	823	6,918	139	100,975	120,208
1982	9,076	23,847	40,488	73,411	**434**		**672**	5,404	2,284	863	1,885	11,542	**354**	85,307	101,555
1983	9,848	9,795	6,424	26,067	**592**		**366**	4,500	2,398	1,473	2,055	11,383	**245**	37,695	44,875
1984	6,588	20,778	13,995	41,361	**1,726**		**389**	7,348	4,408	1,270	1,525	16,666	**265**	58,292	69,395
1985	5,657	35,916	16,037	57,610	**1,521**		640	4,736	3,824	1,773	1,560	14,054	**175**	71,839	85,522
1986	10,734	38,110	14,889	63,733	**2,067**		1,414	8,504	6,980	3,195	1,725	23,885	**255**	87,873	104,611
1987	10,339	28,935	24,632	63,906	**1,265**		1,576	7,892	3,900	3,373	1,920	19,926	**196**	84,028	100,033
1988	8,105	44,524	37,554	90,183	**837**		1,128	6,984	3,144	960	1,438	14,491	**208**	104,882	124,859
1989	9,570	**40,329**	24,282	74,181	**653**		1,060	4,596	3,736	860	2,888	13,793	**240**	88,214	105,016
Avg.	8,862	33,103	24,493	66,458	1,070		806	5,695	3,399	1,439	1,630	14,039	218	80,715	96,089
1990	7,443	**52,142**	22,619	82,204	**676**		1,328	2,364	2,256	643	1,515	8,781	**179**	91,164	108,529
1991	9,690	51,645	23,206	84,541	**878**	**5,897**	800	2,620	1,948	598	680	13,421	**134**	98,096	108,995
1992	5,344	55,889	34,129	95,362	**1,579**	**5,284**	1,556	3,496	1,384	375	543	14,217	**99**	109,678	121,864
1993	13,130	66,125	58,962	138,217	**899**	**4,472**	2,120	4,272	1,556	758	905	14,982	259	153,458	170,508
1994	14,801	48,368	33,094	96,263	**1,263**	**6,795**	1,144	**4,623**	1,552	403	765	16,545	207	113,015	125,572
1995	22,431	**33,805**	16,784	73,020	**4,429**	**3,790**	686	3,088	**2,309**	543	438	15,282	144	88,446	98,273
1996	14,179	**79,019**	**28,949**	122,147	**1,915**	**4,920**	670	4,668	**1,587**	550	743	15,053	288	137,488	152,764
1997	11,796	**114,938**	**26,996**	153,730	**1,837**	**7,728**	586	**2,970**	1,088	330	615	15,154	357	169,241	188,046
1998	5,439	31,039	**25,968**	62,446	**1,245**	**3,337**	974	**4,132**	1,564	**393**	**446**	12,091	132	74,669	82,966
Avg.	11,584	59,219	30,079	100,881	1,636	5,278	1,096	3,581	1,694	510	739	13,947	200	115,028	128,613
CHANGE FROM 1998 to 1999															
Number	3,306	(10,494)	(6,021)	(13,209)	278	(1,066)	236	(218)	440	137	522	329	168	(12,712)	(14,124)
Percent	61	-34	-23	-21	22	-32	24	-5	28	35	117	3	127	-17	-17
Goals						Under review									
Lower	4,400	30,000	14,000	49,400	500	2,000	650	2,600	1,800	625	625	8,800	120	57,320	64,800
Point	6,800	36,000	17,500	60,300	600	2,000	850	3,500	2,100	750	750	10,450	150	71,000	78,889
Upper	9,200	55,000	28,000	92,200	1000	2,000	1,500	5,600	3,600	1,250	1,250	16,200	240	108,640	120,711
AVERAGE PERCENT OF GOAL															
77-79	196	63	59	77	210		52	101	58	34	116	72	88	76	
80-89	130	92	140	110	178		108	163	162	192	217	134	145	114	
90-98	170	164	172	167	273	264	146	102	81	68	99	133	133	162	

[a] Alsek escapement = (weir count X 4.0) – above-weir harvest; Taku esc. 5 trib count X 5.2; Stikine esc L. Tahltan count X 5.15.

Appendix A3.–Detailed 1999 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 NO.	STREAM	DATE	TIDAL	MOUTH	LIVE	DEAD	TOTAL	SURVEY	OBS	USE	COMMENT
1999	10130030	Keta River	7/1/99	0	1	5	0	6	A	EDH	2	
1999	10130030	Keta River	8/11/99	0	0	106	1	107	H	KAP	2	60 below Hill Creek
1999	10130030	Keta River	8/31/99	0	0	52	0	52	H	DLM	2	Hill Cr. down
1999	10130030	Keta River	9/1/99	0	0	276	0	276	H	KAP	3	peak total
1999	10130030	Keta River	9/1/99	0	0	224	0	224	H	KAP	2	partial survey, Hill Cr. up
1999	10130060	Marten River	7/16/99	0	1	1	0	2	A	EDH	2	15 seals off of mouth
1999	10145007	Herring Cove	8/10/99	1500	0	0	0	1500	A	PSD	2	
1999	10155040	Blossom River	8/11/99	0	0	48	0	48	H	KAP	1	
1999	10155040	Blossom River	9/1/99	0	0	211	1	212	H	KAP	3	
1999	1017104A	Barrier Creek	8/6/99	0	0	11	0	11	H	KAP	2	
1999	1017104A	Barrier Creek	8/18/99	0	0	18	0	18	H	KAP	3	
1999	1017104B	Butler Creek	8/6/99	0	0	84	0	84	H	KAP	3	
1999	1017104B	Butler Creek	8/12/99	0	0	83	0	83	H	KAP	2	
1999	1017104B	Butler Creek	8/18/99	0	0	106	0	106	H	KAP	3	
1999	1017104C	Clear Creek	8/6/99	0	0	11	0	11	H	KAP	2	
1999	1017104C	Clear Creek	8/12/99	0	0	21	1	22	H	KAP	3	
1999	1017104C	Clear Creek	8/18/99	0	0	18	0	18	H	KAP	3	
1999	1017104H	Humpy Creek	8/19/99	0	0	16	0	16	F	DLM	1	partial survey
1999	1017104I	Indian Creek	8/6/99	0	0	37	0	37	H	KAP	3	
1999	1017104I	Indian Creek	8/12/99	0	0	50	2	52	F	KAP	3	
1999	1017104I	Indian Creek	8/18/99	0	0	32	4	36	H	KAP	3	
1999	1017104K	King Creek	8/6/99	0	0	45	0	45	H	KAP	2	early
1999	1017104K	King Creek	8/19/99	0	0	200	0	200	H	KAP	3	schooled up
1999	1017104L	Leduc River	8/6/99	0	0	33	0	33	H	KAP	3	
1999	1017104L	Leduc River	8/12/99	0	0	18	0	18	H	KAP	2	
1999	1017104L	Leduc River	8/18/99	0	0	9	1	10	H	KAP	2	
1999	1017104S	South Fork Chickamin	8/6/99	0	0	7	0	7	H	KAP	1	poor vis
1999	1017104S	South Fork Chickamin	8/11/99	0	0	27	0	27	H	KAP	2	
1999	1017104S	South Fork Chickamin	8/18/99	0	0	51	3	54	H	KAP	3	
1999	10175015	Eulachon River	8/6/99	0	0	32	0	32	H	KAP	2	
1999	10175015	Eulachon River	8/18/99	0	0	54	0	54	H	KAP	3	
1999	1017503B	Boundary Cr Unik R	8/6/99	0	0	23	0	23	H	KAP	2	mouth clear water
1999	1017503B	Boundary Cr Unik R	8/13/99	0	0	38	1	39	F	KAP	3	mouth clear again
1999	1017503B	Boundary Cr Unik R	8/22/99	0	0	23	3	26	F	KAP	2	

-continued-

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	STREAM NO.	STREAM	DATE	TIDAL	MOUTH	LIVE	DEAD	TOTAL	SURVEY	OBS	USE	COMMENT
1999	1017530C	Clear Creek-Unuk R	7/25/99	0	0	29	0	29	F	KAP	2	
1999	1017530C	Clear Creek-Unuk R	8/6/99	0	0	67	1	68	H	KAP	2	partial survey
1999	1017530G	Genes Lake CreekUnuk	8/6/99	0	60	0	0	60	H	KAP	2	in lake
1999	1017530G	Genes Lake CreekUnuk	8/19/99	0	84	0	0	84	H	KAP	3	
1999	1017530G	Genes Lake CreekUnuk	8/19/99	0	0	216	7	223	F	KAP	3	
1999	1017530K	Kerr Creek-Unuk R	8/6/99	0	0	10	0	10	H	KAP	1	muddy at bottom
1999	1017530K	Kerr Creek-Unuk R	8/13/99	0	0	41	0	41	F	KAP	2	murky
1999	1017530L	Lake Creek-Unuk R	8/16/99	0	0	9	0	9	B	KAP	3	plus 2 jacks
1999	1017530Q	Cripple Ck-Unuk R	8/11/99	0	0	194	2	196	F	KAP	2	murky at bottom
1999	1017530Q	Cripple Ck-Unuk R	8/23/99	0	0	182	20	202	F	KAP	3	murky at bottom
1999	10180070	Hatchery Ck-Yes Bay	8/23/99	0	0	21	0	21	F	TPZ	2	Timothy P Zadina
1999	10180070	Hatchery Ck-Yes Bay	8/31/99	0	0	22	0	22	F	TPZ	2	Timothy P Zadina
1999	10180070	Hatchery Ck-Yes Bay	9/13/99	0	0	1	1	2	F	TPZ	2	
1999	10180070	Hatchery Ck-Yes Bay	9/20/99	0	0	0	1	1	F	TPZ	2	
1999	10644031	Crystal Creek	6/24/99	0	200	0	0	200	A	WRB	2	ALL BELOW RAPIDS
1999	10644031	Crystal Creek	7/8/99	110	0	0	0	110	A	WRB	1	TO DARK FOR COUNTING
1999	10644031	Crystal Creek	7/16/99	1900	0	0	0	1900	A	WRB	2	400 BLW RAPIDS, 1300 ABV
1999	10644031	Crystal Creek	8/4/99	850	0	150	0	1000	A	WRB	2	150 @ RAPIDS, + 300 IN RACEWAY
1999	10644031	Crystal Creek	8/16/99	300	0	150	0	450	A	WRB	2	PLUS 600 IN RACEWAY
1999	10740024	Aaron Creek	8/2/99	0	0	550	0	550	A	WRB	2	INC 400 ABOUT 6 MI UPSTREAM
1999	10740024	Aaron Creek	8/11/99	0	0	150	0	150	A	WRB	1	TO MANY PINKS FOR GOOD COUNT
1999	10740047	Tom Lake Creek	8/11/99	0	0	4	0	4	A	WRB	2	TO MANY PINKS FOR GOOD COUNT
1999	10740049	Harding River	7/15/99	0	0	7	0	7	A	WRB	2	
1999	10740049	Harding River	8/11/99	0	0	12	0	12	A	WRB	1	TO MANY PINKS FOR GOOD COUNT
1999	10740053	Bradfield River E Fk	8/2/99	0	0	5	0	5	A	WRB	1	MOSTLY GLACIAL
1999	10840013	Shakes Slough	8/11/99	0	0	14	0	14	A	WRB	2	SHADOWS
1999	10840017	Goat Ck Stikine R	8/11/99	0	0	15	0	15	A	WRB	2	
1999	10840020	Andrews Creek	7/20/99	0	150	18	0	168	A	WRB	2	
1999	10840020	Andrews Creek	7/23/99	0	70	90	0	160	A	WRB	2	RIVER HIGH
1999	10840020	Andrews Creek	8/2/99	0	440	165	0	605	A	WRB	2	INC 80 IN FALLS FORK
1999	10840020	Andrews Creek	8/11/99	0	140	290	4	434	A	WRB	1	TO MANY PINKS FOR GOOD COUNT
1999	10840020	Andrews Creek	8/11/99	0	0	129	0	129	H	KAP	1	
1999	10840020	Andrews Creek	8/19/99	0	0	518	8	526	F	TWR	2	
1999	1084013A	W of Hot Springs	7/23/99	0	0	1	0	1	A	WRB	2	

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	STREAM NO.	STREAM	DATE	TIDAL	MOUTH	LIVE	DEAD	TOTAL	SURVEY	OBS	USE	COMMENT
1999	10841010	North Arm Creek	7/19/99	0	0	0	0	0	A	WRB	2	
1999	10841010	North Arm Creek	7/20/99	0	0	0	0	0	A	WRB	2	
1999	10841010	North Arm Creek	8/2/99	0	3	13	0	16	A	WRB	2	MINIMUM COUNT
1999	10841010	North Arm Creek	8/11/99	0	0	22	0	22	A	WRB	2	
1999	10880120	Little Talhtan River	8/5/99	0	0	1312	0	1312	H	KAP	2	
1999	10880120	Little Talhtan River	8/5/99	0	0	1310	69	1379	H	KAP	3	includes 47 below weir
1999	11014007	Farragut River	8/12/99	0	0	7	0	7	A	WRB	1	VERY GLACIAL
1999	11032009	Chuck R Windham Bay	7/14/99	3	0	0	0	3	A	WRB	2	
1999	11032009	Chuck R Windham Bay	7/18/99	0	0	4	0	4	A	WRB	2	
1999	11032009	Chuck R Windham Bay	8/12/99	0	0	6	0	6	A	WRB	2	ONLY 4K PINKS ABV GORGE
1999	11117010	King Salmon River	7/5/99	0	0	75	0	75	A	AJM	2	mostly kings in lower pools
1999	11117010	King Salmon River	7/8/99	40	0	30	0	70	A	AJM	2	most in lower creek
1999	11117010	King Salmon River	7/23/99	0	0	103	0	103	H	KAP	2	
1999	11117010	King Salmon River	7/31/99	0	0	190	0	190	H	KAP	2	
1999	11117010	King Salmon River	7/31/99	0	0	200	0	200	F	KAP	3	plus 35 jacks
1999	11117010	King Salmon River	7/31/99	0	0	158	0	158	H	KAP	3	
1999	11132220	Nakina River	7/29/99	0	0	1190	0	1190	H	KAP	2	total
1999	11132220	Nakina River	7/29/99	0	0	70	0	70	H	KAP	2	IAIV
1999	11132220	Nakina River	7/29/99	0	0	430	0	430	H	KAP	2	IAIII
1999	11132220	Nakina River	7/29/99	0	0	140	0	140	H	KAP	2	IAII
1999	11132220	Nakina River	7/29/99	0	0	550	0	550	H	KAP	2	IAI
1999	11132220	Nakina River	8/4/99	0	0	625	0	625	H	KAP	3	IAI
1999	11132220	Nakina River	8/4/99	0	0	1610	0	1610	H	KAP	2	IA III IV
1999	11132220	Nakina River	8/4/99	0	0	196	0	196	H	KAP	2	I A V
1999	11132220	Nakina River	8/4/99	0	0	459	0	459	H	KAP	2	I A II
1999	11132220	Nakina River	8/4/99	0	0	1898	2	1900	H	KAP	3	peak total
1999	11132220	Nakina River	8/4/99	0	0	192	0	192	H	KAP	3	IAIV
1999	11132220	Nakina River	8/4/99	0	0	898	2	900	H	KAP	3	IAIII
1999	11132220	Nakina River	8/4/99	0	0	183	0	183	H	KAP	3	IAII
1999	11132240	Kowatua Creek	8/11/99	0	0	220	0	220	H	KAP	2	
1999	11132240	Kowatua Creek	8/20/99	0	0	431	0	431	H	KAP	3	
1999	11132240	Kowatua Creek	8/20/99	0	0	560	1	561	H	KAP	3	
1999	11132270	Nahlin River	7/22/99	0	0	532	0	532	H	KAP	3	peak total
1999	11132270	Nahlin River	7/22/99	0	0	16	0	16	H	KAP	3	IAIII

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	STREAM NO.	STREAM	DATE	TIDAL	MOUTH	LIVE	DEAD	TOTAL	SURVEY	OBS	USE	COMMENT
1999	11132270	Nahlin River	7/22/99	0	0	144	0	144	H	KAP	3	IAII
1999	11132270	Nahlin River	7/22/99	0	0	372	0	372	H	KAP	3	IAI
1999	11132270	Nahlin River	7/29/99	0	0	489	1	490	H	KAP	3	total
1999	11132270	Nahlin River	7/29/99	0	0	40	0	40	H	KAP	3	IAI
1999	11132270	Nahlin River	7/29/99	0	0	90	0	90	H	KAP	3	IAII
1999	11132270	Nahlin River	7/29/99	0	0	359	1	360	H	KAP	3	IAIII
1999	11132275	Tseta Creek	7/29/99	0	0	221	0	221	H	KAP	3	
1999	11132275	Tseta Creek	8/4/99	0	0	142	0	142	H	KAP	2	late
1999	11132275	Tseta Creek	8/4/99	0	0	131	0	131	H	KAP	2	
1999	11132280	Dudidontu River	7/30/99	0	0	339	1	340	H	KAP	2	
1999	11132280	Dudidontu River	8/4/99	0	0	526	1	527	H	KAP	3	
1999	11132280	Dudidontu River	8/4/99	0	0	606	0	606	H	KAP	2	
1999	11140015	Salmon Creek Gast Ch	7/29/99	1	0	1	0	2	F	RRW	3	
1999	11150052	Montana Creek	8/12/99	0	0	5	0	5	F	LED	2	2 cwt's observed
1999	11150052	Montana Creek	8/26/99	0	0	1	1	2	F	RRW	3	Lower index N 58'26.149 W134'38 .409
1999	11150069	Fish Creek-Douglas I	7/29/99	2	0	0	0	2	F	LED	3	
1999	11150069	Fish Creek-Douglas I	8/10/99	1	0	3	5	9	F	RRW	2	See document #34 for pink and chum counts.
1999	11150069	Fish Creek-Douglas I	8/17/99	2	0	10	0	12	F	CWF	3	
1999	11150069	Fish Creek-Douglas I	8/25/99	7	0	42	4	53	F	LED	3	tide high stopped counts at pond outlet
1999	11150069	Fish Creek-Douglas I	9/9/99	3	0	8	0	11	F	LED	3	
1999	11532054	Big Boulder Creek	8/10/99	0	0	111	0	111	F	KAK	3	
1999	11532054	Big Boulder Creek	8/17/99	0	0	61	0	61	F	RPE	3	+9 jacks
1999	18230020	Kluckshu River (CAN)	8/2/99	0	0	492	8	500	H	KAP	2	poor light
1999	18230020	Kluckshu River (CAN)	8/3/99	0	0	442	0	442	H	KAP	2	
1999	18230042	Tatshenshine R (CAN)	8/2/99	0	0	5	0	5	F	KAP	2	
1999	18230043	Takhanni River (CAN)	8/2/99	0	0	168	0	168	H	KAP	2	
1999	18230043	Takhanni River (CAN)	8/2/99	0	0	188	6	194	H	KAP	3	
1999	18230045	Goat Creek	8/2/99	0	0	51	0	51	H	KAP	3	
1999	18230045	Goat Creek	8/3/99	0	0	49	0	49	H	KAP	2	
1999	18230050	Blanchard Ck (CAN)	8/1/99	0	0	371	0	371	H	KAP	2	includes 86 above bridge
1999	18230050	Blanchard Ck (CAN)	8/2/99	0	0	290	0	290	H	KAP	2	I A I
1999	18230050	Blanchard Ck (CAN)	8/2/99	0	0	80	0	80	H	KAP	2	I A II above bridge

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

Usage Codes: 1= not useful for indexing or estimating escapement; 2= potentially useful for indexing or estimating escapement; 3= Potentially useful as the "peak" survey count for this species.

Appendix A4.–Estimated abundance and composition by age and sex of the escapement of chinook salmon to selected systems in Southeast Alaska and transboundary rivers, 1999.

PANEL A: AGE COMPOSITION OF LARGE CHINOOK SALMON IN THE KETA RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n				2	76		6	83		4	12			2	185
	%				0.6	22.6		1.8	24.7		1.2	3.6			0.6	55.1
	SE of %				0.4	2.3		0.7	2.4		0.6	1.0			0.4	2.7
	Escapement				6	219		17	239		12	35			6	533
	SE of esc.				4	34		7	37		6	11			4	69
Females	n					6		4	95	1	6	35		3	1	151
	%					1.8		1.2	28.3	0.3	1.8	10.4		0.9	0.3	44.9
	SE of %					0.7		0.6	2.5	0.3	0.7	1.7		0.5	0.0	2.7
	Escapement					17		12	274	3	17	101		9	3	435
	SE of esc.					7		6	40	3	7	20		5	3	58
Combined	n				2	82		10	178	1	10	47		3	3	336
	%				0.6	24.4		3.0	53.0	0.3	3.0	14.0		0.9	0.9	100.0
	SE of %				0.4	2.3		0.9	2.7	0.3	0.9	1.9		0.5	0.5	0.0
	Escapement				6	236		29	513	3	29	135		9	9	968
	SE of esc.				4	36		10	67	3	10	24		5	5	116

PANEL B: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE BLOSSOM RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n				1	5			2		1					9
	%				7.7	38.5			15.4		7.7					69.2
	SE of %				7.7	14.0			10.4		7.7					13.3
	Escapement				59	295			118		59					532
	SE of esc.															
Females	n					1			2			1				4
	%					7.7			15.4			7.7				30.8
	SE of %					7.7			10.4			7.7				13.3
	Escapement					59			118			59				236
	SE of esc.															
Combined	n				1	6			4		1	1				13
	%				7.7	46.2			30.8		7.7	7.7				100.0
	SE of %				7.7	14.4			13.3		7.7	7.7				0.0
	Escapement				59	354			236		59	59				768
	SE of esc.															

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PANEL C: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHICKAMIN RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
	n		2			43			34			18				97
	%		1.2			25.0			19.8			10.5				56.4
	SE of %		0.8			3.3			3.0			2.3				3.8
	Escapement		31			664			525			278				1,497
	SE of esc.															
Females	n					1			39			35				75
	%					0.6			22.7			20.3				43.6
	SE of %					0.6			3.2			3.1				3.8
	Escapement					15			602			540				1,158
	SE of esc.															
Combined	n		2			44			73			53				172
	%		1.2			25.6			42.4			30.8				100.0
	SE of %		0.8			3.3			3.8			3.5				0.0
	Escapement		31			679			1,127			818				2,655
	SE of esc.															

PANEL D: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE UNUK RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		24			249			129			56			1	459
	%		3.9			38.9			17.2			7.4			0.1	67.5
	SE of %		0.9			3.3			2.6			1.4			0.1	3.4
	Escapement		240			2,402			1,062			460			8	4,172
	SE of esc.		78			540			154			81			8	652
Females	n					3			104			136			1	244
	%					0.4			13.8			18.1			0.1	32.5
	SE of %					0.3			2.4			1.4			0.4	3.4
	Escapement					25			855			1,120			8	2,008
	SE of esc.					14			130			161			8	266
Combined	n		24			252			233			192			2	703
	%		3.9			39.3			31.0			25.6			0.3	100.0
	SE of %		0.3			5.0			4.2			1.9			0.4	0.0
	Escapement		240			2,427			1,917			1,580			16	6,180
	SE of esc.		78			540			255			215			12	776

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PANEL E: AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE STIKINE RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		50	1		135	1		133			154			7	481
	%		5.9	0.1		15.8	0.1		15.6			18.1			0.8	56.5
	SE of %		1.5	0.1		3.3	0.1		1.4			1.7			0.3	3.0
	Escapement		1,509	30		4,074	30		4,014			4,647			211	14,515
	SE of esc.		385	30		987	30		697			817			86	1,962
Females	n		1			5			134	2		215	1		13	371
	%		0.1			0.6			15.7	0.2		25.2	0.1		1.5	43.5
	SE of %		0.1			0.3			1.6	0.2		2.1	0.1		0.4	3.0
	Escapement		30			151			4,044	60		6,488	30		392	11,195
	SE of esc.		30			70			725	43		1,113	30		124	1,840
Combined	n		51	1		140	1		267	2		369	1		20	852
	%		6.0	0.1		16.4	0.1		31.3	0.2		43.3	0.1		2.3	100.0
	SE of %		1.5	0.1		3.4	0.1		2.3	0.2		3.1	0.1		0.5	0.0
	Escapement		1,539	30		4,225	30		8,058	60		11,135	30		603	25,711
	SE of esc.		392	30		918	30		1,336	43		1,844	30		164	3,492

PANEL F: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN ANDREW CREEK IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		5			42			28			15			1	91
	%		3.7			31.3			20.9			11.2			0.7	67.9
	SE of %		1.6			4.0			3.5			2.7			0.7	4.0
	Escapement		69			575			384			206			14	1,247
	SE of esc.															
Females	n					2			10			26			5	43
	%					1.5			7.5			19.4			3.7	32.1
	SE of %					1.1			2.3			3.4			1.6	4.0
	Escapement					27			137			356			69	589
	SE of esc.															
Combined	n		5			44			38			41			6	134
	%		3.7			32.8			28.4			30.6			4.5	100.0
	SE of %		1.6			4.1			3.9			4.0			1.8	0.0
	Escapement		69			603			521			562			82	1,836
	SE of esc.															

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PANEL G: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KING SALMON RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		1			12			12			8				33
	%		1.7			20.7			20.7			13.8				56.9
	SE of %		1.7			5.4			5.4			4.6				6.6
	Escapement		7			80			80			53				220
	SE of esc.															
Females	n								7			18				25
	%								12.1			31.0				43.1
	SE of %								4.3			6.1				6.6
	Escapement								47			120				167
	SE of esc.															
Combined	n		1			12			19			26			0	58
	%		1.7			20.7			32.8			44.8			0.0	100.0
	SE of %		1.7			5.4			6.2			6.6			0.0	0.0
	Escapement		7			80			127			173			0	387
	SE of esc.															

PANEL H: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE TAKU RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		6			252	2		135	1		25				421
	%		0.8			35.4	0.3		28.5			5.3				70.6
	SE of %		0.3			5.0	0.2		2.9	0.2		1.1				3.0
	Escapement		218			9,939	96		8,002	60		1,490				19,805
	SE of esc.		96			1,576	70		1,674	60		410				1,962
Females	n					3			94			38	1		3	139
	%					0.6			19.9			8.1	0.2		0.6	29.4
	SE of %					0.3			2.4			1.4	0.2		0.4	3.0
	Escapement					156			5,581			2,266	60		179	8,242
	SE of esc.					93			1,211			567	60		107	1,720
Combined	n		6			255	2		229	1		63	1		3	560
	%		0.8			36.0	0.3		48.4	0.2		13.4	0.2		0.6	100.0
	SE of %		0.3			5.0	0.2		4.2	0.2		1.9	0.2		0.4	0.0
	Escapement		218			10,095	96		13,583	60		3,756	60		179	28,045
	SE of esc.		96			1,590	70		2,748	60		861	60		107	4,253

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PANEL I: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHILKAT RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n															
	%					15.3			11.0			31.3			3.0	60.6
	SE of %															
	Escapement					413			297			844			80	1,634
	SE of esc.					91			75			174			27	1,962
Females	n															
						0.5			8.8			30.1				39.4
	SE of %															
	Escapement					14			237			812				1,063
	SE of esc.					10			65			169				1,720
Combined	n															
	%					15.8			19.8			61.4			3.0	100.0
	SE of %															
	Escapement					427			534			1,656			80	2,698
	SE of esc.					94			109			302			27	418

PANEL J: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE ALSEK (KLUKSHU) RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		1			36	1		42	1		6				87
	%		0.6			20.9	0.6		24.4	0.6		3.5				50.6
	SE of %		0.6			3.1	0.6		3.3	0.6		1.4				3.8
	Escapement		13			459	13		536	13		77				1,109
	SE of esc.		13			68	13		72	13		31				84
Females	n					1			65			19				85
	%					0.6			37.8			11.0				49.4
	SE of %					0.6			3.7			2.4				3.8
	Escapement					13			829			242				1,084
	SE of esc.					13			81			53				84
Combined	n		1			37	1		107	1		25				172
	%		0.6			21.5	0.6		62.2	0.6		14.5				100.0
	SE of %		0.6			3.1	0.6		3.7	0.6		2.7				0.0
	Escapement		13			472	13		1,364	13		319				2,193
	SE of esc.		13			69	13		81	13		59				0

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PANEL K: AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE SITUK RIVER IN 1999

		Brood year and age class														
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n	12	6		28			53			9					108
	%	9.6	4.8		9.8			21.8			3.7					49.7
	SE of %	1.9	1.4		2.0			2.7			1.2					3.3
	Escapement	197	99		200			446			76					1,017
	SE of esc.															
Females	n				4			92	3		24					123
	%				1.4			37.8	1.2		9.9					50.3
	SE of %				0.8			3.2	0.7	0.0	2.0					3.0
	Escapement				29			774	25		202					1,030
	SE of esc.															
Combined	n	12	6		32			145	3		33					231
	%	9.6	4.8		11.1			59.6	1.2		13.6					100.0
	SE of %	1.9	1.4		2.1			3.2	0.7		2.3					0.0
	Escapement	197	99		228			1,220	25		278					2,046
	SE of esc.															

SUMMARY: PERCENTAGE AGE COMPOSITION ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 KEY SOUTHEAST ALASKA RIVERS IN 1999

	Brood year and age class													
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta	NE	NE		1%	24%		3%	53%	<1%	3%	14%		1%	1%
2. Blossom	NE	NE		8%	46%			31%		8%	8%			
3. Chickamin	NE	1%			26%			42%			31%			
4. Unuk	NE	4%			39%			31%			26%			<1%
5. Stikine	NE	6%	<1%		16%	<1%		31%	<1%		43%	<1%		2%
6. Andrew Cr	NE	4%			33%			28%			31%			4%
7. King Salmon	NE	2%			21%			33%			45%			
8. Taku	NE	1%			36%	<1%		48%	<1%		13%	<1%		1%
9. Chilkat	NE	NE			16%			20%			61%			3%
10. Alsek	NE	<1%			18%	<1%		57%	<1%		24%			
11. Situk	10%	5%		11%			60%	1%		14%				
Average				2%	25%	<1%	6%	34%	<1%	2%	27%	<1%	<1%	1%

-continued-

SUMMARY: ESTIMATED NUMBERS OF CHINOOK SALMON BY AGE CLASS IN ESCAPEMENTS TO 11 KEY SOUTHEAST ALASKA RIVERS IN 1999

	Brood year and age class														
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
1. Keta	0	0	0	6	236	0	29	513	3	29	135	0	9	9	969
2. Blossom	0	0	0	59	354	0	0	236	0	59	59	0	0	0	768
3. Chickamin	0	31	0	0	679	0	0	1,127	0	0	818	0	0	0	2,655
4. Unuk	0	240	0	0	2,427	0	0	1,917	0	0	1,580	0	0	16	6,180
5. Stikine	0	1,539	30	0	4,225	30	0	8,058	60	0	11,135	30	0	603	25,710
6. Andrew Cr	0	69	0	0	603	0	0	521	0	0	562	0	0	82	1,836
7. King Salmon	0	7	0	0	80	0	0	127	0	0	173	0	0	0	387
8. Taku	0	218	0	0	10,095	96	0	13,583	60	0	3,756	60	0	179	28,047
9. Chilkat	0	0	0	0	427	0	0	534	0	0	1,656	0	0	80	2,697
10. Alsek	0	5	0	0	427	7	0	1,365	7	0	587	0	0	0	2,398
11. Situk	197	99	0	228	0	0	1,220	25	0	278	0	0	0	0	2,047

PERCENTAGE MALES BY AGE CLASS ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 KEY SOUTHEAST ALASKA RIVERS IN 1999

	Brood year and age class													
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta					93%		59%	47%		41%	26%		0%	67%
2. Blossom					83%			50%						
3. Chickamin					98%			47%			34%			
4. Unuk		100%			99%			55%			29%			50%
5. Stikine		98%			96%			50%			42%			35%
6. Andrew Cr		100%			95%			74%			37%			17%
7. King Salmon					100%			63%			31%			
8. Taku		100%			98%			59%			40%			0%
9. Chilkat					97%			56%			51%			
10. Alsek		100%			93%			47%			32%			
11. Situk	100%	100%		88%			37%			27%				
Average	100%	100%		88%	95%		48%	55%		34%	36%		0%	34%

Summary notes:

1) Age-.3 fish (3-ocean-age) were predominant on average, but many exceptions: Blossom (54% age-.2), Unuk (39% age-.2), Andrew Cr (33% age-.2, 31% age-.4) Stikine (43% age-.4), King Salmon (45% age 1.4) and Chilkat (61% age 1.4)
2) Age-.2 (2-ocean-age) component relatively strong (16% to 54%), compared to historical averages, in all systems except Situk (11%).
3) Subyearling (0-check; age-0.) smolt progeny were seen in Keta, Blossom and Situk returns in 1999.

Appendix A5.–Average length, by age, of chinook salmon in selected systems in Southeast Alaska and transboundary rivers, 1999.

PANEL A: AVERAGE LENGTH OF CHINOOK SALMON IN THE KETA RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n				2	76		6	83		4	12			2
	Avg. length				708	711		785	828		926	929			888
	SD				46	33		85	75		81	94			96
	SE				33	4		35	8		41	27			68
Females	n					6		4	94	1	6	35		3	1
	Avg. length					730		771	849	800	873	921		980	1,000
	SD					48		43	45		48	48		5	
	SE					20		21	5		20	8		3	
Combined	n				2	82		10	177		10	47		3	3
	Avg. length				708	712		780	840		894	923		980	925
	SD				46	35		69	62		65	62		5	94
	SE				33	4		22	5		21	9		3	54

PANEL B: AVERAGE LENGTH OF CHINOOK SALMON IN THE BLOSSOM RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n				1	5			2		1				
	Avg. length				670	744			785		930				
	SD					136			7						
	SE					61			5						
Females	n					1			2			1			
	Avg. length					750			835			780			
	SD								7						
	SE								5						
Combined	n				1	6			4		1	1			
	Avg. length				670	745			810		930	780			
	SD					121			29						
	SE					49			15						

PANEL C: AVERAGE LENGTH OF CHINOOK SALMON IN THE CHICKAMIN RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		2			43			34			18			
	Avg. length		418			669			796			922			
	SD		74			56			64			85			
	SE		74			9			11			20			
Females	n					1			39			35			
	Avg. length					690			817			914			
	SD								42			48			
	SE								7			8			
Combined	n		2			44			73			53			
	Avg. length		418			669			807			917			
	SD		74			34			57			44			
	SE		52			5			7			6			

-continued-

PANEL D: AVERAGE LENGTH OF CHINOOK SALMON IN THE UNUK RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		24			249			129			56			1
	Avg. length		434			619			765			878			1,105
	SD		24			49			50			66			
	SE		5			3			4			9			
Females	n					3			104			136			1
	Avg. length					722			793			874			880
	SD					13			39			55			
	SE					7			4			5			
Combined	n		24			252			233			192			2
	Avg. length		434			620			778			875			993
	SD		24			50			48			58			159
	SE		5			3			3			4			113

PANEL E: AVERAGE LENGTH OF CHINOOK SALMON IN THE STIKINE RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		19	1		112	1		132			149			7
	Avg. length		357	392		561	621		738			838			811
	SD		23			54			61			59			84
	SE		5			5			5			5			32
Females	n		1			4			132	2		209	1		12
	Avg. length		376			674			755	796		832	861		838
	SD					116			30	3		41			52
	SE					58			3	2		3			15
Combined	n		20	1		116	1		264	2		358	1		19
	Avg. length		358	392		565	621		747	796		834	861		828
	SD		23			60			49	3		50			65
	SE		5			6			3	2		3			15

PANEL F: AVERAGE LENGTH OF CHINOOK SALMON IN ANDREW CREEK IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		5			42			28			15			1
	Avg. length		382			578			747			837			945
	SD		31			60			58			70			
	SE		14			9			11			18			
Females	n					2			10			26			5
	Avg. length					698			744			841			869
	SD					32			52			59			62
	SE					23			17			12			28
Combined	n		5			44			38			41			6
	Avg. length		382			583			746			840			882
	SD		31			34			57			44			45
	SE		14			3			9			7			19

-continued-

PANEL G: AVERAGE LENGTH OF CHINOOK SALMON IN THE KING SALMON RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		1			12			12			8			
	Avg. length		410			641			768			888			
	SD					33			35			43			
	SE					9			10			15			
Females	n								7			18			
	Avg. length								778			845			
	SD								42			56			
	SE								16			13			
Combined	n		1			12			19			26			
	Avg. length		410			641			772			858			
	SD					33			57			44			
	SE					9			13			9			

PANEL H: AVERAGE LENGTH OF CHINOOK SALMON IN THE TAKU RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		136	4		250	1		113	4		163	1		4
	Avg. length		373	401		561	610		745	760		878	820		974
	SD		40	23		65			75	41		72			44
	SE		3	12		4			7	21		6			22
Females	n					6	1		71	1		267	4		7
	Avg. length					659	568		807	765		844	861		853
	SD					46			47			39	47		39
	SE					19			6			2	24		15
Combined	n		136	4		256	2		185	5		430	5		11
	Avg. length		373	401		564	589		769	761		857	853		897
	SD		40	23		66	30		72	35		57	45		72
	SE		3	12		4	21		5	16		3	20		22

PANEL I: AVERAGE LENGTH OF CHINOOK SALMON IN THE CHILKAT RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		16			74			36			60			2
	Avg. length		376			604			792			902			1,028
	SD		40			63			65			54			173
	SE		10			7			11			7			123
Females	n					2			32			63			
	Avg. length					643			765			831			
	SD					11			49			42			
	SE					8			9			5			
Combined	n		16			77			68			123			2
	Avg. length		376			605			779			866			1,028
	SD		40			63			59			60			173
	SE		10			7			7			5			123

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PANEL J: AVERAGE LENGTH OF CHINOOK SALMON IN THE ALSEK RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n					36	1		42	1		6			
	Avg. length					546	578		784	645		861			
	SD					76			90			35			
	SE					13			14			14			
Females	n					1			65			19			
	Avg. length					488			779			846			
	SD								45			58			
	SE								6			13			
Combined	n					37	1		107	1		25			
	Avg. length					545	578		781	645		850			
	SD					76			66			53			
	SE					12			6			11			

PANEL K: AVERAGE LENGTH OF CHINOOK SALMON IN THE SITUK RIVER IN 1999

		Brood year and age class													
		1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n	12	6		28			53			9				
	Avg. length	363	396		580			792			844				
	SD	24	47		53			51			57				
	SE	7	19		10			7			19				
Females	n				4			92	3		24				
	Avg. length				619			792	777		858				
	SD				38			38	59		49				
	SE				19			4	34		10				
Combined	n	12	6		32			145	3		33				
	Avg. length	363	396		585			792	777		854				
	SD	24	47		51			48	59		52				
	SE	7	19		9			4	34		9				

SUMMARY: AVERAGE LENGTH OF MALE CHINOOK SALMON IN SOUTHEAST ALASKA IN 1999

	Brood year and age class													
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta					711		785	828		926	929			
2. Blossom					744									
3. Chickamin					669			796			922			
4. Unuk		434			619			765			878			
5. Stikine		357			561			738			838			811
6. Andrew Cr		382			578			747			837			
7. King Salmon					641			768			888			
8. Taku		373	401		561			745	760		878			974
9. Chilkat		376			604			792			902			
10. Alsek					546			784			861			
11. Situk	363	396		580			792			844				

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SUMMARY: AVERAGE LENGTH OF FEMALE CHINOOK SALMON IN SOUTHEAST ALASKA IN 1999

	Brood year and age class													
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta					730		771	849		873	921		980	
2. Blossom														
3. Chickamin								817			914			
4. Unuk					722			793			874			
5. Stikine					674			755			832			838
6. Andrew Cr								744			841			869
7. King Salmon								778			845			
8. Taku					659			807			844	861		853
9. Chilkat								765			831			
10. Alsek								779			846			
11. Situk				619			792	777		858				

SUMMARY: AVERAGE LENGTH OF CHINOOK SALMON SAMPLED IN SOUTHEAST ALASKA IN 1999, SEXES COMBINED

	Brood year and age class													
	1997	1996	1995	1996	1995	1994	1995	1994	1993	1994	1993	1992	1993	1992
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
1. Keta					712		780	840		894	923		980	925
2. Blossom					745			810			780			
3. Chickamin					669			807			917			
4. Unuk		434			620			778			875			
5. Stikine		358			565			747			834			828
6. Andrew Cr		382			583			746			840			882
7. King Salmon					641			772			858			
8. Taku		373	401		564			769	761		857	853		897
9. Chilkat		376			605			779			866			
10. Alsek					545			781			850			
11. Situk	363	396		585			792	777		854				

Note: Age classes with fewer than three fish sampled were not reported (in summary).

Summary notes on length data--SEAK chinook 1999:

1) Keta, Blossom & Chickamin have the longest fish in the region across all ages and both sexes. Unuk was next for both sexes, except Chilkat ranked 4th in 1.3 males and 3rd in 1.4 males.
2) Stikine and Andrew Cr consistently have the smallest fish at age and sex.
3) The 3 TBR rivers (Alsek, Taku, Stikine) produce short age-1.1 and -1.2 males.
4) Females age-1.2 chinook are much longer than age-1.2 males; in the four systems where data was sufficient to tell (Keta, Unuk, Stikine, Taku).
5) Female age-1.3 chinook are usually 10-30 mm longer than their males counterparts and note that Taku females 62 mm longer. Age-1.3 males were longer than females in the Chilkat (27mm) and about the same length as males in Andrew Creek and the Alsek.
6) Age-1.4 males were longer than age-1.4 females in all systems.

Appendix A6.–Computer files used to complete this report.

File name	Description
TOTALCHTS.XLW	Excel workbook with tables and charts with annual counts for each index area.
SUMVER99.XLS	Appendix table A2, with expanded escapement totals for Southeast Alaska
ESC99.XLS	Table 1. Estimated chinook escapement in 1999.
GOALS.XLS	Appendix Table A1. Expanded goals for Southeast Alaska.