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Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 2004

by

Keith A. Pahlke

February 2006

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

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

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

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

General

Alaska Department of Fish and Game	ADF&G
Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
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
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
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	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
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.
minute (angular)	'
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
variance	
population	Var
sample	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 2004 was 156,579 large (age .3 and older) Chinook salmon, a 30% increase from the escapement of 121,306 fish estimated in 2003. All 11 escapement indices were within or above escapement goal ranges for the first time since 1989. Estimated age and sex composition and mean length at age of all stocks sampled in 2004 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, King Salmon River, Situk River, Andrew Creek, 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 regionwide, all-gear catch ceilings for Chinook salmon, designed to rebuild spawning escapements by 1995 (ADF&G 1981). In 1985, the Alaskan program was incorporated into a comprehensive coastwide rebuilding program for all wild stocks of Chinook salmon, under the auspices of the U.S./Canada Pacific Salmon Treaty (PST).

To track the spawning escapement, the Alaska Department of Fish and Game (ADF&G), the Canadian Department of Fisheries and Oceans (DFO), the Taku River Tlingit First Nation (TRTFN), and the Tahltan First Nation (TFN) count spawning Chinook salmon in a designated set of 11 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.

Programs to estimate total escapement and survey count-to-escapement expansion factors for index counts have been implemented for all 11 index stocks. Long-term annual programs are in place on the Situk, Alsek, Chilkat, Taku, Stikine and Unuk rivers. Short-term (2–3 year) projects were used to estimate expansion factors for the other five systems. Estimates of escapement from these mark-recapture and weir studies are generally superior to expanded survey count estimates, and are preferentially employed whenever they are available.

This project obtained indices of spawner abundance for major Chinook salmon stocks in Southeast Alaska. Objectives for 2004 were to count large (≥660 mm MEF, 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 and King Salmon rivers and in Andrew Creek, and to compile and compare the indices to those from past years.

Escapement data are provided annually to the Joint Chinook Technical Committee (CTC) of the Pacific Salmon Commission (PSC), who use them to evaluate the status of the indicator stocks (PSC 1997). Estimates of the total escapement of large

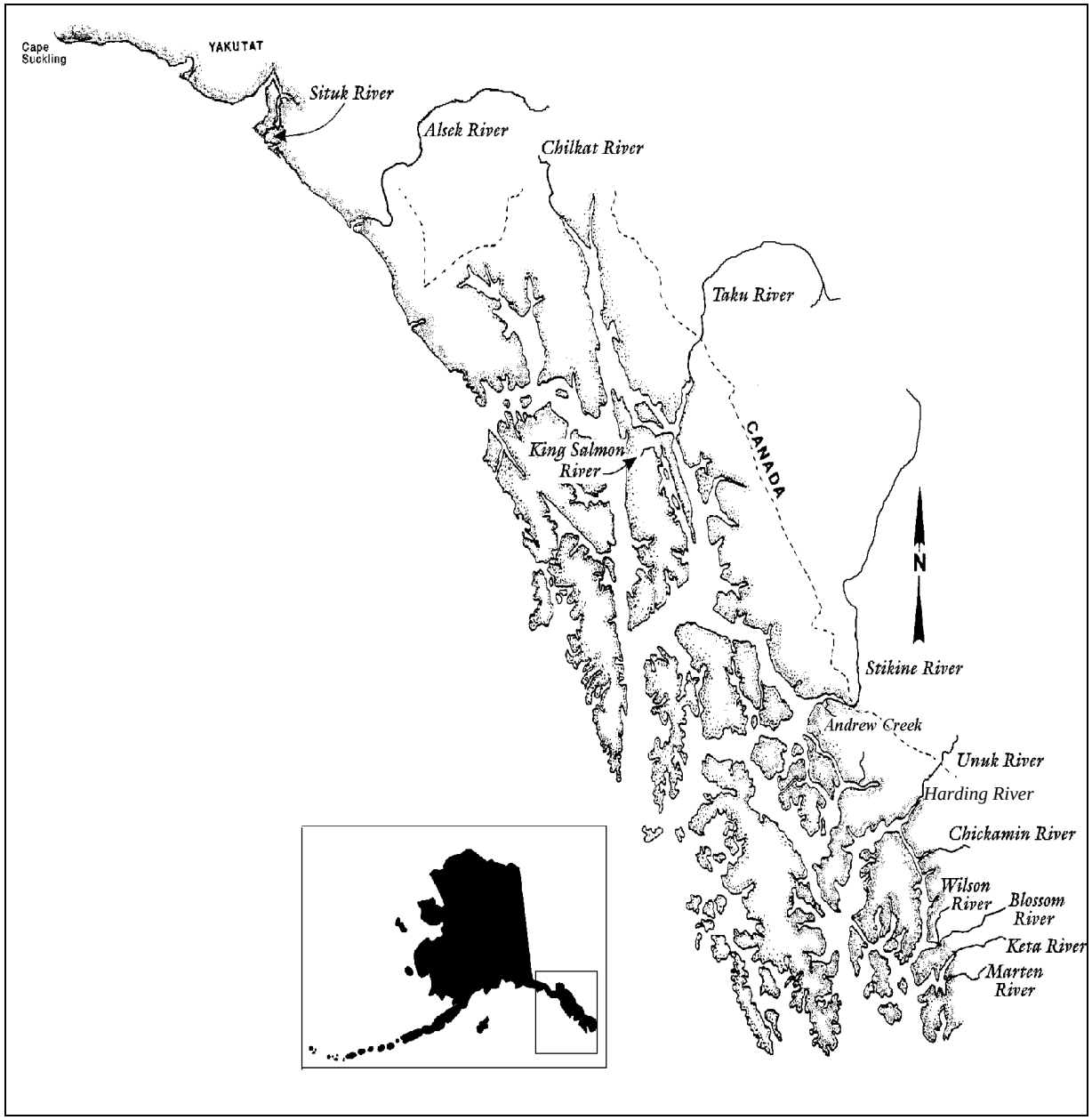

Figure 1.–Location of selected Chinook salmon systems in Southeast Alaska, Yakutat, and trans-boundary rivers.

spawners for six stocks (Situk, Chilkat, Taku, Stikine, Andrew and King Salmon rivers) and index counts for the remaining five stocks are provided to the CTC to determine trends in escapement.

In addition to these applications, biological escapement goals (BEGs, 5AAC 39.222) have been established for all 11 systems and fisheries are managed to achieve those escapement goal ranges.

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. 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 have provided annual independent estimates of total escapement since 1995 (McPherson et al. 2000; McPherson et al. 1998a).

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.

Helicopter surveys of the Little Tahltan River index area have been conducted annually since 1975, and the DFO and TFN have 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 1997; Pahlke and Etherton 1999, 2000; Pahlke et al. 2000; Der Hovanisian et al. 2005; Der Hovanisian et al. *In prep;* Der Hovanisian et al. 2001, 2003, 2004).

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 operated on Andrew Creek in 1997 and 1998.

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 periodically 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. Since 1998, mark-recapture studies have been conducted annually to estimate the escapement of spawning Chinook salmon in the Alsek River and radiotelemetry studies were conducted in 1998 and 2002 to estimate the distribution of spawning Chinook salmon (Pahlke et al. 1999; Pahlke and Etherton 2001a, 2001b; Pahlke and Etherton 2002; Pahlke and Waugh 2003; Pahlke and Waugh 2004, *In prep.*).

The Unuk, Chickamin, Blossom, and Keta river drainages all feed into Behm Canal–a narrow passage of water east of Ketchikan, Alaska. Misty Fiords National Monument/Wilderness Area surrounds the eastern or "back" Behm Canal and includes the Boca de Quadra fjords. Many 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 III et al. 1998a; Jones III and McPherson 1999, 2002; Weller and McPherson 2003a, 2003b, *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 north-east of Ketchikan. Although it is technically a transboundary river, there are no Chinook spawning areas on the Chickamin River 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, 1996 and 2001–2004, and spawning distribution was estimated by radiotelemetry in 1996 (Pahlke 1996; Pahlke 1997a; Freeman and McPherson 2003, 2005, *In prep.*).

The Blossom, Keta, Wilson, and Marten rivers are non-transboundary rivers that flow into Behm Canal approximately 45 km east of Ketchikan. These rivers lie inside the boundaries of the Misty Fiords National Monument in southern Behm Canal but are within an area that has been specifically excluded from Wilderness designation, because of the potential development of a large-scale molybdenum mine (Quartz Hill) near the divide of the Blossom and Keta rivers. The mine is presently undeveloped, but an access road has been completed that terminates at salt water near the mouth of the Blossom River.

The Keta River drainage covers about 192 km^2 and the Blossom about 176 km^2 (Bigelow et al. 1995) and have been surveyed by helicopter annually since 1975. Chinook salmon escapements

to the Wilson and Marten rivers have been monitored on an intermittent basis in recent years. Mark-recapture experiments were conducted in 1998 to estimate the escapement of Chinook salmon in the Blossom and Keta rivers (Brownlee et al. 1999) and were repeated on the Keta River in 1999 and 2000 (Freeman et al. 2000, 2001) and on the Blossom in 2004 (Pahlke and Magnus 2005).

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. Helicopter surveys have been conducted annually since 1975 and foot surveys since 1992.

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 2005).

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. 2001).

METHODS

There are 34 river systems in the region (Figure 1) with populations of wild Chinook salmon. Three transboundary rivers, the Taku, Stikine, and Alsek, are classed as major producers–each with potential production (harvest plus escapement) greater than 10,000 fish (Kissner 1974). 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 list 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). Abundance in the Chilkat River is estimated only by a mark-recapture program. 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 (Pahlke 1998).

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 were available to produce such goals. As a result, escapement goals were originally set based on the highest observed escapement count prior to 1981 (Pahlke 1997b). Goals for the Chilkat River and Andrew Creek were added in 1985, bringing the total number of regularly monitored river systems to 11. 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 developed data standards in 1997 for stock specific assessments of escapement, terminal runs, and forecasts of abundance which are used to evaluate existing stock assessment programs (PSC 1997). This data has been collected routinely at weirs and during mark-recapture studies and recently specific programs have been implemented to collect age, sex and length data from Chinook salmon in the Blossom, Keta, 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. Survey conditions on each index survey are rated as poor, normal or excellent for that particular index area, and coded as to whether that survey is potentially useful for indexing or estimating escapement. Factors that affect the rating include water level, clarity, light conditions, and weather.

Only large Chinook salmon 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 distinct 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. In some systems age- 1.2 fish may be larger than 660 mm MEF and be difficult to avoid counting.

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. Foot surveys are conducted by at least two people walking in the creek bed or on the riverbank.

Weather, distances involved, run timing, etc., can make it difficult for a single surveyor to complete all the index surveys annually under normal or excellent conditions. Thus, alternate surveyors are selected to conduct the counts when the primary surveyor is unavailable. Also, new surveyors take on primary responsibilities at infrequent intervals. Since between-observer variability and bias can be significant (Jones III et al. 1998b), new surveyors must be trained and calibrated against the primary surveyor to provide consistency and continuity in the data. Alternate observers accompany the primary observer on regularly scheduled surveys to learn survey methods and counting techniques (training flights). Each alternate observer also accompanies the primary observer on additional regularly scheduled surveys to independently count Chinook salmon (calibration flights). Each calibration flight consists of two passes over the index area so the two observers in turn sit in the preferred location in the helicopter during one pass along the river. Counts are not shared during the calibration surveys, but are shared and discussed following the completion of the second pass of each flight. Calibration data will be collected annually for several years. The relationship between observer escapement counts will be determined from accumulated data and applied to counts as appropriate.

Several index areas are routinely surveyed by more than one method; e.g. Andrew Creek is surveyed from airplanes, helicopters and by foot.

The various surveys are conducted as close as possible to each other to promote comparison and calibration of the different methods.

Counts and other observations from the 2004 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 season's total escapement counted in a river system during the peak spawning period. Expansion factors are based on comparisons with weir counts, mark-recapture estimates, and spawning distribution studies. 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). The total estimated escapement in the index areas represents approximately 90% of the region total (Pahlke 1998). Escapement estimates for the Chilkat River are not available prior to 1991. From 1991 to 1997 the estimated escapement to the Chilkat River averaged 6% of the estimated regionwide total. Therefore, prior to 1991 the expanded index counts represent approximately 84% of the estimated Southeast Alaska total escapement.

Expansion factors for individual rivers have been revised, based on results from experiments to estimate total escapement and 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 (Pahlke and Bernard 1996; Pahlke et al. 1996 and McPherson et al. 1998a). 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. More mark-recapture studies were conducted on all four rivers and the expansion factors for the Behm Canal systems were revised again in 2002 (McPherson et al. 2003). On Andrew Creek, a weir was operated over 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 *In prep.*). 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 area counts are reasonably accurate in assessing trends in escapements. However, Johnson et al. (1992) demonstrated that expansion factors used before 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 2005). 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, 1997a). Expansion factors will continue to

Table 1.–Peak survey counts, survey expansion factors, estimated total escapement from expanded survey counts, mark-recapture projects or weir, for large Chinook salmon returning to Southeast Alaska and transboundary rivers in 2004.

	Survey area	Survey count	Survey expansion factor	Survey expansion estimated escapement [a]	Estimated total escapement (M-R or weir) [b]	Reference[c]
Major producers						
Alsek River	Klukshu	2,523	5.0	12,547 [d]	7,343	Pahlke and Waugh *In prep.*
Taku River	5 tributaries	9,138	5.2	47,518	68,199	Jones III et al. *In prep.*
Stikine River	Little Tahltan	16,381	5.15	84,362	48,900	Der Hovanisian and Etherton. 2006
Category subtotal				144,427	124,442	
Medium producer*s*						
Situk River	NA	NA	NA	NA	755 [e]	
Chilkat River [f]	NA	NA	NA	NA	3,422	Ericksen 2005
Andrew Cr.	All	1,534	2.0	3,068	3,068	
Unuk River	6 tributaries	1,008	5.0[g]	5,040	3,963	Weller and McPherson *In prep.*
Chickamin River	8 tributaries	798	5.17[g]	4,126	3,275	Freeman and McPherson 2005
Blossom River	All	333	4.0[g]	1,332	734	Pahlke and Magnus 2005
Keta River	All	376	3.0[g]	1,128	1,128	
Category subtotal					16,345	
Minor producers						
King Salmon R.	All	89	1.5	134	134	
Index system total					140,921	M-R plus survey expansions
Region total			1/0.9		156,578	

[a] Estimated by multiplying survey count by expansion factor.

[b] Mark-recapture or weir count if available, otherwise survey expansion used. Final numbers used for ADF&G management.

[c] Reference document for mark-recapture estimate.

[d] Klukshu weir count × 5 minus aboriginal fishery harvest above weir (68).

[e] Situk River weir count, minus estimated sport harvest above weir (41).

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

[g] Unuk, Chickamin, Blossom and Keta River expansion factors revised 2002.

be revised as additional data become available. Ongoing research projects should provide more information on the expansion factors for the Taku, Stikine, Unuk, Chickamin, Blossom 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.

AGE, SEX, AND LENGTH COMPOSITION OF ESCAPEMENTS

Estimates of escapement by age and sex for all 11 systems having Chinook salmon stock assessment projects in Southeast Alaska in 2004 (Appendix A4) were compiled to provide a basic statistical summary for managers and researchers. Estimates for the Chickamin, Unuk, Stikine, Taku, Chilkat, Blossom, and Alsek rivers were the results of

mark-recapture experiments (Freeman and McPherson *In prep.*; Weller and McPherson *In prep.*; Der Hovanisian and Etherton. 2006; Ericksen 2005; Pahlke and Magnus 2005; Jones III et al. *In prep.;* Pahlke and Waugh *In prep.*). Results compiled from each of these projects are the reported unbiased estimates of escapement of medium- and large-sized Chinook salmon, except for the Stikine River, where the unbiased estimates include small fish. Size classification of small and medium fish varies slightly between projects. Estimates for medium and large fish from the Situk River are based on age sampling and a total census of the escapement at a weir. Age composition estimates for the Keta and King Salmon rivers and Andrew Creek were calculated by dividing the peak survey count by the escapement expansion factor (Table 1), and multiplying the result by the age composition of the escapement sampled on the spawning grounds of each drainage in 2004. Standard errors include variance of the estimated escapements and proportions by age from sampling. Note that the survey index counts for the Blossom and Keta include many age 1.2 Chinook salmon because of their large size at age (65% to 75% of age-1.2 fish in these systems are ≥ 660 mm MEF) makes them part of the large-fish population counted in surveys. All fish in the medium and large size categories sampled and aged on the spawning grounds (most are age 1.2 and older) are used in the calculations reported in Appendix A4. Also note that there may be slight biases for some systems without mark-recapture estimates in 2004; however, we have employed sampling gear to minimize size or sex selective sampling in these spawning ground samples. The estimates for systems with mark-recapture or weir (Situk) projects, are the result of batteries of tests and stratification to produce unbiased estimate of age and sex structure.

Estimates of mean length by sex and age and their estimated variances were also calculated for each system (Appendix A5). These estimates are either the unbiased estimates reported in the publications cited above, or made using the spawning ground samples as noted above.

All Chinook salmon sampled for age, sex and length data were also examined for missing adipose fins, which indicates the presence of a coded-wire tag (CWT). In most cases fish with missing adipose fins were sacrificed to recover the tag. On the Taku, Chilkat, Stikine, Chickamin and Unuk rivers most of the CWT tagged fish were wild fish tagged earlier in those rivers in ongoing projects. Other tags were recovered from both non-natal wild and hatchery stocks. Sample sizes and tags recovered are summarized in Appendix A9.

RESULTS

In 2004, 34 locations, 24 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. In 1998 and 1999 escapements to the Taku River declined dramatically and have remained relatively low, but escapement to the Stikine River has increased greatly, including the highest on record in 2001.

The estimated escapement (expanded) of large Chinook salmon for all Southeast Alaska and transboundary rivers in 2004 was 156,579 (Table 1), a 29% increase from the estimated 121,306 fish in 2003. Escapement indices for all 11 index areas were within or above escapement goal ranges for the first time since 1989.

TAKU RIVER

The count of 9,138 large Chinook salmon in the five index areas of the Taku River was up from 5,481 in 2003 and above the recent 10-year average of 8,335 (Table 2), with counts in four of five tributaries above 2003 levels (Table 3). Counts increased steadily from 1983 to 1993, and exceeded the upper limit of the survey goal range five times in the 90s (Figure 2).

Table 2.–Counts of spawning Chinook salmon in index areas of the Taku River, 1951–2004.

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)
2000	2,907	N(H)	728	P(H)	702	N(H)	953	N(H)	482	N(H)	5,772	160	N(H)
2001	1,552	P(H)	935	N(H)	1,050	N(H)	1,024	N(H)	479	N(H)	5,040	202	N(H)
2002	4,066	E(H)	1,099	N(H)	945	N(H)	1,145	N(H)	834	N(H)	8,089	192	N(H)
2003	2,126	N(H)	861	E(H)	850	E(H)	1,000	N(H)	644	E(H)	5,481	436	N(H)
2004	4,091	N(H)	1,787	N(H)	828	N(H)	1,396	N(H)	1,036	N(H)	9,138	906	N(H)
94-03 Ave	3,782		1,901		852		1,017		783		8,335	482	

[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 = conditions excellent.

[c] Partial survey of Nakina River in 1957–59; comparisons made from carcass weir (W) 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
1999	1,900	46	532	13	561	13	431	10	527	13	221	5	4,172
2000	2,907	49	728	12	702	12	953	16	482	8	160	3	5,932
2001	1,552	30	935	18	1,050	20	1,024	20	479	9	202	4	5,242
2002	4,066	49	1,099	13	945	11	1,145	14	834	10	192	2	8,281
2003	2,126	36	861	15	850	14	1,000	17	644	11	436	7	5,917
Average	4,146	48	1,786	20	754	9	1,013	12	618	7	384	4	8,640
2004	4,091	41	1,787	18	828	8	1,396	14	1,036	10	906	9	10,044

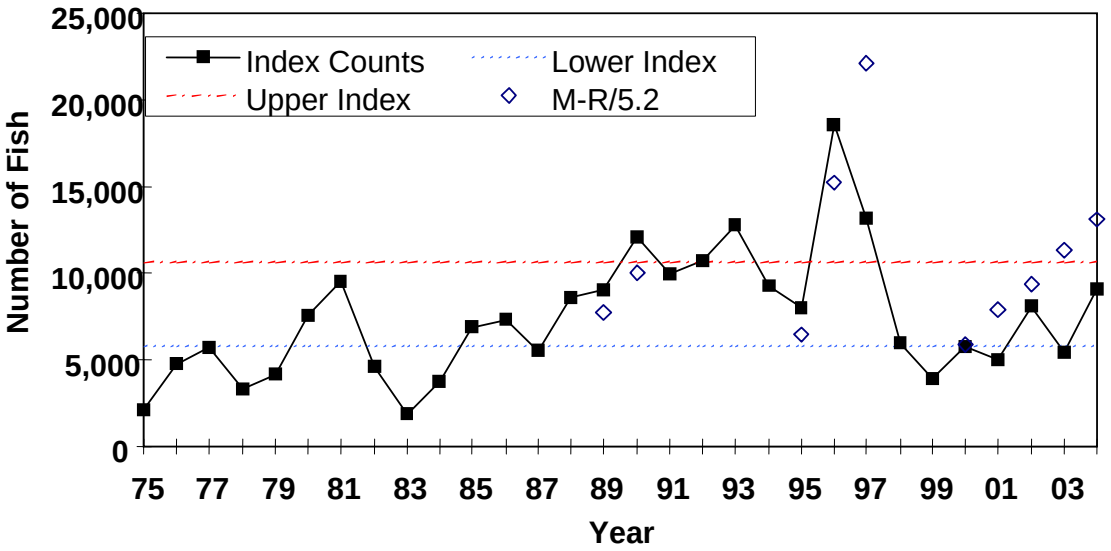

Figure 2.–Counts of Chinook salmon in index areas of the Taku River, 1975–2004 and mark-recapture estimates divided by expansion factor of 5.2. Lines show upper and lower limits of index escapement goal range.

The sum of counts from the five index areas was expanded by a survey expansion factor of 5.2. 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. 2000 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 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 9,138 by 5.2 results in an escapement estimate of 47,518 large Chinook salmon in 2004. A mark-recapture experiment conducted in 2004 resulted in a higher escapement estimate (68,000 large; SE = 2,021; Jones III et al. *In prep.*).

Age, sex and length data were collected from carcasses at the Nakina, Nahlin, and Tatsamenie rivers, and live fish were sampled with angling gear at the Nahlin, Dudidontu and Tatsamenie rivers (Appendix A4; A5).

STIKINE RIVER

At the Little Tahltan River weir, 16,381 Chinook salmon were counted in 2004. The weir count was the highest in the 20 years the weir has been operated and over twice the 1994–2003 average of 6,039 (Table 5). Aerial surveys of Beatty Creek and the mainstem Tahltan River were discontinued as recommended in Bernard et al (2000). Surveys of the Little Tahltan have continued in order to maintain the time series of data and to train surveyors.

The peak aerial survey above the Little Tahltan River weir was 6,014 large fish in 2004. From 1985 to 2004, the proportion of the total escapement of Chinook salmon counted during peak aerial surveys has ranged from 28.4% to 56.6% and averaged 38.6% (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, 1999 and 2003, survey conditions were not unusual and there is no explanation for the lower than average proportion of escapement observed. Age, sex and length data was collected from 650 fish sampled at the Little Tahltan River weir (Appendix A4).

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 2004 weir count was above the revised escapement goal range for the Little Tahltan River, which has been met or exceeded every year since the weir was installed in 1985 (Figure 3). Expansion of the 2004 Little Tahltan weir count of 16,381 large Chinook salmon by the survey expansion factor (5.15) produced a total Stikine River escapement estimate of 84,362 large Chinook salmon. The estimate of total escapement to the Stikine River from a mark-recapture experiment conducted in 2004 is 48,900 large Chinook (SE = 3,896; Der Hovanisian and Etherton. 2006) which is well above the upper end of the escapement goal range for the drainage.

ANDREW CREEK

The 2004 survey count of Chinook salmon in Andrew Creek was 1,534 fish, compared to 595 in 2003 (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). Since 1985, Andrew Creek escapements have exceeded the lower limit of the goal in all but two years (Figure 4).

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).

Four surveys were conducted between 7 August and 17 August with counts of 1,534 (helicopter),

Table 4.–Index counts of Taku River Chinook salmon, mark-recapture estimates of escapement, percent of escapement observed, and expansion factor (π).

Year	Counts[a]	M-R	SE	% Observed	π
1989	8,986	40,329	5,646	22.3	4.5
1990	12,077	52,142	9,326	23.2	4.3
1995	7,971	33,805	5,060	23.6	4.2
1996	18,576	79,019	9,048	23.5	4.2
1997	13,201	114,938	17,888	11.5	8.7
Ave.	12,162	64,047		19.0	5.2
1998	5,969	not available			
1999	3,951	not available			
2000	5,772	not available			
2001	5,040	41,179	6,236	12.2	8.2
2002	8,089	48,848	5,906	16.6	6.0
2003	5,481	41,678	5,906	13.2	7.6
2004	9,138	68,000	2,021	14.8	6.8

[a] Sum of five tributaries, not 6 as prior to 1999.

Table 5.–Counts of spawning Chinook salmon in the Little Tahltan River, Stikine River, 1975–2004.

Year	Weir count	Above-Weir catch [b]	Escapement	Aerial survey		
				Peak count [a, 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	E(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
1999	4,738	0	4,738	1,379	N(H)	29.1
2000	6,640	9	6,631	2,720	N(H)	41.0
2001	9,730	0	9,730	4,158	N(H)	42.7
2002	8,110	0	8,110	no survey		
2003	6,492	0	6,492	1,903	N(H)	29.3
94-03 Avg.	6,039	5	6,039	2,101		34.8
2004	16,381	0	16,381	6,014	E(H)	36.7

[a] (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 .

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

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

Table 6.–Counts of spawning Chinook salmon in selected rivers in central Southeast Alaska, 1956–2004. (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 conditions; E = excellent conditions; P = poor conditions; (B) = escapement surveyed from boat.

										Bradfield River			
Year	Andrew Cr.[a]		North Arm		Clear Creek		Harding River		Aaron Creek	N. Fork		E. Fork	
1956	4,500	(A)	–		–		–		–	–		–	
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)	–		–		–		–	–		–	
1976	404	(W/F)	–		–		12	N(A)	24	–		13	P(A)
1977	456	(W/F)	–		–		410	E(A)		–			
1978	388	(W/F)	24	E(F)	–		12	N(H)	–	–		63	P(A)
1979	327	(W/F)	16	E(F)	–		–		–	–		10	P(A)
1980	282	(W/F)	68	F(N)	–		–		–	30	P(H)	–	
1981	536	(W/F)	84	E(F)	4	P(F)	28	P(H)	12	84	P(H)	–	
1982	672	(W/F)	138	F(N)	188	N(F)	8	E(A)	–			–	
1983	366	(W/F)	15	F(N)	–		15	P(A)	–	55	N(H)	–	
1984	389	(W/F)	31	F(N)	–		35	N(B)	–	–		–	
1985	320	E(F)	44	E(F)	–		243	N(F)	179	58	N(A)	85	N(A)
1986	708	N(F)	73	F(N)	45	E(A)	240	N(B)	178	104	E(A)	215	E(A)
1987	788	E(H)	71	E(F)	122	N(F)	40	E(A)	51	186	P(A)	175	P(A)
1988	564	N(F)	125	F(N)	167	N(F)	70	P(A)	325	680	N(A)	410	N(A)
1989	530	E(F)	150	A(N)	49	N(H)	80	P(A)	135	193	P(A)	132	P(A)
1990	664	E(F)	83	F(N)	33	P(H)	24	P(A)	–	–		–	
1991	400	N(A)	38	A(N)	46	N(A)	42	N(F)	–	81	P(A)	320	P(A)
1992	778	E(H)	40	E(F)	31	N(A)	48	P(A)	30	P(A)	–		–
1993	1,060	E(F)	53	E(F)	–		40	N(A)	–	33	P(A)	118	P(A)
1994	572	E(H)	58	E(F)	10	N(A)	87	N(H)	27	P(H)	15	P(H)	–
1995	343	P(A)	28	A(P)	1	E(A)	38	N(H)	65	N(H)	16	P(A)	43	P(A)
1996	335	N(F)	35	F(N)	21	N(A)	75	N(A)	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)
1999	605	E(A)	22	N(A)	–		–		550	N(A)	–		5	P(A)
2000	690	N(A)	35	N(A)	–		–		16	P(A)	–		33	N(A)
2001	1,054	N(F)	28	N(F)			150	N(H)	130	N(A)	248	E(A)	115	E(A)
2002	876	N(F)	34	N(F)	8	N(A)	33	A	15	A				
2003	595	N(H)	39	F(N)	19	F(N)	5	P(A)	24	P(A)	-		95	N(A)
94–03	585		35		15		66		97		89		54	
2004	1,534	N(H)	27	F(N)	65	F(P)	69	H(N)	115	A(N)	26	A(N)(	113	A(N)

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

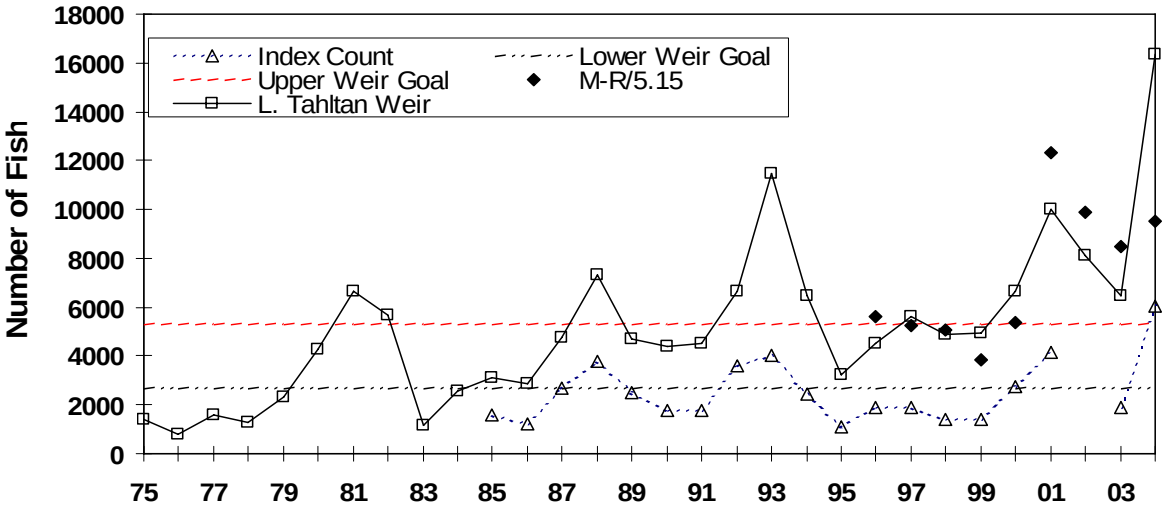

Figure 3.–Counts of Chinook salmon at the Little Tahltan River weir, Stikine River, 1975–2004. Mark-recapture estimates divided by expansion factor of 5.15. Data for 1985–2000 from weir counts, 1975–1984 estimated by doubling index count. Lines show upper and lower limits of escapement goal range.

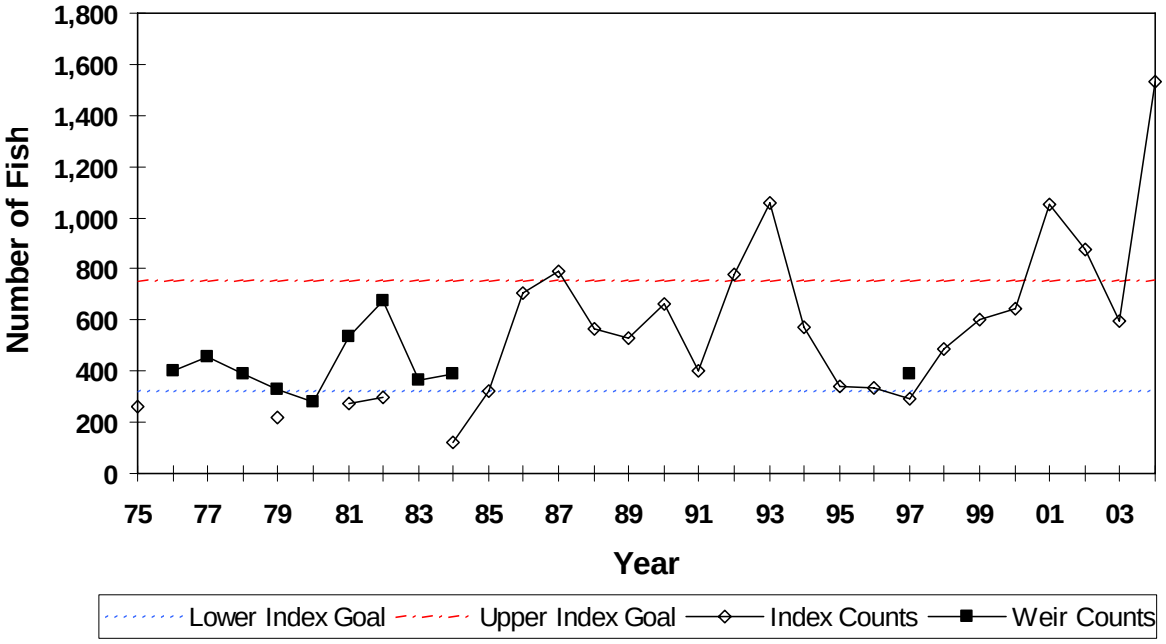

Figure 4.–Counts of Chinook salmon at the Andrew Creek Weir, 1976–1984, 1997 and in aerial/foot surveys, 1975, 1985–2004. Lines show upper and lower bounds of index escapement goal range.

1,450 and 920 (aerial) and 1,844 (foot survey) Chinook salmon counted (Appendix A3). The helicopter count was used as the peak count based on experience of the surveyors and extremely low water which would allow the foot surveyors to count a higher proportion than usual. Expansion of the helicopter count of 1,534 large Chinook salmon by the survey expansion factor (2) produced a total Andrew Creek escapement estimate of 3,068 large Chinook salmon.

Age, sex, and length data was collected from 205 pre-spawning fish in Andrew Creek, using angling gear and dip nets (Appendix A4; A5).

ALSEK RIVER

The count of large Chinook salmon through the Klukshu River weir in 2004 was 2,523 fish, a 49% increase from the count of 1,737 in 2003 (Table 7; Figure 5). The escapement to the Klukshu, estimated by subtracting the Aboriginal Fishery (AF) harvest (68) and sport harvest (0) above the weir from the weir count, was 2,455 fish. This was within the escapement goal range of 1,100 to 2,300, adopted in 1998 (McPherson et al. 1998b). All of the sport and some of the AF harvest was below the weir.

No aerial survey of the Klukshu River was conducted in 2004. However, in helicopter surveys we counted 46 large Chinook salmon in the Takhanne River, and 84 in the Blanchard River. 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 1997b). Results from the 1998 tagging study to estimate distribution and escapement of Alsek River Chinook salmon indicated that the Klukshu River accounts for about 16–25% of the Chinook salmon escapement to the Alsek River drainage (Pahlke et al. 1999). Results from the 1999 and 2000 studies indicate less than 20% of the escapement to the Alsek drainage is accounted for in the Klukshu River (Pahlke and Etherton 2001b, 2002). On the basis of the results of those two studies, the expansion factor was revised to 5.0 (Table 8). The escapement to the entire drainage was then estimated by expanding the weir count by 5.0 and subtracting the above-weir (68) harvest, resulting in an estimated escapement of 12,547 fish. Results of a mark-recapture experiment indicate a total escapement of 7,343 large Chinook salmon (SE = 595; Pahlke and Waugh *In prep.*).

Age, sex and length data were collected from 1,056 live fish sampled at the Klukshu River weir, other spawning areas and at a lower river tagging project (Appendix A4; A5).

UNUK RIVER

In 2004, 1,008 large Chinook salmon were counted in all index areas of the Unuk River (Table 9), a 10% decrease over the count in 2003 and similar to the recent 10-year average of 1,018 (Table 10). 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 1981 (Figure 6).

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, 1997a; 1997b). After five more years of mark-recapture estimates were obtained the expansion factors were revised in 2002 to 5.0 on the Unuk and 5.17 on the Chickamin River (Table 11; McPherson et al. 2003). The expansion factor produced an estimated escapement of 5,040 large Chinook salmon to the Unuk River in 2004, and the ongoing mark-recapture program estimated an escapement of 3,963 large Chinook salmon (SE = 470; Weller and McPherson *In prep.*). As part of that project, 1,115 fish were sampled for age, sex and size data (Appendix A4, A5). Live fish were sampled with angling gear and carcasses were collected by spear.

Table 7.–Escapement of Chinook salmon to the Klukshu River and counts of spawning adults in other tributaries of the Alsek River, 1966–2004. (A) = aerial survey from fixed wing aircraft; (H) = helicopter survey; E = excellent survey conditions; N = normal conditions; P = poor conditions; – = no survey.

	Klukshu River													
				Above-weir harvest						Takhanne				
Year[a]	Aerial count		Weir count	AF	Sport	Brood	Escapement[b]	Blanchard River		River		Goat Creek		Total[c]
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
1999	500	P(H)	2,193	27	0	0	2,166	371	N(H)	194	N(H)	51	N(H)	2,782
2000	–		1,365	44	0	0	1,321	168	N(H)	152	N(H)	33	N(H)	1,698
2001	–		1,825	87	0	0	1,738	543	N(H)	287	N(H)	21	N(H)	2,589
2002	–		2,241	100	0	0	2,141	351	N(H)	220	N(H)	86	E(H)	2,798
2003	–		1,737	76	0	0	1,661	127	N(H)	105	N(H)	10	N(H)	1,903
94–03 avg.	923		2,672	109	0	3	2,560	256		212		40		3,059
2004	–		2,523	68	0	0	2,455	84	P(H)	46	P(H)	–		2,585

[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) catch and broodstock.

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

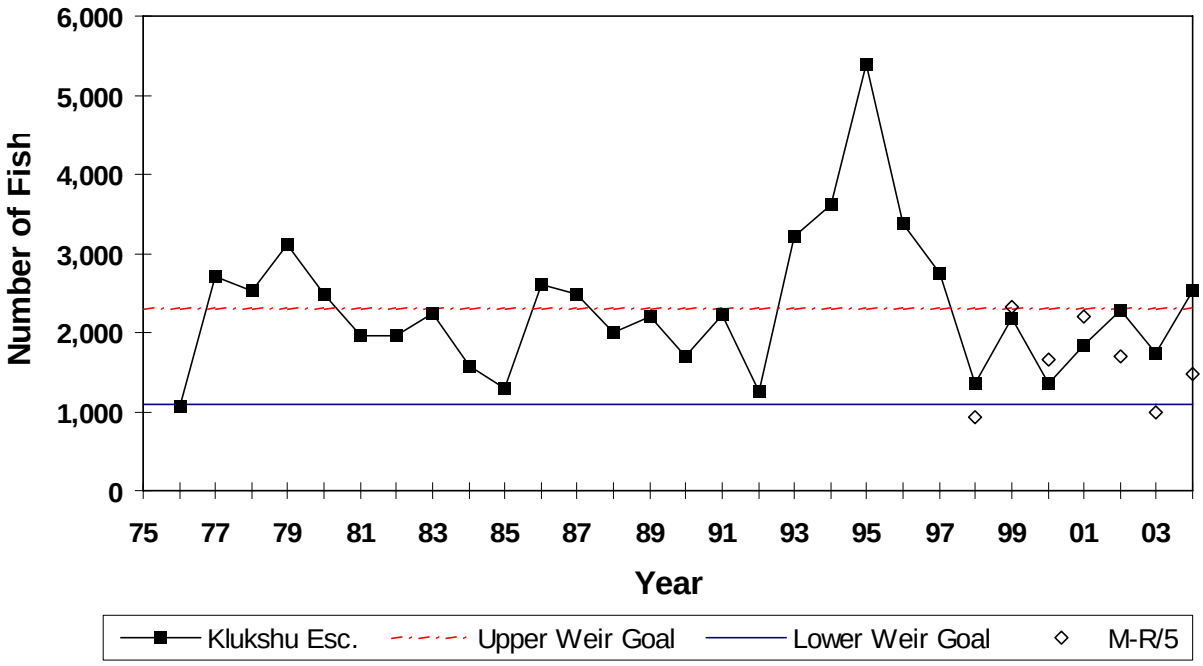

Figure 5.–Weir count of Chinook salmon to the Klukshu River tributary of the Alsek River, 1976–2004. Mark-recapture estimates divided by expansion factor of 5.0. Lines show upper and lower limits of escapement goal range.

Table 8.–Klukshu River weir counts of large Chinook salmon, mark-recapture estimates of escapement to Alsek River, percent of escapement observed at weir, and expansion factor (π). From Pahlke and Waugh In prep.

Year	Counts	M-R	SE	% Observed	π
1998	1,184	4,621	1,430	25.6	3.9
1999	1,663	11,597	2,886	14.3	7.0
2000	1,218	8,295	1,597	14.7	6.8
2001	1,538	11,022	1,336	14.0	7.2
2002	2,067	8,504	623	24.3	4.1
2003	1,313	4,932	525	26.6	3.8
2004	2,376	7,343	595	32.4	3.1
Ave.	1,893	8,045	1,279	21.7	5.1

Table 9.–Peak escapement counts of Chinook salmon to index areas of the Unuk River, 1960–2004.

Year[a]	Cripple Creek		Genes Lake Cr.		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
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
1998	311	N(F)	283	N(F)	39	N(H)	81	N(F)	22	N(F)	104	N(F)	840
1999	202	N(F)	307	N(F)	54	N(H)	67	N(F)	9	N(F)	41	N(F)	680
2000	450	N(F)	565	N(F)	116	N(H)	86	N(H)	56	E(H)	68	N(H)	1,341
2001	701	N(F)	806	N(F/H)	217	E(H)	167	N(H)	84	N(H)	44	P(H)	2,019
2002	156	P(F)	455	N(F/H)	78	N(H)	87	N(H)	61	N(H)	60	E(F)	897
2003	232	P(F)	448	N(F)	95	N(H)	198	E(F)	68	E(F)	80	N(F)	1,121
94-03 Avg	309		407		86		114		39		65		1,018
2004	237	N(F)	388	E(F)	78	N(F)	191	E(F)	47	N(H)	67	N(F)	1,008

[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.

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

Year	Cripple Creek	%	Genes Lake Creek	%	Eulachon Creek	%	Clear Creek	%	Lake Creek	%	Kerr Creek	%	Total
1978	394	36	374	34	218	20	85	8	20	2	15	1	1,106
1979	363	63	101	18	48	8	14	2	30	5	20	3	576
1980	748	74	122	12	95	9	28	3	5	0	18	2	1,016
1981	324	44	112	15	196	27	54	7	20	3	25	3	731
1982	538	40	329	24	384	28	24	2	48	4	28	2	1,351
1983	459	41	338	30	288	26	24	2	12	1	4	0	1,125
1984	644	35	647	35	350	19	113	6	32	2	51	3	1,837
1985	284	24	553	47	275	23	37	3	22	2	13	1	1,184
1986	532	25	838	39	486	23	183	9	25	1	62	3	2,126
1987	860	44	398	20	520	26	107	5	37	2	51	3	1,973
1988	1,068	61	154	9	146	8	292	17	60	3	26	1	1,746
1989	351	31	302	26	298	26	128	11	27	2	43	4	1,149
1990	86	15	284	48	81	14	103	17	26	4	11	2	591
1991	358	55	123	19	43	7	96	15	23	4	12	2	655
1992	327	37	360	41	57	7	69	8	31	4	30	3	874
1993	448	42	330	31	132	12	137	13	8	0	13	1	1,068
1994	161	23	300	42	52	7	128	18	18	3	52	7	711
1995	211	27	347	45	74	10	66	9	35	5	39	5	772
1996	417	36	400	34	79	7	148	13	25	2	98	8	1,167
1997	244	38	154	24	53	8	113	18	13	2	59	9	636
1998	311	37	283	34	39	5	81	10	22	3	104	12	840
1999	202	30	307	45	54	8	67	10	9	1	41	6	680
2000	450	34	565	42	116	9	86	6	56	4	68	5	1,341
2001	701	35	806	40	217	11	167	8	84	4	44	2	2,019
2002	156	17	455	51	78	9	87	10	61	7	60	7	897
2003	232	21	448	40	95	8	198	18	68	6	80	7	1,121
Avg.	425	38	359	32	175	14	97	9	30	3	39	4	1,127
2004	237	24	388	38	78	8	191	19	47	5	67	7	1,008

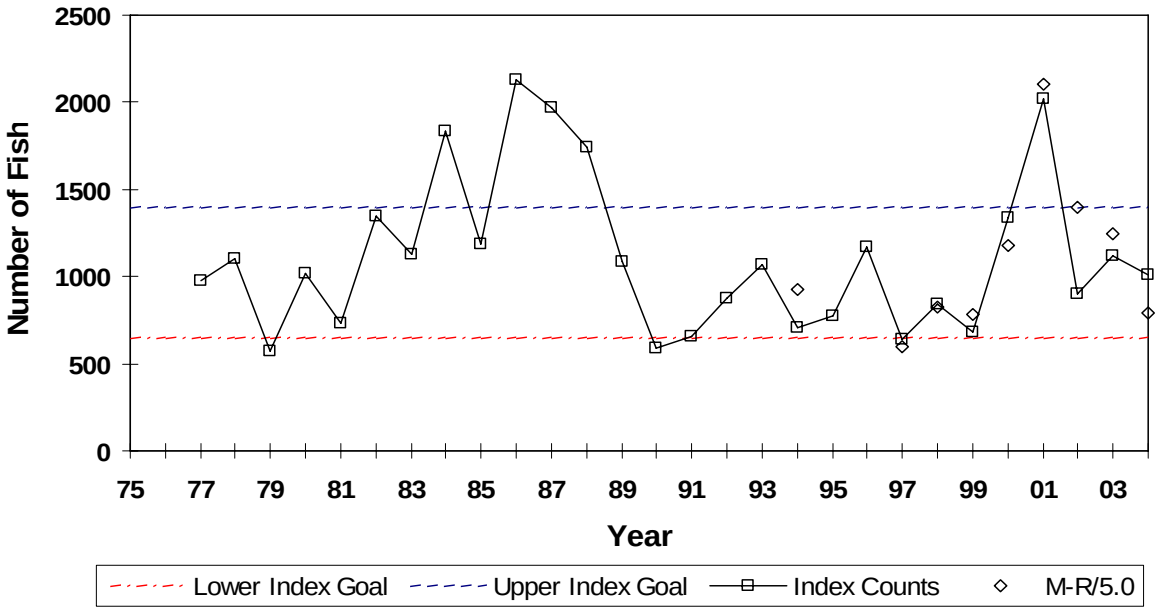

Figure 6.–Counts of large Chinook salmon in index areas of the Unuk River, 1975–2004, and mark-recapture estimates divided by expansion factor (5.0). Lines show upper and lower limits of index escapement goal range.

Table 11.–Index counts of Unuk River Chinook salmon, mark-recapture estimates of escapement, percent of escapement observed, and expansion factor (π). From Weller and McPherson *In prep.*

Year	Counts	M-R	SE	% Observed	π
1997	636	2,970	277	21.4	4.7
1998	840	4,132	413	20.3	4.9
1999	680	3,914	490	17.4	5.8
2000	1,341	5,872	644	22.8	4.4
2001	2,019	10,541	1,181	19.1	5.2
Ave.	1,069	5,736	635	18.5	5.0
2002[a]	897	6,988	805	12.8	7.8
2003	1,121	5,546	433	20.2	4.9
2004	1,008	3,963	325	25.4	3.9

a 2002 not included due to poor survey conditions.

CHICKAMIN RIVER

In index areas on eight tributaries of the Chickamin River, 798 large Chinook salmon were counted in 2004, down from the counts in 2003 of 964 (Table 12). Counts in 2004 were above the 10-year average in five out of eight Chickamin River tributaries (Table 13). The 2004 count was within the index survey escapement goal range of 450 to 900 fish (Figure 7) (McPherson and Carlile 1997). The summed counts for 2004 were multiplied by a survey expansion factor of 5.17 to produce a total escapement estimate of 4,126 fish to the system. A mark-recapture program conducted in 2004 estimated a total escapement of 3,275 (SE = 278) large Chinook salmon (Freeman and McPherson *In prep.*). Angling and spears were used to collect age, sex and length data from 1,094 fish in 2004 (Appendix A4; A5).

Table 12.–Counts of Chinook salmon in index areas of the Chickamin River, 1960–2004.

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
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
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
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
2000	109	N(H)	27	N(H)	230	E(H)	61	N(H)	63	N(H)	20	N(H)	251	N(H)	40	P(H)	801
2001	264	E(H)	27	N(H)	270	E(H)	59	N(H)	61	N(H)	78	N(F)	221	N(H)	30	N(H)	1,010
2002	329	N(H)	20	N(H)	102	N(H)	23	N(H)	146	E(H)	9	P(H)	361	E(H)	23	N(H)	1,013
2003	183	E(H)	13	N(H)	172	N(H)	37	E(H)	21	N(H)	119	E(H)	363	N(H)	56	N(H)	964
94-03 Avg.	120		17		124		34		51		37		191		37		612
2004	109	N(H)	17	N(H)	143	N(H)	35	E(F)	56	E(F)	162	E(F)	272	N(H)	4	P(H)	798

[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 %.

Table 13.–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
1999	54	11	18	4	106	21	33	7	52	10	16	3	200	40	22	4	501
2000	109	14	27	3	230	29	61	8	63	8	20	2	251	31	40	5	801
2001	264	26	27	3	270	27	59	6	61	6	78	8	221	22	30	3	1,010
2002	329	32	20	2	102	10	23	2	146	14	9	1	361	36	23	2	1,013
2003	183	19	13	1	172	18	37	4	21	2	119	12	363	38	56	6	964
Avg.	149	21	64	9	107	15	27	4	56	8	33	5	216	31	39	6	694
2004	109	14	17	2	143	18	35	4	56	7	162	20	272	34	4	1	798

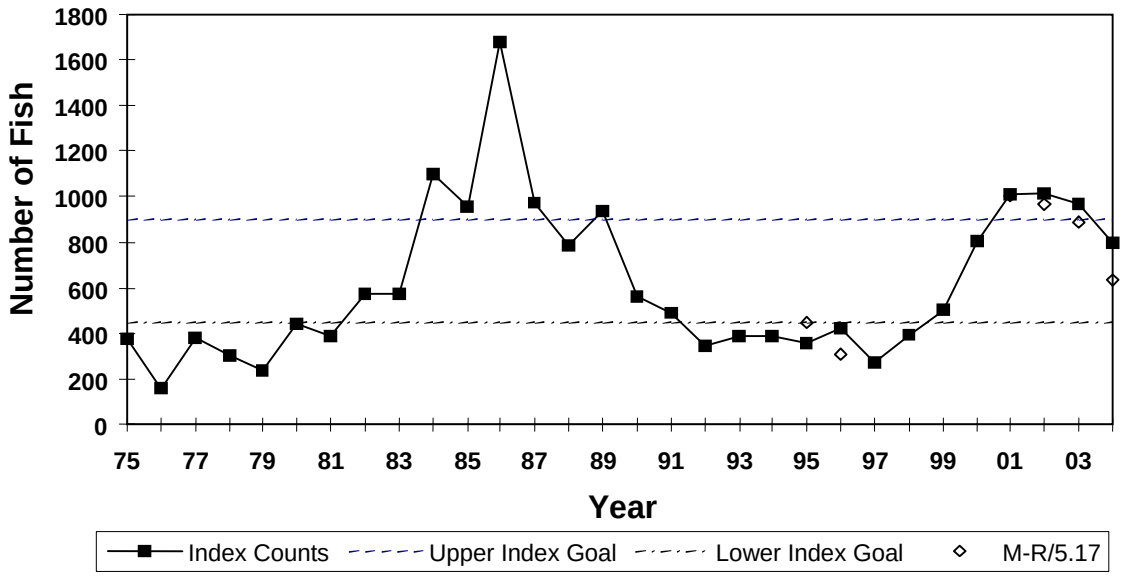

Figure 7.–Counts of Chinook salmon in index areas of the Chickamin River, 1975–2004 and mark-recapture estimates divided by expansion factor (5.17). Lines show upper and lower limits of index escapement goal range.

BLOSSOM RIVER

In index areas of the Blossom River, 333 large Chinook salmon were counted in 2004, up from 203 fish counted in 2003 (Table 14). The 2004 count was within 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 studies, the expansion factors for the Blossom and Keta rivers were revised in 1996 from 1.6 to 2.5 (Pahlke 1997b) and again in 2002 to 4.0 (McPherson et al. 2003). The count for 2004 was multiplied by the expansion factor of 4.0 to produce a total escapement estimate of large 1,332 fish. A mark-recapture program conducted in 2004 estimated a total escapement of 734 (SE = 76) large Chinook salmon (Pahlke and Magnus 2005).

Angling was used to sample age, sex and length data and 345 samples were collected in 2004 (Appendix A4; A5).

KETA RIVER

In 2004, 376 Chinook salmon were counted in the Keta River, up from 322 counted in 2003 (Table 12) and within the 1996 revised index goal range of 250 to 500 large fish (McPherson and Carlile 1997). Prior to 1990, counts of Chinook salmon in the Keta River increased steadily since implementation of the 1980 rebuilding program, and had exceeded the escapement goal range every year since 1981 (Figure 9). Based on results of mark-recapture studies in 1998–2000, the expansion factor for the Keta River was revised in 2001 from 2.5 to 3.0 (Freeman et al. 2001). The peak count for 2004 was multiplied by a survey expansion factor of 3 to produce a total escapement estimate of 1,128 large fish.

Angling was used to collect 119 age, sex and length samples from live fish (Appendix A4; A5).

KING SALMON RIVER

One helicopter survey and two foot surveys were conducted on King Salmon River in 2004. The peak count during the helicopter surveys was 89 large Chinook salmon while only 33 were counted during the foot survey. The peak count was up from the 78 fish counted in 2003. (Table 15; 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 since 1993 and the 2004 count was within the range. The peak count of 89 was multiplied by the survey expansion factor of 1.5 to produce a total escapement estimate of 134 large fish to the system. Angling gear was used to collect age, sex and length data from 23 Chinook salmon in 2004 (Appendix A4; A5).

SITUK RIVER

The count of all Chinook salmon through the Situk River weir in 2004 was 1,563 fish (796 large). The estimate of sport harvest above the weir is 41 large fish. The escapement estimate of large fish (3-5 ocean age) as determined by analysis of length and age samples was 755 (Table 16). Escapements have met or exceeded the escapement goal range of 450–1,050 large spawners (730 point) 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. 2001). The escapement counts from the base period all exceeded the revised escapement goal, indicating the Situk Chinook salmon stock may not have been depressed.

Age, sex and length data was collected from 178 live fish sampled at the weir (Appendix A4; A5).

Table 14.–Counts of Chinook salmon for selected rivers in Behm Canal, 1961–2004. Survey types: F = foot, A = airplane, H = helicopter, – = no survey. Conditions: P = poor, N = normal, E = excellent.

Year[a]	Keta River		Blossom River		Wilson River		Marten River		Grant River		Klahini River		Total
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	N(H)	239	N(H)	–		135	N(H)	–		–		646
1992	217	N(H)	150	N(H)	109	E(H)	76	(H)	25	N(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
1999	276	E(H)	212	N(H)	–		–		–		–		488
2000	300	N(H)	231	N(H)	–		–		–		–		531
2001	343	E(H)	204	N(H)	79	E(H)	–		–		83	E(H)	626
2002	411	E(H)	224	E(H)	–		–		–		–		635
2003	322	N(H)	203	E(H)	–		–		–		–		525
1994-03 avg.	286		190		44		117		9		83		540
2004	376	E(H)	333	E(H)	–		–		–		–		709

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

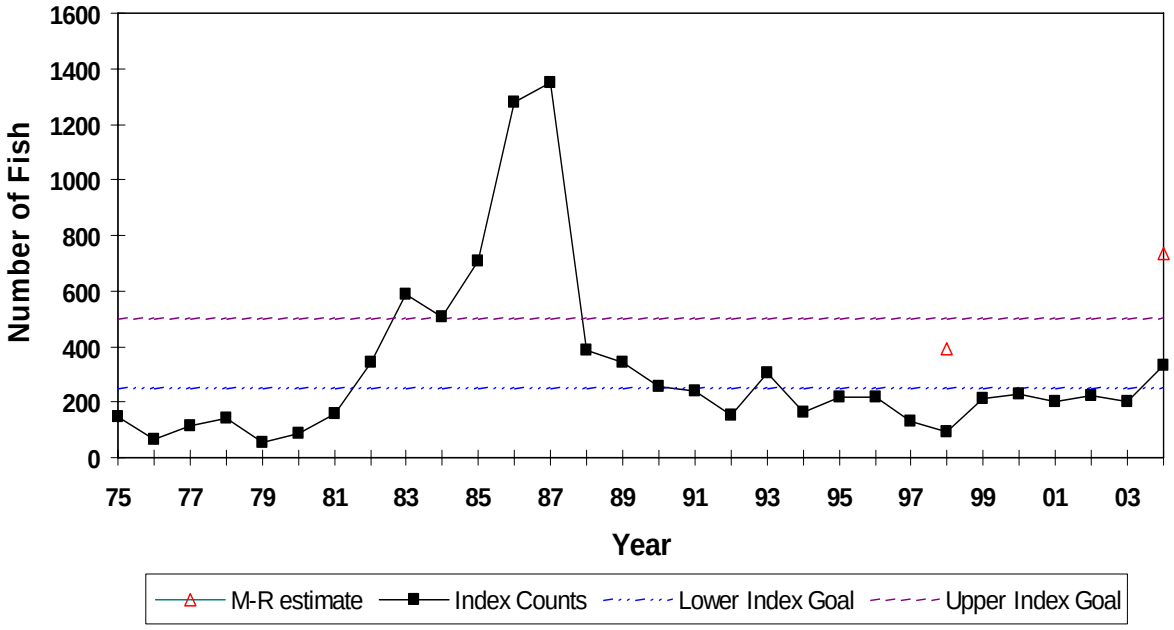

Figure 8.–Counts of Chinook salmon into the Blossom River, 1975–2004 and mark-recapture estimates. Lines show upper and lower limits of index escapement goal range.

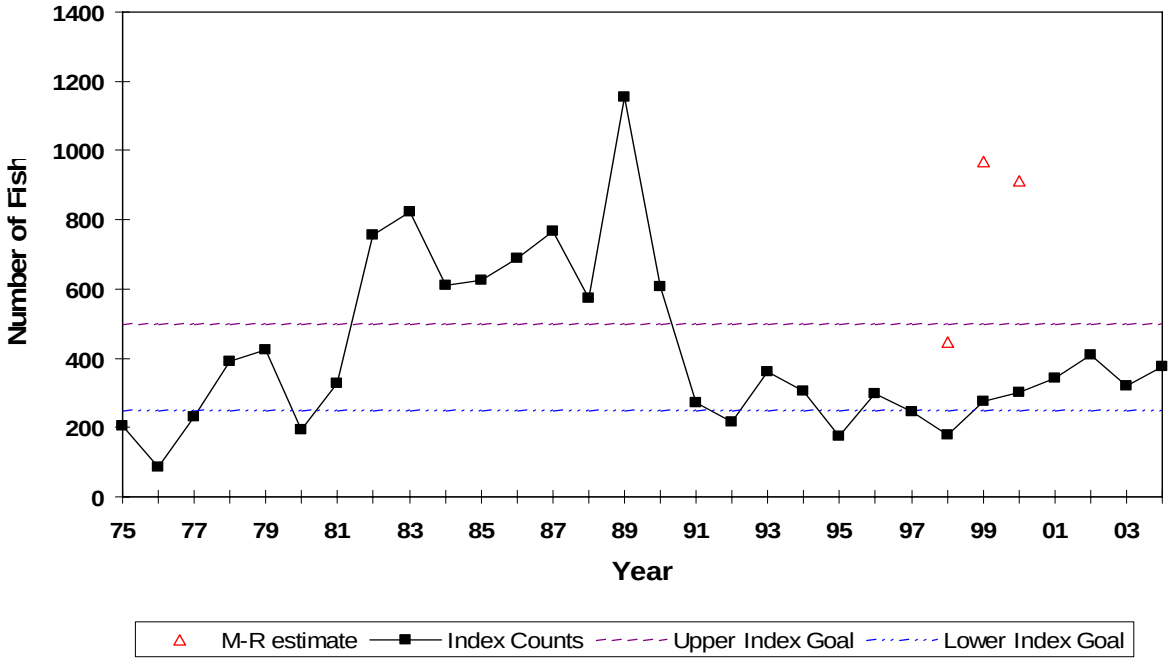

Figure 9.–Counts of Chinook salmon to the Keta River, 1975–2004 and mark-recapture estimates for 1998–2000. Lines show upper and lower limits of index escapement goal range.

Table 15.–Peak escapement counts and weir counts of spawning Chinook salmon in the King Salmon River, 1971–2004.

	Survey count			Survey as percent of weir count	Total egg take (adults)	Total weir count (adults)	Total weir count (jacks)[b]	Adults below weir (foot ct)	Total inriver (adults)	Total natural spawning
	Below weir	Above weir								
Year	A	B		B/(D-C)	C	D	E	F	D+F	D+F-C
1971	–	94	(F)	–	–	–	–	–	–	
1972	–	90	(F)	–	–	–	–	–	–	
1973	–	211	(F)	–	–	–	–	–	–	
1974	–	104	(F)	–	–	–	–	–	–	
1975	–	42	(H)	–	–	–	–	–	–	
1976	–	65	(H)	–	–	–	–	–	–	
1977	–	134	(H)	–	–	–	–	–	–	
1978	–	57	(H)	–	–	–	–	–	–	
1979	–	88	(H)	–	17	–	–	–	–	
1980	–	70	(H)	–	–	–	–	–	–	
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----------						
1994	–	140	N(F)	----------no weir or egg take----------						
1995	–	97	P(H)	----------no weir or egg take----------						
1996	–	192	E(F)	----------no weir or egg take----------						
1997		238	N(F)	----------no weir or egg take----------						
1998		88	E(F)	----------no weir or egg take----------						
1999		200	E(F)	----------no weir or egg take----------						
2000		91	N(F)	----------no weir or egg take----------						
2001		98	N(F)	----------no weir or egg take----------						
2002		102	N(F)	----------no weir or egg take----------						
2003		78	N(F)	----------no weir or egg take----------						
83–92 Avg.	17	126		67%	31	209	56	22	231	188
2004		89	E(F)	----------no weir or egg take----------						

[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%.

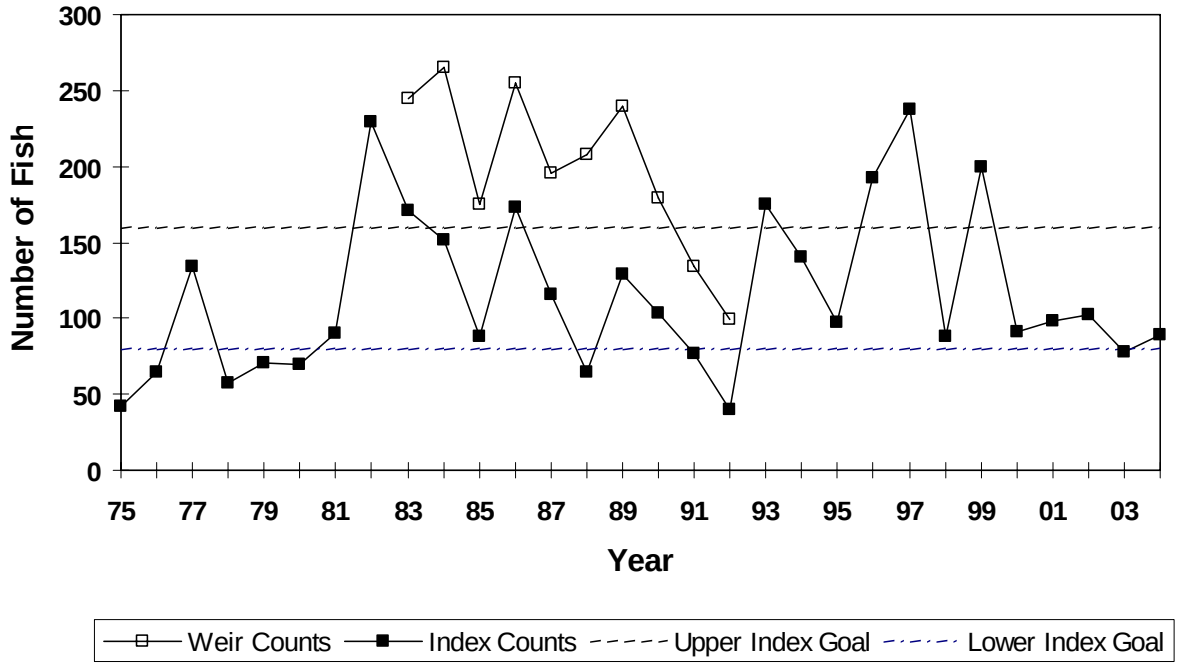

Figure 10.–Counts of Chinook salmon at a weir and in survey counts in the index area of the King Salmon River, 1975–2004. Lines show upper and lower limits of index escapement goal range.

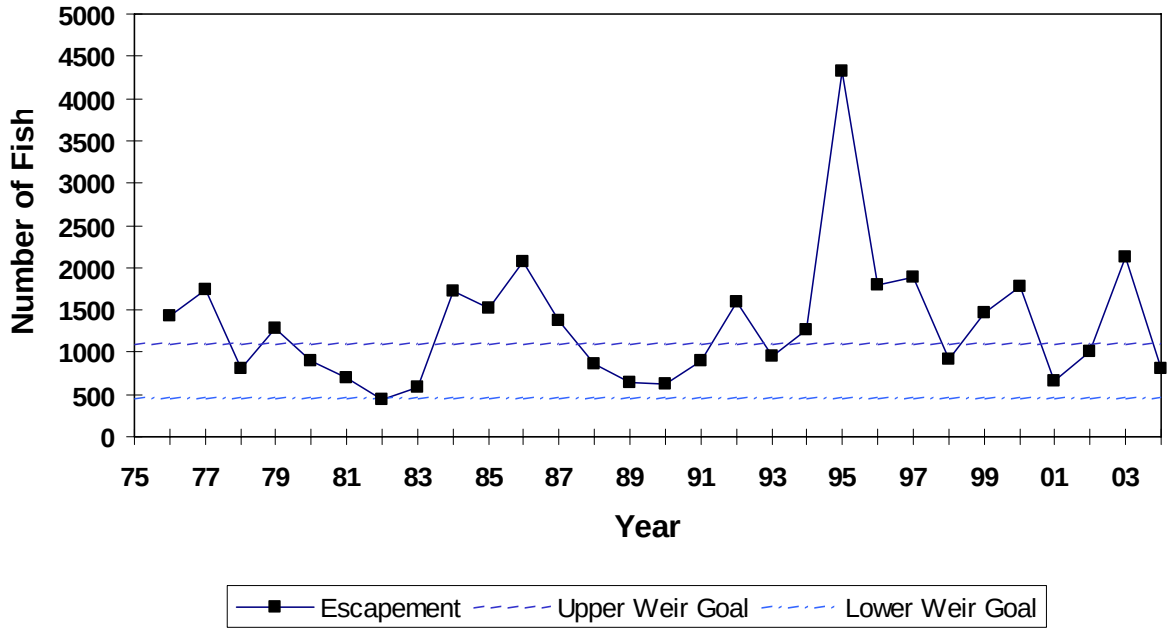

Figure 11.–Counts of large Chinook salmon at the Situk River weir, 1975–2004. Lines show upper and lower limits of escapement goal range.

Table 16.–Estimated harvests and escapement, by size class, of Situk River Chinook salmon, 1976–2004.

	Harvests Below Weir				Weir Count				Harvest Above Weir				Estimated Escapement[c]			
Year	182-70 Gillnet	Subsistence	Sport	Total	small	medium	large	Total	small	medium	large	Total	Small [b]	medium	large	Total
1976	1,002	41	200	1,243		520	1,421	1,941						520	1,421	1,941
1977	833	24	244	1,101		148	1,732	1,880						148	1,732	1,880
1978	382	50	210	642		295	808	1,103						295	808	1,103
1979	1,028	25	282	1,335		470	1,284	1,754						470	1,284	1,754
1980	969	57	233	1,259		220	905	1,125						220	905	1,125
1981	858	62	130	1,050		105	702	807						105	702	807
1982	248	27	63	338		177	434	611						177	434	611
1983	349	50	52	451		257	592	849						257	592	849
1984	512	89	151	752		475	1,726	2,201						475	1,726	2,201
1985	484	156	511	1,151		461	1,521	1,982						461	1,521	1,982
1986	202	99	37	338		505	2,067	2,572						505	2,067	2,572
1987	891	24	395	1,310		505	1,379	1,884						505	1,379	1,884
1988	299	90	132	521		193	885	1,078		39	17	56		154	868	1,022
1989	1	496[a]	0	497	972	243	637	1,852		0	0	0	991	243	637	1,871
1990	0	516	0	516	147	499	628	1,274		0	0	0	236	499	628	1,363
1991	786	220	67	1,073	584	132	897	1,613	2	19	8	29	582	114	889	1,585
1992	1,504	341	127	1,972	131	236	1,618	1,985	3	28	23	54	129	207	1,595	1,931
1993	790	202	50	1,042	2,730	490	980	4,200	92	13	28	133	2,638	477	952	4,067
1994	2,656	367	397	3,420	1,634	1,471	1,311	4,416	50	80	40	170	1,584	1,391	1,271	4,246
1995	8,106	528	1,180	9,814	2,914	617	4,700	8,231	84	52	370	506	2,830	565	4,330	7,725
1996	3,717	478	1,270	5,465	1,374	602	2,175	4,151	568	107	375	1,050	1,061	495	1,800	3,356
1997	2,339	352	802	3,493	1,729	582	2,690	5,001	467	148	812	1,427	1,521	434	1,878	3,833
1998	2,101	594	494	3,189	3,125	851	1,353	5,329	405	206	429	1,040	2,902	645	924	4,471
1999	3,810	588	605	5,003	473	301	1,947	2,721	150	112	486	748	396	189	1,461	2,046
2000	1,318	594	352	2,264	413	161	2,518	3,092	211	60	733	1,004	381	101	1,785	2,267
2001	1,087	402	45	1,534	463	102	696	1,261	300	5	40	345	163	97	656	916
2002	1,078	416	63	1,557	300	448	1,024	1,772	18	24	24	66	282	424	1,000	1,706
2003	2,342	600	414	3,356	334	329	2,615	3,278	108	30	498	636	226	299	2,117	2,642
94-03	2,855	492	562	3,910	1,276	546	2,103	3,925	236	82	381	699	1,135	464	1,722	3,321
2004	1,222	396	294	1,912	348	419	796	1,563	3	7	41	51	345	412	755	1,512

[a] 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.

[b] Small Chinook escapement includes 1- and 2-ocean jacks from 1990 to 1996; 1-ocean fish not counted before 1990.

[c] Escapement from McPherson et al (2003), based on age composition.

CHILKAT RIVER

The 2004 escapement to the Chilkat River was estimated by mark-recapture experiment to be 3,422 large Chinook salmon (SE = 456), a 40% decrease from the escapement estimated in 2003 and below the 10 year average of 4,244 (Ericksen 2005; Table 17). The escapement goal was reviewed in 2003 and revised slightly to a range of 1,750 to 3,500 large fish (Ericksen and McPherson 2004). Estimated escapements have been within, or exceeded the escapement goal ranges since the start of the program in 1991 (Figure 12). The mark-recapture experiment also provided age, sex, and size data from 279 fish captured with nets and spears on the spawning grounds (Appendix A4; A5).

Table 17.–Mark recapture estimates of large Chinook salmon escapement in Chilkat River, 1991–2004.

Year	Mark-Recapture Estimate of Escapement	SE
1991	5,897	1,005
1992	5,284	949
1993	4,472	851
1994	6,795	1,057
1995	3,790	805
1996	4,920	751
1997	8,100	1,193
1998	3,675	565
1999	2,271	408
2000	2,035	334
2001	4,517	722
2002	4,051	429
2003	5,657	690
Ave.	4,390	697
2004	3,422	456

From Ericksen 2005.

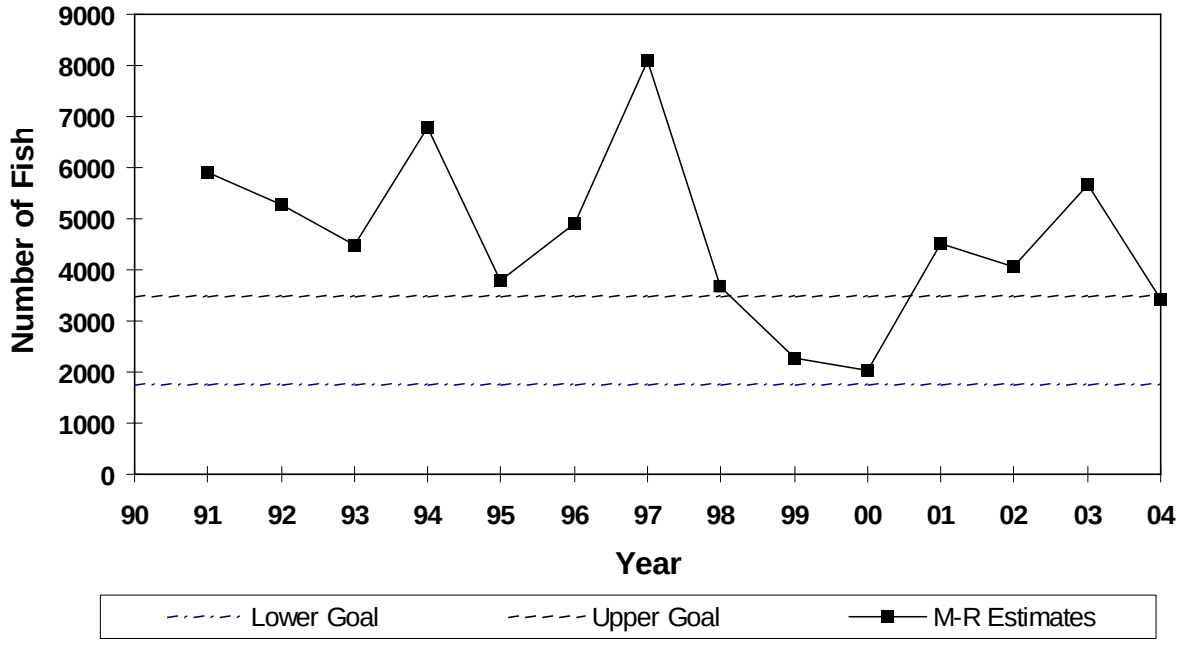

Figure 12.–Mark-recapture estimates of large Chinook salmon escapement to the Chilkat River, 1991–2004. Lines show upper and lower limits of escapement goal range.

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 is assumed to cause a proportional change in the index count. Consequently, if this assumption holds, 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; 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. Also, the proportion of fish counted in an index area may vary with the number of fish in the index area, e.g. a lower proportion of fish may be counted when abundance is extremely high.

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 III et al. 1998b), new surveyors must be trained and calibrated against the primary surveyor to provide consistency and continuity in the data.

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, periodic counts have been made in the two rivers since 1982 because of their proximity to other surveyed systems. Grant and Klahini rivers are small Chinook systems near the Unuk River in Behm Canal which have been surveyed sporadically. In 2004, no surveys were conducted on any of these systems. Since 1995 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; 14). The remaining systems are too remote, and funds are not currently available for these surveys. However, several are routinely surveyed by the local management biologists and in 2004, 113 Chinook were counted in the East Fork of the Bradfield River (Table 6).

OBSERVER TRAINING

No calibration surveys were conducted in 2004. 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 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 independently estimated distribution and escapement for Chinook salmon in the Unuk (Pahlke et al. 1996; Jones III and McPherson 1999, 2000), Chickamin (Pahlke 1996, 1997a), Stikine (Pahlke and Etherton 1999; Bernard et al. 2000), Taku (Pahlke and Bernard 1996; McPherson et al. 1998a, *In prep.*), Keta (Brownlee et al. 1999), Blossom (Pahlke and Magnus 2005) and Alsek rivers (Pahlke et al. 1999). Total escapement 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 and again in 2002. After three mark-recapture

experiments, the expansion factor for the Keta River was revised again in 2001. 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 2002 based on 4 years of mark-recapture studies.

Changing the escapement goals, however, requires a formal review by ADF&G and the CTC 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 and 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) and for the Chilkat River in 2003 (Ericksen and McPherson 2004).

Expansion factors and escapement goals will continue to be revised as we complete more studies that 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 produces inaccurate estimates of total escapement. However, because escapement to small and medium systems are a small proportion of the total regional escapement, errors in those estimates have little effect on estimates of regional escapement. In 1997, the method used to expand the index counts to a total regional escapement estimate was revised based on over 20 years of systematic escapement surveys in Southeast Alaska and the transboundary rivers (Pahlke 1998). 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 contribution to regionwide escapement of the unsurveyed systems.

Observer training and calibration flights conducted in 2000 and 2001 indicated a fairly consistent undercounting by the alternate observer when compared with the primary observer counts. Calibration flights conducted in 2003 with the same pair of observers indicated on average a better agreement.

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, sex, and length composition estimates for all sampled Chinook stocks in Southeast Alaska and transboundary rivers are presented in Appendix A4 and A5. An interesting pattern became apparent in 1999, when the largest fish were observed in the southern systems and average size decreased towards the north. In 2000 and 2001, the largest fish were again seen in the southern systems, but fish in two of the northern systems, the Chilkat and Alsek rivers, were larger than Chinook salmon in the central systems. The trend has continued since 2002, with the smallest fish in the region returning to the Taku River and Andrew Creek. Many (up to 75%) of the 2-ocean fish sampled on the Blossom, Keta and Chickamin rivers were of legal size (28" total length; approximately 625mm MEF),

which is uncommon in other systems in Southeast Alaska. Mean lengths at age were tested for differences between systems, (Appendix A6).

The age-.2 (2-ocean-age jack) component was strong in 2004, except in the Alsek River which may indicate above average survival rates for the 2000 brood year. The 3- and 4-ocean-age (1999 and 1998 broods) classes were well represented in most systems in 2004, however age-.3 fish dominated the returns to the Taku and Alsek rivers. The 1999 brood year (age-0.4) continued to dominate the return to the Situk River, as was noted in 2002 and 2003.

Sampling strategies were designed to make the estimated age and sex distributions relatively unbiased for age-.2 to age-.5 fish. A weir was used to sample the Situk River; stratified mark-recapture studies were used on the Alsek, Chilkat, Taku, Stikine, Unuk and Chickamin rivers; and non-selective rod and reel and/or carcass sampling was used on the Blossom, Keta, Andrew Creek and King Salmon systems. Therefore, comparisons of length or age compositions between stocks within the age-.2. to age-.5 should be relatively unbiased. The Situk River is the only Chinook system in Southeast Alaska where the escapement of age-.1 jacks are estimated annually. The mean length at age data is unbiased for all stocks.

Seven of the Chinook salmon marked with coded-wire tags that were recovered in Southeast Alaska rivers were wild fish from systems other than the river they were recovered in (Appendix A9). Seven more tags were from three different hatchery release sites and for the third year in a row, fish tagged in the Unuk River were recovered in the Chickamin River, and a fish tagged in the Taku was recovered in the lower Stikine River.

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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, 2004.

		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	17,500	14,000	28,000
Situk[f]	All				730	450	1,050
Chilkat[g]	All				2,200	1,750	3,500
Andrew Cr.[h]	All	400	325	750	800	650	1,500
Unuk[i]	6 tributaries	800	650	1,400			
Chickamin[i]	8 tributaries	525	450	900			
Blossom[i]	All	300	250	500			
Keta[i]	All	300	250	500			
King Salmon R.[j]	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. 1998b.

[d] McPherson et al. 2000.

[e] Bernard et al. 2000.

[f] McPherson et al. 2005.

[g] Ericksen and McPherson 2004

[h] Clark et al. 1998.

[i] McPherson and Carlile 1997.

[j] McPherson and Clark *In prep*.

Appendix A2.–Estimated total escapements of large Chinook salmon to escapement indicator systems and to Southeast Alaska and transboundary rivers, 1975–2004. Numbers may be revised annually as data are 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	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		1,914	584	609		63		
1976	5,320	24,582	5,723	35,625	**1,421**		**404**		810	272	252		98		
1977	13,490	29,496	11,445	54,431	**1,732**		**456**	4,870	1,875	448	690	10,071	201	64,703	77,027
1978	12,650	17,124	6,835	36,609	**808**		**388**	5,530	1,594	572	1,176	10,068	86	46,763	55,670
1979	15,520	21,617	12,610	49,747	**1,284**		**327**	2,880	1,233	216	1,278	7,218	113	57,078	67,950
77-79 Avg.	13,887	22,746	10,297	46,929	1,275		390	4,427	1,567	412	1,048	9,119	133	56,181	66,883
1980	12,435	39,239	30,573	82,247	**905**		**282**	5,080	2,299	356	576	9,498	104	91,849	109,344
1981	9,815	49,559	36,057	95,431	**702**		**536**	3,655	1,985	636	987	8,501	139	104,071	123,894
1982	9,845	23,847	40,488	74,180	**434**		**672**	6,755	2,952	1,380	2,262	14,455	**354**	88,989	105,939
1983	11,185	9,795	6,424	27,404	**592**		**366**	5,625	3,099	2,356	2,466	14,504	**245**	42,153	50,182
1984	7,860	20,778	13,995	42,633	**1,726**		**389**	9,185	5,697	2,032	1,830	20,859	**265**	63,757	75,901
1985	6,415	35,916	16,037	58,368	**1,521**		640	5,920	4,943	2,836	1,872	17,732	**175**	76,275	90,804
1986	13,035	38,110	14,889	66,034	**2,067**		1,414	10,630	9,022	5,112	2,070	30,315	**255**	96,604	115,004
1987	12,455	28,935	24,632	66,022	**1,379**		1,576	9,865	5,041	5,396	2,304	25,561	**196**	91,779	109,261
1988	9,970	44,524	37,554	92,048	**868**		1,128	8,730	4,064	1,536	1,725	18,051	**208**	110,307	131,318
1989	11,010	**40,329**	24,282	75,621	**637**		1,060	5,745	4,829	1,376	3,465	17,112	**240**	92,973	110,682
Avg.	10,403	33,103	24,493	67,999	1,083		806	7,119	4,393	2,302	1,956	17,659	218	85,876	102,233
1990	8,490	**52,142**	22,619	83,251	**628**		1,328	2,955	2,916	1,028	1,818	10,673	**179**	94,103	112,027
1991	11,115	51,645	23,206	85,966	**889**	**5,897**	800	3,275	2,518	956	816	15,151	**134**	101,251	112,501
1992	6,215	55,889	34,129	96,233	**1,595**	**5,284**	1,556	4,370	1,789	600	651	15,845	**99**	112,177	124,641
1993	16,105	66,125	58,962	141,192	**952**	**4,472**	2,120	5,340	2,011	1,212	1,086	17,193	263	158,648	176,276
1994	18,100	48,368	33,094	99,562	**1,271**	**6,795**	1,144	**4,623**	2,006	644	918	17,401	210	117,173	130,192
1995	26,985	**33,805**	16,784	77,574	**4,330**	**3,790**	686	3,860	**2,309**	868	525	16,368	146	94,088	104,542
1996	17,995	**79,019**	**28,949**	125,963	**1,800**	**4,920**	670	5,835	**1,587**	880	891	16,583	288	142,834	158,704
1997	14,145	**114,938**	**26,996**	156,079	**1,878**	**8,100**	586	**2,970**	1,406	528	738	16,206	357	172,642	191,824
1998	**4,621**	31,039	**25,968**	61,628	**924**	**3,675**	974	**4,132**	2,021	**364**	**446**	12,536	132	74,296	82,551
1999	**11,597**	**20,545**	**19,947**	52,089	**1,461**	**2,271**	1,210	**3,914**	2,544	848	**968**	13,216	300	65,605	72,894
Avg.	13,537	55,352	29,065	97,954	1,573	5,023	1,107	4,127	2,111	793	886	15,117	211	113,282	126,615

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	MAJOR SYSTEMS				MEDIUM SYSTEMS										
Year	Alsek	Taku	Stikine	Major. subt.	Situk	Chilkat	Andrew	Unuk	Chickamin	Blossom	Keta	Med subt.	King Salmon	Total all systems	Expanded Region total
2000	**8,295**	30,014	**27,531**	65,840	**1,785**	**2,035**	1,380	**5,872**	4,141	924	**913**	17,050	137	83,027	92,252
2001	**11,022**	**41,179**	**63,523**	115,724	**656**	**4,517**	2,108	**10,541**	**5,177**	816	1,029	24,844	147	140,715	156,350
2002	**8,504**	**52,409**	**50,875**	111,788	**1,000**	**4,050**	1,752	**6,988**	**5,007**	896	1,233	20,926	153	132,867	147,630
2003	**4,932**	**36,435**	**46,824**	88,191	**2,117**	**5,657**	1,190	**5,546**	**4,579**	812	966	20,867	117	109,175	121,306
2004	**7,343**	**68,199**	**48,900**	124,442	**755**	**3,422**	3,068	**3,963**	**3,275**	**734**	1,128	16,345	134	140,921	156,579
Avg.	8,019	45,750	47,531	101,300	1,263	3,936	1,900	6,582	4,436	836	1,054	20,006	138	121,444	134,938
CHANGE FROM 2003 to 2004:															
Number	2,411	31,764	2,076	36,251	(1,362)	(2,235)	1,878	(1,583)	(1,304)	(78)	162	(4,522)	17	31,746	35,273
Percent	49%	87%	4%	41%	-64%	-40%	158%	-29%	-28%	-10%	17%	-22%	15%	29%	29%
Escapement goals:															
Lower	5,500	30,000	14,000	49,400	450	1,750	650	3,250	2,325	1,000	750	10,175	120	59,696	66,329
Point	8,500	36,000	17,500	62,000	730	2,200	800	4,000	2,700	1,200	900	14,920	150	75,370	83,744
Upper	11,500	55,000	28,000	92,200	1050	3,500	1,500	7,000	4,650	2,000	1,500	21,250	240	111,693	124,103
Average percent of goal:															
77-79	163%	63%	59%	76%	175%		52%	111%	45%	27%	93%	66%	89%	74%	
80-89	122%	92%	140%	110%	148%		108%	178%	126%	153%	174%	128%	145%	113%	
90-99	159%	154%	166%	158%	215%	228%	148%	103%	60%	53%	79%	110%	141%	149%	
00-04	94%	127%	272%	163%	173%	179%	253%	165%	127%	56%	94%	145%	92%	160%	

Appendix A3.–Detailed 2004 Southeast Alaska Chinook salmon escapement surveys as entered into Commercial Fisheries Division Integrated Fisheries Database (IFDB/ALEX). **I**ncludes all surveys where Chinook salmon were observed, many are not used to estimate escapement.

Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
10130030	Keta River	8/13/04	0	252	-	252	H	KAP	2	
10130030	Keta River	8/19/04	0	376	-	376	H	KAP	3	low water, 220 below camp
10130030	Keta River	9/1/04	0	370	4	374	H	KAP	3	200 above Hill Cr.
10155040	Blossom River	8/13/04	0	275	-	275	H	KAP	2	
10155040	Blossom River	8/19/04	0	333	-	333	H	KAP	3	
10155040	Blossom River	9/1/04	0	296	-	296	H	KAP	3	fungussed up
1017104A	Barrier Creek	8/8/04	0	16	1	17	H	KAP	3	
1017104A	Barrier Creek	8/12/04	0	9	-	9	H	KAP	2	
1017104A	Barrier Creek	9/3/04	0	40	-	40	F	KAP	2	JL survey, new fish
1017104B	Butler Creek	8/8/04	0	141	1	142	H	KAP	3	
1017104B	Butler Creek	8/12/04	0	127	-	127	H	KAP	2	
1017104C	Clear Creek	8/8/04	0	4	-	4	H	KAP	2	
1017104C	Clear Creek	8/9/04	0	2	-	2	F	KAP	2	JL survey
1017104C	Clear Creek	8/12/04	0	-	-	-	H	KAP	1	
1017104H	Humpy Creek	8/12/04	0	20	-	20	H	KAP	1	too early, too many humpies
1017104H	Humpy Creek	8/26/04	0	161	1	162	F	KAP	2	JL survey
1017104H	Humpy Creek	9/1/04	0	78	1	79	H	KAP	2	
1017104I	Indian Creek	8/8/04	0	26	-	26	H	KAP	2	
1017104I	Indian Creek	8/8/04	0	54	2	56	F	KAP	3	JL survey, excell vis
1017104J	Lucky Jake Creek	8/8/04	0	3	-	3	H	KAP	1	water too low, 2 in RP
1017104K	King Creek	8/12/04	0	207	-	207	H	KAP	2	
1017104K	King Creek	8/13/04	0	220	-	220	F	KAP	2	JL survey
1017104K	King Creek	8/27/04	0	117	-	117	H	KAP	1	poor vis
1017104K	King Creek	9/1/04	0	271	1	272	H	KAP	3	
1017104L	Leduc River	8/8/04	0	15	-	15	H	KAP	2	
1017104L	Leduc River	8/12/04	0	15	-	15	H	KAP	2	
1017104L	Leduc River	8/17/04	0	35	-	35	F	KAP	3	JL survey
1017104S	South Fork Chickamin	8/8/04	0	76	-	76	H	KAP	2	
1017104S	South Fork Chickamin	8/9/04	0	109	-	109	H	KAP	2	
1017104S	South Fork Chickamin	8/12/04	0	106	-	106	H	KAP	2	
10175015	Eulachon River	8/4/04	0	27	-	27	F	CFH	1	
10175015	Eulachon River	8/12/04	0	32	-	32	H	KAP	1	partial survey
10175015	Eulachon River	8/16/04	0	77	1	78	F	CFH	2	
10175015	Eulachon River	8/27/04	0	20	2	22	H	KAP	1	poor vis
1017503B	Boundary Cr Unik R	8/13/04	0	49	2	51	F	CFH	2	

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
1017530C	Clear Creek-Unuk R	8/1/04	0	64	-	64	F	CFH	2	
1017530C	Clear Creek-Unuk R	8/7/04	0	75	-	75	H	KAP	2	poor vis
1017530C	Clear Creek-Unuk R	8/7/04	0	110	-	110	F	CFH	2	
1017530C	Clear Creek-Unuk R	8/12/04	0	122	-	122	H	KAP	3	50 in grotto
1017530C	Clear Creek-Unuk R	8/18/04	0	189	2	191	F	CFH	3	plus 5 jacks
1017530G	Genes Lake CreekUnuk	7/27/04	0	284	-	284	F	CFH	2	
1017530G	Genes Lake CreekUnuk	8/8/04	0	300	16	316	F	CFH	2	plus 49 jacks
1017530G	Genes Lake CreekUnuk	8/12/04	220	-	-	220	H	KAP	2	mouth only, water high
1017530G	Genes Lake CreekUnuk	8/13/04	0	384	4	388	F	CFH	3	roger, plus 98 jacks
1017530G	Genes Lake CreekUnuk	8/19/04	0	300	31	331	F	CFH	2	plus 10 jacks
1017530K	Kerr Creek-Unuk R	8/7/04	0	5	-	5	H	KAP	1	poor vis
1017530K	Kerr Creek-Unuk R	8/12/04	0	21	1	22	H	KAP	2	poor vis
1017530K	Kerr Creek-Unuk R	8/22/04	0	66	1	67	F	CFH	2	plus 9 jacks
1017530L	Lake Creek-Unuk R	8/7/04	0	32	-	32	H	KAP	2	
1017530L	Lake Creek-Unuk R	8/12/04	0	47	-	47	H	KAP	3	12 at riffles
1017530Q	Cripple Ck-Unuk R	8/12/04	0	230	7	237	F	CFH	3	
1017530Q	Cripple Ck-Unuk R	8/24/04	0	62	4	66	F	CFH	2	plus 12 jacks
10644031	Crystal Creek	6/16/04	0	-	-	-	A	WRB	2	NO ONE FISHING ABV RAPIDS
10644031	Crystal Creek	6/23/04	0	-	-	110	A	WRB	2	60 ABV RAPIDS, 50 BLW
10644031	Crystal Creek	6/30/04	0	-	-	340	A	WRB	2	260 ABV 80 BLW RAPIDS
10644031	Crystal Creek	7/7/04	40	-	-	480	A	WRB	2	70 BLW 300 ABV RAPIDS, 70 FLOATING RKS
10644031	Crystal Creek	7/8/04	0	20	-	340	A	TST	2	
10644031	Crystal Creek	7/15/04	240	20	320	760	A	WRB	2	120 BLW CRYSTAL CR. ALL DEAD ABV RAPIDS
10644031	Crystal Creek	7/18/04	100	20	50	1,120	A	WRB	2	350 ABV RKS 300 ABV RAPID 300 BLW
10644031	Crystal Creek	7/22/04	0	30		330	A	WRB	1	ONLY COUNTED ABV FLOATING RKS
10644031	Crystal Creek	7/29/04	0	120	40	940	A	WRB	2	300+ IN HOLDING PONDS, DEAD ABV RAPIDS
10644031	Crystal Creek	8/9/04	0	50	50	790	A	TST	2	
10644031	Crystal Creek	8/10/04	0	200	150	800	A	WRB	2	
10644031	Crystal Creek	8/17/04	0	150	60	410	A	WRB	2	INC 70 ABV RAPIDS, 400 + IN PONDS
10740024	Aaron Creek	7/18/04	0	-	-	-	A	WRB	2	

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
10740024	Aaron Creek	8/7/04	0	29	-	29	H	KAP	2	partial survey
10740024	Aaron Creek	8/13/04	0	115	-	115	A	WRB	2	
10740049	Harding River	8/7/04	0	69	-	69	H	KAP	3	
10740049	Harding River	8/13/04	0	6	-	6	A	WRB	1	TOO MANY CHUM FOR GOOD COUNT
10740052	Bradfield River N Fk	8/13/04	0	26	-	26	A	WRB	2	ALL 3 MI UP OR MORE
10740053	Bradfield River E Fk	8/13/04	0	113	-	113	A	WRB	2	
10840013	Shakes Slough	8/12/04	0	140	-	140	A	TST	2	
10840016	Kikahe River	8/12/04	0	50	-	50	A	TST	2	
10840016	Kikahe River	8/18/04	0	47	6	53	F	SNF	2	BIG DEEP WATER
10840017	Goat Ck Stikine R	7/28/04	0	25	-	25	F	TST	2	MOSTLY IN MOUTH
10840017	Goat Ck Stikine R	8/12/04	0	90	-	90	A	TST	2	
10840017	Goat Ck Stikine R	8/19/04	0	102	35	137	F	SNF	2	
10840020	Andrews Creek	7/16/04	0	140	-	140	A	TST	2	
10840020	Andrews Creek	7/18/04	200	10	-	210	A	WRB	2	
10840020	Andrews Creek	7/21/04	770	60	-	830	A	WRB	2	220 M OF CR, 550 M OF SLOUGH
10840020	Andrews Creek	7/28/04	0	27	-	27	B	TWR	1	
10840020	Andrews Creek	8/7/04	0	1,524	10	1,534	H	KAP	3	410 in N. fork, lots sockeye
10840020	Andrews Creek	8/12/04	0	1,450	-	1,450	A	TST	2	130 IN OLD CHANNEL
10840020	Andrews Creek	8/13/04	130	780	10	920	A	WRB	2	440 MAIN STR, 140 LEFT FK, 200 OLD CHANNEL
10840020	Andrews Creek	8/17/04	0	1,271	573	1,844	F	SNF	2	MORE WATER RETURNING TO OLD CHANNEL
10840020	Andrews Creek	8/17/04	0	40	-	40	F	SNF	2	JACKS
1084013A	W of Hot Springs	8/18/04	0	65	-	65	F	SNF	2	BIG DEEP WATER, POOR VIS.
10841010	North Arm Creek	7/16/04	0	60	-	60	A	TST	2	
10841010	North Arm Creek	7/21/04	10	11	-	21	A	WRB	2	
10841010	North Arm Creek	7/28/04	0	2	-	2	F	TST	1	
10841010	North Arm Creek	8/12/04	0	10	-	10	A	TST	2	TOO MANY PINKS
10841010	North Arm Creek	8/16/04	0	50	7	57	F	SNF	2	GOOD NUMBERS IN M
10880120	Little Talhtan River	7/29/04	0	4,332	228	4,560	H	KAP	2	
10880120	Little Talhtan River	8/7/04	0	3,608	2,406	6,014	H	KAP	3	peak survey
11014007	Farragut River	7/31/04	0	-	-	-	A	WRB	1	
11032009	Chuck R Windham Bay	7/15/04	0	4	-	4	A	WRB	2	6K PINKS ABV GORGE
11032009	Chuck R Windham Bay	7/18/04	0	8	-	8	A	WRB	2	

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
11032009	Chuck R Windham Bay	8/2/04	0	12	-	12	A	WRB	2	ALL IN ONE SPOT ABOUT 3 MILES UP
11032009	Chuck R Windham Bay	8/4/04	0	5	-	5	A	WRB	1	
11034003	Rusty River	8/4/04	0	2	-	2	A	WRB	1	
11117010	King Salmon River	7/23/04	0	28	-	28	H	KAP	1	vis excel, early?
11117010	King Salmon River	7/26/04	0	33	-	33	H	KAP	1	some fungussed
11117010	King Salmon River	7/26/04	0	89	-	89	F	KAP	2	water very low, 3 jacks, fungus
11132220	Nakina River	7/28/04	0	1,375	5	1,380	H	KAP	2	IA1
11132220	Nakina River	7/28/04	0	3,495	5	3,500	H	KAP	2	total, w/o IA4
11132220	Nakina River	7/28/04	0	540	-	540	H	KAP	2	IA2
11132220	Nakina River	7/28/04	0	1,580	-	1,580	H	KAP	2	IA3
11132220	Nakina River	8/6/04	0	893	20	913	H	KAP	3	IA1
11132220	Nakina River	8/6/04	0	380	20	400	H	KAP	3	IA2
11132220	Nakina River	8/6/04	0	2,225	20	2,245	H	KAP	3	IA3
11132220	Nakina River	8/6/04	0	4,001	90	4,091	H	KAP	3	peak total
11132220	Nakina River	8/6/04	0	503	20	523	H	KAP	3	IA4
11132240	Kowatua Creek	8/9/04	0	736	-	736	H	KAP	3	
11132240	Kowatua Creek	8/18/04	0	826	2	828	H	KAP	3	
11132240	Kowatua Creek	8/24/04	0	703	1	704	H	JAD	2	
11132255	Tatsamenie River	8/18/04	0	590	3	593	H	KAP	3	IA1, poor vis
11132255	Tatsamenie River	8/18/04	0	335	5	340	H	KAP	3	IA2, por vis
11132255	Tatsamenie River	8/18/04	0	925	8	933	H	KAP	3	total, poor vis
11132255	Tatsamenie River	8/24/04	0	320	-	320	H	JAD	2	1A1, below L. Tats; backseat replicate survey
11132255	Tatsamenie River	8/24/04	0	365	1	366	H	KAP	3	IA2, above little lake
11132255	Tatsamenie River	8/24/04	0	1,394	2	1,396	H	KAP	3	peak total
11132255	Tatsamenie River	8/24/04	0	1,029	1	1,030	H	KAP	3	IA1, below little lake
11132255	Tatsamenie River	8/24/04	0	364	1	365	H	JAD	2	1A2, above L. Tats; backseat replicate survey
11132270	Nahlin River	7/22/04	0	1,465	-	1,465	H	KAP	3	IA3, upper end
11132270	Nahlin River	7/22/04	0	353	-	353	H	KAP	3	IA2, middle
11132270	Nahlin River	7/22/04	0	572	2	574	H	KAP	3	IA1, lower
11132270	Nahlin River	7/22/04	0	2,390	2	2,392	H	KAP	3	total, lots sockeye
11132270	Nahlin River	7/28/04	0	1,167	30	1,197	H	KAP	3	IA3
11132270	Nahlin River	7/28/04	0	1,757	30	1,787	H	KAP	3	total, possible peak
11132270	Nahlin River	7/28/04	0	402	-	402	H	KAP	3	IA2

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs[a]	Use[b]	Comment
11132270	Nahlin River	7/28/04	0	188	-	188	H	KAP	3	IA1
11132275	Tseta Creek	7/28/04	0	886	20	906	H	KAP	3	Lots whitetails top end
11132280	Dudidontu River	7/28/04	0	668	15	683	H	KAP	2	poor vis, 212 above forks
11132280	Dudidontu River	8/6/04	0	992	44	1,036	H	KAP	3	219 up Matasu, 215 above fork
11132280	Dudidontu River	8/6/04	0	980	-	980	H	KAP	3	EJ backseat survey
11150069	Fish Creek-Douglas I	8/23/04	0	70	152	472	F	RJB	3	
18230043	Takhanni River (CAN)	8/2/04	0	44	2	46	H	KAP	2	vis poor
18230050	Blanchard Ck (CAN)	8/2/04	0	69	15	84	H	KAP	2	vis poor

[a] Observer initials on file in Commercial Fisheries IFDB/ALEX database**.**

[b] IFDB Standard 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 select systems in Southeast Alaska and transboundary rivers, 2004.

PANEL A. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KETA RIVER IN 2004

		BROOD YEAR AND AGE CLASS														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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	18		3	39		2	14		0	7				84
	%	0.7	12.1		2.5	32.1		1.8	12.7		0.0	6.4				68.2
	SE of %	0.7	3.5		1.4	4.4		1.3	3.3		0.0	2.4				4.7
	Escapement	10	177		36	469		27	186		0	93				997
	SE of esc.	10	53		21	91		19	55		0	37				155
Females	n							2	10		3	19		1		35
	%							1.8	9.1		2.7	17.3		0.9		31.8
	SE of %							1.3	2.8		1.6	3.7		0.9		4.7
	Escapement							27	133		40	252		13		464
	SE of esc.							19	45		23	67		13		100
Combined	n	1	18		3	39		4	24		3	26		1		119
	%	0.7	12.1		2.5	32.1		3.6	21.8		2.7	23.6		0.9		100.0
	SE of %	0.7	3.5		1.4	4.4		1.8	4.1		1.6	4.2		0.9		0.0
	Escapement	10	177		36	469		53	318		40	345		13		1,461
	SE of esc.	10	53		21	91		27	77		23	81		13		212

Abundance of medium fish Keta river, Scott McPherson, ADF&G, Douglas, AK. personal communication

PANEL B. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE BLOSSOM RIVER IN 2004

Males	n				7	141		9	61		4	25				247
	%				2.0	40.9		2.6	17.7		1.2	7.2				71.6
	SE of %				0.8	2.9		0.9	2.1		0.6	1.4				2.5
	Escapement				18	356		23	154		10	63				623
	SE of esc.				1	25		8	23		5	13				57
Females	n					1		3	51		3	40				98
	%					0.3		0.9	14.8		0.9	11.6				28.4
	SE of %					0.3		0.5	1.9		0.5	1.7				2.5
	Escapement					3		8	129		8	101				247
	SE of esc.					3		4	21		4	18				31
Combined	n				7	142		12	112		7	65				345
	%				2.0	41.2		3.5	32.5		2.0	18.8				1.0
	SE of %				0.0	2.9		0.0	0.0		0.0	0.0				0.0
	Escapement				18	358		30	283		18	164				870
	SE of esc.				3	38		9	34		7	24				75

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PANEL C. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHICKAMIN RIVER IN 2004[a]

		BROOD YEAR AND AGE CLASS														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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		34			436	1		159	1		114			1	**746**
	%		4.0			43.6	0.1		13.5	0.1		9.5			0.1	**70.9**
	SE of %		0.8			2.6	0.1		1.2	0.1		1.0			0.1	**2.0**
	Escapement		186			2,031	4		626	4		443			4	**3,299**
	SE of esc.		43			218	4		68	4		54			4	**290**
Females	n					11			88		1	245			3	**348**
	%					1.0			7.4		0.1	20.5			0.3	**29.1**
	SE of %					0.3			0.8		0.1	1.6			0.1	**2.0**
	Escapement					46			342		4	953			12	**1,357**
	SE of esc.					14			45		4	96			7	**127**
Combined	n		34			447	1		247	1	1	359			4	**1,094**
	%		4.0			44.6	0.1		20.8	0.1	0.1	30.0			0.3	**100.0**
	SE of %		0.8			2.6	0.1		1.5	0.1	0.1	2.1			0.2	**0.0**
	Escapement		186			2,077	4		969	4	4	1,396			16	**4,656**
	SE of esc.		43			220	4		96	4	4	131			8	**363**

[a] From Freeman and McPherson *In prep.*

PANEL D. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE UNUK RIVER IN 2004[b]

Males	n	12	507	186	108				813
	%	1.2	47.9	15.0	8.6				72.7
	SE of %	0.4	3.1	1.3	0.9				2.0
	Escapement	75	2,909	912	523				4,419
	SE of esc.	24	332	93	63				393
Females	n		5	78	255			4	342
	%		0.4	6.2	20.3			0.3	27.3
	SE of %		0.2	0.8	1.7			0.2	2.0
	Escapement		27	377	1,234			19	1,658
	SE of esc.		12	51	120			10	151
Combined	n	12	512	264	363			4	1,155
	%	1.2	48.3	21.2	28.9			0.3	100.0
	SE of %	0.4	3.1	1.6	2.1			0.2	
	Escapement	75	2,936	1,289	1,756			19	6,077
	SE of esc.	24	334	122	160			10	470

[b] From: Weller and McPherson *In prep.*

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PANEL E. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE STIKINE RIVER IN 2004

		BROOD YEAR AND AGE CLASS[c]														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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			112	1		154	2		60				334
	%		0.9			19.1	0.1		23.2	0.3		9.0				52.5
	SE of %		0.4			2.3	0.1		1.7	0.2		1.1				2.2
	Escapement		529			11,485	90		13,947	179		5,383				31,613
	SE of esc.		243			1,531	90		1,430	127		782				2,542
Females	n					8			176	2		129			1	316
	%					1.3			26.3	0.3		19.3			0.1	47.3
	SE of %					0.5			1.8	0.2		1.6			0.1	2.2
	Escapement					766			15,792	179		11,574			90	28,401
	SE of esc.					275			1,593	127		1,280			90	2,472
Combined	n		5			120	1		330	4		189			1	650
	%		0.9			20.4	0.1		49.6	0.6		28.3			0.1	100.0
	SE of %		0.4			2.3	0.1		2.2	0.3		1.9			0.1	0.0
	Escapement		529			12,251	90		29,738	359		16,958			90	60,015
	SE of esc.		243			1,583	90		2,540	181		1,678			90	4,236

[c] From: Der Hovanisian and Etherton. 2006.

PANEL F. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN ANDREW CREEK IN 2004

Males	n					40			58			22			1	121
	%					19.1			28.4			10.8			0.5	59.8
	SE of %					4.5			3.3			2.3			0.5	3.5
	Escapement					689			1,026			390			18	2,123
	SE of esc.					166			240			116			18	399
Females	n								29			53			2	84
	%								14.2			26.0			1.0	40.2
	SE of %								2.6			3.4			0.7	3.5
	Escapement								514			940			35	1,490
	SE of esc.								144			237			26	355
Combined	n					40			87			75			3	205
	%					19.1			42.6			36.8			1.5	100.0
	SE of %					4.5			3.8			3.9			0.9	0.0
	Escapement					689			1,540			1,330			53	3,613
	SE of esc.					166			350			321			32	700

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PANEL G. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KING SALMON RIVER IN 2004

		BROOD YEAR AND AGE CLASS														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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			11			1			1	15
	%					7.1			48.7			4.4			4.4	64.6
	SE of %					4.9			10.1			4.2			4.2	10.3
	Escapement					10			68			6			6	90
	SE of esc.					7			18			6			6	21
Females	n								7			1				8
	%								31.0			4.4				35.4
	SE of %								9.9			4.4				10.3
	Escapement								43			6				49
	SE of esc.								15			6				16
Combined	n					2			18			2			1	23
	%					7.1			79.7			8.9			4.4	100.0
	SE of %					4.8			7.8			5.6			4.1	0.0
	Escapement					10			111			12			6	139
	SE of esc.					7			21			8			6	23

From Scott McPherson, ADF&G Douglas, personal communication .

PANEL H. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE TAKU RIVER IN 2004[d]

Males	n	10	1	518	10	566	2	78	0	0	1,185
	%	0.4	0.0	24.4	0.5	30.9	0.1	4.3	0.0	0.0	60.6
	SE of %	0.1	0.0	1.6	0.2	1.2	0.1	0.5	0.0	0.0	1.1
	Escapement	387	39	21,140	415	26,765	96	3,730	0	0	52,573
	SE of esc.	128	39	1,801	134	929	68	411	0	0	2,199
Females	n	0	0	18	0	521	6	163	3	1	712
	%	0.0	0.0	1.0	0.0	28.8	0.3	9.0	0.2	0.1	39.4
	SE of %	0.0	0.0	0.2	0.0	1.2	0.1	0.7	0.1	0.1	1.1
	Escapement	0	0	846	0	24,993	288	7,825	144	48	34,145
	SE of esc.	0	0	199	0	876	118	577	83	48	261
Combined	n	10	1	536	10	1087	8	241	3	1	1,897
	%	0.4	0.0	25.4	0.5	59.7	0.4	13.3	0.2	0.1	100.0
	SE of %	0.1	0.0	1.6	0.2	1.5	0.2	0.8	0.1	0.1	0.0
	Escapement	387	39	21,987	415	51,758	384	11,555	144	48	86,718
	SE of esc.	128	39	1,816	134	874	136	680	83	48	2,021

[d] From: Jones III et al. *In prep.*

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PANEL I. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE CHILKAT RIVER IN 2004[e]

		BROOD YEAR AND AGE CLASS														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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		37			69			48			21			1	176
	%		13.4			24.6			17.2			7.4			0.3	62.9
	SE of %		0.2			0.3			0.2			0.2			0.0	2.9
	Escapement		742			1,361			950			406			15	3,474
	SE of esc.		273			492			167			99			6	450
Females	n								53			49			1	103
	%								19.0			17.6			0.5	37.1
	SE of %								0.2			0.2			0.0	2.9
	Escapement								1,049			973			29	2,051
	SE of esc.								183			218			11	423
Combined	n		37			69			101			70			2	279
	%		13.4			24.6			36.2			25.0			0.8	100.0
	SE of %		2.0			2.6			2.9			2.6			0.5	
	Escapement		742			1,361			1,999			1,379			44	5,525
	SE of esc.		273			492			333			303			19	880

[e] From: Ericksen 2005.

PANEL J. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE ALSEK RIVER IN 2004[f]

Males	n					14			298	2		114	0		0	428
	%					1.0			28.6	0.2		11.1	0.0		0.0	40.9
	SE of %					0.3			1.4	0.1		1.0	0.0		0.0	1.5
	Escapement					78			2,232	15		863	0		0	3,188
	SE of esc.					23			205	11		102	0		0	273
Females	n					25	1		451	11		136	4		0	628
	%					1.4	0.1		43.1	1.1		13.2	0.4		0.0	59.1
	SE of %					0.4	0.1		1.5	0.3		1.1	0.2		0.0	1.5
	Escapement					110	4		3,359	83		1,027	30		0	4,614
	SE of esc.					29	4		286	26		115	15		0	371
Combined	n					39	1		749	13		250	4		0	1,056
	%					2.4	0.1		71.7	1.3		24.2	0.4		0.0	100.0
	SE of %					0.5	0.1		1.4	0.3		1.3	0.2		0.0	0.0
	Escapement					188	4		5,591	98		1,890	30		0	7,802
	SE of esc.					40	4		447	28		181	15		0	598

[f] From: Pahlke and Waugh *In prep.*

-continued-

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PANEL K. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE SITUK RIVER IN 2004[g]

		BROOD YEAR AND AGE CLASS														
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
		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	1		20	0		24	4		31	3		2		86
	%	0.6	0.6		11.2	0.0		13.5	2.2		17.4	1.7		1.1		48.3
	SE of %	0.6	0.6		2.4	0.0		2.6	1.1		2.9	1.0		0.8		3.8
	Escapement	8	8	0	170	0	0	204	34		263	25		17		731
	SE of esc.															
Females	n		1		8	0		30	2		46	3		2		92
	%		0.6		4.5	0.0		16.9	1.1		25.8	1.7		1.1		51.7
	SE of %		0.6		1.6	0.0		2.8	0.8		3.3	1.0		0.8		3.8
	Escapement		8		68	0	0	255	17		391	25		17		781
	SE of esc.															
Combined	n	1	2		28	0		54	6		77	6		4		178
	%	0.6	1.1		15.7	0.0		30.3	3.4		43.3	3.4		2.2		100.0
	SE of %	0.6	0.8		2.7	0.0		3.5	1.4		3.7	1.4		1.1		0.0
	Escapement	8	17	0	238	0	0	459	51	0	654	51	0	34		1,512
	SE of esc.															

[g] From: Scott McPherson, ADF&G Douglas, personal communication.

SUMMARY. PERCENTAGE AGE COMPOSITION ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 SOUTHEAST ALASKA RIVERS IN 2004.[*]

	BROOD YEAR AND AGE CLASS													
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
	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	1	12		2	32		4	22		3	24		1	
2. Blossom	0	0		2	41		3	32		2	19		0	
3. Chickamin	NE	4			45			21			30			0
4. Unuk	NE	1			48			21			29			0
5. Stikine	NE	1			20			50	1		28			
6. Andrew Cr	NE	NE			19			43			37			2
7. King Salmon	NE	NE			7			80			9			4
8. Taku	NE	0	0		25	0		60	0		13			
9. Chilkat	NE	13			25			36			25			1
10. Alsek	NE	<1			2			72	1		24			
11. Situk	1	1		16	0		30	3		43	3		2	

[*] Small fish not included (NE) in experimental design, except on Stikine and Situk Rivers, 2004.

-continued-

Appendix A4.–Page 7 of 7.

SUMMARY. ESTIMATED NUMBERS OF CHINOOK SALMON BY AGE CLASS IN ESCAPEMENTS TO 11 KEY SOUTHEAST ALASKA RIVERS IN 2004.

	BROOD YEAR AND AGE CLASS														
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997	
	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	10	177	0	36	469	0	53	318	0	40	345	0	13	0	1,461
2. Blossom	0	0	0	18	358	0	30	283	0	18	164	0	0	0	870
3. Chickamin	0	186	0	0	2,077	4	0	969	4	4	1,396	0	0	16	4,656
4. Unuk	0	75	0	0	2,936	0	0	1,289	0	0	1,756	0	0	19	6,075
5. Stikine	0	529	0	0	12,251	90	0	29,738	359	0	16,958	0	0	90	60,015
6. Andrew Cr	0	0	0	0	689	0	0	1,540	0	0	1,330	0	0	53	3,612
7. King Salmon	0	0	0	0	10	0	0	111	0	0	12	0	0	6	139
8. Taku	0	387	39	0	21,987	415	0	51,758	384	0	11,555	144	0	48	86,718
9. Chilkat	0	742	0	0	1,361	0	0	1,999	0	0	1,379	0	0	44	5,525
10. Alsek	0	0	0	0	188	4	0	5,591	98	0	1,890	30	0	0	7,802
11. Situk	8	17	0	238	0	0	459	51	0	654	51	0	34	0	1,512

SUMMARY. PERCENTAGE SEX COMPOSITION THAT WERE MALES BY AGE CLASS ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 KEY SOUTHEAST ALASKA RIVERS IN 2004.

	BROOD YEAR AND AGE CLASS													
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
	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	100	100		100	100		50	58		0	27			
2. Blossom				100	99		75	54		57	38			
3. Chickamin		100			98			65			32			25
4. Unuk		100			99			71			30			0
5. Stikine		100			94	100		47	50		32			0
6. Andrew Cr					100			67			29			34
7. King Salmon					100			61			50			56
8. Taku		100	100		96	100		52	25		32	0		0
9. Chilkat		100			100			48			29			34
10. Alsek					41			40	15		46	0		
11. Situk	100	50		71			44	67		40	50			
Average	100	93		90	93		56	57		32	36			21

Appendix A5.–Average length (MEF), by age, of Chinook salmon in selected systems in Southeast Alaska and transboundary rivers, 2004

		Brood year and age class													
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
		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
Panel A. Average length of Chinook salmon in the Keta River in 2004															
Males	n	1	21		3	39		2	14			7			
Average length		510	442		698	664		875	841			958			
	SD		43		71	60		0	100			87			
	SE		9		41	10		0	27			33			
Females	n							2	10		3	19		1	
Average length								855	833		897	946		1010	
	SD							50	52		40	34			
	SE							36	17		23	8			
Combined	n	1	21		3	39		4	24		3	26		1	1
Average length		510	442		698	664		865	838		897	949		1010	
	SD		43		71	60		31	82		40	52			
	SE		9		41	10		15	17		23	10			
Panel B. Average length of Chinook salmon in the Blossom River in 2004															
Males	n	2	44		7	147		9	61		4	25			
Average length		378	458		731	661		802	795		969	964			
	SD	25	38		63	50		117	68		33	58			
	SE	18	6		24	4		39	9		16	12			
Females	n					1		3	51		3	40			
Average length						710		837	835		888	921			
	SD							73	48		38	39			
	SE							42	7		22	6			
Combined	n	2	44		7	148		12	112		7	65			
Average length		378	458		731	662		811	813		934	937			
	SD	25	38		63	50		105	63		53	52			
	SE	18	6		24	4		30	6		20	6			
Panel C. Average length of Chinook salmon in the Chickamin River in 2004															
Males	n		47			436	1		158	1		113			1
Average length			430			658	690		787	815		925			1,050
	SD		43			52			70			76			
	SE		6			3			6			7			
Females	n					11			88		1	245			3
Average length						722			822		905	898			955
	SD					62			43			47			13
	SE					19			5			3			8
Combined	n		47			447	1		246		1	358			4
Average length			430			659	690		799		905	906			979
	SD		43			53			64			59			49
	SE		6			3			4			3			24

-continued-

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PANEL D. AVERAGE LENGTH OF CHINOOK SALMON IN THE UNUK RIVER IN 2004[a].

		BROOD YEAR AND AGE CLASS													
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
		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		32			507			186			108			
Average length			394			640			770			885			
SD			41			48			62			73			
SE			7			2			5			7			
Females	n					5			78			255			4
Average length						669			794			873			871
SD						36			45			45			30
SE						16			5			3			15
Combined	n		32			512			264			363			4
Average length			394			640			777			877			871
SD			41			48			58			55			30
SE			7			2			4			3			15

[a] From: Weller and McPherson *In prep.*

PANEL E. AVERAGE LENGTH OF CHINOOK SALMON IN THE STIKINE RIVER IN 2004[b]

Males	n		5			112	1		154	2		60			
Average length			578			617	692		782	854		889			
SD			25			57			76	42		54			
SE			11			5			6	30		7			
Females	n					8			176	2		129			1
Average length						696			792	779		839			815
SD						76			40	69		34			
SE						27			3	49		3			
Combined	n		5			120	1		330	4		189			1
Average length			578			622	692		787	817		855			815
SD			25			66			54	64		55			
SE			11			6			3	32		4			

[b] From: Little Tahltan River Samples: Der Hovanisian and Etherton. 2006.

PANEL F. AVERAGE LENGTH OF CHINOOK SALMON IN ANDREW CREEK IN 2004

Males	n		1			40			58			22			1
Average length			325			615			741			858			980
SD						50			61			66			
SE						8			8			14			
Females	n								29			53			2
Average length									784			840			863
SD									38			44			47
SE									7			6			33
Combined	n		1			40			87			75			3
Average length			325			615			755			845			902
SD						51			56			52			74
SE						8			6			6			43

-continued-

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		Brood year and age class													
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
		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
Panel G. Average length of Chinook salmon in the King Salmon River in 2004															
Males	n				2			11			1			1	
	Average length				658			825			830			735	
	SD				32			77							
	SE				23			23							
Females	n							7			1				
	Average length							816			890				
	SD							36							
	SE							14							
Combined	n				2			18			2			1	
	Average length				658			821			860			735	
	SD				32			63			42				
	SE				23			15			30				
Panel H. Average length of Chinook salmon in the Taku River in 2004[c]															
Males	n		47	1		521	10		566	2		78			
	Average length		380	560		609	598		741	785		837			
	SD		68			69	78		65	57		88			
	SE		10			3	25		3	40		10			
Females	n					18			521	6		163	3		1
	Average length					737			752	741		815	783		830
	SD					62			45	36		46	12		
	SE					15			2	15		4	7		
Combined	n		47	1		539	10		1,087	8		241	3		1
	Average length		380	560		613	598		747	752		822	783		830
	SD		68			72	78		57	43		63	12		
	SE		10			3	25		2	15		4	7		

[c] From:Jones III et al. *In prep.*.

Panel I. Average length of Chinook salmon in the Chilkat River in 2004[d]															
Males	n		27			89			162			61			3
	Average length		381			589			772			910			883
	SD		37			65			69			82			185
	SE		7			7			5			11			107
Females	n								179			146			6
	Average length								787			859			926
	SD								43			53			95
	SE								3			4			39
Combined	n		27			89			342			207			9
	Average length		381			589			780			874			912
	SD		37			65			57			67			121
	SE		7			7			3			5			40

[d] From: Ericksen 2005

-continued-

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PANEL J. AVERAGE LENGTH OF CHINOOK SALMON IN THE ALSEK RIVER IN 2004[e]

		BROOD YEAR AND AGE CLASS													
		2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
		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					30	1		308	2		115			
Average length						573	590		795	777		944			
	SD					74			82	154		94			
	SE					14			5	109		9			
Females	n					9			441	11		135	4		
Average length						572			771	774		870	850		
	SD					47			44	42		50	62		
	SE					16			2	13		4	31		
Combined	n					39	1		749	13		250	4		
Average length						573	590		781	774		904	850		
	SD					68			63	59		82	62		
	SE					11			2	16		5	31		

[e] From: Klukshu River weir: Pahlke and Waugh *In prep.*.

PANEL K. AVERAGE LENGTH OF CHINOOK SALMON IN THE SITUK RIVER IN 2004

Males	n	1	1	20		24	4		31	3		2
Average length		370	340	576		767	828		875	842		960
	SD			71		70	132		46	3		
	SE			16		14	66		8	2		
Females	n		1	8		30	2		46	3		2
Average length			450	582		764	790		844	833		810
	SD			47		43			41	19		14
	SE			17		8			6	11		10
Combined	n	1	2	28		54	6		77	6		4
Average length		370	395	578		765	820		856	838		885
	SD		78	64		56	116		45	13		87
	SE		55	12		8	47		5	5		43

-continued-

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SUMMARY. AVERAGE LENGTH OF MALE CHINOOK SALMON SAMPLED IN SOUTHEAST ALASKA IN 2004

	BROOD YEAR AND AGE CLASS													
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
	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		442			664			841			958			
2. Blossom				731	661		802	795		969	964			
3. Chickamin		430			658			787			925			
4. Unuk		394			640			770			885			
5. Stikine		578			617			782			889			
6. Andrew Cr					615			741			858			
7. King Salmon								825						
8. Taku		380			609	598		741			837			
9. Chilkat		381			589			772			910			
10. Alsek					573			795	777		944			
11. Situk				576			767	828		875				

SUMMARY. AVERAGE LENGTH OF FEMALE CHINOOK SALMON SAMPLED IN SOUTHEAST ALASKA IN 2004

	BROOD YEAR AND AGE CLASS													
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
	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								833			946			
2. Blossom								835			921			
3. Chickamin					722			822			898			
4. Unuk					669			794			873			871
5. Stikine					696			792			839			
6. Andrew Cr								784			840			
7. King Salmon								816						
8. Taku					737			752	741		815			
9. Chilkat								787			859			
10. Alsek					572			771	774		870	850		
11. Situk				582			764			844				

SUMMARY. AVERAGE LENGTH OF CHINOOK SALMON SAMPLED IN SOUTHEAST ALASKA IN 2004 SEXES COMBINED

	BROOD YEAR AND AGE CLASS													
	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	1997	1998	1997
	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		442			664		865	838			949			
2. Blossom				731	662		811	813		934	937			
3. Chickamin		430			659			799			906			979
4. Unuk		394			640			777			877			871
5. Stikine		578			622			787	817		855			
6. Andrew Cr					615			755			845			
7. King Salmon								821			860			
8. Taku		380			613	598		747	752		822			
9. Chilkat		381			589			780			874			
10. Alsek					573			781	774		904			
11. Situk				578			765	820		856	838		885	
Averages		434		655	626		814	793	781	895	879			925

Note: Age classes with fewer than four fish sampled were not reported in summary panels.

Appendix A6.–Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.2 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2004. **Bold numbers indicate probability of <0.01 that they are the same.**

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.2 FISH, SEXES COMBINED

				Difference in mean length										
System	Age class	Average length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.2	664	10	0	-2	-5	-24	-42	-49	-6	-51	-75	-91	
2. Blossom	1.2	662	4	2	0	-3	-22	-40	-47	-4	-49	-73	-89	
3. Chickamin	1.2	659	3	5	3	0	-19	-37	-44	-1	-46	-70	-86	
4. Unuk	1.2	640	2	24	22	19	0	-18	-25	18	-27	-51	-67	
5. Stikine	1.2	622	6	42	40	37	18	0	-7	36	-9	-33	-49	
6. Andrew Cr	1.2	615	8	49	47	44	25	7	0	43	-2	-26	-42	
7. King Salmon	1.2	658	23	6	4	1	-18	-36	-43	0	-45	-69	-85	
8. Taku	1.2	613	3	51	49	46	27	9	2	45	0	-24	-40	
9. Chilkat	1.2	589	7	75	73	70	51	33	26	69	24	0	-16	
10. Alsek	1.2	573	11	91	89	86	67	49	42	85	40	16	0	
11. Situk	1.2													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.2 FISH, SEXES COMBINED

				Test statistics for differences in mean length										
System	Age class	Average length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Sal.	Taku	Chilkat	Alsek	Situk
1. Keta	1.2	664	10	0.00	-0.19	-0.48	-2.35	**-3.60**	**-3.83**	-0.24	**-4.88**	**-6.14**	**-6.12**	
2. Blossom	1.2	662	4	0.19	0.00	-0.60	**-4.92**	**-5.55**	**-5.25**	-0.17	**-9.80**	**-9.05**	**-7.60**	
3. Chickamin	1.2	659	3	0.48	0.60	0.00	**-5.27**	**-5.52**	**-5.15**	-0.04	**-10.84**	**-9.19**	**-7.54**	
4. Unuk	1.2	640	2	2.35	**4.92**	**5.27**	0.00	**-2.85**	**-3.03**	0.78	**-7.49**	**-7.01**	**-5.99**	
5. Stikine	1.2	622	6	**3.60**	**5.55**	**5.52**	**2.85**	0.00	-0.70	1.51	-1.34	**-3.58**	**-3.91**	
6. Andrew Cr	1.2	615	8	**3.83**	**5.25**	**5.15**	**3.03**	0.70	0.00	1.77	-0.23	-2.45	**-3.09**	
7. King Salmon	1.2	658	23	0.24	0.17	0.04	-0.78	-1.51	-1.77	0.00	-1.94	**-2.87**	**-3.33**	
8. Taku	1.2	613	3	**4.88**	**9.80**	**10.84**	**7.49**	1.34	0.23	1.94	0.00	**-3.15**	**-3.51**	
9. Chilkat	1.2	589	7	**6.14**	**9.05**	**9.19**	**7.01**	**3.58**	2.45	**2.87**	**3.15**	0.00	-1.23	
10. Alsek	1.2	573	11	**6.12**	**7.60**	**7.54**	**5.99**	**3.91**	**3.09**	**3.33**	**3.51**	1.23	0.00	
11. Situk	1.2													

Appendix A7.–Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.3 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2004. **Bold numbers indicate probability of <0.01 that they are the same.**

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.3 FISH, SEXES COMBINED

				Difference in mean length										
System	Age class	Average length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.3	838	17	0	-25	-39	-61	-51	-83	-17	-91	-58	-57	
2. Blossom	1.3	813	6	25	0	-14	-36	-26	-58	8	-66	-33	-32	
3. Chickamin	1.3	799	4	39	14	0	-22	-12	-44	22	-52	-19	-18	
4. Unuk	1.3	777	4	61	36	22	0	10	-22	44	-30	3	4	
5. Stikine	1.3	787	3	51	26	12	-10	0	-32	34	-40	-7	-6	
6. Andrew Cr	1.3	755	6	83	58	44	22	32	0	66	-8	25	26	
7. King Salmon	1.3	821	15	17	-8	-22	-44	-34	-66	0	-74	-41	-40	
8. Taku	1.3	747	2	91	66	52	30	40	8	74	0	33	34	
9. Chilkat	1.3	780	3	58	33	19	-3	7	-25	41	-33	0	1	
10. Alsek	1.3	781	2	57	32	18	-4	6	-26	40	-34	-1	0	
11. Situk	1.3													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.3 FISH, SEXES COMBINED

				Test statistics for differences in mean length										
System	Age class	Average length	SE	Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.3	838	17	0.00	-1.39	-2.23	**-3.49**	**-2.95**	**-4.60**	-0.75	**-5.30**	**-3.36**	**-3.33**	
2. Blossom	1.3	813	6	1.39	0.00	-1.94	**-4.99**	**-3.88**	**-6.84**	0.50	**-10.21**	**-4.92**	**-5.06**	
3. Chickamin	1.3	799	4	2.23	1.94	0.00	**-3.89**	-2.40	**-6.10**	1.42	**-11.15**	**-3.80**	**-4.02**	
4. Unuk	1.3	777	4	**3.49**	**4.99**	**3.89**	0.00	2.00	**-3.05**	**2.83**	**-6.43**	0.60	0.89	
5. Stikine	1.3	787	3	**2.95**	**3.88**	2.40	-2.00	0.00	**-4.77**	2.22	**-10.41**	-1.65	-1.66	
6. Andrew Cr	1.3	755	6	**4.60**	**6.84**	**6.10**	**3.05**	**4.77**	0.00	**4.09**	-1.24	**3.73**	**4.11**	
7. King Sal.	1.3	821	15	0.75	**-0.50**	-1.42	**-2.83**	-2.22	**-4.09**	0.00	**-4.87**	**-2.68**	**-2.64**	
8. Taku	1.3	747	2	**5.30**	**10.21**	**11.15**	**6.43**	**10.41**	1.24	**4.87**	0.00	**8.59**	**10.88**	
9. Chilkat	1.3	780	3	**3.36**	**4.92**	**3.80**	-0.60	1.65	**-3.73**	**2.68**	**-8.59**	0.00	0.28	
10. Alsek	1.3	781	2	**3.33**	**5.06**	**4.02**	-0.89	1.66	**-4.11**	**2.64**	**-10.88**	-0.28	0.00	
11. Situk	1.3													

Appendix A8.–Differences in mean lengths (Panel A) and test results (Z, Panel B) for statistical differences in mean lengths between age-1.4 Chinook salmon (sexes combined) sampled in 11 rivers in Southeast Alaska in 2004. **Bold numbers indicate probability of <0.01 that they are the same.**

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 FISH, SEXES COMBINED

System	Age class	Average length	SE	Difference in mean length										
				Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.4	949	10	0	-12	-43	-72	-94	-104	-89	-127	-75	-45	
2. Blossom	1.4	937	6	12	0	-31	-60	-82	-92	-77	-115	-63	-33	
3. Chickamin	1.4	906	3	43	31	0	-29	-51	-61	-46	-84	-32	-2	
4. Unuk	1.4	877	3	72	60	29	0	-22	-32	-17	-55	-3	27	
5. Stikine	1.4	855	4	94	82	51	22	0	-10	5	-33	19	49	
6. Andrew Cr	1.4	845	6	104	92	61	32	10	0	15	-23	29	59	
7. King Salmon	1.4	860	30	89	77	46	17	-5	-15	0	-38	14	44	
8. Taku	1.4	822	4	127	115	84	55	33	23	38	0	52	82	
9. Chilkat	1.4	874	5	75	63	32	3	-19	-29	-14	-52	0	30	
10. Alsek	1.4	904	5	45	33	2	-27	-49	-59	-44	-82	-30	0	
11. Situk	1.4													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 FISH, SEXES COMBINED

System	Age class	Average length	SE	Test statistics for differences in mean length										
				Keta	Blossom	Chickamin	Unuk	Stikine	Andrew Cr	King Salmon	Taku	Chilkat	Alsek	Situk
1. Keta	1.4	949	10	0.00	-1.03	**-4.12**	**-6.90**	**-8.73**	**-8.92**	**-2.81**	**-11.79**	**-6.71**	**-4.02**	
2. Blossom	1.4	937	6	1.03	0.00	**-4.62**	**-8.94**	**-11.37**	**-10.84**	-2.52	**-15.95**	**-8.07**	**-4.23**	
3. Chickamin	1.4	906	3	**4.12**	**4.62**	0.00	**-6.84**	**-10.20**	**-9.09**	-1.53	**-16.80**	**-5.49**	-0.34	
4. Unuk	1.4	877	3	**6.90**	**8.94**	**6.84**	0.00	**-4.40**	**-4.77**	-0.56	**-11.00**	-0.51	**4.63**	
5. Stikine	1.4	855	4	**8.73**	**11.37**	**10.20**	**4.40**	0.00	-1.39	0.17	**-5.83**	**2.97**	**7.65**	
6. Andrew Cr	1.4	845	6	**8.92**	**10.84**	**9.09**	**4.77**	1.39	0.00	0.49	**-3.19**	**3.71**	**7.55**	
7. King Sal.	1.4	860	30	**2.81**	**2.52**	1.53	0.56	-0.17	-0.49	0.00	-1.26	0.46	1.45	
8. Taku	1.4	822	4	**11.79**	**15.95**	**16.80**	**11.00**	**5.83**	**3.19**	1.26	0.00	**8.12**	**12.81**	
9. Chilkat	1.4	874	5	**6.71**	**8.07**	**5.49**	0.51	**-2.97**	**-3.71**	-0.46	**-8.12**	0.00	**4.24**	
10. Alsek	1.4	904	5	**4.02**	**4.23**	0.34	**-4.63**	**-7.65**	**-7.55**	-1.45	**-12.81**	**-4.24**	0.00	
11. Situk	1.4													

Appendix A9.–Numbers of Chinook salmon examined for coded-wire tags and numbers of tags recovered in rivers in Southeast Alaska and transboundary rivers, 2003–2004. Hatchery CWTs expanded by tag ratio reported in Tag Lab database.

	2004					2003				
	Chinook Sampled	Hatchery CWTs	Expanded Hatchery CWTs	Non Natal Wild CWTs	Natal Wild CWTs	Chinook Sampled	Hatchery CWTs	Expanded Hatchery CWTs	Non Natal Wild CWTs	Natal Wild CWTs
Situk River	469	0	0	0	0	663	0	0	0	0
Alsek River	2,085	0	0	0	0	2,350	0	0	0	0
Chilkat River	1,061	0	0	0	52	1,019	0	0	0	1944
Taku River	2,162	0	0	0	43	3,727	0	0	0	63
King Salmon River	23	0	0	0	0	69	0	0	0	0
Stikine River	6,329	2	2	2	14	4,804	0	0	1	9
	2 Taku wild, 2L Port Walter (1Unuk brood, 1 Chickamin					*1 Taku River wild*				
Andrew Creek	205	0	0	0	0	300	4	54	0	0
	1 ad clip not recovered					*7 clips, 4 heads; 2 Earl West, 1 Hidden Falls, 1 Anita Bay*				
Unuk River	1,841	0	0	0	62	1,850	0	0	0	32
Chickamin River	1,739	5	57	5	37	1,370	0	0	1	0
	5 Unuk wild, 4 Neets Bay, 1 Anita Bay					*1 Unuk River wild*				
Blossom River	404	0	0	0	0	37	1	10	0	0
						1 Neets Bay				
Keta River	119	0	0	0	0	231	1	24	0	0
										Tamgass Creek
Totals	16,437	7	59	7	208	16,420	6	88	2	123

Notes:

1) Expanded hatchery numbers are from listed tag ratios in ADF&G Tag Lab database.

2) Non-natal wild CWTs are recoveries in a stream from Chinook smolt that were tagged in another river, i.e. Chickamin River had five Chinook tags from Unuk in 2004.

3) Natal CWTs are recoveries of wild Chinook tagged as smolt in that river.

Appendix A10.–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.
SUMVER04XLS	Appendix Table A2, with expanded escapement totals for Southeast Alaska
ESCAP2004.XLS	Table 1. Estimated Chinook escapement in 2004
GOALS.XLS	Appendix Table A1. Expanded goals for Southeast Alaska.
AGELENGTHSEAK2004.XLS	Appendix Table A4-A7. Length and age summaries for 2004
CWTrecovs.xls	coded-wire tag recoveries.