Fishery Data Series No. 07-62

Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 2005

by

Keith A. Pahlke

October 2007

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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by
Keith A. Pahlke
Division of Sport Fish, Douglas

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Keith A. Pahlke [a]
Alaska Department of Fish and Game, Division of Sport Fish
P.O. Box 110024, Juneau, AK 99811-0024, USA

[a] Author to whom all correspondence should be addressed. email: *keith.pahlke@alaska.gov*

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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 2005 was 112,546 large (age .3 and older) Chinook salmon, a 28% decrease from the escapement of 157,065 fish estimated in 2004. Ten of 11 escapement indices were within or above escapement goal ranges and only the Alsek River was slightly below. Estimated age and sex composition and mean length at age of all stocks sampled in 2005 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, Chilkat, Taku, Stikine and Unuk rivers. Short-term (2–3 year) projects were used to estimate expansion factors for the other six 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 2005 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

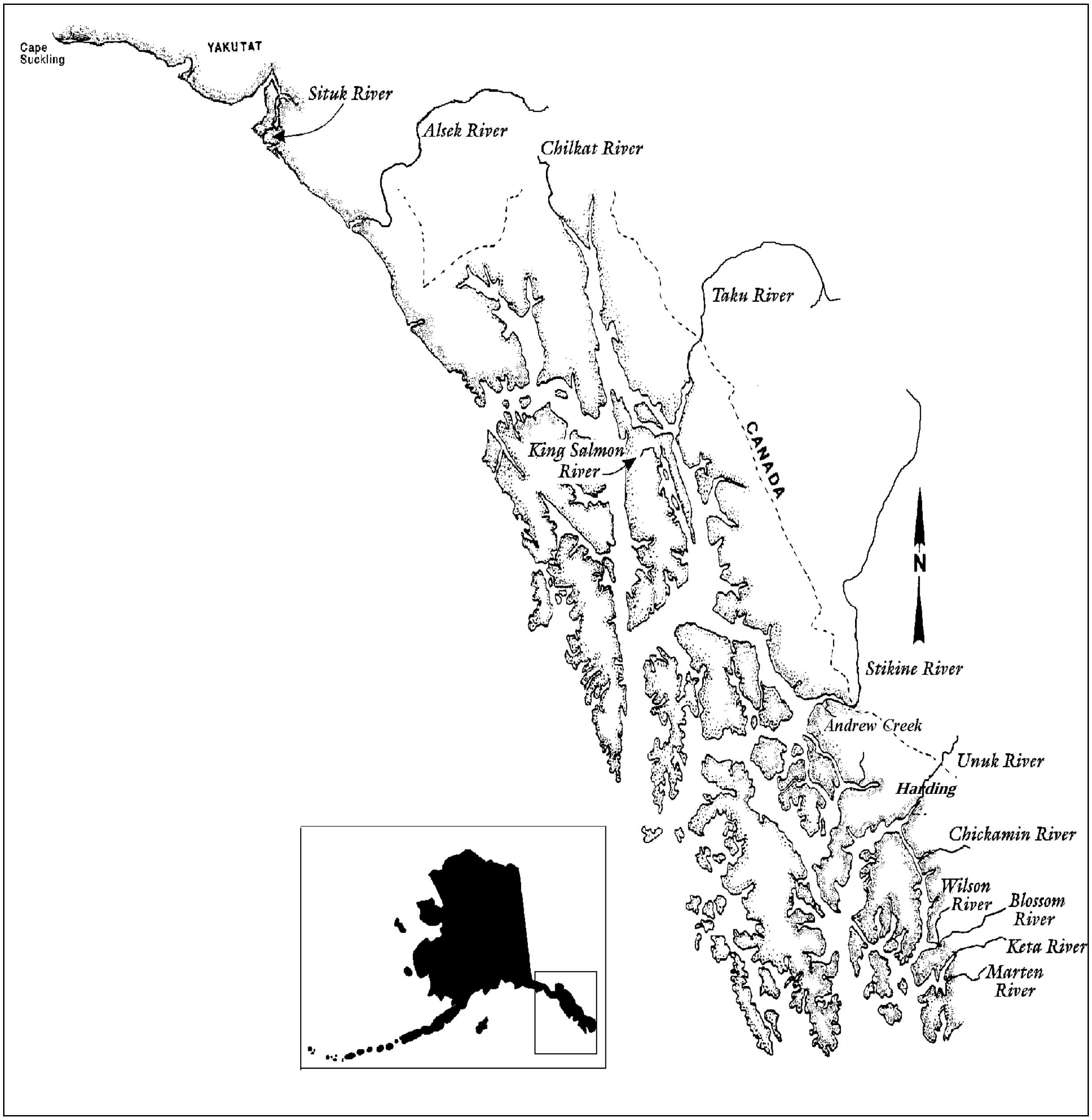

Figure 1.–Location of selected Chinook salmon systems in Southeast Alaska, Yakutat, and trans-boundary rivers.

spawners for six stocks (Situk, Chilkat, Taku, Stikine, and King Salmon rivers and Andrew Creek) 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, 1999, 2000; Pahlke et al. 2000; Der Hovanisian et al. 2001, 2003, 2004, 2005; Richards et al. *In prep.*).

Andrew Creek flows into the lower Stikine River in Alaska, not far from the limit of tidal influence. The drainage covers about 200 km^2 with two main tributaries. Only a small portion of the North fork is accessible to salmon and most spawning occurs in the South fork. From 1976 to 1984, a weir was operated on Andrew Creek to provide brood stock for hatcheries. Foot, aerial fixed-wing and helicopter surveys to count Chinook salmon have been conducted annually since 1985. A 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, 2002; Pahlke and Waugh 2003; 2004, 2006).

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 km2. 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; 2006a, 2006b).

The Chickamin River is a large, glacial river with a drainage of approximately 2,000 km^2. It originates in British Columbia and flows into Behm Canal approximately 32 km southeast of Burroughs Bay and 65 km northeast 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 2001–2005, and spawning distribution was estimated by radiotelemetry in 1996 (Pahlke 1996, 1997a; Freeman and McPherson 2003, 2004, 2005; Freeman et al. 2007, Weller et al. *In prep.*).

The Blossom, Keta, Wilson, and Marten rivers are clear water 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 and 2005 (Pahlke and Magnus 2005, 2006).

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. The basin encompasses an area approximately 2,600 km^2 (Bugliosi 1988), and 1,667 km^2 are considered accessible to anadromous fish (Ericksen and McPherson 2004). 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; Ericksen and Chapell 2006).

The Situk River is a small drainage (176 km^2) 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). These data have been collected routinely at weirs and during mark–recapture studies and recently specific programs have been implemented to collect age, sex and length data 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 during 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 m 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. Because 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 2005 surveys (Appendix A3) are entered into the ADF&G Division of Commercial Fisheries 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 (because indices are only a partial count of spawning abundance), counts from index areas are increased by an expansion factor (Table 1). An expansion factor is an estimate of the proportion of the total 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; 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, 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 this report. 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

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 2005.

	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	1,070	4 .17	4,462 [d]		
Taku River	5 tributaries	3,981	5 .20	20,701	38,806	Jones III et al. *In prep.*
Stikine River	Little Tahltan	7,387	5 .36	39,594	40,501	Richards et al. *In prep.*
Category subtotal				64,757	83,769	
			Medium Producers			
Situk River	NA	NA	NA	NA	613 [e]	
Chilkat River	NA	NA	NA	NA	3,366	Ericksen and Chapell 2006
Andrew Cr.	All	1,015	1 .95	1,979	NA	
Unuk River	6 tributaries	929	4 .87	4,524	4,742	Weller and McPherson 2006b
Chickamin R.	8 tributaries	926	4 .79	4,436	4,257	Weller et al. *In prep.*
Blossom River	All	445	3 .01	1,339	926	Weller et al. *In prep.*
Keta River	All	497	3 .01	1,496	NA	
Category subtotal					17,379	
			Minor Producers			
King Salmon R.	All	94	1 .52	143	NA	
Index system total					101,291	M-R plus survey expansions
Region total			1/0 .9		112,545	

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

[b] Estimated from mark-recapture program or weir count. Final numbers used for ADF&G management.

[c] Reference document for mark-recapture estimate.

[d] Klukshu weir count large fish & immediate harvest (72) × 4.17

[e] Situk River weir count, minus estimated sport harvest above weir (0)

will continue to be revised as additional data become available (Appendix B1). Ongoing research projects should provide more information on the expansion factors for the Taku, Stikine, Unuk, Chickamin, and Blossom 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 2005 were compiled to provide a basic statistical summary for managers and researchers. Estimates for the Chickamin, Unuk, Stikine, Taku, Chilkat, and Blossom rivers were the results of mark–recapture experiments (Weller and McPherson 2006b; Weller et al. *In prep.*; Richards et al. *In prep.*; Ericksen and Chapell 2006; Pahlke and Magnus. 2006; Jones III et al. *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 2005. 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. Also note that there may be slight biases for some systems without mark–recapture estimates in 2005; 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. 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 may indicate 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 2005, 44 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 with one exception have remained below the 1990–1999 average, but escapement to the Stikine River has increased greatly since 1999, including the highest on record in 2001.

The estimated escapement (expanded) of large Chinook salmon for all Southeast Alaska and transboundary rivers in 2005 was 112,545 (Table 1), a 28% decrease from the estimated 157,065 fish in 2004. Escapement indices for 10 of 11 index areas were within or above escapement goal ranges.

TAKU RIVER

The count of 3,981 large Chinook salmon in the five index areas of the Taku River was down from 9,138 in 2004 and below the recent 10-year average of 8,319 (Table 2), with counts in four of five tributaries below 2004 levels (Table 3). Counts increased from 1983 to 1993, and exceeded the upper limit of the survey goal range five times in the 90s (Figure 2).

The sum of counts from the five index areas was expanded by a survey expansion factor of 5.20. The expansion factor was revised in 1999 based on five years of mark–recapture experiments on the Taku River (Appendix B9; McPherson et al. 2000). McPherson et al. 2000 recommended 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 (SE 1.78) which corresponds to an index goal range of 5,800 to 10,600 fish.

Table 2.–Counts of spawning Chinook salmon in index areas of the Taku River, 1951–2005.

Year [a]	Nakina River		Nahlin River		Kowatua River		Tatsamenie River		Dudidontu River		5 Trib. Total	Tseta Creek [b]	
1951	5,000	(F) [c]	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[d]	(F/W)	–		–		–		–		1,500		
1958	2,500[d]	(F/W)	2,500	(A)	–		–		4,500	(A)	9,500		
1959	4,000[d]	(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 [e]	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[f]	(W)	1,228	E(H)	204	E(H)	8,986	494	E(H)
1990	7,917	E(H)	1,658	E(H)	614[f]	(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)

-continued-

Table 2.–Page 2 of 2.

Year [a]	Nakina River		Nahlin River		Kowatua River		Tatsamenie River		Dudidontu River		5 Trib. Total	Tseta Creek [b]	
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)
2005	1,213	N(H)	471	P(H)	833	E(H)	1,146	N(H)	318	N(H)	3,981	215	N(H)
95–04 Avg.	3,712		1,838		894		1,046		829		8,319	511	

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

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

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

[d] Partial survey of Nakina River in 1957–59; comparisons made from carcass weir (W) counts.

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

[f] Carcass weir at Kowatua River used to partially count escapement due to poor survey conditions, 1989, 1990.

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
2004	4,091	41	1,787	18	828	8	1,396	14	1,036	10	906	9	10,044
Average	4,024	47	1,731	20	758	10	1,018	13	606	7	377	5	8,513
2005	1,213	29	471	11	833	20	1,146	27	318	8	215	5	4,196

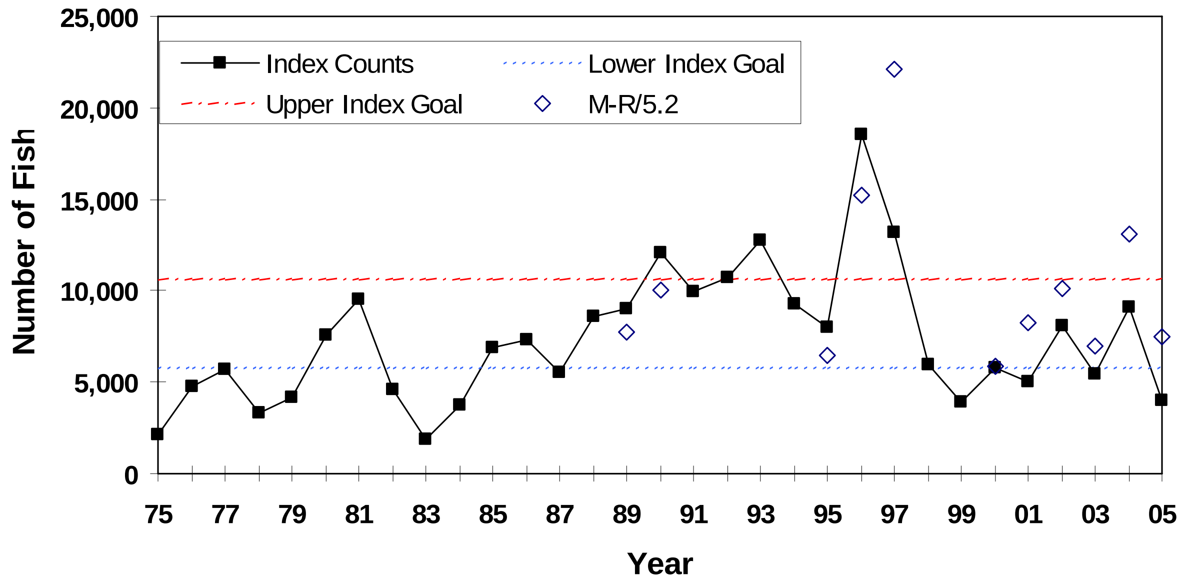

Figure 2.–Counts of Chinook salmon in index areas of the Taku River, 1975–2005 and mark–recapture estimates divided by expansion factor of 5.2. Lines show upper and lower limits of index escapement goal range.

Expansion of the survey counts of 3,981 by 5.20 results in an escapement estimate of 20,701 (SE 7,086) large Chinook salmon in 2005 (Table 1). A mark–recapture experiment conducted in 2005 resulted in a higher escapement estimate (38,806 large; SE = 4,528; Jones III et al. *In prep.*).

Commercial fisheries targeting Taku River Chinook salmon were opened in 2005 for the first time in 27 years. The combined U.S. and Canadian fleets harvested about 28,000 fish, the highest catch since before statehood.

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 Nahlin, Dudidontu and Tatsamenie rivers (Appendices A4, panel H and A5, panel H).

STIKINE RIVER

At the Little Tahltan River weir, 7,387 large Chinook salmon were counted in 2005. The weir count was less than half the record count of 16,381 in 2004, but still above the 1995–2004 average of 7,040 (Table 4).

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 2,157 large fish in 2005. 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 35.5% during 1995–2004 (Table 4). 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, 2003, and 2005, 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 960 fish sampled at the Little Tahltan River weir (Appendices A4, panel E and A5, panel E).

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 2005 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). The expansion factor was revised to include the annual estimates through

Table 4.–Counts of large spawning Chinook salmon in the Little Tahltan River, Stikine River, 1975–2005.

Year	Weir Count	Above Weir Catch	Escapement	Aerial Survey Peak Count [a, b]		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	4,940	0	4,940	1,379	N(H)	27.9
2000	6,640	9	6,631	2,720	N(H)	41.0
2001	9,738	0	9,730	4,158	N(H)	42.7
2002	7,490	0	7,490	No survey		
2003	6,492	0	6,492	1,903	N(H)	29.3
2004	16,381	0	16,381	6,014	E(H)	36.7
95–04 Avg.	6,980	3	6,977	2,500		35.5
2005	7,387	0	7,387	2,157	N(H)	29.2

[a] N = normal survey conditions; (H) = helicopter survey; P = survey conditions hampered by glacial or turbid waters; E = excellent survey conditions .

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

2005. Expansion of the 2005 weir count of 7,387 large Chinook salmon by the survey expansion factor of 5.36 (SE 1.35; Appendix B6) produced a total Stikine River escapement estimate of 39,594 (SE 9,972; Table 1) large Chinook salmon. The estimate of total escapement to the Stikine River from a mark–recapture experiment conducted in 2005 is 40,501 large Chinook (SE = 2,571; Richards et al. *In prep.*) which is well above the upper end of the escapement goal range for the drainage.

Commercial fisheries targeting Stikine River Chinook salmon were opened in 2005 for the first time in 27 years. The combined U.S. and Canadian fleets harvested about 43,000 fish, the highest catch since before statehood.

ANDREW CREEK

The 2005 survey count of Chinook salmon in Andrew Creek was 1,015 fish, compared to 1,534 in 2004 (Table 5). 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 to 2.0 (SE 0.409). A weir was operated and surveys were also conducted in 1997 and the expansion factor was revised again to 1.95 (SE 0.45; Appendix B7). No survey expansion was necessary for the years when the weir provided total escapement counts (Appendix A2).

Five surveys were conducted between 2 August and 15 August with counts of 797 and 1,015 (helicopter), 1,050 and 890 (fixed-wing) and 1,701 (foot survey) Chinook salmon counted (Appendix A3). The helicopter count was used as the peak count based on experience of the surveyors and what was most representative of normal survey conditions. Expansion of the helicopter count of 1,015 large Chinook salmon by the survey expansion factor (1.95) produced a total Andrew Creek escapement estimate of 1,979 (SE 455) large Chinook salmon (Table 1; Appendix B7).

Age, sex, and length data was collected from 242 pre-spawning fish in Andrew Creek, using angling gear and dip nets (Appendices A4, panel F and A5, panel F).

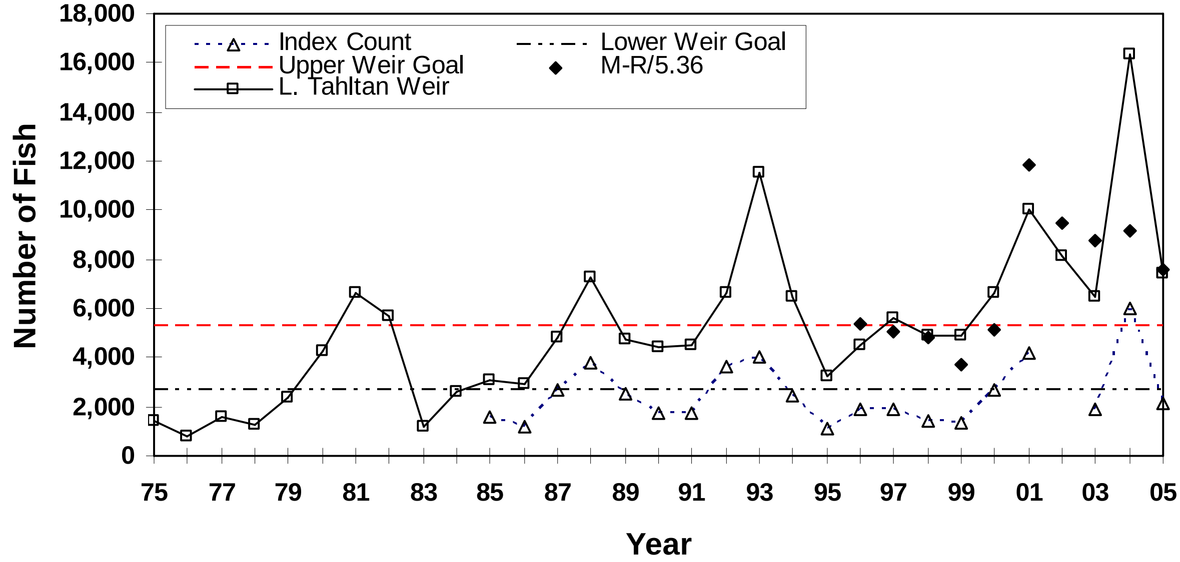

Figure 3.–Counts of Chinook salmon at the Little Tahltan River weir, Stikine River, 1975–2005, and mark–recapture estimates divided by expansion factor of 5.36. Data for 1985–2000 from weir counts, 1975–1984 estimated by doubling index count. Lines show upper and lower limits of escapement goal range.

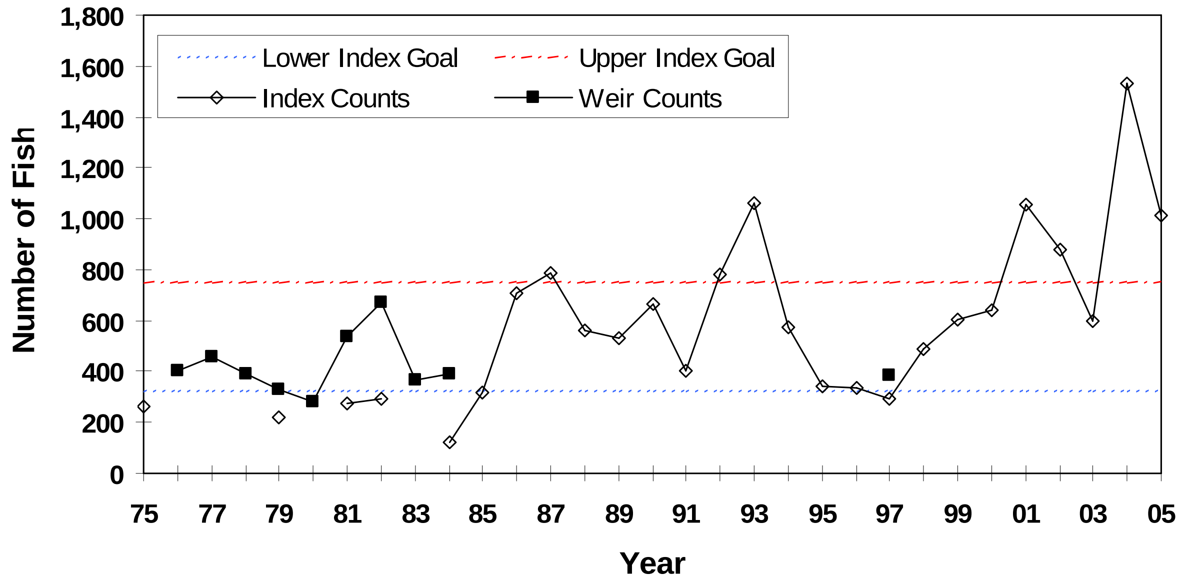

Figure 4.–Counts of Chinook salmon at the Andrew Creek Weir, 1976–1984, 1997 and in aerial/foot surveys, 1975, 1985–2005. Lines show upper and lower bounds of index escapement goal range.

Table 5.–Counts of spawning Chinook salmon in selected rivers in central Southeast Alaska, 1956–2005.

Year	Andrew Creek [a]		North Arm		Clear Creek		Harding River		Aaron Creek		Bradfield River North Fork		Bradfield River East 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)
2004	1,534	N(H)	27	F(N)	65	F(P)	69	H(N)	115	A(N)	26	A(N)	113	A(N)
95–04 Avg.	681		35		24		64		105		92		61	
2005	1,015	N(H)	78	N(F)	102	N(F)	15	P(A)	79	N(A)			122	N(A)

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

ALSEK RIVER

The count of large Chinook salmon through the Klukshu River weir in 2005 was 1,070 fish, a 27% decrease from the count of 2,523 in 2004 (Table 6; Figure 5). The escapement to the Klukshu River, estimated by subtracting the Aboriginal Fishery (AF) harvest (36) and sport harvest (0) above the weir from the weir count, was 1,034 fish. This was just below 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 2005. However, in helicopter surveys we counted 47 large Chinook salmon in the Takhanne River, 7 in Goat Creek, and 112 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. After the conclusion of the mark–recapture program in 2004 the expansion factor was revised with seven years of data (Pahlke and Waugh 2006). The revised expansion factor, based on the estimate of large fish at the weir and the harvest immediately below the weir, is 4.17 (SE 1.71; Appendix B10). This expansion factor has not been through the approval process with the PSC. The sum of the total weir count of 1,070 plus the immediate harvest below the weir of 22 in the aboriginal fishery and 56 in the sport fishery was multiplied by the proportion of large fish in the sample collected at the weir (0.932) to get an estimate of large Chinook salmon returning to the Klukshu River (1,070), which was then multiplied by the EF of 4.17 to produce an estimate of escapement to the Alsek drainage of 4,462 large Chinook salmon (Pahlke and Waugh 2006; Table 1; Appendix B10).

Age, sex and length data were collected from 561 live fish sampled at the Klukshu River weir, (Appendices A4, panel J and A5, panel J).

UNUK RIVER

In 2005, 929 large Chinook salmon were counted in all index areas of the Unuk River, a 8% decrease over the count in 2004 and below the recent 10-year average of 1,048 (Tables 7 and 8). 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 radiotracking 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 more mark–recapture estimates were obtained the expansion factors were revised in 2002 to 5.0 (McPherson et al. 2003) and again in this report to 4.87 (SE 0.60; Appendix B5). The expansion factor produced an estimated escapement of 4,524 (SE 557) large Chinook salmon to the Unuk River in 2005, and the ongoing mark–recapture program estimated an escapement of 4,742 large Chinook salmon (SE = 396; Weller and McPherson 2006b). As part of that project, 749 fish were sampled for age, sex and size data (Appendices A4, panel D and A5, panel D). Live fish were sampled with angling gear and carcasses were collected by spear.

CHICKAMIN RIVER

In index areas on eight tributaries of the Chickamin River, 926 large Chinook salmon were counted in 2005, compared to 798 in 2004 (Table 9). Counts in 2005 were above the 10-year average in four out of eight Chickamin River tributaries (Table 10). The 2005 count was above the index survey escapement goal range of 450 to 900 fish (Figure 7) (McPherson and Carlile 1997). The summed counts for 2005 were multiplied by a survey expansion factor of 4.79 to produce a total escapement estimate of 4,436 (SE 716) fish to the system (Table 1; Appendix B4). A mark–

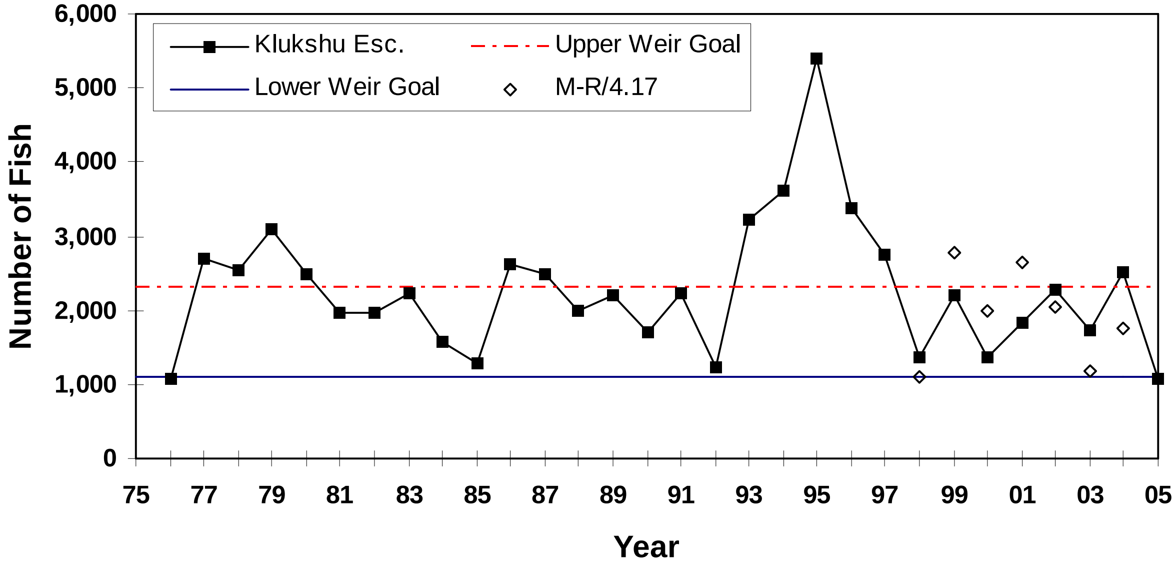

Figure 5.–Weir count of Chinook salmon to the Klukshu River tributary of the Alsek River, 1976–2005. Mark–recapture estimates divided by expansion factor of 4.17. Lines show upper and lower limits of escapement goal range.

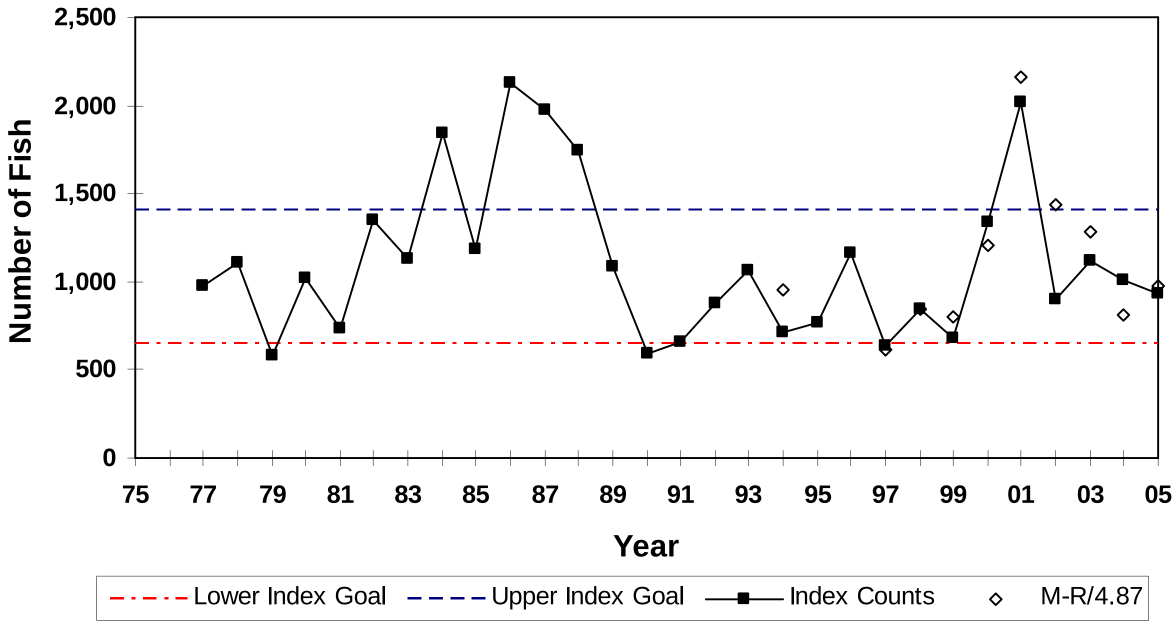

Figure 6.–Counts of large Chinook salmon in index areas of the Unuk River, 1975–2005, and mark–recapture estimates divided by expansion factor (4.87). Lines show upper and lower limits of index escapement goal range.

Table 6.–Count of Chinook salmon through the Klukshu River weir, harvest above and below the weir, estimated proportion of large fish through the weir, and counts of spawning adults in other tributaries of the Alsek River, 1966–2005.

	Klukshu River													
Year	Aerial Count [a]		Weir Count	Below Weir	Total	% Large	$\hat{C}_L$ [b]	Above Weir	Blanchard River		Takhanne River		Goat Creek	
1966	1,000		–						100		200		–	
1967	1,500		–						200		275		–	
1968	1,700		–						425		225		–	
1969	700		–						250		250		–	
1970	500		–						100		100		–	
1971	300	A	–						–		–		–	
1972	1,100		–						12	(A)	250		–	
1973	–		–						–		49	(A)	–	
1974	62		–						52	(A)	132		–	
1975	58		–						81	(A)	177	(A)	–	
1976	–		1,278	130	1,408	0.98	1,382	214	–		–		–	
1977	–		3,144	195	3,339	0.75	2,517	446	–		–		–	
1978	–		2,976	195	3,171	0.89	2,819	446	–		–		–	
1979	–		4,404	422	4,826	0.93	4,477	1,300	–		–		–	
1980	–		2,673	130	2,767	0.70	1,937	150	–		–		–	
1981	–		2,113	150	2,263	0.88	1,997	150	35	(H)	11	(H)	–	
1982	633	N(H)	2,369	183	2,552	0.86	2,200	400	59	(H)	241	(H)	13	(H)
1983	917	N(H)	2,537	202	2,739	0.97	2,645	300	108	(H)	185	(H)	–	
1984	–		1,672	275	1,947	0.92	1,797	100	304	(H)	158	(H)	28	(H)
1985	–		1,458	170	1,628		1,381	175	232	(H)	184	(H)	–	
1986	738	P(H)	2,709	125	2,834	0.84	2,394	102	556	(H)	358	(H)	142	(H)
1987	933	E(H)	2,616	326	2,942	0.93	2,733	125	624	(H)	395	(H)	85	(H)
1988	–		2,037	249	2,286	0.86	1,973	43	437	E(H)	169	E(H)	54	E(H)
1989	893	E(H)	2,456	215	2,671	0.82	2,183	254	–		158	E(H)	34	E(H)
1990	1,381	E(H)	1,915	468	2,383	0.88	2,109	217	–		325	E(H)	32	E(H)
1991	–		2,489	652	3,141	0.97	3,051	266	121	N(H)	86	E(H)	63	E(H)
1992	261	P(H)	1,367	139	1,506	0.88	1,323	124	86	P(H)	77	N(H)	16	N(H)
1993	1,058	N(H)	3,303	258	3,561	0.85	3,043	82	326	N(H)	351	E(H)	50	N(H)
1994	1,558	N(H)	3,727	387	4,114	0.72	2,952	107	349	N(H)	342	E(H)	67	N(H)
1995	1,053	E(H)	5,678	921	6,599	0.92	6,072	281	338	P(H)	260	P(H)	–	
1996	788	N(H)	3,599	656	4,255	0.81	3,464	217	132	N(H)	230	N(H)	12	N(H
1997	718	P(H)	2,989	267	3,256	0.94	3,045	160	109	P(H)	190	P(H)	–	
1998	–		1,364	266	1,630	0.69	1,131	17	71	P(H)	136	N(H)	39	N(H)
1999	500	P(H)	2,193	337	2,530	0.76	1,918	27	371	N(H)	194	N(H)	51	N(H)
2000	–		1,365	53	1,416	0.89	1,263	44	168	N(H)	152	N(H)	33	N(H)
2001	–		1,825	152	1,977	0.85	1,679	87	543	N(H)	287	N(H)	21	N(H)
2002	–		2,241	185	2,426	0.92	2,237	100	351	N(H)	220	N(H)	86	E(H)
2003	–		1,737	136	1,873	0.76	1,416	76	127	N(H)	105	N(H)	10	N(H)
2004	–		2,523	113	2,636	0.94	2,481	68	84	P(H)	46	P(H)	–	
95–04 Avg.	765		2,551	309	2,860	0.85	2,471	108	229		182		36	
2005	–		1,070	78	1,148	0.93	1,070	36	112	E(H)	47	N(H)	7	N(H)

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

[b] $\hat{C}_L$ = weir count plus catch immediately below weir multiplied by estimated proportion of large fish at weir (Pahlke and Waugh 2006).

Table 7.–Peak escapement counts of Chinook salmon to index areas of the Unuk River, 1960–2005.

Year [a]	Cripple Creek		Genes Lake Creek		Eulachon Creek		Clear Creek		Lake Creek		Kerr Creek		Total
1960	–		–		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	–[b]		–		3	(A)	–		–		–		3
1977	529[b]	(F)	339	(F)	57	(H)	34	(H)			15	(H)	974
1978	394[b]	(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[c]
1992	327	(W/F)	360	(F)	57	(F)	69	(F)	31	(H)	30	(H)	874[c]
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
2004	237	N(F)	388	E(F)	78	N(F)	191	E(F)	47	N(H)	67	N(F)	1,008
95–04 Avg.	316		415		88		120		42		66		1,048
2005	314	N(F)	338	N(F)	99	N(H)	132	E(F)	33	N(H)	13	P(F)	929

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

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

[c] Cripple Creek weir count reduced by /0.625 to be comparable with foot surveys.

Table 8.–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
2004	237	24	388	38	78	8	191	19	47	5	67	7	1,008
Avg.	425	38	359	32	175	14	97	9	30	3	39	4	1,127
2005	314	34	338	36	99	11	132	14	33	4	13	1	929

recapture program conducted in 2005 provided an estimate of total escapement of 4,257 (SE = 591) large Chinook salmon (Weller et al. *In prep.*). Angling and spears were used to collect age, sex and length data from 1,208 fish in 2005 (Appendices A4, panel C and A5, panel C).

BLOSSOM RIVER

In index areas of the Blossom River, 445 large Chinook salmon were counted in 2005, up from 333 fish counted in 2004 (Table 11). The 2005 count was within the index survey goal range of 250 to 500 (McPherson and Carlile 1997). Counts had exceeded the point goal of 300 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 River was revised in 1996 from 1.6 to 2.5 (Pahlke 1997b), in 2002 to 4.0 (McPherson et al. 2003) and again in 2006 to 3.01 (Appendix B3; Weller et al. *In prep.)*. The count for 2005 was multiplied by the expansion factor of 3.01 (SE 1.53) to produce a total escapement estimate of large 1,339 (SE 350) fish. A mark–recapture program conducted in 2005 estimated a total escapement of 926 (SE = 99) large Chinook salmon (Pahlke and Magnus. 2006).

Angling was used to sample age, sex and length data and 398 samples were collected in 2005 (Appendices A4, panel B and A5, panel B).

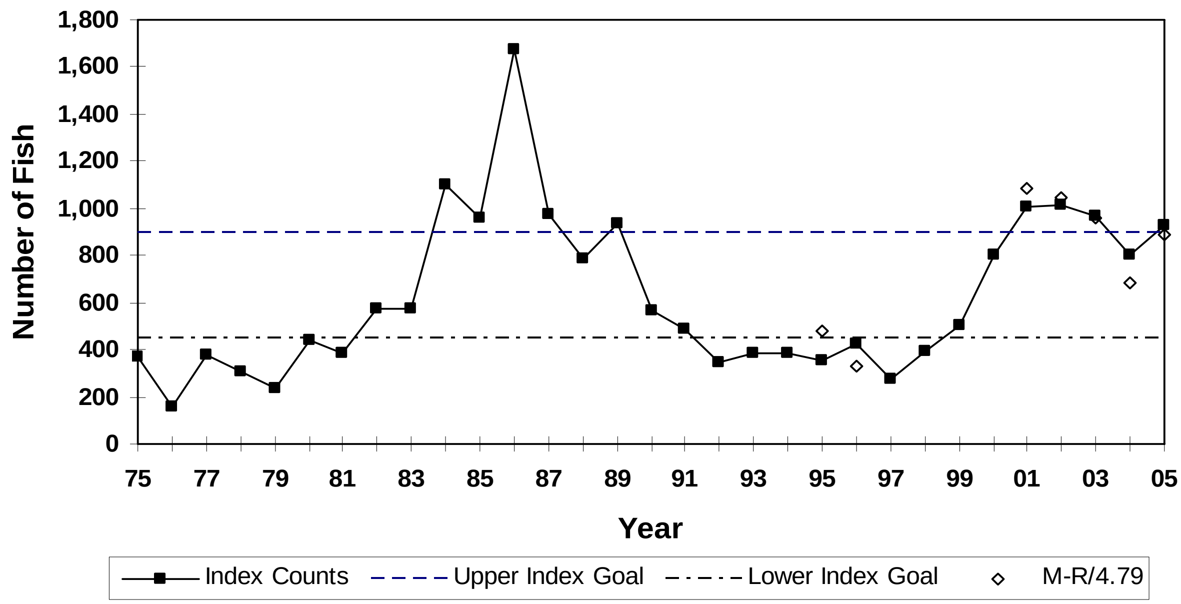

Figure 7.–Counts of Chinook salmon in index areas of the Chickamin River, 1975–2005 and mark–recapture estimates divided by expansion factor (4.79). Lines show upper and lower limits of index escapement goal range.

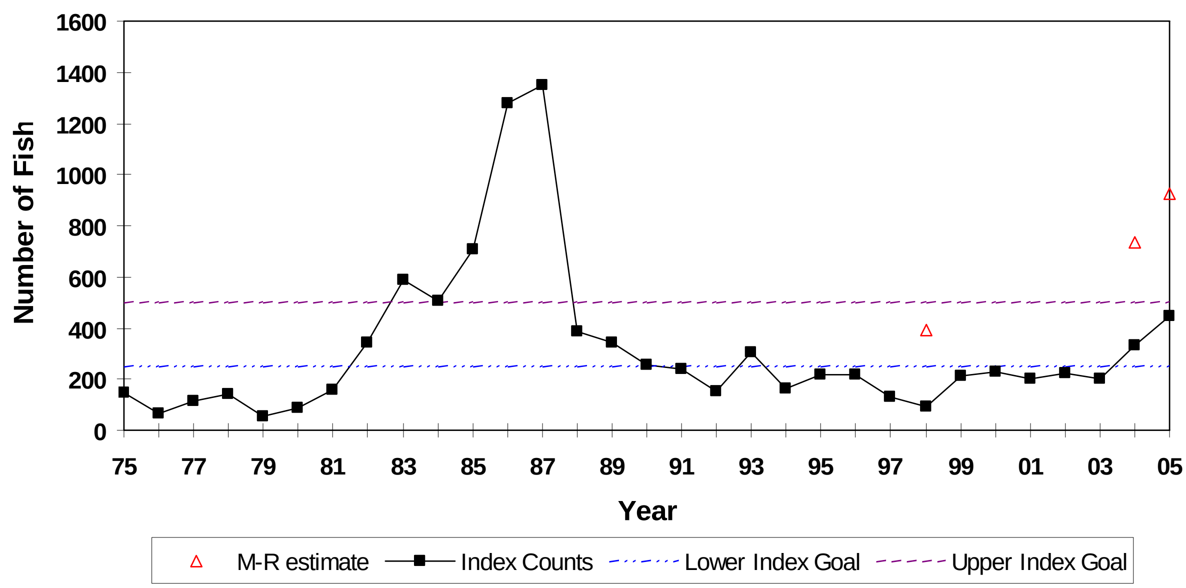

Figure 8.–Counts of Chinook salmon into the Blossom River, 1975–2005 and mark–recapture estimates. Lines show upper and lower limits of index escapement goal range.

Table 9.–Counts of Chinook salmon in index areas of the Chickamin River, 1960–2005.

Year [a]	South Fork Creek		Barrier Creek		Butler Creek		Leduc Creek		Indian Creek		Humpy Creek		King Creek		Clear Falls Creek		Total [b]
1960	–		–		–		–		–		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
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
95–04 Avg.	128		16		132		35		55		49		205		32		653
2005	106	P(H)	46	E(H)	115	N(H)	69	N(H)	49	N(H)	38	N(H)	450	E(H)	53	N(H)	926

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

[b] Totals for 1975–1980, 1983 and 1986 expanded for unsurveyed index areas by 1981–1992 average %.

Table 10.–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
2004	109	14	17	2	143	18	35	4	56	7	162	20	272	34	4	1	798
Avg.	147	21	62	9	109	16	27	4	56	8	39	6	219	31	38	5	698
2005	106	11	46	5	115	12	69	7	49	5	38	4	450	49	53	6	926

KETA RIVER

In 2005, 497 Chinook salmon were counted in the Keta River, up from 376 counted in 2004 (Table 11) 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 3.01 (SE 0.56) (Freeman et al. 2001). The peak count for 2005 was multiplied by 3.01 to produce a total escapement estimate of 1,496 (SE 278) large fish (Table 1; Appendix B2).

Angling was used to collect 117 age, sex and length samples from live fish (Appendices A4, panel A and A5, panel A).

KING SALMON RIVER

Two helicopter surveys and one foot survey were conducted on King Salmon River in 2005. The peak count during the helicopter surveys was 37 large Chinook salmon under poor conditions while 94 were counted during the foot survey, also under poor conditions. The peak count was up from the 89 fish counted in 2004. (Table 12; 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 94 was multiplied by the survey expansion factor of 1.52 (SE 0.27) to produce a total escapement estimate of 143 (SE 25) large fish to the system (Table 1; Appendix B8). Angling gear was used to collect age, sex and length data from 45 Chinook salmon in 2005 (Appendices A4, panel G and A5, panel G).

Table 11.–Counts of Chinook salmon for selected rivers in Behm Canal, 1961–2005.

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
2004	376	E(H)	333	E(H)	–		–		–		–		709
95-04 Avg.	293		207		44		96		9		83		59
2005	497	E(H)	445	E(H)									942

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

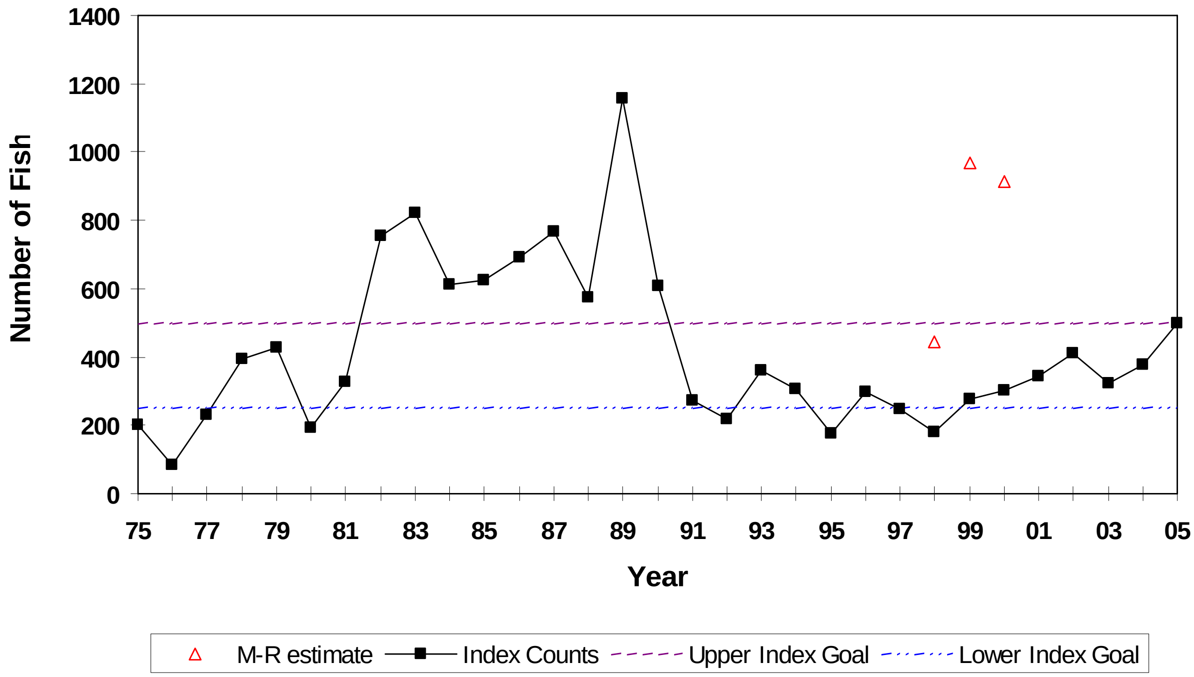

Figure 9.–Counts of Chinook salmon to the Keta River, 1975–2005 and mark–recapture estimates for 1998–2000. Lines show upper and lower limits of index escapement goal range.

SITUK RIVER

The count of all Chinook salmon through the Situk River weir in 2005 was 1,054 Chinook salmon, of which 613 were large (Tables 1 and 13). There was no harvest above the weir. 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) and a creel survey. 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 146 live fish sampled at the weir (Appendices A4, panel K and A5, panel K).

CHILKAT RIVER

The 2005 escapement to the Chilkat River was estimated by mark–recapture experiment to be 3,366 large Chinook salmon (SE = 780), similar to the escapement estimated in 2004 and below the 10 year average of 4,244 (Ericksen and Chapell 2006; Table 14). 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 625 fish captured with nets and spears on the spawning grounds (Appendices A4, panel I and A5, panel I)

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 (Table 11). Grant and Klahini rivers are small Chinook systems near the Unuk River in Behm Canal which have been surveyed. sporadically (Table 11). In 2005, 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

Table 12.–Peak escapement counts and weir counts of spawning Chinook salmon in the King Salmon River, 1971–2005.

	Survey Count [a]		Survey as Percent of Weir Count	Total Egg Take (Adults)	Total Weir Count (Adults)	Total Weir Count (Jacks) [b]	Adults Below Weir (Foot Count)	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				
2004		89 E(F)			no weir or egg take				
83–92 Avg.	17	126	67%	31	209	56	22	231	188
2005		94 P(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%.

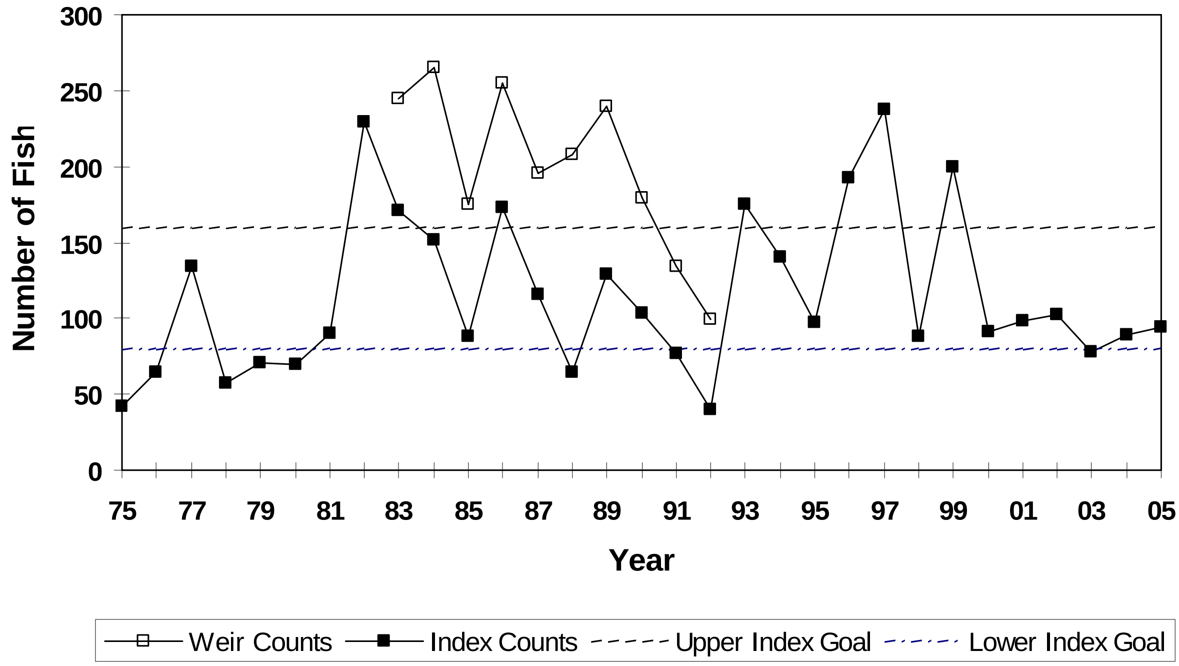

Figure 10.–Counts of Chinook salmon at a weir and in survey counts in the index area of the King Salmon River, 1975–2005. Lines show upper and lower limits of index escapement goal range.

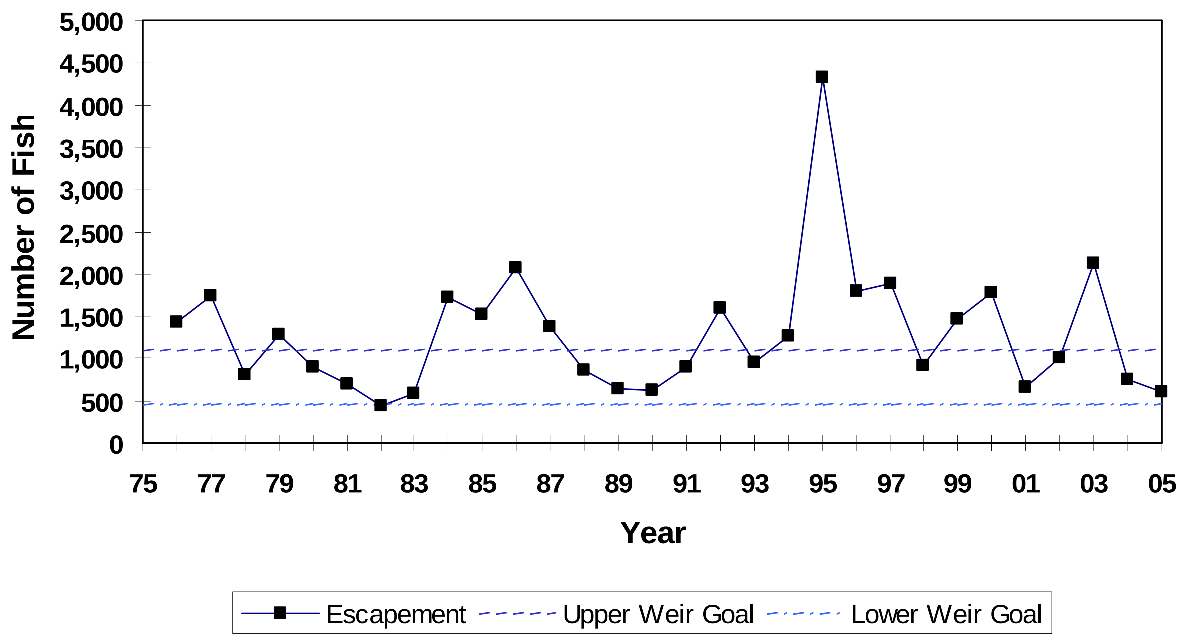

Figure 11.–Counts of large Chinook salmon at the Situk River weir, 1975–2005. Lines show upper and lower limits of escapement goal range.

Table 13.–Estimated harvests and escapement, by size class, of Situk River Chinook salmon, 1976–2005.

	Harvests Below Weir				Weir Count				Harvest Above Weir				Estimated Escapement [a]			
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[c]	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
2004	1,222	396	294	1,912	348	419	796	1,563	3	7	41	51	345	412	755	1,512
95–04	2,712	495	552	3,759	1,147	441	2,051	3,640	231	75	381	687	1,011	366	1,671	3,047
2005	1	140	101	242	178	263	613	1,054	0	0	0	0	178	263	613	1,054

[a] Escapement from McPherson et al (McPherson et al. 2005a), based on age composition.

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

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

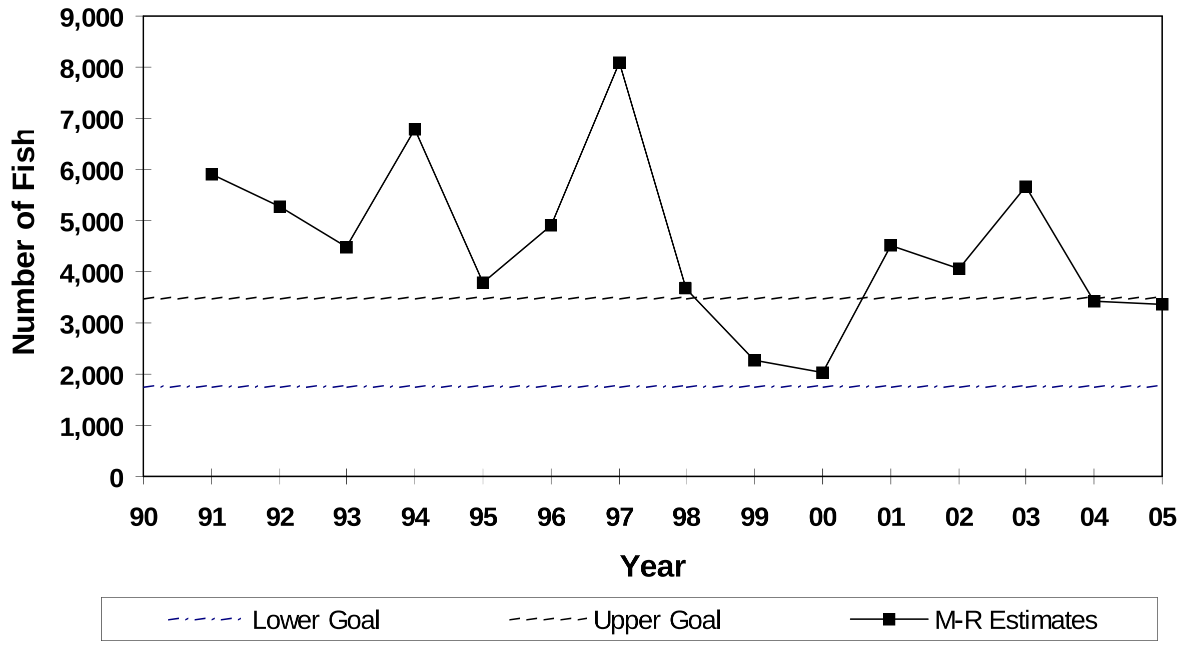

Figure 12.–Mark–recapture estimates of large Chinook salmon escapement to the Chilkat River, 1991–2005. Lines show upper and lower limits of escapement goal range.

Table 14.–Mark recapture estimates of large Chinook salmon escapement in Chilkat River, 1991–2005.

Year	Escapement Estimate	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
2004	3,422	456
95-04 Avg.	4,244	697
2005	3,366	780

Source: From Ericksen 2005.

feasibility of adding these medium and small systems to the program. (Table 5). 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 2005, 122 Chinook were counted in the East Fork of the Bradfield River and 79 in Aaron Creek (Table 5).

CODED WIRE TAG RECOVERY

Two 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). Four more tags were from three different hatchery release sites and for the fifth time a fish tagged in the Taku was recovered in the lower Stikine River.

OBSERVER TRAINING

No calibration surveys were conducted in 2005.

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, features 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 features 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.

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, 2006) and Alsek rivers (Pahlke et al. 1999; Pahlke and Waugh 2006). 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 and the Blossom River in 2007. 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 and again in 2004. The most current estimates for the expansion factors and variances around them are used in Appendices B2–B10. Some of these expansions are different from those reported in previous years, as they are revised each time another year of data is collected. In 2006 additional EF estimates were collected for the Blossom, Stikine, Taku and Unuk rivers. After 2006 only Stikine, Taku and Unuk will continue annually.

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 Appendices A4-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 625 mm MEF), which is uncommon in other systems in Southeast Alaska. Mean lengths at age were tested for differences between systems, (Appendices A6-A8).

The age-.2 (2-ocean-age jack) component was below average in most systems in 2005, which may indicate below average survival for the 2001 brood year. Above average survival rates for the 2000 brood year continued in 2005 with the 3-ocean-age class strong in most systems.

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 is estimated annually. The mean length-at-age data are unbiased for all stocks.

Two 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). Four more tags were from three different hatchery release sites and for the fifth time 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, 2005.

		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. 2005b.

[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, 1975–2005.

	MAJOR SYSTEMS				MEDIUM SYSTEMS										
Year	Alsek	Taku	Stikine	Major Subtotal	Situk	Chilkat	Andrew	Unuk	Chickamin	Blossom	Keta	Medium Subtotal	King Salmon	Total All Systems	Expanded Region Total
1975		12,917	7,571				508		1,914	584	611		64		
1976	5,075	24,575	5,723	35,374	**1,421**		**404**		810	272	253		99		
1977	12,036	29,489	11,445	52,970	**1,732**		**456**	4,870	1,875	448	692	10,073	204	63,247	75,294
1978	11,431	17,118	6,835	35,384	**808**		**388**	5,530	1,594	572	1,180	10,072	87	45,543	54,218
1979	17,396	21,611	12,610	51,618	**1,284**		**327**	2,880	1,233	216	1,283	7,223	134	58,974	70,207
77-79 Avg.	13,621	22,740	10,297	46,657	1,275		390	4,427	1,567	412	1,052	9,123	141	55,921	66,573
1980															
1981	9,974	39,229	30,573	79,776	**905**		**282**	5,080	2,299	356	578	9,500	106	89,382	106,408
1982	8,158	49,546	36,057	93,760	**702**		**536**	3,655	1,985	636	990	8,504	153	102,418	121,926
1983	9,199	23,842	40,488	73,529	**434**		**672**	6,755	2,952	1,380	2,270	14,463	393	88,386	105,221
1984	9,873	9,792	6,424	26,089	**592**		**366**	5,625	3,099	2,356	2,475	14,513	**245**	40,847	48,627
1985	7,018	20,774	13,995	41,787	**1,726**		**389**	9,185	5,697	2,032	1,836	20,865	**265**	62,918	74,902
1986	5,869	35,906	16,672	58,446	**1,521**		625	5,920	4,943	2,836	1,879	17,724	**175**	76,345	90,887
1987	10,216	38,100	15,478	63,794	**2,067**		1,383	10,630	9,022	5,112	2,077	30,292	**255**	94,341	112,310
1988	10,605	28,928	25,607	65,140	**1,379**		1,540	9,865	5,041	5,396	2,312	25,533	**196**	90,869	108,177
1989	8,240	44,512	39,040	91,792	**868**		1,102	8,730	4,064	1,536	1,731	18,031	**208**	110,031	130,989
Avg.	9,628	**40,329**	25,243	75,200	**637**		1,036	5,745	4,829	1,376	3,477	17,100	**240**	92,540	110,167
1990	8,590	**52,142**	23,514	84,246	**628**		1,298	2,955	2,916	1,028	1,824	10,649	**179**	95,074	113,183
1991	11,322	51,645	24,124	87,091	**889**	**5,897**	782	3,275	2,518	956	819	15,136	**134**	102,361	113,734
1992	5,429	55,889	35,479	96,797	**1,595**	**5,284**	1,520	4,370	1,789	600	653	15,812	**99**	112,708	125,231
1993	12,836	66,125	61,295	140,257	**952**	**4,472**	2,071	5,340	2,011	1,212	1,090	17,148	266	157,670	175,189
1994	14,830	48,368	34,403	97,601	**1,271**	**6,795**	1,118	**4,623**	2,006	644	921	17,378	213	115,192	127,991
1995	23,788	**33,805**	17,448	75,041	**4,330**	**3,790**	670	3,860	**2,309**	868	527	16,354	147	91,542	101,713
1996	15,338	**79,019**	**28,949**	123,306	**1,800**	**4,920**	655	5,835	**1,587**	880	894	16,571	292	140,169	155,743
1997	11,737	**114,938**	**26,996**	153,671	**1,878**	**8,100**	**478**	**2,970**	1,406	528	741	16,101	361	170,133	189,037
1998	**4,969**	31,039	**25,968**	61,976	**924**	**3,675**	952	**4,132**	2,021	**364**	**446**	12,514	134	74,623	82,915
1999	**13,617**	**19,734**	**19,947**	53,298	**1,461**	**2,271**	1,182	**3,914**	2,544	848	**968**	13,188	304	66,790	74,211
Avg.	12,246	55,270	29,812	97,328	1,573	5,023	1,073	4,127	2,111	793	888	15,085	213	112,626	125,895

-continued-

Appendix A2.–Page 2 of 2.

Year	MAJOR SYSTEMS: Alsek	Taku	Stikine	Major Subtotal	MEDIUM SYSTEMS: Situk	Chilkat	Andrew	Unuk	Chickamin	Blossom	Keta	Medium Subtotal.	King Salmon	Total All Systems	Expanded Region total
2000	**6,835**	**30,529**	**27,531**	64,895	**1,785**	**2,035**	1,348	**5,872**	4,141	924	**913**	17,018	138	82,052	91,168
2001	**6,111**	**42,980**	**63,523**	112,614	**656**	**4,517**	2,060	**10,541**	**5,177**	816	1,033	24,799	149	137,562	152,847
2002	**5,396**	**52,409**	**50,875**	108,680	**1,000**	**4,050**	1,712	**6,988**	**5,007**	896	1,237	20,890	155	129,725	144,139
2003	**4,782**	**36,435**	**46,824**	88,041	**2,117**	**5,657**	1,163	**5,546**	**4,579**	812	969	20,843	118	109,003	121,114
2004	**6,995**	**68,199**	**48,900**	124,094	**755**	**3,422**	2,998	**3,963**	4,126	734	1,132	17,130	135	141,359	157,065
2005	4,462	**38,806**	**40,501**	83,769	**613**	**3,366**	1,979	**4,742**	**4,257**	**926**	1,496	17,379	143	101,291	112,545
Avg.	5,764	44,893	46,359	97,016	1,263	3,936	1,876	6,582	4,548	851	1,130	19,677	140	116,832	129,813
CHANGE FROM 2004 to 2005:															
Number	(2,533)	(29,393)	(8,399)	(40,325)	(142)	(56)	(1,019)	779	131	192	364	250	8	(40,068)	(44,520)
Percent	-36%	-43%	-17%	-32%	-19%	-2%	-34%	20%	3%	26%	32%	1%	6%	-28%	-28%
Escapement goals:															
Lower	5,500	30,000	14,000	49,500	450	1,750	650	3,250	2,325	1,000	750	10,175	120	59,796	66,440
Point	8,500	36,000	17,500	62,000	730	2,200	800	4,000	2,700	1,200	900	14,920	150	75,945	83,383
Upper	11,500	55,000	28,000	94,500	1,050	3,500	1,500	7,000	4,650	2,000	1,500	21,250	240	115,943	128,826
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	89%	125%	265%	159%	158%	175%	256%	157%	132%	57%	100%	1435%	92%	156%	

Note: Numbers may be revised annually as data are collected. Index escapements are expanded by average expansion factors, 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).

Appendix A3.–Detailed 2005 Southeast Alaska Chinook salmon escapement surveys as entered into Commercial Fisheries Division Integrated Fisheries Database (IFDB/ALEX).

Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs. [a]	Use [b]	Comment [c]
101-30-030	Keta River	8/16/05	0	497	0	497	H	KAP	3	Excellent visibility
101-55-040	Blossom River	8/16/05	0	328	0	328	H	KAP	3	Excellent visibility
101-55-040	Blossom River	8/25/05	0	445	0	445	H	KAP	3	
101-71-04A	Barrier Creek	8/16/05	0	25	0	25	H	KAP	2	
101-71-04A	Barrier Creek	8/25/05	0	46	0	46	H	KAP	3	
101-71-04B	Butler Creek	8/9/05	0	96	0	96	H	KAP	2	
101-71-04B	Butler Creek	8/10/05	0	118	2	120	F	KAP	2	GF Survey
101-71-04B	Butler Creek	8/16/05	0	110	5	115	H	KAP	2	
101-71-04C	Clear Creek	8/7/05	0	57	0	57	F	KAP	3	JL survey
101-71-04C	Clear Creek	8/9/05	0	46	0	46	H	KAP	3	
101-71-04C	Clear Creek	8/16/05	0	53	0	53	H	KAP	3	
101-71-04H	Humpy Creek	8/16/05	0	23	0	23	H	KAP	1	too dark
101-71-04H	Humpy Creek	8/25/05	0	38	0	38	H	KAP	3	lots of spawnouts
101-71-04I	Indian Creek	8/9/05	0	49	0	49	H	KAP	2	
101-71-04I	Indian Creek	8/9/05	0	79	3	82	F	DLM	2	Excellent Conditions
101-71-04J	Lucky Jake Creek	8/9/05	0	20	0	20	H	KAP	1	
101-71-04K	King Creek	8/16/05	0	312	0	312	H	KAP	2	schooled in the lower river
101-71-04K	King Creek	8/25/05	0	450	0	450	H	KAP	3	fish to the top of I.A.
101-71-04L	Leduc River	8/9/05	0	23	0	23	H	KAP	2	
101-71-04L	Leduc River	8/13/05	0	48	0	48	F	KAP	2	JL survey
101-71-04L	Leduc River	8/16/05	0	69	0	69	H	KAP	3	Lots in upper pools
101-71-04P	Ranger Paige Creek	8/9/05	0	19	0	19	H	KAP	1	
101-71-04S	South Fork Chickamin	8/9/05	0	29	0	29	H	KAP	1	poor visibility
101-71-04S	South Fork Chickamin	8/16/05	0	79	4	83	H	KAP	2	poor visibility
101-71-04S	South Fork Chickamin	8/25/05	0	102	4	106	H	KAP	2	Late
101-75-015	Eulachon River	8/13/05	0	89	0	89	F	KAP	3	Christy survey
101-75-015	Eulachon River	8/16/05	0	99	0	99	H	KAP	3	1 Left fork
101-75-30C	Clear Creek-Unuk R	8/5/05	0	93	0	93	F	KAP	2	Christy survey
101-75-30C	Clear Creek-Unuk R	8/9/05	0	81	0	81	H	KAP	2	
101-75-30C	Clear Creek-Unuk R	8/12/05	0	109	1	110	F	KAP	2	CH Survey
101-75-30C	Clear Creek-Unuk R	8/16/05	0	128	4	132	F	KAP	3	CH Survey
101-75-30G	Genes Lake Cr Unuk	8/6/05	0	146	0	146	F	KAP	2	Partial survey
101-75-30G	Genes Lake Cr Unuk	8/9/05	0	174	0	174	H	KAP	2	Partial survey
101-75-30G	Genes Lake Cr Unuk	8/11/05	0	305	1	306	F	KAP	2	Peak survey f+h
101-75-30G	Genes Lake Cr Unuk	8/11/05	0	205	1	206	F	KAP	2	CH Survey

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs. [a]	Use[b]	Comment
101-75-30K	Kerr Creek-Unuk R	8/9/05	0	13	0	13	H	KAP	1	poor visibility
101-75-30L	Lake Creek-Unuk R	8/7/05	0	26	0	26	B	KAP	2	All on Mounds
101-75-30L	Lake Creek-Unuk R	8/9/05	0	33	0	33	H	KAP	3	28 on riffles
101-75-30L	Lake Creek-Unuk R	8/16/05	0	30	0	30	B	KAP	2	
101-75-30Q	Cripple Ck-Unuk R	8/9/05	0	308	6	314	F	KAP	3	CH survey
101-80-070	Hatchery Ck-Yes Bay	8/31/05	0	10	1	11	F	KAV	2	
106-41-015	Salmon Bay Lake W Hd	9/15/05	0	100	0	100	F	TWR	2	
106-41-032	Red Lake Head	9/16/05	0	1	0	1	F	TST	2	In M of old channel
106-44-031	Crystal Creek	6/22/05	15	0	10	25	A	WRB	2	25 sport boats @mouth
106-44-031	Crystal Creek	7/19/05	350	0	7	357	A	WRB	2	70 below rapids 130 above 110 floating rks
106-44-031	Crystal Creek	7/27/05	550	200	0	750	A	WRB	2	60 abv rapids 90 floating rks 400 blw Ck
106-44-031	Crystal Creek	7/29/05	0	280	0	280	A	TST	2	30 in Cr 250+in Slough + 170 in pens
106-44-031	Crystal Creek	8/7/05	410	150	20	580	A	WRB	2	Inc 10@ rapid, 400 slough + 400 in pens
106-44-031	Crystal Creek	9/1/05	80	60	0	140	A	WRB	1	Pen dry, kings spawning
107-40-024	Aaron Creek	8/2/05	0	40	0	40	A	WRB	2	Too many pinks for good count
107-40-024	Aaron Creek	8/7/05	0	79	0	79	A	WRB	3	mostly glacial
107-40-049	Harding River	7/22/05	0	15	0	15	A	WRB	2	Too many chum for good count
107-40-049	Harding River	8/7/05	0	14	0	14	A	WRB	2	Too many pink and chum for good count
107-40-053	Bradfield River E Fork	8/7/05	0	122	0	122	A	WRB	3	Mostly glacial
107-40-055	Eagle R Bradfield	8/7/05	0	5	0	5	A	WRB	2	
108-40-017	Goat Ck Stikine R	7/27/05	7	0	0	7	B	TWR	1	
108-40-017	Goat Ck Stikine R	8/9/05	0	66	0	66	F	TST	2	1 jack
108-40-020	Andrews Creek	7/18/05	80	330	1	411	A	WRB	2	140 N fk 180 Abv fks
108-40-020	Andrews Creek	7/28/05	0	285	0	285	F	TST	2	200 in slouth 60% water in old channel
108-40-020	Andrews Creek	8/2/05	550	500	0	1,050	A	WRB	2	100 N fk 40 Main fk 550 in slough
108-40-020	Andrews Creek	8/7/05	150	740	0	890	A	WRB	2	180 N fk 440 abv fk 120 blw fk 150 slough
108-40-020	Andrews Creek	8/9/05	0	797	0	797	H	KAP	2	101 N fork to many pinks
108-40-020	Andrews Creek	8/9/05	0	1,671	30	1,701	F	SNF	2	185 N fk 40 in slough 15 jacks
108-40-020	Andrews Creek	8/15/05	0	1,015	0	1,015	H	KAP	2	165 N fork channel change

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs. [a]	Use [b]	Comment
108-40-13A	W of Hot Springs	7/27/05	0	3	0	3	B	TWR	1	
108-40-13A	W of Hot Springs	8/9/05	0	102	0	102	B	SNF	2	
108-41-010	North Arm Creek	7/18/05	0	15	0	15	A	WRB	2	
108-41-010	North Arm Creek	7/27/05	0	2	0	2	B	TST	1	
108-41-010	North Arm Creek	8/2/05	10	68	0	78	A	WRB	2	
108-41-010	North Arm Creek	8/9/05	0	50	0	50	F	TST	2	1 jack
108-80-120	Little Talhtan River	8/8/05	0	1,800	197	1,997	H	KAP	2	+169 Below the weir
110-14-007	Farragut River	8/10/05	0	23	0	23	A	WRB	1	very glacial, very minimal count
110-32-009	Chuck R Windham Bay	7/10/05	0	6	0	6	A	TST	2	
110-32-009	Chuck R Windham Bay	8/1/05	0	6	0	6	A	WRB	1	Too many pinks for good count
110-34-008	Sanborn Creek	8/2/05	0	1	0	2	F	TWR	2	Veryclose to end of str
111-17-010	King Salmon River	7/23/05	0	37	0	37	H	KAP	1	Too many pinks
111-17-010	King Salmon River	8/1/05	0	94	0	94	F	KAP	2	38 Above main trib
111-32-220	Nakina River	7/28/05	0	150	0	150	H	KAP	2	IA3
111-32-220	Nakina River	7/28/05	0	14	0	14	H	KAP	2	IA4,Partial survey
111-32-220	Nakina River	7/28/05	0	25	0	25	H	KAP	2	IA2,Water high
111-32-220	Nakina River	7/28/05	0	221	0	221	H	KAP	2	Vis. poor IA1
111-32-220	Nakina River	8/8/05	0	1,203	0	1,203	H	KAP	3	Peak total
111-32-220	Nakina River	8/8/05	0	210	0	210	H	KAP	3	IA1
111-32-220	Nakina River	8/8/05	0	17	0	17	H	KAP	3	IA4, nothing up top
111-32-220	Nakina River	8/8/05	0	87	10	97	H	KAP	3	IA2
111-32-220	Nakina River	8/8/05	0	889	0	889	H	KAP	3	IA3
111-32-240	Kowatua Creek	8/8/05	0	833	0	833	H	KAP	3	Excel vis., early, Lots of sockeye
111-32-240	Kowatua Creek	8/23/05	0	775	3	778	H	KAP	3	Excel visibility
111-32-255	Tatsamenie River	8/23/05	0	1,146	0	1,146	H	KAP	3	Peak total
111-32-255	Tatsamenie River	8/23/05	0	281	0	281	H	KAP	3	IA2,138 outlet of big lake
111-32-255	Tatsamenie River	8/23/05	0	865	0	865	H	KAP	3	IA1 Below little tat
111-32-270	Nahlin River	7/22/05	0	77	0	77	H	KAP	1	Poor Visability IA 2
111-32-270	Nahlin River	7/22/05	0	416	0	416	H	KAP	2	Poor visability IA3
111-32-270	Nahlin River	7/28/05	0	77	2	79	H	KAP	2	IAI
111-32-270	Nahlin River	7/28/05	0	38	0	38	H	KAP	2	All at cabin riffles,IA2
111-32-270	Nahlin River	7/28/05	0	347	7	354	H	KAP	2	IA3
111-32-270	Nahlin River	7/28/05	0	464	7	471	H	KAP	2	Peak survey total

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Stream no.	Stream	Date	Mouth	Live	Dead	Total	Survey	Obs [a]	Use [b]	Comment
111-32-275	Tseta Creek	7/28/05	0	215	0	215	H	KAP	2	180 up top
111-32-280	Dudidontu River	7/28/05	0	191	0	191	H	KAP	1	Poor, Muddy below Matatsu
111-32-280	Dudidontu River	8/8/05	0	317	1	318	H	KAP	2	139 Ablve Matatsu
115-32-053	37 Mile Creek	8/23/05	0	9	1	10	F	RPE	1	+ 1 jack, from Klehini upstream
115-32-054	Big Boulder Creek	8/3/05	0	49	0	49	F	RPE	2	+ 7 jacks
115-32-054	Big Boulder Creek	8/16/05	0	55	1	56	F	RPE	2	+ 12jacksS
115-32-055	Little Boulder Creek	8/23/05	0	4	0	4	F	RPE	1	+ 2 jacks
182-30-043	Takahanni River (CAN)	8/3/05	0	44	3	47	H	KAP	3	
182-30-045	Goat Creek	8/3/05	0	4	3	7	H	KAP	2	door on
182-30-050	Blanchard Ck (CAN)	8/3/05	0	92	20	112	H	KAP	3	Peak total
182-30-050	Blanchard Ck (CAN)	8/3/05	0	19	20	39	H	KAP	2	IA2, above bridge
182-30-050	Blanchard Ck (CAN)	8/3/05	0	73	0	73	H	KAP	2	IA1, all very large fish

[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.

[c] Includes all surveys where Chinook salmon were observed, many are not used to estimate escapement.

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, 2005.

PANEL A. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KETA RIVER IN 2005																
		BROOD YEAR AND AGE CLASS														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		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		5	25		2	22			2				58
	%		2.7		5.5	26.9		2.1	22.9			2.1				62.2
	SE of %		2.0		2.5	4.7		1.5	4.3			1.5				5.1
	Escapement		44		91	443		34	377			34				1,024
	SE of esc.		31		42	102		24	95			24				179
Females	n					6		1	22			5			2	36
	%					6.5		1.0	22.9			5.2			2.1	37.8
	SE of %					2.7		1.0	4.3			2.3			1.5	5.1
	Escapement					108		17	377			86			34	622
	SE of esc.					45		17	95			40			24	131
Combined	n		2		5	31		3	44			7			2	94
	%		2.7		5.5	33.5		3.1	45.8			7.3			2.1	100.0
	SE of %		2.0		2.5	5.0		1.8	5.2			2.7			1.5	0.0
	Escapement		44		91	551		51	754			120			34	1,646
	SE of esc.		31		42	116		30	152			48			24	262
PANEL B. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE BLOSSOM RIVER IN 2005																
Males	n		13		3	119		6	104			20			1	266
	%		3.3		0.8	29.9		1.5	26.1			5.0			0.3	66.8
	SE of %		1.7		0.5	4.8		0.6	3.0			1.1			0.2	3.5
	Escapement		57		10	430		17	296			57			3	871
	SE of esc.		23		6	90		7	40			14			3	123
Females	n					1		4	95		1	29		1	1	132
	%					0.3		1.0	23.9		0.3	7.3		0.3	0.3	33.2
	SE of %					3.4		0.5	2.9		0.2	1.3		0.2	0.2	6.3
	Escapement					3		11	271		3	83		3	3	376
	SE of esc.					3		6	37		3	17		3	3	47
Combined	n		13		3	120		10	199		1	49		1	2	398
	%		3.3		2.8	30.2		2.5	50.0		0.3	12.3		0.3	0.5	1.0
	SE of %		1.7		0.5	4.8		0.7	4.1		0.2	1.7		0.2	0.3	0.0
	Escapement		57		10	433		28	567		3	140		3	6	1,247
	SE of esc.		23		6	90		9	65		3	24		3	4	144

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Panel C. Age composition of medium and large Chinook salmon in the Chickamin River in 2005 [a]																
		Brood year and age class														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		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					171	1		322			39	2		2	537
	%					20.7	0.1		36.7			4.4	0.2		0.2	62.4
	SE of %					3.4	0.1		2.1			0.7	0.2		0.2	2.3
	Escapement					1,009	6		1,793			217	11		11	3,047
	SE of esc.					204	6		256			45	8		8	399
Females	n					2			263	1		60			4	330
	%					0.2			29.9	0.1		6.8			0.5	37.6
	SE of %					0.2			2.0	0.1		0.9			0.2	2.3
	Escapement					11			1,462	6		333			22	1,834
	SE of esc.					8			215	6		62			11	266
Combined	n					173	1		586	1		99	2		6	867
	%					20.9	0.1		66.7	0.1		11.3	0.2		0.7	100.0
	SE of %					3.4	0.1		2.4	0.1		1.2	0.2		0.3	0.0
	Escapement					1,020	6		3,253	6		550	11		33	4,881
	SE of esc.					204	6		452	6		92	8		14	624

[a] Weller et al. *In prep.*.

Panel D. Age composition of medium and large Chinook salmon in the Unuk River in 2005 [b]																
		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		68			94	1		390			39			1	593
	%		6.7			9.1	0.1		44.2			4.5			0.1	64.7
	SE of %		1.3			1.7	0.1		2.2			0.7			0.1	2.0
	Escapement		372			507	5		2,454			247			6	3,591
	SE of esc.		75			104	5		219			44			6	306
Females	n					1			213	1		93			1	309
	%					0.1			24.3	0.1		10.6			0.1	35.3
	SE of %					0.1			1.6	0.1		1.1			0.1	2.0
	Escapement					6			1,348	6		589			6	1,956
	SE of esc.					6			137	6		75			6	184
Combined	n		68			95	1		603	1		132			2	902
	%		6.7			9.2	0.1		68.6	0.1		15.1			0.2	100.0
	SE of %		1.3			1.7	0.1		2.4	0.1		1.3			0.2	
	Escapement		372			513	5		3,803	6		836			13	5, 547
	SE of esc.		75			105	5		321	6		96			9	435

[b] From: Weller and McPherson 2006b.

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PANEL E. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE STIKINE RIVER IN 2005

		BROOD YEAR AND AGE CLASS[c]														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		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			33	1		305	3		88	1		1	433
	%		0.1			3.0	0.1		29.5	0.3		8.7	0		0.1	41.9
	SE of %		0.1			0.6	0.1		1.5	0.2		0.9	0.1		0.1	1.6
	Escapement		33			1,272	33		12,391	124		3,644	41		41	17,580
	SE of esc.		33			241	33		968	72		436	41		41	1,261
Females	n					6			364	7		212			1	590
	%					0.6			35.8	0.7		20.9			0.1	58.1
	SE of %					0.2			1.5	0.3		1.3			0.1	1.6
	Escapement					248			15,040	290		8,779			41	24,399
	SE of esc.					102			1,131	111		769			41	1,660
Combined	n		1			39	1		669	10		300	1		2	1,023
	%		0.1			3.6	0.1		65.3	1.0		29.6	0.1		0.2	100.0
	SE of %		0.1			0.6	0.1		1.5	0.3		1.5	0.1		0.1	0.0
	Escapement		33			1,521	33		27,431	414		12,424	41		83	41,979
	SE of esc.		33			265	33		1,801	133		985	41		59	2,589

[c] Richards et al. *In prep.*

PANEL F. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN ANDREW CREEK IN 2005

		1.2	1.3	1.4	Total
Males	n	15	101	24	140
	%	6.3	45.8	11.1	63.2
	SE of %	2.0	3.4	2.2	3.4
	Escapement	143	1,035	250	1,428
	SE of esc.	44	219	72	284
Females	n		40	40	80
	%		18.4	18.4	36.8
	SE of %		2.7	2.7	3.4
	Escapement		415	416	832
	SE of esc.		107	108	195
Combined	n	15	141	64	220
	%	6.3	64.2	29.5	100.0
	SE of %	2.0	3.3	3.2	0.0
	Escapement	143	1,451	666	2,260
	SE of esc.	44	303	162	454

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PANEL G. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE KING SALMON RIVER IN 2005

		BROOD YEAR AND AGE CLASS														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n					12			3			3				18
	%					33.8			8.8			9.1				51.7
	SE of %					4.1			5.0			5.0				6.5
	Escapement					72			19			19				110
	SE of esc.					9			11			11				14
Females	n								5			11				16
	%								15.1			33.2				48.3
	SE of %								6.1			7.2				6.5
	Escapement								32			71				103
	SE of esc.								13			15				14
Combined	n					12			8			14				34
	%					33.8			23.9			42.2				100.0
	SE of %					4.1			7.3			7.0				0.0
	Escapement					72			51			90				212
	SE of esc.					9			16			15				35

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

PANEL H. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE TAKU RIVER IN 2005 [d]

		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		24	1		284	4		652	5		144			1	1,121
	%		10.7	0.0		12.6	0.2		33.5	0.3		7.6			0.1	55.5
	SE of %		0.1	0.0		1.3	0.1		1.1	0.1		0.6			0.1	1.5
	Escapement		595	18		5,623	76		14,888	118		3,378			24	24,672
	SE of esc.		238	18		685	39		1,645	54		468			24	2,485
Females	n		2			40			543	3		252			1	841
	%		0.1			2.1			28.8	0.2		13.4			0.1	44.5
	SE of %		0.1			0.3			1.2	0.1		0.9			0.1	1.5
	Escapement		35			939			12,793	71		5,954			24	19,816
	SE of esc.		25			181			1,540	41		772			24	3,219
Combined	n		32	1		324	4		1,195	8		396			2	1,962
	%		1.3	0.0		14.8	0.2		62.2	0.4		21.0			0.1	100.0
	SE of %		0.3	0.0		1.3	0.1		1.4	0.2		1.1			0.1	0.0
	Escapement		582	18		6,562	76		27,681	189		9,332			47	44,488
	SE of esc.		133	18		750	39		3,075	70		1,150			34	4,630

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

-continued-

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PANEL I. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE CHILKAT RIVER IN 2005 [e]

		BROOD YEAR AND AGE CLASS														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n		24			138			133			74			1	370
	%		10.7			28.5			17.4			9.7			0.2	6709
	SE of %		0.1			0.2			0.2			0.1			0.0	1.9
	Escapement		595			1,588			969			541			11	3,704
	SE of esc.		238			616			224			139			8	711
Females	n					2			105			146				253
	%					0.4			13.9			19.2				33.7
	SE of %					0.0			0.1			0.2				1.9
	Escapement					23			771			1,067				1,861
	SE of esc.					17			181			261				318
Combined	n		24			140			239			221			1	625
	%		10.7			28.9			31.3			28.9			0.2	100.0
	SE of %		0.1			1.8			1.9			1.8			0.2	
	Escapement		595			1,611			1,740			1,608			11	5,565
	SE of esc.		238			625			390			386			8	1,014

[e] From: Ericksen 2005, Ericksen and Chapell 2006.

PANEL J. AGE COMPOSITION OF MEDIUM AND LARGE CHINOOK SALMON IN THE ALSEK RIVER IN 2005

		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					23	2		74	2		60				161
	%					5.5	0.5		19.5	0.5		16.0				42.0
	SE of %					1.9	0.4		2.0	0.4		1.9				2.9
	Escapement					244	21		872	21		713				1,872
	SE of esc.					74	15		241	16		211				453
Females	n								101	4		112			1	218
	%								26.9	1.1		29.8			0.3	58.0
	SE of %								2.3	0.5		2.5			0.3	2.9
	Escapement								1,199	48		1,331			12	2,589
	SE of esc.								339	26		377			12	711
Combined	n					23	2		175	6		172			1	379
	%					5.5	0.5		46.4	1.6		45.8			0.3	100.0
	SE of %					1.9	0.4		2.6	0.6		2.8			0.3	0.0
	Escapement					244	21		2,071	70		2,044			12	4,462
	SE of esc.					74	15		559	32		568			12	1,138

-continued-

Appendix A4.–Page 6 of 7.

PANEL K. AGE COMPOSITION OF SMALL, MEDIUM AND LARGE CHINOOK SALMON IN THE SITUK RIVER IN 2005

		BROOD YEAR AND AGE CLASS														
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
Males	n	15	3		24	4		26	2		25					99
	%	010.3	2.1		16.4	2.7		17.8	1.4		17.1					67.8
	SE of %	2.5	1.2		3.1	1.4		3.2	1.0		3.1					3.9
	Escapement	108	22		173	29		188	14		180					715
	SE of esc.															
Females	n				4			23	1		19					47
	%				2.7			15.8	0.7		13.0					32.2
	SE of %				1.4			3.0	0.7		2.8					3.9
	Escapement				29			166	7		137					339
	SE of esc.															
Combined	n	15	3		28	4		49	3		44					145
	%	10.3	2.1		19.2	2.7		33.6	2.1		30.1					100.0
	SE of %	2.5	1.2		3.3	1.4		3.9	1.2		3.8					0.0
	Escapement	108	22		202	29		354	22		318					1,054
	SE of esc.															

SUMMARY. PERCENTAGE AGE COMPOSITION ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 SOUTHEAST ALASKA RIVERS IN 2005.[a]

	BROOD YEAR AND AGE CLASS													
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
	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	0	3		6	33		3	46		3	24		1	
2. Blossom	0	3		1	30		3	50		2	19		0	
3. Chickamin	NE	5	0.1		20	0.1		63			30			0
4. Unuk	NE	7			9			69			29			0
5. Stikine	NE	0			4			65	1		28			
6. Andrew Cr	NE	NE			6			64			37			2
7. King Salmon	NE	NE			34			24			9			4
8. Taku	NE	1			15			62	0		13			
9. Chilkat	NE	1			15			62			21			1
10. Alsek	NE	<1			5			46	2		46			
11. Situk	10	2		19	3		34	2		30				

[a] Small fish not included (NE) in experimental design, except on Stikine and Situk Rivers, 2005.

-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 2005.

	Brood Year and Age Class														
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998	
	0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5	Total
1. Keta	0	44	0	91	551	0	51	754	0	0	120	0	0	34	1,646
2. Blossom	0	57	0	10	433	0	28	567	0	3	140	0	3	6	1,247
3. Chickamin	0			0	1,020	6	0	3,253	6	0	550	11	0	33	4,881
4. Unuk	0	372	0	0	513	5	0	3,803	6	0	836	0	0	13	5,548
5. Stikine	0	33	0	0	1,521	33	0	27,431	414	0	12,424	41	0	83	41,979
6. Andrew Cr	0	0	0	0	143	0	0	1,451	0	0	666	0	0	0	2,260
7. King Salmon	0	0	0	0	72	0	0	51	0	0	90	0	0	0	212
8. Taku	0	582	18	0	6,562	76	0	27,681	189	0	9,332	0	0	47	44,488
9. Chilkat	0	595	0	0	1,611	0	0	1,740	0	0	1,608	0	0	11	5,565
10. Alsek	0	0	0	0	246	21	0	2,086	70	0	2,059	0	0	12	4,494
11. Situk	108	22	0	202	29	0	354	22	0	318	0	0	0	0	1,054

SUMMARY. PERCENTAGE SEX COMPOSITION OF MALES BY AGE CLASS ESTIMATED FROM CHINOOK SALMON SAMPLED IN 11 KEY SOUTHEAST ALASKA RIVERS IN 2005.

	Brood Year and Age Class													
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
	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	80		67	50			29			0
2. Blossom		100		100	99		60	52			41			
3. Chickamin					99			55			39	100		33
4. Unuk		100			99			65			30			46
5. Stikine		100			84	100		45	30		29	100		50
6. Andrew Cr					100			71			38			
7. King Salmon					100			37			21			
8. Taku		94	100		86	100		54	63		36			50
9. Chilkat		100			99			56			34			100
10. Alsek					100			42	32		35			0
11. Situk	100	100		86	100		53	67		57				
Average	100	99		95	95		60	54		57	33			40

Appendix A5.–Average length (MEF), by age, of Chinook salmon in selected systems in Southeast Alaska and transboundary rivers, 2005.

PANEL A. AVERAGE LENGTH OF CHINOOK SALMON IN THE KETA RIVER IN 2005															
		BROOD YEAR AND AGE CLASS													
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		2		5	25		2	22			2			
Average length			565		694	708		840	838			878			
	SD		21		85	49		127	71			173			
	SE		15		38	10		90	15			122			
Females	n					6		1	22			5			2
Average length						685		830	848			931			953
	SD					33			34			76			39
	SE					13			7			34			
Combined	n		2		5	31		3	44			7			2
Average length			565		694	704		837	843			916			953
	SD		21		85	47		90	55			98			39
	SE		15		38	8		52	8			37			28
PANEL B. AVERAGE LENGTH OF CHINOOK SALMON IN THE BLOSSOM RIVER IN 2005															
Males	n		45		3	119		6	104			20			1
Average length			481		655	659		818	794			902			905
	SD		34		43	40		64	64			124			
	SE		5		25	4		26	6			28			
Females	n					1		4	95		1	29		1	1
Average length						710		816	835		885	893		910	955
	SD							19	43			44			
	SE							9	4			8			
Combined	n		45		3	120		10	199		1	49		1	2
Average length			481		655	659		818	814		885	897		910	930
	SD		34		43	40		49	59			85			35
	SE		5		25	4		15	4			12			25
PANEL C. AVERAGE LENGTH OF CHINOOK SALMON IN THE CHICKAMIN RIVER IN 2005															
Males	n		50	2		193	1		320			39	2		2
Average length			456	430		641	680		795			888	895		850
	SD		41	49		57			69			66	49		148
	SE		6	35		4			4			11	35		105
Females	n					2			261	1		59			4
Average length						715			819	770		875			941
	SD					28			44			54			15
	SE					20			3			7			7
Combined	n		50	2		195	1		581	1		98	2		6
Average length			456	430		642	680		805	770		881	895		911
	SD		41	49		57			61			59	49		82
	SE		6	35		4			3			6	35		34

-continued-

PANEL D. AVERAGE LENGTH OF CHINOOK SALMON IN THE UNUK RIVER IN 2005 [b].

		BROOD YEAR AND AGE CLASS													
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
		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		63			93	1		385			39			1
Average length			430			607	430		776			891			995
	SD		39			67			63			71			
	SE		5			7			3			11			
Females	n					1			209	1		91			1
Average length						765			806	795		858			930
	SD								43			49			
	SE								3			5			
Combined	n		63			94	1		594	1		130			2
Average length			430			608	430		786	795		868			963
	SD		39			69			59			59			46
	SE		5			7			2			5			33

[b] From: Weller and McPherson 2006b.

PANEL E. AVERAGE LENGTH OF CHINOOK SALMON IN THE STIKINE RIVER IN 2005 [c]

Males	n		1			33	1		305	3		88	1		1
Average length			442			685	609		758	766		844	832		1,020
	SD					88			73	76		59			
	SE					15			4	44		6			
Females	n					6			364	7		212			1
Average length						738			763	798		814			877
	SD					26			48	14		44			
	SE					11			3	5		3			
Combined	n		1			39	1		669	10		300	1		2
Average length			442			693	609		760	788		823	832		949
	SD					83			61	41		51			101
	SE					13			2	13		3			71

[c] Richards et al. *In prep.*

PANEL F. AVERAGE LENGTH OF CHINOOK SALMON IN ANDREW CREEK IN 2005

Males	n					15	1		100			24			
Average length						598	610		731			818			
	SD					92			64			84			
	SE					24			6			17			
Females	n								40			40			
Average length									744			811			
	SD								39			41			
	SE								6			6			
Combined	n					15	1		140			64			
Average length						598	610		734			814			
	SD					92			58			60			
	SE					24			5			8			

-continued-

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PANEL G. AVERAGE LENGTH OF CHINOOK SALMON IN THE KING SALMON RIVER IN 2005

		Brood year and age class													
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n					12			3			3			
	Average length					630			707			935			
	SD					32			97			44			
	SE					9			56			26			
Females	n								5			11			
	Average length								817			912			
	SD								48			37			
	SE								22			11			
Combined	n					12			8			14			
	Average length					630			776			917			
	SD					32			85			38			
	SE					9			30			10			

PANEL H. AVERAGE LENGTH OF CHINOOK SALMON IN THE TAKU RIVER IN 2005 [d]

		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		283	4		652	5		144			1
	Average length		518	590		614	614		744	780		838			900
	SD		107			98	37		78	37		76			
	SE		20			6	18		3	17		6			
Females	n		2			40			542	3		251			1
	Average length		550			746			757	773		807			860
	SD		42			40			44	13		46			
	SE		30			6			2	7		3			
Combined	n		32	1		323	4		1,194	8		395			2
	Average length		520	590		630	614		750	778		818			880
	SD		104			102	37		65	29		61			28
	SE		18			6	18		2	10		3			20

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

PANEL I. AVERAGE LENGTH OF CHINOOK SALMON IN THE CHILKAT RIVER IN 2005 [e]

		0.1	1.1	2.1	0.2	1.2	2.2	0.3	1.3	2.3	0.4	1.4	2.4	0.5	1.5
Males	n		24			138			133			74			1
	Average length		382			586			762			903			945
	SD		35			62			84			75			
	SE		7			5			7			9			
Females	n		0			2			105			146			
	Average length					698			790			857			
	SD					32			52			46			
	SE								5			4			
Combined	n		24			140			239			221			1
	Average length		382			588			774			873			945
	SD		35.1			63			73			62			
	SE		7			5			5			4			

[e] From: Ericksen and Chapell 2006

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Appendix A5.–Page 4 of 5.

PANEL J. AVERAGE LENGTH OF CHINOOK SALMON IN THE ALSEK RIVER IN 2005

		Brood year and age class													
		2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
		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					23	2		74	2		60			
Average length						564	616		835	694		922			
	SD					115	6		95	105		57			
	SE					24	4		11	74		7			
Females	n								101	4		112			1
Average length									785	778		845			829
	SD								41	29		45			
	SE								4	14		4			
Combined	n					23	2		175	6		172			1
Average length						564	616		806	750		872			829
	SD					115	6		73	68		62			
	SE					24	4		6	28		5			

PANEL K. AVERAGE LENGTH OF CHINOOK SALMON IN THE SITUK RIVER IN 2005

		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	15	3		24	4		26	2		25		15		
Average length		372	348		562	634		786	810		870		372		
	SD	33	11		90	49		83	42		60		33		
	SE	8	6		18			16	30		12		8		
Females	n				4			23	1		19				
Average length					573			773	805		841				
	SD				64			53			52				
	SE				32			11			12				
Combined	n	15	3		28	4		49	3		44		15		
Average length		372	348		563	634		780	808		857		372		
	SD	33	11		86	49		70	30		58		33		
	SE	8	6		16			10	17		9		8		

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Appendix A5.–Page 5 of 5.

Summary. Average length of male Chinook salmon sampled in Southeast Alaska in 2005														
	Brood Year and Age Class													
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
	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				694	708			838			878			
2. Blossom		481		655	659		818	794			902			
3. Chickamin		456			641			795			888			850
4. Unuk		430			607			776			891			
5. Stikine					685			758	766		844			
6. Andrew Creek					598			731			818			
7. King Salmon					630			707			935			
8. Taku		518			614	614		744			838			
9. Chilkat		382			586			762			903			
10. Alsek					564			835	694		922			
11. Situk				562	634		786	810		870				

Summary. Average length of female Chinook salmon sampled in Southeast Alaska in 2005														
	Brood Year and Age Class													
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
	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					685			848			931			953
2. Blossom								835		885	893			
3. Chickamin					715			819	770		875			941
4. Unuk					765			806			858			930
5. Stikine					738			763	798		814			
6. Andrew Creek								744			811			
7. King Salmon								817			912			
8. Taku					746			757	773		807			
9. Chilkat								790			857			
10. Alsek								785	778		845			
11. Situk				573			773			841				

Summary. Average length of Chinook salmon sampled in Southeast Alaska in 2005 sexes combined														
	Brood Year and Age Class													
	2003	2002	2001	2002	2001	2000	2001	2000	1999	2000	1999	1998	1999	1998
	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					704			843			916			
2. Blossom				655	659		818	814		885	897			
3. Chickamin		456			642	680		805	770		881	895		911
4. Unuk		430			608			786			868			
5. Stikine					693			760	788		823			
6. Andrew Creek					598			734			814			
7. King Salmon								776			917			
8. Taku		520			630	614		750	778		818			
9. Chilkat		382			588			774			873			
10. Alsek					564			806	750		872			
11. Situk				563			780	808		857				
Averages		447		609	632		799	787	771	871	868			911

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 2005.

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	704	8	0	-45	-62	-96	-11	-106	-74	-74	-116	-140	
2. Blossom	1.2	659	4	45	0	-17	-51	34	-61	-29	-29	-71	-95	
3. Chickamin	1.2	642	4	62	17	0	-34	51	-44	-12	-12	-54	-78	
4. Unuk	1.2	608	7	96	51	34	0	85	-10	22	22	-20	-44	
5. Stikine	1.2	693	13	11	-34	-51	-85	0	-95	-63	-63	-105	-129	
6. Andrew Cr	1.2	598	24	106	61	44	10	95	0	32	32	-10	-34	
7. King Salmon	1.2	630	9	74	29	12	-22	63	-32	0	0	-42	-66	
8. Taku	1.2	630	6	74	29	12	-22	63	-32	0	0	-42	-66	
9. Chilkat	1.2	588	5	116	71	54	20	105	10	42	42	0	-24	
10. Alsek	1.2	564	24	140	95	78	44	129	34	66	66	24	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	704	8	0.00	**-4.85**	**-6.65**	**-8.80**	-0.70	**-4.23**	**-5.94**	**-7.32**	**-11.75**	**-5.52**	
2. Blossom	1.2	659	4	**4.85**	0.00	**-2.96**	**-6.33**	**2.44**	**-2.54**	**-2.89**	**-4.19**	**-10.75**	**-3.91**	
3. Chickamin	1.2	642	4	**6.65**	**2.96**	0.00	**-4.20**	**3.66**	-1.83	-1.19	-1.73	**-8.13**	**-3.21**	
4. Unuk	1.2	608	7	**8.80**	**6.33**	**4.20**	0.00	**5.65**	-0.41	1.90	2.43	-2.33	-1.76	
5. Stikine	1.2	693	13	0.70	-2.44	**-3.66**	**-5.65**	0.00	**-3.50**	**-3.89**	**-4.36**	**-7.35**	**-4.71**	
6. Andrew Cr	1.2	598	24	**4.23**	**2.54**	**1.83**	**0.41**	**3.50**	0.00	1.26	1.31	-0.43	-1.01	
7. King Salmon	1.2	630	9	**5.94**	**2.89**	1.19	-1.90	3.89	-1.26	0.00	-0.01	**-3.99**	**-2.57**	
8. Taku	1.2	630	6	**7.32**	**4.19**	1.73	-2.43	4.36	-1.31	0.01	0.00	**-5.44**	**-2.68**	
9. Chilkat	1.2	588	5	**11.75**	**10.75**	**8.13**	2.33	**7.35**	0.43	**3.99**	**5.44**	0.00	-0.96	
10. Alsek	1.2	564	24	**5.52**	**3.91**	**3.21**	1.76	**4.71**	1.01	**2.57**	**2.68**	0.96	0.00	
11. Situk	1.2													

Note: A bold number indicates a significant difference ($P < 0.01$).

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 2005.

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	843	8	0	-29	-38	-57	-83	-109	-67	-93	-69	-37	
2. Blossom	1.3	814	4	29	0	-9	-28	-54	-80	-38	-64	-40	-8	
3. Chickamin	1.3	805	3	38	9	0	-19	-45	-71	-29	-56	-31	1	
4. Unuk	1.3	786	2	57	28	19	0	-26	-52	-10	-36	-12	20	
5. Stikine	1.3	760	2	83	54	45	26	0	-26	16	-10	14	46	
6. Andrew Cr	1.3	734	5	109	80	71	52	26	0	42	16	40	72	
7. King Salmon	1.3	776	30	67	38	29	10	-16	-42	0	-26	-2	30	
8. Taku	1.3	750	2	93	64	56	36	10	-16	26	0	25	56	
9. Chilkat	1.3	774	5	69	40	31	12	-14	-40	2	-25	0	32	
10. Alsek	1.3	806	6	37	8	-1	-20	-46	-72	-30	-56	-32	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	843	8	0.00	**-3.14**	**-4.31**	**-6.65**	**-9.58**	**-11.29**	-2.14	**-10.92**	**-7.16**	**-3.69**	
2. Blossom	1.3	814	4	**3.14**	0.00	-1.81	**-6.26**	**-11.64**	**-12.68**	-1.25	**-14.55**	**-6.39**	-1.17	
3. Chickamin	1.3	805	3	**4.31**	1.81	0.00	**-6.05**	**-13.21**	**-13.02**	-0.97	**-17.76**	**-5.80**	0.09	
4. Unuk	1.3	786	2	**6.65**	**6.26**	**6.05**	0.00	**-8.42**	**-9.87**	-0.33	**-13.23**	-2.25	**3.39**	
5. Stikine	1.3	760	2	**9.58**	**11.64**	**13.21**	**8.42**	0.00	**-4.80**	0.53	**-3.43**	2.75	**7.63**	
6. Andrew Cr	1.3	734	5	**11.29**	**12.68**	**13.02**	**9.87**	**4.80**	0.00	1.37	**3.00**	**5.97**	**9.75**	
7. King Salmon	1.3	776	30	2.14	1.25	0.97	0.33	-0.53	-1.37	0.00	-0.87	-0.05	0.98	
8. Taku	1.3	750	2	**10.92**	**14.55**	**17.76**	**13.23**	**3.43**	**-3.00**	0.87	0.00	**4.89**	**9.61**	
9. Chilkat	1.3	774	5	**7.16**	**6.39**	**5.80**	2.25	**-2.75**	**-5.97**	0.05	**-4.89**	0.00	**4.33**	
10. Alsek	1.3	806	6	**3.69**	1.17	-0.09	**-3.39**	**-7.63**	**-9.75**	-0.98	**-9.61**	**-4.33**	0.00	
11. Situk	1.3													

Note: A bold number indicates a significant difference (P <0.01).

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 2005.

PANEL A. DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 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	1.4	916	37	0	-19	-36	-48	-93	-102	1	-98	-43	-44	
2. Blossom	1.4	897	12	19	0	-17	-29	-74	-83	20	-79	-24	-25	
3. Chickamin	1.4	881	6	36	17	0	-13	-58	-67	37	-62	-7	-9	
4. Unuk	1.4	868	5	48	29	13	0	-45	-54	49	-50	5	4	
5. Stikine	1.4	823	3	93	74	58	45	0	-9	94	-5	50	49	
6. Andrew Cr	1.4	814	8	102	83	67	54	9	0	103	4	59	58	
7. King Salmon	1.4	917	10	-1	-20	-37	-49	-94	-103	0	-99	-44	-45	
8. Taku	1.4	818	3	98	79	62	50	5	-4	99	0	55	54	
9. Chilkat	1.4	873	4	43	24	7	-5	-50	-59	44	-55	0	-1	
10. Alsek	1.4	872	5	44	25	9	-4	-49	-58	45	-54	1	0	
11. Situk	1.4													

PANEL B. TEST VALUES FOR DIFFERENCES IN MEAN LENGTHS FOR AGE-1.4 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	1.4	916	37	0.00	-0.49	-0.95	-1.29	-2.51	**-2.70**	0.03	**-2.64**	-1.16	-1.18	
2. Blossom	1.4	897	12	0.49	0.00	-1.23	-2.23	**-5.99**	**-5.86**	1.27	**-6.36**	-1.89	-1.94	
3. Chickamin	1.4	881	6	0.95	1.23	0.00	-1.61	**-8.66**	**-6.92**	**3.11**	**-9.28**	-1.03	-1.12	
4. Unuk	1.4	868	5	1.29	2.23	1.61	0.00	**-7.77**	**-5.98**	**4.35**	**-8.49**	0.77	0.58	
5. Stikine	1.4	823	3	2.51	**5.99**	**8.66**	**7.77**	0.00	-1.12	**8.94**	-1.13	**9.87**	**8.86**	
6. Andrew Cr	1.4	814	8	2.70	**5.86**	**6.92**	**5.98**	1.12	0.00	8.18	0.52	**6.87**	**6.54**	
7. King Sal.	1.4	917	10	-0.03	-1.27	-3.11	-4.35	-8.94	-8.18	0.00	**-9.36**	**-4.03**	**-4.04**	
8. Taku	1.4	818	3	**2.64**	**6.36**	**9.28**	**8.49**	1.13	-0.52	**9.36**	0.00	**10.64**	**9.59**	
9. Chilkat	1.4	873	4	1.16	1.89	1.03	-0.77	**-9.87**	**-6.87**	**4.03**	**-10.64**	0.00	-0.16	
10. Alsek	1.4	872	5	1.18	1.94	1.12	-0.58	**-8.86**	**-6.54**	**4.04**	**-9.59**	0.16	0.00	
11. Situk	1.4													

Note: A bold number indicates a significant difference (P <0.01).

Appendix A9.–Numbers of Chinook salmon examined for coded wire tags (CWT) and numbers of tags recovered in rivers in Southeast Alaska and transboundary rivers, 2004–2005. Hatchery CWTs expanded by tag ratio reported in ADF&G Mark, Tag, and Age Laboratory database.

	2005					2004				
	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	172	0	0	0	0	469	0	0	0	0
Alsek River	1,018	0	0	0	0	2,085	0	0	0	0
Chilkat River	668	0	0	0	0	1,061	0	0	0	52
Taku River	3,724	0	0	0	48	8,944	0	0	0	96
King Salmon R.	45	0	0	0	0	23	0	0	0	0
Stikine River	5,256	0	0	1	31	6,329	2	2	2	14
	1 Taku wild					*2 Taku wild, 2L Port Walter (1Unuk brood, 1 Chickamin*				
Andrew Creek	242	1	6	0	0	205	0	0	0	0
	1 Crystal Lake/Anita Bay					*1 ad clip not recovered*				
Unuk River	1,151	0	0	0	36	1,841	0	0	0	62
Chickamin R.	1,498	2	27	0	28	1,739	5	57	5	37
	1 Tamgass, 1 Kincolith					*5 Unuk wild, 4 Neets Bay, 1 Anita Bay*				
Blossom River	472	1	10	1	0	404	0	0	0	0
	1 no tag, 1 Crystal Lake/Neets Bay, 1 Unuk wild									
Keta River	117	0	0	1	0	119	0	0	0	0
Totals	14,363	4	43	2	205	23,549	7	59	7	261

Notes:

1.) Expanded hatchery numbers are from listed tag ratios in ADF&G Mark, Tag, and Age Laboratory 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 B.

Appendix B1.–Predicting escapement from index counts using an expansion factor.

The expansion factor provides a means of predicting escapement in years where only an index count of the escapement is available, i.e. no weir counts or mark–recapture experiments were conducted. The expansion factor is the average over several years of the ratio of the escapement estimate (or weir count) to the index count.

Systems where escapement is known

On systems where escapement can be completely enumerated with weirs or other complete counting methods, the expansion factor is an estimate of the expected value of the "population" of annual expansion factors (π's) for that system:

$$\bar{\pi} = \frac{\sum_{y=1}^{k} \pi_y}{k} \tag{1}$$

where $\pi_y = N_y / C_y$ is the observed expansion factor in year *y*, N_y is the known escapement in year *y*, C_y is the index count in year *y*, and *k* is the number of years for which these data are available to calculate an annual expansion factor.

The estimated variance for expansion of index counts needs to reflect two sources of uncertainty for any predicted value of π, (π_p). First is an estimate of the process error (*var*(π); the variation across years in the π's, reflecting, for example, weather or observer-induced effects on how many fish are counted in a survey for a given escapement. Second is the sampling variance of $\bar{\pi}$ (*var* ($\bar{\pi}$)), which will decline as we collect more data pairs.

The variance for prediction will be estimated (Neter et al. 1990):

$$v\hat{a}r(\pi_p) = v\hat{a}r(\pi) + v\hat{a}r(\bar{\pi}) \tag{2}$$

where:

$$v\hat{a}r(\pi) = \frac{\sum_{y=1}^{k} (\pi_y - \bar{\pi})^2}{k-1} \tag{3}$$

and:

$$v\hat{a}r(\bar{\pi}) = \frac{\sum_{y=1}^{k} (\pi_y - \bar{\pi})^2}{k(k-1)} \tag{4}$$

such that:

$$v\hat{a}r(\pi_p) = \frac{\sum_{y=1}^{k} (\pi_y - \bar{\pi})^2}{k-1} + \frac{\sum_{y=1}^{q} (\pi_y - \bar{\pi})^2}{k(k-1)} \tag{5}$$

-continued-

Systems where escapement is estimated

On systems where escapement is estimated, the expansion factor is an estimate of the expected value of the "population" of annual expansion factors (π 's) for that system:

$$\overline{\pi} = \frac{\sum_{y=1}^{k} \hat{\pi}_y}{k} \tag{6}$$

where $\hat{\pi}_y = \hat{N}_y / C_y$ is the estimate of the expansion factor in year *y*, $\hat{N}_y$ is the estimated escapement in year *y*, and other terms are as described above.

The variance for prediction will again be estimated:

$$v\hat{a}r(\pi_p) = v\hat{a}r(\pi) + v\hat{a}r(\overline{\pi}) \tag{7}$$

The estimate of *var*(π) should again reflect only process error. Variation in $\hat{\pi}$ across years, however, represents process error **plus** measurement error within years (e.g. the mark-recapture induced error in escapement estimation) and is described by the relationship (Mood et al. 1974):

$$V(\hat{\pi}) = V[E(\hat{\pi})] + E[V(\hat{\pi})] \tag{8}$$

This relationship can be rearranged to isolate process error, that is:

$$V[E(\hat{\pi})] = V[\hat{\pi}] - E[V(\hat{\pi})] \tag{9}$$

An estimate of *var*(π) representing only process error therefore is:

$$v\hat{a}r(\pi) = v\hat{a}r(\hat{\pi}) - \frac{\sum_{y=1}^{k} v\hat{a}r(\hat{\pi}_y)}{k} \tag{10}$$

where $v\hat{a}r(\hat{\pi}_y) = v\hat{a}r(\hat{N}_y) / C_y^2$ and $v\hat{a}r(\hat{N}_y)$ is obtained during the experiment when N_y is estimated. We can calculate:

$$v\hat{a}r(\hat{\pi}) = \frac{\sum_{y=1}^{k} (\hat{\pi}_y - \overline{\pi})^2}{k-1} \tag{11}$$

and we can estimate $var(\overline{\pi})$ similarly to as we did above:

$$v\hat{a}r(\overline{\pi}) = \frac{\sum_{y=1}^{k} (\hat{\pi}_y - \overline{\pi})^2}{k(k-1)} \tag{12}$$

where both process and measurement errors need to be included.

For large *k* (*k* > 30), equations (11) and (12) provide reasonable parameter estimates, however for small *k* the estimates are imprecise and may result in negative estimates of variance when the results are applied as in equation (7).

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Because *k* is typically < 10, we will estimate $var(\hat{\pi})$ and $var(\overline{\pi})$ using parametric bootstrap techniques Efron and Tibshirani 1993. The sampling distributions for each of the $\hat{\pi}_y$ are modeled using Normal distributions with means $\hat{\pi}_y$ and variances $v\hat{a}r(\hat{\pi}_y)$. At each bootstrap iteration, a bootstrap value $\hat{\pi}_{y(b)}$ is drawn from each of these Normal distributions and the bootstrap value $\hat{\pi}_{(b)}$ is randomly chosen from the *k* values of $\hat{\pi}_{y(b)}$. Then, a bootstrap sample of size *k* is drawn from the *k* values of $\hat{\pi}_{y(b)}$ by sampling with replacement, and the mean of this bootstrap is the bootstrap value $\overline{\pi}_{(b)}$. This procedure is repeated *B* = 1,000,000 times. We can then estimate $var(\hat{\pi})$ using:

$$v\hat{a}r_B(\hat{\pi}) = \frac{\sum_{b=1}^{B}(\hat{\pi}_{(b)} - \overline{\hat{\pi}_{(b)}})^2}{B-1} \tag{13}$$

where:

$$\overline{\hat{\pi}_{(b)}} = \frac{\sum_{b=1}^{B}\hat{\pi}_{(b)}}{B} \tag{14}$$

and we can calculate $var_B(\overline{\pi})$ using equations (13) and (14) with appropriate substitutions. The variance for prediction is then estimated:

$$v\hat{a}r(\pi_p) = v\hat{a}r_B(\hat{\pi}) - \frac{\sum_{y=1}^{k}\text{v}\hat{\text{a}}\text{r}(\hat{\pi}_y)}{k} + v\hat{a}r_B(\overline{\pi}) \tag{15}$$

As the true sampling distributions for the $\hat{\pi}_y$ are typically skewed right, using a Normal distribution to approximate these distributions in the bootstrap process will result in estimates of $var(\hat{\pi})$ and $var(\overline{\pi})$ that are biased slightly high, but simulation studies using values similar to those realized for this application indicated that the bias in equation (15) is < 1%.

Predicting Escapement

In years when an index count (C_p) is available but escapement (N_p) is not known, it can be predicted:

$$\hat{N}_p = \overline{\pi}\, C_p \tag{16}$$

and:

$$v\hat{a}r(\hat{N}_p) = C_p^2 v\hat{a}r(\pi_p) \tag{17}$$

Efron and Tibshirani 1993. An introduction to the bootstrap. Chapman and Hall, New York. 436 pp.

Mood et al. 1974. Introduction to the theory of statistics, 3rd ed. McGraw-Hill Book Co. New York. 564 pp.

Neter et al. 1990. Applied Linear Statistical Models 3rd Ed. Richard D Irwin, Inc. Homewood, Ill. 1181 pp.

Appendix B2.–Peak aerial survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Keta River 1975–2005.

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1975	203	611	114	388	834	12,921	18.6%
1976	84	253	47	161	345	2,212	18.6%
1977	230	692	129	440	945	16,587	18.6%
1978	392	1,180	220	750	1,610	48,181	18.6%
1979	426	1,283	239	815	1,750	56,901	18.6%
1980	192	578	108	367	789	11,559	18.6%
1981	329	990	184	629	1,352	33,939	18.6%
1982	754	2,270	422	1,442	3,097	178,256	18.6%
1983	822	2,475	460	1,573	3,377	211,858	18.6%
1984	610	1,836	342	1,167	2,506	116,670	18.6%
1985	624	1,879	349	1,194	2,563	122,087	18.6%
1986	690	2,077	386	1,320	2,835	149,279	18.6%
1987	768	2,312	430	1,469	3,155	184,937	18.6%
1988	575	1,731	322	1,100	2,362	103,666	18.6%
1989	1,155	3,477	647	2,210	4,745	418,278	18.6%
1990	606	1,824	339	1,159	2,489	115,145	18.6%
1991	272	819	152	520	1,117	23,197	18.6%
1992	217	653	122	415	891	14,765	18.6%
1993	362	1,090	203	693	1,487	41,088	18.6%
1994	306	921	171	585	1,257	29,359	18.6%
1995	175	527	98	335	719	9,602	18.6%
1996	297	894	166	568	1,220	27,658	18.6%
1997	246	741	138	471	1,011	18,975	18.6%
1998	180	**446**	**50**	**348**	**544**	2,500	11.2%
1999	276	**968**	**116**	**741**	**1,195**	13,456	12.0%
2000	300	**914**	**122**	**675**	**1,153**	14,884	13.3%
2001	343	1,033	192	656	1,409	36,888	18.6%
2002	411	1,237	230	786	1,688	52,965	18.6%
2003	322	969	180	616	1,323	32,510	18.6%
2004	376	1,132	211	719	1,545	44,328	18.6%
2005	497	1,496	278	951	2,042	77,449	18.6%
Averages	418	1,260					
Minimum	84	253					
Maximum	1,155	3,477					
$\bar{\pi}$		3.01					
SE $\bar{\pi}$		0.56					
var $\bar{\pi}$		0.313546					

Note: Statistics in bold come directly from mark–recapture experiments in 1998–2000; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark–recapture experiments.

Appendix B3.–Peak aerial survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Blossom River 1975–2005.

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1975	146	439	151	144	734	22,698	34.3%
1976	68	205	70	67	342	4,924	34.3%
1977	112	337	116	110	563	13,357	34.3%
1978	143	430	148	141	719	21,775	34.3%
1979	54	162	56	53	272	3,105	34.3%
1980	89	268	92	88	448	8,435	34.3%
1981	159	478	164	157	800	26,920	34.3%
1982	345	1,038	356	340	1,735	126,743	34.3%
1983	589	1,772	608	580	2,963	369,418	34.3%
1984	508	1,528	524	501	2,555	274,799	34.3%
1985	709	2,133	732	699	3,567	535,278	34.3%
1986	1,278	3,844	1,319	1,259	6,429	1,739,198	34.3%
1987	1,349	4,058	1,392	1,329	6,786	1,937,810	34.3%
1988	384	1,155	396	378	1,932	157,018	34.3%
1989	344	1,035	355	339	1,730	126,010	34.3%
1990	257	773	265	253	1,293	70,332	34.3%
1991	239	719	247	235	1,202	60,825	34.3%
1992	150	451	155	148	755	23,959	34.3%
1993	303	911	313	299	1,524	97,763	34.3%
1994	161	484	166	159	810	27,602	34.3%
1995	217	653	224	214	1,092	50,143	34.3%
1996	220	662	227	217	1,107	51,539	34.3%
1997	132	397	136	130	664	18,554	34.3%
1998	91	**364**	**77**	**213**	**515**	5,929	21.2%
1999	212	638	219	209	1,066	47,858	34.3%
2000	231	695	238	228	1,162	56,821	34.3%
2001	204	614	211	201	1,026	44,315	34.3%
2002	224	674	231	221	1,127	53,430	34.3%
2003	203	611	209	200	1,021	43,881	34.3%
2004	333	**734**	**71**	**609**	**908**	5,073	9.7%
2005	445	**926**	**99**	**791**	**1,148**	9,801	10.7%
Average	315	942					
Minimum	54	162					
Maximum	1,349	4,058					
$\overline{\pi}$		3.01[a]					
SE $\overline{\pi}$		1.03					
var $\overline{\pi}$		1.064847					

Note: Statistics in bold come directly from mark–recapture experiments in; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark-recapture experiments.

[a] Includes preliminary 2006 estimate.

Appendix B4.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Chickamin River 1975–2005**.**

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1975	370	1,771	286	1,211	2,332	81,802	16.1%
1976	157	750	121	513	988	14,670	16.1%
1977	363	1,735	280	1,186	2,284	78,503	16.1%
1978	308	1,476	238	1,009	1,943	56,783	16.1%
1979	239	1,141	184	780	1,503	33,972	16.1%
1980	445	2,128	344	1,455	2,802	118,070	16.1%
1981	384	1,838	297	1,256	2,419	88,043	16.1%
1982	571	2,733	441	1,868	3,597	194,674	16.1%
1983	599	2,868	463	1,961	3,776	214,503	16.1%
1984	1,102	5,274	852	3,605	6,943	725,100	16.1%
1985	956	4,575	739	3,127	6,023	545,696	16.1%
1986	1,745	8,351	1,348	5,708	10,994	1,818,252	16.1%
1987	975	4,666	753	3,189	6,143	567,602	16.1%
1988	786	3,761	607	2,571	4,952	368,875	16.1%
1989	934	4,470	722	3,055	5,884	520,869	16.1%
1990	564	2,699	436	1,845	3,553	189,930	16.1%
1991	487	2,331	376	1,593	3,068	141,610	16.1%
1992	346	1,656	267	1,132	2,180	71,480	16.1%
1993	389	1,862	301	1,272	2,451	90,351	16.1%
1994	388	1,857	300	1,269	2,444	89,887	16.1%
1995	356	**2,309**	**723**	**1,388**	**4,650**	**522,729**	**31.3%**
1996	422	**1,587**	**199**	**1,279**	**2,089**	**39,601**	**12.5%**
1997	272	1,302	210	890	1,714	44,175	16.1%
1998	391	1,871	302	1,279	2,463	91,283	16.1%
1999	492	2,354	380	1,609	3,100	144,532	16.1%
2000	801	3,833	619	2,620	5,046	383,089	16.1%
2001	1,010	**5,177**	**972**	**3,780**	**7,573**	**944,784**	**18.8%**
2002	1,013	**5,007**	**738**	**3,892**	**6,742**	**544,644**	**14.7%**
2003	964	**4,579**	**592**	**3,481**	**5,134**	**350,464**	**12.9%**
2004	798	**4,268**	**893**	**2,519**	**6,018**	**797,449**	**20.9%**
2005	926	**4,257**	**591**	**3,099**	**5,415**	**349,281**	**13.9%**
Averages	571	3,008					
Minimum	157	750					
Maximum	1,745	8,351					
$\overline{\pi}$		4.79					
SE $\overline{\pi}$		0.77					
var $\overline{\pi}$		0.597083					

Note: Statistics in bold come directly from mark–recapture experiments; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark-recapture experiments.

Appendix B5.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Unuk River 1977–2005.

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$V\ \hat{N}_L$	CV
1977	974	4,739	584	3,594	5,885	341,523	12.3%
1978	1,106	5,382	664	4,081	6,682	440,365	12.3%
1979	576	2,803	346	2,125	3,480	119,439	12.3%
1980	1,016	4,944	610	3,749	6,139	371,612	12.3%
1981	731	3,557	439	2,697	4,417	192,370	12.3%
1982	1,351	6,574	811	4,985	8,163	657,072	12.3%
1983	1,125	5,474	675	4,151	6,797	455,625	12.3%
1984	1,837	8,939	1,102	6,778	11,099	1,214,845	12.3%
1985	1,184	5,761	710	4,369	7,154	504,668	12.3%
1986	2,126	10,345	1,276	7,845	12,845	1,627,155	12.3%
1987	1,973	9,601	1,184	7,280	11,921	1,401,382	12.3%
1988	1,746	8,496	1,048	6,443	10,549	1,097,466	12.3%
1989	1,149	5,591	689	4,240	6,942	475,272	12.3%
1990	591	2,876	355	2,181	3,571	125,741	12.3%
1991	655	3,187	393	2,417	3,957	154,449	12.3%
1992	874	4,253	524	3,225	5,281	274,995	12.3%
1993	1,068	5,197	641	3,941	6,453	410,625	12.3%
1994	711	**4,623**	**1,266**	**2,992**	**9,425**	**1,602,756**	**27.4%**
1995	772	3,757	463	2,849	4,664	214,554	12.3%
1996	1,167	5,679	700	4,306	7,051	490,280	12.3%
1997	636	**2,970**	**271**	**2,499**	**3,636**	**73,441**	**9.1%**
1998	840	**4,132**	**394**	**3,433**	**4,974**	**155,236**	**9.5%**
1999	680	**3,914**	**480**	**3,110**	**5,071**	**230,400**	**12.3%**
2000	1,341	**5,872**	**644**	**4,848**	**7,347**	**414,736**	**11.0%**
2001	2,019	**10,541**	**1,181**	**8,705**	**13,253**	**1,394,761**	**11.2%**
2002	897	**6,988**	**764**	**5,759**	**8,677**	**583,696**	**10.9%**
2003	1,121	**5,546**	**433**	**4,814**	**6,530**	**187,489**	**7.8%**
2004	1,008	**3,963**	**325**	**3,406**	**4,684**	**105,625**	**8.2%**
2005	929	**4,742**	**396**	**4,094**	**5,579**	**156,816**	**8.4%**
verages	1,110	5,533					
Minimum	576	2,803					
Maximum	2,126	10,541					
$\overline{\pi}$		4.87					
SE $\overline{\pi}$		0.60					
var $\overline{\pi}$		0.355230					

Note: Statistics in bold come directly from mark–recapture experiments; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark-recapture experiments.

Appendix B6.–Peak survey counts, weir counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Stikine River 1975–2005.

Year	Survey Counts	Little Tahltan Weir Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1975	700		*7,571*	1,623				21.4%
1976	400		*5,723*	933				16.3%
1977	800		*11,445*	1,865				16.3%
1978	632		*6,835*	1,465				21.4%
1979	1,166		*12,610*	2,704				21.4%
1980	2,137		*30,573*	4,982				16.3%
1981	3,334		*36,057*	7,731				21.4%
1982	2,830		*40,488*	6,598				16.3%
1983	594		*6,424*	1,377				21.4%
1984	1,294		*13,995*	3,000				21.4%
1985	1,598	3,114	16,703	4,204			17,672,775	25.2%
1986	1,201	2,891	15,507	3,903			15,232,238	25.2%
1987	2,706	4,783	25,655	6,457			41,693,495	25.2%
1988	3,796	7,292	39,113	9,844			96,908,274	25.2%
1989	2,527	4,715	25,291	6,365			40,516,408	25.2%
1990	1,755	4,392	23,558	5,929			35,155,413	25.2%
1991	1,768	4,506	24,170	6,083			37,004,106	25.2%
1992	3,607	6,627	35,546	8,946			80,038,968	25.2%
1993	4,010	11,449	61,411	15,456			238,892,573	25.2%
1994	2,422	6,426	34,468	8,675			75,257,360	25.2%
1995	1,117	3,259	17,481	4,400			19,356,920	25.2%
1996	1,920	4,840	**23,886**	**2,773**	**NA**	**NA**		11.6%
1997	1,907	5,613	**28,185**	**2,977**	**NA**	**NA**		10.6%
1998	1,385	4,873	**25,968**	**3,931**	**NA**	**NA**		15.1%
1999	1,379	4,738	**19,947**	**3,240**	**NA**	**NA**		16.2%
2000	2,720	6,631	**27,531**	**3,168**	24,879	38,049		11.5%
2001	4,158	9,730	**63,523**	**5,853**	56,521	78,982		9.2%
2002	no survey	7,476	**50,875**	**5,912**	43,798	67,023		11.6%
2003	1,903	6,492	**46,824**	**6,078**	37,968	61,795		13.0%
2004	6,014	16,381	**48,900**	**3,896**	458,127	61,217		8.0%
2005	2,157	7,253	**40,501**	**2,538**				6.3%
Averages	2,131	6,356						
Minimum	400	2,891						
Maximum	6,014	16,381						
$\bar{\pi}$		5.36						
SE $\bar{\pi}$		1.35						
var $\bar{\pi}$		1.82250						

Note: Statistics in bold come directly from mark–recapture experiments; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark-recapture experiments.

Appendix B7.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in Andrew Creek 1975–2005.

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1975	260	508	116	280	736	13,555	22.9%
1976		**404**	0				
1977		**456**	0				
1978		**388**	0				
1979	221	**327**	0				
1980		**282**	0				
1981	300	**536**	0				
1982	332	**672**	0				
1983		**366**	0				
1984	154	**389**	0				
1985	320	625	143	344	906	20,533	22.9%
1986	708	1,383	317	762	2,005	100,512	22.9%
1987	788	1,540	353	848	2,231	124,510	22.9%
1988	564	1,102	253	607	1,597	63,784	22.9%
1989	530	1,036	237	571	1,501	56,325	22.9%
1990	664	1,298	297	715	1,880	88,408	22.9%
1991	400	782	179	431	1,133	32,083	22.9%
1992	778	1,520	348	837	2,203	121,370	22.9%
1993	1,060	2,071	475	1,141	3,002	225,302	22.9%
1994	572	1,118	256	616	1,620	65,606	22.9%
1995	343	670	154	369	971	23,591	22.9%
1996	335	655	150	361	949	22,503	22.9%
1997	293	**478**				0	0.0%
1998	487	952	218	524	1,379	47,557	22.9%
1999	605	1,182	271	651	1,713	73,395	22.9%
2000	690	1,348	309	743	1,954	95,467	22.9%
2001	1,054	2,060	472	1,135	2,985	222,758	22.9%
2002	876	1,712	392	943	2,481	153,873	22.9%
2003	595	1,163	266	640	1,685	70,988	22.9%
2004	1,534	2,998	687	1,651	4,344	471,850	22.9%
2005	1,015	1,979	455	1,093	2,874	206,579	22.9%
Averages	595	1,032					
Minimum	154	282					
Maximum	1,534	2,998					
$\bar{\pi}$		1.95					
SE $\bar{\pi}$		0.45					
var $\bar{\pi}$		0.200518					

Note: Statistics in bold come directly from weir counts; all other statistics are expanded from counts based on the relationship between counts and estimates during years with mark–recapture experiments.

Appendix B8.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in King Salmon River, 1971–2005.

Year	Peak Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1971	94	143	25	93	193	644	17.78%
1972	90	137	24	89	184	590	17.78%
1973	211	320	57	209	432	3,245	17.78%
1974	104	158	28	103	213	788	17.78%
1975	42	64	11	42	86	129	17.78%
1976	65	99	18	64	133	308	17.78%
1977	134	204	36	133	274	1,309	17.78%
1978	57	87	15	56	117	237	17.78%
1979	88	134	24	87	180	565	17.78%
1980	70	106	19	69	143	357	17.78%
1981	101	153	27	100	207	744	17.78%
1982	259	393	70	256	530	4,890	17.78%
1983	183	**245**	0				0.00%
1984	184	**265**	0				0.00%
1985	105	**175**	0				0.00%
1986	190	**255**	0				0.00%
1987	128	**196**	0				0.00%
1988	94	**208**	0				0.00%
1989	133	**240**	0				0.00%
1990	98	**179**	0				0.00%
1991	91	**134**	0				0.00%
1992	58	**99**	0				0.00%
1993	175	266	47	173	358	2,232	17.78%
1994	140	213	38	139	287	1,429	17.78%
1995	97	147	26	96	199	686	17.78%
1996	192	292	52	190	393	2,687	17.78%
1997	238	361	64	236	487	4,129	17.78%
1998	88	134	24	87	180	565	17.78%
1999	200	304	54	198	410	2,916	17.78%
2000	91	138	25	90	186	604	17.78%
2001	98	149	26	97	201	700	17.78%
2002	102	155	28	101	209	758	17.78%
2003	78	118	21	77	160	444	17.78%
2004	89	135	24	88	182	577	17.78%
2005	94	143	25	93	193	644	17.78%
Averages	122	187					
Minimum	42	64					
Maximum	259	393					
$\bar{\pi}$		1.52					
SE $\bar{\pi}$		0.27					
var $\bar{\pi}$		0.072896					

Appendix B9.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI’s for large Chinook salmon spawning in the Taku River, 1973–2005.

Year	Survey Counts	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	$v\ \hat{N}_L$	CV
1973	2,800	14,560	4,984	4,791	24,329	24,840,256	34.2%
1974	3,079	16,011	5,481	5,269	26,753	30,037,196	34.2%
1975	2,484	12,917	4,422	4,251	21,583	19,549,839	34.2%
1976	4,726	24,575	8,412	8,087	41,063	70,766,455	34.2%
1977	5,671	29,489	10,094	9,704	49,274	101,896,508	34.2%
1978	3,292	17,118	5,860	5,633	28,604	34,336,787	34.2%
1979	4,156	21,611	7,398	7,112	36,111	54,725,669	34.2%
1980	7,544	39,229	13,428	12,909	65,548	180,319,778	34.2%
1981	9,528	49,546	16,960	16,304	82,787	287,636,173	34.2%
1982	4,585	23,842	8,161	7,846	39,838	66,606,818	34.2%
1983	1,883	9,792	3,352	3,222	16,361	11,234,161	34.2%
1984	3,995	20,774	7,111	6,836	34,712	50,567,743	34.2%
1985	6,905	35,906	12,291	11,816	59,996	151,066,223	34.2%
1986	7,327	38,100	13,042	12,538	63,663	170,095,329	34.2%
1987	5,563	28,928	9,902	9,519	48,336	98,052,377	34.2%
1988	8,560	44,512	15,237	14,648	74,376	232,160,074	34.2%
1989	8,986	**40,329**	**5,646**	**30,936**	**56,995**	**29,069,351**	**14.0%**
1990	12,077	**52,142**	**9,326**	**37,072**	**80,784**	**52,507,414**	**17.9%**
1991	9,929	51,645	17,674	16,991	86,271	312,356,844	34.2%
1992	10,745	55,889	19,126	18,387	93,361	365,807,701	34.2%
1993	12,713	66,125	22,629	21,754	110,461	512,077,977	34.2%
1994	9,299	48,368	16,552	15,912	80,797	273,975,987	34.2%
1995	7,971	**33,805**	**5,060**	**25,455**	**64,388**	**22,873,263**	**15.0%**
1996	18,576	**79,019**	**9,048**	**64,388**	**99,866**	**124,224,399**	**11.5%**
1997	13,201	**114,938**	**17,888**	**88,593**	**157,717**	**319,980,544**	**15.6%**
1998	5,969	31,039	10,625	10,214	51,864	112,886,800	34.2%
1999	3,951	**19,734**	**3,957**	11,978	27,490	**15,657,849**	**20.1%**
2000	5,772	**30,529**	**5,417**	19,912	41,146	**29,343,889**	**17.7%**
2001	5,040	**42,980**	**6,477**	30,285	55,675	**41,951,529**	**15.1%**
2002	8,089	**52,409**	**10,958**	30,931	73,887	**120,077,764**	**20.9%**
2003	5,481	**36,435**	**6,409**	23,873	48,997	**41,075,281**	**17.6%**
2004	9,138	**68,199**	**9,189**	50,189	86,209	**84,437,721**	**13.5%**
2005	3,981	**38,806**	**4,528**	29,931	47,681	**20,502,784**	**11.7%**
				Preliminary M-R estimates			
Averages	7,010	40,043					
Minimum	1,883	10,248					
Maximum	18,576	114,938					
$\bar{\pi}$		5.20					
SE $\bar{\pi}$		1.78					
var $\bar{\pi}$		3.168400					

Appendix B10.–Peak survey counts, estimated total spawning abundance $\hat{N}_L$ with associated SE's and approximate 95% CI's for large Chinook salmon spawning in the Alsek River, 1976–2005.

Year	Weir Counts [a]	$\hat{N}_L$	SE ($\hat{N}_L$)	Lower 95% CI	Upper 95% CI	v $\hat{N}_L$	CV
1976	5,765	2,360	1,140	10,389	1,382	5,567,461	40.9%
1977	10,496	4,296	2,076	18,917	2,517	18,458,142	40.9%
1978	11,754	4,811	2,324	21,183	2,819	23,146,064	40.9%
1979	18,670	7,642	3,692	33,648	4,477	58,396,875	40.9%
1980	8,077	3,306	1,597	14,557	1,937	10,929,596	40.9%
1981	8,327	3,408	1,646	15,007	1,997	11,615,649	40.9%
1982	9,174	3,755	1,814	16,534	2,200	14,100,518	40.9%
1983	11,028	4,514	2,181	19,875	2,645	20,374,823	40.9%
1984	7,494	3,068	1,482	13,507	1,797	9,410,168	40.9%
1985	5,758	2,357	1,139	10,378	1,381	5,554,894	40.9%
1986	9,981	4,085	1,974	17,988	2,394	16,690,357	40.9%
1987	11,395	4,664	2,253	20,536	2,733	21,752,667	40.9%
1988	8,227	3,367	1,627	14,827	1,973	11,339,073	40.9%
1989	9,105	3,727	1,800	16,409	2,183	13,887,877	40.9%
1990	8,794	3,599	1,739	15,848	2,109	12,955,269	40.9%
1991	12,722	5,207	2,516	22,928	3,051	27,115,966	40.9%
1992	5,519	2,259	1,091	9,946	1,323	5,102,791	40.9%
1993	12,688	5,193	2,509	22,867	3,043	26,970,377	40.9%
1994	12,312	5,039	2,435	22,189	2,952	25,395,683	40.9%
1995	25,322	10,365	5,007	45,637	6,072	107,427,633	40.9%
1996	14,443	5,912	2,856	26,030	3,464	34,949,232	40.9%
1997	12,697	5,197	2,511	22,883	3,045	27,008,922	40.9%
1998	**4,969**	**1,431**	2,164	7,774	1,131	3,723,801	28.8%
1999	**13,617**	**4,427**	4,940	22,294	1,918	10,719,237	32.5%
2000	**6,835**	**1,678**	3,546	10,124	1,263	4,650,300	24.6%
2001	**6,111**	**805**	4,533	7,689	1,679	8,210,439	13.2%
2002	**5,396**	**714**	3,997	6,795	2,237	14,580,748	13.2%
2003	**4,782**	**534**	3,735	5,829	1,416	5,843,285	11.2%
2004	**6,995**	**556**	5,905	8,085	2,481	17,926,084	7.9%
2005	4,462	1,826	882	8,042	1,070	3,335,472	40.9%
Averages	2,356	9,764					
Minimum	1,070	4,462					
Maximum	6,072	25,322					
$\bar{\pi}$		4.17					
SE $\bar{\pi}$		1.710					
var $\bar{\pi}$		2.913330					

[a] Weir count includes immediate harvest below weir times proportion of large fish at weir.

APPENDIX C.

Appendix C1.–Computer files used to complete this report.

File Name	Description
TOTALCHTS.XLs	Excel workbook with tables and charts with annual counts for each index area.
SUMVER05.XLS	Appendix Table A2, with expanded escapement totals for Southeast Alaska.
ESCAP2005.XLS	Table 1. Estimated Chinook escapement in 2005.
GOALS.XLS	Appendix Table A1. Expanded goals for Southeast Alaska.
AGELENGTHSEAK2005.XLS	Appendix Table A4-A7. Length and age summaries for 2005.
PahlkeCWTrecovs_05.xls	Coded wire tag recoveries.
ALSEKESC.XLS	Calculation of historical total escapement of Alsek River Chinook based on latest expansion factor.
Total escs with SE.xls	Calculations of total escapements with standard errors, includes estimates of average EF and variance around them.