YUKON RIVER SALMON 2012 SEASON SUMMARY AND 2013 SEASON OUTLOOK

Prepared by

THE UNITED STATES AND CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

March 2013
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Alaska Department of Fish and Game
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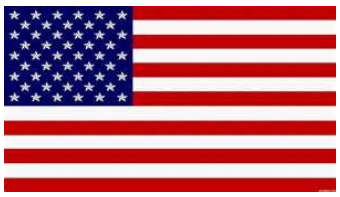

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, Special Publications and the Division of Commercial Fisheries Regional Reports. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

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 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)

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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The Regional Information Report Series was established in 1987 and was redefined in 2007 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as area management plans, budgetary information, staff comments and opinions to Alaska Board of Fisheries proposals, interim or preliminary data and grant agency reports, special meeting or minor workshop results and other regional information not generally reported elsewhere. Reports in this series may contain raw data and preliminary results. Reports in this series receive varying degrees of regional, biometric and editorial review; information in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author or the Division of Commercial Fisheries if in doubt of the level of review or preliminary nature of the data reported. Regional Information Reports are available through the Alaska State Library and on the Internet at: http://www.adfg.alaska.gov/sf/publications/

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1.0 ABSTRACT

The Joint Technical Committee (JTC) of the United States and Canada serves as a scientific advisory body to the Yukon River Panel. The JTC discusses harvest and escapement goals, management trends, postseason reviews, preseason outlooks, and results of cooperative research projects. This report summarizes the status of Chinook *Oncorhynchus tshawytscha*, coho *O. kisutch*, and summer and fall chum salmon *O. keta* stocks in 2012, presents an outlook for the 2013 season, and provides data on salmon harvests in commercial, subsistence, aboriginal, personal use, domestic, and sport/recreational fisheries. Summaries of Yukon River research projects (e.g., sonar, weir, stock identification), a review of marine fisheries and research pertinent to Yukon River salmon, and a summary of Restoration and Enhancement Fund (R&E) projects are also included. The preliminary 2012 estimate of Chinook salmon escapement in Canada was about 33,000 fish, falling below the goal range of 42,500–55,000 fish. Preliminary harvest estimates were about 26,000 Canadian origin Chinook salmon for subsistence in Alaska and 2,200 Chinook salmon for Yukon Territory aboriginal fisheries. For fall chum salmon, the preliminary 2012 drainagewide total run size estimate was 963,000 fish, based on the postseason expanded escapement and estimated harvest. The escapement goal range for chum salmon in Canada was 70,000 to 104,000 fish and the preliminary 2012 estimate for fall chum salmon escapement in the Yukon River mainstem in Canada was about 138,000 fish, exceeding the upper end of the goal range. The total commercial harvest (including commercial related) of fall chum salmon in Alaska was 289,000 fish, the largest harvest since 1995. By preliminary estimate, the Alaska subsistence harvest of fall chum salmon was 94,000 fish. The Canadian commercial harvest was 3,205 fall chum salmon and the aboriginal harvest was about 4,000 fish. Recommended Yukon River escapement goals for Chinook, chum, and coho salmon in 2013 remain unchanged from 2012.

Keywords: Yukon watershed, Yukon River Salmon Agreement, Chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, coho salmon *O. kisutch*, escapement, season outlook.

2.0 INTRODUCTION

The United States (U.S.) and Canada Yukon River Joint Technical Committee (JTC) was established in 1985 and serves as a scientific advisory body to the Yukon River Panel. The JTC meets semi-annually to discuss harvest and escapement goals, management trends, preseason outlooks and postseason reviews, and results of cooperative research projects.

The fall JTC meeting was held November 14 and 15, 2012 in Vancouver, British Columbia. The meeting was attended by 11 U.S. and 7 Canadian members, 1 U.S. advisor who teleconferenced on a specific topic, and 2 members of the Pacific Salmon Commission staff. In addition, the 2 new co-chairs of the Yukon River Panel attended part of the meeting for orientation purposes.

U.S.[1] and Canadian[2] members of the JTC provided postseason fishery reviews on management, stock assessment, harvests, and escapement. Updates were provided on salmon by-catch in the Bering Sea and Gulf of Alaska trawl fisheries, marine research surveys[3], and research projects conducted within the Yukon River drainage[4]. Because habitat and juvenile salmon production are important topics for the Restoration and Enhancement (R&E) fund, a special session was devoted to those topics. Presentations included Canadian Yukon habitat research[5], a guest presentation on juvenile Chinook *Oncorhynchus tshawytscha* production and habitat

[1] Stephanie Schmidt, Bonnie Borba (Alaska Department of Fish and Game)

[2] Mary Ellen Jarvis, Elizabeth MacDonald (Department of Fisheries and Oceans Canada)

[3] Jim Murphy (U.S. National Oceanic and Atmospheric Administration)

[4] Casie Stockdale (Association of Village Council Presidents); Alyssa Frothingham (Tanana Chiefs Conference); Chris Stark (Bering Sea Fishermen's Association); Caroline Brown (Alaska Department of Fish and Game); Aaron Martin (U.S. Fish and Wildlife Service)

[5] Sean Collins (Department of Fisheries and Oceans Canada)

considerations[6], and a graduate research project on in-migration studies of under-yearling Chinook salmon in a non-natal creek in the upper Yukon River[7].

Subcommittee work reported during the November 2012 meeting included updates on efforts to determine priority areas for escapement monitoring in Canada and to develop statistical corrections for historical Chinook salmon age composition with probable sampling bias. Genetics, mesh size, and *Ichthyophonus* subcommittees were tasked with continuing ongoing monitoring and bringing new information and research needs to the attention of the JTC when warranted. Another subcommittee worked during the interim to develop standard protocols, called "Terms of Reference," for the JTC.[8]

Conceptual proposals for the Restoration and Enhancement Fund (R&E) were reviewed prior to the meeting by the R&E subcommittee, and the results were presented to and reviewed by the full JTC.

Fall meeting attendance:

Steve Smith (JTC Co-Chair), Department of Fisheries and Oceans Canada (DFO)
Marc Labelle, DFO
Mary Ellen Jarvis, DFO
Trix Tanner, DFO
Bonnie Huebschwerlen, DFO
Sean Collins, DFO
Elizabeth MacDonald, DFO
Jan Conitz (JTC Co-Chair), Alaska Department of Fish and Game Division of Commercial Fisheries (ADF&G-CF)
Stephanie Schmidt, ADF&G-CF
Bonnie Borba, ADF&G-CF
Steve Hayes, ADF&G-CF
Caroline Brown, ADF&G Division of Subsistence
Aaron Martin, U.S. Fish and Wildlife Service (USFWS)
Randy Brown, USFWS
Jim Murphy, National Ocean and Atmospheric Administration (NOAA)
Casie Stockdale, Association of Village Council Presidents (AVCP)
Alyssa Frothingham, Tanana Chiefs Conference (TCC)
Chris Stark, Bering Sea Fishermen's Association (BSFA)
Toshihide Hamazaki (by teleconference November 15 session only), ADF&G-CF

The spring JTC meeting was held February 26–28, 2013 in Vancouver, British Columbia. The 2013 preseason outlooks for drainagewide and Canadian-origin stocks were presented, along with updated run estimates from 2012. Information about the recently concluded Alaska Board of Fisheries (BOF) Arctic-Yukon-Kuskokwim Region meeting was provided. The 2013 border escapement goals for Chinook and fall chum salmon *O. keta* were discussed and did not change

[6] Mike Bradford (Department of Fisheries and Oceans Canada and Cooperative Resource Management Institute, Simon Fraser University)
[7] Steve Smith (Department of Fisheries and Oceans Canada); all presentation copies available from JTC members.
[8] Initially, these were to be bylaws, but the JTC determined that terms of reference was a more appropriate format according to the Yukon River Salmon Agreement.

because new analyses have not yet been conducted. The JTC discussed goals, objectives, timelines, and available data for those new escapement goal analyses at the spring 2013 meeting.

Prior to the spring 2013 JTC meeting, the R&E subcommittee met to finalize their review of Detailed Proposals for the R&E Fund and their results were presented to the full JTC. JTC members had the opportunity to review the R&E Detailed Proposals and participated in making recommendations to the Panel.

Spring meeting attendance:

Steve Smith, JTC Co-Chair; DFO
Mary Ellen Jarvis, DFO
Bonnie Huebschwerlen, DFO
Sean Collins, DFO
Elizabeth MacDonald, DFO
Jan Conitz, JTC Co-Chair; ADF&G-CF
Dan Bergstrom, ADF&G-CF
Stephanie Schmidt, ADF&G-CF
Bonnie Borba, ADF&G-CF
Caroline Brown, ADF&G Division of Subsistence
Aaron Martin, USFWS
Randy Brown, USFWS
Jim Murphy, NOAA
Casie Stockdale, AVCP
Alyssa Frothingham, TCC

Alaskan and Canadian researchers have developed projects to monitor escapement and to determine genetic composition, relative abundance, run characteristics, and other information to characterize the annual salmon migration. Main river sonar, tributary sonar, weir, counting tower projects and aerial surveys are used to monitor escapement. Other information collected at ground based projects may include, but is not limited to, salmon sex and length composition, scales for age determination, tissue samples for genetic stock identification, data on resident species, and information from recovery of tagged fish from various projects. Various government agencies, non-government organizations, and private contractors operate projects throughout the drainage (Appendices A7 and A8).

Summaries of these projects and information used to assess escapement and stock status and provide run outlooks are presented in this report. Much of the information from the 2012 season should be considered preliminary. Although most data sets have been fully compiled and most analyses completed prior to publication of this report, the ADF&G Yukon Area Annual Management Report series (e.g. Estensen et al. 2012, and http://www.adfg.alaska.gov/sf/publications/) and other published sources should be consulted for definitive documentation of postseason information.

3.0 ALASKA MANAGEMENT OVERVIEW

3.1 CHINOOK AND SUMMER CHUM SALMON

The Yukon River drainage is divided into fishery districts and subdistricts for management purposes (Figure 1). ADF&G uses an adaptive management strategy that evaluates run strength inseason to determine a harvestable surplus above escapement requirements and subsistence uses. Preseason, a management strategy is developed, in cooperation with federal subsistence managers, fishermen, tribal council representatives, and other stakeholders, that outlines run and harvest outlooks along with the regulatory subsistence salmon fishing schedule. Additionally, an informational flyer is distributed to the public to prepare fishermen for possible reductions to the subsistence salmon fishing schedule, or to allow for a small commercial fishery contingent on run abundance. The informational flyers are mailed to Yukon River commercial permit holders and approximately 2,900 families identified from ADF&G's survey and permit databases. State and federal staff presents the management strategy to the Yukon River Drainage Fisheries Association (YRDFA), Tanana Chiefs Conference, State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected parties. Before implementing the schedule, subsistence fishing is allowed 7 days a week to provide opportunity to harvest non-salmon species, such as whitefish *Coregonus*, sheefish *Stenodus leucichthys*, pike *Esox lucius*, and suckers *Catostomus catostomus*.

2012 Chinook Salmon Outlook

The expected total Yukon River run size in 2012 was projected to be 193,300[9] fish. However, a run this large was considered unlikely due to model uncertainty and limitations and low productivity in recent years. Model performance each year was analyzed by comparing the expected number of Chinook salmon returning each year based on each model against the actual number of Chinook salmon returning. A correction factor was derived using the average model performance in the past 5 years and applied to the model estimates for 2012. Using this correction factor, the drainagewide run outlook was adjusted to 109,000–146,000 Chinook salmon.

Preseason Management Strategy Planning

Before the 2012 season, ADF&G developed a preseason management strategy with input from USFWS, fishermen, tribal council representatives, and other stakeholders to prepare for the poor run outlook. ADF&G and USFWS staff distributed an informational flyer describing inseason management approaches that were identified for the 2012 Yukon River salmon fisheries. The basis of the preseason strategy was that fishermen and managers entered the 2012 season understanding the prospect that conservation measures would be necessary to share the available subsistence harvest and meet escapement goals. Conservation measures included several management actions.

The subsistence salmon fishing schedule was to begin May 31 in District 1 and be implemented chronologically with the upriver migration until the salmon run size was projected to be of sufficient strength to warrant relaxing, or it became apparent additional conservation measures

[9] Based on the average value for both sibling and Ricker models. Individual values for the Ricker and sibling models were 212,180 and 174,300 respectively. Model estimates are based on the Canadian run component which is then expanded drainagewide under the assumption that the Canadian component is 50% of run.

were necessary. Subsistence fishing was open 7 days per week until the schedule was established. The subsistence salmon fishing schedule was based on current or past fishing schedules that provided reasonable opportunity for subsistence salmon fishing during years of normal to below average runs. The objectives of the schedule were to: 1) reduce harvest early in the run when there is a higher level of uncertainty, 2) spread the harvest throughout the run to reduce harvest impacts on any particular component of the run, and 3) distribute subsistence fishing opportunity among all users during years of low salmon runs. Table 1 shows the 2012 subsistence fishing schedule based in regulations 5 AAC 01.210 and 5 AAC 05.360.

Table 1.–Yukon Area regulatory subsistence salmon fishing schedule, 2012.

Note: this schedule was subject to change depending on run strength.

Area	Regulatory Subsistence Fishing Periods	Approximate Schedule to Begin	Open Fishing Times
Coastal District	7 days/week	All Season	M/T/W/TH/F/SA/SU – 24 hours/day
District Y-1	Two 36-hour periods/week	31-May	Mon. 8 pm to Wed. 8 am /Thu. 8 pm to Sat. 8 am
District Y-2	Two 36-hour periods/week	3-Jun	Wed. 8 pm to Fri. 8 am / Sun. 8 pm to Tue. 8 am
District Y-3	Two 36-hour periods/week	6-Jun	Wed. 8 pm to Fri. 8 am / Sun. 8 pm to Tue. 8 am
Subdistrict Y-4-A	Two 48-hour periods/week	10-Jun	Sun. 6 pm to Tue. 6 pm / Wed. 6 pm to Fri. 6 pm
Subdistricts Y-4-B, C	Two 48-hour periods/week	17-Jun	Sun. 6 pm to Tue. 6 pm / Wed. 6 pm to Fri. 6 pm
Koyukuk and Innoko Rivers	7 days/week	All Season	M/T/W/TH/F/SA/SU – 24 hours/day
Subdistricts Y-5-A, B, C	Two 48-hour periods/week	22-Jun	Tue. 6 pm to Thu. 6 pm /Fri. 6 pm to Sun. 6 pm
Subdistrict Y-5-D	7 days/week	All Season	M/T/W/TH/F/SA/SU – 24 hours/day
Subdistrict Y-6	Two 42-hour periods/week	All Season	Mon. 6 pm to Wed. Noon /Fri. 6 pm to Sun. Noon
Old Minto Area	5 days/week	All Season	Friday 6 pm to Wednesday 6 pm

According to the preseason management plan, the fishing schedule was to be altered to conserve Chinook salmon. Beginning in District 1, one fishing period would be closed (approximately 5-day closure) on the first pulse of salmon and this action would be similarly implemented in upriver fishing districts and subdistricts based on migratory timing. If inseason assessment indicated Chinook salmon run strength continued to be poor after closing the first period, an additional period could be closed or subsistence fishing time could be reduced further on the second pulse of Chinook salmon. These changes to the subsistence schedule were to be announced by short notice news releases on VHF, radio stations, and YRDFA teleconferences.

Due to the considerable travel time that is associated with fish migrating through Subdistrict 4-A and Subdistrict 5-D these areas would be divided into smaller management portions. This strategy provides more management precision and flexibility when implementing a reduced subsistence fishing schedule. Additionally, the Tanana River fisheries would be managed to meet Chinook salmon escapement goals for the Chena and Salcha rivers.

A surplus of summer chum salmon was anticipated above escapement and subsistence needs. However, the extent of a directed chum salmon commercial fishery would be dependent upon the strength of the Chinook salmon run. It was anticipated that the sale of incidental Chinook salmon harvested during summer chum salmon commercial fishing periods would be prohibited.

Inseason Run Assessment

The U.S. management agencies (ADF&G; USFWS) monitor a suite of assessment projects that provide critical salmon run timing, relative abundance, and stock composition information. Information from multiple assessment projects are corroborated when available to provide the best possible assessment.

Initial assessment in the lower river is critical to implementing an inseason management plan to operate an orderly fishery throughout the drainage. Four projects in the lower river provided inseason abundance and timing information: the Lower Yukon test fishery (LYTF), a set gillnet project using 8.5 inch mesh primarily designed to assess Chinook salmon run timing operated near Emmonak; a summer chum salmon directed drift gillnet test fishery using 5.5 inch mesh; Mountain Village drift gillnet test fishery using 7.5 inch mesh; and Pilot Station sonar which provides mainstem abundance estimates for Chinook and summer chum salmon. As in recent years, additional drift test fishing was conducted throughout the 2012 season in the South Mouth with 8.25 inch mesh drift gillnets for Chinook salmon to provide supplemental run timing and relative abundance information.

Ice break up in the lower river occurred on May 25. This break up date was later than the average of May 23. However, coastal ice was still present near the river mouths until around June 20. In the lower river, the water level continued to be high and the debris load moderate until the middle of June. The LYTF was operational at the South Mouth site on May 28 and at the Middle Mouth site on June 4. The Chinook salmon run appeared to be late as indicated by low catch rates recorded by LYTF and reports from subsistence fishermen. The persistent coastal ice was thought to be delaying the entry of salmon into the river. The first pulse of Chinook salmon was observed in the LYTF project on June 24–26. A second pulse on June 28 through July 2, a third pulse on July 2–4, and a fourth pulse on July 6–8. The LYTF project finished with a cumulative CPUE of 7.09, which was the lowest on record and well below the historical average of 22.24 (Figure 2). The first quarter point, midpoint, and third quarter point were June 26, July 2, and July 7, which were 9 to 11 days later than the 1989–2011 average dates. The Chinook salmon drift gillnet project operated in Big Eddy until July 15 and provided valuable supplemental assessment information to the Big Eddy LYTF.

The Pilot Station sonar project preliminary cumulative passage estimate was 106,700 Chinook salmon, which was below the historical average[10] of 148,000 fish, and below the average of late run years of 134,000 fish. Chinook salmon run assessment analysis was focused on making comparisons to other late run years in order to make informed management decisions. The first quarter point, midpoint, and third quarter point were on June 24, June 28, and July 2 respectively. Note that although salmon runs progress from the LYTF sites to Pilot Station over several days, all 3 Pilot Station quarter point dates were earlier in 2012 than those from LYTF. This is due to the fact the quarter point dates for each assessment project are relative to the

[10] Average includes years 1995, 1997, 1999, 2002-2008, and 2010. The sonar did not operate in 1996 and project difficulties occurred in 2000, 2001, and 2009.

cumulative total for that project. The sonar assessment provided an estimate for the first pulse of Chinook salmon of approximately 16,800 fish. The estimate for the second pulse was about 42,600 fish. The estimate for the third pulse was about 9,000 fish and the estimate for the fourth pulse came in around 9,500 fish.

Inseason genetic mixed stock analysis (MSA) on the first pulse of Chinook salmon past LYTF (June 11–25) and Pilot Station sonar (June 10–25) revealed that 45% were Canadian-origin Chinook salmon. Genetic MSA on the second and third pulses of Chinook salmon past Pilot Station sonar (June 26–30 and July 1–7, respectively) revealed that approximately 47% and 45%, respectively, were Canadian-origin Chinook salmon, suggesting the Canadian run size was weak and similar to 2008 and 2010. Background information on MSA for Yukon River Chinook salmon can be found on ADF&G's Gene Conservation Laboratory webpage: http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.yukonchinook_results.

Chinook Salmon Inseason Management

YRDFA facilitated weekly teleconferences to provide managers, fishermen, tribal council representatives, and other stakeholders the opportunity to share information, provide input, and discuss inseason management options. During these weekly teleconferences, ADF&G and USFWS staff provided run assessment and management strategies. Subsistence fishermen provided reports on fishing efforts and water conditions, and were encouraged to provide input on management strategies.

Based on historical run timing information, the first pulse of Chinook salmon was expected to be migrating past the southern portion of the Coastal District during the second week of June. In order to provide protection to Chinook salmon migrating along the coastline to the Yukon River Mouth, gillnet fishing gear was restricted to 6 inch or smaller mesh size June 6 through June 12 in the southern portion of the Coastal District. However, the Chinook salmon run appeared to be tracking later than average. In response to the slowly developing Chinook salmon run, gillnet gear was restricted to 6 inch or smaller mesh in Districts 1 and 2 beginning June 18 and June 20 respectively. Based on inseason information, a subsistence salmon fishing period was cancelled to protect the first pulse beginning in District 1 on June 20 and implemented chronologically as the pulse migrated upriver.

As the run further developed inseason assessment information indicated that the Chinook salmon run size would likely be near or below the lower end of preseason projection (109,000–146,000). Consequently, it became apparent that further conservation measures would be required to meet escapement goals. The southern portion of the Coastal District was restricted to 6 inch or smaller mesh size for the remainder of the season. In the northern portion of the Coastal District, as well as Districts 1 through 5 a second pulse closure was implemented immediately following the first pulse closure. This created a continuous closure on both the first and second pulses. The second pulse closure was followed by a short subsistence fishing period restricted to gillnet mesh size of 6 inch or less, in Districts 1 through 4. These reduced subsistence periods and gear size limitation were implemented to provide fishermen opportunity to harvest summer chum salmon while conserving Chinook salmon.

Based on migratory timing, the continuous closure of both the first and second pulses began July 12 in lower Subdistrict 5-D (Figure 3). The middle and upper Subdistrict 5-D areas were are also closed as the fish migrated through the area, beginning on July 15 and July 17 respectively. Unfortunately, due to the low passage numbers at the Eagle sonar, it was necessary to further

restrict all of Subdistrict 5-D in an attempt to meet the agreed to interim management escapement goal (IMEG) for the Canadian stock. After allowing one short, 36-hour, subsistence salmon fishing period in each area of Subdistrict 5-D, subsistence salmon fishing was again closed in Subdistrict 5-D for the remainder of the summer season. Subsistence closures were most pronounced in Subdistrict 5-D, as management options such as gear restrictions could not be implemented to allow harvest of other salmon. Alternatives are limited, unlike the lower river areas, because very few summer chum salmon migrate through the upper Yukon River above the confluence of the Tanana River and pink salmon typically only migrate through the Anvik River area in any numbers.

Conservative management actions were also taken in Yukon River tributaries, in an effort to provide protection for Alaska Chinook salmon stocks. Gillnets were restricted to 6 inches or smaller mesh size in the Innoko River from June 24 through July 18 and in the Koyukuk River from July 3 through 22.

In the Tanana River, Subdistricts 6-A and 6-B including the Old Minto Area, subsistence salmon fishing gear was restricted to fish wheels which had to be equipped with a live chute[11], the fish wheel had to be attended at all times while in operation, and all Chinook salmon caught had to be returned to the water alive, preferable directly from an extension of the basket chute. These restrictions were in effect from July 20 through July 25. Personal use salmon fishing in Subdistrict 6-C was closed from July 20 through July 29.

In response to a poor Chinook salmon run and the need to fulfill the Canadian border passage objective based upon the IMEG, meet Alaska escapement needs, and provide for subsistence uses, no commercial periods targeting Chinook salmon were allowed in 2012 in the Yukon River mainstem or in the Tanana River (Appendix B2). The sale of incidentally caught Chinook salmon was not allowed by emergency order during the summer season because subsistence fishing had been restricted in Districts 1-5. This action helped ensure fishermen would not target Chinook salmon during commercial fishing periods. Fishermen could release any incidentally caught live Chinook salmon or use them for subsistence purposes. It was required to report on fish tickets any Chinook salmon caught but not sold. In Districts 1–2, fishermen could also donate them to Kwik'Pak Fisheries, the local processor who would process the fish and deliver them to communities upriver that wanted them for subsistence use for free.

The 2012 Canadian-origin Chinook salmon run of approximately 49,000 fish was below the preseason projection of 54,500–72,000 fish. The estimated escapement to the Canadian mainstem was also below the IMEG of 42,500–55,000 Chinook salmon and did not provide for Canadian harvest shares.

Summer Chum Salmon Outlook

The strength of the summer chum salmon run in 2012 was dependent on production from the 2008 (age-4 fish)[12] and 2007 (age-5 fish) escapements, as these age classes dominate the run. The 2012 preseason run outlook was for a runs size of approximately 1.5 million to 2.0 million summer chum salmon. This summer chum salmon run size was anticipated to provide for escapements, a normal subsistence harvest, and a potential commercial harvest of 500,000 to

[11] The live chute is a secondary, hand-operated chute designed to return fish directly to the water with minimum impact, rather than landing with harvested fish in the holding pen or "dead box."

[12] Ages of salmon in this report are presented as total age, from egg-in-gravel to return as spawner, rather than the commonly used decimal (European) notation indicating freshwater and saltwater years.

1,000,000 summer chum salmon. However, the actual commercial harvest of summer chum salmon in 2012 was affected by the poor Chinook salmon run, because Chinook salmon are incidentally harvested in chum salmon directed fisheries.

Summer Chum Salmon Inseason Management

The Yukon River summer chum salmon run was managed according to the guidelines described in the *Yukon River Summer Chum Salmon Management Plan* (Appendix A1). The management plan provided for escapement needs and subsistence use priority before other consumptive uses such as commercial, sport, and personal use fishing. The plan allowed for varying levels of harvest opportunity depending on the run size projection. ADF&G uses the best available data to assess the run including: preseason run outlooks, Pilot Station sonar passage estimate, test fishing indices, age and sex composition, subsistence and commercial harvest reports, and information from escapement monitoring projects.

The 2012 summer chum salmon run comprised approximately 2.1 million fish passing Pilot Station sonar, which was above the historical median of 1.4 million for the project. The first quarter point, midpoint, and third quarter point were June 24, June 29, and July 5, respectively.

The summer chum salmon drift gillnet project in the Lower Yukon River indicated pulses entering the mouth beginning approximately June 13, June 20, June 23, June 26 and July 2. The largest of these pulses passed Pilot Station sonar from June 27 through July 1 and contained approximately 600,400 summer chum salmon.

The summer chum commercial salmon fishery was delayed until the midpoint of the Chinook salmon run to reduce incidental harvest of Chinook salmon. At that time, a harvestable surplus of summer chum salmon had been identified and a total run size of approximately 2 million summer chum salmon was projected based on Pilot Station sonar. The first summer chum salmon directed commercial periods took place June 29 in District 1 and July 2 in District 2. Gillnet gear was restricted to 6 inch or smaller mesh throughout the commercial season. Concurrent subsistence and commercial fishing periods in Districts 1 and 2 were instituted intermittently throughout the season, primarily early in the summer chum salmon commercial season when the subsistence schedule was still in effect. The intent of these concurrent openings was to streamline commercial and subsistence fishing into a single event harvest, therefore reducing the amount of time that Chinook salmon were susceptible to harvest. The department took further measures to provide commercial summer chum salmon harvest opportunities while still protecting Chinook salmon. Using inseason assessment and run timing information, portions of districts that indicated a low abundance of Chinook salmon were opened to summer chum salmon directed commercial fishing. Moreover, commercial fishing was limited to areas and or times in which incidental harvest rates of Chinook salmon were anticipated to be low. The area opened to commercial fishing in periods 1–8 in District 1 was restricted to the South Mouth only (Figure 4). The remaining areas within District 1 were closed. This action was taken because Chinook salmon abundance was low in the South Mouth and Chinook salmon were entering the river primarily through the North and Middle mouths at this point in the season. Unfortunately, this strategy of limiting the area open to commercial fishing to minimize the incidental harvest of Chinook salmon was more difficult to implement in District 2. As the Yukon River becomes more channelized in this area, salmon that enter from each of the mouths are present. Three of the commercial fishing periods in District 2 were limited to 2 separate areas. In period 1, commercial fishing was open from the confluence of the Andreafsky and the Yukon River

mainstem downriver to the District 1 and District 2 boundary line at the Anuk River. In periods 2 and 3 commercial fishing was open from the slough at the community of Pilot Station downriver to the District 1 and District 2 boundary line at the Anuk River. The department scheduled 10 commercial fishing periods in District 1 and 6 in District 2.

The preliminary cumulative summer chum salmon commercial harvest for Districts 1 and 2 combined was 207,849 fish (Appendix A3). A total of 2,421 Chinook salmon were reported incidentally harvested in Districts 1 and 2 during the summer season. The prohibition of Chinook salmon sales continued through the fall season. A total of 103 Chinook salmon were caught but not sold in the fall season. Genetic MSA of incidentally caught Chinook salmon in the summer chum salmon commercial fishery revealed approximately 30% of the Chinook salmon caught were of Canadian-origin.

In Subdistrict 4-A, one buyer operated out of Kaltag and targeted summer chum salmon. New regulations adopted by the BOF in March 2012 allowed ADF&G to open summer chum salmon directed commercial fishing periods in Subdistrict 4-A, during times of Chinook salmon conservation, with fish wheels only. Fish wheels had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. The preliminary cumulative summer chum salmon harvest for Subdistrict 4-A was 108,222 fish (Appendix A3), of which most were females, as most males were returned to the water alive. Thirteen periods were implemented with a total of 552 fishing hours. The summer chum salmon commercial harvest was the largest in District 4 since 1999 (Estensen et al. 2012). At no time during this fishery were Chinook salmon allowed to be sold or kept for subsistence purposes. A total of 59 Chinook salmon were reported caught and released alive back to the water.

District 6 was managed using inseason assessment information provided by multiple escapement projects operated in the Tanana River drainage. However, a harvestable surplus of summer chum salmon was primarily identified based on abundance estimates and genetic information from lower river assessment projects as well as indications from subsistence harvest information and local CPUE. Based upon this surplus and market interest, ADF&G scheduled the first commercial fishing period to target summer chum salmon in District 6 on July 20. The BOF met by teleconference on July 17 to consider an emergency petition regarding an amendment to the *Yukon River Summer Chum Salmon Management Plan* (5 AAC 05.3 62). The BOF adopted an emergency regulation only for the 2012 season specifying that during the summer chum salmon season in District 6, in order to conserve Chinook salmon only fish wheels could be used. Fish wheels had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. ADF&G used this regulation for the initial 3 commercial fishing periods in District 6. There were 7 commercial periods opened and the preliminary cumulative harvest was 3,504 summer chum salmon (Appendix A3). No Chinook salmon were allowed to be sold. A total of 24 Chinook salmon were recorded on fish tickets as caught but not sold and taken home for subsistence use.

The total commercial harvest for Yukon Area combined was 319,575 summer chum salmon (Appendix A3), which is 163% above the 2002–2011 average harvest of 121,637 fish (Appendices B3 and C3).

3.2 FALL CHUM AND COHO SALMON

Management of the Yukon Area fall season commercial salmon fisheries is in accordance with the *Policy for the Management of Sustainable Salmon Fisheries* 5 ACC 39.222, The *Yukon River Drainage Fall Chum Salmon Management Plan* 5 ACC 1.249, The *Yukon River Coho Salmon Management Plan* 5 ACC 05.369, and the *Tanana River Salmon Management Plan* 5 AAC 05.367. The threshold number of fall chum salmon needed to prosecute a commercial fishery is 500,000 fish (Appendix A5) and commercial fishing is generally allowed only on the surplus above that level. The fall chum salmon plan incorporates U.S./Canada treaty objectives for border passage of fall chum salmon and provides guidelines necessary for escapement and prioritized uses. The intent of the plan is to align management objectives with the established escapement goals, provide flexibility in managing subsistence harvests when stocks are low, and bolster salmon escapement as run abundance increases. The sustainable escapement goal (SEG) range for the Yukon River drainage is 300,000 to 600,000 fall chum salmon. There are provisions in the plan to allow incremental levels of subsistence salmon fishing balanced with requirements to attain escapement objectives during low runs.

The coho salmon plan allows a coho salmon directed commercial fishery in the absence of achieving the threshold number of fall chum salmon if a harvestable surplus of coho salmon exists and a commercial fishery will not have a significant impact on fall chum salmon escapement and allocation.

Finally, under the Tanana River plan, commercial fishing in Subdistrict 5-A and District 6 is based on the assessment and timing of salmon stocks bound for the Tanana River drainage.

Fall Chum Salmon Management Overview

The fall season began by regulation on July 16 in lower river District 1. Based on a preseason projection of greater than 800,000 fall chum salmon, all areas were returned to their regulatory subsistence fishing schedules commensurate with switching over to fall management based on timing of fish migrating up river. The schedules were as follows: commercial fishing continued in Districts 1 and 2 and subsistence fishing was open 7 days a week except for 12 hours before, during, and 12 hours after commercial openings. Since there were no commercial openings scheduled, District 3 went to a 7 day a week subsistence schedule on July 18. District 4 went to a 5 day per week schedule beginning on July 25, Subdistricts 5-A, 5-B, and 5-C went on a 5 day per week schedule beginning on July 31, and Subdistrict 5-D was returned to a 7 days per week schedule beginning July 30. District 6 was on a two 42-hour periods per week regulatory schedule.

The first pulse of fall season chum salmon entered the Yukon River on July 16. Fall chum salmon continued to enter the Yukon River over 4 additional pulses through September 7. The pulses that entered through August 8 occurred regularly at a rate of about once a week (Figure 5). LYTF and Mt. Village drift test fisheries are also used for inseason assessment to provide timing and relative abundance along with Pilot Station passage estimates (Figure 6). In between pulses, daily passage of fall chum salmon past Pilot Station sonar project was steady with numbers mostly above 3,000 fish. Run assessment indicated there was a surplus available for commercial harvest and regular commercial fishing periods were scheduled in both Districts 1 and 2. A lull in daily fall chum salmon passage occurred from August 9 through August 18. This coincided with hot (12–18°C), dry, and calm weather in the lower Yukon River drainage. No commercial fishing periods were scheduled in Districts 1 and 2 during this time. The fifth and largest pulse

entered the Yukon River on August 16. From that point, run assessment continued to show a commercial surplus and regular commercial fishing periods in Districts 1 and 2 were scheduled throughout the remaining season. Commercial fishing periods were regularly scheduled in Subdistricts 4-A, 5-B, and 5-C from mid-August through early October, and in District 6 from September through early October. Finally, subsistence fishing was liberalized to 7 days a week, 24 hours a day on August 24 in District 4, on September 26 in Subdistricts 5-A, 5-B, and 5-C, and on September 28 in District 6.

Coho Salmon Management Overview

The first pulse of coho salmon entered Yukon River on August 16 (Figure 7 shows daily passage of coho salmon past Pilot Station sonar in 2012). There were 2 additional pulses of coho salmon through September 7. Pilot Station sonar passage estimates attributed to coho salmon were below average throughout the season. Coho salmon continued to enter Yukon River drainage after September 7 and were monitored at 2 lower river test fisheries but no additional pulses were observed. Coho salmon were harvested incidentally in fall chum salmon directed commercial openings. Because of their high incidental commercial harvest, coupled with below average passage, based on 2 test fisheries and Pilot Station sonar estimates, a coho salmon directed commercial fishery in the lower river in September was not prosecuted in 2012.

4.0 ALASKA HARVEST SUMMARIES

4.1 SUBSISTENCE SALMON FISHERY

Subsistence salmon fishing activities in the Yukon Area typically begin in late May and continue through early October; fishing opportunity in the lower river area in May and in the upper river area in October is highly dependent upon river ice conditions. Throughout the drainage, most Chinook salmon harvested for subsistence use are dried, smoked, or frozen for later human consumption. Summer chum, fall chum and coho salmon harvested in the lower river area are primarily utilized for human consumption and are also dried, smoked, or frozen for later use. In the upper river area summer chum, fall chum, and coho salmon are all an important human food source, but a larger portion of the harvest is fed to dogs used for recreation and transportation (Andersen 1992).

Conservative management strategies were enacted throughout the Yukon River drainage to protect Chinook salmon in 2012; to some extent this affected the subsistence fishing opportunities for summer chum salmon as well. Management actions included reducing or cancelling subsistence fishing openings in a portion of the Coastal District, Districts 1–5, and Subdistrict 6-C. To improve management precision in larger districts such as the Coastal District, District 4, and Subdistrict 5-D, closures were implemented in portions of these districts when Chinook salmon were present while other portions of these districts were allowed to remain open. Additional actions included restricting gillnet mesh size to 6 inch or smaller and requiring fish wheels to be continuously manned during operation to allow for the release of Chinook salmon for several districts. Gear restrictions were enacted in order to allow for subsistence harvest of summer chum salmon while minimizing incidental Chinook salmon harvests. Some areas that do not normally see restrictions were either closed (Northern part of the Coastal District) or restricted to 6 inch or smaller mesh (Coastal District, Innoko River, Koyukuk River).

Apart from the poor Chinook salmon run, summer chum, fall chum and coho salmon runs were strong enough to support escapement, subsistence, and commercial fishing. Throughout the

summer and fall fishing seasons, additional subsistence fishing opportunities for non-salmon fish species were available during subsistence salmon period closures. Stipulations for harvesting non-salmon species required the use of gillnets with 4 inch or less stretch mesh and prohibition of fish wheel operation.

Poor Chinook salmon runs resulted in management actions that reduced subsistence salmon fishing opportunities during the summer season. The preliminary percentage of households meeting over 50% of their needs for each species in 2012 was greater than the recent 5 year average (2007–2011) for each species except for Chinook salmon. Of the households that answered survey questions in 2012 about whether their subsistence needs were met, the majority of households reported meeting over 50% of their needs for summer chum salmon (60% of households). Less than 40% of households that responded reported meeting over 50% of their needs for either fall chum 36% or coho salmon (31%). Only 29% of households that responded to the needs met question reported meeting over 50% of their needs for Chinook salmon, which was lower than reported in both 2010 and 2011.

Commonly cited reasons for not meeting needs included: not enough openings, fishing periods were too short, low Chinook salmon abundance or harvest opportunities, and that households did not have the right size of gillnet or other fishing equipment. Several fishermen reported they were unable to fish because they did not have gear meeting the 7.5 inch maximum mesh size regulation that took effect in 2011 or that met the additional restrictions to 6 inch mesh that occurred in some districts in 2012. Surveyed households mentioned other factors that contributed to the inability to meet subsistence salmon needs including high water and debris, expenses such as fuel, and health or other personal reasons.

Documentation of the subsistence salmon harvest is necessary to determine if sufficient salmon are returning to the Yukon Area for subsistence requirements and if enough fishing opportunities are provided to meet subsistence needs. In years with fishery restrictions, estimates of harvest can be used to assess the effect of the management actions taken to meet escapement goals for future salmon production. The primary method of estimating this harvest is voluntary participation in the annual subsistence salmon harvest survey program conducted by ADF&G in 33 communities in the fall, after most households have completed fishing for salmon (Jallen and Hamazaki 2012). Survey data are expanded to estimate total subsistence harvest in surveyed communities. Additional information on harvest timing is obtained from harvest calendars that are sent to households and filled out voluntarily (Jallen and Hamazaki 2012).

In portions of the upper Yukon and Tanana River drainages that are road accessible, fishermen are required to obtain a household subsistence fishing permit. Harvest reported from subsistence permits are added to the survey estimates to obtain the total number of salmon harvested in the drainage. Subsistence totals also include salmon that are harvested from test fishery projects and distributed to residents of communities near the projects.

The following summary presents preliminary results as of publication date of this report. Final results will be included in an ADF&G Fishery Data Series publication after more thorough review. In 2012, just over 1,420 households were selected to be surveyed. Of these, 1,393 households from 31 communities fished for salmon (not including the Coastal District communities of Hooper Bay and Scammon Bay). Subsistence fishing permits were issued to 398 households in portions of the Yukon River drainage where permits are required. As of publication date of this report, approximately 93% of the subsistence permits had been returned,

and 228 households reported fishing for salmon and other non-salmon fish species. Based on surveys and permits data the preliminary 2012 subsistence salmon harvest estimates in the Alaska portion of the Yukon River drainage totaled approximately 26,065 Chinook, 95,762 summer chum, 93,991 fall chum, and 18,518 coho salmon (Appendices B2–B5). Included in the estimated total subsistence harvest are 2,054 Chinook, 8,355 summer chum, 2,436 fall chum, and 816 coho salmon distributed for subsistence use from the various test fish projects distributed to Yukon River communities. Approximately 430 Chinook salmon and 3,340 summer chum salmon were retained from commercial fisheries or donated by fishermen in District 1 to Kwik'pak Fisheries and were then donated to households in upriver communities and are not included in subsistence harvest totals. For comparison, recent 5 year average (2007–2011) subsistence salmon harvest estimates are 42,808 Chinook, 71,321 summer chum, 80,853 fall chum, and 15,445 coho salmon (Appendices B2–B5) from communities in the Alaska portion of the Yukon River drainage.

4.2 COMMERCIAL FISHERY

Summer Season Harvest

A total of 427 permit holders participated in the summer chum salmon fishery, approximately 18% below the 2002–2011 average of 520 permit holders (Appendix A4). The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 413 permit holders fished in the Lower Yukon Area in 2012, which was approximately 18% below the 2002–2011 average of 502 permits fished. In the Upper Yukon Area, 14 permit holders fished, which was approximately 20% below the 2002–2011 average of 18 permits fished.

Summer Season Commercial Harvest Characteristics

The Chinook salmon age composition, sampled from the incidental catch (n=502) during the Districts 1 and 2 commercial harvests was 19% age-4, 57% age-5, 37% age-6 and 2% age-7. Females comprised 30% of the samples. Mean length of incidental catch was 710 mm using gillnet gear less than 7.5 inch (and less than 6.0 inches throughout the bulk of the run). The mean length in LYTF was 808 mm using gillnet mesh size of 8.5 inches, which was maintained for standardization with previous years.

Summer chum salmon age composition from the District 1 commercial harvest (n=800) was less than 1% age-3, 71% age-4, 24% age-5 and 5% age-6 fish. Females comprised 49% of the sample. The mean length in LYTF was 556 mm using gillnet mesh size of 5.5 inches. Summer chum salmon age composition from the Subdistrict 4-A commercial fish wheel harvest (n=375) was less than 1% age-3, 82% age-4, 15% age-5 and 3% age-6 fish. Females comprised 98.4% of the sample. This high percentage of females is due to only female fish being bought during all commercial periods except period 7. Summer chum salmon age composition from the District 6 commercial fish wheel harvest (n=212) was 2% age-3, 74% age-4, 23% age-5 and 1% age-6 fish. Females comprised 65% of the sample. Mean length for the commercial samples of summer chum salmon was 549 mm. and commercial gear was restricted to 6 inch gillnet mesh size throughout the season.

Fall Season Harvest

A total of 469 permit holders (457 in Lower Yukon Area and 12 in Upper Yukon Area) participated in the fall season salmon fishery, approximately 97% above the 2002–2011 average of 238 permit holders (Appendix A4). There were a total of 41 commercial periods during the fall season in 2012 with the majority of commercial harvest occurring in the lower river districts. A regular schedule of commercial fishing periods was established in Districts 4–6, but limited markets resulted in low fishing effort and relatively small harvests in those areas. The 2012 total commercial harvest for the Yukon River fall season in the Alaska portion of the drainage was 289,692 fall chum and 74,789 coho salmon (Appendix A3). Both species harvested were above their respective most recent 5-year (2007–2011) and 10-year (2002–2011) averages (Appendices B4 and B5). The commercial (including commercial related) harvest of fall chum salmon was the largest since 1995 and the coho salmon harvest was the second largest since 1991. All salmon were sold in the round and no salmon roe was sold separately.

Fall Season Commercial Harvest Characteristics

Fall chum salmon age composition from the District 1 commercial harvest (n=1,022) was 0.9% age-3, 82.2% age-4, 15.3% age-5 and 1.7% age-6 fish. Based on the entire sample not just those that could be aged (n=1,039), females comprised 52.5% of the fish. The mean length of fall chum salmon in the commercial fishery was 566 mm. The proportion of fall chum salmon by age for the dominant age classes are slightly higher for age-4 and lower for age-5 than those observed in LYTF of 78.4% and 17.8% respectively. Proportion of females in the LYTF were similar at 55.4% (n=1,221). Mean length of fall chum salmon in LYTF was 576 mm. Overall proportions of LYTF age-4 were higher than the 1986–2011 average of 65.0% and the age-5 were corresponding lower than average of 31.2% (Bonnie Borba, Yukon Area Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication).

Coho salmon age composition from the District 1 commercial harvest (n=476) was 20.3% age-3, 73.1% age-4 and 6.5% age-5. Based on the entire sample (n=485) not just those that could be aged, females comprised 42.1% of the fish. The mean length of coho salmon in the commercial fishery was 542 mm. The LYTF observed 28.4% age-3, 63.4% age-4 and 8.2% age-5 (n=394). Females comprised 50.8% of the fish sampled (n=429) whereas the 1987–2011 average is 44.6% in the LYTF. Mean length of coho salmon in the LYTF was 556 mm. Overall proportion of age-4 was below the LYTF average of 77.5% whereas the age-3 and age-5 were higher than the averages of 14.5% and 4.8% respectively. Differences between the commercial fishery and the LYTF are likely due to differences in gear types, mesh size and fishing locations in the fall chum and coho salmon commercial fishery, whereas the LYTF uses 6 inch mesh drift gillnet consistently at specific fishing sites.

4.3 SPORT FISHERY

Sport fishing effort for anadromous salmon in the Yukon River drainage is directed primarily at Chinook and coho salmon, with little effort directed at chum salmon. In this report, all of the chum salmon harvested in the sport fishery are categorized as summer chum salmon. Although a portion of the genetically distinct fall chum salmon stock may be taken by sport anglers, most of the sport chum salmon harvest is thought to be made up of summer chum salmon, because the run is much more abundant in tributaries where most sport fishing occurs, and the chum salmon

harvest is typically incidental to efforts directed at Chinook salmon, which overlap in run timing with summer chum salmon.

Most of the drainage's sport fishing effort occurs in the Tanana River drainage along the road system. From 2007 to 2011 the Tanana River made up, on average, 72% of the total Yukon River drainage Chinook salmon sport fish harvest, 21% of the summer chum salmon harvest, and 44% of the coho salmon harvest. In the Tanana River, most Chinook and chum salmon are harvested from the Chena, Salcha, and Chatanika rivers, while most coho salmon are harvested from the Delta Clearwater and Nenana river systems. In the Yukon River drainage, excluding the Tanana River, most sport fishing effort for salmon takes place in the Anvik and Andreafsky rivers.

In 2012, an emergency order was issued on May 1 that reduced the sport fishing bag limit to one Chinook salmon in all Yukon River tributaries (excluding the Tanana River drainage) and closed all waters of the mainstem Yukon River to sport fishing for Chinook salmon effective May 15. On July 18 an emergency order prohibited the retention of Chinook salmon and prohibited the use of bait in all tributaries of the Tanana River drainage effective July 21. On July 30 the Chena River was closed to sport fishing for Chinook salmon.

Alaska sport fishing effort and harvests are monitored annually through a statewide sport fishery postal survey. Harvest estimates are typically not available until approximately one calendar year after the fishing season; therefore, the 2012 harvest estimates will not be available in this report. The total 2011 sport harvest of salmon in the Alaska portion of the Yukon River drainage (including the Tanana River) was estimated at 474 Chinook, 294 summer chum and 463 coho salmon (Appendices B2, B3, and B5). The recent 5 year (2007–2011) average Yukon River drainage sport salmon harvest was estimated at 636 Chinook, 453 summer chum and 662 coho salmon (Appendices B2, B3, and B5).

Since 2005, all freshwater sport fishing guides and guide businesses operating in Alaska have been required to be licensed. In addition, sport fishing guides and businesses are required to report sport fish harvest and fish released by species in logbooks. From 2007 to 2011, guided sport harvests in the Yukon River drainage (excluding the Tanana River drainage) averaged 97 Chinook and 184 coho salmon (Sigurdsson and Powers 2012).

4.4 PERSONAL USE FISHERY

The Fairbanks Nonsubsistence Area, located in the middle portion of the Tanana River, contains the only personal use fishery within the Yukon River drainage. Subsistence or personal use permits have been required in this portion of the drainage since 1973. Personal use fishing regulations were in effect from 1988 until July 1990 and from 1992 until April 1994. In 1995, the Joint Board of Fisheries and Game reestablished the Fairbanks Nonsubsistence Area, and it has been managed consistently under personal use regulations since then. Historical harvest data must account for these changes in status. Subsistence fishing is not allowed within non-subsistence areas.

Subdistrict 6-C is completely within the Fairbanks Nonsubsistence Area and therefore falls under personal use fishing regulations. Personal use salmon or whitefish/sucker permits and a valid resident sport fishing license are required to fish within the Fairbanks Nonsubsistence Area. The harvest limit for a personal use salmon household permit is 10 Chinook, 75 summer chum, and 75 fall chum and coho salmon combined. The personal use salmon fishery in Subdistrict 6-C has

a harvest limit of 750 Chinook, 5,000 summer chum, and 5,200 fall chum and coho salmon combined.

Preliminary results as of publication date of this report are as follows. In 2012, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week. Personal use fishing was closed in the Tanana River within a 1/2 mile radius of the mouth of the Chena River from 6:00 p.m. Friday, July 22 until 6:00 p.m. Friday, August 12 to conserve Chinook salmon. A total of 60 personal use salmon and 12 personal use whitefish and sucker household permits were issued. The 2012 preliminary harvest results based on 97% of the personal use household permits returned in Subdistrict 6-C included 71 Chinook, 378 summer chum, 353 fall chum, and 100 coho salmon. The recent 5 year (2007–2011) average personal use harvest was 128 Chinook, 278 summer chum, 798 fall chum, and 310 coho salmon (Appendices B2–B5) in the Yukon River drainage.

5.0 CANADIAN MANAGEMENT OVERVIEW

5.1 CHINOOK SALMON

The total run of Upper Yukon River[13] Chinook salmon in 2012 was expected to be poor to below average, with a preseason outlook range of 54,000 to 73,000 Chinook salmon. This outlook included an adjustment to reflect a recent trend where actual runs were lower than the preseason outlooks.

Upper Yukon Chinook Salmon Inseason Decision Matrix

Canadian fishing opportunities in 2012 were dependent upon inseason assessments of run strength. As in previous years, a Chinook salmon decision matrix was developed preseason and was included as part of the Integrated Fisheries Management Plan (IFMP)[14]. The decision matrix in the plan provided detailed guidance for the management of fisheries linked to specific inseason run abundance levels. The 2012 decision matrix summarized the management reference points, general allocation plans, and anticipated management responses under different run size scenarios (Table 2).

It is important to note that the incorporation of an escapement goal range of 42,500–55,000 in 2012 resulted in the following decision thresholds.

i. The commercial and domestic fisheries would not open unless it was expected that the border escapement would be greater than 51,000 Chinook salmon based on the Eagle sonar program. The recreational fishery default regulation is that it is open until closed; therefore, the recreational fishery would be closed at a run size of 51,000 or fewer. A border escapement larger than 51,000 fish was sufficient to allow for an unrestricted First Nation fishery.
ii. Consideration would be given to restricting First Nation fisheries if the run size to the border was in the 30,000 to 51,000 range. All other fisheries would not be permitted to target Chinook salmon.
iii. Closures in First Nation fisheries would be expected if the run projection was 30,000 or fewer fish.

[13] The Upper Yukon River is defined as the Canadian portion of the Yukon River drainage excluding the Porcupine River drainage.

[14] Unpublished draft for 2012; available from DFO offices, Whitehorse.

Management discretion was to be used when the inseason projections were close to the trigger points.

Table 2.–Inseason fishery management decision matrix for Upper Yukon Chinook salmon, 2012.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	0–30,000	FN	0	Closures considered.
		CF	0	Closed.
		RF	0	Closed, i.e. Chinook salmon quota varied to zero.
		DF	0	Closed.
YELLOW ZONE	30,000–51,000	FN	0 to 8,000	Catch target to vary with abundance within zone: 0 at run size of 30,000; 8,000 catch at run of 51,000. Catch is subject to International harvest sharing provisions.
		CF	0	Closed.
		RF	0	Closed, i.e. Chinook salmon quota varied to zero.
		DF	0	Closed.
GREEN ZONE	>51,000	FN	8,000+	Unrestricted.
		CF	Variable	Catch target to vary with abundance and be consistent with International agreement on harvest shares.
		RF	100–700	Expected harvest range based on recent harvests. Opportunities subject to abundance and International agreement on harvest shares.
		DF	100–300	

Note: Legend: FN = First Nation fishery; CF = commercial fishery; RF = recreational fishery; DF = domestic fishery.

Upper Yukon Chinook Salmon Decisions and Management

Early in the 2012 season, information from the U.S. test fishery at Emmonak and the Pilot Station sonar program on the lower Yukon River suggested that the Upper Yukon Chinook salmon run would be at the low end of the preseason outlook range of 54,000 to 73,000 Chinook salmon. In response to U.S. conservation measures and uncertainty surrounding projections, DFO began a series of regular teleconferences with First Nation managers to update them on run projections scenarios and to advise that a precautionary approach be adopted early in the season. The commercial fishery remained closed and the catch and possession limits in the recreational fishery were reduced to zero on July 12, 2012.

Further upriver, as the run was migrating into Canada, border escapement projections were usually produced twice weekly, based on data from the Eagle sonar estimate, considering timing information from the fish wheel project at Rampart Rapids, and assuming a reduced Alaska subsistence harvest. Border escapement projections were expanded based on what was considered to be the most likely timing scenario (i.e., early, average or late timing) given the information at hand. The intent of applying different expansions is to ensure that the projections cover an appropriate range of the potential run timing. Border escapement projections were not sufficient to allow for a commercial harvest; consequently the Chinook salmon commercial fishery remained closed throughout the 2012 season.

Porcupine River Chinook Salmon Decisions and Management

DFO and the Vuntut Gwitch'in Government (VGG) held regular teleconference calls to provide updated information on run timing and abundance and to address conservation concerns for Chinook salmon within the Porcupine River drainage. No specific management actions were required inseason, but as with Upper Yukon First Nations, a precautionary approach was taken in the early season when Lower Yukon Area estimates indicated a poor return of Chinook salmon. VGG developed their own management strategies accordingly, and there were no official restrictions required in 2012.

5.2 Fall Chum Salmon

The preseason outlook for the Upper Yukon fall chum salmon run in 2012 was an average to above average run of 247,000 to 300,000 fish.

Two genetically distinct runs of chum salmon enter the Yukon River, an early summer component and a later fall component. Summer chum salmon are characterized by: earlier run timing (early June to mid-July at the river mouth); rapid maturation in freshwater; and smaller body size (average 6–7 pounds). Summer chum salmon spawn primarily in run-off streams in the lower 700 miles of the Yukon River drainage and in the Tanana River drainage. Fall chum salmon are distinguished by: later run timing (mid-July to early September at the mouth); robust body shape; and larger body size (average 7–8 pounds). Fall chum salmon primarily spawn in the upper portion of the drainage in streams that are spring fed or geologically have major upwelling features. Major fall chum salmon spawning areas include the Tanana, Porcupine, and Chandalar river drainages as well as various streams in Yukon Territory, Canada, including the mainstem Yukon River. Like summer chum salmon few coho salmon are bound for the upper reaches of the Yukon River into Canada and most spawn in the lower 700 miles including the Tanana River drainage.

Upper Yukon Fall Chum Salmon Inseason Decision Matrix

The decision matrix adopted by DFO for the management of Upper Yukon chum salmon and included in the 2012 IFMP, provides detailed guidance for specific inseason decisions. The 2012 matrix (Table 3) takes into account the changeover from the mark–recapture program to the use of the Eagle Sonar and the escapement goal range, and therefore differs slightly from the matrices used from 2006 to 2009. The Red Zone includes run projections of less than 40,000 fall chum salmon when closures in all fisheries could be expected. The Yellow Zone includes run projections within a range of 40,000 to 73,000 fish; within this zone, commercial, domestic and recreational fisheries would be closed and the First Nation fishery would likely be reduced with restrictions increasingly more severe the closer the run projection was to the lower end of the Yellow Zone. The Green Zone includes run size projections greater than 73,000 fall chum salmon and indicated that First Nation fisheries would be unrestricted and harvest opportunities within the commercial, domestic, and recreational fisheries would be considered depending on run abundance and international harvest sharing provisions. The difference between the lower end of the escapement goal range (70,000 fish) and the trigger point for the Green Zone is 3,000 fall chum salmon, which is the number of chum salmon needed to allow an unrestricted Canadian aboriginal fishery. Management discretion is used when the inseason projections are close to the trigger points.

Table 3.–Inseason fishery management decision matrix for Upper Yukon fall chum salmon, 2012.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	<40,000	FN	0	Closures considered.
		CF	0	Closed.
		RF	0	Closed, i.e. chum salmon quota varied to zero.
		DF	0	Closed.
YELLOW ZONE	40,000–73,000	FN	0 to 3,000	Catch target to vary with abundance within zone.
		CF	0	Closed.
		RF	0	Closed, i.e. chum salmon quota varied to zero.
		DF	0	Closed.
GREEN ZONE	>73,000	FN	3,000+	Unrestricted.
		CF	Variable	Catch target to vary with abundance and be consistent with International agreement on harvest shares.
		RF	0	Fishing opportunity provided, no catch anticipated.
		DF	0	Fishing opportunity provided, no catch anticipated.

Note: Legend: FN = First Nation fishery; CF = commercial fishery; RF = recreational fishery; DF = domestic fishery.

Upper Yukon Fall Chum Salmon Determination of Inseason Run Status

Genetic stock identification data was used in conjunction with the Pilot Station sonar counts to develop a preliminary index of the Canadian-origin fall chum salmon run size estimates. These data have been useful in recent years since they provide an early indication of potential Upper Yukon run strength as the fish move through the lower section of the Yukon River in Alaska. Other data such as the Rampart Rapids video test fish wheel project results were used to assess run timing for use in projection models. The Eagle sonar program started operation in 2005, and projections from the program have been used for inseason management since 2008. Prior to 2008, the Canadian inseason management regime was based primarily on the DFO tagging program.

Upper Yukon Fall Chum Salmon Decisions and Management

Inseason decisions on fishery openings/closures for Upper Yukon fall chum salmon were made in a similar way to those for Chinook salmon. Pilot Station estimates and historic run timing early in the 2012 fall chum salmon season indicated that the run was above what was expected. Although there is often much uncertainty associated with the chum salmon early inseason forecasts due to the unpredictable size, timing and destination of the pulses, there was sufficient Lower Yukon Area assessment information available to project that border escapements would be of a magnitude strong enough to support a normal aboriginal harvest and to provide opportunities in the commercial fishery. Inseason forecasts of the Canadian fall chum salmon run were based on Eagle sonar estimates, and informed by run timing information from downstream

indicators (Pilot Station and Rampart Rapids) as well as genetic estimates of run composition from the Pilot Station test fishery.

As per the decision matrix, a "border escapement" projection of greater than 73,000 fish was required before commercial fishing opportunities. Since it was anticipated, based on harvest in recent years, that the Alaska subsistence fishery upstream of the Eagle sonar program would take about 15,000 fall chum salmon, a projection greater than 88,000 at the Eagle sonar site was required to meet the border escapement objective.

The objective of management actions in 2012 was to ensure that the conservation objective (70,000–104,000 fall chum salmon escapement goal range) was achieved. By mid-August, it was evident that the fall chum salmon run was at or above the upper end of the preseason forecast based on projections from the LYTF and Pilot Station sonar and indications from the Rampart Rapids fish wheel. The commercial fishery was opened on a conservative schedule commencing on August 31, for 4 days, to provide opportunities for the catch and sale of early run chum salmon, considered to be marketable as food for human consumption. As further confidence in Eagle sonar-guided projections was realized, the commercial fishery was opened for 7 days per week commencing September 7 and remained open until October 15 with a further extension to October 31. The total 2012 commercial fall chum salmon catch was 3,205 fish.

Fishing Branch River Escapement

The Fishing Branch River is the principal fall chum salmon spawning population within the Porcupine River drainage. DFO has maintained an assessment program on this river since the early 1970's, which has involved aerial surveys and/or a counting weir.

Porcupine River Fall Chum Salmon Inseason Decision Matrix

At the Yukon Panel meeting which took place in March 2012, the decision matrix remained the same, as did the IMEG range adopted by the Yukon Panel for 2008 through 2010 and extended to 2013.

The following decision rules for the First Nation fishery in the Porcupine River were developed (Table 4) after the escapement goal range had been adopted by DFO.

i. The run would be considered to be in the GREEN ZONE if the inseason Fishing Branch River escapement projections exceeded 22,000 fall chum salmon. No restrictions in the Vuntut Gwitchin FN fishery would be required for projections in the GREEN ZONE.

ii. Escapement projections within a range of 10,000 to 22,000 fish would constitute the YELLOW ZONE and restrictions may be required, the severity of which would depend upon how close the projections were to the lower end of the range.

iii. Escapement projections of less than 10,000 chum salmon would constitute the RED ZONE and there would be consideration for a full fishery closure.

If inseason information suggested that restrictions were required within the Vuntut Gwitchin FN fishery (projections in the yellow or red zones), DFO and the Vuntut Gwitchin Government would discuss potential conservation options before implementing restrictions.

Table 4.–Inseason fishery management decision matrix for Fishing Branch fall chum salmon.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	<10,000	FN	0	Closures considered.
		RF	0	Closed, i.e. chum salmon quota varied to zero.
YELLOW ZONE	10,000–22,000	FN	0 to 3,000	Catch target to vary with abundance within zone. Catch is subject to International harvest sharing provisions.
		RF	0	Closed, i.e. chum salmon quota varied to zero.
GREEN ZONE	>22,000	FN	3,000+	Unrestricted.
		RF	0	Fishing opportunity provided, no catch anticipated.

Note: Legend: FN = First Nation fishery; RF = recreational fishery.

Porcupine River Fall Chum Salmon Decisions and Management

The preseason outlook for the Porcupine River fall chum salmon run in 2012 was an average to above average run of 49,300 to 60,000 fish. Both the preseason projection and the genetic sampling indicated that the escapement goal would be achieved. The final Fishing Branch River weir passage estimate of 22,399 fall chum salmon was in the low end of the green zone. The lower end of the escapement goal range of 22,000 to 49,000 fall chum salmon was achieved in 2012. The preliminary estimated reconstructed run for the Porcupine River was approximately 50,000[15] fish, which was also below the preseason outlook.

Porcupine River Fall Chum Salmon Determination of Inseason Run Status

Canadian fishery management considered inseason information on the status of the fall chum salmon run from Alaska portions of the river including fishery information, sonar estimates from Pilot Station, and the Ramparts Rapids video test fish wheel data. U.S. genetic stock identification data were used in conjunction with the Pilot Station sonar estimates to develop a preliminary index of the potential run size destined for the Canadian section of the Porcupine River drainage. However, early season forecasts are highly uncertain.

Inseason genetic sampling of fall chum salmon at Pilot Station along with the strong run in the basin indicated that run strength would likely be sufficient to meet escapement. There is uncertainty associated with the genetic sample stock size indication because the Fishing Branch

[15] This is based on the weir count of 22,399 times 1.25 plus the Canadian harvest of 3,354 and the estimated U.S. harvest of Porcupine River fall chum, 19,000 (5% of 384,000).

River component comprises such a small part of the Yukon River run that it is typically misrepresented in the mixed stock samples. Once fall chum salmon approached Old Crow, additional information was provided by the sonar assessment program operated by the VGG and Environmental Dynamics Incorporated (EDI), an environmental consulting firm. This was the second year of sonar enumeration of Porcupine River chum salmon and the inseason data suggested that the run was coming in lower than the preseason outlook. The fall chum salmon run was later than usual and the sonar project ceased operations prior to the end of the run. There are approximately 12 days travel time and known spawning areas between the Old Crow sonar site and the Fishing Branch enumeration weir. The weir is approximately 2,560 river kilometers from the ocean.

While aerial surveys were conducted upstream of the weir in the past to help estimate chum salmon escapement, historic aerial data indicates that counts underestimate the weir passage. Therefore, an aerial survey did not take place in 2012.

6.0 CANADIAN HARVEST SUMMARIES

6.1 ABORIGINAL FISHERY

Upper Yukon Chinook Salmon

In 2012, as part of the implementation of the Yukon River Final Agreements (comprehensive land claim agreements), the collection of inseason harvest information for the Upper Yukon River was conducted by First Nations within their respective Traditional Territories. Before the start of the fishing season, locally hired surveyors distributed catch calendars to known fishermen and asked them to voluntarily record catch and effort information on a daily basis. Interviews were then conducted inseason to obtain more detailed catch, effort, gear, and location information at fish camps or in the community, 1–3 times weekly. In most cases, weekly summaries were completed by the surveyors and e-mailed to the DFO office in Whitehorse. Late or incomplete information was obtained post season and reviewed by First Nation staff in conjunction with DFO.

Based on a preseason outlook for a below average run of 54,000 to 73,000 Upper Yukon Chinook salmon, it was prudent to consider that conservation measures would likely be required in Canadian fisheries (i.e. commercial, domestic and recreational fisheries). DFO hosted frequent teleconferences with the First Nations throughout the Chinook salmon run to provide updated information on run timing and abundance, as well as to announce potential changes to fishing plans in other fisheries. Using the decision matrix described in Section 5.1 (Table 2), DFO recommended that Yukon First Nations develop individual community harvest plans to address conservation concerns for Chinook salmon. Approaches to reductions in harvest varied, but generally the First Nations accepted the need for conservation and implemented harvest monitoring measures in order to stay below what would be considered a normal harvest.

Given the preseason outlook and the inseason information, it was apparent prior to fishing season that it would be challenging to meet the 2012 border escapement and that conservation measures might be required in the aboriginal fishery. It was suggested to the First Nation governments that they take a precautionary approach early in the season. In response to early information, the majority of fishermen decided not to open their fish camps and the Chinook salmon needs of Yukon aboriginal communities were not met in 2012.

In 2012, the Upper Yukon River aboriginal Chinook salmon catch was estimated to be 2,000 fish; including 1,615 fish reported harvest, and an adjustment of 385 fish to account for underreporting. The adjustment was derived through recent harvest data that was expanded based on average percentage of harvest to reflect harvest numbers by each First Nation. While intensive surveys regarding salmon harvest of First Nation communities carried out between 1996 and 2001 provided accurate harvest data, recent data has been less robust, indicating the need to incorporate the adjusted harvest numbers. The adjusted estimate is 25% of the 8,000 Chinook salmon considered to be the harvest of a full unrestricted fishery. The total reported harvest (1,615) and adjusted harvest (2,000) in the First Nation Fishery was 67% and 60% respectively, below the recent 10-year average (2002–2011) of 4,973 salmon and is the lowest on record since the 1970's (Appendix B7). A few First Nation communities have begun buying salmon from other drainages to supplement their salmon needs.

The 2012 harvest recorded by Tr'ondëk Hwëch'in (THFN) in the Dawson area was 359 Chinook salmon, approximately 34% of their recent 10-year average. A harvest of 285 Chinook salmon was reported by the First Nation of Na-Cho Nyäk Dun (NNDFN) on the Stewart River, 41% of the 2002–2011 average of 699 fish. The Selkirk First Nation (SFN) in the Pelly area and Little Salmon Carmacks First Nation (LSCFN) in the Carmacks area, are normally the 2 largest aboriginal fisheries in the mid-area of the upper Yukon River drainage. The harvest reported by Selkirk First Nation was 517 fish, 42% of their 2002–2011 average of 1,219. Little Salmon Carmacks First Nation reported a harvest of 401. The 2002–2011 average for LSCFN was 1,012 fish. Ross River Dena Council (RRDC), fishing on the upper Pelly River, did not report a harvest for 2012, but their 2002–2011 average was 254. The Ta'an Kwach'an Council (TKC), fishing in the vicinity of Lake Laberge near Whitehorse, reported a catch of approximately 10 Chinook salmon, 19% of their recent 10-year average of 54 salmon. TKC has seen a renewed interest in salmon fishing in the last few years that is largely due to the creation of a culture camp. The Teslin Tlingit Council (TTC) voluntarily reduced their fishing to weekends and limited the number harvested per household for the 2012 season. They experienced almost complete compliance by community members and reported a total of 43 Chinook salmon harvested, 90% below the 2002–2011 average of 475 fish.

Upper Yukon Fall Chum Salmon

The preseason outlook for Upper Yukon River fall chum salmon in 2012 indicated an average to above average run of 247,000 to 300,000 fish. The border passage estimate at this run projection would place Canadian Management in the green zone and therefore no restrictions were expected in the First Nation fishery. As inseason information became available, it became apparent that the run was strong, and would support an unrestricted First Nation fishery. This fishery is managed in a similar fashion to the Chinook salmon fishery using an abundance-based approach as described in Section 5.2 (Table 3).

The preliminary 2012 Upper Yukon River fall chum salmon harvest reported in the aboriginal fishery totaled 483 fish. This reported harvest was increased to 700 fish to account for underreporting (Appendix B8). The fall chum salmon adjusted value was based on recent average harvests during conservation years and was below the 10-year average (2002–2011) of 1,903 fish.

The Tr'ondëk Hwëch'in First Nation fishery in the Dawson area reported a harvest of 134 fall chum salmon, 8% of their previous 10-year average of 1,556 fall chum salmon. Selkirk First

Nation at Pelly Crossing reported a harvest of 233 fish; their recent 10-year average was 231 fall chum salmon. Little Salmon Carmacks First Nation did not report a harvest in 2012, but their 2002–2011 average was 85 fall chum salmon. Averages of fall chum salmon derived from a 7-year harvest study conducted by LGL Limited from 1996 to 2002 in the Pelly and Carmacks areas were 433 and 460 fall chum salmon, respectively. These estimates are still preliminary as of publication date of this report.

Porcupine River Chinook and Fall Chum Salmon

Catch estimates of salmon in the aboriginal fishery on the Porcupine River near Old Crow are determined from locally conducted interviews using the catch calendar and a voluntary recording system described above. The Vuntut Gwitch'in Government (VGG) will also conduct an intensive door to door survey, post season.

For the 2012 season, approximately 200 Chinook salmon were harvested (Appendix B7). This data will be finalized from the results of the survey. The recent 10-year average (2002–2011) is 298 Chinook salmon.

Preseason run size forecasts indicated that conservation measures might be required for Porcupine River fall chum salmon during the 2012 season. There was great uncertainty associated with the preseason forecast and with early inseason forecasts.

A total of 3,118 fall chum salmon was harvested in the Old Crow aboriginal fishery, which is 25% above the 2002–2011 average harvest of 2,498 chum salmon although 3,000 fish is considered a normal Old Crow fishery (Appendix B8). Data will be finalized after the post season survey results. Preliminary data suggests that VGG citizens were able to fulfill their needs in 2012.

There were 10 coho salmon harvested on the Porcupine River in 2012, compared to the 2002–2011 average of 194 fish (included under "Canada, other salmon" in Appendix B1).

6.2 COMMERCIAL FISHERY

Chinook Salmon Harvest

The lower Canadian commercial fishery area is located downstream of the Stewart River. The most intensive fishing activity and catch monitoring is conducted in this area, and if a commercial fishery takes place, the data are used for population estimates. Commercial fishermen are legally required to report catches, tag recovery and associated data no later than 8 hours after the closure of each fishery and there is also a requirement that catch forms be either received by the Whitehorse office or post-marked within 10 business days after the closure of each commercial opening. A toll-free telephone catch line is also available for catch reporting.

The inseason Chinook salmon run status indicated that there would not be a sufficient run to support a commercial fishery. As a result, the fishery remained closed throughout the 2012 Chinook salmon season. There was no reported Chinook salmon harvested incidentally during the early fall chum salmon opening in late August. The boundaries of the commercial fishing areas within the Yukon Territory are presented in Figure 8.

The average commercial Chinook salmon catch for the 2002–2011 period, excluding years when the fishery was closed for conservation purposes, was 2,321 fish (Appendix B7). Since 1997,

there has been a marked decrease in commercial catch of Upper Yukon River Chinook salmon, resulting from closures and/or very limited fishing opportunities.

Fall Chum Salmon Harvest

A stronger than expected return of fall chum salmon resulted in opportunities for commercial fishery openings throughout the fall season. A total of 3,205 fall chum salmon were harvested during 2 commercial fishery openings (Appendix A6). Since 1997, there has been a marked decrease in commercial catches of Upper Yukon River fall chum salmon resulting from a limited market as well as reduced fishing opportunities in some years due to below average run sizes.

The total 2012 commercial fall chum salmon catch of 3,205 fish was 41% below the 2002–2011 average of 5,445 fish and 15% lower than the 2007–2011 average of 3,792 fish (Appendix B8). Within the 2002–2011 period, the commercial fall chum salmon catch ranged from 293 in 2009, when the run was late and the fishery was closed most of season due to conservation concerns, to 11,931 fall chum salmon in 2005. The fall chum salmon commercial fishery is somewhat of a misnomer as virtually all of the catch is used for what could be termed personal needs; few fish are sold. This situation could change with the recent development of local value-added products such as smoked fall chum salmon and salmon caviar.

Commercial harvest of coho salmon within the Upper Yukon River drainage is usually negligible. This is thought to be related to a combination of low abundance and limited availability of this species to fisheries due to late migration timing.

6.3 DOMESTIC FISHERY

The domestic fishery was closed during the Chinook salmon season and opened concurrently with the commercial fishery for 2 openings during the fall chum salmon season. In recent years domestic fishermen have targeted Chinook salmon, although historically fall chum salmon were targeted in some years. There was no reported domestic fishing for fall chum salmon in 2012. The average domestic fishery catch of Chinook and fall chum salmon for the 1974 to 2011 period was 393 and 501 fish, respectively; domestic fishery catches were not recorded prior to 1974 (Appendices B7 and B8).

6.4 RECREATIONAL FISHERY

In 1999, the SSC introduced a mandatory Yukon Salmon Conservation Catch Card (YSCCC) in an attempt to improve harvest estimates and to serve as a statistical base to ascertain the importance of salmon to the Yukon River recreational fishery. Anglers are required to report their catch by mail by late fall. The information requested includes the number, species, sex, size, date, and location of all salmon caught and released.

In 2012, in response to early season projections for a poor return of Chinook salmon, the daily catch and possession limits in the recreational fishery were reduced to zero effective 1200 hours July 12. On July 24, continued low border escapement projections and subsequent reductions in the Aboriginal fishery triggered the closure of the Tatchun River to all angling to allow unimpeded passage of Chinook salmon through this popular fishing site.

From catch card information received as of this publication, 6 Chinook salmon were caught and released in the Teslin River in the 2012 recreational fishery.

The average retained Chinook salmon catch within the 2002–2011 period was 226 fish (Appendix B7).

For the 2012 season, the daily catch and possession limits of fall chum salmon in the recreational fishery remained at 2 and 4, respectively. There were no reports of fall chum salmon caught.

7.0 STATUS OF SPAWNING STOCKS IN 2012

7.1 CHINOOK SALMON

Alaska

In Alaska, a suite of projects is used to assess the Chinook salmon run. The Lower Yukon Test Fishery (LYTF) assessment project, which uses 8.5 inch mesh set gillnets, indicated that the run was likely dominated by age-6 fish. Chinook salmon age composition estimated from a sample of 807 fish collected in the LYTF was 1% age-4, 30% age-5, 67% age-6, and 2% age-7 fish. The proportions of age-5 and age-6 fish were similar to those in 2011, and were close to the long-term averages (Larry DuBois, Fisheries Biologist, ADF&G, Anchorage, Alaska; personal communication). Females comprised about 52% of the samples. Chinook salmon age composition estimated from samples collected in escapement projects on the Andreafsky, Anvik, Gisasa, Chena, and Salcha rivers, and Henshaw Creek ranged, among these sampling sites, from 5-15% age-4, 46-65% age-5, 24-49% age-6, and 0-1% age-7 fish. Female percentages in these escapement projects ranged from 28 to 56% (Appendix A10).

The actual 2012 Chinook salmon run came in at the low end of the preseason projection. Chinook salmon escapement goals for the East Fork Andreafsky, Nulato, and Salcha rivers were achieved. However, the Anvik and Chena rivers escapement goals were not met (Table 5). The West Fork Andreafsky aerial survey was not flown this year due to poor conditions. Season cumulative counts on the Gisasa and Henshaw Rivers were below average. The Chena River project operations were hindered by high water conditions for much of the season (Appendices B9, B10, and C9).

Table 5.–Summary of 2012 Chinook salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2012 Chinook Salmon Escapement
E. Fork Andreafsky	Weir	2,100–4,900 (SEG)	2,517
W. Fork Andreafsky	Aerial survey	640–1,600 (SEG)	[a]
Anvik	Aerial survey	1,100–1,700 (SEG)	722
Gisasa	Weir	none	1,323
Henshaw	Weir	none	922
Chena	Tower/Sonar	2,800–5,700 (BEG)	2,220
Salcha	Tower	3,300–6,500 (BEG)	7,165
Goodpaster	Tower [b]	none	678

Note: Biological escapement goal (BEG) and sustainable escapement goal (SEG).

[a] West Fork Andreafsky River was not flown in 2012.

[b] Goodpaster River counts were affected by high turbid water most of the season therefore counts are considered a minimum.

The preliminary Chinook salmon estimate based on Pilot Station sonar counts was 106,726 fish (Appendix A2). Preliminary Chinook salmon passage at Eagle sonar in 2012 was 34,747 fish, and after subtracting estimated U.S. subsistence harvest above Eagle sonar, the estimated border passage was approximately 34,656 fish (Appendix B11).

Canada

In Canada, the suite of inseason U.S. projects provide stock status information considered in management by DFO; the Rapids CPUE fish wheel project and the sonar operated at Eagle near the U.S. Border are particularly important inseason. Both projects provide timing information of Canadian bound stocks. Stock status is estimated using data obtained from Eagle sonar for the mainstem Canadian Chinook salmon (details in Section 8.2). The spawning escapement to the entire mainstem was estimated at 32,656 fish (Appendix B11). In 2012, aerial surveys of the usual systems including Chinook salmon index areas of the Little Salmon, Big Salmon, and Wolf rivers were not conducted by DFO (Appendices B12 and C10).

Escapement to the Big Salmon River has been monitored for the last 8 years using a DIDSON sonar. A total of 2,553 targets identified as Chinook salmon. This estimate represents 7.8% of the Upper Yukon spawning escapement estimate of 32,656 fish. The Big Salmon average sonar estimates from 2005 to 2011 was 5,272 fish (Appendix B12).

The 2012 Whitehorse Rapids Fishway Chinook salmon count of 1,030 was 83.5% of the 2002–2011 average count of 1,225 fish (Appendix B12), and 3.2% of the Yukon spawning escapement estimate of 32,656 fish. The overall sex ratio was 30% female and hatchery-produced fish accounted for 59% of the return.

In 2012, 157 Chinook salmon were counted at the Blind Creek weir and 41% of the sampled Chinook salmon were female. The 2002 to 2011 average count is 559 Chinook salmon (Appendix B12).

DIDSON sonar was operated for the first full season on the Teslin River. A total of 3,396 Chinook salmon targets were enumerated. This estimate represents 10.4% of the Upper Yukon spawning escapement estimate of 32,656 Chinook salmon.

7.2 SUMMER CHUM SALMON ALASKA

Summer chum salmon escapement was above average in most tributaries in 2012. Summer chum salmon goals for East Fork Andreafsky and Anvik rivers were achieved. Counts at the Gisasa and Henshaw Creek were above average (Table 6; Appendices B13 and C11). Chena and Salcha River escapements as assessed by tower counts were below average; however, because the duration of these projects misses the tail end of the summer chum salmon run, it is likely that these counts were very conservative (Appendix B13). The estimated cumulative passage of 2,130,404 summer chum salmon at the Pilot Station sonar project (Appendix A2), through July 18, exceeded the management threshold of 600,000 summer chum salmon.

Table 6.–Summary of 2012 summer chum salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2012 Chinook Salmon Escapement
E. Fork Andreafsky	Weir	>40,000 (BEG)	56,680
Anvik	Sonar	350,000–700,000 (BEG)	483,972
Gisasa	Weir	none	83,423
Henshaw	Weir	none	292,082

Note: Biological escapement goal (BEG).

7.3 FALL CHUM SALMON

Alaska

The preliminary 2012 Yukon River drainagewide total run size estimate of 946,000 fall chum salmon is based on the postseason expanded escapement and estimated harvest. This run size is slightly below the preseason forecast range of 986,000 to 1,114,000 salmon and slightly above the preseason projection of 900,000 fish. Although final assessments of overall run size, spawner distribution, and age composition are not available before publication time, preliminary assessments of run size are made using 2 methods.

The first method is used inseason where fishery management initially places a considerable amount of weight on the Pilot Station sonar abundance estimate until upriver monitoring projects can provide data. The preliminary fall chum salmon passage estimate, based on Pilot Station sonar for the period July 19 through September 7, was 682,510 fish with a 90% confidence interval of 618,803 to 746,217 fish (Figure 5; Appendix A2). In 2012, references to inseason run size included estimates of harvest below Pilot Station sonar and an adjustment factor of 10%. The adjustment factor is derived from the difference of inseason method (1) and the postseason method (2). Method (1) of reconstructing the run was used to provide projections for inseason management and produced an estimated total run size of 973,000 fall chum salmon. The postseason method (2) of assessing run size was derived from individually monitored spawning escapements projects in the upper Yukon and Tanana River drainages, including estimated U.S. and Canadian harvests where appropriate, resulting in an estimate of 946,000 fall chum salmon.

Method (2) includes sonar projects that operated on Chandalar and Sheenjek rivers and provided escapement estimates of 205,000 and 104,700 fall chum salmon respectively. A weir operated on Fishing Branch River in Canada's upper Porcupine River drainage provided an escapement estimate of approximately 22,400 fall chum salmon. Fall chum salmon escapements on the mainstem Yukon River in Canada were estimated using sonar counts minus U.S. and Canadian subsistence/aboriginal harvests upstream of the sonar, resulting in an estimate of approximately 137,700 fish. The project summary section of this report contains more detailed information on the operations at Pilot Station, Chandalar, Sheenjek, Fishing Branch rivers and Mainstem Yukon at Eagle that contribute to the fall chum salmon run reconstruction.

The Delta River, a tributary of the Tanana River, has a BEG range of 6,000 to 13,000 fall chum salmon. Evaluation of the run to the Delta River in 2012 was based on 7 replicate foot surveys conducted between October 17 and November 29. The Delta River escapement was estimated to

be approximately 9,000 fall chum salmon, which was within the BEG range (Appendices B14 and C12).

Initially mixed stock analysis (MSA) is used to assess the fall chum salmon run into the Tanana River drainage, but this can be greatly affected by stock specific run timing. In 2012, MSA suggested the Tanana River component was 202,000 fall chum salmon (the highest since 2005). Inseason assessment of the fall chum salmon run into the Tanana River drainage consisted of monitoring run timing and catch at one test fishery wheel located near the village of Tanana and monitoring subsistence and commercial harvest in the fisheries. Postseason the Tanana River run was assessed based on a regression between historical Delta River population estimates and Tanana River population estimates generated from mark–recapture studies conducted between 1995 and 2007 (excluding harvests in District 6). In 2012, the Tanana River component was estimated using the relationship between the Tanana River (Upper Tanana and Kantishna rivers mark–recapture) and the Delta River. The estimated run size was 131,000 fish, and after subtracting an estimated Tanana River harvest of 29,000 fish, this resulted in an escapement estimate of approximately 102,000 fall chum salmon. The estimated escapement was within the Tanana River BEG range of 61,000 to 136,000 fall chum salmon (Appendix B14). Based on the historical mark–recapture abundance estimates within the Tanana River, the drainage contributes approximately 30% to the overall Yukon River drainage fall chum salmon run.

Preliminary estimates of drainagewide escapement are based on a total run size estimate of 946,000 fish minus U.S. and Canada commercial harvest (293,000 fish) as well as estimated subsistence and aboriginal harvests (83,000 fish) of fall chum salmon. Hence, the 2012 drainagewide escapement of fall chum salmon is estimated to be approximately 570,000 fish which is within the SEG of 300,000 to 600,000 fish. All escapement goals were achieved in 2012 and some exceeded the upper end of the range (Table 7).

Table 7.–Summary of 2012 fall chum salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2012 Fall Chum Salmon Escapement
Drainagewide	Run Reconstruction	300,000–600,000 (SEG)	568,900
Chandalar River	Sonar	74,000–152,000 (BEG)	205,404
Sheenjek River	Sonar	50,000–104,000 (BEG)	104,701[a]
Upper Tributary [b]	Sonar/Weir	212,000–441,000 (BEG)	332,504
Tanana River	M/R regressions	61,000–136,000 (BEG)	102,000
Delta River	Ground Survey	6,000–13,000 (BEG)	9,377

Note: Biological escapement goal (BEG) and sustainable escapement goal (SEG).

[a] Total estimate from both banks includes 72,746 right bank and 31,955 left bank. Goal is measured by right bank passage only.

[b] Upper tributary goal is Chandalar, Sheenjek and Fishing Branch rivers combined.

Historically, Pilot Station sonar fall chum salmon estimates agree reasonably well with the reconstructed run size for most years. In the recent escapement goal analysis (Fleischman and Borba 2009) there was on average 10% disagreement between the Pilot Station sonar estimates (1995, 1997–2005) and the collective escapement and harvest assessment projects. In 2012, the estimate based on collective projects was approximately 5% greater than the preliminary

estimate using Pilot Station sonar and harvest below. Because of the location of the Pilot Station project (river mile 123), the abundance estimate includes Koyukuk River drainage stocks whereas the postseason run reconstruction is based on fish passage to primarily the upper Yukon River systems. Since 2005 the advancement in project assessment tools may also be contributing to the disparities; split-beam sonar replaced with DIDSON, 2 bank sonar operations on Sheenjek River, and changing U.S./Canada border passage from mark–recapture to sonars.

Fall chum salmon entered the Yukon River in 5 pulses in 2012, the first pulse containing high proportions of summer chum salmon (Figure 5). The summer and fall chum salmon runs are split by a calendar date (July 15, at the mouth of the Yukon River), where overlap occurs. As in 2008–2011, the sonar at Pilot Station was operated an additional week into September. Mountain Village test fishery was also operated later into the season, through September 13, 2012. Coho salmon were detected still moving in September but no significant pulses of fall chum salmon entered during that time period. Lower river mainstem Yukon monitoring projects suggested the run was slightly early to average in timing while the timing of upper river escapements was average at most locations. During the chum salmon migration the 5 pulses merged into a bimodal run to the upper Yukon River and timing suggested by genetics for Border US and Canadian stocks materialized in the upriver escapements.

In 2012, the proportion by age class for fall chum salmon include age-3 (1.1%), age-4 (78.5%), age-5 (17.6%) and age-6 (2.8%) fish. Age-4 and age-6 components were below average and age-5 was above average when compared to the Lower Yukon Test Fishery weighted averages for the years 1977 to 2011. These levels of age-4 and age-5 fish were above and below respectively compared to the expected contribution based on the preseason forecast of 65.2% and 32.3%. Females contributed 55.4% to the samples and were near the average of 58.3%. Age and sex composition data were collected in 2012 from escapements in Sheenjek, Toklat, and Delta rivers and escapement into Canada from the mainstem Yukon River (Appendix A24). Age samples from escapements to the mainstem Yukon River at Canadian border, and Toklat and Delta rivers, were most similar in proportions by age to the LYTF whereas the samples collected from the Sheenjek River had a lower proportion of age-4 fish (57%). Sex ratio at the Sheenjek River site was similar to that of the LYTF whereas the other areas contained more males than females in the samples. The differences observed between Sheenjek River and the other areas could be related to the difference in sampling technique.

Canada

The preliminary fall chum salmon spawning escapement estimate based on the Eagle sonar program is 137,743[16] fish (details are presented in Section 8.1). The sonar program near Eagle has operated since 2006 for fall chum salmon; generally there was good agreement between the sonar estimates and estimates derived from the mark–recapture program for 2006–2008 (Appendix B15). The highest estimated fall chum salmon spawning escapement of 437,733 fish occurred in 2005.

Aerial surveys of the mainstem Yukon, Kluane and Teslin River index areas were not conducted between 2007 and 2012. Estimates of the relative abundance of fall chum salmon in these areas

[16] This is based on a sonar estimate of 153,248 fish (expanded for fish passage after the cessation of the program), Eagle subsistence catch of 11,600 fish, and Canadian Upper Yukon catch of 3,905 fish which included: 700 fish in aboriginal, 3,205 fish in commercial, 0 fish in domestic, and 0 fish in recreational catches.

were developed from GSI collected in conjunction with the DFO tagging program (2007–2008) and the Eagle sonar program (2009 to 2012). Historical aerial survey data are presented in Appendices B15, C13 and C14.

In the Porcupine River drainage, the Fishing Branch River weir count was 22,160 fall chum salmon and included 12,413 females and 9,747 males. An adjustment of 239 fall chum salmon was made to account for fish that had migrated past the weir site after the weir was removed. These estimates were developed by extrapolating the last full days' counts based on run timing data. Thus the total estimated 2012 Fishing Branch River escapement is 22,399 fall chum salmon (Table 8; Appendices B15 and C14), which is just above the lower end of the escapement target of 22,000 to 49,000 fall chum salmon. Details of the 2012 weir operation are presented in Section 8.2.

In addition to the Fishing Branch River weir, a sonar program was operated from August 24 to September 29 on the Porcupine River immediately downstream of Old Crow. A total of 27,238 fall chum salmon targets were enumerated, yielding a preliminary passage of 29,824 fish after interpolating. The preliminary spawning escapement estimate developed by the sonar program was 27,793[17] for the Porcupine River in Canada. The sonar data were used inseason to verify run timing and help determine how long to operate the Fishing Branch River weir. More detail is provided in project summary Section 8.2 under Porcupine River Investigations.

Table 8.–Summary of 2012 fall chum salmon escapement counts to Canada, in comparison with existing interim management escapement goals (IMEG).

Location	Assessment Method	Escapement Goal (type)	2012 Fall Chum Salmon Escapement
Fishing Branch River	Weir	22,000–49,000 (IMEG)	22,399
Yukon River Mainstem	Sonar-Harvest	70,000–104,000 (IMEG)	137,743

8.0 PROJECT SUMMARIES

8.1 ALASKA

Pilot Station Sonar

The goal of the Pilot Station sonar project is to estimate the daily upstream passage of Chinook, chum, and coho salmon. The project has been in operation since 1986. Both split-beam and dual frequency identification sonar (DIDSON) are used to estimate total fish passage (Figure 9), and CPUE from the drift gillnet test fishing portion of the project is used to estimate species composition. A detailed history of refinements and enhancements to the project's sonar equipment and apportionment methodologies can be found in Carroll and McIntosh (2008).

[17] This is based on the sonar estimate of 29,824 minus the upstream harvest. Harvest downstream of the sonar was estimated at 1,087 fall chum salmon (Personal communications with William Josie of Vuntut Gwitchin Government) which when subtracted from the overall harvest of 3,118 results in an upstream harvest of 2,031 fish.

Fish passage estimates at Pilot Station are based on a sampling design in which sonar equipment is operated daily in three 3-hour intervals, and drift gillnets are fished twice each day between sonar periods to apportion the sonar counts to species. The test fishing program, uses an assortment of gillnets, 25 fathoms long with mesh sizes ranging from 7.0 cm to 21.6 cm (2.75 in to 8.5 in), drifted through the sonar sampling areas twice daily between sonar data collection periods.

During the 2012 season, sonar units on both banks were operational from June 1 through September 7. Test fishing began on June 1, with the first Chinook salmon caught on June 10, first summer chum salmon caught on June 12, and the first coho salmon caught on July 21.

Drift gillnetting resulted in a catch of 9,845 fish including 461 Chinook, 4,119 summer chum, 2,015 fall chum, and 519 coho salmon; 2,731 fish of other species were also caught. Chinook salmon were sampled for age, sex, and length, and genetic samples were taken from both Chinook and chum salmon. Any captured fish that were not successfully released alive were distributed daily to nearby residents in Pilot Station.

The right bank bottom profiles remained similar to prior years with little or no change throughout the season. Left bank profiles remained linear throughout the field season, and there were no problems with detection due to silt and other environmental factors. Water levels observed near Pilot Station were above average during more than half of both the summer and fall seasons compared to USGS 2001–2011 data (http://waterdata.usgs.gov/ak/nwis/current/?type=flow).

Cumulative passage estimates for each targeted species through September 7 were 90,936 large (>655 mm) Chinook, 15,790 small Chinook (<655 mm), 2,130,404 summer chum, 682,510 fall chum, and 106,782 coho salmon. Additionally, passage estimates for non-target fish species include 352,518 pink salmon and 678,382 other fish species. The DIDSON sonar accounted for an additional 36.1% of Chinook salmon, 31.5% of summer chum salmon, 19.0% of fall chum salmon, and 13.1% of coho salmon passage over the split beam estimates. Overall, the DIDSON estimate contributed an additional 26.6% of the total passage. Based on the averages of passage at Pilot Station sonar for the years 1995, 1997, 1999, 2002–2008, and 2010, large Chinook salmon were below the average of 128,000 fish; small Chinook salmon were below the average of 32,000 fish; and summer chum salmon were above the average of 1,870,000 fish. Based on the averages of passage at Pilot Station sonar for the years 1995, 1997–2008, and 2010–2011, fall chum salmon were above the average of 654,000 fish; coho salmon were below the average of 147,000 fish; pink salmon were above the average of 132,000 fish and other species were slightly above the average of 632,000 fish (Appendix A2).

In 2012, all project goals were met, with passage estimates given to fisheries managers daily during the season. Information generated at the Pilot Station Sonar project was also disseminated weekly through multi-agency international teleconferences and data-sharing with stakeholders in areas from the lower Yukon River all the way to the spawning grounds in Canada.

Yukon River Chinook Salmon Harvest Stock Identification

Scale pattern analysis, age composition estimates, and geographic distribution have been used by ADF&G on an annual basis from 1981 through 2003 to estimate stock composition of Chinook salmon in Yukon River harvests. Three region-of-origin groupings of Chinook salmon, or stock groups, had been identified within the Yukon River drainage. The Lower and Middle stock groups spawn in Alaska and the Upper stock group spawns in Canada.

In 2004, genetic analysis replaced scale pattern analysis as the primary method for stock identification. Tissue samples were collected from fish in mixed-stock harvests in Districts 1 through 5 (Decovich and Howard 2011) and these were typically paired with age data (Leba and DuBois 2011). Genetic analysis has been performed by major age class (age-5 and -6), but in recent years all ages have been combined. Results from these analyses were combined with harvest age composition to provide stock composition by harvest.

ADF&G Gene Conservation Laboratory provided genetic stock estimates for Chinook salmon sampled in the incidental commercial and subsistence harvests in 2011. These estimates, harvest age composition, and geographic location were used to apportion the annual harvest within the drainage to Lower, Middle, and Upper stock groups. U.S. and Canada combined harvest estimates for 2011 were 13.8% from the Lower stock group, 29.8% from the Middle stock group, and 56.4% from the Upper stock group (Appendix A12). U.S.-only harvest estimates from the Lower, Middle, and Upper stock groups were 15.5%, 33.4%, and 51.1%; respectively (Appendix A13). Percentage of the estimated Upper stock group harvest by country was 81.0% U.S. and 19.0% Canada harvest (Appendix A14). Comparing the 2011 total Chinook salmon harvest (U.S. and Canada) percentage with the recent 5-year average (2006 through 2010), all stock group percentages were near average (Appendix A12). Comparing the 2011 Upper stock group harvest (U.S. and Canada) percentage with the average, the U.S. harvest was below average (Appendix A14). The 2012 estimates by stock group will not be available until the following year.

Yukon River Chinook and Chum Salmon Genetic Sampling

Chinook Salmon

ADF&G field crews, along with other collaborators, collected 3,993 samples (axillary process tissue preserved in ethanol) from Chinook salmon harvested by test, tagging, subsistence, and the incidental commercial harvest in 2012. These samples were from mixed-stock fisheries in the mainstem Yukon River in Districts 1, 2, 4 and 5. Samples from test fisheries totaled 2,478 fish: 1,075 from Big Eddy and Middle Mouth combined, 433 from Mountain Village, 457 from Pilot Station Sonar, and 344 from Eagle Sonar. The Pilot Station acoustic tagging project collected 159 samples. Samples from the incidental commercial catch in District 1 were 517 fish. Samples from subsistence fisheries totaled 1,614 fish: 287 from District 1, 480 from District 2, 240 from District 4, and 362 from District 5 villages. Subsistence harvest samples were collected by several organizations: Association of Village Council Presidents, Tanana Chiefs Conference, City of Kaltag, and Rapids Research Center. These organizations typically contract with individual fishermen in several locations to sample their harvest.

A total of 179 baseline Chinook salmon samples were collected from 7 locations: 58 from the Kateel River, 16 from the middle and south forks of the Koyukuk River, 90 from the north and south forks of the Nulato River, 6 from Rodo River, and 9 from Nine Mile River. Chinook salmon genetic samples reside in the Gene Conservation Laboratory, ADF&G, Anchorage.

Chum Salmon

ADF&G, in cooperation with USFWS, collected genetic tissue samples from the Pilot Station test fishery from 4,156 summer and 2,014 fall run chum salmon. Chum salmon genetic samples reside in the Conservation Genetics Laboratory, USFWS, Anchorage. Populations in the baseline are reported in aggregated stock groups (Table 9).

Table 9.–Microsatellite baseline is comprised of 37 stocks used to estimate stock composition of chum salmon collected at Pilot Station sonar test drift gillnet program, Yukon River, 2012.

Stock Aggregate Name	Populations in Baseline
Lower	Andreafsky, Anvik, California, Chulinak, Clear, Dakli, Kaltag, Nulato, Gisasa, Melozitna, Rodo, Tolstoi
Upper Koyukuk	Henshaw, Jim, South Fork Koyukuk (early and late run), Tozitna
Tanana Summer	Chena, Salcha
Tanana Fall	Bluff Cabin, Delta, Nenana, Kantishna, Toklat
Border U.S.	Big Salt, Chandalar, Sheenjek, Black
Porcupine	Fishing Branch
Mainstem	Big Creek, Minto, Pelly, Tatchun
White	Donjek, Kluane
Teslin	Teslin
Aggregate Name	**Aggregate within Aggregate**
Summer	Lower, Middle
Middle	Upper Koyukuk, Tanana Summer
Fall	Tanana Fall, Border U.S., Border Canada, Upper Canada
Fall U.S.	Tanana Fall, Border U.S.
U.S.	Lower, Middle, Tanana Fall, Border U.S.
Border Canada	Porcupine, Mainstem
Upper Canada	White, Teslin
Canada	Border Canada, Upper Canada

Yukon River Chum Salmon Mixed-Stock Analysis

Sampling of chum salmon from the Pilot Station sonar test fishery started at the beginning of June through the first week of September to estimate the stock compositions for the majority of the summer and fall chum salmon runs. Results from this analysis were reported for each pulse or time stratum and distributed by email to fishery managers within 24-48 hours of receiving the samples. For summer chum salmon, the lower river stock group comprised 87% of the run while the middle river stock group comprised 13%. Within the middle river stock group, the Tanana summer component comprised 2% and peaked in passage past Pilot Station sonar during the sampling period of July 19 to 24. For fall chum salmon, 72% of the run was of U.S.-origin and 28% of Canadian-origin. The U.S. portion was further subdivided with Tanana stocks contributing 32% Tanana and U.S. border (Chandalar, Sheenjek, and Black rivers) stocks contributing 40% to the total run. The Canadian portion contributed 14% from mainstem, 1% from Porcupine, 12% from White, and 1% from Teslin river origin stocks to the total run. Stock abundance estimates were derived by combining the Pilot Station sonar passage estimates with the stock composition estimates. To evaluate the concordance of various data sources, an analysis was conducted to compare these stock specific abundance estimates against escapement and harvest estimates. This analysis revealed that the stock proportions were concordant for 2004–2010 (Flannery et al. 2010). However, the level of agreement of estimated abundance between the monitoring methods appeared to be related to the run timing of the summer and fall runs of chum salmon. There was better agreement in 2004 and 2005 when fall chum salmon

comprised the majority of the run after the transition date. Less agreement was found in 2006–2010 when the fall run was late, which suggested that the sonar missed the late returning fish after it ended operations and that escapement projects counted summer chum salmon as fall (Flannery and Wenburg 2012). An analysis is ongoing for the 2011 and 2012 data, and preparations are underway to continue the project for the 2013 season.

Sheenjek River Sonar

The Sheenjek River sonar project has estimated fall chum salmon escapement since 1981, and has undergone a number of changes throughout the years (Dunbar 2004 and Dunbar 2006). Historically, due to unfavorable conditions for transducer placement and a low distribution of migrating fall chum salmon on the left bank (Barton 1985), the biological escapement goal (BEG) was based only on right bank passage and continues to be used. However, since 2005 ADF&G has deployed Dual Frequency Identification Sonar (DIDSON) on both banks (Dunbar and Pfisterer 2009).

In 2012, 36% of the fish migrated on the formerly unmonitored left bank. This compares to 39% in 2005, 2006 and 2009, 40% in 2007 and 2011, and 16 % in 2008 (Dunbar 2012). The left bank sonar did not operate in 2010 because of flooding. It will take several more years of data collection to determine how best to treat the historical estimates, but in order to provide the best escapement number possible the left bank must continue to be monitored. Until then, only the right bank estimate will be used to evaluate whether the BEG is obtained. The transition from split-beam to DIDSON has gone smoothly and this equipment should continue to provide accurate escapement estimates in future years.

In 2012, the fall chum salmon passage estimate at the Sheenjek River sonar site was 86,192 fish during the dates August 9 through September 24. Because of high passage when the project was terminated, the sonar estimate was subsequently adjusted to 104,701 fall chum salmon. The expansion was calculated using a 2^{nd} order polynomial through October 9 (Bonnie Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). For comparison with past years, only the expanded right bank estimate of 72,746 fish was used to evaluate whether the BEG was obtained. The right bank estimate was 31% above the low end of the Sheenjek River biological escapement goal of 50,000 to 104,000 fall chum salmon.

Salcha River Tower

The Salcha River is largest contributor to the Chinook salmon stocks in the Tanana River drainage. In addition, the Salcha combined with Chena River stocks averaged 44% of the middle run stocks in the lower Yukon River from 2002 through 2004. The largest Chinook salmon escapement recorded was 18,514 fish in 1997 and the lowest was 3,294 fish in 1989. The average Chinook salmon escapement from 1987 through 2011 was 9,270 fish. Escapement has been assessed with mark–recapture (1987–1992, 1996) and counting tower (1993–1995, 1997–2012) techniques.

In years when mark–recapture experiments were conducted, abundance of males and females was estimated directly and their relative abundance was used to estimate proportions of males and females. Age composition was determined from samples of scales collected during the marking event (fish were captured on the spawning grounds using electrofishing), during the recapture event (from carcasses), or from samples taken during both events.

In years when tower counts were used to estimate abundance, sex composition was determined from a sample of carcasses collected on the spawning grounds. The proportion of females in the sample was multiplied by the total abundance estimate to estimate abundance of females. Biased estimates of sex composition have been noted during sampling when sex ratios of Chinook salmon collected during carcass surveys were compared with those estimated with mark–recapture methods. Therefore, an adjustment based on the average of ratios of unbiased estimates from mark–recapture experiments to estimates from carcass samples over those years when mark–recapture studies were conducted was developed to more accurately reflect the population. Age composition was determined from scales collected from carcasses.

In 2012, the Salcha River counting tower was in operation from 17 July to 15 August; the estimated Chinook salmon escapement during that time was 7,165 fish (SE=163; Appendix B10). The estimated chum salmon escapement during that time was 46,251 fish (SE=580). A total of 504 Chinook salmon carcasses were collected along the Salcha River from 6 August through 17 August. The estimated proportion of females in the escapement from the carcass survey was 0.59 (SE=0.02) and the gender-bias adjusted estimate was 0.51 (SE=0.10). The largest age class for males (51%) was age-5, whereas the largest for females (77%) was age-6.

8.2 EAGLE SONAR

Since 2006, both Chinook and fall chum salmon passage have been estimated at Six-Mile Bend on the Yukon River near the United States/Canada border using split-beam and dual frequency identification sonar (DIDSON) (Smith and Dunbar 2012; Carroll et al. 2007a; Carroll et al. 2007b).

In 2012 there was only one high water event (July 12–14) that included large amounts of silt and woody debris. Sonar counts were subsequently adjusted to account for fish that may have been missed during this period of high water.

In addition to operating the sonar, a drift gillnet program was conducted at or near Six-Mile Bend to monitor species composition, and to collect age, sex, and length (ASL) data and genetic samples of the fish passing the sonar site. Four gillnets, 25 fathoms in length with mesh sizes including 5.25, 6.5, 7.5, and 8.5 inches, were fished daily to collect the samples. Although there is some minor overlap, Chinook and fall chum salmon runs appear to be largely discrete in time based on test fishery results, local knowledge of catches, and data collected in Canada.

Chinook Salmon

In 2012, the Chinook salmon passage estimate at the Eagle sonar site was 34,747 fish for the dates July 5 through August 19 (Table 10). After subtracting the preliminary Eagle area Chinook salmon subsistence harvest of 91 fish (Deena Jallen, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) from the sonar estimate, the resulting border passage estimate was 34,656 fish. Preliminary Canadian harvest of 2,000 Chinook salmon[18] was subtracted to obtain the estimate of mainstem Yukon River escapement of 32,656 fish, which was 23% below the low end of the interim management escapement goal (IMEG) of 42,500–55,000.

[18] This preliminary harvest estimate comprised only aboriginal fishery harvest and no harvest in commercial, domestic, or recreational fisheries (B. Huebeschwerlen, DFO Whitehorse, personal communication).

A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 50,000[19] fish. This was below the lower end of the precautionary preseason outlook range of 54,000 to 73,000 (JTC 2012)[20] Chinook salmon.

Table 10.–Eagle sonar project passage estimates, and border passage estimates, 2005–2012.

Date	Sonar Estimate	Eagle Area Subsistence Harvest	U.S./Canada Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Mainstem Escapement Estimate
2005	81,528	2,566	78,962	10,977	67,985
2006	73,691	2,303	71,388	8,758	62,630
2007	41,697	1,999	39,698	4,794	34,904
2008	38,097	815	37,282	3,399	33,883
2009	69,957	382	69,575	4,297	65,278
2010	35,074	604	34,470	2,455	32,015
2011	51,271	370	50,901	4,594	46,307
2012 [a]	34,747	91	34,656	2,000	32,656

Note: Estimates for subsistence caught salmon between the sonar site and border (Eagle area) prior to 2008 include an unknown portion caught below the sonar site. This number is most likely in the hundreds for Chinook salmon. Starting in 2008, the estimates for subsistence caught salmon only include salmon harvested between the sonar site and the U.S./Canada border.

[a] Eagle subsistence and Canadian harvest estimates are preliminary.

Fall Chum Salmon

The fall chum salmon passage estimate at the Eagle sonar site was 147,710 fish for the dates August 20 through October 6 (Table 11). Because of the high passage of fall chum salmon when the project was terminated the sonar estimate was subsequently adjusted to 153,248 fish. The expansion was calculated using a 2nd order polynomial calculated to the date October 18 (Bonnie Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). After subtracting the preliminary Eagle area fall chum salmon subsistence harvest of 11,600 fish (Deena Jallen, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) from the sonar estimate, the resulting border passage estimate is 141,648 fall chum salmon. After subtracting the preliminary Canadian harvest (3,905 fish)[21] the resulting escapement of 137,743 fall chum salmon was well above the upper end of the IMEG of 70,000–104,000 fish.

A preliminary reconstruction of the 2012 mainstem fall chum salmon run suggests the total Canadian-origin fall chum salmon run size was approximately 238,000 fish[22]. This reconstruction is slightly below the preseason outlook range of 246,500 to 300,000 Upper Yukon fall chum salmon. The 2012 preseason outlook range was based on the ADF&G drainage wide

[19] As calculated by ADF&G.

[20] This low end is the forecast developed using the adjustment indicated by the model's performance in 2010, while the high end is the forecast developed using the adjustment indicated by the model's performance in 2009. These were the extremes of model performance in the last 5 years update.

[21] Harvest included 700 fish in aboriginal and 3,205 fish in commercial fisheries (Bonnie Huebeschwerlen).

[22] Reconstructed run estimate of 238,000 Canadian Upper Yukon fall chum salmon comprised of 153,248 chum salmon from Eagle Sonar, plus 85,000 estimated US harvest (22.1% of 384,000) of Canadian upper Yukon fall chum salmon.

outlook range of 986,000 to 1,200,000 fall chum salmon and an assumption that upper Yukon Canadian-origin fall chum salmon would constitute at least 25% of the drainage wide return.

Table 11.–Fall chum salmon passage, expansion, border passage, and escapement estimates at Eagle sonar project, 2006–2012.

Date	Sonar Estimate	Expanded Estimate [a]	Eagle Area Subsistence Harvest	U.S./Canada Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Mainstem Escapement Estimate
2006	236,386	245,290	17,775	227,515	6,617	220,898
2007	235,871	282,670	18,691	263,979	9,330	254,649
2008	171,347	193,397	11,381	182,016	6,130	175,886
2009	95,462	101,734	6,995	94,739	1,113	93,626
2010	125,547	132,930	11,432	121,498	3,709	117,789
2011	212,162	224,355	12,477	211,878	6,312	205,566
2012 [b]	147,710	153,248	11,600	141,648	3,905	137,743

Note: Estimates for subsistence caught salmon between the sonar site and border (Eagle area) prior to 2008 include an unknown portion caught below the sonar site. This number is most likely a few thousand for fall chum salmon. Starting in 2008, the estimates for subsistence caught salmon only include salmon harvested between the sonar site and the U.S./Canada border.

[a] Sonar estimates include an expansion for fish that may have passed after operations ceased.

[b] Eagle subsistence and Canadian harvest estimates are preliminary.

8.3 CANADA

Upper Yukon River Salmon Assessment Programs (Yukon Territory)

Blind Creek Weir

A weir was operated in Blind Creek in 2012 to enumerate the Chinook salmon escapement and obtain biological information from the stock. This was the 10th year a weir has been operated in Blind Creek with funding by the Yukon River Panel, Restoration & Enhancement Fund. Camp set up was initiated on July 19; however, high water levels at the start of the project delayed weir construction until July 23 after the water level had subsided. The weir was located at the same site used for the past 9 years, approximately 1 km upstream of the confluence with the Pelly River. Operation of the weir began on July 25 and continued through to August 20. The first fish passed through the counting chamber on July 28. A total of 157 Chinook salmon was counted in 2012 which was the lowest escapement observed over the duration of the project. The 10-year average (2002–2011) weir passage is 559 Chinook salmon (Appendix B12). The midpoint of the run occurred on August 8 and 90% of the run had passed through the weir by August 15. Migrating Chinook were sampled randomly throughout the period of weir operation to obtain information on the age-sex-length structure of the run. A total of 134 Chinook salmon (85% of the run) was live sampled. Of these, 65 (49%) were female and 69 (51%) were male. The mean fork length of females and males sampled was 863 mm and 749 mm, respectively. Jacks (males with a nose to fork length < 630 mm) comprised 13% of the males sampled. The DFO scale lab determined ages from 105 Chinook sampled. Age-6 (46.7%) was the dominant age class, followed by age-5 fish (38.1%). Age-4 and age-7 fish represented 10.5% and 4.8% of the sample, respectively.

Big Salmon Sonar

A long range dual frequency identification sonar (DIDSON) was used to enumerate the Chinook salmon escapement to the Big Salmon River in 2012. The sonar was operated on the Big Salmon River for its 8th year at the same site used for the 2005 to 2011 projects, approximately 1.5 km upstream of the confluence of the Yukon River. The camp and sonar station set-up was initiated on July 14. Sonar operation began on July 18 and operated continuously to August 24. A total of 2,553 targets identified as Chinook salmon were counted during the period of operation. The 2012 sonar count was the second lowest observed with an average of 5,772 Chinook salmon over the 8 year duration of the project (Appendix B12). The Big Salmon River escapement represented 7.8% of the upper Yukon River preliminary escapement estimate of 32,656 Chinook salmon. The first Chinook salmon passing the Big Salmon sonar station was observed on July 25. The peak daily count of 235 fish occurred on August 8, at which time 50% of the run had passed the sonar station; 90% of the run had passed the station on August 17. The peak of the run was approximately 7 days later than average which was consistent with run timing observed at other escapement monitoring projects on the upper Yukon drainage. A carcass pitch was conducted over approximately 145 km of the Big Salmon River, yielding 47 sampled Chinook salmon. Of these, 27 (57.4%) were female and 20 (42.6%) were male. The mean fork length of females and males sampled was 841 mm and 796 mm, respectively. The DFO scale lab determined ages from 40 Chinook sampled. Age-6 (80%) was the dominant age class, followed by age-5 fish (20%).

Teslin River Sonar

In 2012, Chinook salmon returning to spawn in the Teslin River system were enumerated using multiple beam high resolution sonar. Sonar units were operated at a site located on the lower mainstem Teslin River approximately 10 km upstream of the junction of the Teslin and Yukon rivers. This site was identified as part of a Teslin River sonar feasibility study conducted in 2011. Camp facilities were constructed and associated equipment and materials transported to the site on July 1 through 10. Two multiple beam sonars were used for the project; one standard dual frequency identification sonar (DIDSON) and one Adaptive Resolution Imaging Sonar (ARIS). The 2012 project operational plan was to place a sonar on each side of the river. The sonar units were configured to aim across the river enabling ensonification of as much of the migration corridor as possible. The ARIS unit was deployed for the full duration of the project (July 17–September 3) primarily from the north bank of the river. The DIDSON unit was deployed for 30 days (July 20–August 20) primarily from the south bank. A fence consisting of a log boom and page wire was positioned downstream of each sonar to deflect migrating Chinook salmon into the ensonified portion of the river.

The 2011 Teslin sonar feasibility study indicated that 97% of the Chinook salmon observed passing the site were located within the range of the north bank sonar. In 2012, all the passing Chinook salmon were detected by the sonar on the north bank indicating a distribution profile similar to that observed in 2011. A total of 3,396 targets identified as Chinook salmon were counted during the period of operation. The 2012 Teslin River sonar count constituted 10.4% of the upper Yukon River preliminary escapement estimate of 32,656 Chinook salmon. The first Chinook salmon passing the Teslin sonar station was observed on July 27; 50% and 90% of the run had passed the station on August 14 and August 24, respectively. The peak daily count of 186 fish occurred on August 21, at which time 76% of the run had passed the sonar station. The beginning of the run was approximately 7 days later than expected. Two separate carcass pitches

were conducted over approximately 165 km of the mainstem Teslin River yielding 147 sampled Chinook salmon. Of these, 95 (65%) were female and 52 (35%) were male. The mean fork length of females and males sampled was 853 mm and 773 mm respectively. The DFO scale lab determined ages from 118 of the Chinook salmon sampled. Age-6 (68%) was the dominant age class, followed by age-5 (28%) and age-4 (4.2%).

Whitehorse Rapids Fishway Chinook Salmon Enumeration

The Whitehorse Rapids Fishway is a fish ladder bypassing the Whitehorse dam that has a viewing window and trap gates on either side used for sampling fish without handling. A total of 1,037 Chinook were enumerated at the Whitehorse Fishway in 2012. Fishway staff enumerated 1,030 Chinook salmon at the Whitehorse Rapids Fishway between August 7 and Sept 3, 2012. Hatchery personnel counted an additional 7 Chinook salmon up to September 9, 2012. Of the total returning adult Chinook counted at the Fishway, 610 of the 1,037 fish were of hatchery origin. The hatchery component included 501 males and 109 females and represented 59% of the Whitehorse Rapids Fishway count. The wild component included 230 males and 197 females. Female Chinook made up 29.5% of the total run.

In 2012, besides the Chinook salmon viewed for adipose clips (indicating coded wire tags in hatchery fish) in the Whitehorse Rapids Fishway, 33 samples were obtained from the brood stock collected. No weirs (Wolf or Michie creek) were operated in the drainage upstream of the Whitehorse Rapids Fishway in 2012.

The Whitehorse Rapids Fishway program is a joint Yukon Fish and Game Association, Yukon Energy Corporation, and DFO initiative; it has a number of components that are linked to the operation of Whitehorse Rapids Hatchery and the coded wire tagging program. Students count all fish moving upstream through the Fishway, record the sex and relative size of each fish, identify hatchery-origin fish based on the absence of the adipose fin which is removed from all hatchery released fry, and assist with brood stock collection.

Whitehorse Hatchery Operations

The Whitehorse Rapids Hatchery has a current annual release target of 150,000 two-gram Chinook salmon fry. This target has been in place since 2002; releases since that time have ranged from 80,739 fry in 2008 to 176,279 fry in 2003, and the 10-year average (2002–2011) is 152,194 fry (Appendix A15).

Chinook salmon fry reared at the Whitehorse Rapids Hatchery were adipose fin-clipped and injected with Decimal coded wire tags in the early summer of 2012. The tagging procedure in 2012 included the application of separate tag codes to each of 4 release groups, a departure from the use of "Agency-only" tags in the preceding 5 years. As a note, continued Agency only wire use was applied for with the Regional Marking Committee however it was not permitted and Decimal coded wire tags were used following their direction to do so. Tagging procedures otherwise followed the standard procedures used in recent years, including using of Tricaine methane sulphonate (MS222) to anaesthetize the fry prior to clipping and tagging.

The 2012 release was the 16th year in which all fit fish released from the Whitehorse Rapids Fish Hatchery into the Yukon River were marked, i.e., the 1995–2011 brood years. With the exception of all fish released from the 1998 BY, which were adipose-clipped but not tagged, all of the 1995–2011 brood year releases involved adipose fin removal and application of coded wire tags to all fit fish. The initiative to mark all of the fish released from the hatchery provides

an opportunity to accurately determine the hatchery contribution as adult fish migrate upstream through the Whitehorse Rapids Fishway (sampled by viewing) and it is also helpful during brood stock collection. Fin clipping also enables researchers to distinguish hatchery fry from wild fry when investigating juvenile Chinook salmon habitat use. Marked fish are occasionally recovered in marine studies (see Northern Bering Sea Pelagic Trawl Surveys section 9.4).

All 148,488 Chinook salmon fry reared and marked at the Whitehorse Rapids Fish Hatchery from the 2011 brood year were released between May 27 and June 6, 2012. The fry[23] were released into various locations upstream of the Whitehorse Rapids hydroelectric dam (Appendix A15). Average fry weight at time of release was 2.8 grams. Included in the Mainstem Yukon River release total were 1,563 fry that were considered to be too small or unfit for tagging. These fish had their adipose fins removed, and they were released untagged on June 6, 2012 (Appendix A16).

Tag retention for the fish tagged for the 2012 release (2011 brood year) was calculated to be 98.8%. This calculation is derived from information that suggests that 1,700 of the 146,925 tagged fish did not retain their tag. The total 2012 release includes 145,225 adipose-clipped fish with intact coded wire tags, 1,700 fish estimated to have lost their tags, and 1,563 small (or unfit) fish that were clipped but not tagged for a total release of 148,488 fish.

Brood stock collection began on August 14, after 71 Chinook salmon had migrated through the Whitehorse Rapids Fishway, and ended on September 5, 2012. An attempt was made to collect 2 males for each female during brood stock collection to allow matrix spawning. Matrix spawning has been used for 24 years in an effort to maintain genetic diversity. A total of 75 males were used for the brood stock program; 46 of these fish were adipose-clipped (hatchery) and 29 had intact adipose fins (wild). This total represents 10.3% of the total male return of 731 Chinook salmon.

In total, 37 females, including 3 partially spent fish, were spawned for the Whitehorse Rapids Hatchery program, producing a preliminary estimated total of 185,000 green eggs, which was revised to 201,516 at shocking stage. There were no mortalities during holding. Average fecundity was estimated at 5,681 eggs per female with a range from 4,348 to 7,275. The fertilization rate was estimated to be 100%. Shocking and second inventory of the eggs began on October 16 and was completed by October 31, 2012. An estimated total of 188,186 eyed eggs were on hand in October 2012. The overall survival from green egg to eyed egg was estimated to be 93%, including 2 batches of eggs from partially spent females with 0% survival.

On October 31 2012, an estimated 36,250 eyed eggs were transferred from the Whitehorse Rapids Hatchery to the McIntyre Creek Salmon Incubation Facility, including 1,200 for classroom incubation projects. These eggs will be used for the Fox Creek salmon restoration, program funded by the Yukon River Panel Restoration and Enhancement fund.

Porcupine River Investigations

Fishing Branch River Fall Chum Salmon Weir

Fall chum salmon returns to the Fishing Branch River have been assessed annually since 1971 (aerial survey or weir). The weir, established to enumerate fall chum salmon escapement to the

[23] The fish released are referred to as fry, however virtually all of them emigrate to the ocean shortly after release, and they may more accurately be referred to as pre-smolts.

Fishing Branch River, operated during the following periods; 1972–1975; 1985–1989; and has operated annually since 1991 in a cooperative effort between DFO and the Vuntut Gwitchin Government. Spawning escapement estimates for the Fishing Branch River, including aerial expansions for years lacking complete weir counts and have ranged from approximately 5,100[24] fall chum salmon in 2000, to 353,300[25] fall chum salmon in 1975 (Appendix B15).

The Fishing Branch River weir provides the primary assessment of the fall chum salmon return to the Porcupine River drainage. In 2012, the Fishing Branch River weir was operated from September 4 to October 14. The count was 22,160 fall chum salmon and included 14,413 females and 9,747 males. The weir count was expanded to account for fall chum salmon passage after the weir was removed using a parabolic expansion function[26] provided by ADF&G (Bonnie Borba, Commercial Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) and 239 fall chum salmon were added to the total. After extending the daily counts to October 25, the total estimated 2012 Fishing Branch escapement is 22,399 fall chum salmon. The 2012 escapement was 70% of the 2002–2011 average of 31,966 fall chum salmon (Appendix B15).

The estimated midpoint of the run occurred on September 21, one day later than the recent 10-year average midpoint in the run of September 20. The Fishing Branch River weir is usually removed before the run is completely over. Historical weir counts, expanded using the parabolic expansion function described, are presented in Appendix B15. Weir installation dates have ranged from as early as August 18, in 1996, to as late as September 23 in 1972. However, weir installation has been completed by September 6 in all but 3 years, and run data for projects that operated throughout September indicated that an average of only 3% of fall chum salmon have passed through the weir by this date. No consistent expansion method has been applied to estimate fish missed at the beginning of the project, but adjustments have been made when installation timing or first day's counts indicated that a significant portion of the run had been missed. The 2012 escapement count at the Fishing Branch River weir was just over the lower end of the Fishing Branch River Interim Management Goal (IMEG) range of 22,000 to 49,000 fish, which was established for the 2008–2011 period, then extended to 2013.

Porcupine River Sonar

Split beam sonar was used to enumerate fall chum salmon on the Porcupine River from August 24 to September 29, 2012, at a site located approximately 2 km downstream from the community of Old Crow, Yukon. This was the second year of operation for this project. In conjunction with sonar counts, drift netting was conducted downstream of the sonar site, to apportion the sonar counts between fall chum salmon and other adult fish species present at the site. Individually numbered spaghetti tags were applied to captured fall chum salmon, to help determine run timing at the Fishing Branch River enumeration weir.

A total of 27,238 fish targets were counted during the operational period of the sonar project; 92.4% (122 of 132) of fish captured in the drift netting fishery were fall chum salmon. Test netting data from 2012 supported by 2011 data and historical gill netting data (2003 to 2010) from previous fall chum salmon stock assessment programs (mark recapture and CPUE indices)

[24] Weir operations were interrupted due to flooding for an 8 day period following September 22 in 2005. Weir count prior to the flooding was 4,993. Only 60 chum salmon were counted through the weir after operations resumed on October 1, 2005.

[25] Estimate expanded from a count of 301,296 at the weir, which was out of operation due to high water for a three day period at the peak of the run.

[26] The equation used is essentially a shifted and scale parabola is $Y=L/d^2 * (x-d)^2$ where: L=last count; d=number of days expanding for; and x=day count 1 through last count.

show that adult fish other than fall chum salmon are negligible in numbers in comparison to migrating fall chum salmon. The final interpolated total upstream passage estimate of fall chum salmon at the Porcupine River sonar site in 2012 was 29,824 fish.

The 2012 sonar counts suggest a bi-modal distribution of migrating fall chum salmon, with peak daily passage rates on September 5 and 22; a similar pattern of counts was observed at the Fishing Branch weir (when adjusting for travel times). As in 2011, sonar data from 2012 show that nearly all detected fall chum salmon (over 95% of detected fish) migrated within 20 m of the sonar transducer on both river banks, indicating a bank oriented distribution.

There were 108 tags applied as part of the sonar project. Of these, 65 tags (60%) were either recovered or observed at the Fishing Branch River enumeration weir. There are known spawning areas between the sonar site and the weir, and the 60% recovery of tags at the Fishing Branch weir reflected this. There are approximately 12 days travel time between Old Crow sonar sight and the Fishing Branch weir.

The field component of this project was conducted primarily by Vuntut Gwitch'in First Nation technicians who received employment and training related to the operation of split beam sonar, hydroacoustic data analysis, and drift netting.

Stock Identification of Yukon River Chinook and Fall Chum Salmon using Microsatellite DNA Loci

Chinook Salmon

Genetic stock identification of the 2012 Chinook salmon migration bound for Canada was developed using genetic samples collected from the Eagle sonar test drift gillnet program. Variation of 16 microsatellite loci was surveyed from 344 Chinook salmon sampled.

Chinook salmon stock contribution estimates were based on 8 regional reporting groups (stock aggregates; Table 12). The estimated stock composition and the associated standard errors (Table 13) apply for the period from July 14 to August 19, 2012.

Table 12.–Baseline comprised of 24 stocks used to estimate stock compositions of Chinook salmon collected at the Eagle sonar test drift gillnet program, Yukon River, 2012.

Stock Aggregate Name	Populations in Baseline
North Yukon Tributaries	Chandindu and Klondike rivers
White River	Tincup Creek, Nisling River
Stewart River	Mayo and Stewart rivers
Pelly River	Little and Big Kalzas, Earn, Glenlyon, and Pelly rivers, Blind Creek
Mid-mainstem Tributaries	Mainstem Yukon and Nordenskiold rivers
Carmacks Area Tributaries	Little Salmon and Big Salmon rivers, Tatchun Creek
Teslin River	Teslin Lake, Nisutlin, Morley, Jennings and Teslin rivers
Upper Yukon Tributaries	Whitehorse Hatchery and Takhini River

Estimated contributions of the stock aggregates to the total 2012 Eagle sonar estimate were: Carmacks Area Tributaries (13.0%); Teslin River (37.8%); Pelly River (9.7%); Mid-mainstem Tributaries (18.8%); Stewart River (6.4%); North Yukon Tributaries (3.6%); White River (4.3%); and Upper Yukon River tributaries (6.4%; Table 13).

Table 13.–Estimated proportions of Chinook salmon stock composition migrating past the Eagle sonar site in 2012.

Region	Jul 10-16 n=2 Est.	SD	Jul 17-23 n=44 Est.	SD	Jul 24-31 n=133 Est.	SD	Aug 1-6 n=118 Est.	SD	Aug 7-13 n=44 Est.	SD	Aug 14-21 n=3 Est.	SD	Season n=344 Est.	SD
Upper Yukon Tributaries	1.7	(12.0)	4.2	(3.2)	6.2	(2.1)	4.9	(2.5)	12.8	(5.6)	0.2	(6.6)	6.4	(1.5)
Teslin River	15.0	(22.9)	34.8	(9.2)	36.0	(6.5)	48.1	(8.3)	35.5	(11.4)	0.7	(10.5)	37.8	(4.6)
Carmacks Area Tributaries	15.6	(22.8)	15.0	(9.0)	11.6	(4.4)	13.1	(5.6)	10.1	(6.0)	1.6	(10.2)	13.0	(3.1)
Mid-Mainstem	17.8	(22.0)	8.7	(7.8)	14.6	(5.4)	21.2	(8.0)	29.5	(12.0)	97.4	(19.8)	18.8	(4.4)
Pelly River	50.0	(25.1)	17.6	(7.5)	11.7	(3.5)	7.0	(3.3)	0.5	(1.8)	0.0	(10.1)	9.7	(2.0)
Stewart River	0.0	(8.5)	9.2	(5.6)	7.8	(3.3)	3.2	(3.2)	9.8	(5.5)	0.1	(6.8)	6.4	(1.9)
North Yukon Tributaries	0.0	(7.6)	8.4	(4.5)	5.2	(2.0)	1.2	(1.4)	0.0	(0.7)	0.0	(6.4)	3.6	(1.1)
White River	0.0	(9.2)	2.1	(3.7)	7.0	(2.5)	1.4	(1.7)	1.7	(2.2)	0.0	(5.9)	4.3	(1.3)

Note: Eagle sonar switched from enumerating Chinook to fall chum salmon on August 20, 2012.

The estimated abundance for the 6 sample periods (i.e. July 10–16, July 17–23, July 24–31, August 1–6, August 7–13 and August 14–21) were derived from the analysis of individual genetic samples, pooled into these sample periods and multiplied by the final abundance estimate from the Eagle sonar corresponding to these periods (Table 14; Figure 10). The seasonal estimate provided is derived from the genetic analysis (all periods pooled) multiplied by the Eagle sonar abundance estimate.

Table 14.–Estimated abundance of Chinook salmon migrating past the Eagle sonar site in 2012.

Region	Jul 10-16 n=2	Jul 17-23 n=44	Jul 24-31 n=133	Aug 1-6 n=118	Aug 7-13 n=44	Aug 14-21 n=3	Season n=344
Upper Yukon Tributaries	10	262	905	377	576	2	2,214
Teslin River	93	2,180	5,270	3,714	1,596	7	13,146
Carmacks Area Tributaries	96	941	1,699	1,010	455	16	4,515
Mid-Mainstem	110	548	2,136	1,636	1,327	969	6,541
Pelly River	309	1,104	1,716	537	21	0	3,359
Stewart River	0	578	1,137	249	441	1	2,224
North Yukon Tributaries	0	526	758	89	0	0	1,254
White River	0	133	1,018	108	75	0	1,495
Total	617	6,272	14,640	7,719	4,491	995	34,747

Note: Eagle sonar switched from enumerating Chinook to fall chum salmon on August 20, 2012. The season estimate of stock abundances includes periods where tissue samples were not collected.

Fall Chum Salmon

Genetic stock identification of the 2012 fall chum salmon migration bound for Canada was developed using genetic samples collected from the Eagle sonar test drift gillnet program. Variation of 14 microsatellite loci was surveyed for 642 fall chum salmon from the Eagle test drift gillnet program.

Fall chum salmon stock contribution estimates were based on 4 regional reporting groups (stock aggregates; Table 15). The estimated proportions of stock composition are broken down by the various sampling periods from August 3 to September 27 (Table 16).

Table 15–Baseline comprised of 9 stocks used to estimate stock compositions of fall chum salmon collected at the Eagle sonar test netting program, Yukon River, 2012.

Stock Aggregate Name	Population in Baseline
Yukon Early	Chandindu River
White River	Kluane River, Kluane Lake, Donjek River
Mainstem Yukon River	Mainstem Yukon River at Pelly River, Tatchun Creek, Big Creek, and Minto
Teslin River	Teslin River

An estimated 47.3% of the return that passed the sonar site to September 1 originated from the Mainstem Yukon River reporting group, which includes a number of mainstem Yukon River spawning populations, and 52.6% were from the White River aggregate (Table 16). The 2 remaining reporting groups contributing to the run were the Teslin River (0.1%) and the Yukon Early group, which is represented by the Chandindu River population (0.1%).

Table 16.–Estimated proportions of fall chum salmon stock composition migrating past the Eagle sonar site in 2012.

Period	Aug 3		Aug 23-Sep 9		Sep 10-22		Sep 22-26		Sep 27		Season	
Sample Size	n=1		n=185		n=208		n=207		n=41		n=642	
Region	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD
Mainstem	0.7	(24.6)	43.6	(4.5)	33.8	(5.0)	56.2	(4.1)	72.1	(8.5)	47.3	(2.5)
White	0.0	(21.8)	54.7	(4.2)	66.1	(5.0)	42.8	(4.0)	25.8	(7.5)	52.6	(2.5)
Teslin	0.0	(12.3)	0.0	(0.2)	0.0	(0.3)	0.8	(1.0)	1.9	(3.5)	0.1	(0.2)
Yukon Early	99.3	(28.5)	1.7	(1.6)	0.1	(0.3)	0.1	(0.4)	0.1	(1.0)	0.1	(0.2)

The estimated abundance for the 5 sample periods (i.e August 3, August 23 to September 9, September 10–22, September 22–26, and September 27) were derived from the analysis of genetic samples multiplied by the final abundance estimates from the Eagle sonar program corresponding to these periods (Table 17; and Figure 11).

Table 17.–Estimated relative abundance of fall chum salmon migrating past the Eagle sonar site in 2012.

Region	Aug 23-Sep 9	Sep 10-22 [a]	Sep 22-26	Sep 27	Season [b]
Mainstem	13,165	13,057	6,630	4,141	69,818
White	16,534	25,568	5,052	1,485	77,679
Teslin	4	17	99	112	134
Yukon Early	505	32	17	8	80
Total	30,208	38,675	11,799	5,746	147,710

Note: The August 3 time period was removed as all targets enumerated at that time were considered to be Chinook salmon and enumeration of fall chum salmon did not occur until August 20, 2012.

[a] The estimate from September 22 was split between September 10–22 and September 22–26 periods.

[b] The relative abundance estimate is for the entire fall chum salmon season including time periods where Mixed Stock Analysis is not available.

Yukon Education Program 2012

Fisheries and Oceans Canada Whitehorse received R&E funding to contract personnel to support the Stream to Sea education program in Yukon Schools, which DFO had been unable to support in the previous year. The program provides classroom and field activities to engage students in learning about salmon and salmon habitat. Activities include classroom salmon incubation and fry releases. Eight contracts were issued in the fall of 2012 for Salmon Stewardship coordinators in various Yukon communities to provide this education support to schools in 13 Yukon communities.

In August DFO staff collected Chinook salmon eggs from the Klondike River, Tatchun River and Blind Creek, in anticipation of interest in the education program. Whitehorse Rapids Hatchery and the McIntyre Salmon incubation facility agreed to support the provision of Chinook salmon eggs for schools in the Whitehorse area. DFO staff assisted the Salmon Stewardship Coordinator and Kluane Lake School students with the collection of chum salmon eggs from the Kluane River for schools in the Kluane area. Eggs were provided to the schools between early November and early December 2012.

Schools in 9 communities were incubating eggs in November 2012. Updates and details of the education support project will be provided in an R&E Report to be submitted to the YR Panel in March 2013.

Yukon River Canadian Sub-basin Environmental Conditions

The following summary of Environmental Conditions is a request from the Joint Technical Committee to report annually on the conditions influencing fish habitat in the Canadian sub-basin of the Yukon River. The Yukon River Canadian sub-basin includes that area upstream of the Alaska/Yukon Territory border including the Yukon River and the Porcupine River. The sub-basin encompasses a very large expanse of salmon habitat including over 100 documented spawning streams and a further yet identified number of rearing streams. Annual surveys throughout these widespread spawning and rearing habitats is not effectively possible so as a substitute this summary attempts to record significant weather conditions and resulting influences of the past year. The intent of this summary is to record annual environmental conditions that may influence fish habitat with regard to Yukon River Chinook salmon. This record may be used to determine opportunities to improve management, research or restoration strategies and focus habitat considerations in the future.

Because information on specific salmon habitats year to year is not extensively collected, the following information provided is a high level synopsis of what was experienced in the Canadian sub-basin for a given year and the report results should be handled as such. In order to provide an environmental condition report, various weather records and stream discharge measurements from other agencies are used and applied as a means to determine if conditions were within normal ranges on record or if there were unusual instances. Conditions are also collected through observations made by the public, fishermen, consultants, DFO staff and relevant projects or studies. Through scientific study, experience and professional judgment this information is applied to fish habitat to determine general conditions experienced for the year.

The 2011/2012 winter snowpack was well above normal (1971–2000) in the majority of the Yukon drainage as of May 2012. The exception to this was the northern Territory in the Porcupine drainage where substantially less than normal snow occurred for the majority of the

winter until near March when snow accumulations returned to seasonally normal levels as temperatures dropped to below normal conditions. Winter 2011/2012 was also above normal temperature from October to February (+4.7°C above historical average, 1948–present) with the exception of November, which was below normal. It was also the 7th warmest winter on record since 1948 for the Northern BC Mountains and Yukon Region as recorded by Environment Canada. The unusually warm conditions may have caused more frequent ice flows, melts and overflow events to occur than a normal consistently cool winter and may have adversely affected incubating eggs, alevin, fry and possibly overwintering juveniles as the warm condition persisted for almost the entire winter period. May and June 2012 was cool and remained cooler than normal which prolonged the spring freshet by delaying the snow melt. It is likely, and also observed, that some areas experienced "rain on snow" events resulting in abrupt extreme freshet conditions while other areas did not have an unusual spring flood condition. The summer was also recorded as the 7th warmest on record for the Northern BC Mountains and Yukon region since 1948 by Environment Canada (+1.1°C above historical average). Overall though the Yukon experienced cloudier and more frequent precipitation in the southern portion of the Territory than in the central and northern portions which experienced normal and more variable summer conditions according to locals and recorded conditions. The southern portion of the Territory received continuous weather delivery from the Gulf of Alaska throughout the majority of the summer which resulted in the overcast and wetter conditions in the south. Most streams recorded showed an elevated discharge through most of the summer returning to normal near the start of August. At Eagle Alaska, a U.S. Geological Survey water survey site records discharge that reflects the total Canadian sub-basin of the Yukon River excluding the Porcupine River drainage portion. The spring peak in mid-June surpassed the normal range and persisted for the entire summer entirely above the 61 year record until the start of August reflecting similar conditions of the tributary streams.

The young of year juvenile Chinook salmon (0+) from brood year 2011 would have likely been dispersed widely by the strong spring freshet conditions and prolonged elevated water levels described previously. This also likely assisted emigration of the 2010 brood year smolts. The 0+ Chinook salmon juveniles may have experienced a slower growth rate in 2012 due to possible delayed migration to upstream rearing habitats until flows subsided. Where flows did not subside until late in the rearing season, growth to a size that allowed them to surpass the streamflow and access beneficial rearing habitat may have caused a delay in rearing season growth. This is the second consecutive year that significant prolonged flows occurred throughout much of the basin; 2011 and 2012 were high water years. Fish access to rearing habitats, and in some cases spawning habitat, may improve as high water conditions can cause beaver dams, log jams and other obstructions to fail which increases available habitat. High water in 2011 was due to extensive precipitation and conditions in 2012 were related to an above average snowpack throughout most of the drainage that maintained high discharges in most recorded streams.

Entry into the mouth of the Yukon River was late, as much as 11 days later than the historical average, due to coastal ice conditions. Migration of adult Chinook salmon in 2012 was likely delayed due to higher than normal discharge in the Yukon River mainstem until near August 1 at Eagle, Alaska. The return through the Whitehorse Rapids Fishway was approximately 4 days later than the 10 year average at the midpoint of the return. No aerial enumeration/observation surveys of spawning locations were conducted in 2012. From stream discharge records and DNA collection field activities conducted in 2012 it appears that spawning locations returned to near normal flow levels during the time salmon reached the spawning grounds.

Fall 2012 temperature conditions were normal; however, the Dawson area was unusually cold by late October to early November. At this time sufficient snowfall is expected to have fallen to assist insulating frozen streams from further ice growth based on public observation and weather conditions recorded. By mid-November through to mid-December much of the Yukon drainage was experiencing below normal temperatures for the time period.

8.3 RESTORATION AND ENHANCEMENT FUND

The Yukon River Salmon Agreement between Canada and the United States was initialed in March 2001 and signed in December 2002. Under the terms of the Agreement, the two countries established the $1.2M U.S. per annum Yukon River Salmon Restoration and Enhancement (R&E) Fund.

The purpose of the R&E Fund is to financially support:

(a) programs, projects, and associated research and management activities on either side of the Alaska Yukon border directed at restoration, conservation and enhancement of Canadian origin salmon stocks

(b) programs and projects directed at developing stewardship of salmon habitat and resources and maintaining viable fisheries in the Yukon River in Canada.

Seven categories or areas of activity have been established as requiring R&E funding, including:

1. Conservation,
2. Restoration,
3. Enhancement,
4. Stewardship,
5. Viable fisheries,
6. Communications, and
7. Administration.

The R&E funding process is initiated every fall with a Call for Conceptual Proposals. The process is guided by the Yukon River Panel's Budget Priorities Framework and an annually compiled list of Near-Term Priorities. The JTC, through its R&E subcommittee, reviews and screens submitted Conceptual Proposals for technical merit. Based on the merits and appropriateness of the proposed project, the Panel decides which applicants should submit a fully Detailed Proposal. These Detailed Proposals are reviewed by the R&E subcommittee and JTC members in mid-winter. Final funding decisions guided by these reviews are made by the Panel in March or early April.

A total of 32 projects were selected for R&E funding of which 23 (75%) were on-going multi-year projects and 8 (25%) were new. One project was withdrawn prior to initiation. Funds in the amount of $1.104M were allocated to projects. Sixty-eight percent of the funds were directed towards Conservation projects; 18.5% towards Stewardship; 10.5% towards Communications and 3% to Restoration. As of mid-January 2013, 7 projects have completed on time and on budget (Table 18). The remaining projects are on track to complete as scheduled in the coming months. Two projects have passed their contractual end dates having final reports still outstanding.

Status of 2012 R&E Projects

Table 18.–Restoration and enhancement fund projects, cost and status for completion, listed by envelope/category type, 2012.

Project Number	Project Title	Amount (U.S.$)	Status & Due date
CRE-78-12a	Collection and Analysis of Yukon River DNA Baseline Samples in the Alaska and Canada. Year 6	$30,000	Completed
CRE-78-12b	Collection and Analysis of Yukon River DNA Baseline Samples in the Alaska and Canada. Year 6	$30,000	15-Mar-13
CRE-79-12	Yukon River Salmon Stock Identification. Year 11	$30,000	30-Jun-13
URE-08-12	Technical Assistance, Development, and Support to the Yukon River Fish Wheel Salmon Monitoring. Year 11	$5,500	15-Jan-13
URE-22-12	Mountain Village Cooperative Chinook Salmon Drift Test Fishery Project , 2012. Year 3	$18,079	28-Feb-13
URE-09-12	Rampart Rapids all season video monitoring. Year 13	$46,100	15-Jan-13
CRE-137-12	Collection and Comparison of Chinook Salmon Age, Length, Sex and Genetic data using Fish Wheel. Year 3	$34,500	Completed
CRE-143-12	Little Salmon Chinook salmon escapement survey. Year 3	$21,540	28-Feb-13
1-CON-1-N	Yukon River Chinook Salmon Subsistence Sampling: (Holy Cross, Ruby, Fort Yukon)	$48,407	31-Mar-13
5-CON-4-N	Lower Yukon River Subsistence Chinook Salmon Harvest ASL & Stock Composition	$66,812	31-Mar-13
CRE-114-12	Porcupine River Sonar Program – Fall Chum Salmon. Year 2	$115,436	31-Jan-13
CRE-01-12	Mainstem Teslin River Sonar Project. Year 2	$110,860	28-Feb-13
CRE-37-12	Blind Creek Chinook Salmon Enumeration Weir.	$49,500	15-Feb-13
CRE-41-12	Sonar Enumeration of Chinook Salmon on the Big Salmon River. Year 8	$79,811	15-Feb-13
CRE-63-12	Whitehorse Rapids Hatchery (Agency only) Coded Wire Tagging and Recovery. Year 16	$57,798	1-Oct-12
URE-25-12	Temperature Monitoring of Canadian and Alaska Yukon tributaries. Year 3	$11,970	31-Mar-13
8-CON-12	*Collection of ASL Data from Spawning populations of Chinook spawning escapement in Canada*	*$40,000*	*Withdrawn*
	Conservation Total	**$796,313**	
CRE-54-12	Ta'an Kwäch'än Council Community Stewardship Program. Year 6	$26,853	15-Jan-13
	Restoration Total	**$26,853**	

-continued-

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Project Number	Project Title	Amount (U.S.$)	Status & Due date
CRE-67-12	Yukon Schools Fry Releases & Habitat Studies. Year 10	$2,000	15-Mar-13
CRE-65-12	McIntyre Creek Salmon Incubation Project . Year 10	$51,457	31-Mar-13
CRE-51-12	KDFN Michie Creek Salmon and Habitat Monitoring. Year 15	$30,450	31-Dec-12
CRE-06-12	Yukon River North Mainstem Stewardship. Year 7	$30,748	Completed
17-STE-11-N	Salmon Stewardship Coordinators for Yukon Schools	$44,057	31-Jul-13
19-STE-11-N	Professional Development for K-12 Educators to Support Yukon River Salmon Stewardship in Rural Alaska	$32,966	31-Dec-12
CRE-07-12	Tr'ondëk Hwëch'in First Fish Culture Camp. Year 12	$10,000	Completed
23-COM-12-N	Salmon Run Health/Fishing Restrictions Roadside Sandwich Board	$4,070	1-Oct-12
	Stewardship Total	**$205,748**	
CC-01-12	Yukon River Inseason Management Teleconferences. Year 9	$10,000	Completed
CC-02-12	Yukon River Educational Exchange. Year 10	$31,500	Completed
CC-03-12	Yukon River Summer Season Preparedness Process. Year 4	$60,500	Completed
CC-04-12	Science and Salmon Education Outreach Series. Year 2	$7,410	31-Mar-13
CC-05-12	Chinook Subsistence Sampling Outreach Program	$1,970	31-May-13
CC-06-12	MVTF Outreach and Communications	$2,500	31-Mar-13
CC-07-12	Teslin River Sonar Community Communications & Project Presentation	$1,883	31-Mar-13
	Communications Total	**$115,763**	
	Grand Total	**$1,144,677**	

Note: CRE=Canadian Restoration and Enhancement Proposal, URE=U.S. Restoration and Enhancement Proposal, N=New proposal, CC=Communications Committee, COM=Communications category, CON=Conservation category, STE=Stewardship category, and COM=Communications category.

9.0 MARINE FISHERIES INFORMATION

9.1 INTRODUCTION

Yukon River salmon migrate into the Bering Sea during the spring and summer after spending either 0, 1, or 2 winters rearing in fresh water, depending on the species. Information on stock origin from tagging, scale pattern, parasites, and genetic analysis indicate that Yukon River salmon are present throughout the Bering Sea, in regions of the North Pacific Ocean south of the Aleutian chain, and the Gulf of Alaska during their ocean migration (Healey, 1991; Salo 1991). Yukon River salmon have the potential to be captured by fisheries that harvest mixed stocks of salmon, other species of fish (bycatch), and by illegal fishing activities throughout their oceanic distribution. Recovery of coded-wire tags in these fisheries provides one of the key descriptors of the oceanic distribution of Yukon River Chinook salmon (Whitehorse Rapids Chinook salmon; Appendix A20).

Several U.S. fisheries are currently managed to limit the interception and bycatch of salmon stocks that include Yukon River salmon. These fisheries include salmon fisheries in the South Alaska Peninsula area and U.S. groundfish trawl fisheries in both the Gulf of Alaska (GOA) and Bering Sea-Aleutian Islands (BSAI) management areas. Information on the South Alaska Peninsula fisheries and salmon bycatch in the Bering Sea and Gulf of Alaska groundfish fisheries are included here along with information on High Seas Driftnet enforcement activities by the United States Coast Guard and National Marine Fisheries Service. Relative abundance estimates of juvenile Chinook salmon in the northern Bering Sea from pelagic trawl surveys by the Alaska Fisheries Science Center, Auke Bay Laboratories are also included as a leading ecosystem indicator of stock status for Yukon River Chinook salmon.

9.2 WESTERN ALASKA SALMON STOCK IDENTIFICATION PROGRAM

Uncertainty about the magnitude, frequency, location and timing of stock-specific sockeye and chum salmon harvest in Western Alaska fisheries was the impetus for developing the Western Alaska Salmon Stock Identification Program (WASSIP). In May, 2006, a group of 11 signatories to a memorandum of understanding created WASSIP. Signatories include Alaska Department of Fish and Game, Aleut Corporation, Aleutians East Borough, Association of Village Council Presidents, Bering Sea Fishermen's Association, Bristol Bay Native Association, Concerned Area M Fishermen, Kawerak, Lake and Peninsula Borough, Tanana Chiefs Conference, and Yukon River Drainage Fisheries Association. WASSIP was a comprehensive program to sample commercial and subsistence chum and sockeye salmon fisheries in coastal marine areas of western Alaska, from 2006 through 2009. This program is unprecedented in its magnitude and scope, including salmon fisheries from Chignik Bay to Kotzebue Sound, stretching over 3,000 km of shoreline. The program was designed to use genetic data in mixed stock analysis of fisheries samples to more clearly describe harvest patterns of chum and sockeye salmon stocks in Western Alaska. During the 4 years of fishery sampling, approximately 320,000 samples were collected and some 156,000 samples will be analyzed by the ADF&G Gene Conservation Laboratory to estimate stock composition of fishery harvests with the finest resolution possible. Additional populations were added to the genetic baselines for both species and the number of DNA markers was greatly expanded to provide for increased stock resolution. Results of this study provide the most comprehensive examination of stock-specific harvest and harvest rates across Western Alaska fisheries ever attempted.

As no significant sockeye salmon stocks exist in the Yukon River, a synopsis of only chum salmon results from the WASSIP program is presented here. Despite significant advances in genetic baselines and DNA markers, the WASSIP program was unable to reliably differentiate among coastal Western Alaska chum salmon stocks (coastal stocks from Bristol Bay north through Norton Sound, excludes upper Yukon/fall chum salmon stocks) and that group of stocks is identified as Coastal Western Alaska (CWAK) reporting group. The Upper Yukon reporting group (primarily Yukon fall chum salmon) is genetically distinct and analyzed separately. Within the years assessed by WASSIP (2007–2009), the highest harvest rates for CWAK reporting group were in Bristol Bay area fisheries (20.5% to 22.3%). The South Alaska Peninsula June fishery was the only other fishery with harvest rates above 5% in any year. Total harvest rates across all assessed fisheries ranged from 26.7% to 33.2%. The highest harvest rates for Upper Yukon reporting group were in the Yukon Area fall fishery (1.6% to 6.3%). Harvest rates for the

Upper Yukon group were below 1% in all other fisheries. Total harvest rates for Upper Yukon across all assessed fisheries were low and ranged from 2.3% to 7.7%.

Full documentation of the WASSIP process and resulting reports can be found online at http://www.adfg.alaska.gov/index.cfm?adfg=wassip.main. This documentation includes important information to assist stakeholders in interpreting complex and highly technical information provided by this project.

9.3 Salmon Bycatch in the Bering Sea and Gulf of Alaska Groundfish Fisheries

U.S. groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) and Gulf of Alaska (GOA) regions are managed under the Magnuson-Stevens Fisheries Conservation and Management Act by the North Pacific Fishery Management Council (NPFMC), and are regulated by the National Marine Fisheries Service (NMFS) Alaska Regional Office. Annual summaries and inseason information on Pacific salmon bycatch in the Bering Sea and Gulf of Alaska groundfish fisheries are provided by the Alaska Regional Office as part of NMFS catch accounting system (NMFS 2011). Bycatch of Chinook and non-Chinook salmon (principally chum salmon) in the BSAI and GOA remained at low levels in 2011 (Appendices A21 and A22). Estimated bycatch of Chinook salmon during 2012 was 12,765 in BSAI groundfish fisheries and 22,806 in GOA groundfish fisheries. Much of the 2012 BSAI bycatch of Chinook salmon occurred during the A-season (8,995). Bycatch levels on non-Chinook salmon species in 2012 decreased significantly in the BSAI groundfish fisheries from 2011 levels. Estimated bycatch of non-Chinook salmon species during 2012 was 24,251 in BSAI groundfish fisheries. Bycatch of non-Chinook salmon species were not available for GOA groundfish fisheries in 2012, but bycatch levels should be under 10,000 if consistent with bycatch in recent years.

Pollock directed fisheries in the Bering Sea have been the primary groundfish fishery of concern for salmon bycatch as they account for 88% of the total Chinook salmon bycatch and 98% of the non-Chinook salmon bycatch in the BSAI groundfish fisheries (Appendix A23). Harvests are managed in the BSAI pollock fishery by setting an annual total allowable catch (TAC) for pollock and allocating the catch to various sectors of the fishery as specified by the American Fisheries Act in 1998. These allocations are divided into 2 seasons – 40% to the winter roe season (January 20 to June 10; A-season) and 60% to summer/fall season (June 10 to November 1; B-season). Chinook salmon bycatch occurs in both the winter season (61%) and the summer/fall season; non-Chinook salmon are caught almost entirely during the summer/fall season (99%) (Appendix A23).

A variety of regulatory measures have been used to limit salmon bycatch in the GOA and BSAI groundfish fisheries. These measures include: classifying salmon as a prohibited species, salmon savings areas, and a voluntary rolling hotspot system (VRHS). Prohibited species within U.S. groundfish fisheries must be either discarded or donated through the Pacific Salmon Donation Program, which allows for distribution of salmon taken as bycatch to economically disadvantaged individuals by tax exempt organizations. Chinook and Chum Salmon Savings Areas were created in the mid-1990s as part of the BSAI groundfish fisheries. These savings areas enabled cap-and-closure measures to limit salmon bycatch in the Bering Sea pollock fishery. Savings areas are based on locations with historically high spatial and temporal levels of salmon bycatch and were closed to fishing once salmon bycatch levels reached a specified cap.

In 2006, fishing vessels participating in the VRHS were exempted from the salmon savings areas. The VRHS is intended to increase the ability of the pollock fishery to minimize salmon bycatch by adaptively defining area closures with inseason bycatch information.

Escalating numbers of Chinook salmon captured as bycatch in the BSAI pollock fishery in 2006 and 2007 prompted a review of alternative management measures used to limit the bycatch of Chinook salmon and an environmental impact assessment of Chinook salmon bycatch in the Bering Sea pollock fishery (NMFS 2009a, NMFS 2009b). Following these reviews, the NPFMC recommended amendment 91 (http://www.fakr.noaa.gov/frules/75fr53026.pdf, http://www.fakr.noaa.gov/frules/75fr58337.pdf) be added to the BSAI Groundfish Fisheries Management Plan for the Bering Sea pollock fishery. Amendment 91 was implemented by NMFS during the 2011 fishing season and established a bycatch hard-cap of 60,000 Chinook salmon and a performance cap of 47,591 Chinook salmon for vessels participating in an incentive plan agreement (IPA). Chinook salmon bycatch quotas are allocated to each season and sector of the fishery based on bycatch caps, historical Chinook salmon bycatch, and pollock harvest allocations; however provisions are made in the amendment to transfer unused quotas under the approval of the National Marine Fisheries Service (NMFS) Alaska Regional Office. Performance caps establish benchmark performance criteria of incentive plan agreements, the primary tool used to minimize salmon bycatch. Sectors that exceed their proportion of the performance cap more than 2 times in any 7 year period while participating in an IPA will have their hard cap reduced to their proportion of the performance cap. Salmon still retain their classification of a prohibited species; however, amendment 91 establishes benchmark performance criteria for incentive plan agreements such as the voluntary rolling hotspot system that have been used or may be used in the future to avoid salmon bycatch in the Bering Sea pollock fishery.

9.4 NORTHERN BERING SEA PELAGIC TRAWL SURVEYS

Pelagic trawl surveys in the northern Bering Sea shelf were initiated in 2002 as part of the Bering-Aleutian Salmon International Survey (BASIS: 2002–2007). BASIS was developed by member nations of the North Pacific Anadromous Fish Commission (NPAFC) (United States, Russia, Japan, Canada, and Korea) to improve our understanding of marine ecology of salmon in the Bering Sea. The United States (Alaska Fisheries Science Center, Auke Bay Laboratories) continued pelagic trawl surveys in the northern Bering Sea in support of the Bering Sea Integrated Ecosystem Research Project (BSIERP) in 2009 and 2010. Salmon catches during these multi-disciplinary trawl surveys have provided a unique opportunity to evaluate the status of salmon stocks during their juvenile life-history stage. Funding support for the northern Bering Sea trawl studies in 2011 was provided by the Alaska Sustainable Salmon Fund and the Arctic Yukon Sustainable Salmon Initiative to specifically address Yukon River juvenile Chinook salmon. A pelagic trawl survey was conducted in the northern Bering Sea in 2012 as part of Arctic Eis, a multi-disciplinary Arctic research program led by the University of Alaska and the Alaska Fisheries Science Center. Figure 12 summarizes the relative abundance (abundance is relative to trawl catchability) of juvenile Chinook salmon within the northern Bering Shelf (60N–65N). Estimates from 2002 were added to this year's data after correcting for vertical opening of the trawl used in 2002 (Cantrawl model 300) and subsequent years (Cantrawl model 400). Based on genetic stock composition of the juvenile population, the northern Bering Shelf has been identified as the primary index area for Yukon River salmon (Murphy et al. 2009). Juvenile salmon present in the northern Bering Sea in 2009 and 2010 will be the primary contributors to the 2013 return

(Chinook salmon primarily return after 3 to 4 years in the ocean). The juvenile abundance index was similar in 2009 and 2010 and were below average abundance in both years.

9.5 Enforcement of High Seas Driftnet Fishing Moratorium

Provided by the U.S. Coast Guard and NOAA Law Enforcement.

Illegal high seas fishing activity continues to threaten the world's ocean resources and the United States Government is committed to assisting with the protection of these resources from Illegal, Unregulated, and Unreported (IUU) fishing. Operation North Pacific Guard is the United States Coast Guard (USCG) and the National Oceanic & Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS) high seas fisheries enforcement plan and provides monitoring compliance with the North Pacific Anadromous Fisheries Commission (NPAFC) Convention and United Nations moratorium on Large Scale-High Seas Driftnet (HSDN) fishing (General Assembly Resolution 46/215).

Operation North Pacific Guard 2012 commenced in May with a HC-130 deployment out of Shemya Island, Alaska. USCG Cutter RUSH commenced their deployment in late June and the USCG Cutter WAESCHE patrolled the convention area in August. The Canadian Air Force and Department of Fisheries and Oceans also made an extended CP-140 deployment from Hakodate, Japan. During this deployment the CP-140 provided air support with real time sighting reports of fishing fleet activity. In addition, Japan Coast Guard aircraft patrolled the NPAFC Convention Area (www.npafc.org) and coordinated surveillance efforts with the USCG Cutter RUSH in late September. USCG aircraft flew a total of 107 dedicated mission hours in 2012 for IUU fishing activity. The USCG Cutter RUSH conducted a 90 day patrol (34 patrol days in the Convention Area) in direct support of Operation North Pacific Guard. One HSDN fishing vessel (F/V DA CHENG) was apprehended.

The USCG Cutter RUSH intercepted the HSDN vessel F/V DA CHENG on July 27, 2012. The boarding team found approximately 10 nautical miles of net on board, along with 30 tons of albacore tuna, 5–6 tons of shark carcasses, and 500 kilos of shark fins. DA CHENG's claim of Indonesian registry was officially denied by the Indonesia Ministry of Marine Affairs and Fisheries and the U.S. assimilated the vessel to without nationality status, and began preparations to transfer the custody of the vessel, catch, and crew to the Chinese Fishery Law Enforcement Command (FLEC). Photographic evidence by the U.S. strongly suggests that F/V DA CHENG is the same vessel that was identified as SHUN LI No. 6 and later observed changing its name to MITRA 888 in 2011. This vessel was observed actively engaged in High Seas Drift Net fishing in the vicinity of BANGUN PERKASA in 2011, but escaped when USCGC MUNRO elected to board BANGUN PERKASA.

USCG Pacific Area current planning provides up to 200 aircraft hours and a minimum of 77 cutter days in support of the North Pacific NPAFC/IUU/HSDN mission in 2013. NOAA/NMFS will continue to conduct investigations on HSDN violations, revisit placing officers on available Canadian high seas driftnet surveillance flights in 2013, and patrol with USCG HC-130 deployments when able.

10.0 RUN OUTLOOKS

10.1 2013 Yukon River Chinook Salmon

Canadian-Origin Upper Yukon Chinook Salmon

The Canadian-origin upper Yukon River Chinook salmon spawning escapements in 2007 and 2008, the brood years producing the age-6 and age-5 fish returning in 2012, were 34,904 and

33,883 fish, respectively, which were below-average escapements (Appendix A9, Figure 13). The 2013 run of Canadian-origin upper Yukon River Chinook salmon is expected to be poor to below average; the average run size for 2003–2012 was 92,955 fish (S. Schmidt, ADF&G Division of Commercial Fisheries, personal communication).

Stock-recruitment (S/R) and sibling models predict the 2013 run size of Canadian-origin Chinook salmon to be as high as 109,984 and 79,160, respectively (Table 19). However, these models do not include uncertainty associated with lower productivity observed in recent years. Over the past 6 years, observed returns were approximately 35% lower than preseason outlooks developed with the stock-recruitment (S/R) model, 38% lower than preseason outlooks developed with the sibling model, and 35% lower than preseason outlooks developed by averaging the 2 models. It is important to note that neither model incorporates environmental variables such as oceanic or freshwater conditions.

To account for some of the uncertainty in the preseason outlook due to lower productivity in recent years, the projection from each of the 2 models (109,984 and 79,160 for S/R and sibling models, respectively) was adjusted by the recent 6 year model performance. Based on this adjustment, the resulting preseason outlook range is 49,000 to 72,000[27]. In the past 6 years odd-year returns (2007, 2009, and 2011) have been better than even-year returns, due to a stronger age-6 component (Figure 14). However, the 2012 Chinook salmon run had a weaker age-5 component than anticipated and the sibling model is predicting a weak return of age-6 fish for 2013. These outlooks suggest that the 2013 Canadian-origin upper Yukon River Chinook salmon run may be a poor to below average run.

Development of Revised Canadian-origin Chinook Salmon Database

Information from a number of sources suggest that the border and spawning escapement estimates derived from the DFO Chinook salmon mark–recapture program were biased low. In 2008, various stock-recruitment datasets were examined, including those developed from spawning escapements estimated from mark–recapture data and combinations of estimates derived from sonar, radiotelemetry and aerial survey data. Border passage estimates were developed from a combination of Eagle Sonar estimates (2005–2007) and radiotelemetry data (2002–2004). Total spawning escapements for 2002 to 2007 were then calculated by subtracting the Canadian catch from these estimates. Linear regression of the estimated total spawning escapements for these years versus a 3-area aerial survey index of Big Salmon, Little Salmon, and Nisutlin rivers was used to develop historical Canadian spawning escapement estimates back to 1982 (Appendix B11). Age-specific returns were then calculated based on age, harvest and escapement data in the return years (Appendix A9). The resulting database forms the basis for the current stock-recruitment model. Eagle sonar estimates have been used from 2005 to present.

JTC members are pursuing further statistical analysis of mark–recapture and other project data to improve historic run size estimates. A recent analysis has confirmed that the Eagle test fishery samples represents border passage age composition. However correction of bias in historical age composition derived from samples collected in the fish wheel mark–recapture project has not been completed at this time.

[27] The preason range was rounded to the nearest thousand.

Performance of Stock-Recruitment Models for the Years 2001–2012

A review of preseason outlook performance provides an opportunity to document the recent decline in the upper Yukon River Chinook salmon return per spawner values (Table 19). Revised historical Canadian run size estimates were used to reconstruct the 2000 and 2001 runs; border passage estimates for 2002–2004 were based on radiotelemetry estimates while border escapement estimates for 2005–2012 were based on Eagle sonar. The average of the preseason outlook is derived using stock-recruitment (S/R) and sibling model projections compared to postseason estimates of run size (Table 19). The averaged model projection for 2013 is 95,000 Chinook salmon. As stated previously, the preseason estimates derived from each model are multiplied by the 6-year average performance to create a range. Despite good brood year escapements, the observed run sizes were relatively low from 2000 to 2002 and from 2007 to 2012. The causes of low returns are unknown but likely involve a number of factors in the marine and freshwater environments. For example, the 2008 outlook of 117,000 Chinook salmon overestimated the run size by a factor of 1.77, or77% above the actual run. It will be important to determine if the low run sizes observed in the 2007 to 2012 period develop into a long-term trend.

Table 19.–Preseason upper Yukon River Chinook salmon outlooks for 2001 to 2013 and the observed run sizes for 2000 to 2012.

	Expected Run Size (Preseason)					Estimated	Performance
Year	S/R	Sibling	Avg. (S/R & Sib.)	Avg. S/R Performance	Avg. Sib. Performance	Run Size (Postseason)	of Preseason Outlooks
2000	127,784	85,889	107,000			53,000	2.02
2001	126,641	51,082	89,000			86,000	1.03
2002	113,759	107,496	111,000			82,000	1.35
2003	116,948	109,577	113,000			150,000	0.75
2004	123,469	124,326	124,000			117,000	1.06
2005	121,764	117,860	120,000			124,000	0.97
2006	115,995	123,132	120,000			119,000	1.01
2007	118,557	139,934	129,000			88,000	1.47
2008	111,551	122,435	117,000			63,000	1.77
2009	98,172	103541	101,000			87,000	1.16
2010	109,797	116346	113,000			60,000	1.88
2011	102,831	113,323	108,000			72,000	1.50
2012	106,090	87,167	98,000	54,000	73,000	49,000	2.00
2013	109,984	79,160	95,000	49,000	72,000		
Average 2000-2012	114,874	107,854	111,538			88,000	1.38

Note: Run size estimates incorporate: radiotelemetry data (2002–2004); Eagle Sonar estimates (2005–2012); and the relationship between telemetry/sonar to aerial surveys for 2000 and 2001. The average of the preseason spawner/recruit (S/R) and sibling run sizes, and the postseason run sizes are rounded to nearest thousand.

Drainagewide Chinook Salmon

The outlook for the total Yukon River Chinook salmon run can be estimated by applying historical average proportions of Canadian-origin fish in the total run to the outlook estimated for

the Canadian component of the run. The average proportion of Canadian-origin fish in the total run is approximately 50%. The drainagewide run outlook based on the adjusted Canadian-origin model estimate, which attempts to account for low productivity since 2007, is 98,000–143,000 Chinook salmon. Thus, the 2013 Yukon River Chinook salmon run will likely be below average to poor.

Currently, ADF&G and USFWS fisheries managers are traveling to stakeholder meetings such as the YRDFA annual meeting in St. Mary's and the TCC meeting in Fairbanks to engage fishermen, tribal council representatives, and other stakeholders to share information, provide input, and discuss management options. The purpose of these meetings is to work cooperatively to identify options and practical management strategies for 2013 that will assist in getting adequate numbers of fish to the spawning grounds should the Chinook salmon run be similar to the below average runs of 2007–2012.

10.2 YUKON RIVER SUMMER CHUM SALMON

The strength of the summer chum salmon run in 2013 will be dependent on production from the 2009 (age-4 fish) and 2008 (age-5 fish) escapements, as these age classes generally dominate the run. The total runs during 2008 and 2009 were approximately 1.8 and 1.4 million summer chum salmon, respectively, though tributary escapements were highly variable. However, it is worth noting that poor runs have resulted from large escapements. Yukon River summer chum salmon generally exhibit strong run size correlations among adjacent years, although it is expected that the 2013 total run in the Yukon River will be slightly below the 2012 run of approximately 2.0 million fish.

The 2013 run is anticipated to provide for escapements, a normal subsistence harvest, and a surplus for commercial harvest. Summer chum salmon runs have provided for a harvestable surplus in each of the last 10 years (2003–2012). If inseason indicators of run strength suggest sufficient abundance exists to allow for a commercial fishery, the commercially harvestable surplus in Alaska could range from 300,000 to 500,000 summer chum salmon. Similar to the last couple years, the actual commercial harvest of summer chum salmon in 2013 will likely be affected by a potentially poor Chinook salmon run, as Chinook salmon are incidentally harvested in chum salmon-directed fisheries.

10.3 YUKON RIVER FALL CHUM SALMON

Drainagewide Fall Chum Salmon

Preseason outlooks are determined using estimates of escapement and resulting production. Yukon River drainagewide estimated escapements of fall chum salmon for the period 1974 through 2006 have ranged from approximately 180,000 (1982) to 2,000,000 (2005) fish, based on expansion of escapement assessments for selected stocks to approximate overall abundance (Eggers 2001). Escapements in these years resulted in subsequent returns that ranged in size from approximately 311,000 (1996 production) to 3,000,000 (2001 production) fish, using the same approach of approximating overall escapement. Corresponding return per spawner rates ranged from 0.3 to 9.0, averaging 2.0 for all years combined (1974–2006).

A considerable amount of uncertainty has been associated with these run forecasts, particularly in the last decade, because of unexpected run failures (1998 to 2002) followed by strong runs from 2003 through 2008. Weakness in salmon runs prior to 2003 has generally been attributed to

reduced productivity in the marine environment and not low levels of parental escapement. Similarly, recent improvements in productivity may be attributed to the marine environment. Forecasts have been presented as ranges since 1999 to allow for adjustments based on more recent trends in production. Historical ranges included the normal point projection as the upper end and the lower end was determined by reducing the projection by the average ratio of observed to predicted returns from 1998 to each consecutive current year through 2004. In 2005, the average ratio of 2001 to 2004 was used in attempt to capture some of the observed improvement in the run. The point estimate for 2006 and 2007 used 1974 to 1983 odd/even maturity schedules to represent years of higher production, while 2008–2012 used 1984 to current year odd/even maturity schedules to represent years of lower production (Appendix A17). Because of the lack of clear trends in the dataset, the maturity schedule for all completed brood years 1974–2006 (Appendix A17) was used to determine the point estimate in 2013.

Yukon River fall chum salmon return primarily as age-4 and age-5 fish, although age-3 and age-6 fish also contribute to the run (Appendix A17). The 2013 run will be composed of brood years 2007 to 2010 (Table 20). Estimates of returns per spawner (R/S) were used to estimate production for 2007 and 2008. An auto-regressive Ricker spawner-recruit model was used to predict returns from 2009 and 2010. The point projection estimates for 2013 used the 1974 to current complete brood year returns applied to the odd/even maturity schedule. The result is an estimate of 1,029,000 fall chum salmon. The forecast range is based on the upper and lower values of the 80% confidence bounds for the point projection. Confidence bounds were calculated using deviation of point estimates and observed returns from 1987 through 2012. Therefore, the 2013 forecasted run size is expressed as a range from 906,000 to 1,152,000 fall chum salmon. This forecasted run size is average, for an odd-numbered year run (1974–2011).

Table 20.–Forecasted 2013 total run size of fall chum salmon based on parent year escapement for each brood year and predicted return per spawner (R/S) rates, Yukon River, 2007–2010.

Brood Year	Escapement	Estimated Production (R/S)	Estimated Production	Age	Contribution based on age	Current Return
2007	910,883	1.23	1,120,386	6	0.9%	9,127
2008	687,153	1.64	1,126,932	5	33.7%	346,172
2009	482,411	1.85	894,756	4	62.8%	646,221
2010	526,355	1.62	853,198	3	2.6%	27,116
Total expected run (unadjusted)						1,029,000
Total 2013 run size expressed as a range based on the forecasted vs. observed returns from 1987 to 2012 (80% CI):						906,000 to 1,152,000

The contributing parent year escapements from 2007 and 2008 both exceeded the upper end of the drainagewide escapement goal range while 2009 and 2010 were within the drainagewide escapement goal range of 300,000 to 600,000 fall chum salmon (Appendix C16). All parent years are estimated to be exceeding 1.0 return per spawner. The major contributor to the 2013 fall chum salmon run is anticipated to be age-4 fish returning from 2009 parent year (Appendix A17). The combination of good sized escapements and improved production has held up the run during the even year of 2012 and appears to be maintaining average levels in 2013.

For fall chum salmon, the sibling relationship is best between the age-5 to age-6 component (R^2=0.60). Typically the sibling relationship between the age-3 to age-4 fish (R^2=0.49) is slightly

better than the age-4 to age-5 fish (R^2=0.37). Brood year returns of age-3 fish range from zero to 150,000 chum salmon. Returns of age-4 fish from odd-numbered brood years during the time period 1974 to 2006 typically averaged 794,000 fall chum salmon, and ranged from a low of 344,000 for brood year 1997 to a high of 2,152,000 for brood year 2001. Return of age-5 fish from odd-numbered brood years during the time period 1974 to 2006 typically averaged 252,000 fall chum salmon, and ranged from a low of 61,000 for brood year 1975 to a high of 680,000 for brood year 2001.

Additionally, there is uncertainty as to how well returns from large escapements (>700,000) produce since 6 out of 8 failed to yield replacement values. The most recent high production levels of 2.1 return/spawner (average R/S 1998 to 2003, excluding 2001) are well above the poor returns observed in 1994–1997 (average 0.50 R/S). Production in 2005 was at a record low of 0.25 R/S indicating poor survival; however 2006 and 2007 have increased each year respectably.

During the 2013 fall fishing season, estimated strength of the projected run will be adjusted using summer chum salmon run abundance, and inseason monitoring projects data (Appendix A5). With a projected run size range from 906,000 to 1,152,000 fall chum salmon, it is anticipated that escapement goals would be met while supporting normal subsistence fishing activities, and potential commercial harvest levels of 356,000 to 602,000 fall chum salmon. Commercial harvestable surpluses will be determined inseason and opportunity provided where commercial ventures exist.

A summary of preseason outlooks, postseason run size estimates and proportions of the expected run size, observed for the 1998 to 2012 period, documents the fluctuations observed in fall chum salmon estimates (Table 21).

Table 21.–Preseason Yukon River drainagewide fall chum salmon outlooks 1998–2013 and observed run sizes 1998–2012.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	880,000	334,000	0.38
1999	1,197,000	420,000	0.35
2000	1,137,000	239,000	0.21
2001	962,000	383,000	0.40
2002	646,000	425,000	0.66
2003	647,000	775,000	1.20
2004	672,000	614,000	0.92
2005	776,000	2,325,000	3.00
2006	1,211,000	1,144,000	0.94
2007	1,106,000	1,098,000	0.99
2008	1,057,000	905,000	0.86
2009	791,000	576,000	0.73
2010	690,000	606,000	0.88
2011	739,000	1,206,000	1.64
2012	1,114,000	958,000	0.86
2013	1,026,000		
Avg. (1998-2012)	908,000	801,000	0.93

Canadian-Origin Upper Yukon River Fall Chum Salmon

The drainagewide outlook range of 906,000 to 1,152,000 fall chum salmon was used to develop the upper Yukon fall chum salmon outlook. The analyses undertaken to develop the drainagewide outlook range is outlined in Section 7.3. There is a longstanding assumption that

the Canadian contribution to the drainagewide return of fall chum salmon is approximately 30%. Recent genetic stock identification analyses have indicated that this assumption is reasonably close. For the purpose of developing a 2013 outlook, it was assumed that the Upper Yukon Canadian-origin component is likely to be at least 25% of the drainagewide return while the Porcupine River component will be approximately 5% of the drainagewide return. Based upon the drainagewide outlook range of 906,000 to 1,152,000 and an assumed 25% contribution, the upper Yukon outlook range is 226,000 to 288,000 fall chum salmon. The average upper Yukon River fall chum salmon run size for 1998–2012 is approximately 200,000 fish (Table 22).

Table 22.–Preseason upper mainstem Yukon River fall chum salmon outlooks for 1998 to 2013 and observed run sizes for 1998–2012.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Performance of Preseason Outlook
1998	198,000	70,000	2.83
1999	336,000	116,000	2.90
2000	334,000	66,000	5.06
2001	245,000	49,000	5.00
2002	144,000	113,000	1.27
2003	145,000	182,000	0.80
2004	147,000	193,000	0.76
2005	126,000	558,000	0.23
2006	126,000	330,000	0.38
2007	147,000	347,000	0.42
2008	229,000	269,000	0.85
2009	195,000	128,000	1.52
2010	172,000	143,000	1.20
2011	184,000	326,000	0.56
2012	273,000	238,000	1.15
2013	257,000		
Average (1998-2012)	200,000	210,000	1.66

Note: Run sizes are rounded to nearest one thousand. The 2009 through 2012 outlooks are the average of an outlook range.

There is a considerable amount of uncertainty associated with the upper Yukon fall chum salmon run projections due to unexpected run failures within the 1998–2002 period, followed by improved productivity and higher runs observed within the 2003–2007 period. For example: the 1998 outlook of 198,000 overestimated the run size by a factor of 2.83, or 183% above the actual run size. Weakness in fall chum salmon runs prior to 2003 has generally been attributed to reduced productivity in the marine environment and not the result of low levels of parental escapement. A notable development that added to the uncertainty and complexity of both the 2009 and 2010 preseason outlooks was high parent spawning escapements which were well above levels previously observed. For example, the 2005 escapement of approximately 437,500 fall chum salmon was the highest observed within the 1982 to 2010 period, while the 2006 and 2007 escapements were the fourth and third highest observed, respectively (Table 23). Returns from these recent high escapements have helped to redefine a number of S/R parameters including the number of spawners

at maximum sustained yield and the number of spawners at equilibrium, i.e. replacement, the point where the return equals escapement. The 2007–2010 brood year escapements will contribute to the 2013 run (Table 23). The odd year average proportional contribution of each age class to the total returns from a brood year is estimated at 70.7% age-4 and 26.6% age-5 fish.

Table 23.–Summary of upper mainstem Yukon fall chum salmon brood year spawning escapements for the 2007–2010 period and the average contribution for age-3 to age-6 fish returning in 2013.

Brood Year	Escapement	Age	Contribution based on age
2007	254,649	6	1.3%
2008	174,267	5	26.6%
2009	93,626	4	70.7%
2010	117,871	3	1.4%

Given the uncertainty associated with the 2013 Upper Yukon fall chum salmon return, it is prudent to enter the 2013 season with the expectation that inseason assessment programs will determine run strength and appropriate management actions will be undertaken to ensure conservation and harvest sharing objectives are achieved. Since 2002, Upper Yukon fall chum salmon preseason outlooks have usually been based on S/R models, which incorporate escapement and the subsequent associated adult return by age data. Annual runs have been reconstructed using mark–recapture and recent sonar data, and assumed contributions to U.S. catches. Recent genetic stock identification data (i.e., mixed stock analyses) has been used to estimate the annual U.S. catch of upper Yukon River fall chum salmon; it has corroborated some longstanding assumptions and should allow a more accurate estimation of the proportion of Canadian fall chum salmon run harvested in U.S. fisheries.

Canadian-Origin Porcupine River Fall Chum Salmon

In the Canadian section of the Porcupine River, most of the production of fall chum salmon originates from the Fishing Branch River. Conservation concerns for the Fishing Branch River fall chum salmon run arose in the late 1990s and were heightened in 2000 when the count through the Fishing Branch River weir was only 5,057[28] fish, the lowest recorded escapement for the system. However, run sizes improved somewhat within the 2001–2012 period when weir counts ranged from a low of 13,085 fish in 2011 to a high of 119,058 fish in 2005 (Appendix B15). Recent Fishing Branch River fall chum salmon runs appear to be occurring later in the season and it is not unusual for the counting program to end while significant numbers of fish are still migrating. A consistent approach was used to estimate the number of fish that may have migrated after the weir program ended.

The 2007–2010 brood year escapements will contribute to the 2013 run with age 3–6 fish returning in 2013 from these contributing brood years (Table 24). The average age composition of offspring produced is 60.8% age-4 fish and 34.3% age-5 fish.

[28] The counting fence was inoperable due to high water levels for a full week in late September, 2000.

Table 24.–Summary of Fishing Branch River fall chum salmon brood year spawning escapements for the 2007–2010 period and the average contribution for age-3 to age-6 fish returning in 2013.

Brood Year	Escapement	Age	Contribution based on age
2007	32,120	6	1.8%
2008	19,086	5	34.3%
2009	25,828	4	60.8%
2010	15,773	3	3.1%

For many years the preseason outlook for the Porcupine River fall chum salmon was based on an assumed return/spawner rate of 2.5. Based upon the low returns observed in the 2011 run which indicates poor production from the 2007 brood year escapement of 32,150 fall chum salmon, a return/spawner value of 2.5 is unlikely.

The 2013 Porcupine River outlook range is from 45,000 to 58,000 fall chum salmon. This is based on the drainagewide outlook range of 906,000 to 1,152,000 fish and an assumption that approximately 5% of the drainagewide outlook will be Porcupine River fish. Fishing Branch weir escapement alone, which does not include the component of the Fishing Branch run harvested during migration, has accounted for an average of 4% of the total Yukon fall chum salmon run since 1995. This percentage does not include Porcupine fall chum salmon spawning in other Canadian tributaries. While analysis of genetic sampling taken in the Pilot Station sonar test fishery after July 19 between 2004 and 2012 produced an estimation of the contribution of Porcupine stock to the total Yukon River fall chum salmon run, these estimates have not been representative of estimated run size. It is assumed that Porcupine River fall chum salmon contribute too small a proportion, at Pilot Station sonar, to be adequately represented in the genetic analysis.

The 2013 outlook range is the estimated number of fall chum salmon entering the mouth of the Yukon River bound for the Fishing Branch River; hence, the number of fish reaching the Fishing Branch River weir will be reduced by any catches in U.S. and Canadian fisheries prior to the fish reaching the weir[29]. It has been difficult to accurately estimate the U.S. harvest rate (and catch) of Porcupine stocks, although genetic mixed stock analyses may improve this situation in the future. However, the 2013 Fishing Branch River outlook range will only provide for minimal harvest relative to an escapement goal of 22,000 to 49,000 fish. Given the outlook, it is prudent to enter the 2013 season with the expectation that inseason assessment programs will determine the run strength and appropriate management actions will be taken to ensure conservation and harvest sharing objectives are achieved.

As was observed with the Upper Yukon River fall chum salmon stocks, the postseason estimates of the Porcupine[30] River fall chum salmon run sizes were consistently below preseason outlooks throughout the 1998–2002 period (Table 25). For example, the 1998 outlook of 112,000 overestimated the run size by a factor of 4.48; the preseason outlook was 348% above the actual run size. Canadian postseason estimates of the Porcupine drainage fall chum salmon run

[29] Fishing Branch River Weir is not anticipated to be operated in 2013, however an estimate can be obtained based off the Porcupine Sonar.

[30] The Fishing Branch River weir monitors the escapement to what is believed to be the dominant spawning stock within the Porcupine drainage.

consistently exceeded preseason outlooks from 2003 to 2005 while the 2006–2011 postseason estimates were lower than the preseason estimates.

Table 25.–Preseason Porcupine River fall chum salmon outlooks for 1998 to 2013 and observed run sizes for 1998–2012.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Performance of Preseason Outlook
1998	112,000	25,000	4.48
1999	124,000	24,000	5.17
2000	150,000	13,000	11.54
2001	101,000	33,000	3.06
2002	41,000	19,000	2.16
2003	29,000	46,000	0.63
2004	22,000	32,000	0.69
2005	48,000	186,000	0.26
2006	54,000	48,000	1.13
2007	80,000	50,000	1.60
2008	78,000	30,000	2.60
2009	49,000	40,000	1.23
2010	43,000	20,000	2.15
2011	37,000	28,000	1.32
2012	55,000	50,000	1.10
2013	52,000		
Average (1998-2012)	68,000	43,000	2.61

Note: Run sizes are rounded to nearest one thousand. The 2009 through 2013 outlooks are the average of an outlook range.

10.4 YUKON RIVER COHO SALMON

Although there is little comprehensive escapement information for Yukon River drainage coho salmon, it is known that coho salmon primarily return as age-2.1 fish (4 year old, age in European notation) and overlap in run timing with fall chum salmon. The major contributor to the 2013 coho salmon run will be age-4 fish returning from the 2009 parent year. Pilot Station sonar passage estimates cannot be used for evaluating coho salmon in 2009. A coho salmon index developed for the Yukon River from 1995 to 2012 (excluding 1996 and 2009) suggests that the average escapement is 164,000 fish. In 2009 both commercial and subsistence harvests were below average when compared to the recent 5 years.

Escapements are mostly monitored in the Tanana River drainage. The Delta Clearwater River (DCR) is a major producer of coho salmon in the upper Tanana River drainage with comparative escapement monitoring data since 1972. The parent year escapement of 16,850 fish in 2009 was above average and was near the upper end of the sustainable escapement goal (SEG) range of 5,200 to 17,000 coho salmon. Coho salmon escapements in the Nenana River complex were below average in 2009. Assuming average survival, the 2013 coho salmon run is anticipated to be average based on escapements observed in 2009.

10.5 Spawning Escapement Target Options in 2013: Canadian Origin Chinook and Fall Chum Salmon

Canadian origin Chinook and fall chum salmon are managed under the umbrella of the Yukon River Salmon Agreement (YRSA). The Yukon River Panel (YRP) meets annually to recommend the escapement goals.

Upper Yukon River Chinook Salmon

In 2010, the YRP adopted an interim management escapement goal (IMEG) range of 42,500 to 55,000 Chinook salmon, to allow for the uncertainty of information from assessment projects. The IMEG was adopted again in 2012 by YRP and DFO included it in the Integrated Fisheries Management Plan (IFMP) for the Yukon River Chinook salmon in Canada (Appendix A19). In 2013, the JTC also recommended retaining this IMEG range.

Previously, the IMEG was a point goal, of greater than 45,000 Canadian-origin Yukon River Chinook salmon, agreed upon in 2008, and assessed using information from the Eagle sonar program. This recommendation was established for 1 year, recognizing that further analysis of a biologically based escapement goal was required and additional factors such as habitat capacity had yet to be incorporated. In 2009, the JTC recommended that the minimum IMEG (>45,000) established for 2008 be used for the second year. These IMEGs supplanted the longstanding stock rebuilding goal range of 33,000 to 43,000 fish, in place since 1985 and monitored by a mark–recapture program, just upstream of the international border, until the Eagle sonar program came online in 2005.

Upper Yukon River Fall Chum Salmon

The upper Yukon River escapement goal specified within the Yukon River Salmon Agreement is >80,000 fall chum salmon (Appendix A19). This goal was achieved 18 times during the period from 1982–2012. The DFO fall chum salmon mark–recapture program was conducted from 1982 to 2008 while the joint U.S./Canada Eagle sonar program was conducted from 2005 to 2012. The mark–recapture estimates generally agreed with Eagle sonar estimates for fall chum salmon when the two programs were conducted concurrently. The Eagle sonar project became the primary assessment tool for the Canadian border passage and has been applied from 2006 to present.

The upper Yukon River escapement goal was reviewed in 2001 and after considerable analysis of the available data a recommendation was made for a biological escapement goal (BEG) of 60,000 to 129,000 fall chum salmon (Eggers 2001). However, due to concerns over the quality of the data and analytical issues, the BEG recommendation was not accepted during a Pacific Scientific Advice Review Committee (PSARC) review (Tanasichuk 2002).

For 2013, the JTC recommends that the upper Yukon interim management escapement goal (IMEG) remain as established in 2010 as a range from 70,000 to 104,000 fall chum salmon (Appendix A19). This range was developed as 0.8 to 1.2 times the estimated spawners at maximum sustained yield (86,600 fish) which was derived prior to the returns from the exceptional 2005 spawning escapement of 477,498 fall chum salmon. The range was established to offer more flexibility with respect to uncertainties associated with management. The spawner-recruit analysis has not yet been conducted with complete returns from 2005. The JTC

escapement goal subcommittee will continue to examine other data that may be used in recommending a revised escapement goal for future years.

Fishing Branch River Fall Chum Salmon

The escapement goal specified within the Yukon River Salmon Agreement is a range of 50,000 to 120,000 fall chum salmon to the Fishing Branch River. This goal has been achieved only 10 times since 1974 and only 5 times since 1985 when the weir program went back into operation. The Fishing Branch escapement goal was reviewed in 2001 and after considerable analysis of the available data a recommendation was made for a biological escapement goal (BEG) of 27,000 to 56,000 fall chum salmon (Eggers 2001). However, due to concerns over the quality of the data and analytical issues, the BEG recommendation was also not accepted during a PSARC review (Tanasichuk 2002).

The goal of 50,000–120,000 fish generally could not be reached, having been achieved only once over the two fall chum salmon 4 year cycles preceding 2008 when escapements to the upper Yukon River in Canada were rebuilding. This led the JTC to question whether the lack of success was related to an unrealistically high goal. As a result, a JTC escapement goal subcommittee revisited the goal and attempted to address some of the issues raised during the PSARC review. However as with the mainstem goal, analysis has not been conducted to include the returns from the high escapement of 119,058 fall chum salmon observed in 2005.

In April 2008, the Yukon River Panel accepted the Canada/U.S. Joint Technical Committee recommendation to adopt an interim management escapement goal (IMEG) range of 22,000 to 49,000 fall chum salmon for the Fishing Branch River 2008 to 2010 period. This IMEG range was extended in 2010 for another 3 years, 2011–2013 (Appendix A19) before the next review. Following consultation with the Yukon Salmon Subcommittee, the IMEG was subsequently adopted by DFO and included in the IFMP. The 2012 Fishing Branch weir count and run size estimate did not provide any indication that the 2008 IMEG required revision.

The analysis used to determine the IMEG was based on an assumption (Bue and Hasbrouck, unpublished report[31]) that when fishery exploitation has been low to moderate and the production regime has been somewhat stable, a sustainable escapement goal range tends to overlap with the historical spawning escapement range. The sustainable escapement is not necessarily the number of spawners at maximum sustained yield (S*msy*). The analysis uses escapement contrast (i.e. maximum/minimum escapement) and harvest rate information to determine what percentile range of observed escapements is appropriate for the escapement goal range determination. In the Fishing branch River fall chum analysis, escapements from 1985 to 2007 (excluding 1990) were incorporated along with the high contrast ratio of 24:1. The escapement goal range reflects the approximate 25 and 75 percentiles of 22 years of Fishing Branch River weir counts.

[31] Bue, B. G., and J. J. Hasbrouck. *Unpublished*. Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, November 2001 (and February 2002), Anchorage.

11.0 STATUS OF ESCAPEMENT GOALS

Within Alaska, policies for establishment and review of salmon escapement goals are contained in the Policy for the Management of Sustainable Salmon Fisheries (5AAC 39.222) and Policy for Statewide Salmon Escapement Goals (5AAC 39.223), both adopted in 2001. The first Yukon area escapement goals were established in the late 1970s and early 1980s and documented as required under ADF&G's original escapement goal policy signed in 1992 (Buklis 1993). New biological escapement goals were established in 2001 for Yukon River fall chum salmon (Eggers 2001), Anvik River summer chum salmon (Clark and Sandone 2001), and Andreafsky River summer chum salmon (Clark 2001), consistent with the new state policies which were adopted shortly after. Since 2001, ADF&G has conducted a review of salmon escapement goals in the interim between each triennial BOF meeting. For the Arctic-Yukon-Kuskokwim Region, reviews were completed and recommendations made during the 2004, 2007, and 2010 BOF cycles (ADF&G 2004; Brannian et al. 2006; Volk et al. 2009). The most recent review was completed prior to the January 2013 BOF meeting, and recommendations were presented at that meeting (Conitz et al. 2012)[32]. In the Yukon Management Area, which includes the U.S. portion of the Yukon River drainage and coastal waters between Point Romanof and the Naskonat Peninsula, 15 established escapement goals including 6 Chinook, 2 summer chum, 6 fall chum, and 1 coho salmon stocks were reviewed. Additionally, information from 1 Chinook, 2 summer chum, 1 fall chum, and 2 coho salmon stocks without existing goals was reviewed. Yukon River drainagewide goals for summer chum and coho salmon were considered as potential new goals, but were not ultimately recommended for the 2013 cycle (Conitz et al. 2012). They will be reconsidered again during the next cycle. ADF&G can recommend either a biological escapement goal (BEG) or a sustainable escapement goal (SEG). A BEG uses the estimated range of escapement that has the highest potential to provide maximum sustainable yield, based on spawner recruit relationships. An SEG typically uses a time series of escapement data known to have provided sustainable yields over at least a 10 year period.

11.1 CHINOOK SALMON

Escapement goals have been recommended in 2013 for 6 Chinook salmon stocks in the U.S. portion of the Yukon River drainage. The recommended goals are the same as those that were approved during the 2010 cycle. The mainstem Yukon River escapement goal into Canada will be considered at the spring 2013 JTC and Yukon River Panel meetings and is not expected to change (Table 26).

[32] Although the BOF reviews these recommendations, it is actually the Directors of the ADF&G divisions of Commercial Fisheries and Sport Fish who make the final decision on acceptance of recommended goals.

Table 26.–List of Yukon River Chinook salmon escapement goals recommended for 2013.

Chinook Salmon Stock	Goals Recommended for 2013	Goal Type
E. Fork Andreafsky River	2,100–1,700	SEG
W. Fork Andreafsky River	640–1,600	SEG
Anvik River	1,100–1,700	SEG
Nulato R. -N. and S. combined	940–1,900	SEG
Chena River	2,800–5,700	BEG
Salcha River	3,300–6,500	BEG
Canadian Upper Yukon River	42,500–55,000	Yukon Salmon Agreement

Note: The Chinook salmon goals recommended in 2013 are unchanged from those adopted in 2010.

JTC Discussion of Escapement Goal for Upper Yukon River Chinook Salmon

The JTC is planning to begin discussions on setting a new, biologically based escapement goal for Canadian Yukon Chinook salmon during the spring meeting. The current escapement goal is an interim management goal (IMEG) based on negotiations and agreement between U.S. and Canadian representatives and has remained the same since 2010. In order to develop a new biologically-based escapement goal, a spawner recruit analysis is being conducted for Canadian-origin Upper Yukon River Chinook salmon. Accurate and reliable estimates of returns per spawner are fundamental to this analysis, and depend upon accurate estimates of spawning escapement, total abundance, and age composition of both escapement and harvest (Appendix A9). Since implementation of the Eagle sonar project and the associated biological sampling program in 2005, these estimates are generally considered to be reliable and sufficiently accurate (Appendix B11). However, estimates of historic spawning escapement, total run size, and age composition are suspected to be inaccurate and possibly biased in some cases. The spawner recruit analysis currently in progress uses Bayesian state space modeling (Fleischman et al. *In press*), which can incorporate this type of uncertainty to provide the most probable ranges for modeled parameters given the data and known uncertainties.

11.2 SUMMER CHUM SALMON

Current summer chum salmon escapement goals are in place only for East Fork Andreafsky and Anvik rivers (Table 27). The East Fork Andreafsky River goal was changed to a weir based goal in the 2010 BOF meeting, with a lower bound SEG replacing the BEG range primarily because it would be difficult or undesirable to hold escapements below the upper bound of a range through inseason management actions. Both the East and West Fork Andreafsky River aerial survey based goals were eliminated (Volk et al. 2009). No changes to these existing summer chum escapement goals were recommended in the 2013 cycle (Conitz et al. 2012). A Yukon River drainagewide goal was considered but not recommended in the 2013 cycle, but will be considered again during the next cycle.

Table 27.–List of Yukon River summer chum salmon escapement goals recommended for 2013.

Summer Chum Salmon Stock	Goals Recommended for 2013	Goal Type
E. Fork Andreafsky River	>40,000	SEG
Anvik River	350,00–700,000	BEG

11.3 FALL CHUM SALMON

There has been little change to the BEGs established in 2001 for Alaska fall chum salmon stocks (Eggers 2001; Table 28). The Toklat River escapement goal was discontinued in 2010 because the foot survey assessment project was terminated. The drainagewide BEG for fall chum salmon in the Yukon River was changed to an SEG in 2010 (Fleischman and Borba 2009) because the subsistence fishery priority prevents management for maximum sustained yield. There are no fall chum salmon BEGs for Canadian-origin stocks within the Upper Yukon River (mainstem) and Porcupine River drainages. The BEGs recommended in 2001 for the Upper Yukon (60,000–129,000) and Fishing Branch rivers (27,000–56,000) were not accepted by the Pacific Scientific Advice Review Committee (PSARC) review undertaken in 2002 (Tanasichuk 2002), because of concerns with the quality of the data. However, as is outlined in Section 7.3, the JTC has recommended a Canadian Upper Yukon River escapement goal range of 70,000 to 104,000 for 2012. The Fishing Branch River IMEG range of 22,000 to 49,000, initiated in 2008, and extended through 2013. The range for the IMEG for Fishing Branch River was derived using the percentile method (Bue and Hasbrouck *Unpublished;* Otis and Hasbrouck 2004) applied to those years the weir was fully operational. Historical perspective on escapement goals, rebuilding goals and interim goals are presented in Appendix A19.

Table 28.–List of Yukon River fall chum salmon escapement goals recommended for 2013.

Fall Chum Salmon Stock	Goals Recommended for 2013	Goal Type
Yukon River Drainage	300,000–600,000	SEG
Tanana River	61,000–136,000	BEG
Delta River	6,000–13,000	BEG
Upper Yukon R. Tributaries	152,000–312,000	BEG
Chandalar River	74,000–152,000	BEG
Sheenjek River	50,000–104,000	BEG
Canadian Upper Yukon River	70,000–104,000	Yukon Salmon Agreement
Fishing Branch River	22,000–49,000	Yukon Salmon Agreement

11.4 COHO SALMON

A SEG range of 5,200 to 17,000 fish for the Delta Clearwater River is the only goal currently established for coho salmon in the Yukon River drainage.

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FIGURES

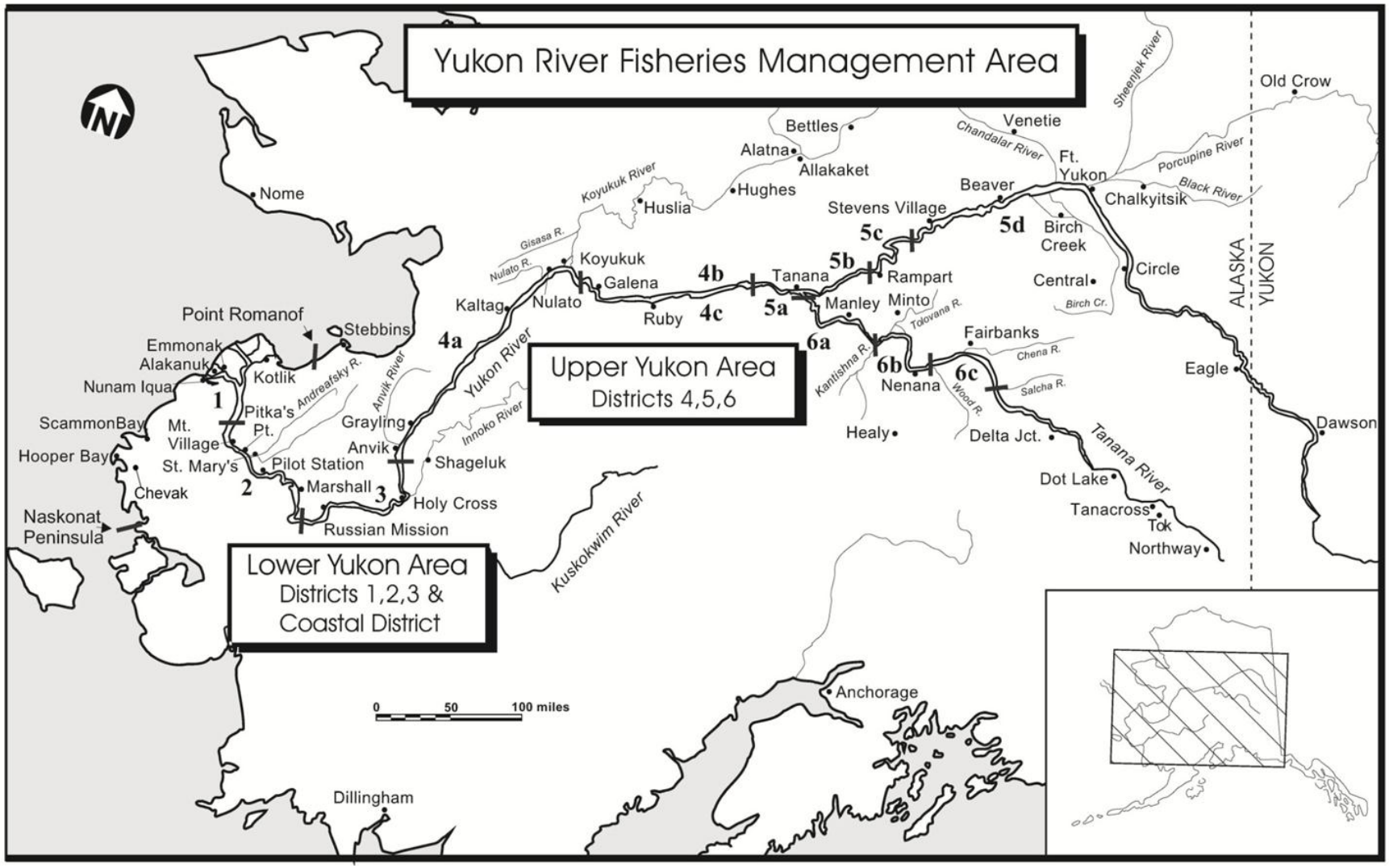
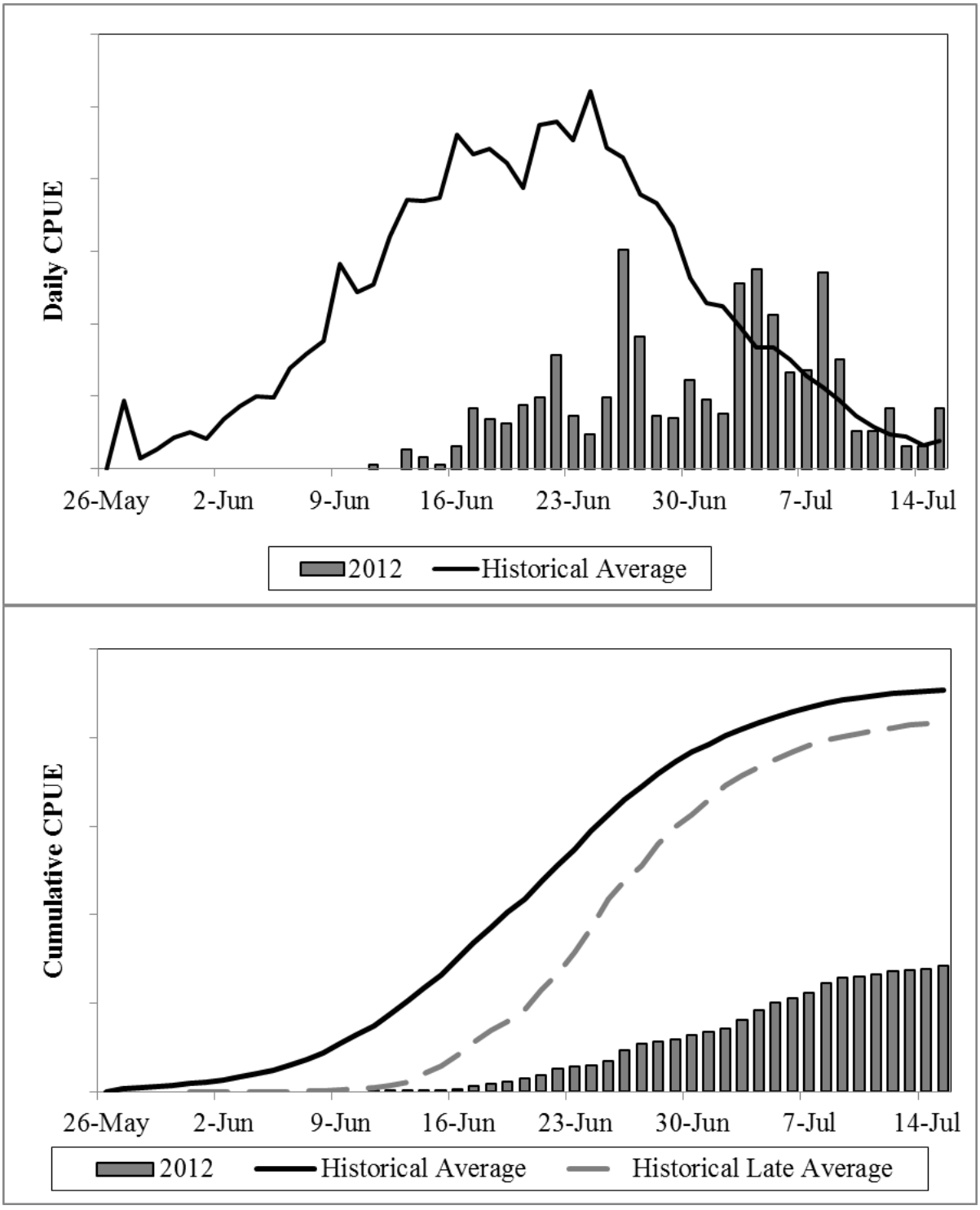


Figure 1.–Map of the Alaska portion of the Yukon River drainage showing communities and fishing districts.



Note: Historical average includes 1989–2011, excluding 2009. Historical late average includes only 1992, 1999, 2001, 2006 and 2010.

Figure 2.–Daily and cumulative CPUE for Chinook salmon in 8.5 inch set gillnet test fishery sites in 2012, compared to historic and late year average run timing, 1989–2011.

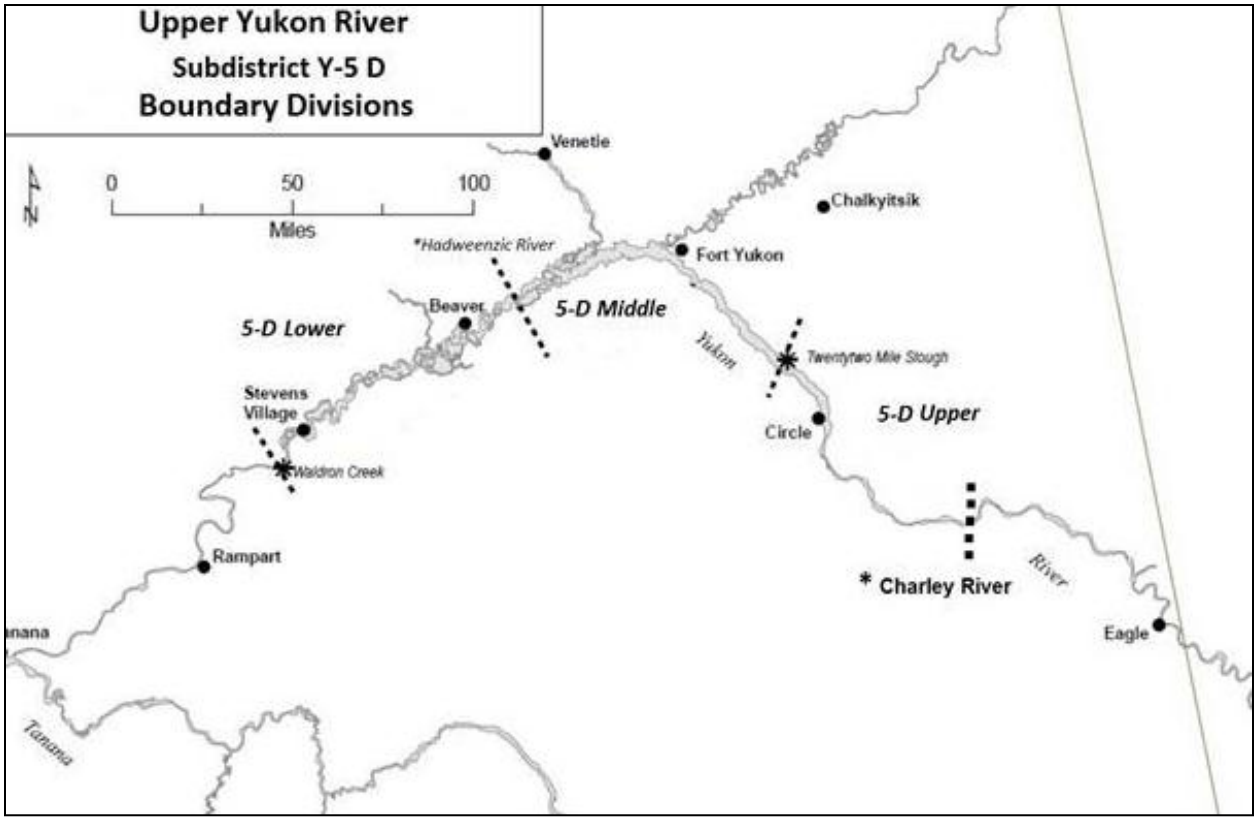
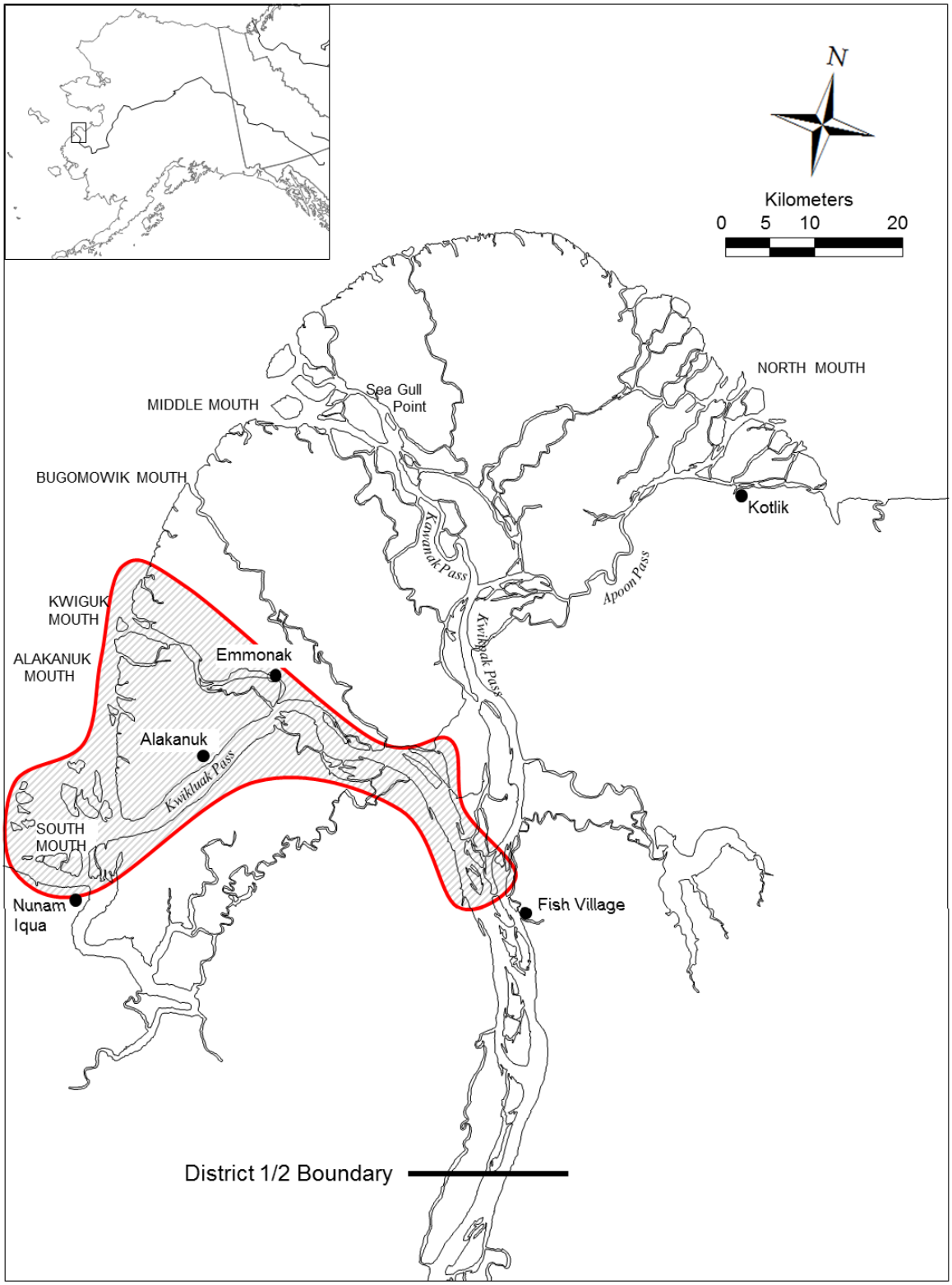


Figure 3.–Subdistrict 5-D was divided into 4 smaller areas during the 2012 season in order to implement Chinook salmon pulse protections.



Note: The red line indicates the boundary of the South Mouth area that was open for summer chum commercial fishing in 2012.

Figure 4.–Yukon River delta showing South, Middle, and North Mouths and boundary between Districts 1 and 2.

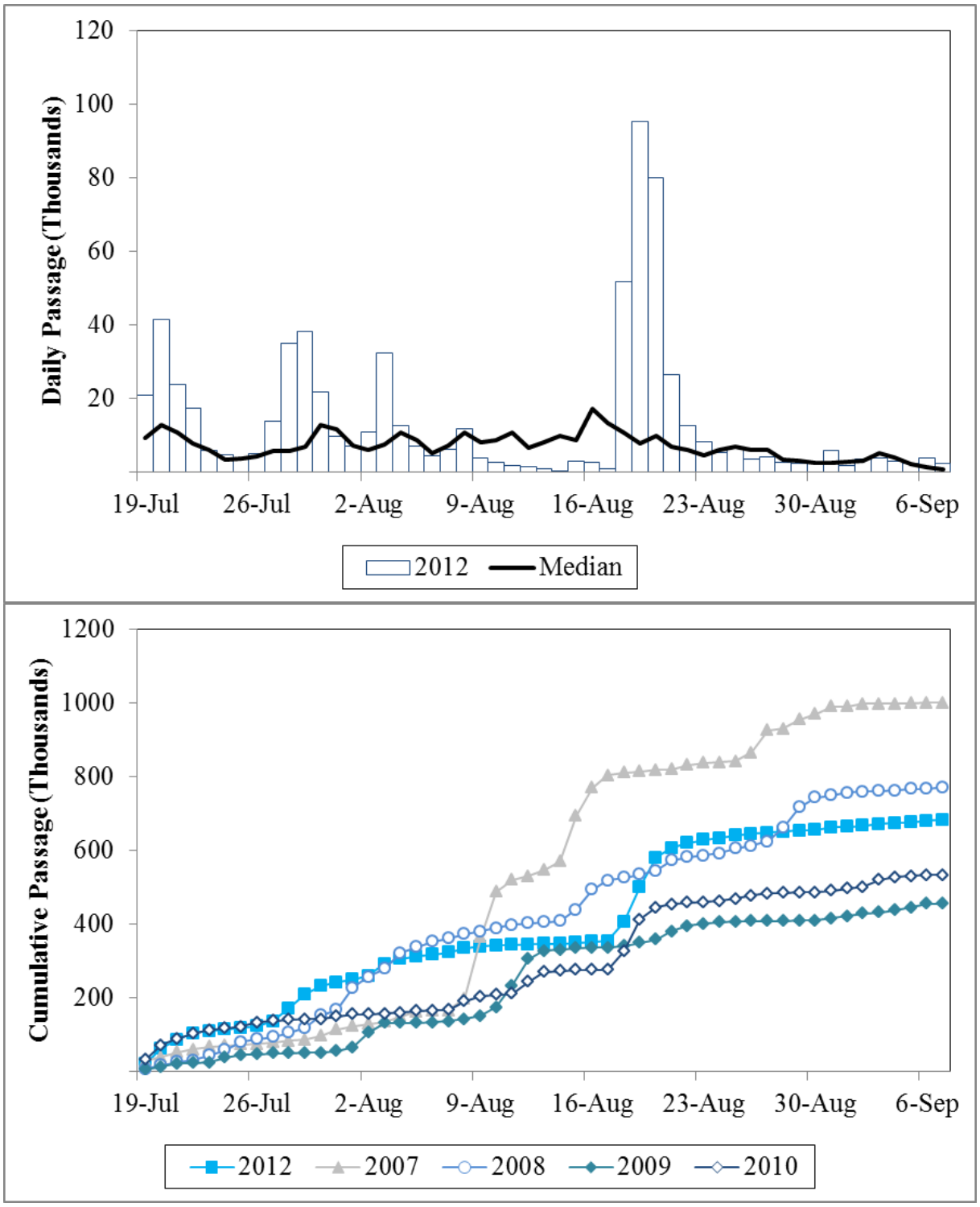


Figure 5.–Daily Pilot Station sonar passage estimates attributed to fall chum salmon 2012 (top), compared to median and cumulative (bottom), compared to other runs of similar size.

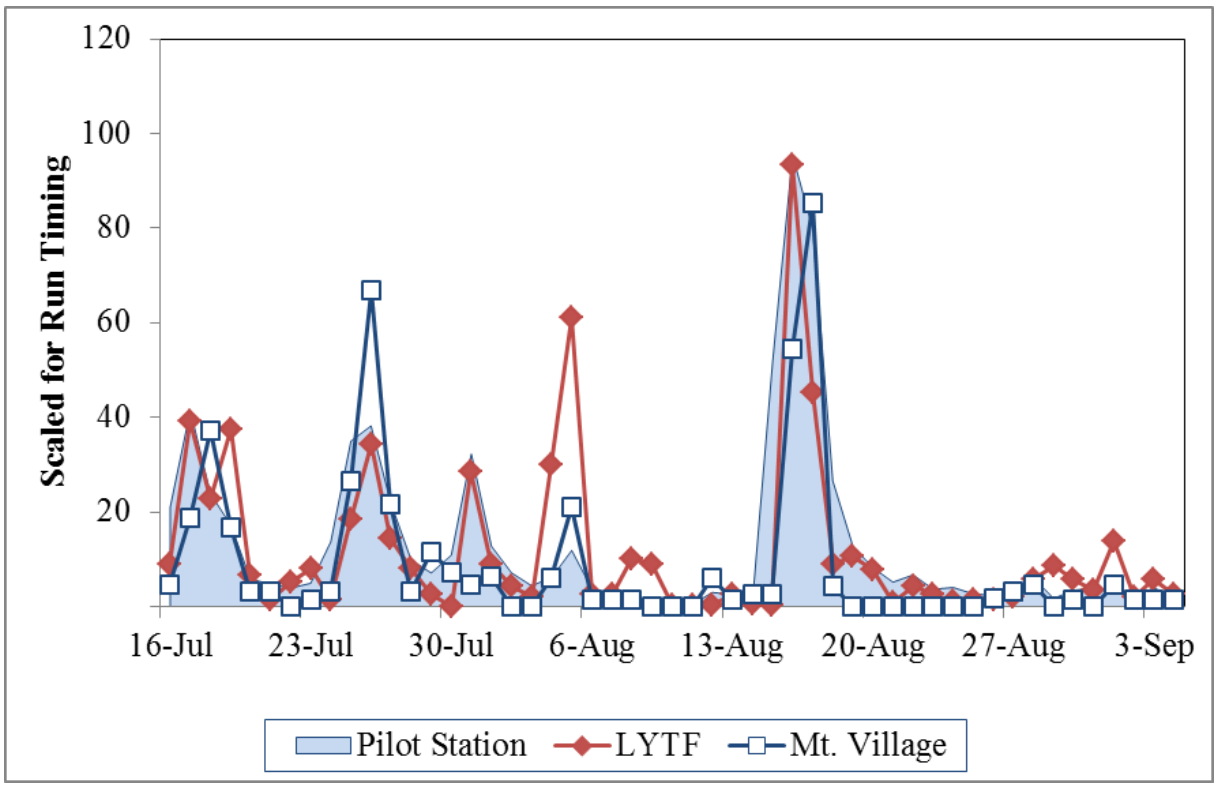


Figure 6.–Comparisons of assessment projects, Lower Yukon Test Fish, Mt. Village Test Fish, and Pilot Station sonar, each lagged for run timing and scaled, 2012.

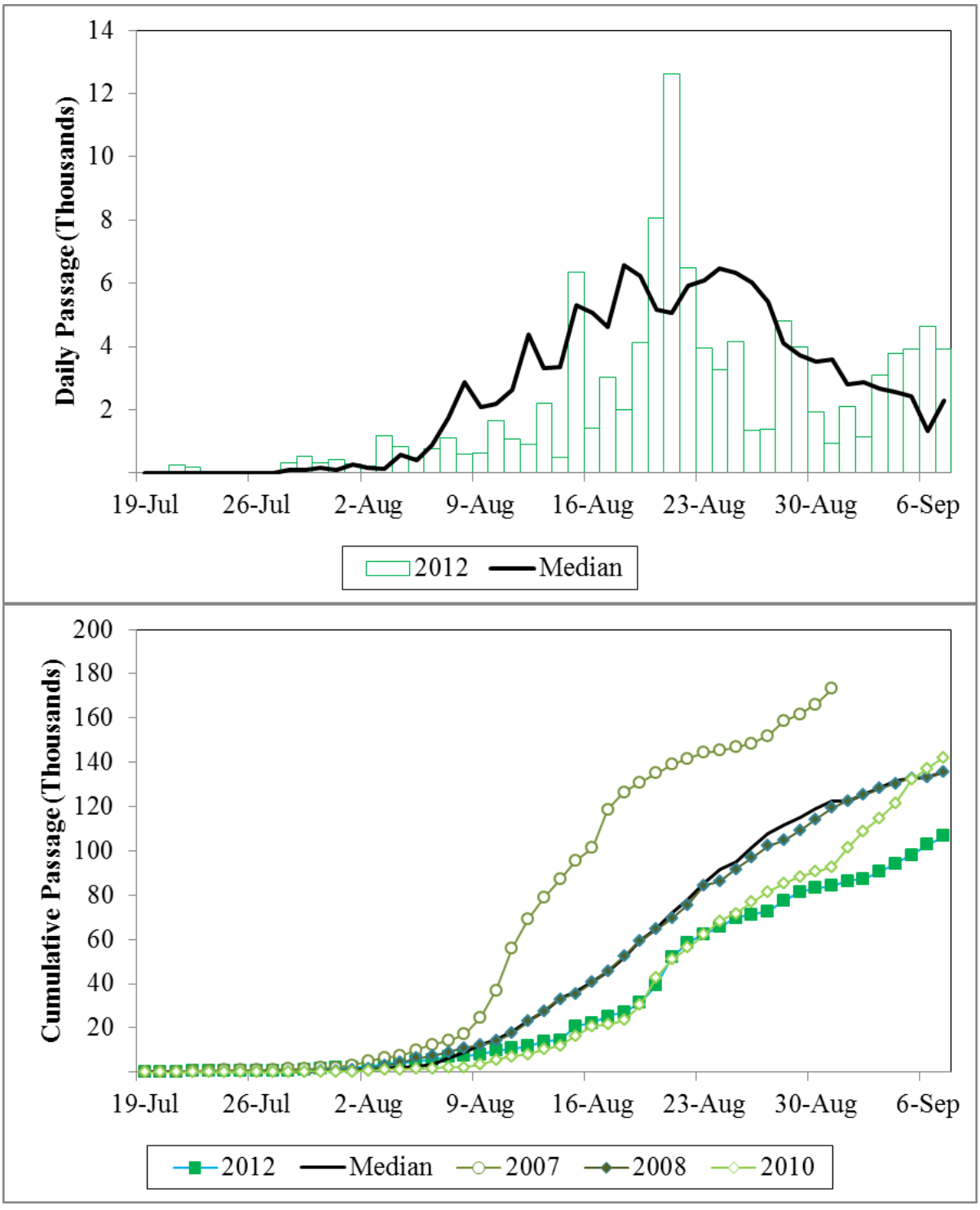


Figure 7.–Daily Pilot Station sonar passage estimates attributed to coho salmon 2012 (top), compared to median and cumulative (bottom), compared to median and 2007–2008 and 2010.

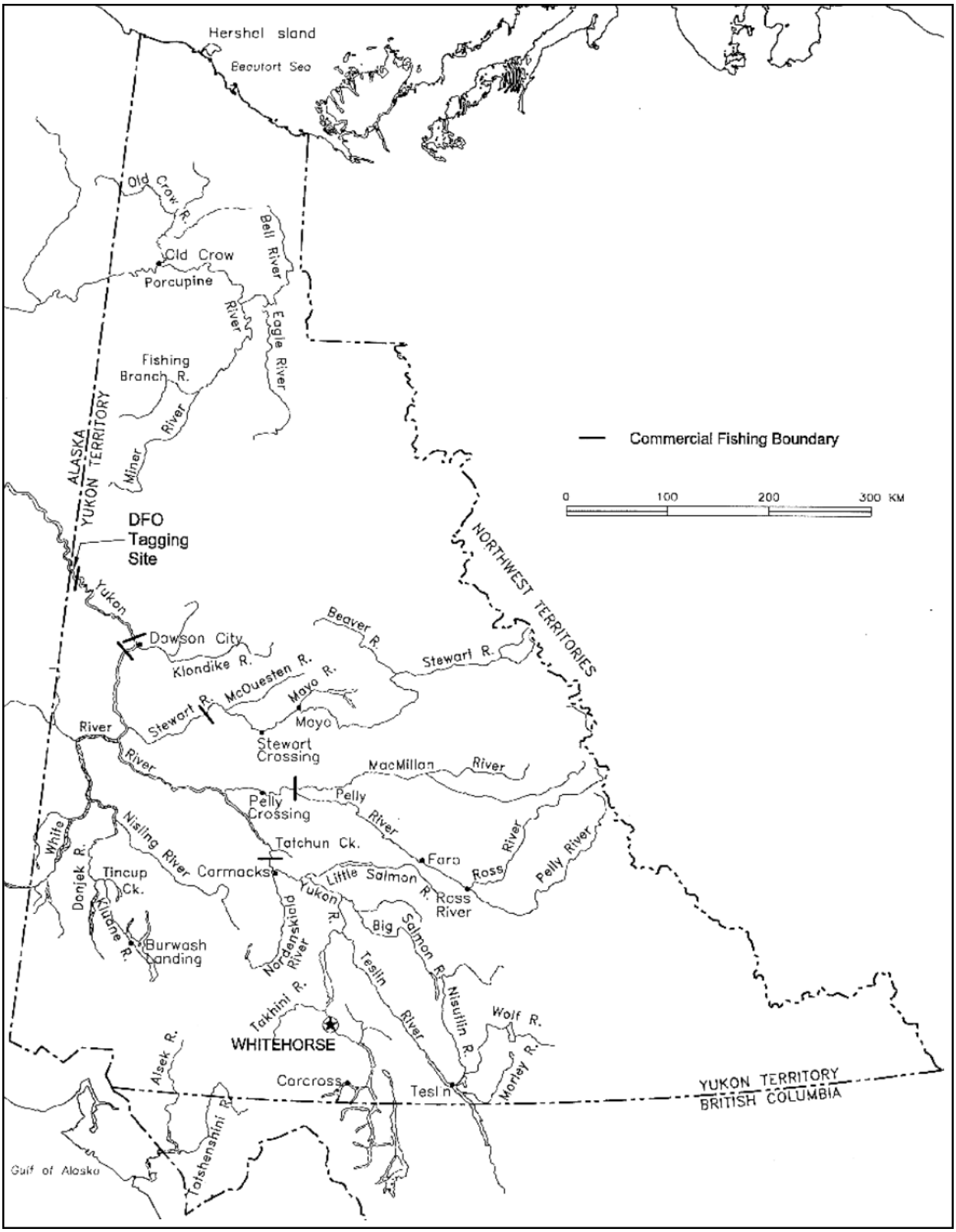


Figure 8.–Commercial fishing boundaries, tributaries, and major towns within the Yukon Territory, Canada.

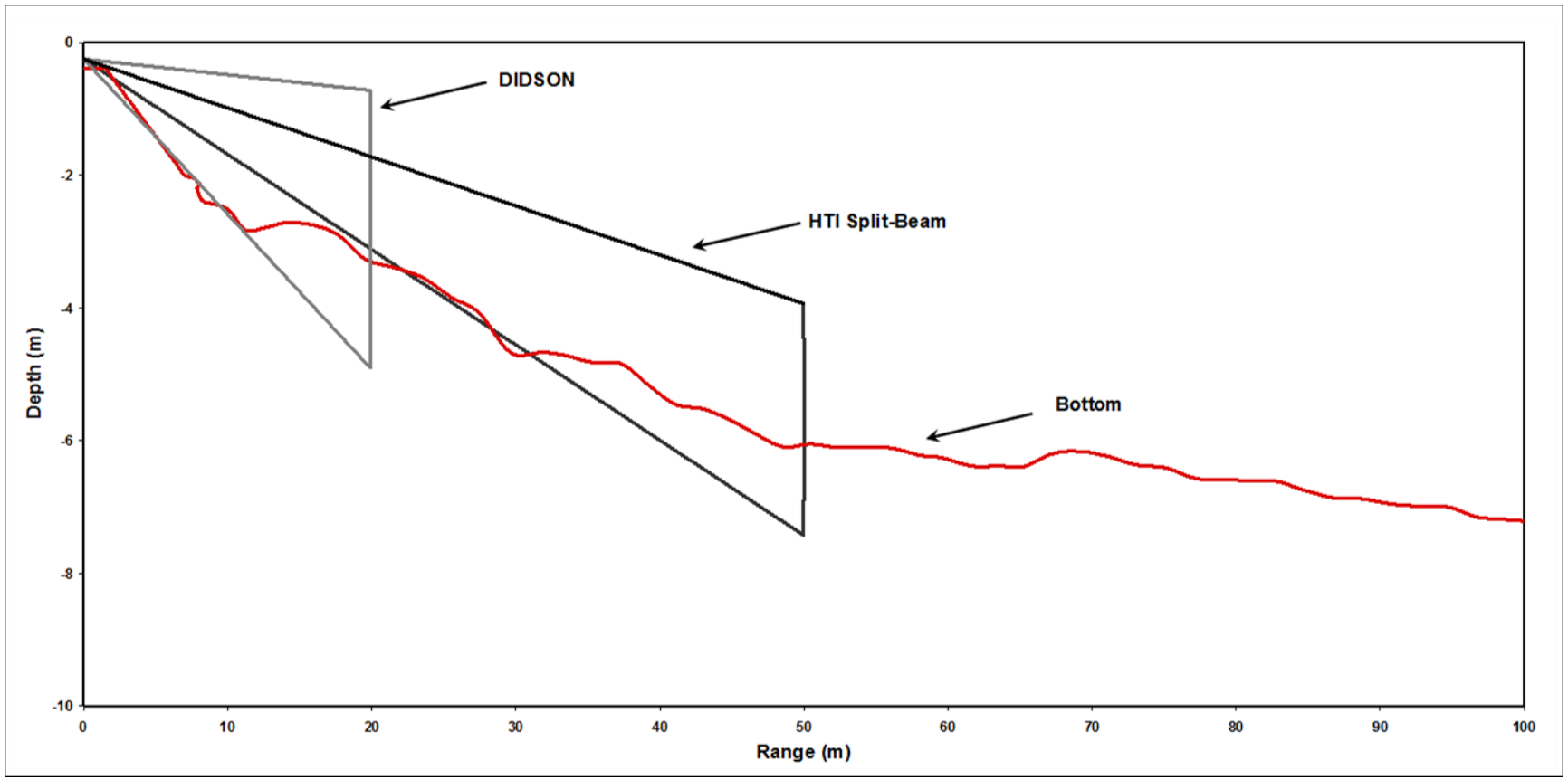
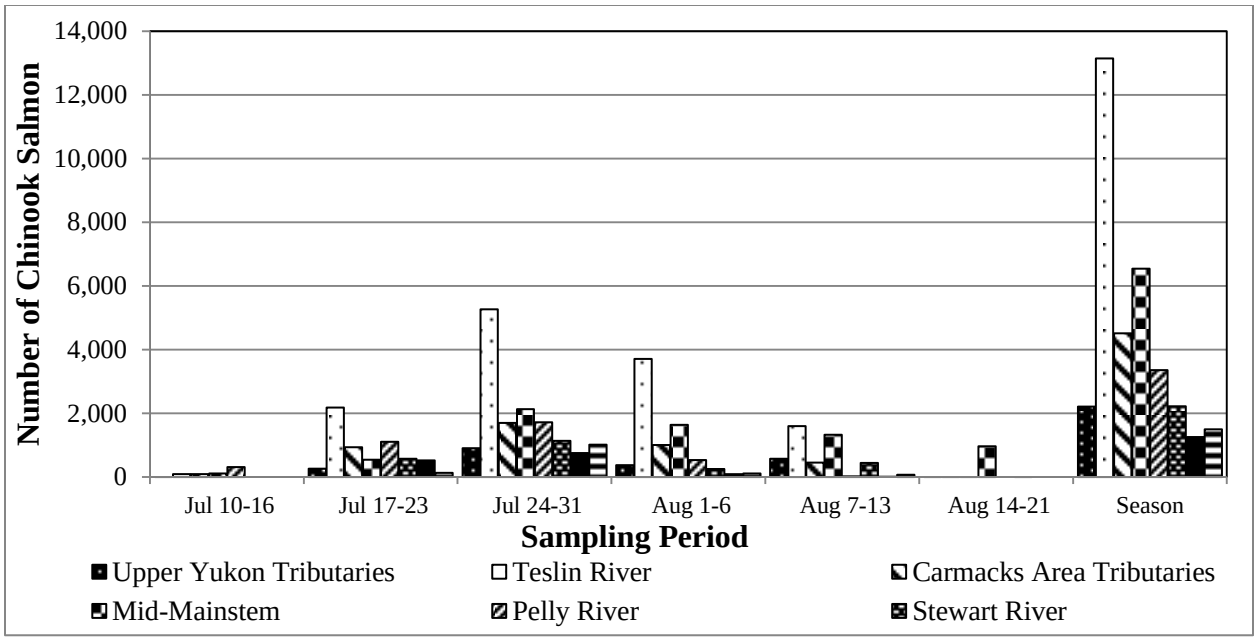
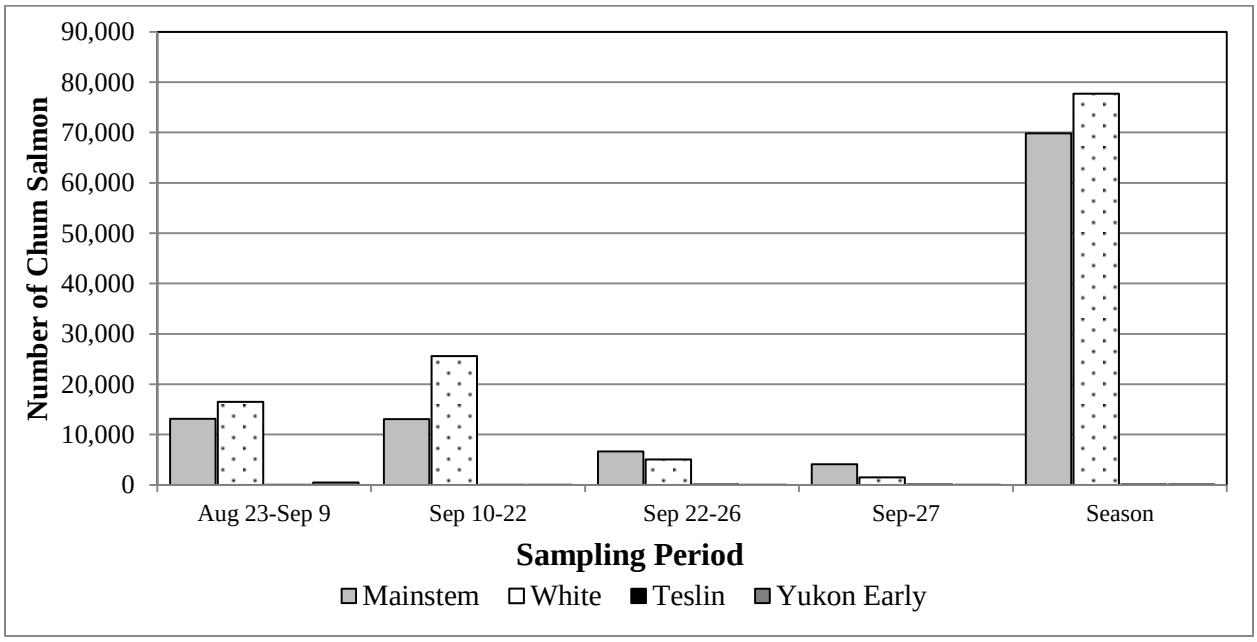


Figure 9.–Schematic representation of the approximate Yukon River profile in 2005 and associated nominal beam-width of the DIDSON and split-beam sonar of the first sampling stratum on the left bank at Pilot Station sonar used from 2005 to present.



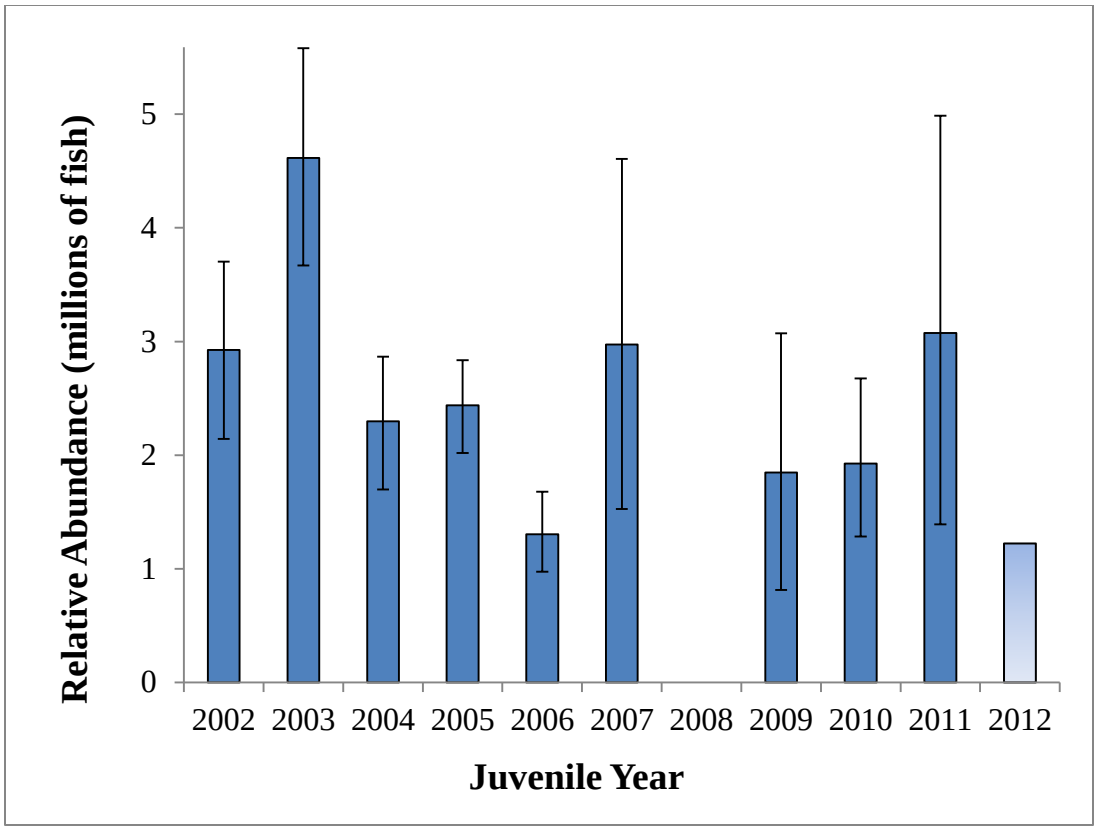
Note: This figure shows total seasonal abundance for 8 regional stock aggregates.

Figure 10.–Estimated abundance of Upper Yukon Chinook salmon stocks at Eagle sonar site in 2012 determined by Genetic Stock Identification analyses.



Note: This figure shows the abundance for each sampling period as well as the seasonal estimate for 4 regional stock aggregates.

Figure 11.–Estimated abundance of Upper Yukon fall chum salmon stocks at Eagle sonar site in 2012 determined by Genetic Stock Identification analyses.



Note: Error bars identify the 80% confidence interval of the abundance estimates. The 2012 estimate is preliminary and subject to change.

Figure 12.–Relative abundance of juvenile Chinook salmon estimated from catch rates in pelagic trawl research surveys in the northern Bering Sea (60N-65N).

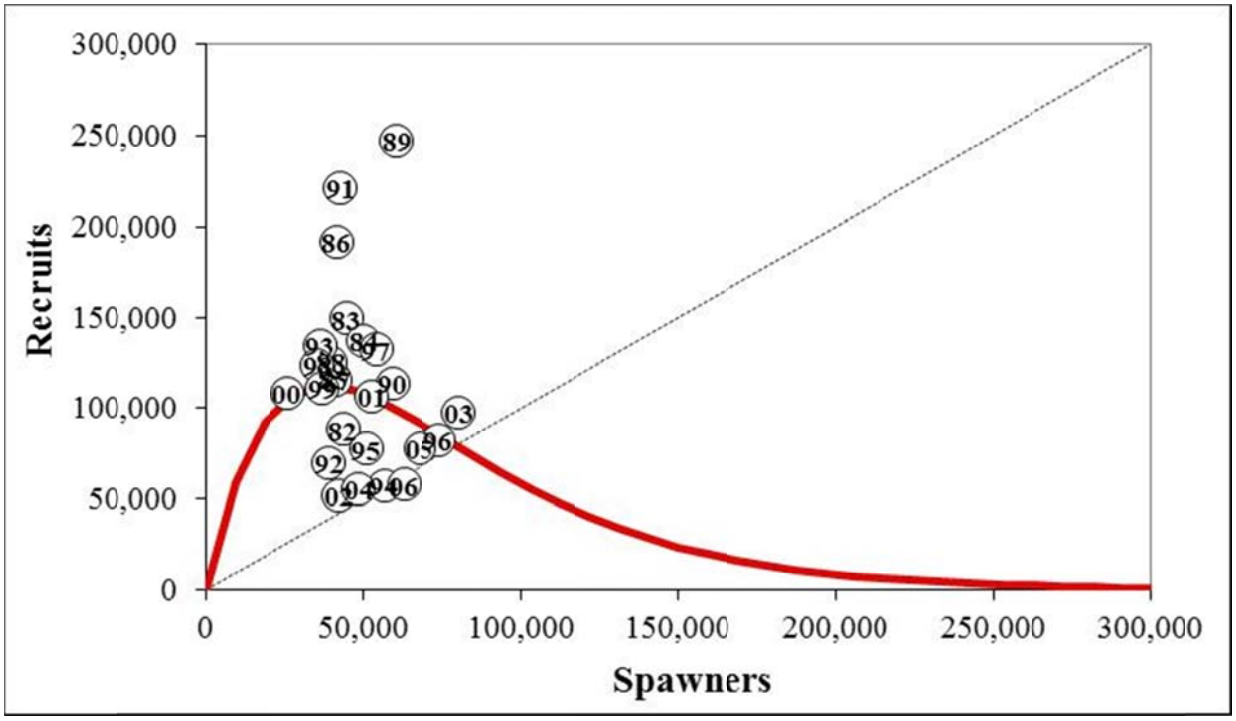


Figure 13.–Yukon River Canadian-origin Chinook salmon recruits versus spawners, Ricker curve, and 1:1 replacement line.

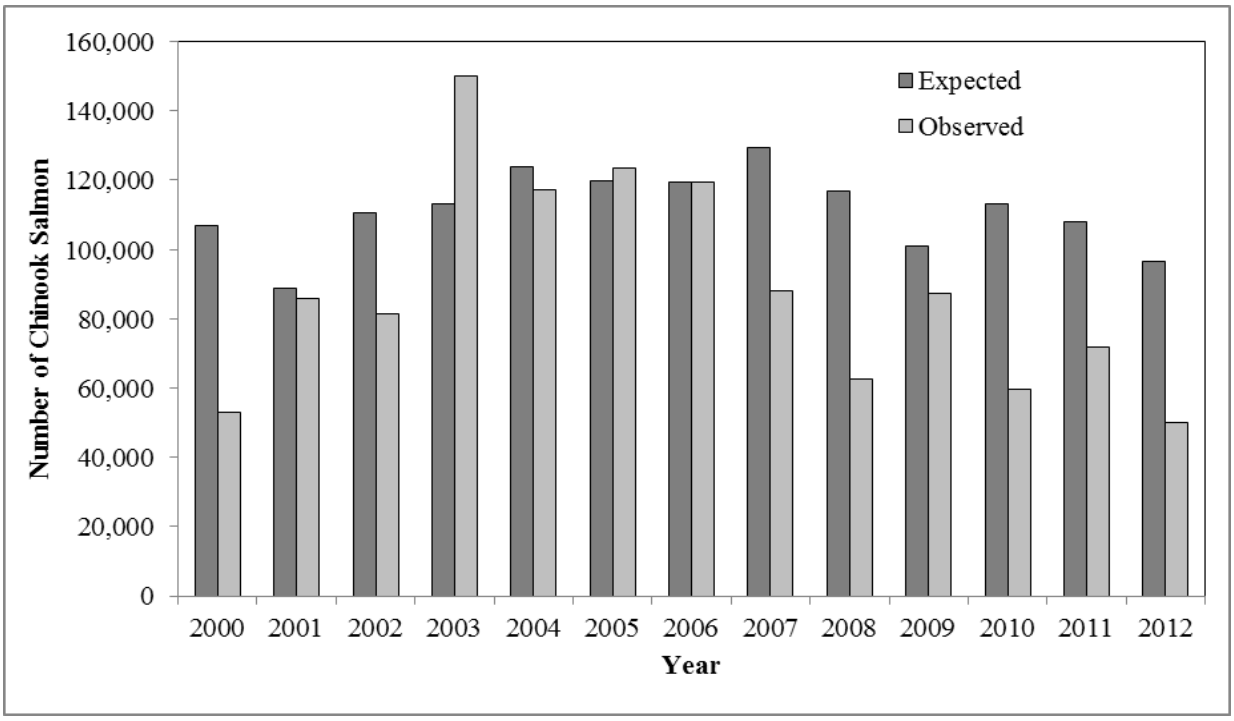


Figure 14.–Expected versus observed number of Canadian-origin Chinook salmon returning to spawn each year.

APPENDIX A: TABLES

Appendix A1.–Yukon River drainage summer chum salmon management plan overview.

	Recommended Management Actions			
Projected Run Size [a]	Commercial	Personal Use	Sport	Subsistence
600,000 or Less	Closure	Closure	Closure	Closure [b]
600,001 to 700,000	Closure	Closure	Closure	Possible Restrictions [b]
700,001 to 1,000,000	Restrictions [b]	Restrictions [b]	Restrictions [b]	Normal Fishing Schedules
900,001 to 1,000,000	0-50,000	Open	Open	Normal Fishing Schedules
Greater than 1,000,000 [d]	Open [c]	Open	Open	Normal Fishing Schedules

[a] ADF&G will use best available data including preseason projections, mainstem river sonar passage estimates, plus the estimated harvest below the sonar site and the Andreafsky River escapement.

[b] The fishery may be opened or less restrictive in areas where indicator(s) suggest the escapement goal(s) in that area will be achieved.

[c] ADF&G may open a drainagewide commercial fishery with the harvestable surplus distributed by district or subdistrict in proportion to the guideline harvest levels established in 5 AAC 05.362 (f) and (g) and 5 AAC 05.365 if buying capacity allows.

[d] Inriver run goal: This is a specific management objective for salmon stocks that are subject to harvest upstream of the point where escapement is estimate.

Appendix A2.–Pilot Station sonar project passage estimates, Yukon River drainage, 1995 and 1997–2012.

	Chinook			Chum						
Year [a]	Large [b]	Small	Total	Summer	Fall [c]	Total	Coho [c]	Pink	Other [d]	Total
2012	90,936	15,790	106,726	2,130,404	682,510	2,812,914	106,782	352,518	678,382	4,057,322
2011	100,217	23,152	123,369	1,977,808	764,194	2,742,002	124,931	6,526	694,700	3,691,528
2010	100,699	19,476	120,175	1,405,533	393,326	1,798,859	155,784	747,297	862,034	3,684,149
2009 [e]	108,361	35,688	144,049	1,421,646	233,307	1,654,953	206,620	23,679	765,140	2,794,441
2008	106,708	23,935	130,643	1,665,667	615,127	2,280,794	135,570	558,050	585,303	3,690,360
2007	90,184	35,369	125,553	1,726,885	684,011	2,410,896	173,289	71,699	1,085,316	3,866,753
2006	145,553	23,850	169,403	3,767,044	790,563	4,557,607	131,919	115,624	875,899	5,850,452
2005 [f]	142,007	17,434	159,441	2,439,616	1,813,589	4,253,205	184,718	37,932	593,248	5,228,544
2004	110,236	46,370	156,606	1,357,826	594,060	1,951,886	188,350	243,375	637,257	3,177,474
2003	245,037	23,500	268,537	1,168,518	889,778	2,058,296	269,081	4,656	502,878	3,103,448
2002	92,584	30,629	123,213	1,088,463	326,858	1,415,321	122,566	64,891	557,779	2,283,770
2001 [g]	85,511	13,892	99,403	441,450	376,182	817,632	137,769	665	353,431	1,408,900
2000	39,233	5,195	44,428	456,271	247,935	704,206	175,421	35,501	361,222	1,320,778
1999	127,809	16,914	144,723	973,708	379,493	1,353,201	62,521	1,801	465,515	2,027,761
1998	71,177	16,675	87,852	826,385	372,927	1,199,312	136,906	66,751	277,566	1,768,387
1997 [h]	118,121	77,526	195,647	1,415,641	506,621	1,922,262	104,343	2,379	621,857	2,846,488
1995	130,271	32,674	162,945	3,556,445	1,053,245	4,609,690	101,806	24,604	1,011,855	5,910,900
Average (1995, 1997, 1999, 2002-2008, and 2010)					Average (1995, 1997-2008, and 2010-2011)					
	128,110	31,607	159,717	1,869,577	653,861	2,271,678	146,998	132,117	632,391	3,323,979

[a] Estimates for all years were generated with the most current apportionment model and may differ from earlier estimates.

[b] Chinook salmon > 655 mm MEFL.

[c] This estimate may not include the entire run. However, since 2008, operations have been extended to September 7 instead of the end date of August 31.

[d] Includes sockeye salmon, cisco, whitefish, sheefish, burbot, suckers, Dolly Varden, and northern pike.

[e] High water levels were experienced at Pilot Station in 2009 during the summer season and extreme low water occurred during the fall season, and therefore passage estimates are considered conservative.

[f] Estimates include extrapolations for the dates June 10 to June 18, 2005 to account for the time before the DIDSON was deployed.

[g] High water levels were experienced at Pilot Station in 2001, and therefore passage estimates are considered conservative.

[h] The Yukon River sonar project did not operate at full capacity in 1996 and there are no passage estimates for that year.

Appendix A3.–Alaska commercial salmon sales and estimated harvest by district 2012.

District/Subdistrict	Number of Fishermen [a]	Chinook [b]	Summer Chum	Fall Chum	Coho
1	284	0	150,800	139,842	39,757
2	210	0	57,049	129,284	29,063
Subtotal	475	0	207,849	269,126	68,820
3	-	-	-	-	-
Total Lower Yukon	475	0	207,849	269,126	68,820
Anvik River	-	-	-	-	-
4-A	11	-	108,222	811	0
4-BC	-	-	-	-	-
Subtotal District 4	11	0	108,222	811	0
5-ABC	3	-	-	2,419	634
5-D	-	-	-	-	-
Subtotal District 5	3	0	0	2,419	634
6	5	0	3,504	17,336	5,335
Total Upper Yukon	19	0	111,726	20,566	5,969
Total Alaska	494	0	319,575	289,692	74,789

Note: Unless otherwise noted, blank cells indicate years in which no information was collected or harvest numbers were insufficient to generate summary information. En dash indicates no commercial fishing activity occurred. Does not include ADF&G test fishery sales.

[a] Number of unique permits fished by district, subdistrict or area. Totals by area may not add up due to transfers between districts or subdistricts.

[b] No Chinook salmon were sold. A total of 2,548 Chinook salmon were reported as caught but not sold in chum salmon directed fisheries.

Appendix A4.–Number of commercial salmon fishing gear permit holders making at least one delivery by district and season, Yukon Area, 1990–2012.

Chinook and Summer Chum Salmon Season									
	Lower Yukon Area				Upper Yukon Area				Yukon Area
Year	District 1	District 2	District 3	Subtotal	District 4	District 5	District 6	Subtotal	Total
1990	453	242	15	679	92	27	23	142	821
1991	489	253	27	678	85	32	22	139	817
1992	438	263	19	679	90	28	19	137	816
1993	448	238	6	682	75	30	18	123	805
1994	414	250	7	659	55	28	20	103	762
1995	439	233	0	661	87	28	21	136	797
1996	448	189	9	627	87	23	15	125	752
1997	457	188	0	639	39	29	15	83	722
1998	434	231	0	643	0	18	10	28	671
1999	412	217	5	631	5	26	6	37	668
2000	350	214	0	562	0	0	0	0	562
2001 [a]	-	-	-	-	-	-	-	-	-
2002	322	223	0	540	0	18	6	24	564
2003	351	217	0	556	3	16	7	26	582
2004	396	212	0	549	0	14	6	20	569
2005	370	228	0	578	0	12	5	17	595
2006	379	214	6	569	0	15	10	25	594
2007	359	220	3	564	5	12	10	27	591
2008	266	181	0	444	8	0	5	13	457
2009	213	166	0	376	6	0	5	11	387
2010	264	181	0	440	5	0	5	10	450
2011	228	182	0	403	0	0	5	5	408
2012	242	178	0	413	11	0	3	14	427
2002-2011 Average	315	202	1	502	3	9	6	18	520

-continued-

Fall Chum and Coho Salmon Season									
	Lower Yukon Area				Upper Yukon Area				Yukon Area
Year	District 1	District 2	District 3	Subtotal	District 4	District 5	District 6	Subtotal	Total
1990	301	227	19	529	11	11	27	49	578
1991	319	238	19	540	8	21	25	54	594
1992	0	0	0	0	0	0	22	22	22
1993 [a]	-	-	-	-	-	-	-	-	-
1994	0	0	0	0	0	1	11	12	12
1995	189	172	0	357	4	12	20	36	393
1996	158	109	0	263	1	17	17	35	298
1997	176	130	0	304	3	8	0	11	315
1998	0	0	0	0	0	0	0	0	0
1999	146	110	0	254	4	0	0	4	258
2000 [a]	-	-	-	-	-	-	-	-	-
2001 [a]	-	-	-	-	-	-	-	-	-
2002 [a]	-	-	-	-	-	-	-	-	-
2003	75	0	0	75	2	0	5	7	82
2004	26	0	0	26	0	0	6	6	32
2005	177	0	0	177	0	0	7	7	184
2006	219	71	0	286	0	4	11	15	301
2007	181	122	0	300	0	2	8	10	310
2008	251	177	0	428	0	3	8	11	439
2009	165	130	0	292	0	0	2	2	294
2010	72	18	0	90	0	0	4	4	94
2011	234	169	0	395	0	2	5	7	402
2012	266	201	0	457	4	3	5	12	469
2002-2011 Average	156	76	0	230	0	1	6	8	238

-continued-

COMBINED SEASON									
	Lower Yukon Area				Upper Yukon Area				Yukon Area
Year	District 1	District 2	District 3	Subtotal	District 4	District 5	District 6	Subtotal	Total
1990	459	258	22	679	92	31	30	153	832
1991	497	272	29	680	85	33	28	146	826
1992	438	263	19	679	90	28	25	143	822
1993	448	238	6	682	75	30	18	123	805
1994	414	250	7	659	55	28	20	103	762
1995	446	254	0	664	87	31	24	142	806
1996	455	217	9	628	87	29	19	135	763
1997	463	221	0	640	39	31	15	85	725
1998	434	231	0	643	0	18	10	28	671
1999	422	238	5	632	6	26	6	38	670
2000	349	214	0	561	0	0	0	0	561
2001 a	-	-	-	-	-	-	-	-	-
2002	322	223	0	540	0	18	6	24	564
2003	358	217	0	557	3	16	8	27	584
2004	399	212	0	551	0	14	9	23	574
2005	392	228	0	581	0	12	9	21	602
2006	396	224	6	574	0	20	16	36	610
2007	366	236	3	566	5	13	12	30	596
2008	297	208	0	474	8	3	11	22	496
2009	226	172	0	391	6	0	6	12	403
2010	274	183	0	444	5	0	6	11	455
2011	260	201	0	437	0	2	7	9	446
2012	284	210	0	475	11	3	5	19	494
2002-2011 Average	329	210	1	512	3	10	9	22	533

Note: Subtotals and combined season totals are not additive since fishermen may have operated in more than one district during the year. Represents the number of permit holders which made at least one delivery.

[a] No commercial fishery was conducted that season.

Appendix A5.–Yukon River drainage fall chum salmon management plan overview, 5AAC 01.249.

Run Size Estimate [b] (Point Estimate)	Recommended Management Action [a] Fall Chum Salmon Directed Fisheries				Targeted Drainagewide Escapement
	Commercial	Personal Use	Sport	Subsistence	
300,000 or Less	Closure	Closure	Closure	Closure [c]	300,000
300,001 to 500,000	Closure	Closure [c]	Closure [c]	Possible Restrictions [c, d]	to
Greater Than 500,001	Open [e]	Open	Open	Pre-2001 Fishing Schedules	600,000

[a] Considerations for the Canadian mainstem rebuilding plans may require more restrictive management actions.

[b] ADF&G will use the best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects.

[c] The fisheries may be opened or less restrictive in areas where indicator (s) suggest the escapement goal(s) in that area will be achieved.

[d] Subsistence fishing will be managed to achieve a minimum drainagewide escapement goal of 300,000 fall chum salmon.

[e] Drainagewide commercial fisheries may be open and the harvestable surplus above 500,000 fall chum salmon will be distributed by district or subdistrict (in proportion to the guidelines harvest levels established in 5 AAC 05.365 and 5 AAC 05.367).

Appendix A6.–Canadian weekly commercial catches of Chinook, fall chum and coho salmon in the Yukon River in 2012.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number of Fishermen	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
29	21-Jul			closed					
30	28-Jul			closed					
31	4-Aug			closed					
32	11-Aug			closed					
33	18-Aug			closed					
34	25-Aug			closed					
35	1-Sep	31-Aug	1-Sep	1.5	0.7	1.0		36	
36	8-Sep	2-Sep	4-Sep	2.5	2.0	5.0		227	
37	15-Sep	9-Sep	15-Sep	7.0	0.4	3.0		198	
38	22-Sep	16-Sep	22-Sep	7.0	1.6	11.0		993	
39	29-Sep	23-Sep	29-Sep	7.0	1.3	9.0		1,122	
40	6-Oct	30-Sep	6-Oct	7.0	1.0	7.0		614	
41	13-Oct	7-Oct	13-Oct	7.0	0.0	0.0		0	
42	20-Oct	14-Oct	20-Oct	7.0	0.0	0.0		0	
43	27-Oct	21-Oct	27-Oct	7.0	0.0	0.0		0	
44	3-Nov	28-Oct	31-Oct	3.5	0.9	3.0		15	
Dawson Area Commercial				56.5		39.0	0	3,205	0
Upriver Commercial							0	0	0
Total Commercial Harvest							0	3,205	0
Domestic							0	0	0
Recreational							0	0	0
Aboriginal Fishery							2,000 [a]	700 [a]	0
Total Upper Yukon Harvest							2,000	3,905	0
Old Crow Aboriginal Fishery							200	3,118	10

Note: Number of fishermen = average number of fishermen over days open.

[a] Numbers were expanded to account for underreporting.

Appendix A7.–Salmon fishery projects conducted in the Alaska portion of the Yukon River drainage in 2012.

Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaska portion of the Yukon River drainage	1) Document and estimate the catch and associated effort of the Alaska Yukon River and; 2) Commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon.	June-Oct.	ADF&G	All aspects
Commercial Catch Sampling and Monitoring	Alaska portion of the Yukon River drainage	1) Determine age, sex and size of Chinook, chum and coho salmon harvested in Alaska Yukon River commercial fisheries and; 2) Monitor Alaska commercial fishery openings and closures.	June-Oct.	ADF&G, ADPS	All aspects Enforcement
Subsistence and Personal Use Catch and Effort Assessment	Alaska portion of the Yukon River drainage	Document and estimate the catch and associated effort of the Alaska Yukon River subsistence salmon fishery via interviews, catch calendars, mail-out questionnaires, telephone interviews, and subsistence fishing permits, and of the personal use fishery based on fishery permits.	Ongoing	ADF&G, YRDFA	All aspects Assistants in Communities
Sport Catch, Harvest and Effort Assessment	Alaska portion of the Yukon River drainage	Document and estimate the catch, harvest, and associated effort of the Alaska Yukon River sport fishery via post-season mail-out questionnaires.	Postseason	ADF&G	All aspects
Biological Sampling of Yukon River Salmon	Lower Yukon, RM 17-1,002	Collect genetics samples and age, sex, and length information from subsistence caught Chinook salmon.	June – Aug.	AVCP, TCC	All aspects
Yukon River Chinook Microsatellite Baseline	Yukon River drainage	Survey standardized microsatellites and Yukon River Chinook salmon both U.S. and Canada populations.	Ongoing	ADF&G, USFWS, DFO	R&M Funding R&E Funding
Yukon River Salmon Stock Identification	Yukon River drainage	Estimate Chinook salmon stock composition of the various Yukon River drainage harvests through genetic stock identification, age compositions, and geographical distribution of catches and escapements.	Ongoing	ADF&G	All aspects R&M Funding
Yukon River Chum Salmon Mixed-Stock Analysis	Pilot Station, RM 123	Estimate the stock compositions of chum salmon using samples collected from Pilot Station sonar test fisheries.	May – Aug.	USFWS	All aspects R&M Funding summer, OSM Funding -fall
YRDFA Weekly Teleconferences	Yukon River drainage	Acts as a forum for fishermen along the Yukon River to interact with state and federal managers for the collection and dissemination of fisheries information.	May – Sept.	YRDFA	All aspects R&M Funding
Lower Yukon River Set Gillnet Test Fishing	South, Middle, and North mouths of the Yukon River Delta, RM 20	1) Index Chinook salmon run timing and abundance using set gillnets and; 2) Sample captured salmon for age, sex, size composition information.	June – Aug.	ADF&G, YDFDA	All aspects

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Hooper Bay Dall Point Offshore Test Fishing	Coastal Bering Sea south of Yukon River outlets	Asses run abundance, species composition, and run timing information of salmon bound for the Yukon River in offshore waters to assist with timely management decisions.	June – July	ADF&G, YDFDA	All aspects
Lower Yukon River Drift Test Fishing	South, Middle, and North mouths of the Yukon River Delta, RM 20	1)Index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets and; 2) Sample captured salmon for age, sex, size composition information.	June – Aug.	ADF&G, YDFDA	All aspects
Mountain Village Drift Gillnet Test Fishing	Mainstem Yukon River, RM 87	1) Index Chinook salmon run timing and relative abundance using drift gillnets and; 2) Sample captured salmon for age, sex, and size composition information.	June – July	YDFDA, ATC, ADF&G	All aspects R&M funding
Mountain Village Drift Gillnet Test Fishing	Mainstem Yukon River, RM 87	1) Index fall chum and coho salmon run timing and relative abundance using drift gillnets and; 2) Sample captured salmon for age, sex, and size composition information.	July – Sept.	BSFA, ATC, ADF&G	All aspects R&M funding
East Fork Weir, Andreafsky River	RM 20 East Fork, Yukon RM 124	Estimate daily escapement, with age, sex and size composition, of Chinook and summer chum salmon into the East Fork of the Andreafsky River.	June – Aug.	USFWS	All aspects OSM Funding
Acoustic Radio Tagging	St. Mary's, Yukon RM 107-123	1) Document 3-demensional trajectory of Chinook and chum salmon migrating upstream in the Yukon mainstem past the Pilot Station sonar, and; 2) Determine trajectory of fish relative to the detection range of the transducers and the drift fishing locations.	June – July	ADF&G	All aspects AKSSF funding
Anvik River Sonar	RM 40 Anvik River, Yukon RM 358	1) Estimate daily escapement of summer chum salmon to the Anvik River and; 2) Estimate age, sex, and size composition of the summer chum salmon escapement.	June – July	ADF&G	All aspects OSM Funding
Yukon River Sonar	Pilot Station, RM 123	Estimate Chinook and summer and fall chum salmon passage in the mainstem Yukon River. Apportionment of species including coho salmon and other finfish.	May – Sept.	ADF&G	All aspects R&M funded
Gisasa River Weir	RM 3 Gisasa River, Koyukuk River drainage, RM 567	1) Estimate daily escapement of Chinook and summer chum salmon into the Gisasa River and; 2) Estimate age, sex, and size composition of the Chinook and summer chum salmon escapements.	June – Aug.	USFWS	All aspects OSM Funding
Henshaw Creek Weir	RM 1 Henshaw Creek, Koyukuk River drainage, RM 976	1) Estimate daily escapement of Chinook and summer chum salmon into Henshaw Creek and; 2) Estimate age, sex, and size composition of the Chinook and summer chum salmon escapements.	June – Aug.	TCC, USFWS-OSM	All aspects oversight & funding report write-up

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Y5-A Test Fish Wheel	Mainstem Yukon River, RM 695	Index the timing of fall chum and coho salmon on the south bank of the Yukon River bound for the Tanana River drainage, using test fish wheel equipped with video monitoring system.	Aug. – Sept.	ADF&G, USFWS	R&M funded contract R&E funded tech support
Chandalar River Sonar	RM 14 Chandalar River, Yukon RM 996	1) Estimate fall chum salmon passage using DIDSON sonar in the Chandalar River.	Aug. – Sept.	USFWS	All aspects TI Funding, R&M Funding-ASL
Sheenjek River Sonar	RM 6 Sheenjek River, Porcupine River drainage, RM 1,060	1) Estimate daily escapement of fall chum salmon into the Sheenjek River using DIDSON sonar and counted both left and right banks and; 2) Estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. – Sept.	ADF&G	All aspects
Yukon River Sonar	Eagle, RM 1,213	1) Estimate daily passage of Chinook and chum salmon in the mainstem Yukon River using both split-beam and DIDSON and; 2) Estimate age, sex, and size composition of salmon captured in the test nets.	July – Oct.	ADF&G, DFO	All aspects, technical support, TI Funding, R&E Funding
Middle Yukon River Chinook Sampling Project	Mainstem Yukon River Kaltag, RM 451	Estimate age, sex, and size composition of Chinook salmon harvested in middle Yukon River subsistence fisheries.	June – July	City of Kaltag	All aspects OSM Funding
Rapids Test Fish Wheel	Mainstem Yukon River, RM 730	1) Index run timing of Chinook and fall chum salmon runs as well as non-salmon species using video monitoring techniques and; 2) Characterize the sex, weight, and girth composition of Chinook salmon.	June – Sept.	Zuray USFWS	All aspects R&E funding
Nenana River Escapement Surveys	Nenana River drainage, RM 860	Aerial surveys for numbers and distribution of coho and chum salmon in 10 tributaries of the Nenana River below Healy Creek.	Sept. – Oct.	ADF&G	All aspects
Delta River Ground Surveys	Tanana River drainage RM 1,031	1) Estimate fall chum salmon spawning escapement in Delta River and; 2) Sample fall chum salmon carcasses for age, sex, and size composition information.	Oct. – Dec.	ADF&G	All aspects
Chena River Tower	RM 45 Chena River, Tanana River drainage, RM 921	Estimate daily escapement of Chinook and summer chum salmon into the Chena River.	July – Aug.	ADF&G	All aspects AYKSSF Funding
Salcha River Tower	RM 4 Salcha River, Tanana River drainage, RM 967	Estimate daily escapement of Chinook and summer chum salmon into the Salcha River.	July – Aug.	BSFA	All aspects R&M Funding

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Upper Tanana Escapement Surveys	Tanana River drainage, RM 991-1,053	Aerial surveys for numbers and distribution of coho and chum salmon in the side sloughs and tributaries of the Tanana River drainage.	Nov.	ADF&G	All aspects
Goodpaster River Tower	RM 45 Goodpaster River, Tanana River drainage, RM 1,049	Estimate daily escapement of Chinook and summer chum salmon into the Goodpaster River.	July – Aug.	BSFA	All aspects Pogo Mine funding
Upper Yukon River Chum Salmon Genetic Stock Identification	Yukon River drainage	Establish the feasibility of using DNA markers for genetic stock identification of chum salmon in the Yukon River.	June – Oct.	USFWS	All aspects
Yukon River Inseason Salmon Harvest Interviews	Emmonak, Holy Cross, Nulato, Huslia, Galena, and Beaver	Collect qualitative inseason subsistence salmon harvest information through weekly interviews.	June – Sept.	USFWS, YRDFA	All aspects OSM funding
Migratory Timing and Harvest Information of Chinook Salmon Stocks	Yukon River drainage	Enlarge existing allozyme and develop a DNA database to characterize the genetic diversity of Chinook salmon in the Yukon River within the U.S. and Canada. U.S. collections include microsatellites and allozyme. Canadian collections include microsatellites.	June – Aug.	USFWS-OSM, ADF&G, DFO	All aspects

Acronyms:

ADF&G = Alaska Department of Fish and Game
ADPS = Alaska Department of Public Safety
AVCP = Association of Village Council Presidents, Inc.
AYKSSF = Arctic-Yukon-Kuskokwim Sustainable Salmon Fund
BSFA = Bering Sea Fishermen's Association
DFO = Department of Fisheries and Oceans (Canada)
DNA = Deoxyribonucleic acid
NPS = National Park Service
OSM = Office of Subsistence Management
R&E =Yukon River Panel Restoration and Enhancement Program
R&M =Research and Management Fund
TCC = Tanana Chiefs Conference, Inc.
UAF = University of Alaska Fairbanks
USFWS = United States Fish and Wildlife Service
USFWS-OSM = United States Fish and Wildlife Service, Office of Subsistence Management
YDFDA =Yukon Delta Fisheries Development Association
YRDFA = Yukon River Drainage Fisheries Association

Appendix A8.–List of harvest/escapement monitoring and incubation/rearing projects involving salmon in the Canadian portion of the Yukon River drainage in 2012.

Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Aboriginal Catch Monitoring	Yukon communities	1) To determine weekly catches and effort in the aboriginal fishery, and; 2) To implement components of the UFA and AFS.	July – Oct.	YFN's DFO	Joint Project
Recreational Catch Monitoring	Yukon River mainstem and tributaries	1) To determine the recreational harvest by species including the date, sex, whether released or retained, and fishing location, and; 2) Salmon caught are reported through the Yukon Salmon Conservation Catch Card (YSCCC) program.	July – Oct.	DFO	All aspects
Escapement Surveys and DNA Collection	Throughout upper Yukon River drainage	1) To conduct surveys of spawning fish by foot, boat, air etc.,; 2) To collect DNA samples from spawning population, and; 3) To enumerate and recover tags in terminal areas.	July – Oct.	R&E Projects DFO YFNs AFS	All aspects
Fishing Branch Chum Salmon Weir	Fishing Branch River headwaters	1) To enumerate fall chum salmon returning to the Fishing Branch River and; 2) obtain age, size, tag and sex composition data.	Aug. – Oct.	DFO VGG	Joint Project
Porcupine River Sonar - Chum	Old Crow	1) Installation and operation of a SIMRAD sonar program for chum salmon, 2) Conduct test netting for species apportionment, sex and length, and; 3) To provide inseason projections of run strength from relationship between sonar and Fishing Branch River Weir counts.	July – Sept.	VGG & EDI	All aspects
Whitehorse Rapids Fishway	Whitehorse	1) To enumerate wild and hatchery reared Chinook salmon returns to the Whitehorse fishway area and; 2) obtain age, size, sex and tag data.	July – Aug.	YF&GA	All aspects
Blind Creek Weir	Pelly River	1) To enumerate Chinook salmon escapement, recover tags and; 2)collect ASL data and DNA samples.	July – Aug.	JW&A	All aspects
Big Salmon Sonar	Big Salmon River	1) Installation and operation of a DIDSON sonar program for Chinook salmon, and; 2) obtain carcass survey, ASL, and genetic samples.	July – Aug.	JW&A	All aspects
Teslin River Sonar	Teslin River	Installation and operation of a DIDSON sonar program for Chinook salmon enumeration.	July – Oct.	BM&A	All aspects
Escapement Sampling	Various Tributaries	Collect ASL data and DNA samples.	Aug. – Oct.	DFO	All aspects

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Whitehorse Rapids Fish Hatchery and Coded-Wire Tagging Project	Whitehorse	1) To rear and release ~150K Chinook salmon fry produced from Whitehorse Rapids Fishway broodstock, and; 2) To mark fry with a CWT, adipose clip, and release upstream of the Whitehorse hydroelectric facility.	Ongoing	GY and YEC, YF&GA	All aspects Coded-wire tagging
McIntyre Incubation Facility and Coded-Wired Tagging Project	Whitehorse	1) To incubate up to 120K CK salmon eggs from brood stock collected at Tatchun R, and/or the Whitehorse Rapids fishway, and; 2) To rear, mark with CWT, adipose clip, and release fry to natal sites.	Ongoing	DFO, YC, YRC	Technical support, field work, project monitoring,
Fox Creek Restoration Program	Whitehorse Area	Rear, tag and release Whitehorse Rapids CK to Fox Creek.	Ongoing	TKC	All aspects

Acronyms:

ASL = Age Sex Length- term that refers to the collection of biological information
AFS = Aboriginal Fisheries Strategy
BM&A = B. Mercer and Associates
CWT = Coded Wire Tag
DFO = Department of Fisheries and Oceans Canada
DNA = Deoxyribonucleic acid
EDI = Environmental Dynamics Incorporated
GY = Government of Yukon-Environment Yukon
JW&A = Jane Wilson & Associates
TKC = Ta'an Kwa'chin Council
VGG = Vuntut Gwitchin Government
YC = Yukon College
YEC = Yukon Energy Corporation
YFN's = Yukon First Nation's
YF&GA = Yukon Fish and Game Association

Appendix A9.–Yukon River Canadian-origin Chinook salmon total run by brood year and escapement by year 1983–2004 based on 3-Area Index, Eagle Sonar (2005–2011), and radio-telemetry (2002–2004).

Brood	Age								
Year	3	4	5	6	7	8	Return	Spawners	R/S
1974						634			
1975					33,080	175			
1976				88,405	22,026	40			
1977			19,491	111,771	19,734	801	151,797		
1978		4,443	22,845	63,235	29,424	1,493	121,439		
1979	1,534	3,388	21,422	100,503	48,253	1,175	176,274		
1980	15	6,604	13,510	70,415	33,978	4,240	128,763		
1981	0	1,122	33,220	114,180	54,845	1,841	205,208		
1982	0	5,141	17,169	37,883	27,763	376	88,330	43,538	2.03
1983	560	7,558	35,117	89,449	16,408	162	149,253	44,475	3.36
1984	69	13,368	34,379	75,041	13,782	138	136,778	50,005	2.74
1985	223	10,738	38,956	62,142	4,756	91	116,906	40,435	2.89
1986	347	20,408	45,928	109,067	15,843	138	191,731	41,425	4.63
1987	0	2,368	33,542	67,697	11,700	18	115,325	41,307	2.79
1988	0	6,641	34,323	75,396	8,937	68	125,366	39,699	3.16
1989	75	13,517	78,826	128,851	25,841	0	247,109	60,299	4.10
1990	56	6,343	24,873	71,641	10,816	9	113,737	59,212	1.92
1991	501	7,108	82,332	121,590	10,182	0	221,712	42,728	5.19
1992	6	2,608	23,981	41,677	1,831	0	70,103	39,155	1.79
1993	14	5,313	36,383	86,880	5,880	0	134,450	36,244	3.71
1994	0	755	19,932	30,638	6,175	0	57,545	56,449	1.02
1995	34	1,784	15,989	52,720	7,026	10	77,562	50,673	1.53
1996	20	276	23,201	44,462	14,610	2	82,571	74,060	1.11
1997	14	3,567	26,386	94,406	7,026	14	132,216	53,821	2.46
1998	0	3,478	39,260	76,502	4,380	0	123,598	35,497	3.48
1999	134	1,692	30,110	76,649	2,870	0	111,455	37,184	3.00
2000	0	2,798	40,704	63,414	1,509	0	108,424	25,870	4.19
2001	8	1,813	50,877	51,785	2,205	0	106,688	52,564	2.03
2002	75	2,262	28,704	20,715	227	2	51,985	42,359	1.23
2003	63	5,898	37,220	52,106	2,232	2	97,520	80,594	1.21
2004	3	2,462	26,660	22,121	4,609	1	55,858	48,469	1.15
2005	9	8,213	29,318	38,509	2,067	0	78,117	67,985	1.15
2006	15	6,050	25,976	25,692			57,733	62,630	0.92
2007	66	2,646	18,386					34,904	
2008	9	3,652						33,883	
2009	153							65,278	
2010								31,818	
2011								46,017	
2012								32,456	
Average	(1982-2005)						116,431	48,502	2.51
							Contrast	3.12	

Note: Current brood year data are preliminary.

Appendix A10.–Chinook salmon age and sex percentages from selected Yukon River escapement projects, 2012.

Location	Sample Size		Age 3	4	5	6	7	Total
Anvik River [a]	229	Males	0.0	14.8	46.3	6.6	0.0	67.7
		Females	0.0	0.0	5.2	26.6	0.4	32.2
		Total	0.0	14.8	51.5	33.2	0.4	99.9
Chena River [a]	198	Males	0.5	5.1	28.3	10.6	0.0	44.5
		Females	0.0	0.0	17.2	38.4	0.0	55.6
		Total	0.5	5.1	45.5	49.0	0.0	100.1
East Fork Andreafsky River [b]	572	Males	0.2	10.6	54.3	6.7	0.0	71.8
		Females	0.0	0.5	10.3	17.0	0.3	28.1
		Total	0.2	11.1	64.6	23.7	0.3	99.9
Gisasa River [b]	523	Males	0.0	11.3	47.2	8.0	0.0	66.5
		Females	0.0	0.2	13.6	18.9	0.7	33.4
		Total	0.0	11.5	60.8	26.9	0.7	99.9
Henshaw Creek [b]	428	Males	0.0	14.6	36.1	7.2	0.0	57.9
		Females	0.0	0.5	12.9	28.3	0.4	42.1
		Total	0.0	15.1	49.0	35.5	0.4	100.0
Yukon Mainstem [c] at Eagle, Alaska	246	Males	0.4	6.1	23.6	19.5	0.8	50.4
		Females	0.0	0.0	6.1	39.8	3.7	49.6
		Total	0.4	6.1	29.7	59.3	4.5	100.0
Salcha River [a]	420	Males	0.2	6.0	20.5	13.6	0.0	40.3
		Females	0.0	0.0	12.4	45.7	1.7	59.8
		Total	0.2	6.0	32.9	59.3	1.7	100.1

[a] Samples were handpicked from carcasses.

[b] Samples were collected from a weir trap.

[c] Samples were from test fishing with drift gillnets.

Appendix A11.–Summer chum salmon age and sex percentages from selected Yukon River escapement projects, 2012.

Location	Sample Size		Age 3	4	5	6	7	Total
Anvik River [a]	422	Males	0.2	26.4	15.8	1.8	0.0	44.2
		Females	0.5	40.2	13.5	1.6	0.0	55.8
		Total	0.7	66.6	29.3	3.4	0.0	100
East Fork Andreafsky River [b]	606	Males	0.2	33.8	15.3	3.1	0.0	52.4
		Females	0.4	35.3	11.0	0.9	0.0	47.6
		Total	0.6	69.1	26.3	4.0	0.0	100
Gisasa River [b]	687	Males	0.0	36.6	9.6	1.0	0.0	47.2
		Females	0.2	42.0	9.8	0.8	0.0	52.8
		Total	0.2	78.6	19.4	1.8	0.0	100
Henshaw Creek [b]	478	Males	0.3	39.2	7.5	0.8	0.0	47.8
		Females	0.6	44.9	5.8	1.0	0.0	52.3
		Total	0.9	84.1	13.3	1.8	0.0	100
Salcha River [c]	159	Males	0.0	18.6	11.4	3.0	3.0	36.0
		Females	1.2	42.5	16.8	1.8	1.8	64.1
		Total	1.2	61.1	28.2	4.8	4.8	100

[a] Samples were collected by beach seine.

[b] Samples were collected from a weir trap.

[b] Samples were handpicked carcasses, structure is vertebra.

Appendix A12.–Total (U.S. and Canada) Yukon River Chinook salmon harvest proportion by stock group, 1981–2012.

Year [a]	Stock Group		
	Lower	Middle	Upper
1981	5.4	54.5	40.1
1982	13.9	24.7	61.4
1983	12.9	33.7	53.3
1984	25.3	40.2	34.5
1985	27.6	22.3	50.1
1986	19.5	9.6	70.9
1987	15.9	19.6	64.5
1988	21.8	15.8	62.5
1989	24.4	15.9	59.7
1990	20.2	25.2	54.7
1991	28.0	25.3	46.7
1992	16.3	21.8	61.9
1993	21.5	25.4	53.1
1994	18.2	21.4	60.4
1995	17.9	22.4	59.7
1996	21.0	10.4	68.6
1997	26.4	16.8	56.9
1998	32.7	17.4	49.8
1999	40.1	6.3	53.6
2000	33.9	12.3	53.8
2001	31.6	16.0	52.4
2002	19.4	29.2	51.4
2003	6.8	28.9	64.3
2004	15.3	28.8	55.9
2005	20.7	21.4	57.9
2006	17.6	27.6	54.9
2007	13.0	30.6	56.4
2008	17.0	28.0	55.0
2009	11.1	31.4	57.5
2010	17.6	32.9	49.6
2011	13.8	29.8	56.4
2012 [b]			
Average			
1981-2010	20.4	23.9	55.7
2006-2010	15.3	30.1	54.7

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] Estimates are not available until the following year.

Appendix A13.–Yukon River Chinook salmon harvest proportion by stock group in Alaska, 1981–2012.

Year [a]	Stock Group		
	Lower	Middle	Upper
1981	5.9	59.8	34.3
1982	15.4	27.5	57.1
1983	14.2	37.0	48.9
1984	28.0	44.3	27.7
1985	30.4	24.6	45.1
1986	22.3	10.9	66.8
1987	17.4	21.4	61.2
1988	24.9	18.1	57.0
1989	27.2	17.7	55.1
1990	22.8	28.4	48.8
1991	31.8	28.7	39.6
1992	18.0	24.1	57.8
1993	23.7	28.0	48.3
1994	20.4	24.1	55.5
1995	20.0	25.0	55.0
1996	24.0	11.8	64.2
1997	28.9	18.3	52.8
1998	34.7	18.5	46.8
1999	44.1	6.9	49.0
2000	37.5	13.6	48.9
2001	37.5	19.0	43.5
2002	22.1	33.3	44.6
2003	7.5	31.7	60.8
2004	16.9	31.6	51.5
2005	23.4	24.2	52.4
2006	19.2	30.2	50.5
2007	13.7	32.3	54.0
2008	18.2	30.0	51.8
2009	12.7	35.7	51.6
2010	18.4	34.5	47.1
2011	15.5	33.4	51.1
2012 [b]			
Average			
1981-2010	22.7	26.4	50.9
2006-2010	16.4	32.5	51.0

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] Estimates are not available until the following year.

Appendix A14.–Upper stock group proportion, by country, from the Yukon River Chinook salmon harvest, 1981–2012.

	Upper Stock Group	
Year [a]	Alaska	Canada
1981	78.1	21.9
1982	83.5	16.5
1983	83.7	16.3
1984	72.7	27.3
1985	81.6	18.4
1986	82.7	17.3
1987	86.7	13.3
1988	79.8	20.2
1989	82.9	17.1
1990	79.2	20.8
1991	74.8	25.2
1992	84.5	15.5
1993	82.6	17.4
1994	81.8	18.2
1995	82.4	17.6
1996	81.9	18.1
1997	84.8	15.2
1998	88.8	11.2
1999	83.0	17.0
2000	81.9	18.1
2001	69.8	30.3
2002	76.3	23.5
2003	86.2	13.8
2004	83.7	16.3
2005	80.1	19.9
2006	84.1	15.9
2007	90.5	9.5
2008	88.1	11.9
2009	78.8	21.2
2010	90.5	9.5
2011	81.0	19.0
2012 [b]		
Average		
1981-2010	82.2	17.8
2006-2010	86.4	13.6

[a] Stock identification methods from 1981 through 2003 were based on scale pattern analysis. Beginning in 2004, genetic analysis was used.

[b] Estimates are not available until the following year.

Appendix A15.–Summary of releases for coded wire tagged Chinook salmon from Whitehorse Hatchery, 1985–2012.

Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	25-May-85	02-32-48	26,670	518	0.019	27,188		0	27,188
Michie	25-May-85	02-32-26	28,269	518	0.018	28,787		0	28,787
Michie	25-May-85	02-32-47	43,325	518	0.012	43,843		0	43,843
Wolf	1985	no-clip	0	0		0		10,520	10,520
SUM	1985		98,264	1,555		99,819		10,520	110,339
Michie	1986	02-37-31	77,170			77,170		1,000	78,170
Wolf	1986					0		5,720	5,720
SUM	1986		77,170			77,170		6,720	83,890
Michie	5-Jun-87	02-48-12	47,644	1,361	0.028	49,005	2.50	9,598	58,603
Michie	5-Jun-87	02-48-13	49,344	808	0.016	50,152	2.50	9,141	59,293
Michie	5-Jun-87	02-48-14	51,888	559	0.011	52,447	2.50	9,422	61,869
Michie	5-Jun-87	02-48-15	43,367	2,066	0.045	45,433	2.50	7,868	53,301
Michie	5-Jun-87	02-42-58	25,945	245	0.009	26,190	2.50	4,171	30,361
Wolf	30-May-87	02-42-59	26,752	123	0.005	26,875	2.50	422	27,297
SUM	1987		244,940	5,162		250,102		40,622	290,724
Michie	10-Jun-88	02-55-49	77,670	1,991	0.025	79,661	2.80	84,903	164,564
Michie	10-Jun-88	02-555-0	78,013	1,592	0.020	79,605	2.70	85,288	164,893
Wolf	5-Jun-88	no-clip	0	0		0		25,986	25,986
SUM	1988		155,683	3,583		159,266		196,177	355,443
Wolf	1989	no-clip	0	0		0		22,388	22,388
Michie	6-Jun-89	02-60-04	26,161	326	0.012	26,487	2.30	0	26,487
Michie	6-Jun-89	02-60-05	24,951	128	0.005	25,079	2.30	0	25,079
Michie	6-Jun-89	02-60-06	25,098	291	0.011	25,389	2.40	0	25,389
Michie	6-Jun-89	02-60-07	25,233	156	0.006	25,389	2.20	95,724	121,113
Fishway	6-Jun-89	02-60-08	25,194	357	0.014	25,551	2.70	0	25,551
Fishway	6-Jun-89	02-60-09	25,190	351	0.014	25,541	2.70	0	25,541
SUM	1989		151,827	1,609		153,436		118,112	271,548
Wolf	6-Jun-90	no-clip	0	0		0		11,969	11,969
Michie	2-Jun-90	02-02-38	24,555	501	0.020	25,056	2.30	0	25,056
Michie	2-Jun-90	02-02-39	24,345	753	0.030	25,098	2.30	0	25,098

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Appendix A15.–Page 2 of 7.

Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Fishway	2-Jun-90	02-02-60	24,508	501	0.020	25,009	2.20	0	25,009
Fishway	2-Jun-90	02-02-63	25,113	254	0.010	25,367	2.20	0	25,367
SUM	1990		98,521	2,009		100,530		11,969	112,499
Wolf	8-Jun-91	18-03-22	49,477	793	0.016	50,270	2.30	0	50,270
Fishway	6-Jun-91	18-03-23	52,948	193	0.004	53,141	2.30	0	53,141
Michie	6-Jun-91	18-03-24	50,020	176	0.004	50,196	2.30	87,348	137,544
SUM	1991		152,445	1,162		153,607		87,348	240,955
Wolf	4-Jun-92	18-08-29	48,239	0	0.000	48,239	2.40	0	48,239
Fishway	4-Jun-92	18-08-28	49,356	99	0.002	49,455	2.30	0	49,455
Michie	4-Jun-92	18-08-30	52,946	643	0.012	53,589	2.20	249,166	302,755
SUM	1992		150,541	742		151,283		249,166	400,449
Wolf	6-Jun-93	18-12-15	50,248	0	0.000	50,248	2.30	0	50,248
Fishway	6-Jun-93	18-12-16	49,957	434	0.009	50,391	2.30	0	50,391
Michie	6-Jun-93	18-12-17	50,169	0	0.000	50,169	2.30	290,647	340,816
SUM	1993		150,374	434		150,808		290,647	441,455
Wolf	2-Jun-94	18-14-27	50,155	270	0.005	50,425	2.30	0	50,425
Michie	2-Jun-94	18-14-28	50,210	127	0.003	50,337	2.30	158,780	209,117
Fishway	2-Jun-94	18-14-29	50,415	125	0.002	50,540	2.30	0	50,540
SUM	1994		150,780	522		151,302		158,780	310,082
Wolf	6-Jun-95	18-12-46	10,067	164	0.016	10,231	1.67	0	10,231
Wolf	6-Jun-95	18-12-47	9,122	0	0.000	9,122	1.53	0	9,122
Michie	6-Jun-95	18-18-26	25,231	337	0.013	25,568	2.47	4,552	30,120
Michie	6-Jun-95	18-18-27	25,187	141	0.006	25,328	2.33	0	25,328
SUM	1995		69,607	642		70,249		4,552	74,801
Wolf	26-May-96	18-07-48	10,131	102	0.010	10,233	2.30	0	10,233
Fox	4-Jun-96	18-28-23	35,452	0	0.000	35,452	2.43	0	35,452
Byng	4-Jun-96	18-10-41	25,263	516	0.020	25,779	2.37	0	25,779
Michie	5-Jun-96	18-33-45	50,082	1,022	0.020	51,104	2.51	0	51,104
Michie	5-Jun-96	18-33-46	50,260	508	0.010	50,768	2.43	0	50,768
Michie	5-Jun-96	18-33-47	49,985	505	0.010	50,490	2.32	0	50,490

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Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Judas	4-Jun-96	18-33-48	49,798	1,016	0.020	50,814	2.43	0	50,814
McClintock	4-Jun-96	18-33-49	49,991	302	0.006	50,293	2.27	0	50,293
SUM	1996		320,962	3,971		324,933		0	324,933
Wolf	1-Jun-97	18-23-25	14,850	150	0.010	15,000	2.30	0	15,000
Wolf	1-Jun-97	18-23-26	20,334	0	0.000	20,334		0	20,334
Wolf	8-Jun-97	18-29-06	10,158	0	0.000	10,158		0	10,158
Fox	11-Jun-97	18-25-54	25,242	0	0.000	25,242	2.43	0	25,242
Fox	11-Jun-97	18-25-55	24,995	253	0.010	25,248		0	25,248
Byng	11-Jun-97	18-29-07	10,029	0	0.000	10,029	2.37	0	10,029
Byng	11-Jun-97	18-29-05	10,155	0	0.000	10,155		0	10,155
Michie	11-Jun-97	18-28-59	49,657	502	0.010	50,159	2.51	0	50,159
Michie	11-Jun-97	18-28-60	50,130	0	0.000	50,130	2.43	0	50,130
Judas	7-Jun-97	18-23-27	19,951	202	0.010	20,153	2.43	0	20,153
Judas	11-Jun-97	18-25-53	25,146	0	0.000	25,146	2.43	0	25,146
McClintock	11-Jun-97	18-25-51	25,399	0	0.000	25,399	2.27	0	25,399
McClintock	11-Jun-97	18-25-52	24,792	251	0.010	25,043		0	25,043
SUM	1997		310,838	1,358		312,196		0	312,196
Michie	12-Jun-98	18-41-22	49,243	1,004	0.020	50,247	2.84	0	50,247
Michie	12-Jun-98	18-41-21	49,197	1,004	0.020	50,201	2.81	0	50,201
Byng	12-Jun-98	18-31-60	24,518	1,022	0.040	25,540	3.00	0	25,540
McClintock	12-Jun-98	18-40-43	49,810	503	0.010	50,313	2.76	0	50,313
Judas	13-Jun-98	02-54-17	19,018	1,432	0.070	20,450	2.55	0	20,450
Judas	12-Jun-98	18-31-59	25,331	256	0.010	25,587	2.60	0	25,587
Wolf	6-Jun-98	02-19-58	10,104	421	0.040	10,525	1.95	0	10,525
Wolf	4-Jun-98	02-46-06	34,813	710	0.020	35,523	2.63	0	35,523
SUM	1998		262,034	6,352		268,386		0	268,386
Michie	6-Jun-99			80,393		80,393	3.13	0	80,393
Byng	6-Jun-99			64,430		64,430	2.92	0	64,430
McClintock	6-Jun-99			64,169		64,169	2.95	0	64,169
Wolf	6-Jun-99			31,048		31,048	3.07	0	31,048

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Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
SUM	1999			240,040		240,040		0	240,040
Michie	8-Jun-00	18-31-28	25,114	254	0.010	25,368	2.80	0	25,368
Michie	8-Jun-00	18-31-29	25,037	253	0.010	25,290	2.80	0	25,290
Michie	8-Jun-00	18-43-03	10,907	110	0.010	11,017	2.84	0	11,017
McClintock	8-Jun-00	18-13-54	25,041	254	0.010	25,295	2.70	0	25,295
McClintock	8-Jun-00	18-13-55	25,016	253	0.010	25,269	2.68	0	25,269
Wolf	4-Jun-00	18-23-53	25,071	253	0.010	25,324	2.67	0	25,324
Wolf	4-Jun-00	18-23-54	25,012	254	0.010	25,266	2.40	0	25,266
SUM	2000		161,198	1,631		162,829		0	162,829
Michie	8-Jun-01	18-44-16	25,318	256	0.010	25,574	2.68	0	25,574
Michie	8-Jun-01	18-44-17	27,293	276	0.010	27,569	2.68	0	27,569
Michie	8-Jun-01	18-44-18	27,337	276	0.010	27,613	2.60	0	27,613
Michie	8-Jun-01	18-44-19	11,629	117	0.010	11,746	2.60	0	11,746
McClintock	8-Jun-01	18-44-12	24,526	248	0.010	24,774	3.13	0	24,774
McClintock	8-Jun-01	18-44-13	25,033	253	0.010	25,286	3.13	0	25,286
McClintock	8-Jun-01	18-36-50	10,840	110	0.010	10,950	3.13	0	10,950
Byng	8-Jun-01	18-44-14	25788	260	0.010	26,048	2.84	0	26,048
Byng	8-Jun-01	18-44-15	25,136	254	0.010	25,390	2.84	0	25,390
Wolf	28-May-01	18-44-10	26,205	265	0.010	26,470	3.34	0	26,470
Wolf	28-May-01	18-44-11	23,902	241	0.010	24,143	3.34	0	24,143
SUM	2001		253,007	2,556		255,563		0	255,563
Wolf	23-May-02	18-51-01	25,334	126	0.005	25,460	3.30	0	25,460
Wolf	2-Jun-02	18-51-02	25,079	177	0.007	25,256	3.10	0	25,256
McClintock	10-Jun-02	18-51-03	24,769	505	0.020	25,274	3.60	0	25,274
Byng	10-Jun-02	18-51-04	24,907	0	0.000	24,907	3.00	0	24,907
Byng	10-Jun-02	18-51-05	24,925	125	0.005	25,050	3.00	0	25,050
Michie	10-Jun-02	18-51-06	27,114	191	0.007	27,305	3.20	0	27,305
Michie	10-Jun-02	18-51-07	26,854	0	0.000	26,854	3.02	0	26,854
Michie	10-Jun-02	18-50-61	27,850	281	0.010	28,131	3.20	0	28,131
Michie	10-Jun-02	18-50-62	27,241	0	0.000	27,241	3.04	0	27,241

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Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	10-Jun-02	18-50-63	8,481	86	0.01	8567	3.2	0	8567
Yukon River								3,062	3062
SUM	2002		242,554	1,491		244,045		3,062	247,107
Wolf	25-May-03	18-47-48	27,489	83	0.0030	27,572	2.72	0	27,572
Wolf	25-May-03	18-47-49	26,704	161	0.0060	26,865	2.69	0	26,865
Byng	2-Jun-03	18-47-47	23,483	71	0.0030	23,554	3.01	0	23,554
Byng	2-Jun-03	18-47-46	27,058	54	0.0020	27,112	2.98	0	27,112
Michie	2-Jun-03	18-49-58	28,485	0	0.0000	28,485	3.05	0	28,485
Michie	2-Jun-03	18-49-59	27,519	0	0.0000	27,519	2.98	0	27,519
Michie	2-Jun-03	18-49-60	15,541	0	0.0000	15,541	3.07		15,541
Judas L. (not in totals)	6-Jun-03							2,500	
SUM	2003		176,279	369		176,648		0	176,648
Wolf	5/28-30/2004	01-01-70	28,946	292		29,238	2.90	0	29,238
Wolf	22-Jun-04							2,514	2,514
Mainstem	5/28-29/2004	02-01-69	24,920	431		25,351	3.10	0	25,351
Byng	8-Jun-04	02-01-68	24,401	626		25,027	3.36	0	25,027
McClintock	8-Jun-04	02-01-67	24,246	879		25,125	3.20	0	25,125
Michie	8-Jun-04	02-01-66	24,609	554		25,163	3.12	0	25,163
Michie	8-Jun-04	02-01-65	13,594	306		13,900	3.12	0	13,900
SUM	2004		140,716	3,088		143,804		2,514	146,318
Wolf	5/31-6/05	18-19-36	10,751	109	1.000	10,860	2.50	0	10,860
Wolf	5/31-6/05	18-56-17	5,835	59	1.000	5,894	2.50	0	5,894
Wolf	7-Jul-05			614		614			614
Byng	13-Jun-05	18-56-18	5,853	119	2.000	5,972	2.50	0	5,972
Byng	13-Jun-05	18-56-19	4,369	89	2.000	4,458	2.50	0	4,458
McClintock	13-Jun-05	18-44-19	10,632	0	0.000	10,632	2.50	0	10,632
Michie	13-Jun-05	02-01-64	4,870	0	0.000	4,870	2.50	0	4,870
Michie	13-Jun-05	02-01-65	5,983	0	0.000	5,983	2.50	0	5,983
Michie	13-Jun-05	08-01-65	28,082	284	1.000	28,366	2.50	0	28,366
Michie	13-Jun-05	18-56-20	5,906	0	0.000	5,906	2.50	0	5,906

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Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Mainstem	6/02,6/14,07/7	08-01-68	28,991	293	1.000	29,284	2.50	0	29,284
SUM	2005		111,272	1,567		112,839			112,839
Wolf	6/4 - 6/11	08-01-66	26,412	0	0.000	26,412	2.66	0	26,412
Wolf	6/4 - 6/11	08-01-71	8,718	88	1.000	8,806	2.66	0	8,806
Mainstem	8-Jun-06	08-01-72	6,761	427	1.500	7,188	2.63	0	7,188
Mainstem	8-Jun-06	08-01-67	28,045	103	1.500	28,148	2.63	0	28,148
Michie	14-Jun-06	08-01-68	39,164	596	1.500	39,760		0	39,760
Michie	14-Jun-06	08-01-74	3,692	56	1.500	3,748	2.41	0	3,748
McClintock	14-Jun-06	08-01-70	29,282	296	1.000	29,578	2.58	0	29,578
McClintock	14-Jun-06	08-01-73	5,426	55	1.000	5,481	2.89	0	5,481
Wolf	11-Jun-06		0	7,658	0.000	7,658	3.02	0	7,658
SUM	2006		147,500	9,279		156,779			156,779
Wolf	5/24-6/3	Agency Tags 18	37,781	771	2.000	38,552		0	38,552
Wolf	3-Jun-07			2,632	0.000	2,632	2.33	0	2,632
Mainstem	29-May-07	Agency Tags 18	35,253	356	1.000	35,609	2.87	0	35,609
Michie	8-Jun-07	Agency Tags 18	50,084	506	1.000	50,590	3.22	0	50,590
McClintock	8-Jun-07	Agency Tags 18	38,383	388	1.000	38,771	3.22	0	38,771
SUM	2007		161,501	4,653		166,154			166,154
Wolf	6/01-6/26	Agency Tags 08	10,939	0	0.000	10,939	2.97		10,939
Wolf	26-Jun-08			2,618		2,618			2,618
Mainstem	5-Jun-08	Agency Tags 08	20,498	418	2.000	20,916	2.84		20,916
Michie	5-Jun-08	Agency Tags 08	24,615	502	2.000	25,117	2.71		25,117
McClintock	5-Jun-08	Agency Tags 08	24,687	1,029	4.000	25,716	2.89		25,716
SUM	2008		80,739	4,567		85,306		0	85,306
Wolf	31-May-09	Agency Tags 08	19,652	199	1.000	19,851	2.76		19,851
Wolf	11-Jun-09			2,672		2,672			2,672
Mainstem	6-Jun-09	Agency Tags 08	42,648	258	0.600	42,906	3.00		42,906
Michie	6-Jun-09	Agency Tags 08	77,048	778	0.100	77,826	2.87		77,826
McClintock	6-Jun-09	Agency Tags 08	26,338	53	0.020	26,391	2.52		26,391
SUM	2009		165,686	3,960		169,646		0	169,646

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Release Location	Release Date	Code	# Tagged & Clipped [a]	Adipose Clipped Only	%Tag-Loss	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Wolf	30-May-10	Agency Tag 18	12,000	0	0.000	12,000	2.89	0	12,000
Michie	1-Jun-10	Agency Tag 18	66,848	2,067	3.000	68,915	3.00	0	68,915
McClintock	1-Jun-10	Agency Tag 18	19,714	0	0.000	19,714	3.00	0	19,714
McClintock	1-Jun-10			1,369		1,369		0	1,369
Mainstem	1-Jun-10	Agency Tag 18	23,985	242	1.000	24,227	2.98	0	24,227
SUM	2010		122,547	3,678		126,225		0	126,225
Wolf	10-Jun-11	Agency Tag 18	10,000	1,550	0.000	11,550	2.76	0	11,550
Michie	6-Jun-11	Agency Tag 18	65,640	1,000	1.500	66,640	2.94	0	66,640
McClintock	6-Jun-11	Agency Tag 18	32,811	0	0.000	32,811	2.65	0	32,811
Mainstem	6-Jun-11	Agency Tag 18	23,921	0	0.000	23,921	2.67	0	23,921
SUM	2011		132,372	2,550		134,922		0	134,922
Wolf	27-May-12	18-61-03	10,171	103	1.000	10,274	2.80	0	10,274
Michie	6-Jun-12	18-13-74	43,412	488	1.100	43,900	2.87	0	43,900
Michie	6-Jun-12	18-17-79	36,033	549	1.500	36,582	2.87	0	36,582
Mainstem	6-Jun-12	18-26-85	28,345	1,705	0.500	30,050	2.78	0	30,050
McClintock	6-Jun-12	18-26-86	27,264	418	1.500	27,682	2.83	0	27,682
SUM	2012		145,225	3,263		148,488		0	148,488
AVERAGE	2002-2011		148,117	3,520		151,637	2.86		152,194
TOTAL			4,434,582	311,793		4,746,375		1,180,189	5,926,564

Note: Hatchery Chinook salmon fry released as 0+ sub yearling smolt.

[a] Usually corresponds to "tagged" category on Mark Recapture Program (MRP) release forms. Coded Wire Tag (CWT) Data recorded from CWT release sheets 1989-94 and; CWT Data prior to 1987 not verified against Salmonid Enhancement Program (SEP) records.

Appendix A16.–Summary of releases of Chinook salmon from Yukon Territory instream incubation/rearing sites 1991–2012.

Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
Klondike R.	1990	Tatchun Ck.	02-01-01-02-12	Spring Fry	Tatchun Ck.	6/28/1991	6/28/1991	13593	21	650	14264	0.74
Klondike R.	1990	Tatchun Ck.	02-01-01-02-09	Spring Fry	Tatchun Ck.	6/28/1991	6/28/1991	15247	173	750	16170	0.74
Klondike R.	1991	Tatchun Ck.	18-06-45	Spring Fry	Tatchun Ck.	NA	8/31/1992	11734	0	817	12551	2.47
Klondike R.	1991	Tatchun Ck.	02-33-56	Spring Fry	Tatchun Ck.	NA	8/31/1992	6453	0	852	7305	2.47
Klondike R.	1991	Tatchun Ck.	18-06-44	Spring Fry	Tatchun Ck.	NA	8/31/1992	11585	0	320	11905	2.47
Klondike R.	1991	Yukon R	NOCN9148	Spring Fry	Pothole Lk.	6/1992	6/1992	0	0	1500	1500	0.00
Klondike R.	1993	Klondike R.	02-01-01-05-03	Spring Fry	Klondike R.	6/30/1994	6/30/1994	6174	10	54	6238	0.88
Klondike R.	1993	Tatchun Ck.	02-01-01-04-07	Spring Fry	Tatchun Ck.	6/30/1994	6/30/1994	12077	246	71	12394	0.99
Klondike R.	1993	Tatchun Ck.	02-01-01-05-05	Spring Fry	Tatchun Ck.	6/30/1994	6/30/1994	9982	0	61	10043	0.99
Klondike R.	1994	Klondike R.	02-01-01-06-03	Spring Fry	Klondike R.	NA	7/4/1995	2159	11	190	2360	0.75
Klondike R.	1994	Klondike R.	02-01-01-06-02	Spring Fry	Klondike R.	NA	7/4/1995	1809	16	56	1881	0.75
Klondike R.	1994	Tatchun Ck.	02-01-01-05-11	Spring Fry	Tatchun Ck.	7/4/1995	7/4/1995	12431	100	686	13217	0.81
Klondike R.	1994	Tatchun Ck.	02-01-01-05-15	Spring Fry	Tatchun Ck.	7/4/1995	7/4/1995	2490	33	177	2700	0.81
Klondike R.	1994	Tatchun Ck.	02-01-01-06-01	Spring Fry	Tatchun Ck.	7/4/1995	7/4/1995	1476	19	155	1650	0.81
Klondike R.	1994	Tatchun Ck.	02-01-01-05-13	Spring Fry	Tatchun Ck.	7/4/1995	7/4/1995	11649	238	413	12300	0.81
Klondike R.	1995	Klondike R.	02-01-01-04-08	Spring Fry	Klondike R.	6/22/1996	6/22/1996	11423	1707	0	13130	0.76

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
Mayo River	1991	Mayo R.	NOCN9147	Spring Fry	Mayo R.	6/1992	6/1992	0	0	13000	13000	0.00
Mayo River	1992	Mayo R.	NOCN9292	Spring Fry	Mayo R.	7/1993	7/1993	0	0	500	500	0.00
McIntyre Ck.	1990	Takhini R.	02-33-55	Fall Fry 5-8 gm	Takhini R.	9/13/1990	9/13/1990	7967	80	39	8086	3.20
McIntyre Ck.	1990	Takhini R.	02-33-54	Fall Fry 5-8 gm	Takhini R.	9/13/1990	9/13/1990	10789	109	101	10999	3.20
McIntyre Ck.	1991	Takhini R.	02-01-01-03-08	Spring Fry	Flat Ck.	NA	7/4/1992	12141	143	3425	15709	0.98
McIntyre Ck.	1991	Takhini R.	02-01-01-03-09	Spring Fry	Flat Ck.	NA	7/4/1992	13102	466	1398	14966	0.98
McIntyre Ck.	1991	Takhini R.	02-01-01-03-10	Spring Fry	Flat Ck.	NA	7/4/1992	4955	261	601	5817	0.98
McIntyre Ck.	1992	Klondike R.	02-01-01-04-04	Spring Fry	Klondike R.	7/1/1993	7/1/1993	12832	240	144	13216	1.14
McIntyre Ck.	1992	Klondike R.	02-01-01-04-05	Spring Fry	Klondike R.	7/1/1993	7/1/1993	7546	256	167	7969	1.14
McIntyre Ck.	1992	Takhini R.	02-34-24	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	9532	823	95	10450	2.71
McIntyre Ck.	1992	Takhini R.	02-34-23	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	9822	850	218	10890	2.71
McIntyre Ck.	1992	Takhini R.	18-14-54	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	10925	567	227	11719	2.71
McIntyre Ck.	1992	Takhini R.	18-14-53	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	10658	865	226	11749	2.71
McIntyre Ck.	1992	Takhini R.	02-02-17	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	2291	114	37	2442	2.71
McIntyre Ck.	1992	Takhini R.	02-34-22	Spring Fry	Flat Ck.	8/17/1993	8/17/1993	10355	314	40	10709	2.71
McIntyre Ck.	1992	Tatchun Ck.	02-01-01-04-02	Spring Fry	Tatchun Ck.	6/17/1993	6/17/1993	4654	633	335	5622	0.76
McIntyre Ck.	1993	Takhini R	18-17-51	Spring Fry	Flat Ck.	8/26/1994	8/31/1994	7410	46	222	7678	2.60

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	1993	Takhini R.	18-17-50	Spring Fry	Flat Ck.	8/26/1994	8/31/1994	11227	40	87	11354	2.6
McIntyre Ck.	1993	Takhini R.	18-17-49	Spring Fry	Flat Ck.	8/26/1994	8/31/1994	11071	159	142	11372	2.6
McIntyre Ck.	1993	Takhini R.	18-17-48	Spring Fry	Flat Ck.	8/26/1994	8/31/1994	11375	0	104	11479	2.6
McIntyre Ck.	1993	Takhini R.	18-17-52	Spring Fry	Flat Ck.	8/26/1994	8/31/1994	10668	21	198	10887	2.6
McIntyre Ck.	1993	Takhini R.	02-02-16	Spring Fry	Takhini R.	8/30/1994	8/30/1994	9343	271	36	9650	2.8
McIntyre Ck.	1993	Takhini R.	02-01-63	Spring Fry	Takhini R.	8/30/1994	8/30/1994	10899	222	62	11183	2.8
McIntyre Ck.	1994	Takhini R.	02-01-01-04-15	Spring Fry	Takhini R.	8/14/1995	8/14/1995	9887	0	410	10297	2.2
McIntyre Ck.	1994	Takhini R.	02-01-01-04-13	Spring Fry	Takhini R.	8/14/1995	8/14/1995	14452	0	365	14817	2.2
McIntyre Ck.	1994	Takhini R.	02-01-01-04-12	Spring Fry	Flat Ck.	8/14/1995	8/14/1995	14193	59	281	14533	2.2
McIntyre Ck.	1994	Takhini R.	02-01-01-04-14	Spring Fry	Flat Ck.	8/14/1995	8/14/1995	13586	130	295	14011	2.2
McIntyre Ck.	1995	Takhini R.	02-01-01-05-08	Spring Fry	Takhini R.	8/12/1996	8/12/1996	15731	251	496	16478	2.1
McIntyre Ck.	1995	Takhini R.	02-01-01-05-09	Spring Fry	Takhini R.	8/12/1996	8/12/1996	8085	41	293	8419	2.1
McIntyre Ck.	1995	Takhini R.	02-01-01-05-10	Spring Fry	Flat Ck.	8/7/1996	8/7/1996	10727	65	170	10962	2.0
McIntyre Ck.	1995	Tatchun Ck.	02-01-01-02-10	Spring Fry	Tatchun Ck.	6/27/1996	6/27/1996	14530	49	62	14641	0.8
McIntyre Ck.	1995	Tatchun Ck.	02-01-01-02-11	Spring Fry	Tatchun Ck.	6/27/1996	6/27/1996	13526	91	294	13911	0.8
McIntyre Ck.	1996	Takhini R.	02-01-01-06-14	Spring Fry	Flat Ck.	7/2/1997	7/4/1997	15622	158	382	16162	0.8
McIntyre Ck.	1996	Takhini R.	02-01-01-04-06	Spring Fry	Flat Ck.	7/2/1997	7/4/1997	14845	37	280	15162	0.8
McIntyre Ck.	1996	Tatchun Ck.	02-01-01-07-03	Spring Fry	Tatchun Ck.	6/27/1997	6/27/1997	1521	15	148	1684	1.0

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	1997	Tatchun Ck.	02-01-01-06-08	Spring Fry	Tatchun Ck.	6/19/1998	6/19/1998	9284	150	74	9508	1.1
McIntyre Ck.	1997	Tatchun Ck.	02-01-01-06-09	Spring Fry	Tatchun Ck.	6/19/1998	6/19/1998	10318	211	188	10717	1.1
McIntyre Ck.	1997	Tatchun Ck.	02-01-01-07-02	Spring Fry	Tatchun Ck.	6/19/1998	6/19/1998	2536	52	0	2588	1.1
McIntyre Ck.	1997	Takhini R.	02-01-01-07-09	Spring Fry	Flat Ck.	6/22/1998	6/22/1998	11374	115	115	11604	1.1
McIntyre Ck.	1997	Takhini R.	02-01-01-06-11	Spring Fry	Takhini R.	6/23/1998	6/23/1998	12933	334	118	13385	1.1
McIntyre Ck.	1997	Takhini R.	02-01-01-06-10	Spring Fry	Takhini R.	6/23/1998	6/23/1998	12186	37	115	12338	1.1
McIntyre Ck.	1997	Takhini R.	02-01-01-07-08	Spring Fry	Takhini R.	6/23/1998	6/23/1998	12341	253	148	12742	1.1
McIntyre Ck.	1998	Tatchun Ck.	02-01-01-06-12	Spring Fry	Tatchun Ck.	NA	7/8/1999	10363	0	67	10430	NA
McIntyre Ck.	1998	Tatchun Ck.	02-01-01-06-13	Spring Fry	Tatchun Ck.	NA	7/8/1999	4733	0	82	4815	NA
McIntyre Ck.	1998	Takhini R.	02-01-01-07-10	Spring Fry	Takhini R.	NA	7/14/1999	13753	28	148	13929	NA
McIntyre Ck.	1998	Takhini R.	02-01-01-07-11	Spring Fry	Flat Ck.	NA	7/15/1999	11273	23	206	11502	NA
McIntyre Ck.	1999	Takhini R.	02-01-0-07-07	Spring Fry	Flat Ck.	NA	6/23/2000	11333	114	219	11666	0.8
McIntyre Ck.	1999	Takhini R.	02-01-01-07-12	Spring Fry	Flat Ck.	NA	6/23/2000	12246	0	214	12460	0.8
McIntyre Ck.	1999	Takhini R.	02-01-01-06-04	Spring Fry	Takhini R.	NA	6/24/2000	11105	0	147	11252	0.9
McIntyre Ck.	1999	Takhini R.	02-01-01-06-05	Spring Fry	Takhini R.	NA	6/24/2000	12044	0	88	12132	0.9
McIntyre Ck.	1999	Takhini R.	02-01-01-06-06	Spring Fry	Takhini R.	NA	6/24/2000	4561	0	0	4561	0.9
McIntyre Ck.	1999	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	6/19/2000	12239	188	409	12836	1.0
McIntyre Ck.	1999	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	6/19/2000	987	10	0	997	1.0

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	2000	Takhini R.	02-01-01-08-01	Spring Fry	Takhini R.	NA	7/25/2001	11724	163	123	12010	1.1
McIntyre Ck.	2000	Takhini R.	02-01-01-08-02	Spring Fry	Flat Ck.	NA	7/26/2001	9995	101	60	10156	1.1
McIntyre Ck.	2000	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	7/9/2001	11654	360	10	12024	1.1
McIntyre Ck.	2000	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	7/9/2001	6321	329	14	6664	1.1
McIntyre Ck.	2001	Takhini R.	02-01-01-08-04	Spring Fry	Takhini R.	NA	6/29/2002	10109	314	301	10724	1.0
McIntyre Ck.	2001	Takhini R.	02-01-01-08-05	Spring Fry	Takhini R.	NA	6/29/2002	9814	100	405	10319	1.0
McIntyre Ck.	2001	Takhini R.	02-01-01-08-07	Spring Fry	Flat Ck.	NA	6/28/2002	4161	42	0	4203	1.0
McIntyre Ck.	2001	Tatchun Ck.	02-01-01-08-03	Spring Fry	Tatchun Ck.	NA	6/27/2002	6432	415	279	7126	1.0
McIntyre Ck.	2002	Takhini R.	02-11-22-31-41	Spring Fry	Takhini R.	NA	7/21/2003	8431	0	55	8486	1.7
McIntyre Ck.	2002	Takhini R.	02-11-22-31-42	Spring Fry	Takhini R.	NA	7/21/2003	14017	0	76	14093	1.7
McIntyre Ck.	2002	Takhini R.	02-01-01-07-01	Spring Fry	Takhini R.	NA	7/21/2003	11589	13	104	11706	1.7
McIntyre Ck.	2002	Takhini R.	02-11-21-38-46	Spring Fry	Flat Ck.	NA	7/22/2003	6426	65	0	6491	1.7
McIntyre Ck.	2002	Tatchun Ck.	02-01-01-07-14	Spring Fry	Tatchun Ck.	NA	7/4/2003	10746	50	79	10875	1.4
McIntyre Ck.	2002	Tatchun Ck.	02-01-01-07-15	Spring Fry	Tatchun Ck.	NA	7/4/2003	13261	0	166	13427	1.4
McIntyre Ck.	2003	Tatchun R.	02-01-02-01-05	Spring Fry	Tatchun R.	NA	6/27/2004	10701	805	0	11506	1.1
McIntyre Ck.	2003	Tatchun R.	02-01-02-01-04	Spring Fry	Tatchun R.	NA	6/27/2004	9919	556	0	10475	1.1
McIntyre Ck.	2003	Tatchun R.	02-01-02-01-03	Spring Fry	Tatchun R.	NA	6/27/2004	5249	395	0	5644	1.1
McIntyre Ck.	2003	Takhini R	02-01-02-02-01	Spring Fry	Takhini R.	NA	7/12/2004	10449	268	0	10717	1.3

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	2003	Takhini R.	02-01-02-01-06	Spring Fry	Takhini R.	NA	7/12/2004	11685	178	0	11863	1.3
McIntyre Ck.	2003	Takhini R.	02-01-02-01-08	Spring Fry	Flat Ck.	NA	8/16/2004	7785	95	0	7880	1.1
McIntyre Ck.	2003	Tatchun R.	02-01-01-09-01	Spring Fry	Tatchun R.	NA	8/20/2004	9381	143	0	9524	1.3
McIntyre Ck.	2003	Tatchun R.	02-01-01-08-08	Spring Fry	Tatchun Ck.	NA	8/20/2004	5216	79	0	5295	1.5
McIntyre Ck.	2003	Takhini R.	02-01-01-09-03	Spring Fry	Takhini R.	NA	8/21/2004	10112	154	0	10266	1.2
McIntyre Ck.	2003	Takhini R.	02-01-01-09-02	Spring Fry	Takhini R.	NA	8/21/2004	10180	155	0	10335	1.2
McIntyre Ck.	2003	Takhini R.	02-01-02-01-03	Spring Fry	Takhini R.	NA	8/21/2004	5390	82	0	5472	1.2
McIntyre Ck.	2004	Tatchun R.	02-01-01-08-09	Spring Fry	Tatchun R.	NA	6/27/2005	2361	426	0	2787	1.3
McIntyre Ck.	2004	Takhini R.	02-01-02-02-02	Spring Fry	Takhini R.	NA	7/14/2005	23068	2175	1100	26343	1.3
McIntyre Ck.	2004	Takhini R.	02-01-02-02-03	Spring Fry	Takhini R.	NA	7/14/2005	9146	1016	1100	11262	1.3
McIntyre Ck.	2004	Takhini R.	02-01-02-01-08	Spring Fry	Flat Ck.	NA	7/7/2005	5592	233	0	5825	1.3
McIntyre Ck.	2005	Takhini R.	02-1-2-2-5	Spring Fry	Takhini R.	NA	7/10/2006	10766	748	0	11514	1.3
McIntyre Ck.	2005	Takhini R.	02-1-2-1-9	Spring Fry	Takhini R.	NA	7/10/2006	10952	534	0	11486	1.6
McIntyre Ck.	2005	Takhini R.	02-1-2-2-6	Spring Fry	Takhini R.	NA	7/10/2006	11108	394	0	11502	1.6
McIntyre Ck.	2005	Takhini R.	02-1-2-3-4	Spring Fry	Takhini R.	NA	7/18/2006	2520	152	0	2672	1.6
McIntyre Ck.	2005	Tatchun R.	02-1-2-1-7	Spring Fry	Tatchun R.	NA	7/7/2006	9243	182	0	9425	2.4
McIntyre Ck.	2005	Tatchun R.	02-1-2-3-3	Spring Fry	Tatchun R.	NA	7/23/2006	26094	847	0	26941	2.4
McIntyre Ck.	2006	Takhini R	02-01-02-03-09	Spring Fry	Takhini R	7/17/2007	7/20/2007	8422	936	552	9910	1.6a

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	2006	Takhini R.	02-01-02-03-07	Spring Fry	Takhini R.	7/17/2007	7/20/2007	10108	645	185	10938	1.6[a]
McIntyre Ck.	2006	Takhini R.	02-01-02-03-08	Spring Fry	Takhini R.	7/17/2007	7/20/2007	10080	420	183	10683	1.6[a]
McIntyre Ck.	2006	Takhini R.	02-01-02-04-01	Spring Fry	Takhini R.	7/17/2007	7/20/2007	8881	567	688	10136	1.6[a]
McIntyre Ck.	2006	Takhini R.	02-01-02-04-04	Spring Fry	Takhini R.	7/17/2007	7/20/2007	1500	131	55	1686	1.6[a]
McIntyre Ck.	2006	Tatchun R.	02-01-02-04-02	Spring Fry	Tatchun R.	7/21/2007	7/26/2007	9775	182	185	10142	>2.4[a]
McIntyre Ck.	2006	Tatchun R.	02-01-02-04-03	Spring Fry	Tatchun R.	7/21/2007	7/26/2007	9450	476	113	10039	>2.4[a]
McIntyre Ck.	2006	Tatchun R.	02-01-02-03-05	Spring Fry	Tatchun R.	7/21/2007	7/26/2007	8972	955	196	10123	>2.4[a]
McIntyre Ck.	2006	Tatchun R.	02-01-02-03-06	Spring Fry	Tatchun R.	7/21/2007	7/26/2007	6261	261	101	6623	>2.4[a]
McIntyre Ck.	2007	Tatchun R.	02-01-02-04-03	Spring Fry	Tatchun R.	6/27/2008	6/27/2008	10170	103	145	10418	1.6
McIntyre Ck.	2007	Tatchun R.	02-01-02-04-05	Spring Fry	Tatchun R.	6/27/2008	6/27/2008	10056	311	228	10595	1.6
McIntyre Ck.	2007	Tatchun R.	02-01-02-04-06	Spring Fry	Tatchun R.	6/27/2008	6/27/2008	4345	44	328	4717	1.6
McIntyre Ck.	2007	Takhini R.	02-01-02-04-08	Spring Fry	Takhini R.	7/2/2008	7/2/2008	6756	209	197	7162	1.4
McIntyre Ck.	2007	Takhini R.	02-01-02-04-07	Spring Fry	Takhini R.	7/2/2008	7/2/2008	9490	293	119	9902	1.4
McIntyre Ck.	2008	Tatchun R.	02-01-02-05-06	Spring Fry	Tatchun R.	6/30/2009	6/30/2009	2576	136	37	2749	1.3
McIntyre/ Fox	2008	Whitehorse Fishway	02-01-02-05-01	Spring Fry	Fox Creek	7/3/2009	7/3/2009	10141	459	0	10600	1.4
McIntyre/ Fox	2008	Whitehorse Fishway	02-01-02-05-02	Spring Fry	Fox Creek	7/3/2009	7/3/2009	10019	459	0	10478	1.4
McIntyre/ Fox	2008	Whitehorse Fishway	02-01-02-05-03	Spring Fry	Fox Creek	7/3/2009	7/10/2009	9739	1253	0	10992	1.4
McIntyre/ Fox	2008	Whitehorse Fishway	02-01-02-05-04	Spring Fry	Fox Creek	7/9/2009	7/10/2009	9194	1417	0	10611	1.4
McIntyre/ Fox	2008	Whitehorse Fishway	02-01-02-05-05	Spring Fry	Fox Creek	7/9/2009	7/10/2009	9747	1126	0	10873	1.4

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	Number Tagged	# Ad. Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Ck.	2009	Tatchun R.	02-01-02-05-07	Spring Fry	Tatchun R.	6/21/2010	6/21/2010	1373	131	0	1504	1.3
McIntyre/ Fox	2009	Whitehorse Fishway	02-01-02-05-09	Spring Fry	Fox Creek	6/18/2010	6/18/2010	7930	1251	0	9181	1.1
McIntyre Ck.	2010	Tatchun Ck.	02-01-02-06-02	Spring Fry	Tatchun R.	6/27/2011	6/27/2011	9378	152	0	9530	1.2
McIntyre Ck.	2010	Tatchun Ck.	02-01-02-06-04	Spring Fry	Tatchun R.	6/27/2011	6/27/2011	10594	3567	0	14161	1.2
McIntyre/ Fox	2010	Whitehorse Fishway	02-01-02-06-06	Spring Fry	Fox Creek	5/7/2011	5/7/2011	2864	2362	0	5226	1.2[a]
McIntyre/ Fox	2010	Whitehorse Fishway	02-01-02-06-07	Spring Fry	Fox Creek	5/7/2011	5/7/2011	1161	826	0	1987	1.2[a]
McIntyre Ck.	2011	Tatchun Ck.	02-01-02-07-01	Spring Fry	Tatchun R.	6/28/2012	6/28/2012	3481	175	0	3656	1.5
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-02	Spring Fry	Fox Creek	7/11/2012	7/11/2012	3121	87	0	3208	1.5
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-03	Spring Fry	Fox Creek	7/11/2012	7/11/2012	10060	135	0	10195	1.5
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-04	Spring Fry	Fox Creek	7/11/2012	7/11/2012	9932	139	0	10071	1.5
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-08	Spring Fry	Fox Creek	7/11/2012	7/11/2012	10612	89	0	10701	1.5
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-06-08	Spring Fry	Fox Creek	7/18/2012	7/18/2012	10577	71	0	10648	1.8
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-05	Spring Fry	Fox Creek	7/18/2012	7/18/2012	11208	113	0	11321	1.8
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-09	Spring Fry	Fox Creek	7/24/2012	7/24/2012	10806	32	0	10838	2.0
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-06	Spring Fry	Fox Creek	7/24/2012	7/24/2012	10956	76	0	11032	2.0
McIntyre/ Fox	2011	Whitehorse Fishway	02-01-02-07-07	Spring Fry	Fox Creek	7/26/2012	7/26/2012	9053	91	0	9144	2.0

Notes: NA= Not Available; #=Number; Ad=Adipose; Rel.=Released. Klondike R. refers to North Klondike River.

[a] Weight (WT) not taken at release, but based on earlier sampling data and assumed growth.

Appendix A17.–Yukon River fall chum salmon estimated brood year production and return per spawner estimates 1974–2012.

				Estimated Brood Year Return								(R)	(R/P)
	(P)	Estimated Annual Totals		Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Run	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return [a]	Spawner
1974	436,485	478,875	915,360	91,751	497,755	68,693	0	0.14	0.76	0.10	0.00	658,199	1.51
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,401	123	0.10	0.85	0.04	0.00	1,437,415	0.98
1976	268,841	339,043	607,884	102,062	587,479	137,039	4,316	0.12	0.71	0.16	0.01	830,896	3.09
1977	514,843	447,918	962,761	102,660	1,075,198	175,688	4,189	0.08	0.79	0.13	0.00	1,357,735	2.64
1978	320,487	434,030	754,517	22,222	332,230	90,580	0	0.05	0.75	0.20	0.00	445,032	1.39
1979	780,818	615,377	1,396,195	41,114	769,496	274,311	3,894	0.04	0.71	0.25	0.00	1,088,815	1.39
1980	263,167	488,373	751,540	8,377	362,199	208,962	3,125	0.01	0.62	0.36	0.01	582,663	2.21
1981	551,192	683,391	1,234,583	45,855	955,725	278,386	8,888	0.04	0.74	0.22	0.01	1,288,854	2.34
1982	179,828	373,519	553,347	11,327	400,323	166,754	679	0.02	0.69	0.29	0.00	579,083	3.22
1983	347,157	525,485	872,642	12,569	875,355	223,468	2,313	0.01	0.79	0.20	0.00	1,113,705	3.21
1984	270,042	412,323	682,365	7,089	408,040	174,207	8,516	0.01	0.68	0.29	0.01	597,852	2.21
1985	664,426	515,481	1,179,907	46,635	874,819	270,984	3,194	0.04	0.73	0.23	0.00	1,195,632	1.80
1986	376,374	318,028	694,402	0	429,749	368,513	4,353	0.00	0.54	0.46	0.01	802,615	2.13
1987	651,943	406,143	1,058,086	12,413	617,519	290,767	7,720	0.01	0.67	0.31	0.01	928,419	1.42
1988	325,137	353,685	678,822	41,003	175,236	152,368	10,894 [c]	0.11	0.46	0.40	0.03	379,501	1.17
1989	506,173	545,166	1,051,339	2,744	282,905	345,136 [c]	19,661	0.00	0.43	0.53	0.03	650,446	1.29
1990	369,654	352,007	721,661	710	579,452 [c]	405,472	30,095	0.00	0.57	0.40	0.03	1,015,729	2.75
1991	591,132	439,096	1,030,228	3,663 [c]	993,021	364,812	11,921	0.00	0.72	0.27	0.01	1,373,417	2.32
1992	324,253	148,846	473,099	6,554	646,049	193,073	3,768	0.01	0.76	0.23	0.00	849,444	2.62
1993	352,688	91,015	443,703	7,655	442,167	98,767	3,195	0.01	0.80	0.18	0.01	551,784	1.56
1994	769,920	169,225	939,145	4,234	217,211	147,685	1,603 [c]	0.01	0.59	0.40	0.00	370,733	0.48
1995	963,560	461,147	1,424,707	2,286	263,666	68,918 [c]	381	0.01	0.79	0.21	0.00	335,251	0.35
1996	787,688	260,923	1,048,611	415	165,691 [c]	136,431	8,274	0.00	0.53	0.44	0.03	310,811	0.39

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				Estimated Brood Year Return								(R)	(R/P)
	(P)	Estimated Annual Totals		Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Run	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return [a]	Spawner
1997	481,336	170,059	651,395	3,087 [c]	243,950	118,044	3,326	0.01	0.66	0.32	0.01	368,407	0.77
1998	251,213	70,820	322,033	648	268,971	57,858	6,678	0.00	0.80	0.17	0.02	334,155	1.33
1999	283,786	131,175	414,961	29,023	703,881	173,990	13,683	0.03	0.76	0.19	0.01	920,577	3.24
2000	210,756	28,543	239,299	8,431	296,273	115,162	0	0.02	0.71	0.27	0.00	419,866	1.99
2001	336,435	44,976	381,411	135,700	2,151,589	679,544	33,497	0.05	0.72	0.23	0.01	3,000,330	8.92
2002	396,901	27,411	424,312	0	447,044	235,927	15,115	0.00	0.64	0.34	0.02	698,086	1.76
2003	693,967	79,529	773,496	24,401	847,126	502,783	16,581	0.02	0.61	0.36	0.01	1,390,891	2.00
2004	536,344	76,296	612,640	0	384,577	150,381	2,183	0.00	0.72	0.28	0.00	537,141	1.00
2005	1,990,251	290,183	2,280,434	2,625	383,552	99,322	5,309	0.01	0.78	0.20	0.01	490,808	0.25
2006	880,503	270,486	1,150,989	25,217	416,994	341,851	27,030	0.03	0.51	0.42	0.03	811,073	0.92
2007	910,883	205,667	1,116,550	87,862	849,499	169,532	9,091	0.08	0.76	0.15		1,115,984 [d]	>1.23
2008	687,153	217,947	905,100	10,015	756,273	359,264						1,125,552 [e]	>1.64
2009	482,411	93,319	575,730	10,768									
2010	526,355	80,005	606,360										
2011	881,009	325,666	1,206,675										
2012	572,730	390,872	963,602										
Average-11	569,219	301,164	870,383										
Min-06	179,828	27,411	239,299	0	165,691	57,858	0	0.00	0.43	0.04	0.00	310,811	0.25
Max-06	1,990,251	683,391	2,280,434	150,451	2,151,589	679,544	33,497	0.14	0.85	0.53	0.03	3,000,330	8.92
	549,773	All Brood Years (1974-2006)		28,876	585,475	217,493	8,015	0.03	0.68	0.28	0.01	839,860	1.96
	409,858	Even Brood Years (1974-2006)		19,414	389,134	185,350	7,448	0.03	0.65	0.31	0.01	601,346	1.78
	698,433	Odd Brood Years (1974-2006)		38,930	794,088	251,645	8,617	0.03	0.72	0.24	0.01	1,093,280	2.16

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Note: Current brood year data is preliminary.

[a] The estimated number of salmon which returned are based upon annual age composition observed in lower Yukon test nets each year, weighted by test fish CPUE.

[b] Contrast in escapement data is 11.07.

[c] Based upon expanded test fish age composition estimates for years in which the test fishery terminated early both in 1994 and 2000.

[d] Brood year return for 3, 4, and 5 year fish, indicate that production (R/P) from brood year 2007 was at least 1.23. Recruits estimated for incomplete brood year.

[e] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2008 was at least 1.64. Recruits estimated for incomplete brood year.

Appendix A18.–Canadian Yukon River mainstem fall chum salmon estimated brood year production and return per spawner estimates 1982–2012.

Brood	Return by Age						
Year	3	4	5	6	Return	Spawners	R/S
1982	4,098	142,640	30,840	719	178,297	31,958	5.58
1983	2,355	165,499	66,390	637	234,881	90,875	2.58
1984	6,566	70,181	28,367	212	105,326	56,633	1.86
1985	2,712	111,346	26,190	689	140,937	62,010	2.27
1986	141	120,963	82,832	629	204,565	87,940	2.33
1987	1,015	118,092	36,000	2,839	157,946	80,776	1.96
1988	394	60,209	24,764	1,656	87,023	36,786	2.37
1989	1,258	27,678	56,516	4,507	89,959	35,750	2.52
1990	299	101,440	79,702	5,041	186,482	51,735	3.60
1991	207	201,389	87,223	2,893	291,712	78,461	3.72
1992	9,251	96,723	54,264	742	160,980	49,082	3.28
1993	306	71,619	18,395	746	91,066	29,743	3.06
1994	231	41,537	35,079	1,642	78,489	98,358	0.80
1995	742	61,762	47,115	363	109,982	158,092	0.70
1996	840	13,895	18,977	397	34,109	122,429	0.28
1997	189	24,909	60,130	948	86,176	85,419	1.01
1998	757	49,025	27,495	0	77,277	46,252	1.67
1999	520	142,025	93,080	0	235,625	58,552	4.02
2000	758	85,513	19,855	1,187	107,313	53,732	2.00
2001	2,775	490,800	181,032	13,385	687,992	33,491	20.54
2002	4,325	99,419	122,373	4,322	230,439	98,679	2.34
2003	3,561	165,203	154,568	3,759	327,091	143,133	2.29
2004	2,677	79,572	34,088	2,897	119,234	154,080	0.77
2005	0	86,942	23,173	772	110,887	437,498	0.25
2006	5,716	98,487	121,951	1,389	227,543	211,994	1.07
2007	20,277	258,952	49,123			254,649	
2008	4,245	121,159				174,267	
2009	1,909					93,626	
2010						117,871	
2011						205,617	
2012						137,743	
Average	(1982-2006)				174,453	95,738	2.91
					Contrast (1982 to 2006)	14.71	

Note: Eagle sonar project test fishery samples were used starting brood year 2004-2007 for 6-year olds through 3-year olds respectively; earlier data is from fish wheel mark-recapture samples. Current brood year data is preliminary.

Appendix A19.–Escapement, rebuilding and interim goals for Canadian origin Chinook and fall chum salmon stocks, 1985–2012.

	Canadian Origin Stock Targets					
	Chinook Salmon		Fall Chum Salmon			
	Mainstem Escapement	Stabilization/ Rebuilding/	Mainstem Escapement	Stabilization/ Rebuilding/	Fishing Branch	
Year	Goal	Interim Goals	Goal	Interim Goals	Escapement Goal	Interim Goal
1985	33,000-43,000					
1986	33,000-43,000					
1987	33,000-43,000		90,000-135,000		50,000-120,000	
1988	33,000-43,000		90,000-135,000		50,000-120,000	
1989	33,000-43,000		90,000-135,000		50,000-120,000	
1990	33,000-43,000	18,000	80,000		50,000-120,000	
1991	33,000-43,000	18,000	80,000		50,000-120,000	
1992	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1993	33,000-43,000	18,000	80,000	51,000	50,000-120,000	
1994	33,000-43,000	18,000	80,000	61,000	50,000-120,000	
1995	33,000-43,000	18,000	80,000		50,000-120,000	
1996	33,000-43,000	28,000	80,000	65,000	50,000-120,000	
1997	33,000-43,000	28,000	80,000	49,000	50,000-120,000	
1998	33,000-43,000	28,000	80,000		50,000-120,000	
1999	33,000-43,000	28,000	80,000		50,000-120,000	
2000	33,000-43,000	28,000	80,000		50,000-120,000	
2001	33,000-43,000	28,000	80,000		50,000-120,000	
2002	33,000-43,000	28,000	80,000	60,000	50,000-120,000	
2003 [a]	33,000-43,000	28,000 [b]	80,000	65,000	50,000-120,000	15,000
2004	33,000-43,000	28,000	80,000	65,000	50,000-120,000	13,000
2005	33,000-43,000	28,000	80,000	65,000	50,000-120,000	24,000
2006	33,000-43,000	28,000	80,000		50,000-120,000	28,000
2007	33,000-43,000		80,000		50,000-120,000	34,000
2008	33,000-43,000	45,000 [c]	80,000		50,000-120,000	22,000-49,000 [d]
2009	33,000-43,000	45,000 [c]	80,000		50,000-120,000	22,000-49,000 [d]
2010	33,000-43,000	42,500-55,000 [e]	80,000	70,000-104,000 [f]	50,000-120,000	22,000-49,000 [d]
2011	33,000-43,000	42,500-55,000 [f]	80,000	70,000-104,000 [f]	50,000-120,000	22,000-49,000 [d]
2012	33,000-43,000	42,500-55,000 [f]	80,000	70,000-104,000 [f]	50,000-120,000	22,000-49,000 [d]
2013	33,000-43,000	42,500-55,000 [f]	80,000	70,000-104,000 [f]	50,000-120,000	22,000-49,000 [d]

Note: All single numbers are considered minimums.

[a] Treaty was signed by governments in December 2002.

[b] In 2003 the goal was set at 25,000. However, if the U.S. decided on a commercial opening the goal would be increased to 28,000 fish.

[c] Interim management escapement goal (IMEG) using Eagle sonar estimates of Canadian border passage, previous years were measured by mark–recapture abundance estimates.

[d] Interim management escapement goal (IMEG) established for 2008–2013.

[e] The IMEG goal of 42,500 to 55,000 was chosen at the Spring 2010 Yukon River Panel meeting to include a precautionary approach to put more large older fish on the spawning grounds. The Panel eventually agreed with 42,500 for the lower end of the range based on an average of the 2 proposed lower goals of 40,000 and 45,000 discussed.

[f] The IMEGs from 2010 were recommended to continue in 2013.

Appendix A20.–Recoveries of Chinook salmon coded wire tags from the Whitehorse Rapids Fish hatchery in the U.S. domestic groundfish fisheries and research trawl surveys.

Brood Year	Tag Code	Release Location	Release Date	Recovery Date	Age (yrs)	Length (mm)	Latitude	Longitude	Gear Type
1988	02006	Michie Cr.	06/06/89	03/25/92	4	620	56° 44’	173° 15’	Domestic Trawl
1988	--	McClintock R.	06/06/89	03/19/94	6		Area 513		Domestic Trawl
1990	180322	Wolf Cr.	08/08/91	03/14/94	4	687	60° 06’	178° 58’	Domestic Trawl
1991	180830	Michie Cr.	06/04/92	02/24/95	4		55° 19’	164° 43’	Domestic Trawl
1992	181215	Wolf Cr.	06/06/93	12/06/94	2	400	56° 52’	171° 18’	Domestic Trawl
1992	181216	Yukon R.	06/15/93	06/02/97	5	833	59° 29’	167° 49’	Domestic Trawl
1993	181428	Michie Cr.	06/01/94	03/10/98	5	760	59° 26’	178° 05’	Domestic Trawl
1995	182823	Fox Cr.	06/04/96	03/29/98	3	650	58° 56’	178° 06’	Domestic Trawl
1995	183348	Judas Cr.	06/04/96	03/30/99	4	660	57° 43’	173° 34’	Domestic Trawl
1996	182554	Michie Cr.	06/11/97	03/16/00	4	550	55° 56’	168° 52’	Domestic Trawl
1997	183159	Judas Cr.	06/12/98	03/28/01	4	550	56° 18’	170° 33’	Domestic Trawl
1999	182353	Wolf Creek	06/10/00	03/03/03	4	650	56° 26’	169° 55’	Domestic Trawl
2000	184412	McClintock R.	06/08/01	02/15/02	2	230	56° 10’	166° 00’	Domestic Trawl
2001	185106	Michie Cr.	06/10/02	10/03/02	1	193	64° 06’	164° 31’	Research Trawl
2001	185102	Wolf Cr.	06/02/02	10/03/02	1	153	64° 06	164° 31’	Research Trawl
2001	185061	Michie Cr.	06/10/02	10/04/02	1	155	63° 00’	165° 58’	Research Trawl
2001	185107	Michie Cr.	06/10/02	02/08/03	2	250	56° 44’	167° 00’	Domestic Trawl
2001	185101	Wolf Cr.	05/23/02	10/08/04	3	590	54°01’	166° 29’	Domestic Trawl
2001	185061	Michie Cr.	06/10/02	03/15/05	4	640	57° 21’	171° 39’	Domestic Trawl
2003	--	Yukon R.	--	09/11/04	1	154	64° 01’	166° 01’	Research Trawl
2001	185101	Wolf Cr.	05/23/02	02/21/06	5	800	55° 42’	168° 53’	Domestic Trawl
2005	080166	Wolf Cr.	03/03/06	02/07/09	4	630	56° 29’	168° 12’	Domestic Trawl
2005	080173	McClintock R.	06/14/06	03/02/09	4	650	56° 22’	169° 21’	Domestic Trawl
2005	080169	Mitchie Cr.	06/14/06	03/26/10	5	900	57° 07’	172° 26’	Domestic Trawl
2006	18	Yukon R.	--	09/13/07	1	176	65° 12’	168° 06’	Research Trawl
2006	18	Yukon R.	--	09/13/07	1	179	65° 12’	168° 06’	Research Trawl
2006	18	Yukon R.	--	09/13/07	1	125	65° 12’	168° 06’	Research Trawl
2010	18	Yukon R.	--	09/24/10	1	190	63° 49’	162° 47’	Research Trawl
--	18	Yukon R.	--	03/06/10	--	650	57° 05’	171° 43’	Domestic Trawl
--	18	Yukon R.	--	03/13/10	--	580	56° 43’	172° 27’	Domestic Trawl
--	18	Yukon R.	--	03/13/10	--	630	56° 43’	172° 27’	Domestic Trawl
--	18	Yukon R.	--	03/19/10	--	660	56° 46’	172° 20’	Domestic Trawl
--	18	Yukon R.	--	03/23/10	--	640	57° 02’	171° 38’	Domestic Trawl
--	18	Yukon R.	--	03/24/10	--	680	57° 02’	172° 17’	Domestic Trawl
--	18	Yukon R.	--	03/25/10	--	630	56° 55’	172° 24’	Domestic Trawl
--	18	Yukon R.	--	03/29/10	--	680	Area 509		Domestic Trawl
--	08	Yukon R.	--	03/09/11	--	650	Area 521		Domestic Trawl
--	08	Yukon R.	--	10/15/11	--	590	55° 13’	165° 49’	Domestic Trawl

Appendix A21.–Estimated bycatch (numbers) of Pacific salmon by species, and year in United States groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) management area, 1991–2012.

Year	Chinook	Chum	Coho	Sockeye	Pink	Total Non-Chinook
1991	48,880 [a]	28,270 [a]	656 [a]	1,310 [a]	26 [a]	30,262 [a]
1992	41,955	40,090 [a]	1,266 [a]	14 [a]	80 [a]	41,450 [a]
1993	46,014	242,916 [a]	324 [a]	22 [a]	8[a]	243,270 [a]
1994	43,821	94,107	228	20	193	94,548
1995	23,436	20,983	871	0	21	21,875
1996	63,205	77,819	234	5	2	78,060
1997	50,530	66,816	109	3	66	66,994
1998	55,431	--	--	--	--	65,697
1999	14,599	--	--	--	--	47,132
2000	8,223	--	--	--	--	59,327
2001	40,547	--	--	--	--	60,731
2002	39,684	--	--	--	--	82,483
2003	53,571	--	--	--	--	197,150
2004	59,964	--	--	--	--	450,541
2005	74,266	--	--	--	--	709,388
2006	87,084	--	--	--	--	325,183
2007	129,568	--	--	--	--	97,348
2008	24,105	--	--	--	--	16,877
2009	13,796	--	--	--	--	47,130
2010	12,383	--	--	--	--	14,423
2011	26,671	--	--	--	--	192,909
2012	12,765					24,251

Sources: Berger 2010; NMFS 2012.

Appendix A22.–Estimated bycatch (numbers) of Pacific salmon by species and year in United States groundfish fisheries in the Gulf of Alaska (GOA) management area, 1991–2012.

Year	Chinook	Chum	Coho	Sockeye	Pink	Total Non-Chinook
1991	38,894	13,711	1,133	46	64	14,954
1992	16,787	11,140	55	21	0	11,216
1993	19,260	55,268	306	15	799	56,388
1994	13,615	36,782	42	96	306	37,226
1995	14,652	64,067	668	41	16	64,792
1996	15,761	3,969	194	2	11	4,176
1997	15,230	3,349	41	7	23	3,420
1998	16,984	--	--	--	--	13,544
1999	30,600	--	--	--	--	7,529
2000	26,729	--	--	--	--	10,995
2001	15,104	--	--	--	--	6,063
2002	12,920	--	--	--	--	3,219
2003	15,369	--	--	--	--	9,530
2004	17,777	--	--	--	--	5,809
2005	31,270	--	--	--	--	6,608
2006	19,004	--	--	--	--	4,226
2007	40,539	--	--	--	--	3,421
2008	16,176	--	--	--	--	2,156
2009	8,397	--	--	--	--	2,355
2010	54,559	--	--	--	--	NA
2011	20,775	--	--	--	--	NA
2012	22,806	--	--	--	--	NA

Sources: Berger 2010; NMFS 2012.

Appendix A23.–Estimated bycatch (numbers) of Chinook and non-Chinook salmon in the Bering Sea-Aleutian Islands (BSAI) groundfish fisheries by season, 1991–2012.

	BSAI Chinook Salmon Bycatch				BSAI Non-Chinook Salmon Bycatch			
	A-season		B-season		A-season		B-season	
Year	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries
1991	38,791 [a]	7,601 [a]	2,114 [a]	374 [a]	2,850 [a]	166 [a]	26,101 [a]	1,145 [a]
1992	25,691	5,728	10,259	277	1,951 [a]	169 [a]	38,324 [a]	1,005 [a]
1993	17,264	7,424	21,252	74	1,594 [a]	254 [a]	240,597 [a]	825 [a]
1994	28,451	10,470	4,686	214	3,991	1,608	88,681	268
1995	10,579	8,360	4,405	92	1,708	1,325	17,556	1,286
1996	36,068	7,248	19,554	334	222	443	77,014	381
1997	10,935	5,466	33,973	156	2,083	627	63,904	381
1998	15,193	3,737	36,130	371	4,002	518	60,040	1,137
1999	6,352	2,442	5,627	178	362	31	44,810	1,929
2000	3,422	3,146	1,539	116	213	137	58,358	619
2001	18,484	6,387	14,961	715	2,386	517	54,621	3,207
2002	21,794	4,483	12,701	706	1,377	321	79,404	1,381
2003	32,609	7,435	12,977	550	3,834	279	185,351	1,686
2004	23,093	7,623	28,603	645	422	606	440,038	9,475
2005	27,331	6,302	40,030	602	595	435	704,993	3,365
2006	58,391	4,191	24,304	198	1,328	984	308,318	14,553
2007	69,420	7,699	52,350	100	8,524	1,115	85,264	2,445
2008	16,638	2,358	4,842	267	322	195	14,947	1,413
2009	9,711	1,299	2,658	128	48	115	46,227	740
2010	7,630	1,836	2,067	850	40	182	13,240	961
2011	7,137	514	18,362	658	297	118	191,149	1,345
2012	7,773	1222	3,577	193	11	297	22,203	1,740

Note: A-season (winter; January 20-June 10) B-season (summer/fall; June 10-November 1). Actual fishing dates when fishing starts and stops varies by year. Source: NMFS 2012.

[a] Community Development Quota (CDQ) bycatch not included.

Appendix A24.–Fall chum salmon age and sex percentages from selected Yukon River escapement projects, 2012.

Location	Sample Size		Age 3	4	5	6	7	Total
Sheenjek River [a]	180	Males	0.0	22.8	21.7	2.2	0.0	46.7
		Females	0.0	33.9	17.2	2.2	0.0	53.3
		Total	0.0	56.7	38.9	4.4	0.0	100
Yukon Mainstem [b]	473	Males	0.2	35.3	19.7	0.8	0.0	56.0
at Eagle, Alaska		Females	0.8	34.5	8.7	0.0	0.0	44.0
		Total	1.0	69.8	28.4	0.8	0.0	100
Toklat River [c]	150	Males	-	-	-	-	-	-
		Females	-	-	-	-	-	-
		Total	2.0	79.3	18.0	0.7	0.0	100
Delta River [d]	180	Males	1.1	47.8	17.8	0.6	0.0	67.3
		Females	0.6	23.3	8.9	0.0	0.0	32.8
		Total	1.7	71.1	26.7	0.6	0.0	100

[a] Samples were collected by beach seine, throughout the run, structure is vertebra.
[b] Samples were from test fishing with drift gillnets, structure is scales.
[c] Samples were handpicked carcasses, structure is vertebra. Unable to pair ages with sex due to sampling error.
[d] Samples were handpicked carcasses from east and middle channels, structure is vertebra.

APPENDIX B: TABLES

Appendix B1.–Alaska and Canadian total utilization of Yukon River Chinook, chum and coho salmon, 1961–2012.

	Alaska [a,b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon [d]	Total	Chinook	Other Salmon	Total
1961	141,152	461,597	602,749	13,246	9,076	22,322	154,398	470,673	625,071
1962	105,844	434,663	540,507	13,937	9,436	23,373	119,781	444,099	563,880
1963	141,910	429,396	571,306	10,077	27,696	37,773	151,987	457,092	609,079
1964	109,818	504,420	614,238	7,408	12,221	19,629	117,226	516,641	633,867
1965	134,706	484,587	619,293	5,380	11,789	17,169	140,086	496,376	636,462
1966	104,887	309,502	414,389	4,452	13,324	17,776	109,339	322,826	432,165
1967	146,104	352,397	498,501	5,150	16,961	22,111	151,254	369,358	520,612
1968	118,632	270,818	389,450	5,042	11,633	16,675	123,674	282,451	406,125
1969	105,027	424,399	529,426	2,624	7,776	10,400	107,651	432,175	539,826
1970	93,019	585,760	678,779	4,663	3,711	8,374	97,682	589,471	687,153
1971	136,191	547,448	683,639	6,447	17,471	23,918	142,638	564,919	707,557
1972	113,098	461,617	574,715	5,729	7,532	13,261	118,827	469,149	587,976
1973	99,670	779,158	878,828	4,522	10,182	14,704	104,192	789,340	893,532
1974	118,053	1,229,678	1,347,731	5,631	11,646	17,277	123,684	1,241,324	1,365,008
1975	76,705	1,307,037	1,383,742	6,000	20,600	26,600	82,705	1,327,637	1,410,342
1976	105,582	1,026,908	1,132,490	5,025	5,200	10,225	110,607	1,032,108	1,142,715
1977	114,494	1,090,758	1,205,252	7,527	12,479	20,006	122,021	1,103,237	1,225,258
1978	129,988	1,615,312	1,745,300	5,881	9,566	15,447	135,869	1,624,878	1,760,747
1979	159,232	1,596,133	1,755,365	10,375	22,084	32,459	169,607	1,618,217	1,787,824
1980	197,665	1,730,960	1,928,625	22,846	23,718	46,564	220,511	1,754,678	1,975,189
1981	188,477	2,097,871	2,286,348	18,109	22,781	40,890	206,586	2,120,652	2,327,238
1982	152,808	1,265,457	1,418,265	17,208	16,091	33,299	170,016	1,281,548	1,451,564

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	Alaska [a,b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon [d]	Total	Chinook	Other Salmon	Total
1983	198,436	1,678,597	1,877,033	18,952	29,490	48,442	217,388	1,708,087	1,925,475
1984	162,683	1,548,101	1,710,784	16,795	29,767	46,562	179,478	1,577,868	1,757,346
1985	187,327	1,657,984	1,845,311	19,301	41,515	60,816	206,628	1,699,499	1,906,127
1986	146,004	1,758,825	1,904,829	20,364	14,843	35,207	166,368	1,773,668	1,940,036
1987	188,386	1,246,176	1,434,562	17,614	44,786	62,400	206,000	1,290,962	1,496,962
1988	150,009	2,325,377	2,475,386	21,427	33,915	55,342	171,436	2,359,292	2,530,728
1989	157,632	2,289,501	2,447,133	17,944	23,490	41,434	175,576	2,312,991	2,488,567
1990	149,433	1,055,515	1,204,948	19,227	34,304	53,531	168,660	1,089,819	1,258,479
1991	154,651	1,335,111	1,489,762	20,607	35,653	56,260	175,258	1,370,764	1,546,022
1992	169,642	863,575	1,033,217	17,903	21,312	39,215	187,545	884,887	1,072,432
1993	161,718	341,593	503,311	16,611	14,150	30,761	178,329	355,743	534,072
1994	171,654	551,743	723,397	21,198	38,342	59,540	192,852	590,085	782,937
1995	179,748	1,437,837	1,617,585	20,884	46,109	66,993	200,632	1,483,946	1,684,578
1996	141,649	1,121,273	1,262,922	19,612	24,395	44,007	161,261	1,145,668	1,306,929
1997	176,025	545,066	721,091	16,528	15,900	32,428	192,553	560,966	753,519
1998	99,760	199,735	299,495	5,937	8,168	14,105	105,697	207,903	313,600
1999	125,427	236,464	361,891	12,468	19,736	32,204	137,895	256,200	394,095
2000	45,870	106,936	152,806	4,879	9,283	14,162	50,749	116,219	166,968
2001	56,620	116,523	173,143	10,144	9,872	20,016	66,764	126,395	193,159
2002	69,010	122,360	191,370	9,258	8,567	17,825	78,268	130,927	209,195
2003	101,000	199,917	300,917	9,619	11,435	21,054	110,619	211,352	321,971
2004	114,370	206,099	320,469	11,238	9,930	21,168	125,608	216,029	341,637
2005	86,369	478,749	565,118	11,371	18,583	29,954	97,740	497,332	595,072

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	Alaska [a,b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon [d]	Total	Chinook	Other Salmon	Total
2006	96,067	528,606	624,673	9,072	11,908	20,980	105,139	540,514	645,653
2007	90,753	532,103	622,856	5,094	14,332	19,426	95,847	546,435	642,282
2008	50,362	481,407	531,769	3,713	9,566	13,279	54,075	490,973	545,048
2009	35,111	354,624	389,735	4,758	2,011	6,769	39,869	356,635	396,504
2010	55,092	393,233	448,325	2,706	5,891	8,597	57,798	399,124	456,922
2011	41,625	762,109	803,734	4,884	8,226	13,110	46,509	770,335	816,844
2012 [e]	28,531	897,095	925,626	2,200	7,033	9,233	30,731	904,128	934,859
Average									
1961-2011	124,618	852,569	977,186	11,321	17,617	28,938	135,939	870,186	1,006,124
2002-2011	73,976	405,921	479,897	7,171	10,045	17,216	81,147	415,966	497,113
2007-2011	54,589	504,695	559,284	4,231	8,005	12,236	58,820	512,700	571,520

[a] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe.

[b] Commercial, subsistence, personal-use, test fish retained for subsistence, and sport catches combined. Does not include harvest from the Coastal District communities of Hooper Bay and Scammon Bay.

[c] Catch in number of salmon. Commercial, Aboriginal, domestic, and sport catches combined.

[d] Includes coho salmon harvests in First Nations recreational and commercial fisheries, most of which was harvested in the Old Crow Aboriginal fishery (99.8%).

[e] Data are preliminary.

Appendix B2.–Alaska catch of Yukon River Chinook salmon, 1961–2012.

Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
1961	21,488	119,664					141,152	141,152
1962	11,110	94,734					105,844	105,844
1963	24,862	117,048					141,910	141,910
1964	16,231	93,587					109,818	109,818
1965	16,608	118,098					134,706	134,706
1966	11,572	93,315					104,887	104,887
1967	16,448	129,656					146,104	146,104
1968	12,106	106,526					118,632	118,632
1969	14,000	91,027					105,027	105,027
1970	13,874	79,145					93,019	93,019
1971	25,684	110,507					136,191	136,191
1972	20,258	92,840					113,098	113,098
1973	24,317	75,353					99,670	99,670
1974	19,964	98,089					118,053	118,053
1975	12,867	63,838					76,705	76,705
1976	17,806	87,776					105,582	105,582
1977	17,581	96,757				156	114,494	114,494
1978	30,297	99,168				523	129,988	130,476
1979	31,005	127,673				554	159,232	159,232
1980	42,724	153,985				956	197,665	197,665
1981	29,690	158,018				769	188,477	188,477
1982	28,158	123,644				1,006	152,808	152,808
1983	49,478	147,910				1,048	198,436	198,436
1984	42,428	119,904				351	162,683	162,683
1985	39,771	146,188				1,368	187,327	187,327
1986	45,238	99,970				796	146,004	146,004
1987	51,418	134,760 [h]		1,706		502	188,386	188,386

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
1988	43,907	100,364		2,125	1,081	944	148,421	150,009
1989	48,446	104,198		2,616	1,293	1,063	157,616	157,632
1990	48,587	95,247 [i]	413	2,594	2,048	544	149,433	149,433
1991	46,773	104,878 [j]	1,538		689	773	154,651	154,651
1992	45,626	120,245 [k]	927		962	431	168,191	169,642
1993	62,486	93550	560	426	1572	1,695	160,289	161,718
1994	53,077	113,137	703		1631	2,281	170,829	171,654
1995	48,535	122,728	1,324	399	2,152	2,525	177,663	179,748
1996	43,306	89,671	521	215	1,698	3,873	139,284	141,649
1997	55,978	112,841	769	313	2811	2,174	174,886	176,025
1998	53,733	43618	81	357	926	654	99,369	99,760
1999	52,194	69,275	288	331	1,205	1,023	124,316	125,427
2000	35,841	8518	0	75	597	276	45,307	45,870
2001	52,937	- [l]	0	122	0	679	53,738	56,620
2002	42,620	24128	0	126	528	486	67,888	69,010
2003	55,109	40,438	0	204	680	2,719	99,150	101,000
2004	53,675	56,151	0	201	792	1,513	112,332	114,370
2005	52,561	32,029	0	138	310	483	85,521	86,369
2006	47,710	45,829	0	89	817	739	95,184	96,067
2007	53,976	33,634	0	136	849	960	89,555	90,753
2008	43,694	4,641	0	126	0	409	48,870	50,362
2009	32,900	316	0	127	0	863	34,206	35,111
2010	43,259	9,897	0	162	0	474	53,792	55,092
2011	40,211	82 [n]	0	89	0	474	40,856	41,625
2012	26,065 [m]	0	0	71 [m]	0	636 [o]	26,772	28,531

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
Averages								
1961-2011	36,159	88,092	324	576	943	1,031	124,064	124,627
2002-2011	46,572	24,715	0	140	398	912	72,735	73,976
2007-2011	42,808	9,714	0	128	170	636	53,456	54,589

[a] Includes test fish harvest and commercial retained fish (not sold) that were utilized for subsistence. Does not include harvest from the Coastal District communities of Scammon Bay and Hooper Bay.

[b] Includes ADF&G test fish sales prior to 1988.

[c] Includes an estimate of the number of salmon harvested for the commercial production of salmon roe; including carcasses from subsistence caught fish.

[d] Prior to 1987, and 1990, 1991, and 1994 personal use was considered part of subsistence.

[e] Test fish sales is the number of salmon sold by ADF&G test fisheries.

[f] Sport fish harvest for the Alaska portion of the Yukon River drainage. Most of this harvest is taken within the Tanana River drainage (see Brase and Baker (2012) and Burr (2012)).

[g] Yukon Area Total includes harvest from the Coastal District communities of Scammon Bay and Hooper Bay (1978, 1988–1989 and 1992 to present).

[h] Includes 653 and 2,136 Chinook salmon illegally sold in Districts 5 (Yukon River) and 6 (Tanana River), respectively.

[i] Includes the illegal sales of 1,101 Chinook salmon.

[j] Includes the illegal sales of 2,711 Chinook salmon in District 1, and 284 Chinook salmon in District 2.

[k] Includes the illegal sales of 1,218 Chinook salmon in District 1, and 207 Chinook salmon in District 2.

[l] Summer season commercial fishery was not conducted.

[m] Data are preliminary.

[n] No Chinook salmon were sold in the summer season. A total of 82 Chinook salmon were sold in District 1 and 2 in the fall season.

[o] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix B3.–Alaska catch of Yukon River summer chum salmon, 1970–2012.

Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
1970	166,504	137,006					303,510	303,510
1971	171,487	100,090					271,577	271,577
1972	108,006	135,668					243,674	243,674
1973	161,012	285,509					446,521	446,521
1974	227,811	589,892					817,703	817,703
1975	211,888	710,295					922,183	922,183
1976	186,872	600,894					787,766	787,766
1977	159,502	534,875				316	694,693	694,693
1978	171,383	1,052,226	25,761			451	1,249,821	1,249,821
1979	155,970	779,316	40,217			328	975,831	975,831
1980	167,705	928,609	139,106			483	1,235,903	1,235,903
1981	117,629	1,006,938	272,763			612	1,397,942	1,397,942
1982	117,413	461,403	255,610			780	835,206	835,206
1983	149,180	744,879	250,590			998	1,145,647	1,145,647
1984	166,630	588,597	277,443			585	1,033,255	1,033,255
1985	157,744	516,997	417,016			1,267	1,093,024	1,093,024
1986	182,337	721,469	467,381			895	1,372,082	1,372,082
1987	170,678	442,238	180,303	4,262		846	798,327	827,995
1988	196,599	1,148,650	468,032	2,225	3,587	1,037	1,820,130	1,851,360
1989	167,155	955,806 [h]	496,934	1,891	10,605	2,132	1,634,523	1,636,864
1990	115,609	302,625 [i]	214,552	1,827	8,263	472	643,348	643,348
1991	118,540	349,113 [j]	308,989		3,934	1,037	781,613	781,613
1992	125,497	332,313 [k]	211,264		1,967	1,308	672,349	689,044
1993	104,776	96,522	43,594	674	1,869	564	247,999	268,797
1994	109,904	80,284	178,457		3,212	350	372,207	387,110
1995	118,723	259,774	558,640	780	6,073	1,174	945,164	962,524
1996	102,503	147,127	535,106	905	7,309	1,946	794,896	817,131

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
1997	97,109	95,242	133,010	391	2,590	662	329,004	344,715
1998	86,004	28,611	187	84	3,019	421	118,326	119,688
1999	70,323	29,389	24	382	836	555	101,509	114,970
2000	64,895	6,624	0	30	648	161	72,358	85,535
2001	58,239	- [l]	0	146	0	82	58,467	72,383
2002	72,260	13,558	19	175	218	384	86,614	101,410
2003	68,304	10,685	0	148	119	1,638	80,894	94,862
2004	69,672	26,410	0	231	217	203	96,733	104,995
2005	78,902	41,264	0	152	134	435	120,887	135,244
2006	90,907	92,116	0	262	456	583	184,324	208,495
2007	76,805	198,201	0	184	10	245	275,445	291,566
2008	68,394	151,186	0	138	80	371	220,169	238,289
2009	67,742	170,272	0	308	0	174	238,496	251,293
2010	65,948	232,888	0	319	0	1,183	300,338	322,763
2011	77,715	275,161	0	439	0	294	353,609	371,914
2012	95,762 [m]	319,575 [m]	0	378 [m]	3,070 [m]	453 [n]	419,238	439,284

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
Averages								
1970-2011	124,340	375,140	161,029	725	2,298	713	623,192	632,149
2002-2011	73,665	121,174	2	236	123	551	195,751	212,083
2007-2011	71,321	205,542	0	278	18	453	277,611	295,165

[a] Includes test fish harvest and commercial retained fish (not sold) that were utilized for subsistence. Does not include harvest from the Coastal District communities of Scammon Bay and Hooper Bay.

[b] Includes ADF&G test fish sales prior to 1988.

[c] Includes an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses from subsistence caught fish. These data are only available since 1990. In JTC reports prior to 2009 subsistence plus commercial related harvests are noted as subsistence "use".

[d] Prior to 1987, 1990, 1991, and 1994 personal use was considered part of subsistence.

[e] Test fish sales is the number of salmon sold by ADF&G test fisheries.

[f] The majority of the sport fish harvest is taken in the Tanana River Drainage (see Brase and Baker (2012) and Burr (2012)). Division of Sport Fish does not differentiate between the 2 races of chum salmon. Sport fish harvest is assumed to be primarily summer chum salmon caught incidental to directed Chinook salmon fishing.

[g] Yukon Area Total includes subsistence harvest from the Coastal District communities of Hooper Bay and Scammon Bay (1978, 1987–1989 and 1992 to present).

[h] Includes illegal sales of 150 summer chum salmon in District 1.

[i] Does not include 1,233 female summer chum salmon sold in Subdistrict 6-C with roe extracted and roe sold separately. These fish are included in estimated harvest to produce roe sold.

[j] Includes the illegal sales of 1,023 summer chum salmon.

[k] Includes the sales of 31 summer chum salmon in District 1, and 91 summer chum salmon in District 2.

[l] Summer season commercial fishery was not conducted.

[m] Data are preliminary.

[n] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix B4.–Alaska harvest of Yukon River fall chum salmon, 1961–2012.

Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Yukon River Total	Yukon Area Total [f]
1961	101,772 [g, h]	42,461	0			144,233	144,233
1962	87,285 [g, h]	53,116	0			140,401	140,401
1963	99,031 [g, h]		0			99,031	99,031
1964	120,360 [g, h]	8,347	0			128,707	128,707
1965	112,283 [g, h]	23,317	0			135,600	135,600
1966	51,503 [g, h]	71,045	0			122,548	122,548
1967	68,744 [g, h]	38,274	0			107,018	107,018
1968	44,627 [g, h]	52,925	0			97,552	97,552
1969	52,063 [g, h]	131,310	0			183,373	183,373
1970	55,501 [g, h]	209,595	0			265,096	265,096
1971	57,162 [g, h]	189,594	0			246,756	246,756
1972	36,002 [g, h]	152,176	0			188,178	188,178
1973	53,670 [g, h]	232,090	0			285,760	285,760
1974	93,776 [g, h]	289,776	0			383,552	383,552
1975	86,591 [g, h]	275,009	0			361,600	361,600
1976	72,327 [g, h]	156,390	0			228,717	228,717
1977	82,771 [h]	257,986	0			340,757	340,757
1978	84,239 [h]	236,383	10,628			331,250	331,915
1979	214,881	359,946	18,466			593,293	593,293
1980	167,637	293,430	5,020			466,087	466,087
1981	177,240	466,451	11,285			654,976	654,976
1982	132,092	224,187	805			357,084	357,084
1983	187,864	302,598	5,064			495,526	495,526
1984	172,495	208,232	2,328			383,055	383,055
1985	203,947	267,744	2,525			474,216	474,216
1986	163,466	139,442	577			303,485	303,485
1987	342,597 [i]	[j]		19,066		361,663	361,885

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Yukon River Total	Yukon Area Total [f]
1988	151,586	133,763	3,227	3881	27,663	320,120	322,382
1989	211,147	270,195	14,749	5082	20,973	522,146	522,302
1990	167,900	124,174	12,168	5176	9,224	318,642	318,642
1991	145,524	230,852	23,366	0	3,936	403,678	403,678
1992	107,602	15,721 [k]	3,301	0	1,407	128,031	128,237
1993	76,762	[j]		163	0	76,925	77,045
1994	123,218	3,631	4,368	0	0	131,217	131,564
1995	130,506	250,733	32,324	863	1,121	415,547	415,901
1996	128,866	88,342	17,288	356	1,717	236,569	236,961
1997	95,141	56,713	1,474	284	867	154,479	154,479
1998	62,867	[j]		2	0	62,869	62,903
1999	89,736	20,371	0	261	1,171	111,539	111,743
2000	19,306	[j]		1	0	19,307	19,396
2001	35,144	[j]		10	0	35,154	35,713
2002	19,390	[j]		3	0	19,393	19,677
2003	56,784	10,996	0	394	0	68,174	68,320
2004	62,206	4,110	0	230	0	66,546	66,866
2005	91,464	180,249	0	133	0	271,846	271,916
2006	83,815	174,542	0	333	0	258,690	258,877
2007	100,987	90,677	0	173	0	191,837	192,071
2008	88,971	119,265	0	181	0	208,417	208,803
2009	65,961	25,269	0	78	0	91,308	91,466
2010	68,459	2,550	0	3,209	0	74,218	74,404
2011	79,887	238,979	0	347	0	319,213	319,528
2012	93,638 [l]	289,692	0	353 [l]	166	383,849	383,858

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Yukon River Total	Yukon Area Total [f]
Averages							
1961-2011	105,591	152,794	3,755	1,609	2,837	242,851	243,005
2002-2011	71,792	94,071	0	508	0	156,964	157,193
2007-2011	80,853	95,348	0	798	0	176,999	177,254

[a] Includes test fish harvest and commercial retained fish (not sold) that were utilized for subsistence. Does not include harvest from the Coastal District communities of Scammon Bay and Hooper Bay.

[b] Includes fish sold in the round and estimated numbers of female salmon commercially harvested for production of salmon roe (see Bergstrom et. al 1992; 1990 Yukon Area AMR). Includes ADF&G test fish prior to 1988. Beginning in 1999 commercial harvest may include some commercial related harvest.

[c] Includes an estimate of the number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence. In prior JTC reports subsistence plus commercial related harvests are noted as subsistence "use".

[d] Prior to 1987, and in 1991, 1992 and 1994 personal use was considered part of subsistence.

[e] Test fish sales is the number of salmon sold by ADF&G test fisheries.

[f] Yukon Area Total includes harvest from the Coastal District communities of Scammon Bay and Hooper Bay (1978, 1987–1989 and 1992 to present).

[g] Catches estimated because harvests of species other than Chinook salmon were not differentiated.

[h] Minimum estimates from 1961-1978 because subsistence surveys were conducted prior to the end of the fishing season.

[i] Includes an estimated 95,768 and 119,168 fall chum salmon illegally sold in Districts 5 (Yukon River) and 6, respectively.

[j] Commercial fishery was not conducted .

[k] Commercial fishery operated only in District 6, the Tanana River.

[l] Data are preliminary.

Appendix B5.–Alaska harvest of Yukon River coho salmon, 1961–2012.

Year	Subsistence	[a]	Commercial	[b]	Commercial Related	[c]	Personal Use	[d]	Test Fish Sales	[e]	Sport Fish	[f]	Yukon River Total	Yukon Area Total [g]
1961	9,192	[h, i]	2,855		0								12,047	12,047
1962	9,480	[h, i]	22,926		0								32,406	32,406
1963	27,699	[h, i]	5,572		0								33,271	33,271
1964	12,187	[h, i]	2,446		0								14,633	14,633
1965	11,789	[h, i]	350		0								12,139	12,139
1966	13,192	[h, i]	19,254		0								32,446	32,446
1967	17,164	[h, i]	11,047		0								28,211	28,211
1968	11,613	[h, i]	13,303		0								24,916	24,916
1969	7,776	[h, i]	15,093		0								22,869	22,869
1970	3,966	[h, i]	13,188		0								17,154	17,154
1971	16,912	[h, i]	12,203		0								29,115	29,115
1972	7,532	[h, i]	22,233		0								29,765	29,765
1973	10,236	[h, i]	36,641		0								46,877	46,877
1974	11,646	[h, i]	16,777		0								28,423	28,423
1975	20,708	[h, i]	2,546		0								23,254	23,254
1976	5,241	[h, i]	5,184		0								10,425	10,425
1977	16,333	[i]	38,863		0						112		55,308	55,308
1978	7,787	[i]	26,152		0						302		34,241	34,330
1979	9,794		17,165		0						50		27,009	27,009
1980	20,158		8,745		0						67		28,970	28,970
1981	21,228		23,680		0						45		44,953	44,953
1982	35,894		37,176		0						97		73,167	73,167
1983	23,905		13,320		0						199		37,424	37,424
1984	49,020		81,940		0						831		131,791	131,791
1985	32,264		57,672		0						808		90,744	90,744
1986	34,468		47,255		0						1,535		83,258	83,258
1987	82,371	[j]		[k]			2,523				1,292		86,186	86,186

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
1988	67,830	99,907	0	1,250	13,720	2,420	185,127	186,976
1989	40,711	85,493	0	872	3,945	1,811	132,832	133,045
1990	43,460	41,032	3,255	1,181	2,650	1,947	93,525	93,525
1991	37,388	103,180	3,506	0	2,971	2,775	149,820	149,820
1992	51,921	6,556 [l]	1,423	0	1,629	1,666	63,195	63,254
1993	15,772	[k]		0	0	897	16,669	16,709
1994	41,694	120	4,331	0	0	2,174	48,319	48,400
1995	28,225	45,939	1,074	417	193	1,278	77,126	77,278
1996	30,312	52,643	3,339	198	1,728	1,588	89,808	89,900
1997	23,945	35,320	0	350	498	1,470	61,583	61,583
1998	17,772	1	0	9	0	758	18,540	18,889
1999	20,823	1,601	0	147	236	609	23,416	23,484
2000	14,717	[k]		0	0	554	15,271	15,493
2001	21,620	[k]		34	0	1,248	22,902	23,404
2002	15,241	[k]		20	0	1,092	16,353	16,601
2003	23,580	25,243	0	549	0	1,477	50,849	51,141
2004	20,732	20,232	0	233	0	1,623	42,820	42,883
2005	26,971	58,311	0	107	0	627	86,016	86,295
2006	19,371	64,942	0	279	0	1,000	85,592	85,927
2007	19,514	44,575	0	135	0	597	64,821	64,931
2008	16,739	35,691	0	50	0	341	52,821	52,937
2009	15,760	8,026	0	70	0	964	24,820	25,066
2010	12,921	3,750	0	1,062	0	944	18,677	18,801
2011	12,289	76,303	0	232	0	463	89,287	89,342
2012	18,418 [m]	74,789	0	100 [m]	39	662 [n]	94,008	94,082

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Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total [g]
Averages								
1961-2011	22,919	29,619	368	389	1,149	1,019	51,396	51,505
2002-2011	18,312	37,453	0	274	0	913	53,206	53,392
2007-2011	15,445	33,669	0	310	0	662	50,085	50,215

[a] Includes test fish harvest and commercial retained fish (not sold) that were utilized for subsistence. Does not include harvest from the Coastal District communities of Scammon Bay and Hooper Bay.

[b] Includes fish sold in the round and estimated numbers of female salmon commercially harvested for production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR). Includes ADF&G test fish prior to 1988. Beginning in 1999 commercial harvest may include some commercial related harvest.

[c] Includes an estimate of number of salmon harvested for the commercial production of salmon roe and the carcasses used for subsistence.

[d] Prior to 1987, and 1991, 1992 and 1994 personal use was considered part of subsistence.

[e] Test fish sales is the number of salmon sold by ADF&G test fisheries.

[f] The majority of the sport-fish harvest is taken in the Tanana River drainage (see Brase and Baker (2012) and (Burr 2012)).

[g] Yukon Area Total includes harvest from the Coastal District communities of Scammon Bay and Hooper Bay (1978, 1988–1989 and 1992 to present).

[h] Catches estimated because harvests of species other than Chinook salmon were not differentiated.

[i] Minimum estimates from 1961-1978 because subsistence surveys were conducted prior to the end of the fishing season.

[j] Includes an estimated 5,015 and 31,276 coho salmon illegally sold in Districts 5 and 6 (Tanana River), respectively.

[k] Commercial fishery was not conducted.

[l] Commercial fishery operated only in District 6, the Tanana River.

[m] Data are preliminary.

[n] Data are unavailable at this time. Estimated based on the previous 5-year average.

Appendix B6.–Alaska and Canadian total utilization of Yukon River Chinook and fall chum salmon, 1961–2012.

	Chinook Salmon			Fall Chum Salmon		
Year	Canada [a]	Alaska [b, c]	Total	Canada [a]	Alaska [b, c]	Total
1961	13,246	141,152	154,398	9,076	144,233	153,309
1962	13,937	105,844	119,781	9,436	140,401	149,837
1963	10,077	141,910	151,987	27,696	99,031 [d]	126,727
1964	7,408	109,818	117,226	12,187	128,707	140,894
1965	5,380	134,706	140,086	11,789	135,600	147,389
1966	4,452	104,887	109,339	13,192	122,548	135,740
1967	5,150	146,104	151,254	16,961	107,018	123,979
1968	5,042	118,632	123,674	11,633	97,552	109,185
1969	2,624	105,027	107,651	7,776	183,373	191,149
1970	4,663	93,019	97,682	3,711	265,096	268,807
1971	6,447	136,191	142,638	16,911	246,756	263,667
1972	5,729	113,098	118,827	7,532	188,178	195,710
1973	4,522	99,670	104,192	10,135	285,760	295,895
1974	5,631	118,053	123,684	11,646	383,552	395,198
1975	6,000	76,705	82,705	20,600	361,600	382,200
1976	5,025	105,582	110,607	5,200	228,717	233,917
1977	7,527	114,494	122,021	12,479	340,757	353,236
1978	5,881	129,988	135,869	9,566	331,250	340,816
1979	10,375	159,232	169,607	22,084	593,293	615,377
1980	22,846	197,665	220,511	22,218	466,087	488,305
1981	18,109	188,477	206,586	22,281	654,976	677,257
1982	17,208	152,808	170,016	16,091	357,084	373,175
1983	18,952	198,436	217,388	29,490	495,526	525,016
1984	16,795	162,683	179,478	29,267	383,055	412,322
1985	19,301	187,327	206,628	41,265	474,216	515,481
1986	20,364	146,004	166,368	14,543	303,485	318,028
1987	17,614	188,386	206,000	44,480	361,663 [d]	406,143
1988	21,427	148,421	169,848	33,565	320,120	353,685
1989	17,944	157,616	175,560	23,020	522,146	545,166
1990	19,227	149,433	168,660	33,622	318,642	352,264
1991	20,607	154,651	175,258	35,418	403,678	439,096
1992	17,903	168,191	186,094	20,815	128,031 [e]	148,846
1993	16,611	160,289	176,900	14,090	76,925 [d]	91,015
1994	21,198	170,829	192,027	38,008	131,217	169,225
1995	20,884	177,663	198,547	45,600	415,547	461,147
1996	19,612	139,284	158,896	24,354	236,569	260,923
1997	16,528	174,886	191,414	15,600	154,479	170,079
1998	5,937	99,369	105,306	7,954	62,869	70,823
1999	12,468	124,316	136,784	19,636	111,539	131,175

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Year	Chinook Salmon			Fall Chum Salmon		
	Canada [a]	Alaska [b, c]	Total	Canada [a]	Alaska [b, c]	Total
2000	4,879	45,307	50,186	9,246	19,307 [d]	28,553
2001	10,144	53,738 [f]	63,882	9,872	35,154 [d]	45,026
2002	9,258	67,888	77,146	8,092	19,393 [d]	27,485
2003	9,619	99,150	108,769	10,905	68,174	79,079
2004	11,238	112,332	123,570	9,750	66,546	76,296
2005	11,371	85,521	96,892	18,572	271,846	290,418
2006	9,072	95,184	104,256	11,796	258,690	270,486
2007	5,094	89,555	94,649	13,830	191,837	205,667
2008	3,426	48,870	52,296	9,566	208,417	217,983
2009	4,758	34,206	38,964	2,011	91,308	93,319
2010	2,705	53,792	56,497	5,787	74,218	80,005
2011	4,884	40,856	45,740	8,163	319,213	327,376
2012 [g]	2,200	26,772	28,972	7,023	383,849	390,872
Averages						
1961-2011	11,321	124,064	135,385	17,422	242,851	260,272
2002-2011	7,171	72,735	79,907	9,847	156,964	166,811
2007-2011	4,231	53,456	57,687	7,871	176,999	184,870

Note: Canadian managers sometimes do not refer to chum as fall chum salmon since they only have one run.

[a] Catches in number of salmon. Includes commercial, Aboriginal, domestic, and sport catches combined.

[b] Catch in number of salmon. Includes estimated number of salmon harvested for the commercial production of salmon roe (see Bergstrom et al. 1992: 1990 Yukon Area AMR).

[c] Commercial, subsistence, personal-use, test fish, and sport catches combined. Does not include the subsistence harvest from the Coastal District communities of Hooper Bay and Scammon Bay.

[d] Commercial fishery did not operate within the Alaska portion of the drainage.

[e] Commercial fishery operated only in District 6, the Tanana River.

[f] No commercial fishery was conducted during the summer season.

[g] Data are preliminary.

Appendix B7.–Canadian catch of Yukon River Chinook salmon, 1961–2012.

	Mainstem Yukon River Harvest							Porcupine River Aboriginal Fishery	Total Canadian
Year	Commercial	Domestic	Aboriginal Fishery	Sport [a]	Test Fishery	Combined Non-Commercial	Total	Harvest	Harvest
1961	3,446		9,300			9,300	12,746	500	13,246
1962	4,037		9,300			9,300	13,337	600	13,937
1963	2,283		7,750			7,750	10,033	44	10,077
1964	3,208		4,124			4,124	7,332	76	7,408
1965	2,265		3,021			3,021	5,286	94	5,380
1966	1,942		2,445			2,445	4,387	65	4,452
1967	2,187		2,920			2,920	5,107	43	5,150
1968	2,212		2,800			2,800	5,012	30	5,042
1969	1,640		957			957	2,597	27	2,624
1970	2,611		2,044			2,044	4,655	8	4,663
1971	3,178		3,260			3,260	6,438	9	6,447
1972	1,769		3,960			3,960	5,729		5,729
1973	2,199		2,319			2,319	4,518	4	4,522
1974	1,808	406	3,342			3,748	5,556	75	5,631
1975	3,000	400	2,500			2,900	5,900	100	6,000
1976	3,500	500	1,000			1,500	5,000	25	5,025
1977	4,720	531	2,247			2,778	7,498	29	7,527
1978	2,975	421	2,485			2,906	5,881		5,881
1979	6,175	1,200	3,000			4,200	10,375		10,375
1980	9,500	3,500	7,546	300		11,346	20,846	2,000	22,846
1981	8,593	237	8,879	300		9,416	18,009	100	18,109
1982	8,640	435	7,433	300		8,168	16,808	400	17,208
1983	13,027	400	5,025	300		5,725	18,752	200	18,952
1984	9,885	260	5,850	300		6,410	16,295	500	16,795
1985	12,573	478	5,800	300		6,578	19,151	150	19,301
1986	10,797	342	8,625	300		9,267	20,064	300	20,364
1987	10,864	330	6,069	300		6,699	17,563	51	17,614
1988	13,217	282	7,178	650		8,110	21,327	100	21,427
1989	9,789	400	6,930	300		7,630	17,419	525	17,944
1990	11,324	247	7,109	300		7,656	18,980	247	19,227
1991	10,906	227	9,011	300		9,538	20,444	163	20,607
1992	10,877	277	6,349	300		6,926	17,803	100	17,903

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Year	Mainstem Yukon River Harvest							Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
	Commercial	Domestic	Aboriginal Fishery	Sport [a]	Test Fishery	Combined Non-Commercial	Total		
1993	10,350	243	5,576	300		6,119	16,469	142	16,611
1994	12,028	373	8,069	300		8,742	20,770	428	21,198
1995	11,146	300	7,942	700		8,942	20,088	796	20,884
1996	10,164	141	8,451	790		9,382	19,546	66	19,612
1997	5,311	288	8,888	1,230		10,406	15,717	811	16,528
1998	390	24	4,687	-	737	5,448	5,838	99	5,937
1999	3,160	213	8,804	177		9,194	12,354	114	12,468
2000	-	-	4,068	-	761	4,829	4,829	50	4,879
2001	1,351	89	7,421	146	767	8,423	9,774	370	10,144
2002	708	59	7,139	128	1,036	8,362	9,070	188	9,258
2003	2,672	115	6,121	275	263	6,774	9,446	173	9,619
2004	3,785	88	6,483	423	167	7,161	10,946	292	11,238
2005	4,066	99	6,376	436		6,911	10,977	394	11,371
2006	2,332	63	5,757	606		6,426	8,758	314	9,072
2007	-	-	4,175	2 [b]	617	4,794	4,794	300	5,094
2008	1 [c]	-	2,885	-	513	3,398	3,399	314	3,713
2009	364	17	3,791	125		3,933	4,297	461	4,758
2010	-	-	2,455 [d]	1 [e]		2,456	2,456	250	2,706
2011	4 [c]	-	4,550 [d]	40		4,590	4,594	290	4,884
2012 [f]	-	-	2,000 [d]	-		2,000	2,000	200	2,200
Averages									
1961-2011	5,595	393	5,377	342	608	5,921	11,078	259	11,321
2002-2011	2,321 [g]	74	4,973	226	519	5,481	6,874	298	7,171
2007-2011	364 [g]	17	3,571	42	565	3,834	3,908	323	4,231

Note: Dash "-" means fishery did not occur.

[a] Sport fish harvest unknown before 1980.

[b] Sport fishery involved non-retention of Chinook salmon for most of the season thus effectively closed.

[c] Closed during Chinook salmon season, harvested in chum salmon fishery.

[d] Adjusted to account for underreporting.

[e] Fishery was closed, one fish mistakenly caught and retained.

[f] Data are preliminary.

[g] 2008 and 2011 were not included in average.

Appendix B8.–Canadian catch of Yukon River fall chum salmon, 1961–2012.

	Mainstem Yukon River Harvest						Porcupine River Aboriginal Fishery	Total Canadian
Year	Commercial	Domestic	Aboriginal Fishery	Test Fishery	Combined Non-Commercial [a]	Total [a]	Harvest	Harvest
1961	3,276		3,800		3,800	7,076	2,000	9,076
1962	936		6,500		6,500	7,436	2,000	9,436
1963	2,196		5,500		5,500	7,696	20,000	27,696
1964	1,929		4,200		4,200	6,129	6,058	12,187
1965	2,071		2,183		2,183	4,254	7,535	11,789
1966	3,157		1,430		1,430	4,587	8,605	13,192
1967	3,343		1,850		1,850	5,193	11,768	16,961
1968	453		1,180		1,180	1,633	10,000	11,633
1969	2,279		2,120		2,120	4,399	3,377	7,776
1970	2,479		612		612	3,091	620	3,711
1971	1,761		150		150	1,911	15,000	16,911
1972	2,532				0	2,532	5,000	7,532
1973	2,806		1,129		1,129	3,935	6,200	10,135
1974	2,544	466	1,636		2,102	4,646	7,000	11,646
1975	2,500	4,600	2,500		7,100	9,600	11,000	20,600
1976	1,000	1,000	100		1,100	2,100	3,100	5,200
1977	3,990	1,499	1,430		2,929	6,919	5,560	12,479
1978	3,356	728	482		1,210	4,566	5,000	9,566
1979	9,084	2,000	11,000		13,000	22,084		22,084
1980	9,000	4,000	3,218		7,218	16,218	6,000	22,218
1981	15,260	1,611	2,410		4,021	19,281	3,000	22,281
1982	11,312	683	3,096		3,779	15,091	1,000	16,091
1983	25,990	300	1,200		1,500	27,490	2,000	29,490
1984	22,932	535	1,800		2,335	25,267	4,000	29,267
1985	35,746	279	1,740		2,019	37,765	3,500	41,265
1986	11,464	222	2,200		2,422	13,886	657	14,543
1987	40,591	132	3,622		3,754	44,345	135	44,480
1988	30,263	349	1,882		2,231	32,494	1,071	33,565
1989	17,549	100	2,462		2,562	20,111	2,909	23,020
1990	27,537	0	3,675		3,675	31,212	2,410	33,622
1991	31,404	0	2,438		2,438	33,842	1,576	35,418
1992	18,576	0	304		304	18,880	1,935	20,815
1993	7,762	0	4,660		4,660	12,422	1,668	14,090

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	Mainstem Yukon River Harvest						Porcupine River Aboriginal Fishery Harvest	Total Canadian Harvest
Year	Commercial	Domestic	Aboriginal Fishery	Test Fishery	Combined Non-Commercial [a]	Total [a]		
1994	30,035	0	5,319		5,319	35,354	2,654	38,008
1995	39,012	0	1,099		1,099	40,111	5,489	45,600
1996	20,069	0	1,260		1,260	21,329	3,025	24,354
1997	8,068	0	1,238		1,238	9,306	6,294	15,600
1998 [b]	-		1,795		1,795	1,795	6,159	7,954
1999	10,402	0	3,234		3,234	13,636	6,000	19,636
2000	1,319	0	2,927		2,927	4,246	5,000	9,246
2001	2,198	3	3,077	1 [c]	3,080	5,278	4,594	9,872
2002	3,065	0	3,167	2,756 [c]	3,167	6,232	1,860	8,092
2003	9,030	0	1,493	990 [c]	1,493	10,523	382	10,905
2004	7,365	0	2,180	995 [c]	2,180	9,545	205	9,750
2005	11,931	13	2,035		2,048	13,979	4,593	18,572
2006	4,096	0	2,521		2,521	6,617	5,179	11,796
2007	7,109	0	2,221	3,765 [c]	2,221	9,330	4,500	13,830
2008	4,062	0	2,068		2,068	6,130	3,436	9,566
2009	293	0	820		820	1,113	898	2,011
2010	2,186	0	1,523 [d]		1,523	3,709	2,078	5,787
2011	5,312	0	1,000 [d]		1,000	6,312	1,851	8,163
2012 [e]	3,205	0	700 [d]		700	3,905	3,118	7,023
Averages								
1961-2011	10,453	501	2,430	1,701	2,745	12,993	4,518	17,422
2002-2011	5,445	1	1,903	2,127	1,904	7,349	2,498	9,847
2007-2011	3,792	-	1,526	3,765	1,526	5,319	2,553	7,871

Note: Dash"-" means fishery did not occur.

[a] Test fishery was not included in totals as it was live-release.

[b] A test fishery and aboriginal fishery took place, but all other fisheries were closed.

[c] The chum salmon test fishery practiced live-release.

[d] Adjusted to account for underreporting.

[e] Data are preliminary.

Appendix B9.–Chinook salmon aerial survey indices for selected spawning areas in the Alaska portion of the Yukon River drainage, 1961–2012.

	Andreafsky River		Anvik River		Nulato River			Gisasa River
Year	East Fork	West Fork	Drainagewide Total	Index Area [a]	North Fork [b]	South Fork	Both Forks	
1961	1,003		1,226		376 [c]	167	543	266 [c]
1962	675 [c]	762 [c]						
1963								
1964	867	705						
1965		355 [c]	650 [c]					
1966	361	303	638					
1967		276 [c]	336 [c]					
1968	380	383	310 [c]					
1969	231 [c]	231 [c]	296 [c]					
1970	665	574 [c]	368					
1971	1,904	1,682						
1972	798	582 [c]	1,198					
1973	825	788	613					
1974		285	471 [c]		55 [c]	23 [c]	78 [c]	161
1975	993	301	730		123	81	204	385
1976	818	643	1,053		471	177	648	332
1977	2,008	1,499	1,371		286	201	487	255
1978	2,487	1,062	1,324		498	422	920	45 [c]
1979	1,180	1,134	1,484		1,093	414	1,507	484
1980	958 [c]	1,500	1,330	1,192	954 [c]	369 [c]	1,323 [c]	951
1981	2,146 [c]	231 [c]	807 [c]	577 [c]		791	791	
1982	1,274	851						421
1983			653 [c]	376 [c]	526	480	1,006	572
1984	1,573 [c]	1,993	641 [c]	574 [c]				
1985	1,617	2,248	1,051	720	1,600	1,180	2,780	735
1986	1,954	3,158	1,118	918	1,452	1,522	2,974	1,346
1987	1,608	3,281	1,174	879	1,145	493	1,638	731
1988	1,020	1,448	1,805	1,449	1,061	714	1,775	797
1989	1,399	1,089	442 [c]	212 [c]				
1990	2,503	1,545	2,347	1,595	568 [c]	430 [c]	998 [c]	884 [c]
1991	1,938	2,544	875 [c]	625 [c]	767	1,253	2,020	1,690
1992	1,030 [c]	2,002 [c]	1,536	931	348	231	579	910
1993	5,855	2,765	1,720	1,526	1,844	1,181	3,025	1,573
1994	300 [c]	213 [c]		913 [c]	843	952	1,795	2,775
1995	1,635	1,108	1,996	1,147	968	681	1,649	410
1996		624	839	709		100	100	
1997	1,140	1,510	3,979	2,690				144 [c]
1998	1,027	1,249 [c]	709 [c]	648 [c]	507	546	1,053	889 [c]

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	Andreafsky River		Anvik River		Nulato River			Gisasa River
Year	East Fork	West Fork	Drainagewide Total	Index Area [a]	North Fork [b]	South Fork	Both Forks	
1999	[c]	870 [c]	[c]	950 [c]	[c]	[c]		[c]
2000	1,018	427	1,721	1,394	[c]	[c]		[c]
2001	1,059	565	1,420	1,177	1,116	768	1,884 [d]	1,298 [c]
2002	1,447	917	1,713	1,329	687	897	1,584	506
2003	1,116 [c]	1,578 [c]	1,100 [c]	973 [c]	[c]	[c]		
2004	2,879	1,317	3,679	3,304	856	465	1,321	731
2005	1,715	1,492	2,421	1,922	323	230	553	958
2006	591 [c]	824	1,876	1,776 [e]	1,292	-	1,292	843
2007	1,758	976	1,529	1,497	2,583	-	2,583	593
2008	278 [c]	262 [c]	992 [c]	827 [c]	922	-	922	487
2009	84 [c]	1,678	832	590	2,260	-	2,260	515
2010	537	858	974	721	356	355	711	264
2011	620	1,173	642	501	788	613	1,401	906
2012	[c]	[c]	722	451	682	691	1,373	[c]
SEG [f]	[g]	640-1,600		1,100-1,700			940-1,900	[g]
Averages								
1961-2011	1,302	1,122	1,227	1,117	889	562	1,325	746
2002-2011	1,103	1,108	1,576	1,344	1,119	512	1,403	645
2007-2011	655	989	994	827	1,382	484	1,575	553

Note: Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.

[a] Anvik River Index Area includes mainstem counts between Yellow River and McDonald Creek.

[b] Nulato River mainstem aerial survey counts below the forks are included with the North Fork.

[c] Incomplete, poor timing and/or poor survey conditions resulting in minimal or inaccurate counts.

[d] In 2001, the Nulato River escapement goal was established for both forks combined.

[e] Index area includes counts from Beaver Creek to McDonald Creek.

[f] Sustainable escapement goal.

[g] Escapement goal was discontinued in 2010. Note: weir-based goal replaced E. Fork Andreafsky R. aerial survey goal.

Appendix B10.–Chinook salmon escapement counts for selected spawning areas in the Alaska portion of the Yukon River drainage, 1986–2012.

	Andreafsky River Weir		Nulato River Tower	Henahaw Creek Weir		Gisasa River Weir		Chena River Tower		Salcha River Tower	
Year	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem. [a]	No. Fish	% Fem. [a]
1986	1,530	23.3 [b]						9,065 [c]	25.4		
1987	2,011	56.1 [b]						6,404 [c]	48.2	4,771 [c]	52.0
1988	1,339	38.7 [b]						3,346 [c]	33.9	4,322 [c]	45.3
1989		13.6 [d]						2,730 [c]	45.3	3,294 [c]	43.8
1990		41.6 [d]						5,603 [c]	36.3	10,728 [c]	36.2
1991		33.9 [d]						3,172 [c]	31.5	5,608 [c]	40.7
1992		21.2 [d]						5,580 [c]	21.6	7,862 [c]	36.0
1993		29.9 [d]						12,241 [b]	11.7	10,007 [b]	23.9
1994	7,801	35.5 [e]	1,795			2,888	[f]	11,877 [b]	32.4	18,399 [b]	38.8
1995	5,841	43.7 [e]	1,412			4,023	46.0	11,394 [c]	51.7	13,643 [b]	48.5
1996	2,955	41.9 [e]	756			1,991	19.5	7,153 [c]	26.8	7,570 [c]	26.2
1997	3,186	36.8 [e]	4,766			3,764	26.0	13,390 [b]	25.6	18,514 [b]	43.4
1998	4,034	29.0 [e]	1,536			2,414	16.2	4,745 [b]	28.4	5,027 [b]	26.1
1999	3,444	28.6 [e]	1,932			2,644	26.4	6,485 [b]	45.6	9,198 [b]	47.4
2000	1,609	54.3 [e]	908	244	29.7	2,089	34.4	4,694 [c]	21.7	4,595 [b]	38.1
2001		[g]	[g]	1,103	36.3	3,052	49.2	9,696 [b]	30.1	13,328 [b]	32.5
2002	4,123	21.1 [e]	2,696	649	30.8	2,025	20.7	6,967 [c]	27.3	9,000 [b,h]	30.1
2003	4,336	45.3 [e]	1,716 [e]	763	38.4	1,901	38.1	11,100 [b,i]	31.8	15,500 [b,h]	34.3
2004	8,045	37.3 [e]	[j]	1,248	21.3	1,774	30.1	9,645 [b]	43.9	15,761 [b]	54.5
2005	2,239	50.2 [e]	[j]	1,059	41.4	3,111	34.0	[g]	30.6	5,988 [b]	47.1
2006	6,463	42.6 [e]	[j]		[g]	3,030	28.2	2,936 [b]	32.1	10,679 [b]	37.6
2007	4,504	44.7 [e]	[j]	740	24.9	1,425	39.0	3,806 [b]	26.0	6,425 [b]	31.0
2008	4,242	34.8 [e]	[j]	766	27.7	1,735	16.2	3,208 [b]	29.0	5,415 [b,h]	34.1
2009	3,004	46.0 [e]	[j]	1,637	49.0	1,955	29.3	5,253 [b]	40.0	12,774 [b]	33.9
2010	2,413	48.6 [e]	[j]	857	49.6	1,516	29.0	2,382 [b]	20.6	6,135 [b]	26.6
2011	5,213	20.2 [e]	[j]	1,796	33.9	2,692	19.5	[g]	22.7	7,200 [k]	36.3
2012	2,517	28.0 [l]	[j]	922	43.0 [l]	1,323	17.0	2,220 [b,m]	39.1	7,165 [b]	50.9
SEG[n]	2,100-4,900										
BEG[o]								2,800-5,700		3,300-6,500	

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	Andreafsky River Weir		Nulato River Tower	Henahaw Creek Weir		Gisasa River Weir		Chena River Tower		Salcha River Tower	
Year	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.
Averages											
1986-2011	3,917	36.8	1,946	987	34.8	2,446	29.5	6,786	31.5	9,270	37.8
2002-2011	4,458	39.1	2,206	1,057	35.2	2,116	28.4	5,662	30.4	9,488	36.6
2007-2011	3,875	38.9	-	1,159	37.0	1,865	26.6	3,662	27.7	7,590	32.4

[a] In years when only carcass surveys were conducted, proportions of males and females were adjusted based on the average of ratios of unbiased estimates from mark–recapture experiments to estimates from carcass samples over those years when mark–recapture studies were conducted. In years when mark–recapture experiments were conducted, proportions of males and females were estimated as the ratio of the abundance estimate of each gender to the abundance estimate of all fish.

[b] Tower counts.

[c] Mark–recapture population estimate.

[d] Counting project terminated due to budget constraints.

[e] Weir counts.

[f] Partial weir counts.

[g] No estimate due to extreme high water conditions.

[h] Estimate includes an expansion for missed counting days based on average run timing. Minimum documented abundances from successful counting days were 4,644 in 2002, 11,758 in 2003, and 5,415 in 2008.

[i] Estimate includes an expansion for missed counting days based on average run timing. Minimum documented abundance during successful counting days was 8,739 (SE=653) fish.

[j] Project did not operate.

[k] Aerial survey estimate. High water conditions prevented tower counting much of the season.

[l] Preliminary.

[m] Estimated includes an expansion for missed counting days based on using 2 DIDSON sonars to assess Chinook salmon passage.

[n] Sustainable escapement goal SEG) established by the Alaska Board of Fisheries, January 2010.

[o] Biological escapement goal (BEG) established by the Alaska Board of Fisheries, January 2001.

Appendix B11.–Chinook salmon estimated U.S.-Canada border passage, total Canadian harvest, and spawning escapement in Canada, 1982–2012.

Year	Historic Wheel Mark-recapture Border Passage Estimate [a]	Canadian Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Spawning Escapement Estimate [b]
1982	36,598	60,346 [c]	16,808	43,538
1983	47,741	63,227 [c]	18,752	44,475
1984	43,911	66,300 [c]	16,295	50,005
1985	29,881	59,586 [c]	19,151	40,435
1986	36,479	61,489 [c]	20,064	41,425
1987	30,823	58,870 [c]	17,563	41,307
1988	44,445	61,026 [c]	21,327	39,699
1989	42,620	77,718 [c]	17,419	60,299
1990	56,679	78,192 [c]	18,980	59,212
1991	41,187	63,172 [c]	20,444	42,728
1992	43,185	56,958 [c]	17,803	39,155
1993	45,027	52,713 [c]	16,469	36,244
1994	46,680	77,219 [c]	20,770	56,449
1995	52,353	70,761 [c]	20,088	50,673
1996	47,955	93,606 [c]	19,546	74,060
1997	53,400	69,538 [c]	15,717	53,821
1998	22,588	41,335 [c]	5,838	35,497
1999	23,716	49,538 [c]	12,354	37,184
2000	16,173	30,699 [c]	4,829	25,870
2001	52,207	62,333 [c]	9,774	52,559
2002	49,214	51,428 [d]	9,070	42,358
2003	56,929	90,037 [d]	9,446	80,591
2004	48,111	59,415 [d]	10,946	48,469
2005	42,245	78,962 [e]	10,977	67,985
2006	36,748	71,388 [e]	8,758	62,630
2007	22,120	39,698 [e]	4,794	34,904
2008	14,666	37,282 [e]	3,399	33,883

-continued-

Year	Historic Wheel Mark-recapture Border Passage Estimate [a]	Canadian Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Spawning Escapement Estimate [b]
2009	-	69,575 [e]	4,297	65,278
2010	-	34,470 [e]	2,456	32,014
2011	-	50,901 [e]	4,594	46,307
2012	-	34,656 [e]	2,000	32,656
Averages				
1982-2011	40,136	61,259	13,291	47,968
2002-2011	NA	58,316	6,874	51,442
2007-2011	NA	46,385	3,908	42,477

[a] From 1982 to 2008, a mark-recapture program was used to determine border passage. Fish wheels near the US/Canada border captured and tagged fish and recaptures were collected from upstream fisheries. After Eagle sonar operations initiated in 2005, it became obvious that the mark-recapture estimates were biased low and the JTC recommended future fish passage estimates to be based on Eagle sonar passage estimates.

[b] Canadian spawning escapement estimated as border passage minus Canadian harvest, except where estimated directly as noted as follows.

[c] Chinook salmon passage for Yukon mainstem at U.S.-Canada border from 1982-2001 was reconstructed using a linear relationship with 3-area index (aerial surveys of Little Salmon, Big Salmon, and Nisutlin rivers in 2002-2007) plus Canadian harvests.

[d] Border passage estimated in 2002-2004 using escapement estimate from a radio tagging proportion study, plus Canadian harvest.

[e] Border passage estimated from Eagle sonar counts since 2005.

Appendix B12.–Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2012.

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a,c]	Nisutlin River [a,d]	Ross River [a,e]	Wolf River [a,f]	Blind Creek Weir	Chandindu River Weir	Big Salmon Sonar	Klondike River Sonar	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution
1961												1,068	0
1962												1,500	0
1963												483	0
1964												595	0
1965												903	0
1966		7 [g]										563	0
1967												533	0
1968			173 [g]	857 [g,c]	407 [g]	104 [g]						414	0
1969			120	286	105							334	0
1970		100		670 [c]	615		71 [g]					625	0
1971		130	275	275 [c]	650		750 [h]					856	0
1972		80	126	415	237		13 [h]					391	0
1973		99	27 [g]	75 [g]	36 [g]							224	0
1974		192		70 [g]	48 [g]							273	0
1975		175		153 [g]	249		40 [g]					313	0
1976		52		86 [g]	102							121	0
1977		150	408	316 [g]	77							277	0
1978		200	330	524	375							725	0
1979		150	489 [g]	632	713		183 [g]					1,184	0
1980		222	286 [g]	1,436	975		482					1,383	0
1981		133	670	2,411	1,626	949	502					1,555	0
1982		73	403	758	578	155	225					473	0
1983	100	264	101 [g]	540	701	43 [g,i]	252					905	0
1984	150	153	434	1,044	832	151 [g]	374					1,042	0
1985	210	190	255	801	409	23 [g]	226					508	0
1986	228	155	54 [g]	745	459 [g]	72 [j]	271					557	0
1987	100	159	468	891	183	180 [g]	39					327	0
1988	204	152	368	765	267	242	78					405	16

-continued-

Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a,c]	Nisutlin River [a,d]	Ross River [a,e]	Wolf River [a,f]	Blind Creek Weir	Chandindu River Weir	Big Salmon Sonar	Klondike River Sonar	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution
1989	88	100	862	1,662	695	433 [j]	135					549	19
1990	83	643	665	1,806	652	457 [g]	380					1,407	24
1991			326	1,040		250	201					1,266 [k]	51 [k]
1992	73	106	494	617	241	423	110					758 [k]	84 [k]
1993		183	184	572	339	400	168					668 [k]	73 [k]
1994	101 [g]	477	726	1,764	389	506	393					1,577 [k]	54 [k]
1995	121	397	781	1,314	274	253 [g]	229					2,103	57
1996	150	423	1,150	2,565	719	102 [g]	706					2,958	35
1997	193	1,198	1,025	1,345	277		322	957				2,084	24
1998	53	405	361	523	145		66	373	132			777	95
1999		252	495	353	330		131	892	239			1,118	74
2000	19 [l]	276 [m]	46	113	20		32		4			677	69
2001	39 [l]		1,035	1,020	481		154		129			988	36
2002			526	1,149	280		84					605	39
2003			1,658	3,075	687		292	1,115	185			1,443	70
2004			1,140	762	330		226	792				1,989	76
2005			1,519	952	807	363	260	525		5,584		2,632	57
2006			1,381	1,140	601		114	677		7,308		1,720	47
2007			451	601	137		54	304		4,450		427	56
2008			93	303			22	276		1,329		399	54
2009			821	1,827	497		134	716		9,261	5,147	828	47
2010			63 [g]	656	288		94	270		3,817	803	672	49
2011			38 [g]	405			81	360		5,156	1,181	1,534	48
2012[r]								157		2,553		1,030	59
Averages													
1961-2011	120	235	521	894	435	284	213	605	138	5,272	-	936	25
2002-2011	-	-	769	1,087	453	-	136	559	-	5,272	-	1,225	54
2007-2011	-	-	293	758	307	-	77	385	-	4,803	2,377	772	51

-continued-

Note: Canadian mainstem border passage and spawning escapement estimates are based on a 3-Area escapement index, radiotelemetry (local) (2002–2004), and Eagle Sonar (2005–2007).

[a] Data obtained by aerial survey unless otherwise noted. Only peak counts are listed. Survey rating is fair to good, unless otherwise noted.

[b] All foot surveys prior to 1997 except 1978 (boat survey) and 1986 (aerial survey) and weir counts from 1997 to 2000.

[c] For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.

[d] One Hundred Mile Creek to Sidney Creek.

[e] Index areas is from Big Timber Creek to Lewis Lake.

[f] Wolf Lake to Fish Lake outlet except where otherwise indicated.

[g] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

[h] Counts are for Wolf Lake to Red River portion of survey area only. Corresponding counts for 1987 to 1982 are: 377, 395, 104, 95, 124, 110, 109, and 14, respectively. The corresponding count for this section in 1990 was 188.

[i] Information on area surveyed is unavailable.

[j] Counts are for Big Timber Creek to Sheldon Lake.

[k] Counts and estimated percentages may be slightly exaggerated. In some or all of these years a number of adipose-clipped fish ascended the fishway, and were counted more than once. These fish would have been released into the fishway as fry between 1989 and 1994, inclusive.

[l] Foot survey.

[m] Flood conditions caused early termination of this program.

[n] High water delayed project installation, therefore, counts are incomplete.

[o] Weir was breached from July 31 to August 7 due to high water.`

[p] Resistance board weir tested for 3 weeks.

[q] Combination resistance board weir and conduit weir tested and operational from July 10-30.

[r] Data are preliminary.

Appendix B13.–Summer chum salmon ground based escapement counts for selected spawning areas in the Alaska portion of the Yukon River drainage, 1973–2012.

	Andreafsky River			Anvik River			Rodo River	Kaltag River	Nulato River		
	East Fork		West Fork						South Fork	North Fork [a]	Mainstem
Year	Aerial [b]	Sonar, Tower, or Weir Counts	Aerial [b]	Tower and Aerial [c]	Sonar	Aerial [b]	Tower	Aerial [b]	Aerial [b]	Tower
1973	10,149 [d]		51,835	249,015						
1974	3,215 [d]		33,578	411,133		16,137		29,016	29,334	
1975	223,485		235,954	900,967		25,335		51,215	87,280	
1976	105,347		118,420	511,475		38,258		9,230 [d]	30,771	
1977	112,722		63,120	358,771		16,118		11,385	58,275	
1978	127,050		57,321	307,270		17,845		12,821	41,659	
1979	66,471		43,391	-	277,712	-		1,506	35,598	
1980	36,823 [d]		114,759	-	482,121	-		3,702 [d]	11,244 [d]	
1981	81,555	147,312 [e]	-	-	1,479,582	-		14,348	-	
1982	7,501 [d]	180,078 [e]	7,267 [d]	-	444,581	-		-	-	
1983	-	110,608 [e]	-	-	362,912	-		1,263 [d]	19,749	
1984	95,200 [d]	70,125 [e]	238,565	-	891,028	-		-	-	
1985	66,146	-	52,750	-	1,080,243	24,576		10,494	19,344	
1986	83,931	167,614 [f]	99,373	-	1,085,750	-		16,848	47,417	
1987	6,687 [d]	45,221 [f]	35,535	-	455,876	-		4,094	7,163	
1988	43,056	68,937 [f]	45,432	-	1,125,449	13,872		15,132	26,951	
1989	21,460 [d]	-	-	-	636,906	-		-	-	
1990	11,519 [d]	-	20,426 [d]	-	403,627	1,941 [d]		3,196 [d,g]	1,419 [d]	
1991	31,886	-	46,657	-	847,772	3,977		13,150	12,491	
1992	11,308 [d]	-	37,808 [d]	-	775,626	4,465		5,322	12,358	
1993	10,935 [d]	-	9,111 [d]	-	517,409	7,867		5,486	7,698	
1994	-	200,981 [h,i]	-	-	1,124,689	-	47,295	-	-	148,762 [i]
1995	-	172,148 [h]	-	-	1,339,418	12,849	77,193	10,875	29,949	236,890
1996	-	108,450 [h]	-	-	933,240	4,380	51,269	8,490 [d,h]	-	129,694

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	Andreafsky River			Anvik River		Rodo River	Kaltag River	Nulato River		
	East Fork		West Fork					South Fork	North Fork [a]	Mainstem
Year	Aerial [b]	Sonar, Tower, or Weir Counts	Aerial [b]	Tower and Aerial [c]	Sonar	Aerial [b]	Tower	Aerial [b]	Aerial [b]	Tower
1997	-	51,139 [h]	-	-	605,752	2,775 [d]	48,018	-	-	157,975
1998	-	67,720 [h]	-	-	487,301	-	8,113	-	-	49,140
1999	-	32,587 [h]	-	-	437,356	-	5,339	-	-	30,076
2000	2,094 [d]	24,785 [h]	18,989 [d]	-	196,349	-	6,727	-	-	24,308
2001	-	2,134 [h,i]	-	-	224,058	-	- [j]	-	-	- [k]
2002	-	44,194 [h]	-	-	459,058	-	13,583	-	-	72,232
2003	-	22,461 [h]	-	-	256,920	-	3,056	-	-	19,590 [i]
2004	-	64,883 [h]	-	-	365,353	-	5,247	-	-	- [j]
2005	-	20,127	-	-	525,391	-	22,093	-	-	- [j]
2006	3,100 [d]	102,260	617	-	605,485	-	- [j]	7,772	11,658	- [j]
2007	-	69,642	-	-	460,121	-	- [j]	21,825	15,277	- [j]
2008	9,300	57,259	25,850	-	374,928	-	- [j]	12,070	10,715	- [j]
2009	736	8,770	3,877	-	193,099	621	- [j]	2,120	567	- [j]
2010	1,982	72,839	24,380	-	396,173	-	- [j]	1,891	1,038	- [j]
2011	12,889	100,473	10,020	-	642,527	6,011	- [j]	9,454	8,493	- [j]
2012	[d]	56,680	[d]	-	483,972	15,606	- [j]	20,600	14,948	- [j]
GOAL			>116 [m]		350-700 [l]				>53 [n]	
Average 2002-2012		56,291	12,949		427,906			9,189	7,958	

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Year	Henshaw Creek	Gisasa River		Hogatza River		Tozitna River	Chena River		Salcha River	
				Clear & Caribou Cr.	Clear Creek					
	Weir	Aerial [b]	Weir	Aerial [b]	Tower	Weir & Aerial [b]	Aerial [b]	Tower	Aerial [b]	Tower
1973							79 [d]		290	
1974		22,022				1,823	4,349		3,510	
1975		56,904		22,355		3,512	1,670		7,573	
1976		21,342		20,744		725 [d]	685		6,484	
1977		2,204 [d]		10,734		761 [d]	610		677 [d]	
1978		9,280 [d]		5,102		2,262	1,609		5,405	
1979		10,962		14,221		-	1,025 [d]		3,060	
1980		10,388		19,786		580	338		4,140	
1981		-		-		-	3,500		8,500	
1982		334 [d]		4,984 [d]		874	1,509		3,756	
1983		2,356 [d]		28,141		1,604	1,097		716 [d]	
1984		-		184 [d]		-	1,861		9,810	
1985		13,232		22,566		1,030	1,005		3,178	
1986		12,114		-		1,778	1,509		8,028	
1987		2,123		5,669 [d]		-	333		3,657	
1988		9,284		6,890		2,983	432		2,889 [d]	
1989		-		-		-	714 [d]		1,574 [d]	
1990		450 [d]		2,177 [d]		36	245 [d]		450 [d]	
1991		7,003		9,947		93	115 [d]		154 [d]	
1992		9,300		2,986		794	848 [d]		3,222	
1993		1,581		-		970	168	5,400	212	5,809
1994		6,827	51,116 [i]	8,247 [o]		-	1,137	9,984	4,916	39,450
1995		6,458	136,886	-	116,735	4,985	185 [d]	3,519 [i]	934 [d]	30,784
1996		-	158,752	27,090 [o]	100,912	2,310	2,061	12,810 [i]	9,722	74,827
1997		686 [d]	31,800	1,821 [d]	76,454	428 [d]	594 [d]	9,439 [i]	3,968 [d]	35,741
1998		-	21,142	120 [d,p]	212 [l]	7 [d]	24 [d]	5,901	370 [d]	17,289
1999		-	10,155	-	11,283	-	520	9,165	150	23,221
2000	27,271	-	11,410	-	19,376	480	105	3,515	228	20,516
2001	35,031	-	17,946	-	3,674	12,527	2	4,773	-	14,900

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	Henshaw Creek	Gisasa River		Hogatza River			Tozitna River	Chena River		Salcha River	
				Clear & Caribou Cr.	Clear Creek						
Year	Weir	Aerial [b]	Weir	Aerial [b]	Tower		Weir & Aerial [b]	Aerial [b]	Tower	Aerial [b]	Tower
2002	25,249	-	33,481	-	13,150		18,789	-	1,021 [i]	78	20,837 [l]
2003	22,556	-	25,999	-	6,159		8,487	-	573 [i]	-	-
2004	86,474	-	37,851	-	15,661		25,003	-	15,162 [i]	-	47,861
2005	237,481	-	172,259	-	26,420		39,700	219	2,928 [i]	4,320	193,085
2006	-	1,000	261,305	-	29,166		22,629	469	35,109 [i]	152	111,869
2007	44,425	-	46,257	-	6,029 [q]		8,470	-	4,999	4 [d]	13,069
2008	97,281	20,470	36,938	-	- [j]		9,133	37	1,300 [i]	0 [d]	2,212 [i]
2009	156,201	1,060	25,904	3,981	- [j]		8,434	-	16,516	-	31,035
2010	105,398	1,096	47,669	840	- [j]		-	-	7,560	-	22,185
2011	248,247	13,228 [d]	95,796	3,665	- [j]		11,351	[d]	[r]	[d]	[r]
2012	292,082		83,423	23,022	- [j]		11,045	[d]	6,882	[d]	46,252
GOAL				>17 [s]						>3.5 [m]	
Average 2002-2011	113,701		78,346		16,098 [t]		16,888		9,463		55,269

Note: Unless otherwise noted blank cells indicate years prior to the project being operational. En dash indicates years in which no information was collected.

[a] Includes mainstem counts below the confluence of the North and South Forks, unless otherwise noted.

[b] Aerial survey counts are peak counts only, survey rating is fair or good unless otherwise noted..

[c] From 1972-1979 counting tower operated; escapement estimate listed is the tower counts plus expanded aerial survey counts below the tower.

[d] Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.

[e] Sonar count.

[f] Tower count.

[g] Mainstem counts below the confluence of the North and South Forks of the Nulato River included in the South Fork counts.

[h] Weir count.

[i] Incomplete count due to late installation and/or early removal of project or high water events.

[j] Project did not operate.

[k] No counts due to incomplete operations.

[l] Biological Escapement Goals (in thousands of fish) established by the Alaska Board of Fisheries, Jan. 2010.

[m] Interim escapement objective (in thousands of fish).

[n] Interim escapement objective (in thousands of fish) for North Fork Nulato River only.

[o] BLM helicopter survey.

[p] Consists of Clear Creek only.

[q] Project operated as a video monitoring system.

[r] No estimates due to high water conditions that prevented counting for much of the season.

[s] Consists of Clear and Caribou Creeks interim escapement objectives (in thousands of fish) of 9,000 and 8,000, respectively.

[t] 10 year average is similar to median of all years Caribou Creek was monitored 1995-2007.

Appendix B14.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Alaska portions of the Yukon River Drainage, 1971–2012.

	Yukon River	Tanana River Drainage						Upper Yukon River Drainage	
Year	Mainstem Sonar Estimate	Toklat River [a]	Kantishna River Abundance Estimate [b]	Delta River [c]	Bluff Cabin Slough [d]	Upper Tanana River Abundance Estimate [e]	Tanana River Estimate [f]	Chandalar River [g]	Sheenjek River [h]
1971									
1972				5,384					
1973				10,469					
1974		41,798		5,915					89,966 [i]
1975		92,265		3,734 [j]					173,371 [i]
1976		52,891		6,312 [j]					26,354 [i]
1977		34,887		16,876 [j]					45,544 [i]
1978		37,001		11,136					32,449 [i]
1979		158,336		8,355					91,372 [i]
1980		26,346 [k]		5,137	3,190 [l]				28,933 [i]
1981		15,623		23,508	6,120 [l]				74,560 [m]
1982		3,624		4,235	1,156				31,421 [m]
1983		21,869		7,705	12,715				49,392 [m]
1984		16,758		12,411	4,017				27,130 [m]
1985		22,750		17,276 [j]	2,655 [l]				152,768 [m, n]
1986		17,976		6,703 [j]	3,458			59,313	84,207 [n, o]
1987		22,117		21,180	9,395			52,416	153,267 [n, o]
1988		13,436		18,024	4,481 [l]			33,619	45,206 [o]
1989		30,421		21,342 [j]	5,386 [l]			69,161	99,116 [o]
1990		34,739		8,992 [j]	1,632			78,631	77,750 [o]
1991		13,347		32,905 [j]	7,198				86,496 [p]
1992		14,070		8,893 [j]	3,615 [l]				78,808
1993		27,838		19,857	5,550 [l]				42,922
1994		76,057		23,777 [j]	2,277 [l]				150,565
1995	1,053,248	54,513 [k]		20,587	19,460	268,173	230,643	280,999	241,855

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Year	Yukon River Mainstem Sonar Estimate	Tanana River Drainage						Upper Yukon River Drainage	
		Toklat River [a]	Kantishna River Abundance Estimate [b]	Delta River [c]	Bluff Cabin Slough [d]	Upper Tanana River Abundance Estimate [e]	Tanana River Estimate [f]	Chandalar River [g]	Sheenjek River [h]
1996		18,264		19,758 [j]	7,074 [l]	134,563	132,922	208,170	246,889
1997	506,621	14,511		7,705 [j]	5,707 [l]	71,661	88,641	199,874	80,423 [q]
1998	372,927	15,605		7,804 [j]	3,549 [l]	62,384	82,475	75,811	33,058
1999	379,493	4,551	27,199	16,534 [j]	7,037 [l]	97,843	109,309	88,662	14,229
2000	247,935	8,911	21,450	3,001 [j]	1,595	34,844	55,983	65,894	30,084 [r]
2001	376,182	6,007 [s]	22,992	8,103 [j]	1,808 [l]	96,556 [t]	116,012	110,971	53,932
2002	326,858	28,519	56,719	11,992 [j]	3,116	109,970	163,421	89,850	31,642
2003	889,778	21,492	87,359	22,582 [j]	10,600 [l]	193,418	263,302	214,416	44,047 [u]
2004	594,060	35,480	76,163	25,073 [j]	10,270 [l]	123,879	187,409	136,706	37,878
2005	1,813,589	17,779 [k]	107,719	28,132 [j]	11,964 [l]	337,755	372,758	496,484	561,863 [n, v]
2006	790,563		71,135	14,055 [j]		202,669	233,193	245,090	160,178 [n]
2007	684,011		81,843	18,610 [j]		320,811	357,016	228,056	65,435 [n]
2008	615,127			23,055 [j]	1,198 [l]		264,200	178,278 [x]	50,353 [n, w]
2009	233,307 [x]			13,492 [j]	2,900 [l]		159,828		54,126 [n, w]
2010	393,326			17,933 [j]	1,610 [l]		212,660	157,998	22,053
2011	764,194			23,639 [j]	2,655 [l]		270,846	295,335	97,976 [n, w]
2012	682,510 [y]			9,377 [d]			102,096 [y]	205,404 [y]	104,701 [n, w, y]
Escapement [z]	300,000 [aa]	15,000 [ab]		6,000		46,000 [ac]	61,000	74,000	50,000
Objective	600,000	33,000		13,000		103,000	136,000	152,000	104,000
Averages									
1971-2011	653,861 [ad]	31,243	61,398	14,555	5,446	158,040	194,154	160,273	91,253
2002-2011	763,501 [ad]	25,818	80,156	19,856	5,539	214,750	248,463	226,913	112,555
2007-2011	614,165 [ad]	-	81,843	19,346	2,091	320,811	252,910	214,917	57,989

-continued-

[a] Expanded total abundance estimates for upper Toklat River index area using stream life curve (SLC) developed with 1987–1993 data. Index area includes Geiger Creek, Sushana River, and mainstem floodplain sloughs from approximately 0.25 mile upstream of roadhouse.

[b] Fall chum salmon abundance estimate for the Kantishna and Toklat River drainages is based on a mark–recapture program. Tag deployment occurs at a fish wheel located near the mouth of the Kantishna River and recaptures are collected at 4 fish wheels; 2 located 8 miles upstream of the mouth of the Toklat River (1999–2005) and one fish wheel on the Kantishna River (2000–2002, 2006–2007) and 2 fish wheels in 2003–2005.

[c] Estimates are a total spawner abundance, using migratory time density curves and stream life data, unless otherwise indicated.

[d] Peak foot survey, unless otherwise indicated.

[e] Fall chum salmon abundance estimate for the upper Tanana River drainage is based on a mark–recapture program. Tag deployment occurs from a fish wheel (2 fish wheels in 1995) located just upstream of the Kantishna River and recaptures are collected from one fish wheel (2 fish wheels in 1995) located downstream from the village of Nenana.

[f] Tanana River abundance estimates prior to 1995 can be found in Eggers (2001) but are based on Upper Tanana plus Toklat River escapement. Estimates from 1995-1998 are based on the relationship of the Upper Tanana to the Kantishna river abundance estimates, and 2008-2012 are based on the relationship of the Tanana estimate (1995-2007) with the Delta River escapements. The harvests from the Tanana River fisheries are removed to estimate escapement.

[g] Single-beam sonar estimate for 1986 to 1990, split-beam sonar estimate 1995 to 2006. DIDSON in since 2007, project was aborted in 2009.

[h] Single-beam sonar estimate beginning in 1981, split-beam sonar estimate 2002 to 2004, DIDSON since 2005.

[i] Total escapement estimate using sonar to aerial survey expansion factor of 2.22.

[j] Population estimate generated from replicate foot surveys and stream life data (area under the curve method).

[k] Minimal estimate because of late timing of ground surveys with respect to peak of spawning.

[l] Aerial survey count, unless otherwise indicated.

[m] Project started late, estimated escapements expanded for portion missed using average run timing curves based on Chandalar (1986-1990) and Sheenjek (1991-1993) rivers.

[n] Sonar counts include both banks in 1985-1987. In addition to the historical right bank count, the left bank was enumerated with DIDSON (right bank count for 2005-2009 and 2011-2012 was 266,963, 106,397, 39,548, 35,912, 28,480, 49,080 and 57,823 respectively, not including expansions by bank).

[o] Expanded estimates for period approximating second week August through fourth week September, using annual Chandalar River run timing data (1986-1990).

[p] Total abundance estimates are for the period approximating second week August through fourth week of September (1991 to present). Comparative escapement estimates before 1986 are considered more conservative; approximating the period end of August through September.

[q] Data interpolated due to high water from 29 August until 3 September 1997, during buildup to peak passage.

[r] Project ended early (September 12) because of low water.

[s] Minimal estimate because Sushana River was breached by the main channel and uncountable.

[t] Low numbers of tags deployed and recovered resulted in an estimate with an extremely large confidence interval (95% CI +/- 41,072).

[u] Project ended on peak daily passages due to late run timing, estimate was expanded based on run timing (87%) at Rampart.

[v] Project ended while still counting >10,000 fish per day, estimate was expanded based on run timing (73%) at Rampart.

[w] Run timing was late and counts were expanded to represent the remainder of the run after the project was terminated for the season.

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[x] Pilot Station sonar project encountered record low water levels during the fall season causing difficulties with species apportionment and catchability. Fall chum salmon estimate is suspected of being conservative and should not be used in averages or run reconstructions.

[y] Data are preliminary.

[z] Escapement goal (EG) includes individual tributary BEGs and drainagewide SEG.

[aa] Drainagewide escapement goal is related to mainstem passage estimate at Pilot Station sonar minus upriver harvests.

[ab] EG discontinued in 2010.

[ac] The BEG for the Tanana River as a whole is 61,000 to 136,000. However it includes the Toklat plus and the Upper Tanana which was broke out for comparison to the upper Tanana River abundance estimates.

[ad] Does not include 2009.

Appendix B15.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Canadian portions of the Yukon River Drainage, 1971–2012.

	Porcupine Drainage						Canadian Mainstem		
Year	Fishing Branch River [a]	Porcupine River Sonar	Mainstem Yukon River Index [b,c]	Koidern River [b]	Kluane River [b, d]	Teslin River [b, e]	Border Passage Estimate [t]	Harvest	Spawning Escapement Estimate [f]
1971	312,800 [g]								
1972	35,230 [h]				198 [i, j]				
1973	15,991		383		2,500				
1974	31,841				400				
1975	353,282		7,671		362 [j]				
1976	36,584 [g]				20				
1977	88,400 [g]				3,555				
1978	40,800 [g]				0 [j]				
1979	119,898 [g]				4,640 [j]				
1980	55,268 [g]				3,150		39,130	16,218	22,912
1981	57,386 [k]				25,806		66,347	19,281	47,066 [l]
1982	15,901 [g]		1,020 [m]		5,378		47,049	15,091	31,958
1983	27,200 [g]		7,560		8,578 [j]		118,365	27,490	90,875
1984	15,150 [g]		2,800 [n]	1,300	7,200	200	81,900	25,267	56,633 [l]
1985	56,223		10,760	1,195	7,538	356	99,775	37,765	62,010
1986	31,810		825	14	16,686	213	101,826	13,886	87,940
1987	49,038		6,115	50	12,000		125,121	44,345	80,776
1988	23,645		1,550	0	6,950	140	69,280	32,494	36,786
1989	44,041		5,320	40	3,050	210 [i]	55,861	20,111	35,750
1990	35,000 [o]		3,651	1	4,683	739	82,947	31,212	51,735
1991	37,870		2,426	53	11,675	468	112,303	33,842	78,461
1992	22,539		4,438	4	3,339	450	67,962	18,880	49,082
1993	28,707		2,620	0	4,610	555	42,165	12,422	29,743
1994	65,247		1,429 [i]	20 [i]	10,734	209 [i]	133,712	35,354	98,358
1995	51,971 [p]		4,701	0	16,456	633	198,203	40,111	158,092

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	Porcupine Drainage						Canadian Mainstem		
Year	Fishing Branch River [a]	Porcupine River Sonar	Mainstem Yukon River Index [b,c]	Koidern River [b]	Kluane River [b, d]	Teslin River [b, e]	Border Passage Estimate [t]	Harvest	Spawning Escapement Estimate [f]
1996	77,302		4,977		14,431	315	143,758	21,329	122,429
1997	27,031		2,189		3,350	207	94,725	9,306	85,419
1998	13,687		7,292		7,337	235	48,047	1,795	46,252
1999	12,958				5,136	19 [i]	72,188 [q]	13,636	58,552
2000	5,057		933 [i]		1,442	204	57,978 [q]	4,246	53,732
2001	21,737		2,453		4,884	5	38,769 [q]	5,278	33,491
2002	13,600		973		7,147	64	104,853 [q]	6,174	98,679
2003	29,713		7,982		39,347	390	153,656 [q]	10,523	143,133
2004	20,417		3,440		18,982	167	163,625 [q]	9,545	154,080
2005	119,058		16,425		34,600	585	451,477	13,979	437,733
2006	30,954		6,553		18,208	620	227,515 [r, s]	6,617	220,898
2007	32,150						263,979 [r, s]	9,330	254,649
2008	19,086 [p]						182,016 [r, s]	6,130	175,886
2009	25,828 [u]						94,739 [r]	1,115	93,626
2010	15,773 [u]						121,498 [r]	3,709	117,789
2011	13,085 [u,p]	12,438					211,878 [r]	6,312	205,566
2012[w]	22,399 [u]	29,824					141,648 [r]	3,905	137,743
Goal[x]	50,000-120,000								>80,000
IMEG	22,000-49,000 [y]								70,000-104,000 [z]
Averages									
1971-2011	51,933		4,480	223	8,982	317	121,020	17,275	103,744
2002-2011	31,966		7,075	-	23,657	365	197,524	7,343	190,175
2007-2011	21,184		-	-	-	-	174,882	5,319	169,503

-continued-

[a] Weir count, unless otherwise indicated.
[b] Aerial survey, unless otherwise indicated.
[c] Index area includes Tatchun Creek to Fort Selkirk.
[d] Index area includes Duke River to end of spawning sloughs below Swede Johnston Creek.
[e] Index area includes Boswell Creek area (5 km below to 5 km above confluence).
[f] Excludes Fishing Branch River escapement (estimated border passage minus Canadian mainstem harvest).
[g] Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.
[h] Weir installed September 22. Estimate consists of weir count of 17,190 after September 22, and tagging passage estimate of 17,935 before weir installation.
[i] Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[j] Foot survey, unless otherwise indicated.
[k] Initial aerial survey count doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.
[l] Escapement estimate based on mark–recapture program unavailable. Estimate based on assumed average exploitation rate.
[m] Boat survey.
[n] Total index not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.
[o] Weir not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000-40,000 fish considering aerial survey timing.
[p] Incomplete count caused by late installation and/or early removal of project or high water events.
[q] 1999 to 2004 border passage estimates were revised using a Stratified Population Analysis System (Arnason et. al 1995).
[r] 2006 to present border passage estimate is based on sonar minus harvest from Eagle residents upstream of deployment.
[s] Mark–recapture border passage estimates include 217,810, 235,956, and 132,048 from 2006 to 2008 respectively, during transition to sonar.
[t] Border Passage Estimate is based off of a mark-recapture estimate unless otherwise indicated.
[u] Run timing was late and counts were expanded to represent the remainder of the run after the project was terminated for the season.
[w] Data are preliminary.
[x] Escapement Objective (EO) based on US/Canada Treaty Obligations, some years stabilization or rebuilding goals are applied.
[y] Interim management escapement goal (IMEG) established for 2008-2012 based on percentile method.
[z] Interim management escapement goal (IMEG) established for 2010-2012 based on brood table of Canadian origin mainstem stocks (1982 to 2003).

Appendix B16.–Coho salmon passage estimates or escapement estimates for selected spawning areas in the Alaska portion of the Yukon River Drainage, 1972–2012.

		Nenana River Drainage				Upper Tanana River Drainage		
Year	Yukon River Mainstem Sonar Estimate [a]	Lost Slough	Nenana Mainstem [c]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [d]	Clearwater Lake and Outlet	Richardson Clearwater River
1972						632 (b)	417 (f)	454 (f) [e]
1973						3,322 (u)	551 (u)	375 (u)
1974		1,388 (f)			27 (f)	3,954 (h) [e]	560 (f)	652 (h)
1975		827 (f)			956 (f)	5,100 (b)	1,575 (b)	
1976		118 (f)			281 (f)	1,920 (b)	1,500 (b)	80 (f) [e]
1977		524 (f) [e]		310 (g)	1,167 (f)	4,793 (b)	730 (b)	327 (f)
1978		350 (f)		300 (g)	466 (f)	4,798 (b)	570 (b)	
1979		227 (f)			1,987 (f)	8,970 (b)	1,015 (b)	372 (f)
1980		499 (f) [e]		1,603 (g)	592 (f)	3,946 (b)	1,545 (b)	611 (f)
1981		274 (f)		849 (w) [i]	1,005 (f)	8,563 (u) [j]	459 (f)	550 (f)
1982				1,436 (w) [i]	(f)	8,365 (g) [j]		
1983		766 (f)		1,042 (w)	103 (f)	8,019 (b) [j]	253 (f)	88 (f)
1984		2,677 (f)		8,826 (w)	(f)	11,061 (b)	1,368 (f)	428 (f)
1985		1,584 (f)		4,470 (w)	2,081 (f)	5,358 (b)	750 (f)	
1986		794 (f)		1,664 (w)	218 (b)	10,857 (b)	3,577 (f)	146 (f) [e]
1987		2,511 (f)		2,387 (w)	3,802 (f)	22,300 (b)	4,225 (b)	
1988		348 (f)		2,046 (w)		21,600 (b)	825 (b)	
1989				412 (w)	824 (f) [e]	11,000 (b)	1,600 (b)	483 (f)
1990		688 (f)	1,308 (f)		(h) [e]	8,325 (b)	2,375 (b)	
1991		564 (f)	447 (f)		52 (f)	23,900 (b)	3,150 (b)	
1992		372 (f)			490 (f)	3,963 (b)	229 (b)	500 (f)

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Year	Yukon River Mainstem Sonar Estimate [a]	Nenana River Drainage				Upper Tanana River Drainage		
		Lost Slough	Nenana Mainstem [c]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [d]	Clearwater Lake and Outlet	Richardson Clearwater River
1993		350 (f)	419 (f)	666 (w) [k]	581 (h)	10,875 (b)	3,525 (b)	
1994		944 (h)	1,648 (h)	1,317 (w) [l]	2,909 (h)	62,675 (b)	3,425 (b)	5,800 (f)
1995	100,664	4,169 (f)	2,218 (h)	500 (w)	1,512 (h)	20,100 (b)	3,625 (b)	
1996		2,040 (h)	2,171 (h)	201 (u) [e]	3,668 (g/b)	14,075 (b)	1,125 (b) [e]	
1997	105,956	1,524 (h)	1,446 (h)	[m]	1,996 (h)	11,525 (b)	2,775 (b)	
1998	129,076	1,360 (h) [e]	2,771 (h) [e]	[m]	1,413 (g/b)	11,100 (b)	2,775 (b)	
1999	60,886	1,002 (h) [e]	745 (h) [e]	370 (h)	662 (h) [e]	10,975 (b)		
2000	169,392	55 (h) [e]	68 (h) [e]	[m]	879 (h) [e]	9,225 (b)	1,025 (b)	2,175 (h)
2001	132,283	242 (h)	859 (h)	699 (h)	3,753 (h)	27,500 (b)	4,425 (b)	1,531 (f)
2002	117,908	0 (h)	328 (h)	935 (h)	1,910 (h)	38,625 (b)	5,900 (b)	874 (f)
2003	265,119	85 (h)	658 (h)	3,055 (h)	4,535 (h)	102,800 (b)	8,800 (b)	6,232 (h)
2004	199,884	220 (h)	450 (h)	840 (h)	3,370 (h)	37,550 (b)	2,925 (b)	8,626 (h)
2005	184,071	430 (h)	325 (h)	1,030 (h)	3,890 (h)	34,293 (b)	2,100 (b)	2,024 (h)
2006	131,919	194 (h)	160 (h)	634 (h)	1,916 (h)	16,748 (b)	4,375 (b)	271 (h)
2007	173,289	63 (h)	520 (h)	605 (h)	1,733 (h)	14,650 (b)	2,075 (b)	553 (h)
2008	135,570	1,342 (h)	1,539 (h)	578 (h)	1,652 (h)	7,500 (b)	1,275 (b)	265 (h)
2009	206,620 [n]	410 (h)		470 (h)	680 (h)	16,850 (b)	5,450 (b)	155 (h)
2010	155,784	1,110 (h)	280 (h)	340 (h)	720 (h)	5,867 (b)	813 (b)	1,002 (h)
2011	124,931	369 (h)			912 (h)	6,180 (b)	2,092 (b)	575 (h)

-continued-

Year	Yukon River Mainstem Sonar Estimate [a]	Nenana River Drainage				Upper Tanana River Drainage		
		Lost Slough	Nenana Mainstem [c]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [d]	Clearwater Lake and Outlet	Richardson Clearwater River
2012	106,782 [o]		106 (h)		405 (h)	5,230 (b)	396 (h)	515 (h)
SEG [p]						5,200-17,000 [p]		
Averages								
1972-2011	145,782 [n]	845	966	1,392	1,551	15,996	2,257	1,352
2002-2011	165,386 [n]	422	533	943	2,132	28,106	3,581	2,058
2007-2011	147,394 [n]	659	780	498	1,139	10,209	2,341	510

Note: Only peak counts presented. Survey rating is fair to good, unless otherwise noted. Denotations of survey methods include: (b)=boat, (f)=fixed wing, (g)=ground/foot, (h)=helicopter, and (u)=undocumented.

[a] Passage estimates for coho salmon are incomplete. The sonar project is terminated prior to the end of the coho salmon run.

[c] Index area includes mainstem Nenana River between confluence's of Lost Slough and Teklanika River.

[d] Index area is lower 17.5 miles of system.

[e] Poor survey.

[i] Weir was operated at the mouth of Clear Creek (Shores Landing).

[j] Expanded estimate based on partial survey counts and historic distribution of spawners from 1977 to 1980.

[k] Weir project terminated on October 4, 1993. Weir normally operated until mid- to late October.

[l] Weir project terminated September 27, 1994. Weir normally operated until mid-October.

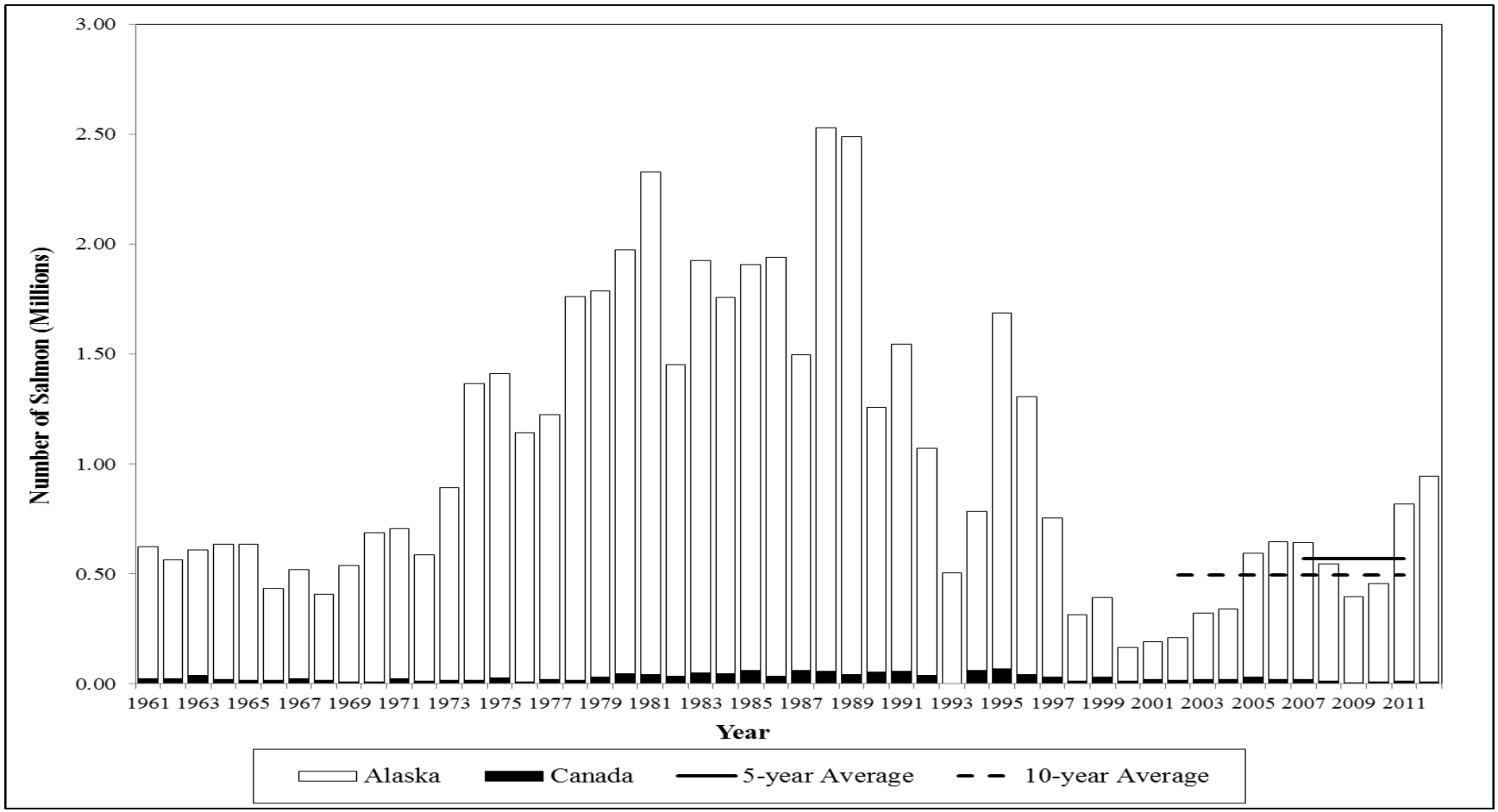
[m] No survey of Wood Creek due to obstructions in creek.

[n] Pilot Station sonar project encountered record low water levels during the fall season causing difficulties with species apportionment and catchability. Coho salmon are suspected of being over estimated therefore this value should not be used in averages or run reconstructions.

[o] Data preliminary.

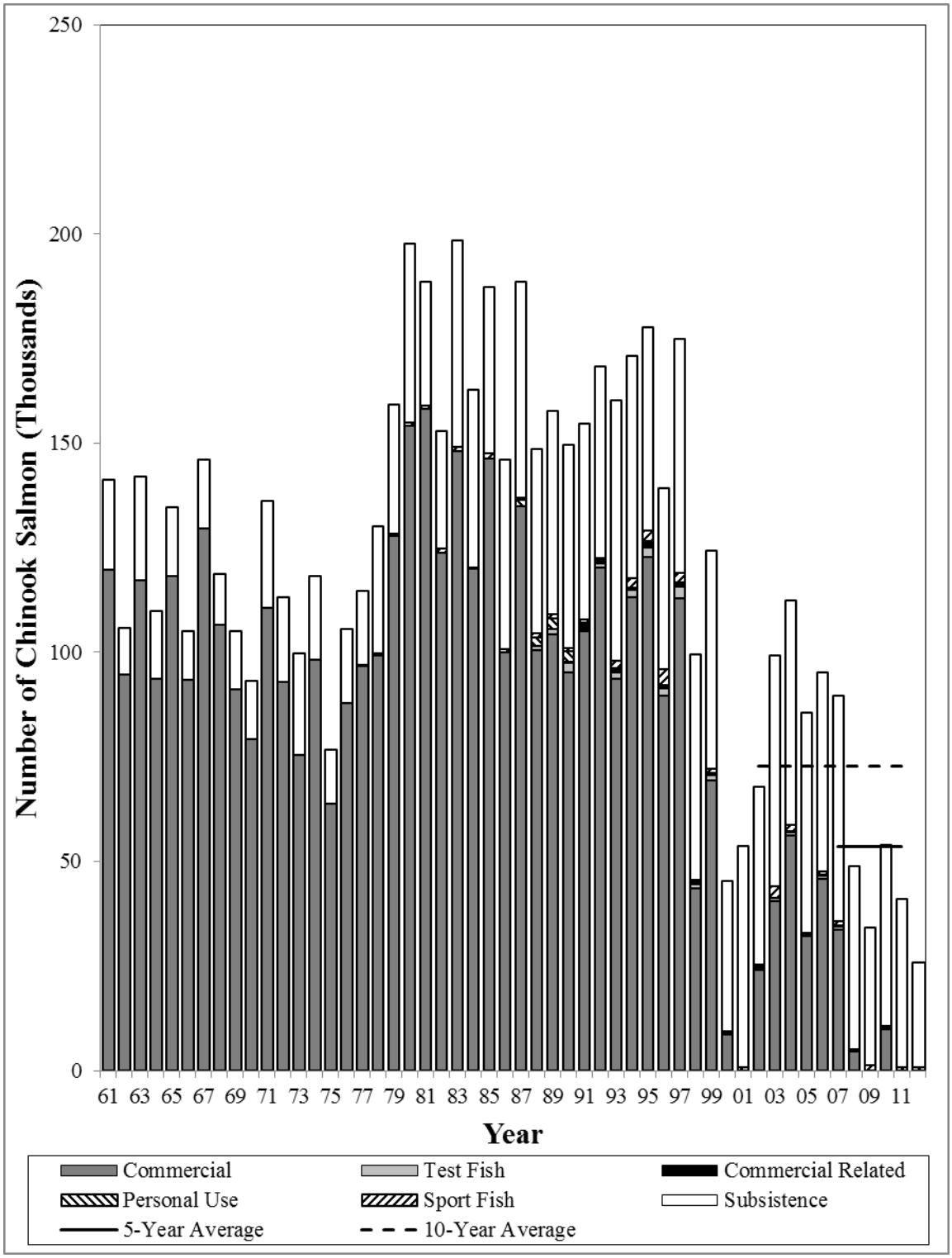
[p] Sustainable escapement goal (SEG) established January 2004, (replaces BEG of greater than 9,000 fish established March, 1993) based on boat survey counts of coho salmon in the lower 17.5 river miles during the period October 21 through 27.

APPENDIX C: FIGURES



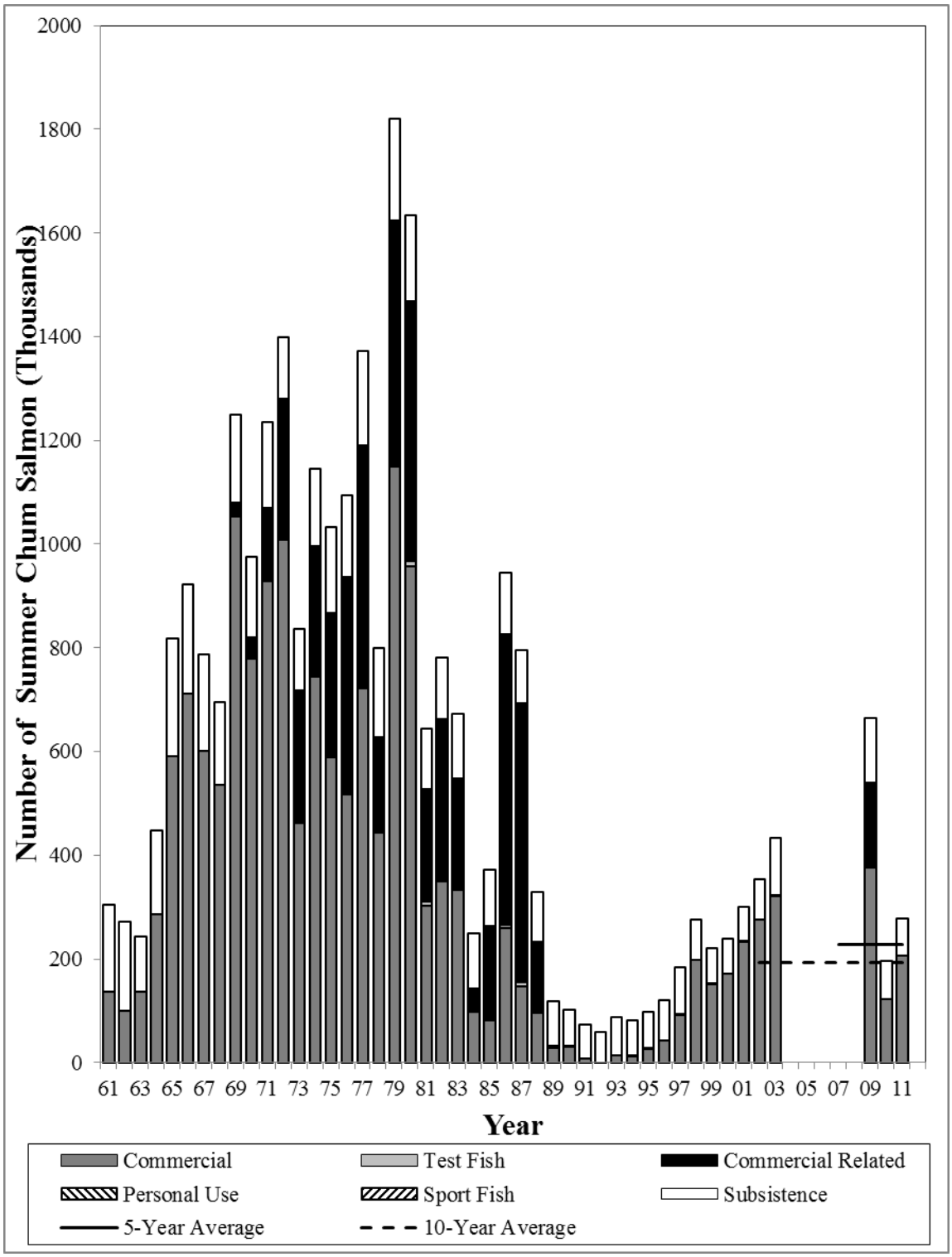
Note: Subsistence harvest estimates of fall chum and coho salmon are minimal prior to 1979 because of timing of harvest surveys. The 2012 harvest estimates are preliminary.

Appendix C1.–Total utilization of Chinook, chum and coho salmon, Yukon River, 1961–2012.



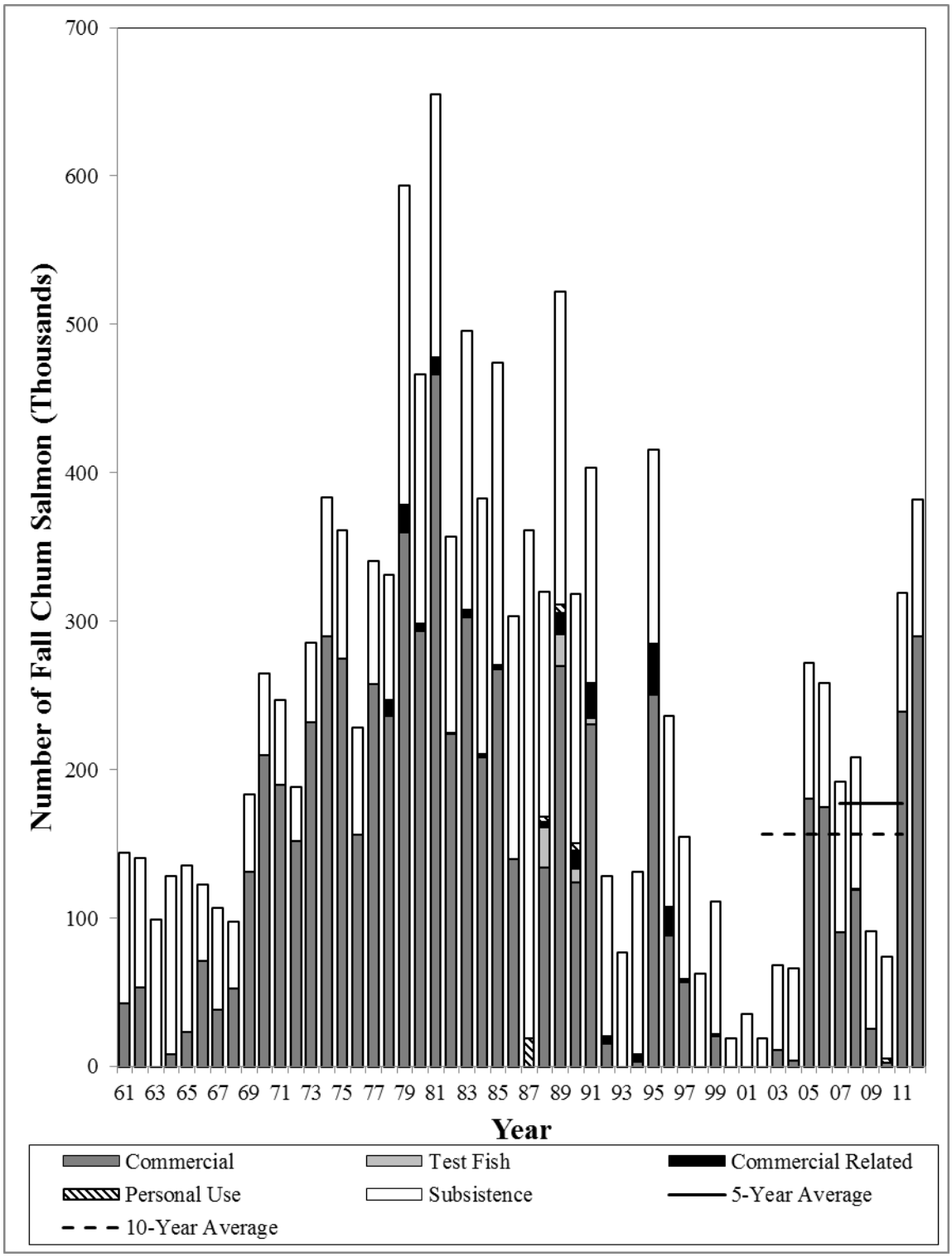
Note: No commercial fishery occurred in 2001. The 2012 harvest estimates are preliminary.

Appendix C2.–Alaska harvest of Chinook salmon, Yukon River, 1961–2012.



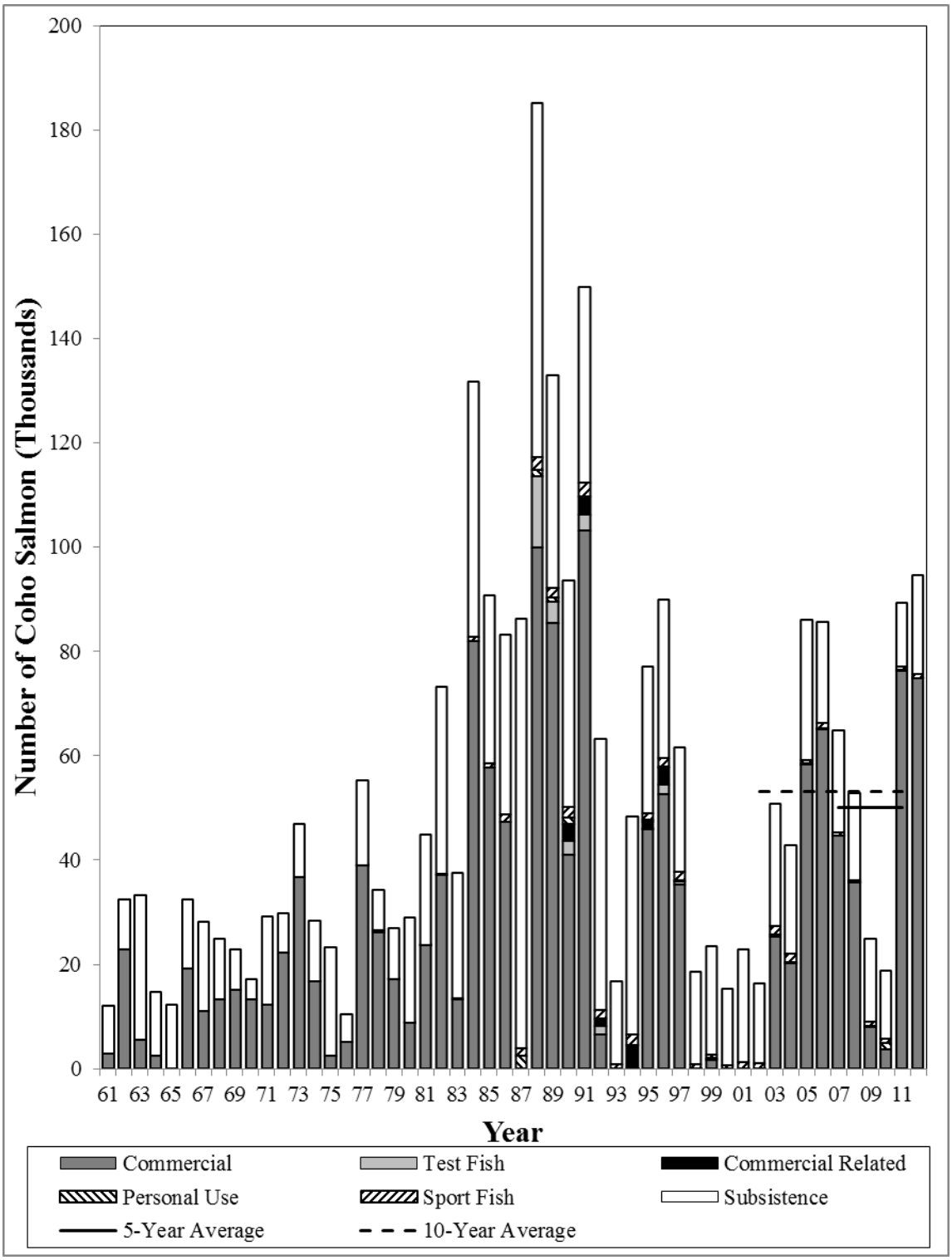
Note: The 2012 harvest estimates are preliminary.

Appendix C3.–Alaska harvest of summer chum salmon 1961–2012.



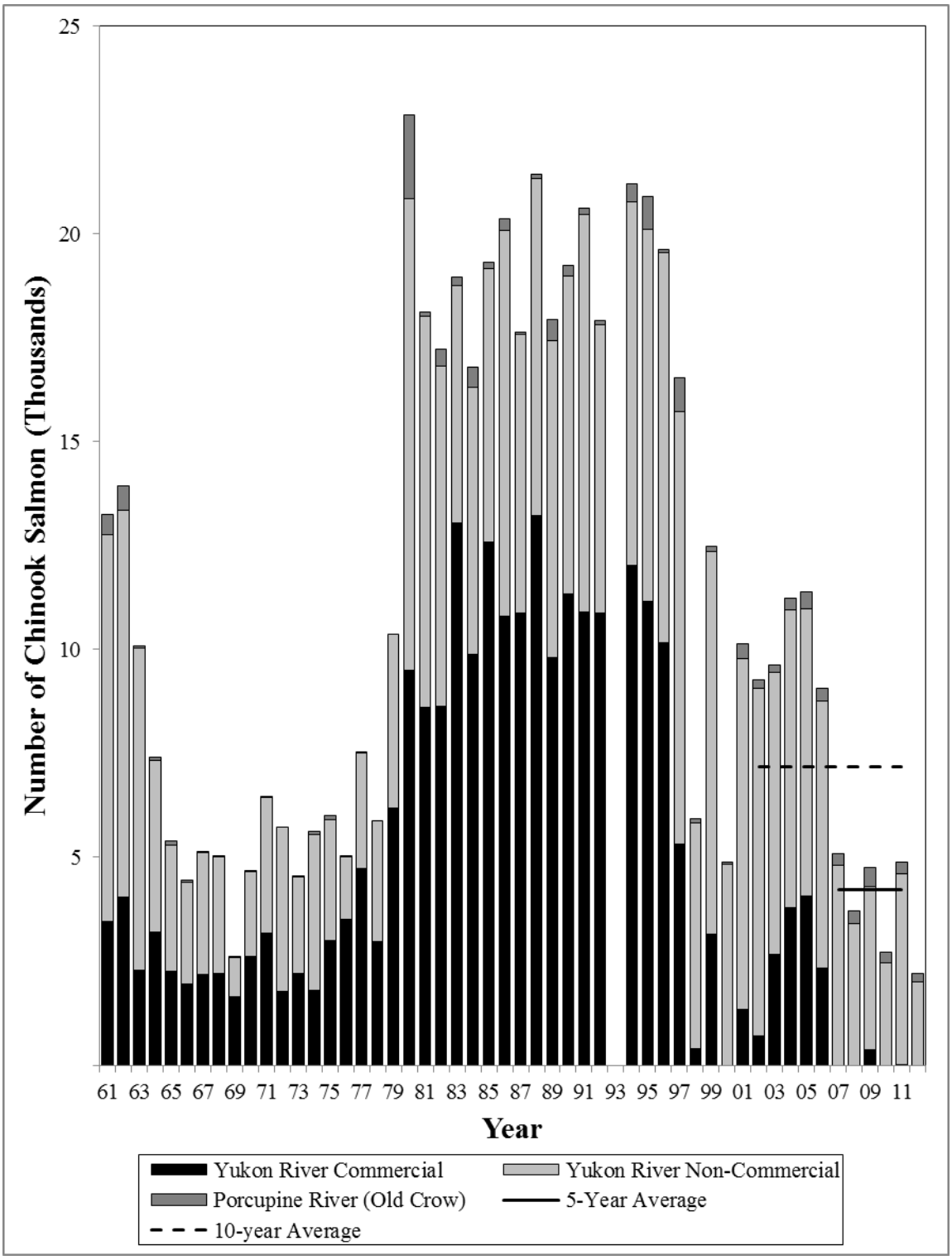
Note: The commercial fishery was closed 2000–2002. The 2012 harvest estimates are preliminary.

Appendix C4.–Alaska harvest of fall chum salmon, Yukon River, 1961–2012.



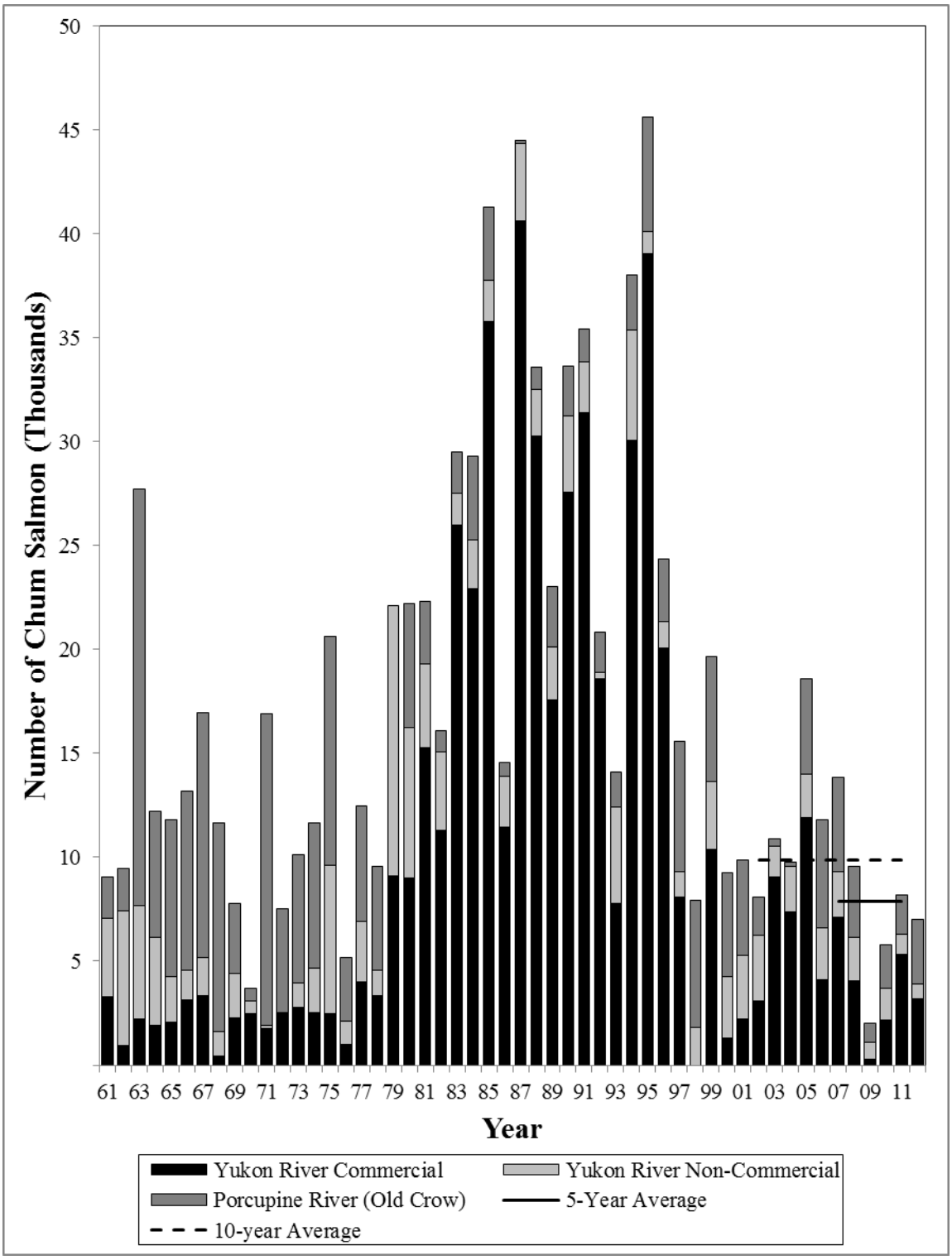
Note: The commercial fishery was closed 2000–2002. The 2012 harvest estimates are preliminary.

Appendix C5.–Alaska harvest of coho salmon, Yukon River, 1961–2012.



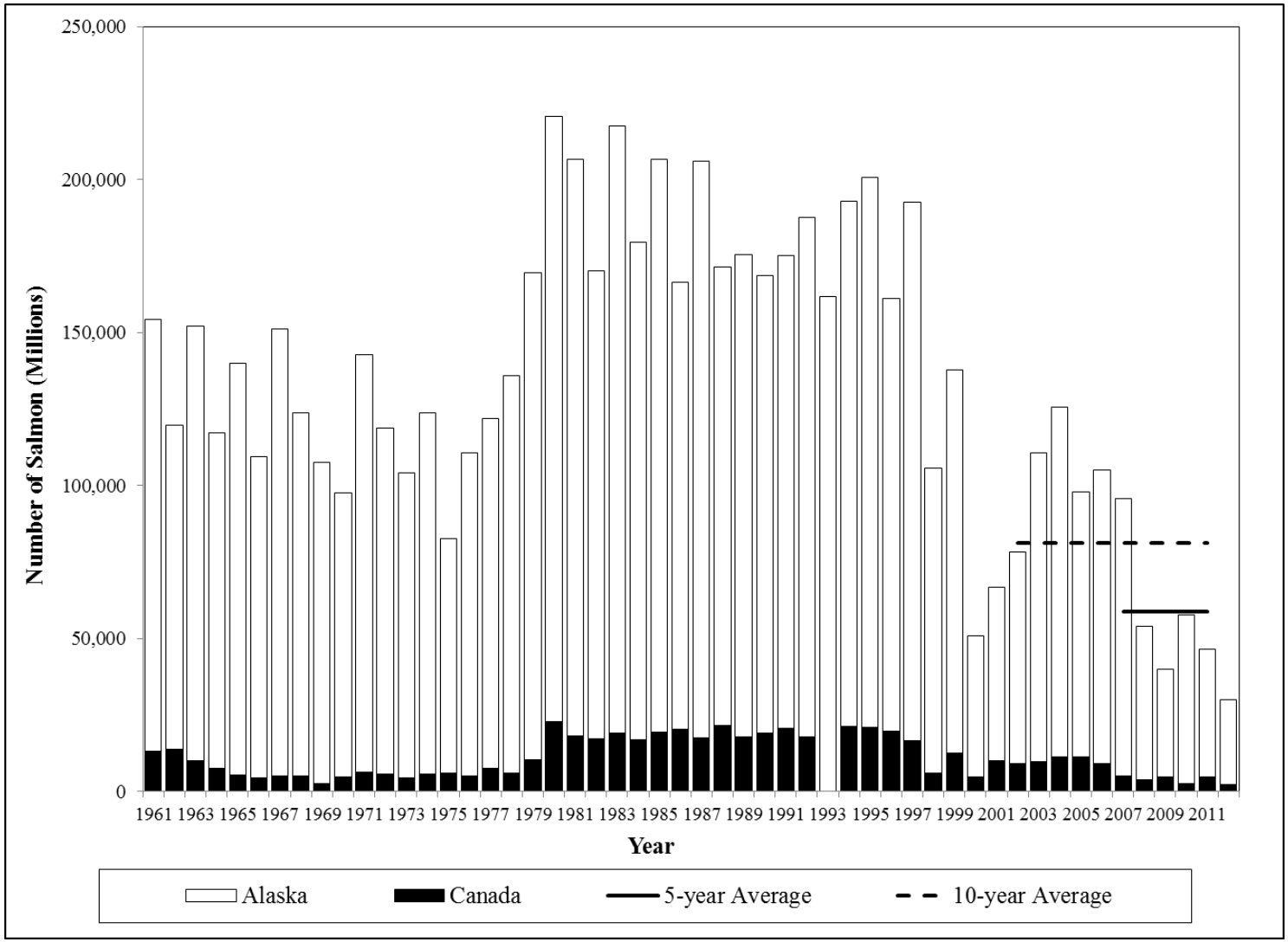
Note: The 2012 harvest estimates are preliminary.

Appendix C6.–Canadian harvest of Chinook salmon, Yukon River, 1961–2012.



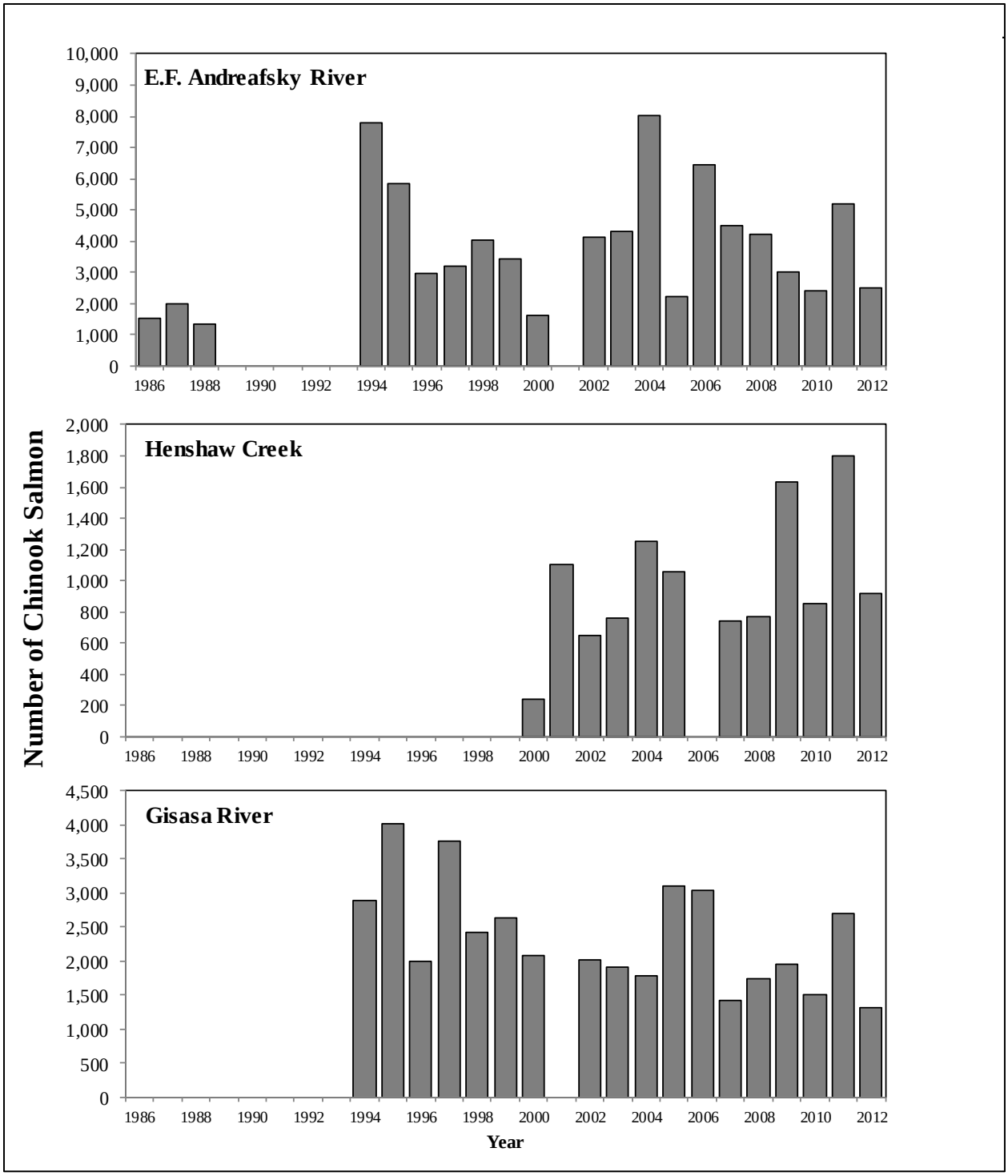
Note: The 2012 harvest estimates are preliminary.

Appendix C7.–Canadian harvest of fall chum salmon, Yukon River, 1961–2012.



Note: The 2012 harvest estimates are preliminary.

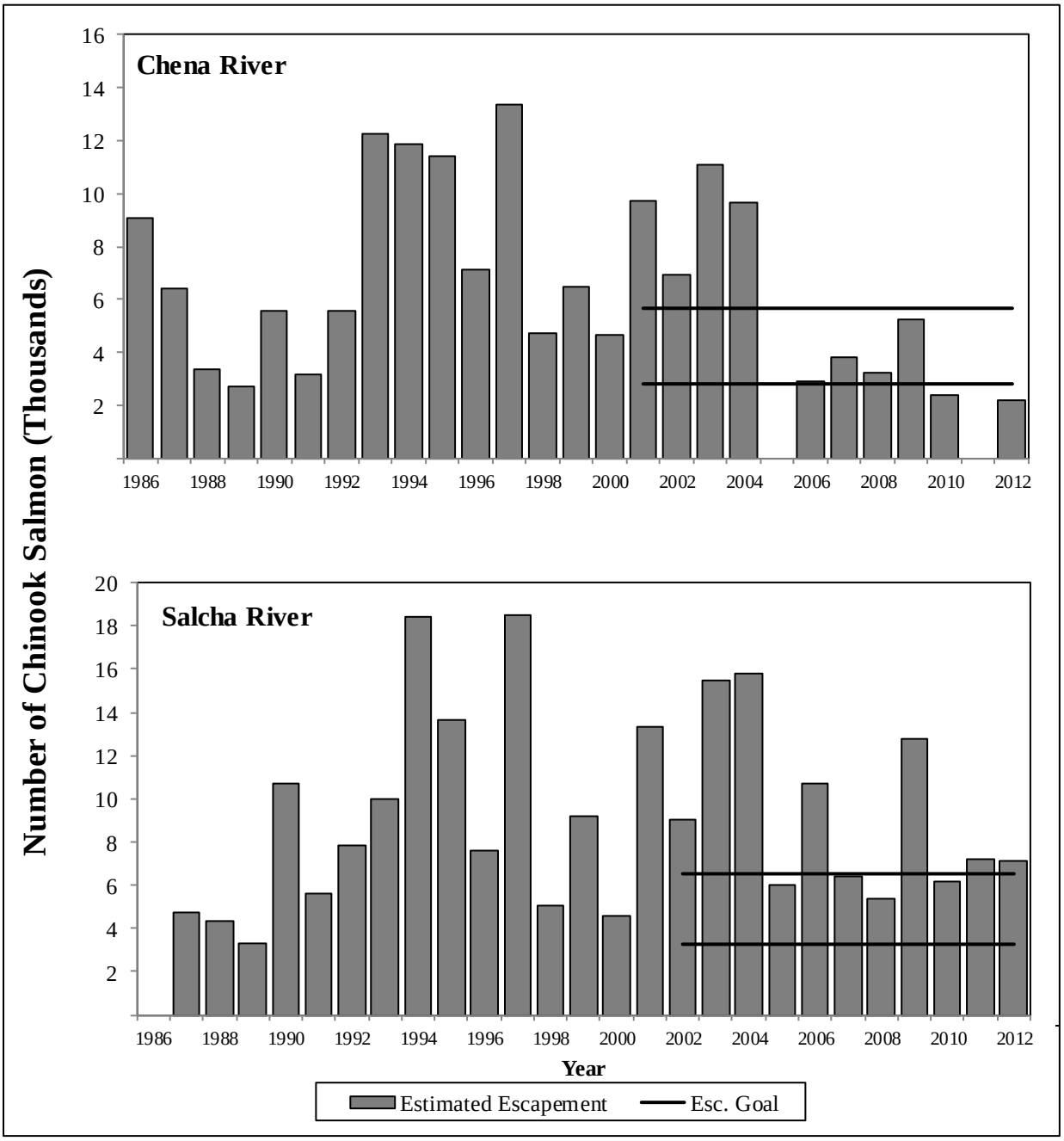
Appendix C8.–Total utilization of Chinook salmon, Yukon River, 1961–2012.

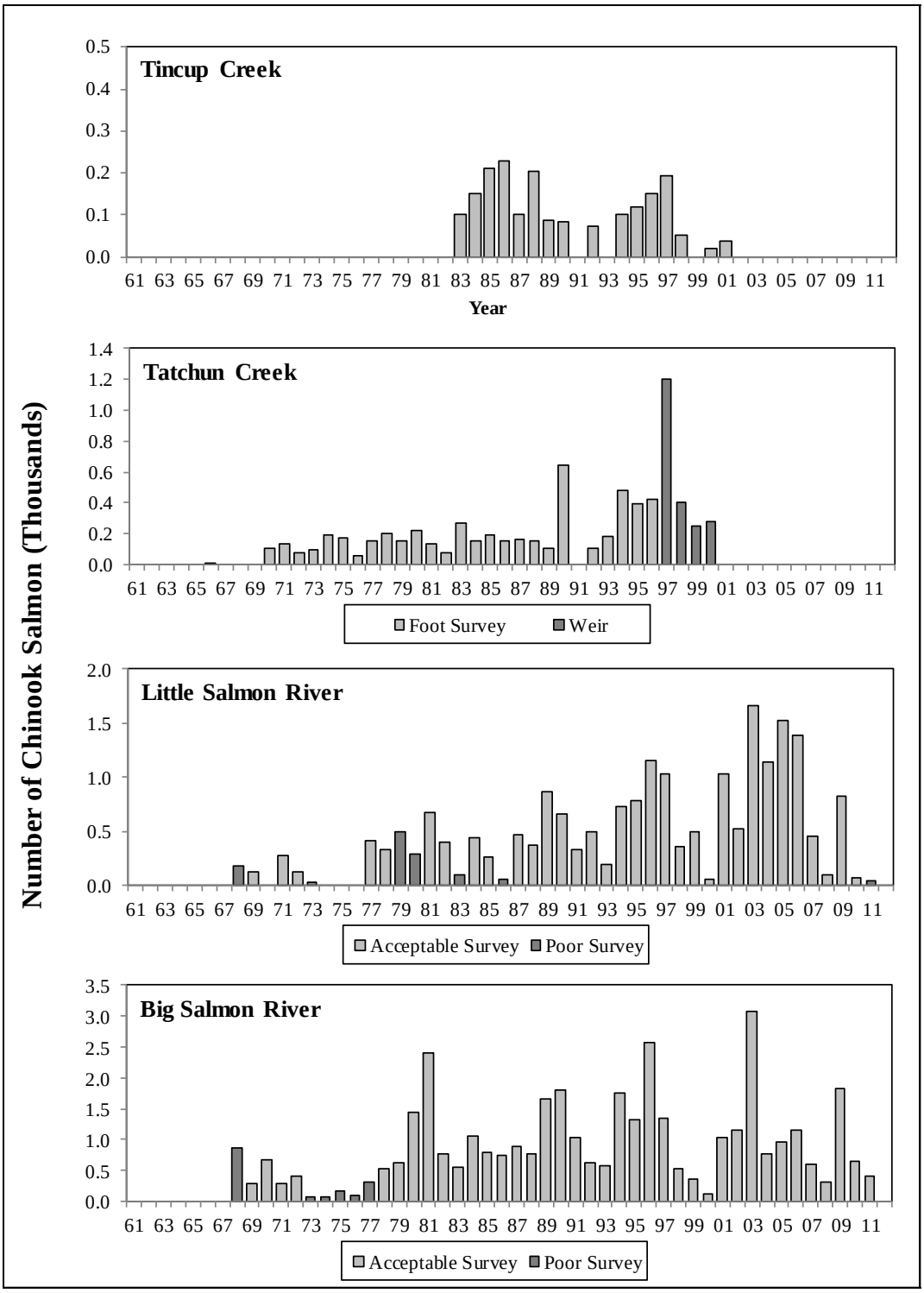


Note: Incomplete counts caused by late installation and/or early removal of project or high water events are excluded from the graphs. Vertical scale is variable.

Appendix C9.–Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2012.

-continued-

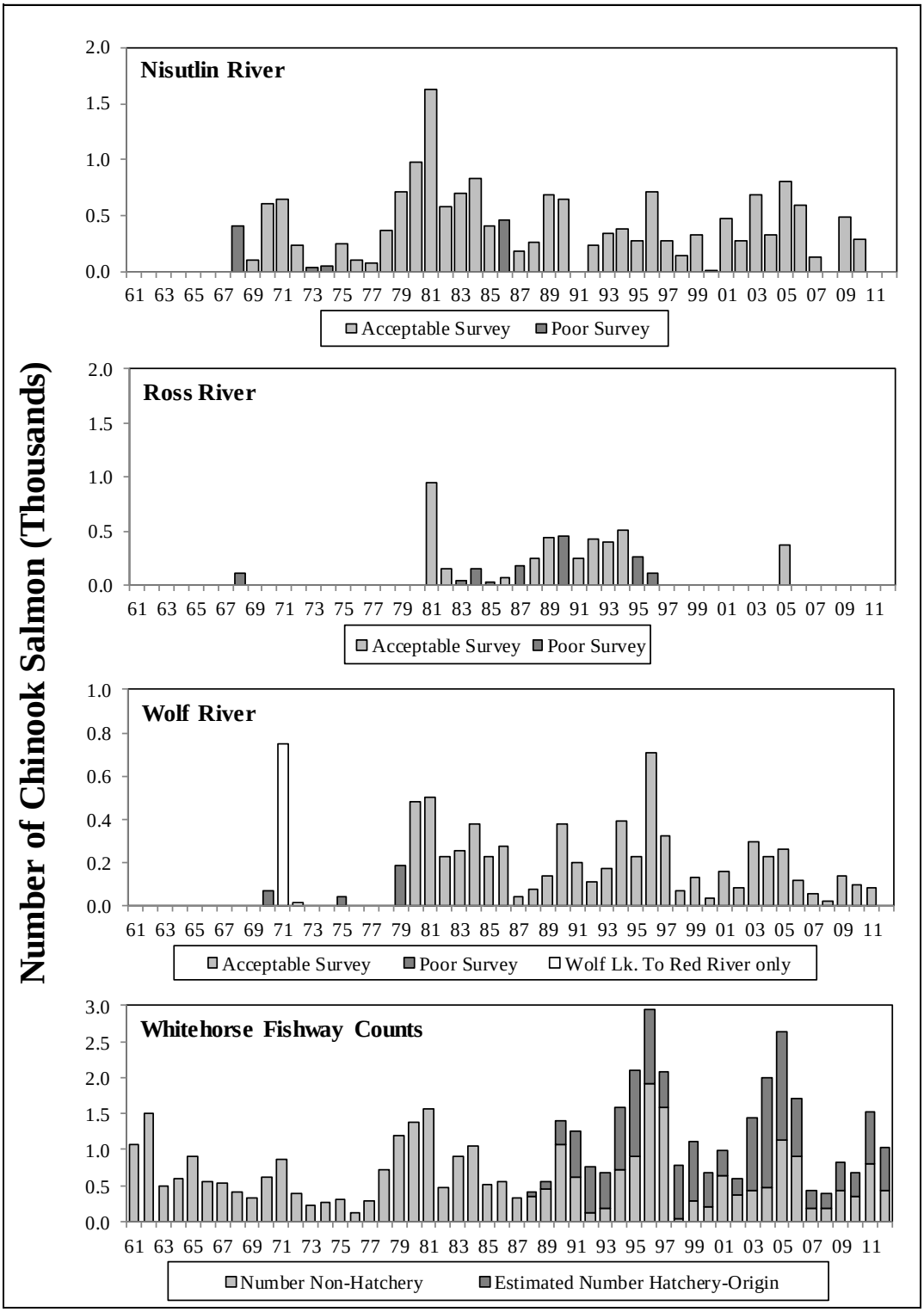

Chena River
Salcha River
Number of Chinook Salmon (Thousands)
Year
Estimated Escapement
Esc. Goal

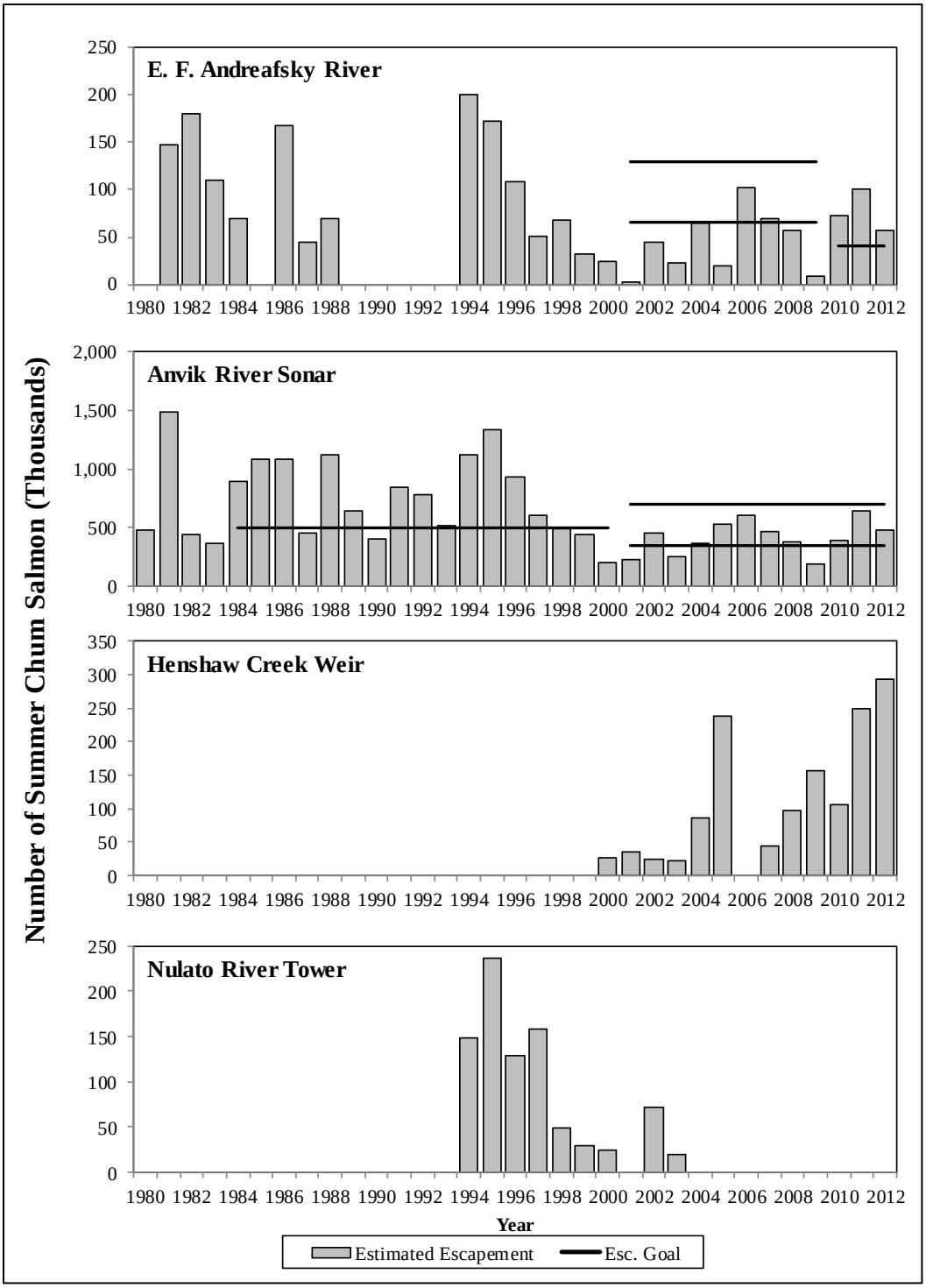


Note: Estimates are aerial survey observations unless noted otherwise. Note, vertical scale is variable.

Appendix C10.–Chinook salmon escapement estimates for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2012.

-continued-

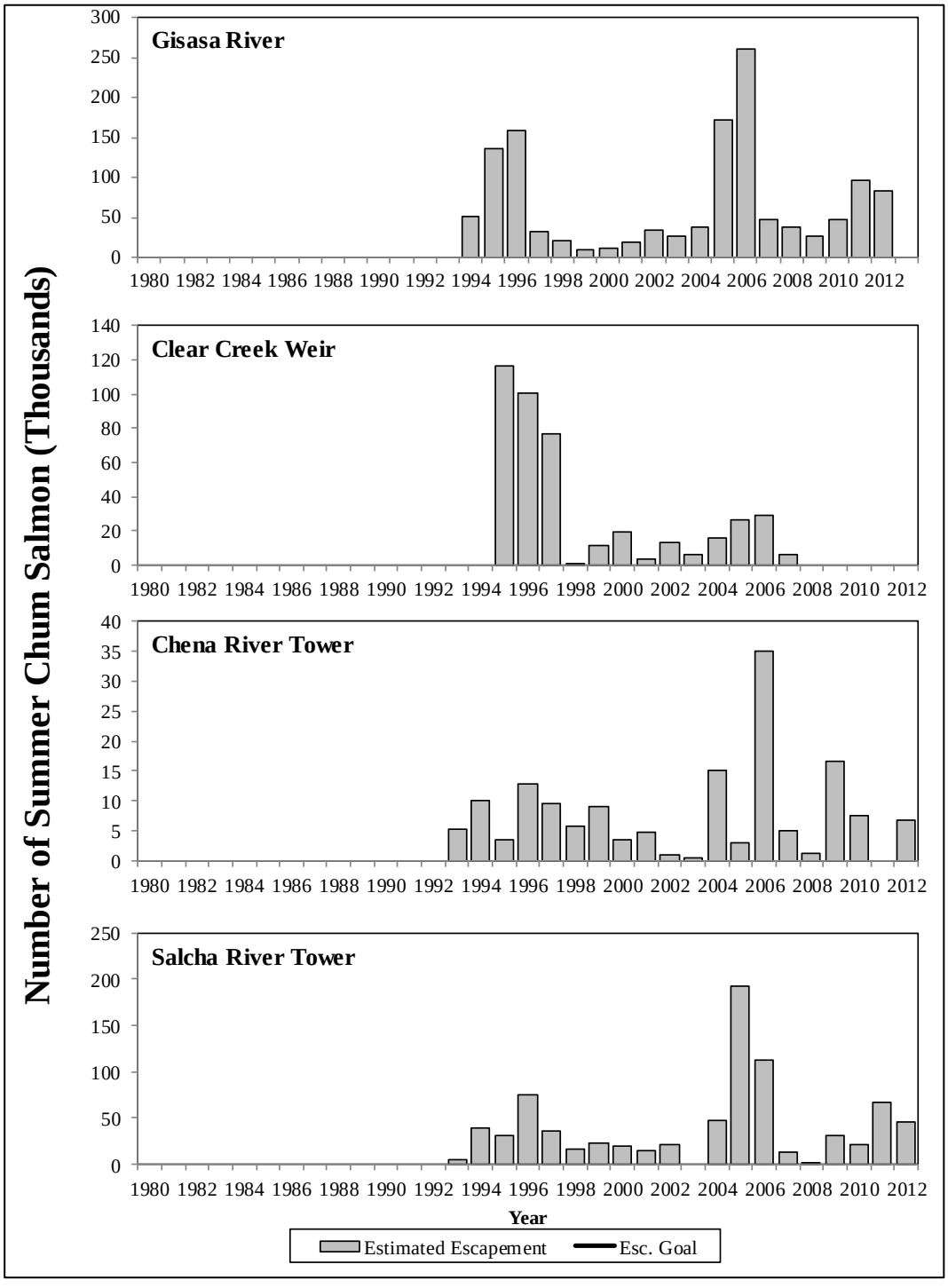

Number of Chinook Salmon (Thousands)
Nisutlin River
Acceptable Survey
Poor Survey
Ross River
Acceptable Survey
Poor Survey
Wolf River
Acceptable Survey
Poor Survey
Wolf Lk. To Red River only
Whitehorse Fishway Counts
Number Non-Hatchery
Estimated Number Hatchery-Origin

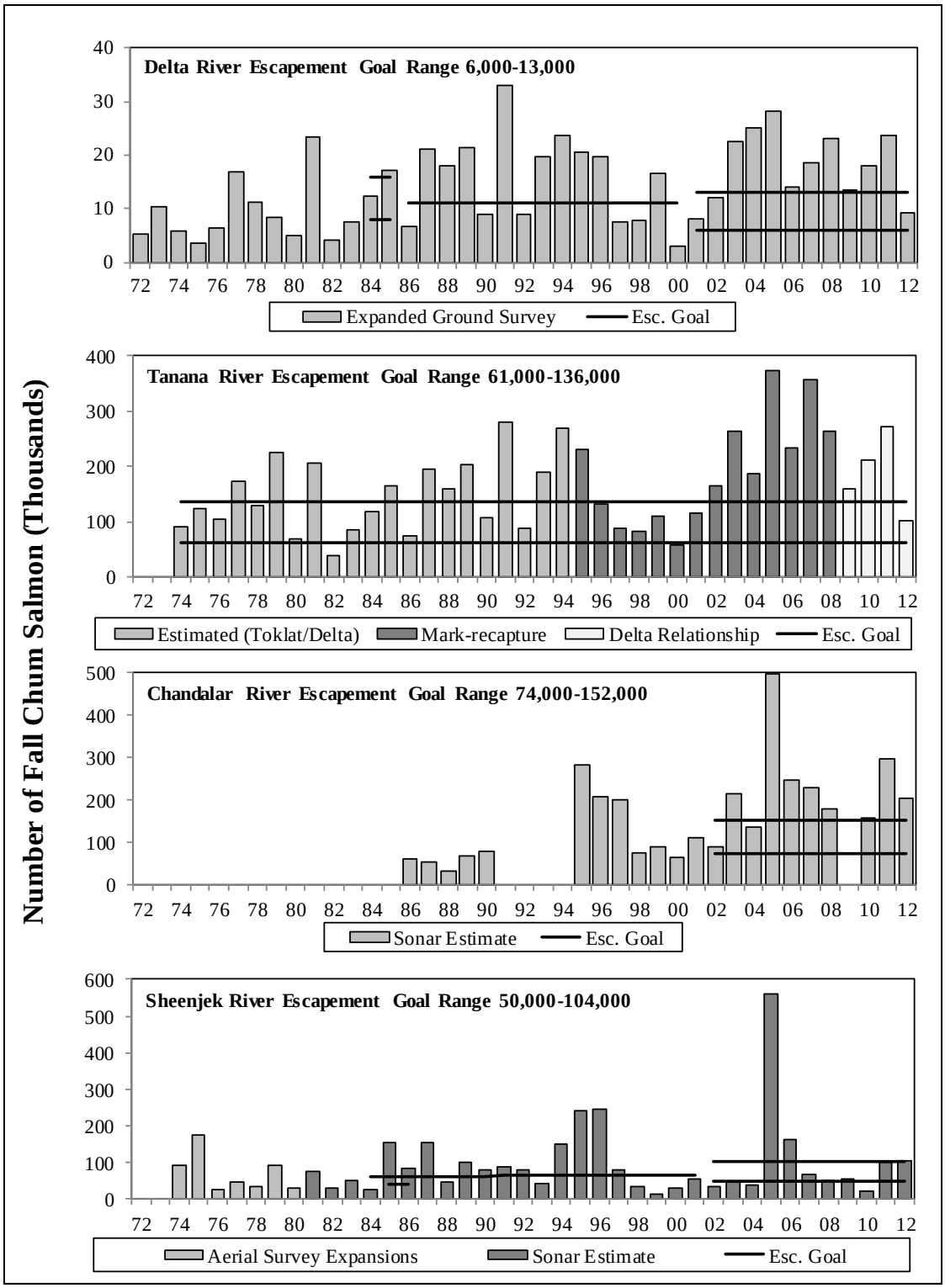


Note: Incomplete counts caused by late installation and/or early removal of project or high water events are excluded from graphs. The vertical scale is variable.

Appendix C11.–Summer chum salmon ground based escapement estimates for selected tributaries in the Alaska Yukon River drainage, 1980–2012.

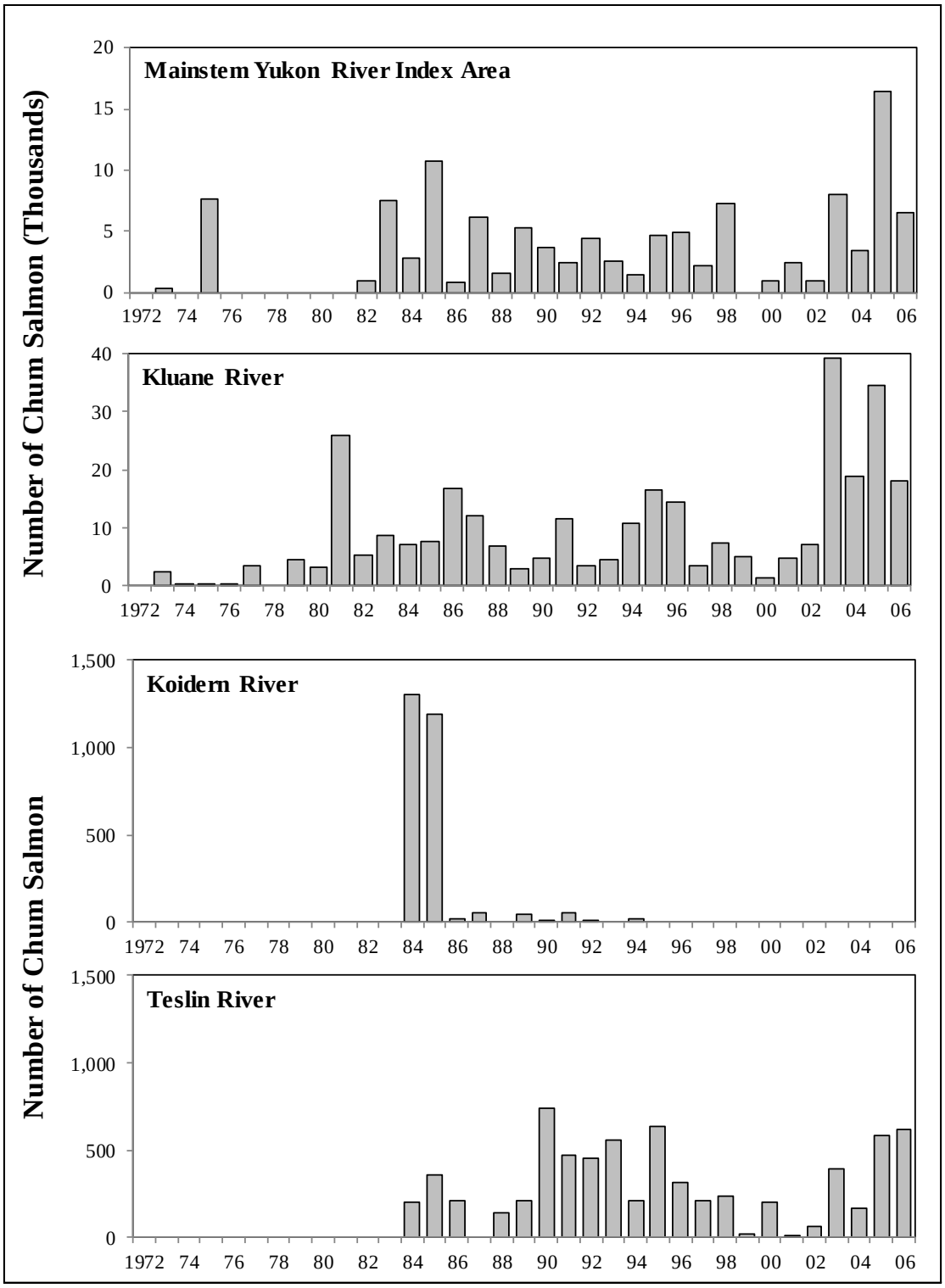
-continued-


Number of Summer Chum Salmon (Thousands)
Gisasa River
Clear Creek Weir
Chena River Tower
Salcha River Tower
Year
Estimated Escapement
Esc. Goal



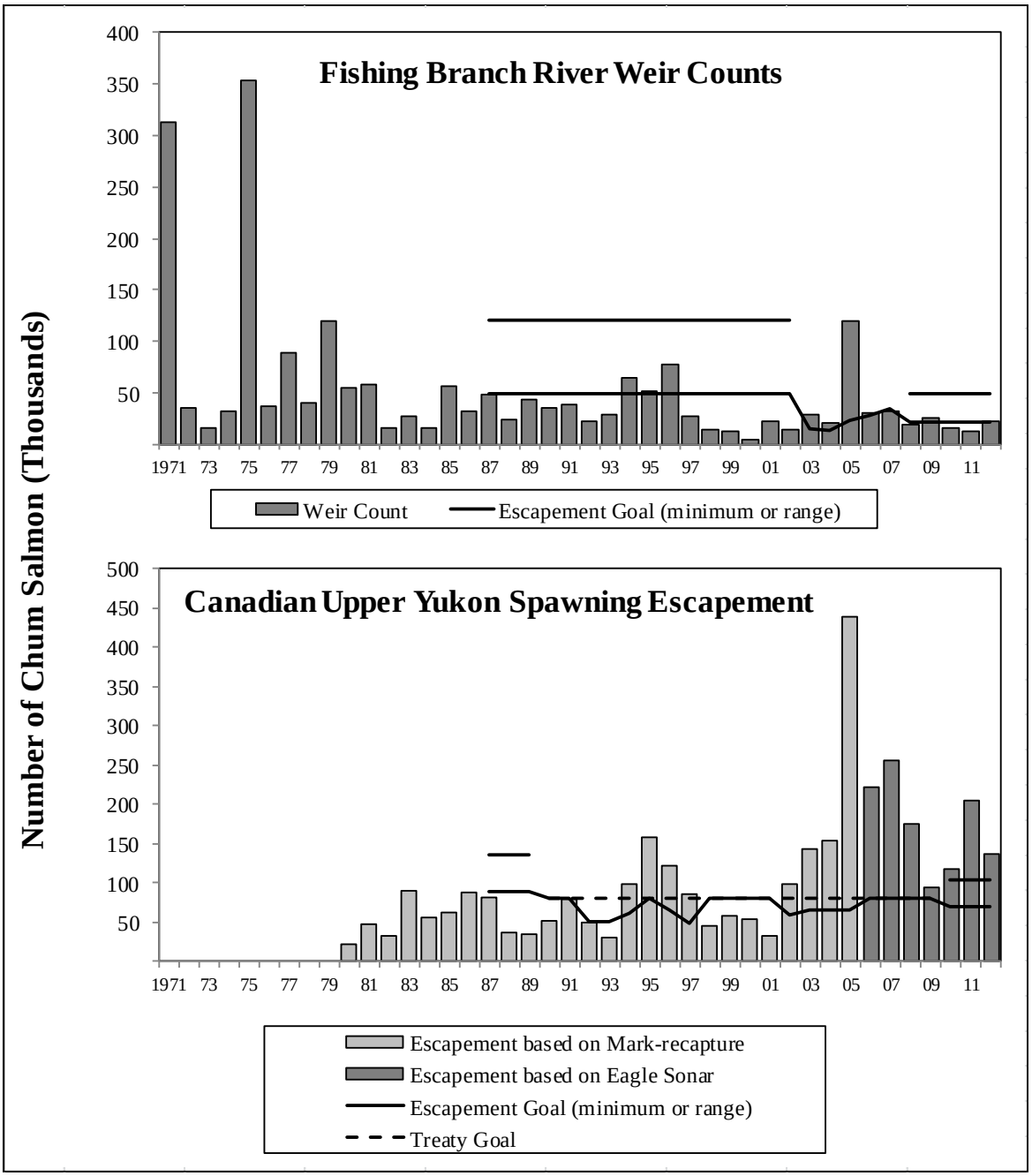
Note: Horizontal lines represent escapement goals or ranges. Note, vertical scale is variable.

Appendix C12.–Fall chum salmon escapement estimates for selected spawning areas in the Alaska portion of the Yukon River drainage, 1971–2012.



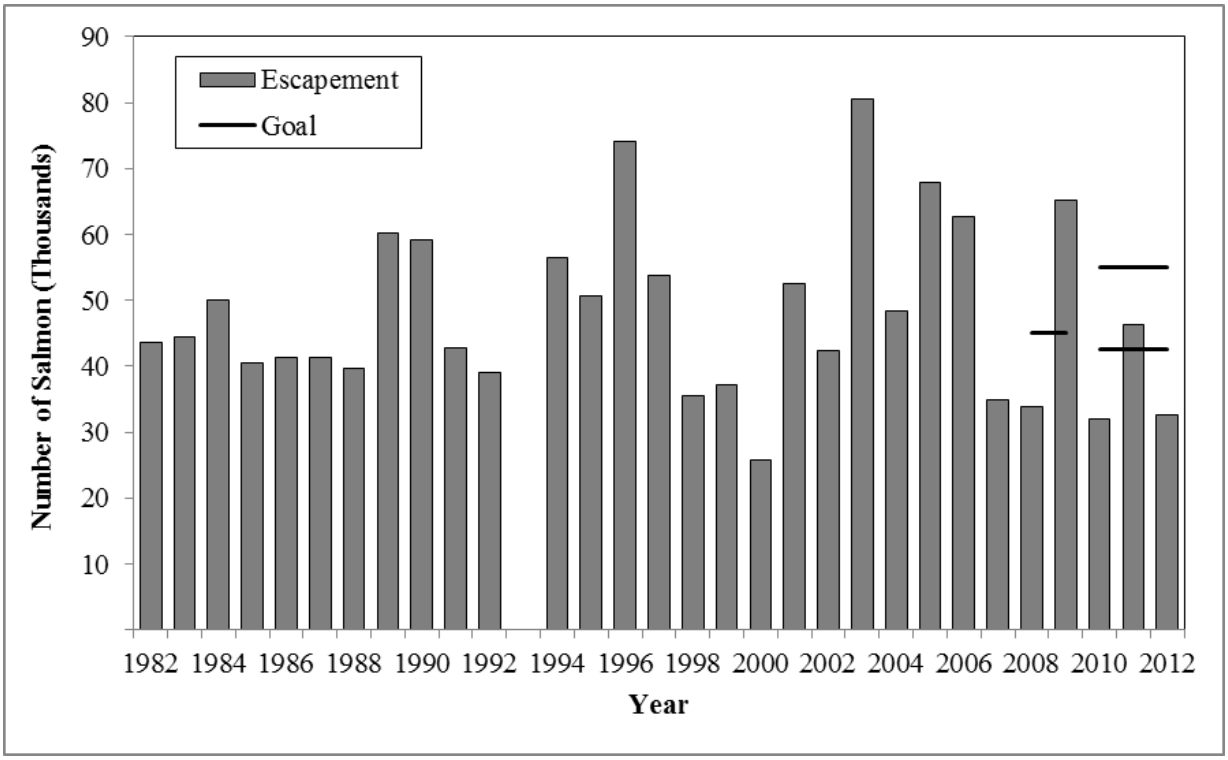
Note: The vertical scales vary. Genetic stock identification was used to determine relative tributary spawning abundance from 2007 to 2012 (not depicted).

Appendix C13.–Fall chum salmon aerial survey estimates for selected spawning areas in the Canadian portion of the Yukon River drainage, 1972–2006.



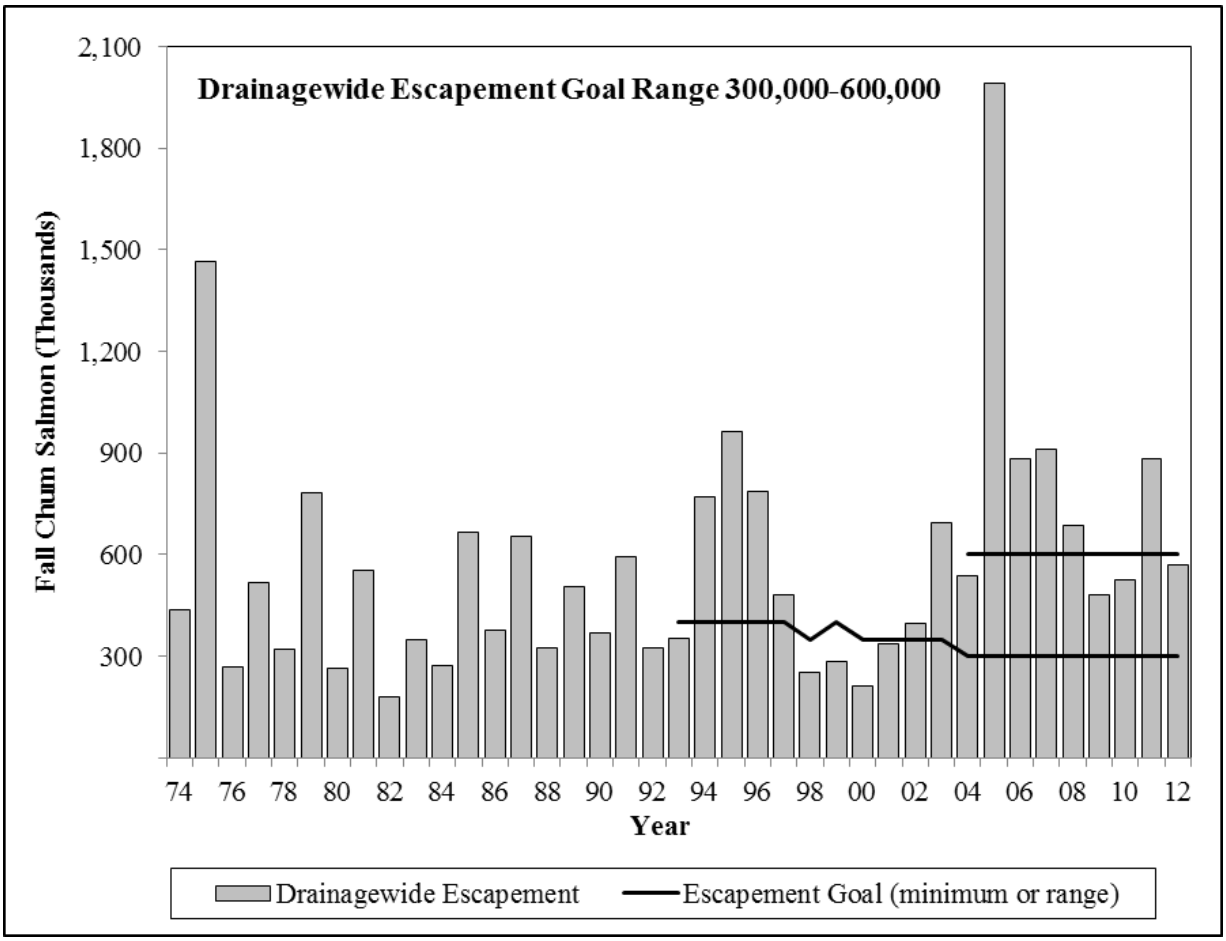
Note: Horizontal lines represent escapement goals which include treaty, rebuilding, and interim stabilization goals.

Appendix C14.–Fall chum salmon spawning escapement estimates for Canadian portion of the Yukon River drainage, 1971–2012.



Note: The JTC adopted a revised escapement database in March 2008. The 2008 and 2009 interim management escapement goal (IMEG) was set at 45,000. The IMEG for 2010–2012 was 42,500 to 55,000 salmon.

Appendix C15.–Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982–2012.



Appendix C16.–Estimated drainagewide escapement of fall chum salmon, Yukon River, 1974–2012.