YUKON RIVER SALMON 2013 SEASON SUMMARY AND 2014 SEASON OUTLOOK

Prepared by

THE UNITED STATES AND CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

March 2014
Regional Information Report 3A14-01
Alaska Department of Fish and Game
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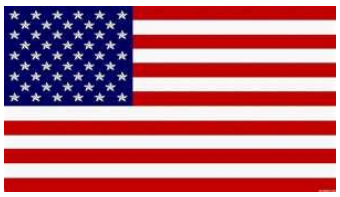

Symbols and Abbreviations

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 2013, presents 2014 season outlook, 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., escapement counting and sampling, stock identification), a review of marine fisheries and research pertinent to Yukon River salmon, and a summary of 2013 Restoration and Enhancement Fund projects are also included. For 2013, the preliminary estimate of Chinook salmon escapement in Canada was about 28,700, falling below the goal range of 42,500–55,000 fish. A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 38,000 fish. For fall chum salmon, the preliminary estimate of drainagewide total run size was 866,000 fish, based on the postseason run reconstruction and estimated harvest. The preliminary fall chum salmon escapement estimate for the Yukon River mainstem in Canada was about 200,000 fish, nearly twice as high as the upper end of the escapement goal range in Canada of 70,000 to 104,000 fish. Fall chum escapement in the Porcupine River was about 23,400, exceeding the lower bound of the escapement goal range of 22,000–49,000 fish. The total combined U.S. and Canadian commercial harvest of fall chum salmon was 241,000 fish. The preliminary estimate of combined Alaska subsistence and Canadian aboriginal harvest of fall chum salmon was 103,000 fish. Recommended interim management escapement goals for upper Yukon River Chinook, chum, and coho salmon in 2014 remain unchanged from 2013.

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 5–7, 2013 in Seattle, Washington. The meeting was attended by 11 U.S. and 4 Canadian members, 1 U.S. advisor, a guest presenter, and 1 additional U.S. guest.

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 and marine research surveys[3]. Status of current research projects and opportunities for new research in the Yukon River drainage were discussed. Special presentations were provided on U.S. subsistence fisheries law and regulations[4] and on the process of making sonar-based estimates for run timing and inseason abundance of Chinook *Oncorhynchus tshawytscha* salmon[5]. A special full-day session was included to discuss age, sex, and length composition estimates of Canadian Chinook salmon[6] and current scientific understanding of escapement quality issues (i.e. size and age at maturity). Plans to proceed with an escapement goal workshop in the 2014 fall meeting were discussed briefly, and the Canadian

[1] Stephanie Schmidt, Bonnie Borba (Alaska Department of Fish and Game, Commercial Fisheries Division)
[2] Mary Ellen Jarvis, Elizabeth MacDonald (Department of Fisheries and Oceans Canada)
[3] Jim Murphy (U.S. National Oceanic and Atmospheric Administration)
[4] Caroline Brown (Alaska Department of Fish and Game, Subsistence Division)
[5] Carl Pfisterer (guest presenter, Alaska Department of Fish and Game, Commercial Fisheries Division)
[6] Toshihide "Hamachan" Hamazaki (JTC advisor, biometrics, Alaska Department of Fish and Game, Commercial Fisheries Division)

Index Area Priority Planning Subcommittee (CIAPPS) was asked to resume work on identifying key index areas for stock assessment in Canada.

Also at the fall meeting, conceptual proposals for the Restoration and Enhancement Fund (R&E) were reviewed and final ratings and comments on these proposals were approved by the full JTC. The R&E subcommittee reviewed and rated all the proposals prior to the November meeting. The JTC briefly discussed and will be involved in plans to update the R&E fund priorities; this process will be initiated and directed by the Yukon River Panel.

Fall meeting attendance:

Susan Antpoehler (JTC Co-Chair), Department of Fisheries and Oceans Canada (DFO)
Mary Ellen Jarvis, 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
Dan Bergstrom, 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)
Brian McKenna, Tanana Chiefs Conference (TCC)
Chris Stark, Bering Sea Fishermen's Association (BSFA)
Toshihide Hamazaki (November 7 session only), ADF&G-CF

The spring JTC meeting was held February 25–27, 2014 by video teleconference with U.S. members convening in Fairbanks Alaska and Canadian members meeting in Whitehorse Yukon Territory. The 2014 preseason outlooks for drainagewide and Canadian-origin stocks were presented, along with preliminary run estimates from 2013. A recently completed analysis of Canadian Chinook salmon age, sex, and length composition estimates was presented[6], with the objective of determining the most accurate brood table for use in future escapement goal analysis. The JTC agreed to move forward using the results of this analysis to represent Chinook salmon age composition for years 1982–2004. Additional presentations and discussion topics included pre-season management plans in Alaska and Canada, marine fisheries and research survey reports, an update on the Chinook salmon genetic baseline, and 2014 Chinook and fall chum salmon escapement goal recommendations. The JTC also discussed and developed a recommendation for 10 highest priority management needs to provide to the Panel for their planned update of the R&E near term priority list.

Prior to the February 2014 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 also reviewed the R&E Detailed Proposals and participated in finalizing recommendations to the Panel at the February JTC meeting.

Spring meeting attendance:

Susan Antpoehler, JTC Co-Chair; DFO
Mary Ellen Jarvis, DFO
Trix Tanner, 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
Brian McKenna, TCC
Chris Stark, BSFA
Hamachan Hamazaki, ADF&G-CF (biometrics)

Visitors:

Roberta Joseph, (Tr'ondëk Hwëch'in FN)
Jeff Estensen, ADF&G-CF
Steve Fleischman, ADF&G-SF (biometrics)

Over time, 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 in the Yukon River. 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 or vertebra 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 2013 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. All Alaska subsistence and personal use harvest data are considered preliminary until the relevant ADF&G Fisheries Data Series reports (e.g. Jallen et al. 2012) are published.

This report is focused on Chinook and fall chum salmon stocks that occur on both sides of the international border. However, 2 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 the 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 in Canada, with the exception of a Porcupine River population. Most Yukon River coho salmon spawn in the lower 700 miles of the drainage, including the Tanana River drainage.

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). 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. Before implementing the salmon fishing schedule 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*. As the season progresses, ADF&G uses an adaptive management strategy that evaluates run strength inseason to determine a harvestable surplus above escapement requirements and subsistence uses.

2013 Chinook Salmon Outlook

The expected total Yukon River Chinook salmon run size in 2013 was projected to be 189,400[7] 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 6 years and applied to the model estimates for 2013. Using this correction factor, the drainagewide run outlook was adjusted to 98,000–144,000 Chinook salmon.

Preseason Management Strategy Planning

ADF&G and USFWS staff attended many fishery meetings throughout the winter of 2012 and spring of 2013 to discuss management options with the user groups on the Yukon River. Before the 2013 season, U.S. management agencies (ADF&G, USFWS) developed a preseason management strategy with input from fishermen, tribal council representatives, and other stakeholders to prepare for the poor run outlook. The 2013 management plan was developed with the expectation that the total Chinook salmon run size could be near the lower end of the preseason projection range, approximately 100,000 fish and was more conservative than in previous years., . Achieving escapement objectives was expected to be extremely challenging with a run of this size, and severe conservation measures were deemed necessary. Specific conservation strategies were identified which addressed the need to minimize the harvest of Chinook salmon while allowing

[7] Based on the average value for both sibling and Ricker models. Individual values for the Ricker and sibling models were 220,000 and 158,800, 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.

for the harvest of the abundant summer chum salmon. Information about these planned conservation strategies was distributed to the public through the informational flyer, 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 also presented the management strategy to the Yukon River Drainage Fisheries Association (YRDFA), Tanana Chiefs Conference (TCC), State of Alaska Advisory Committees, Federal Regional Advisory Councils, and other interested and affected parties.

The subsistence salmon fishing schedule was to begin May 30 in District 1 and be implemented chronologically consistent with migratory timing as the run progresses upstream. 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 2013 subsistence fishing schedule based in regulations 5 AAC 01.210 and 5 AAC 05.360.

Table 1.–Yukon Area regulatory subsistence salmon fishing schedule, 2013.

Area	Regulatory Subsistence Fishing Periods	Date Schedule To Begin	Open Fishing Times
Coastal District	7 days/wk	All Season	M/T/W/TH/F/SA/SU - 24 hours/day
District 1	Two 36-hour periods/wk	May 30	Mon. 8 pm to Wed. 8 am / Thu. 8 pm to Sat. 8 am
District 2	Two 36-hour periods/wk	June 2	Wed. 8 pm to Fri. 8 am / Sun. 8 pm to Tue. 8 am
District 3	Two 36-hour periods/wk	June 5	Wed. 8 pm to Fri. 8 am / Sun. 8 pm to Tue. 8 am
Subdistrict 4A	Two 48-hour periods/wk	June 9	Sun. 6 pm to Tue. 6 pm / Wed. 6 pm to Fri. 6 pm
Subdistricts 4B, C	Two 48-hour periods/wk	June 16	Sun. 6 pm to Tue. 6 pm / Wed. 6 pm to Fri. 6 pm
Koyukuk and Innoko Rivers	7 days/wk	All Season	M/T/W/TH/F/SA/SU - 24 hours/day
Subdistricts 5A, B, C	Two 48-hour periods/wk	June 21	Tue. 6 pm to Thu. 6 pm / Fri. 6 pm to Sun. 6 pm
Subdistrict 5D	7 days/wk	All Season	M/T/W/TH/F/SA/SU - 24 hours/day
Subdistrict 6	Two 42-hour periods/wk	All Season	Mon. 6 pm to Wed. Noon / Fri. 6 pm to Sun. Noon
Old Minto Area	5 days/wk	All Season	Friday 6 pm to Wednesday 6 pm

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

However, in response to the poor runs observed in 2011 and 2012, extensive measures were taken to drastically alter the subsistence fishing schedule by implementing closures and reducing fishing time to conserve Chinook salmon. Based on the expectation that the 2013 Chinook salmon run could potentially be weaker than the run observed in 2012, it was anticipated that the subsistence fishing schedule would be reduced even more than in previous years in an effort to meet escapement objectives.

According to the preseason management plan, when the subsistence schedule was initiated, gillnets would be restricted to 6-inch maximum mesh size in each district including the Coastal District and the Innoko and Koyukuk rivers. The 6-inch maximum mesh size restriction would be implemented to target summer chum salmon while conserving Chinook salmon. Subsistence fishing on the first pulse of Chinook salmon would be closed. Based on the poor preseason projection, it was likely the closure would be extended to protect the second pulse (meaning an

approximately 10 day closure). The closure would be initiated in District 1 and similarly implemented in upriver fishing districts and subdistricts based on migratory timing. Additionally, the Tanana River fisheries would be managed to meet Chinook salmon escapement goals for the Chena and Salcha rivers.

Fishermen were strongly encouraged to voluntarily reduce their Chinook salmon harvest to not exceed 25% of their average annual historical harvest to help ensure adequate escapement. For example, a family that normally harvests 40 Chinook salmon were requested to consider taking only 10 this year and shift their harvest to other salmon species, where possible, to supplement a reduced Chinook salmon harvest.

A surplus of summer chum salmon was anticipated above escapement and subsistence needs. However, the extent of a directed summer chum salmon commercial fishery would be dependent upon the strength of the Chinook salmon run. The sale of incidental Chinook salmon harvested during summer chum salmon commercial fishing periods would be prohibited. Additionally, new commercial gear options available in the Lower Yukon Area including dip nets, beach seines, and 5.5-inch mesh size gillnets (30 meshes deep) would likely be employed early in the summer chum salmon directed commercial season to reduce the incidental harvest of Chinook salmon. Later in the season, gillnets with 6-inch maximum mesh size were expected to be utilized when the rate of incidental harvest of Chinook salmon was anticipated to be low.

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. Three 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; and a sonar project near Pilot Station which provides mainstem abundance estimates for Chinook and summer chum salmon. As in recent years, additional drift test fishing was conducted throughout the 2013 season in the South Mouth at the Big Eddy site 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 June 3, which was considerably later than the average[8] of May 23. The LYTF was operational at the South Mouth site on June 10 and at the Middle Mouth site on June 13. The first Chinook salmon was caught in both the LYTF and in the lower river subsistence fishery on June 10. In the lower river, the water level continued to be high and the debris load moderate until the middle of June. Test fishing project operations were hindered due to high water and debris and initial assessment of the Chinook salmon run in the lower river was challenging. The LYTF (set gillnet) concluded operations on July 14, with a

[8] http://aprfc.arh.noaa.gov/products/fcst.php?product=SRAK48PACR.

cumulative CPUE of 7.41, which was the second lowest on record and well below the historical average of 20.10 (Figure 2). The first quarter point, midpoint, and third quarter point were June 23, June 28, and July 1, respectively. While the set gillnet test fishery experience problems during the Chinook salmon run and was not effective at monitoring the run in 2013. The drift gillnet project operated at the Big Eddy site until July 15 and provided valuable supplemental assessment information for Chinook salmon entering the South Mouth of the Yukon River.

The preliminary cumulative passage estimate at the sonar project located near Pilot Station was 117,000 ± 38,000 (90% CI) Chinook salmon, which was lower than the historical average[9] of 145,000 fish, and also lower than the average of 135,000 fish for years with late run timing[10]. 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 22, June 25, and July 2, respectively. The first pulse of Chinook salmon was estimated to be approximately 39,000 fish, the second pulse was approximately 8,600, the third pulse was about 17,900 fish, and the fourth pulse was 11,700 fish. For more background information on ADF&G operated sonar projects including Pilot Station site on the Yukon River, please refer to the department's sonar webpage[11].

Inseason genetic mixed stock analysis (MSA) on the first pulse of Chinook salmon at the sonar located near Pilot Station (June 16–23) revealed that 72% were Canadian-origin Chinook salmon. Genetic MSA on the second pulse of Chinook salmon at the sonar (June 24–July 1) indicated that 50% were Canadian-origin Chinook salmon. Since there were not enough samples from July 1 until the end of the third pulse, samples from June 29 through July 10 were pooled together for genetic MSA on the final groups of Chinook salmon moving past the sonar. Analyses indicated that 27% of these samples were from Canadian-origin Chinook salmon. For more background information on MSA for Yukon River Chinook salmon and related topics and updates, please refer to the department's Gene Conservation Laboratory webpage[12].

Chinook Salmon Inseason Management

Weekly teleconferences were facilitated by YRDFA 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 inseason assessment information, the Chinook salmon run appeared to be tracking later than average. Consistent with the new regulation requiring the protection of the first pulse of Chinook salmon, a subsistence fishing period was cancelled in District 1 and the northern portion of the Coastal District beginning June 20, and closures were similarly implemented in upriver districts chronologically as the pulse migrated into those areas. The relatively long Subdistricts 4-A and 5-D were subdivided into smaller areas to improve management precision and flexibility

[9] Average includes years 1995, 1997, 1999, 2002-2008, and 2010-2012. The sonar did not operate in 1996 and project difficulties occurred in 2000, 2001, and 2009.

[10] Average late run years 1999, 2006, 2010, 2012.

[11] http://www.adfg.alaska.gov/index.cfm?adfg=sonar.site&site=12.

[12] http://www.adfg.alaska.gov/index.cfm?adfg=fishinggeneconservationlab.yukonchinook_results.

to ensure full protection of Chinook salmon as the reduced subsistence fishing schedule was implemented.

As the Chinook salmon run progressed, inseason projections indicated that the run was very weak and would likely be insufficient to meet all escapement objectives. Each of the subsequent 3 pulses of Chinook salmon were protected by subsistence fishing closures as they migrated through Districts 1–5. Very limited fishing opportunity was provided in between pulses to allow harvest of chum salmon and other species. During these open subsistence fishing periods, gillnets continued to be restricted to 6-inch or smaller mesh size and in the upper river districts, and the use of fish wheels was allowed with the stipulation that all Chinook salmon were to be released unharmed. In District 5, where relatively few summer chum salmon were available, subsistence fishing time was reduced even further to avoid offering opportunity that would primarily target Chinook salmon. Unfortunately, the most severe reductions in subsistence fishing opportunity occurred in Subdistrict 5-D, where additional closures were necessary to increase Chinook salmon passage into Canada in an attempt to meet the Canadian interim management escapement goal (IMEG) for the Canadian stock.

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 5 to July 14 and in the Koyukuk River from June 19 to July 26.

In the Tanana River, subsistence salmon fishing was closed to protect the first pulse of Chinook salmon from July 12–July 14 in Subdistricts 6-A and 6-B and from July 12–July 15 in the Old Minto Area. A second subsistence fishing period was closed when it became apparent that the escapement goal for the Chena River was unlikely to be achieved. These restrictions were in effect from July 20 to July 25. Additionally, in Subdistrict 6-C, personal use salmon fishing was closed from July 12 to August 5, nearly spanning the entire duration of the Chinook salmon run.

2013 Summer Chum Salmon Outlook

The strength of the summer chum salmon run in 2013 was dependent on production from the 2009 (age-4 fish)[13] and 2008 (age-5 fish) escapements, as these age classes dominate the run. The 2013 preseason run outlook was for a run size of approximately 1.5 million to 1.8 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 800,000 summer chum salmon. Similar to the last couple years, the actual commercial harvest of summer chum salmon in 2013 was anticipated to be affected by a poor Chinook salmon run, as Chinook salmon are incidentally harvested in chum salmon-directed fisheries.

Summer Chum Salmon Inseason Run Assessment and 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

[13] 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.

assess the run including: preseason run outlooks, sonar passage estimate near Pilot Station, test fishing indices, age, sex and length composition, subsistence and commercial harvest reports, and information from escapement monitoring projects.

Approximately 2.7 million summer ± 120,000 (90% CI) summer chum salmon passed the sonar project near Pilot Station, which was well above the historical median of 1.9 million for the project. The first quarter point, midpoint, and third quarter point were June 22, June 27, and July 2, respectively, which were similar to historical average quarter points (June 22, June 27, and July 4, respectively for years 1995 and 1996–2012). Three large pulses of summer chum were detected with the largest group passing the sonar project from June 21 to 23 and contained approximately 600,000 summer chum salmon.

Liberal commercial fishing opportunity was provided to target the available surplus of summer chum salmon in Districts 1 and 2, Subdistrict 4-A, and District 6. However, a suite of strategies were used to conservatively manage these fisheries to minimize incidental harvest of Chinook salmon.

Utilizing new regulations adopted by the Alaska Board of Fisheries (BOF) in 2013, ADF&G allowed for the commercial harvest of summer chum salmon using dip nets and beach seines beginning June 18 in District 1 and June 20 in District 2. The intent was to provide for summer chum salmon commercial fishing opportunity even during times when subsistence fishing closures had been enacted to protect Chinook salmon. The impact to Chinook salmon was expected to be minimal as fishermen were required to immediately release incidentally caught Chinook salmon back to the water alive. This was the first time since the reemergence of the summer chum salmon commercial fishery in the Lower Yukon Area, in 2008, in which commercial fishing began near the first quarter point of the summer chum salmon run when a large volume of fish were available. The department allowed fifteen 12-hour periods in District 1 and 17 periods in District 2 using dip nets and beach seines only. Unfortunately, due to the difficulty of operating beach seine gear in the high water conditions present during the summer season, very few fishermen chose to operate beach seine gear and the limited interest in using this gear quickly waned.

As in recent years, the use of gillnet gear was delayed until after the midpoint of the Chinook salmon run to reduce incidental harvest. Utilizing another new gear option, the first commercial gillnet period in District 1 took place July 2 with gillnets restricted to 5 ½-inch or smaller mesh size, not to exceed 30 meshes in depth. This gear option was used for the first 6 commercial gillnet periods in District 1. Additionally, similar to the last several years, commercial gillnet fishing in District 1 was initially limited to the South Mouth only (Figure 4). The incidental Chinook salmon harvest rates were anticipated to be low because Chinook salmon catch in the LYTF operating in this area are relatively low. Later in the season, all of District 1 was open to commercial fishing and the gillnet gear restriction was relaxed to 6-inch or smaller mesh size.

Unfortunately, the strategy of limiting the area open to commercial fishing to minimize the incidental harvest of Chinook salmon is more challenging to implement in District 2. As the Yukon River begins to become more channelized in this area, the likelihood of encountering Chinook salmon in a commercial gillnet fishery increases. Therefore, the use of dip nets and beach seine gear was continued for several more periods, before transitioning to gillnet gear in District 2 on July 8. At that time, gillnets were restricted to the traditional, 6-inch or smaller mesh size to maximize the summer chum salmon harvest while trying to avoid limiting

fishermen participation by restricting the gear further. During the gillnet portion of the commercial season in Districts 1 and 2, concurrent subsistence and commercial fishing periods were regularly instituted. The intent of these concurrent openings was to streamline commercial and subsistence fishing into a single event, therefore reducing the amount of time that Chinook salmon were susceptible to harvest.

The sale of incidentally caught Chinook salmon was prohibited by emergency order during the entire commercial fishing season because subsistence fishing had been restricted during the season in Districts 1-5. This action helped ensure fishermen would not target Chinook salmon during commercial fishing periods, and fishermen could release any incidentally caught Chinook salmon alive or use them for subsistence purposes. It was required to report on fish tickets any Chinook salmon caught but not sold. The prohibition of Chinook salmon sales continued through the fall season.

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. Commercial fishing in Subdistrict 4-A began July 1 and 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. Additionally, new regulations were adopted by the BOF, effective 2013 fishing season, that detailed construction specifications for commercial fish wheels in Subdistrict 4-A that are intended to reduce the potential for injuring Chinook salmon while being released. After the vast majority of the Chinook salmon run had passed through the area, the requirement that commercial fish wheels must be manned at all times during operations and all Chinook salmon caught in the fish wheels must immediately be released to the water alive was discontinued. A total of twenty seven 24-hour periods were implemented resulting in a total of 648 fishing hours in Subdistrict 4-A.

District 6 was managed using inseason assessment information provided by multiple projects that operated in the Tanana River drainage. A harvestable surplus of summer chum salmon was expected based on sonar abundance estimates and genetic stock composition information. Based on this surplus and favorable market interest, the department scheduled the first commercial fishing period to target summer chum salmon in District 6 on July 19 (Table 6). As in Subdistrict 4-A, commercial fishing gear was initially restricted to fish wheels that 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. These gear restrictions were relaxed on August 4 after the Chinook salmon run in the Tanana River was nearly over. ADF&G scheduled seven commercial fishing periods. No Chinook salmon were allowed to be sold.

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

By regulation, the fall season began in District 1 after July 15. Chum salmon captured in District 1 of the Lower Yukon Area after that date were considered fall chum salmon. The subsequent transition of upriver districts and subdistricts to the fall season was based on the migration timing of fall chum salmon. The sonar project near Pilot Station began counting chum salmon as fall chum salmon after July 18. Although all chum salmon entering the Yukon River after July 15 were considered fall chum salmon, both summer and fall chum salmon enter Yukon River through late July.

In 2013, from July 16 through the end of July, fall chum salmon entry into Yukon River was steady with daily and cumulative passages at the sonar near Pilot Station comparable to historical medians (Figure 5). However, by the end of July (the median first quarter point) fall chum salmon passage did not gain as expected and had a cumulative passage of 132,000 fish, slightly lower than the historical median passage of 139,000 fish. Moving into August, daily fall chum salmon passages at the sonar project continued to be below historical medians. The cumulative fall chum salmon passage past the sonar near Pilot Station on August 11 was 220,000 fish, which was lower than the historical median for that date of 311,000 fish. During this time no commercial fishing periods were announced in Districts 1 and 2 to ensure enough fall chum salmon were getting upriver for escapement and subsistence use.

Although several relatively small groups of fall chum salmon entered the Yukon River through mid-August, the first substantial pulse of fall chum salmon did not pass the sonar near Pilot Station until August 14. This pulse lasted 2 days and approximately 195,000 fall chum salmon passed by the sonar during that time. Following this pulse, cumulative counts rose above historical medians. Commercial fishing resumed in Districts 1 and 2 and continued through the end of August. Unseasonably hot, dry, and calm weather in conjunction with above average water temperature in the lower Yukon River may have contributed to the delay of substantial pulses until mid-August. A second pulse of fall chum salmon began August 18 and lasted 5 days with approximately 174,000 fall chum salmon passing by the sonar. By August 23, the cumulative fall chum passage at the sonar near Pilot Station was 600,000 fish, which was above the historical median of 467,500 fish. A third pulse began August 25 and lasted 3 days with approximately 65,000 fall chum salmon passing by the sonar.

Commercial openings were announced in Subdistricts 5-B and 5-C from mid-August through the first week in October, and commercial fishing occurred in District 6 from mid-August through the end of September.

An estimated total of 717,000 ± 64,000 (90% CI) fall chum salmon were counted at the sonar project near Pilot Station from July 19 through September 7, 2013. Because of the magnitude of the largest pulse, the overall median timing was 6 days late. The 2013 season quarter points were August 7, 15 and 20, compared to median dates of July 30, August 9 and August 17, respectively. This was the second latest median point in 26 years of estimates of fall chum salmon from the sonar project at Pilot Station (latest occurred August 17, 1998).

Coho Salmon Management Overview

Coho salmon passage was below average the entire season with only 3 individual daily sonar counts surpassing the average mark. The largest sonar count occurred on August 15 and the second largest occurred on August 27 (both days counted approximately 10,000 coho salmon each) and overall timing of coho salmon passage was average (Figure 6). An estimated total of 85,000 ± 16,700 (90% CI) coho salmon were counted at the sonar project near Pilot Station in 2013. LYTF operated until September 20, using 6 inch mesh gillnets, and 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 test fisheries and sonar estimates, a coho salmon directed commercial fishery in the lower river in September was not prosecuted in 2013.

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 2013 and 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 (Figure 3). Additional actions included restricting gillnet mesh size to 6 inch or smaller, and allowing the use of selective gear types (dip nets, beach seines, fish friendly fish wheels) in portions of the drainage with the requirement that Chinook salmon be released alive. 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.

The preliminary percentage of households meeting over 50% of their needs for each species in 2013 was greater than the recent 5 year average (2008–2012) for each species except for Chinook salmon. Of the households that answered survey questions in 2013 about whether their subsistence needs were met, the majority of households reported meeting over 50% of their needs for summer chum (65% of households), fall chum (54% of households) and coho salmon (51% of households). Only 21% 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 2010–2012.

Commonly cited reasons for not meeting needs included: not enough openings, fishing periods were closed or 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 newly allowed gear types (dipnets, beach seines); 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 the Coastal District and Districts 1–5 in 2013. 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 2013, just over 1,370 households were selected to be surveyed. Of these, 1,100 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 369 households in portions of the Yukon River drainage where permits are required. As of publication date of this report, approximately 89% of the subsistence permits had been returned,

and 184 households reported fishing for salmon and other non-salmon fish species. Based on surveys and permits data the preliminary 2013 subsistence salmon harvest estimates in the Alaska portion of the Yukon River drainage totaled approximately 11,000 Chinook, 92,000 summer chum, 112,900 fall chum, and 14,100 coho salmon (Appendices B2–B5). Included in the estimated total subsistence harvest are 901 Chinook, 5,860 summer chum, 2,937 fall chum, and 457 coho salmon distributed for subsistence use from the various test fish projects distributed to Yukon River communities. For comparison, recent 5-year average (2008–2012) subsistence salmon harvest estimates are 37,675 Chinook, 76,710 summer chum, 80,515 fall chum, and 15,830 coho salmon (Appendices B2–B5) from communities in the Alaska portion of the Yukon River drainage. At least 750 summer chum salmon were retained from commercial fisheries or donated by fishermen in District 1 to Kwik'pak Fisheries and were subsequently donated to households in Galena and are not included in subsistence harvest totals. Other salmon donations also occurred to support the community of Galena and others that were unable to meet their needs due to spring flooding and fishery closures. These donated salmon are not added to subsistence harvests.

4.2 COMMERCIAL FISHERY

Summer Season Harvest

During the summer season there were a total of 48 commercial periods in the Lower Yukon Area and 34 commercial periods in the Upper Yukon Area. The total commercial harvest for the summer season in the Alaska portion of the Yukon River drainage in 2013 was 485,587 summer chum salmon (Appendix A3). The cumulative summer chum salmon commercial harvest for Districts 1 and 2 combined was 379,143 fish, the largest harvest on record for the Lower Yukon Area since 1989. The cumulative summer chum salmon commercial harvest in the Upper Yukon Area fishery was 106,444 fish (Appendix A3). The total summer chum salmon commercial harvest for the entire Yukon Area was 220% above the 2003–2012 average harvest of 151,776 fish (Appendices B3 and C3).

Approximately 189,000 summer chum salmon were harvested during dip net and beach seine periods in the Lower Yukon Area, with 928 Chinook salmon reported as released. This harvest accounted for half of the total commercial summer chum salmon harvest in the Lower Yukon Area. Dip nets were surprisingly successful and accounted for nearly all (99.6%) of the summer chum salmon harvest taken with these new gear types. The combined summer chum salmon harvest in the gillnet commercial fishery in Districts 1 and 2 was approximately 190,000 fish.

The preliminary cumulative summer chum salmon harvest for Subdistrict 4-A was 100,507 fish, with the majority of the harvest being female (Appendix A3). A single fish buyer operated in Kaltag during the 2013 season and the summer chum salmon harvest was 167% greater than the most recent 10-year average (2003–2012). In District 6, the preliminary cumulative harvest was 5,937 summer chum salmon (Appendix A3).

The sale of incidentally caught Chinook salmon was prohibited by emergency order during the entire commercial fishing season. A total of 439 Chinook salmon were reported incidentally harvested in Districts 1 and 2 during the summer season in the Lower Yukon Area, while a total of 44 Chinook salmon were caught but not sold in the fall season. In Subdistrict 4-A, 100 Chinook salmon were reported as caught and released alive back to the water and no Chinook salmon were reported to have been kept for subsistence purposes. Only 97 Chinook salmon were reported as caught and released alive back to the water in District 6, while 1 Chinook salmon was

recorded on a fish ticket as caught but no sold. A total of 1,124 Chinook salmon were caught and released and 484 Chinook salmon were caught and retained for subsistence purposes but not sold.

A total of 395 individual permit holders participated in the summer chum salmon fishery. In the Lower Yukon Area fishery, 384 permits holders participated in commercial periods operated in Districts 1 and 2 and in the Upper Yukon Area fishery 11 permit holders participated in Subdistrict 4-A and District 6 (Appendix A4).

Summer Season Commercial Harvest Characteristics

The Chinook salmon age composition, sampled from the incidental catch (n=29) during the District 1 summer chum salmon gillnet commercial fishery was 34% age-4, 24% age-5 and 41% age-6 fish. Females comprised 38% of the samples. Mean length from the incidental catch was 691 mm. The majority of the samples were collected from the first 3 periods.

Summer chum salmon were sampled from commercial harvests in District 1, Subdistrict 4-A, and District 6. Summer chum salmon age composition from the District 1 commercial harvest (n=1,729) was 47% age-4, 51% age-5, 2% age-6 fish and less than 1% age-7 fish. Females comprised 46% of the harvest. Summer chum salmon age composition from the Subdistrict 4-A commercial fish wheel harvest (n=553) was less than 1% age-3, 58% age-4, and 41% age-5 fish. Females comprised 95% of the sample. This high percentage of females is because only females were purchased during most commercial periods; males were sorted and released live from fish wheels. Summer chum salmon age composition from the District 6 commercial fish wheel harvest (n=407) was 62% age-4, 38% age-5 and less than 1% age-6 fish. Females comprised 58% of the sample. The mean length from District 1, Subdistrict 4-A, and District 6 summer chum commercial fisheries was 558, 539, and 559 mm, respectively.

Fall Season Harvest

There were a total of 43 commercial periods during the fall season in 2013. The majority of fall season commercial harvest occurred in the Lower Yukon Area (a regular schedule of commercial fishing periods was established in Upper Yukon Area, but limited markets resulted in low fishing effort and relatively small harvests). The total commercial harvest for the Yukon River fall season in the Alaska portion of the drainage in 2013 was 238,051 fall chum and 66,199 coho salmon (Appendix A3). Both species harvested were above their respective most recent 5-year (2008–2012) and 10-year (2003–2012) averages (Appendices B4 and B5). The fall chum salmon harvest was the fifth largest since 1990 and the coho salmon harvest was the fourth largest since 1990. All salmon were sold in the round and no salmon roe was sold separately. A total of 443 individual permit holders participated in the fall chum and coho salmon fishery: 436 in Districts 1 and 2 combined and 7 in Districts 4, 5, and 6 combined (Appendix A4).

Fall Season Commercial Harvest Characteristics

Fall chum salmon age composition from the District 1 commercial harvest (n=902) was <1% for age-3 and age-6, with the dominant age classes representing 70.6% age-4 and 28.9% age-5. Based on the entire sample, not just those that could be aged (n=918), females comprised 47.7% of the commercial fish. The mean length of fall chum salmon in the commercial fishery was 575 mm. The proportion of fall chum salmon by age for the dominant age classes are higher for age-4 and lower for age-5 than those observed in LYTF of 63.7% and 35.3% age-5, respectively. Proportions of females in the LYTF were higher at 57.2% (n=1,298). Mean length of fall chum

salmon in LYTF was 583 mm. Overall proportions of LYTF age-4 were slightly lower than the 1986–2012 average of 66.1% and the age-5 were correspondingly higher than average of 31.7% (Bonnie Borba, Yukon Area Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication).

Coho salmon age composition from the commercial harvest in District 1 (n=469) was 12.2% age-3, 82.7% age-4 and 5.1% age-5. Based on the entire sample (n=490), not just those that could be aged, females comprised 43.7% of the commercial fish. The mean length of coho salmon in the commercial fishery was 563 mm. The LYTF observed 17.8% age-3, 74.5% age-4 and 7.7% age-5 (n=325). Females comprised 47.4% of the fish sampled (n=340), whereas the 1987–2012 average is 44.1% in the LYTF. Mean length of coho salmon in the LYTF was 572 mm. Overall proportions of age-4 was slightly below the LYTF average of 76.7%, whereas the age-3 and age-5 averages were higher than the averages of 15.3% 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 gillnets 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 2008 to 2012 harvests in the Tanana River represented, on average, 74%, 15% and 36% of the total Yukon River drainage Chinook, summer chum and coho salmon sport fish harvest respectively. 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 2013, an emergency order was issued on May 15 closing all waters of the mainstem Yukon River to sport fishing for Chinook salmon for the 2013 season and prohibiting the retention of Chinook salmon in all tributaries of the Yukon River (excluding the Tanana River) effective May 22 through June 30. This emergency order reopened the tributaries on July 1 with a reduced sport limit of 1 Chinook salmon. On July 9 two emergency orders were issued, both effective July 12. The first emergency order prohibited the retention of Chinook salmon and the use of bait in all tributaries of the Tanana River drainage. The second emergency order prohibited the retention of Chinook salmon and the use of bait in the remainder of Yukon River tributaries. Effective July 24 the use of bait was again permitted in the Yukon River tributaries (excluding the Tanana River) and the reduced sport limit of 1 Chinook salmon was restored. A final emergency order was issued on July 29 that closed the Chena River to sport fishing for Chinook salmon as the escapement was projected to be below the goal, while the Salcha River was reopened to retention of Chinook salmon and the use of bait because the escapement goal was projected to be met.

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 2013 harvest estimates are not available for this report. The total 2012 sport harvest of salmon in the Alaska portion of the Yukon River drainage (including the Tanana River) was estimated at 345 Chinook, 271 summer chum and 131 coho salmon (Appendices B2, B3, and B5). The recent 5-year (2008–2012) average Yukon River drainage sport salmon harvest was estimated at 513 Chinook, 459 summer chum and 569 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 2008 to 2012, guided sport harvests in the Yukon River drainage (excluding the Tanana River drainage) averaged 88 Chinook and 192 coho salmon (Sigurdsson and Powers 2013).

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.

In 2013, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week. This fishery was closed from 12:00 p.m. Wednesday, July 10 until 6:00 p.m. Monday, August 5 to conserve Chinook salmon. A total of 53 personal use salmon and 14 personal use whitefish and sucker household permits were issued. The 2013 preliminary harvest results based on 97% of the personal use household permits returned in Subdistrict 6-C included 42 Chinook, 138 summer chum, 383 fall chum, and 109 coho salmon. The recent 5-year (2008–2012) average personal use harvest was 115 Chinook, 305 summer chum, 845 fall chum, and 303 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[14] Chinook salmon in 2013 was expected to be poor to below average, with a preseason outlook range of 49,000 to 71,000 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 2013 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)[15]. The decision matrix in the plan provided detailed guidance for the management of fisheries linked to specific inseason run abundance levels. The 2013 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 2013 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 would be 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.

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

[14] The Upper Yukon River is defined as the Canadian portion of the Yukon River drainage excluding the Porcupine River drainage.
[15] Unpublished draft for 2013; available from DFO offices, Whitehorse.

Table 2.–Inseason fishery management decision matrix for Upper Yukon Chinook salmon, 2013.

	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 2013 season, information from the U.S. Lower Yukon test fish project at Emmonak and the sonar program near Pilot Station, in the Lower Yukon Area, suggested that the Canadian-origin Chinook salmon run to the upper Yukon River would be at the low end of the preseason outlook range of 49,000 to 71,000 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 19, 2013.

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 2013 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 2013.

5.2 Fall Chum Salmon

The 2013 preseason outlook for the Canadian-origin fall chum salmon run to the upper Yukon River was an average to above average run of 226,000 to 288,000 fish.

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 2013 IFMP, provides detailed guidance for specific inseason decisions. The 2013 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, 2013.

	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 were used in conjunction with the counts from the sonar project near Pilot Station 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 for fall chum salmon in 2006, 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 and closures in Canada for fall chum salmon were made in a similar way to those for Chinook salmon. 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 component of the fall chum salmon run were based on Eagle sonar estimates, and informed by run timing information from downstream indicators (sonar operated near Pilot Station and the fish wheel project at Rampart Rapids) as well as genetic estimates of run composition from the test fishery at the sonar project near Pilot Station.

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 intention of management actions in 2013 was to ensure that the interim management escapement goal (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 sonar near Pilot Station and indications from the Rampart Rapids fish wheel. The commercial fishery was opened on a conservative schedule commencing on August 27, for 3 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 seven days per week commencing September 2 and remained open until October 14. The total 2013 commercial and domestic fall chum salmon harvest was 3,387 fish (Appendix A6).

Porcupine River Fall Chum Salmon Inseason Decision Matrix

At the Yukon Panel meeting in March 2013, 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 VGG would discuss potential conservation options before implementing restrictions.

Table 4.–Inseason fishery management decision matrix for Fishing Branch River fall chum salmon, 2013.

	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 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 the sonar project near Pilot Station, and the Ramparts Rapids video test fish wheel data. U.S. genetic stock identification data were used in conjunction with the sonar estimates to develop a preliminary index of the potential run size destined for the Canadian portion of the Porcupine River drainage. However, early inseason forecasts are highly uncertain.

Inseason MSA analysis of fall chum salmon sampled from the test fishery conducted near Pilot Station along with the strong run in the basin indicated that run strength would likely be sufficient to meet escapement. However, there is uncertainty associated with the genetic sample stock size indication because the Fishing Branch 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 VGG and Environmental Dynamics Incorporated (EDI), an environmental consulting firm. This was the third 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, but in sufficient numbers to allow for a harvest of chum salmon by VGG citizens.

Porcupine River Fall Chum Salmon Decisions and Management

The preseason outlook for the Porcupine River fall chum salmon run in 2013 was an average to above average run of 45,300 to 57,600 fish. The preseason projection indicated that the escapement goal would be achieved. The final Fishing Branch River weir passage estimate of 25,376[16] fall chum salmon (Appendix B15) 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 2013. The preliminary estimated reconstructed run for the Porcupine River was approximately 53,000[17] fish, which was just above the preseason outlook.

6.0 CANADIAN HARVEST SUMMARIES

6.1 ABORIGINAL FISHERY

Upper Yukon Chinook Salmon

In 2013, 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 postseason and reviewed by First Nation staff in conjunction with DFO.

Based on a preseason outlook for a below average run of 49,000 to 71,000 Upper Yukon Chinook salmon, it was prudent to consider that conservation measures would likely be required in all Canadian 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.

In 2013, the Upper Yukon River aboriginal Chinook salmon catch was estimated to be 1,902 fish; including 1,253 fish reported by First Nations and an adjustment of 649 fish to account for 2 communities that did not report their harvest (Appendix A6). This adjustment was derived using recent harvest data averages. The adjusted estimate is 24% of the 8,000 Chinook salmon that would likely be harvested in an unrestricted aboriginal fishery[18] and 57% below the recent 10-year average (2003–2012) of 4,459 salmon. This represents the lowest harvest of Chinook salmon on record since 1980 (Appendix B7). It should be noted that while some records of catches in the aboriginal fishery do exist from 1961 to 1979, the information is not considered reliable as there was no consistent data collection method in place until 1980.

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[16] This escapement estimate is based on the Porcupine Sonar count of 35,626 minus upstream harvest of 1,380 and multiplied by the proportion of tagged fish returning to the Fishing Branch River upstream of the historic weir site (74.1%).

[17] This is based on the Porcupine Sonar count of 35,626 fish plus downstream harvest of 903 fish and the US harvest (assumed to be 5% of 338,000 fish).

[18] Interim Basic Needs allocation estimate as established from Yukon River Salmon Harvest study data from 1996 to 2002, excluding years where the fishery was restricted for conservation (1998–2000).

The 2013 harvest recorded by Tr'ondëk Hwëch'in (THFN) in the Dawson area was 602 Chinook salmon, approximately 63% of the recent 10-year average. A harvest of 237 Chinook salmon was reported by the First Nation of Na-Cho Nyäk Dun (NNDFN) on the Stewart River, 37% of the 2003–2012 average of 647 fish. The harvest reported by Selkirk First Nation (SFN) was 350 fish, or 32% of their 2003–2012 average of 1,085. The Ta'an Kwach'an Council (TKC), fishing in the vicinity of Lake Laberge near Whitehorse, reported a catch of approximately 40 Chinook salmon, 74% of their recent 10-year average of 54 salmon. Most of the harvest taken by TKC was during a culture camp. Prior to the season, the Teslin Tlingit Council (TTC) approved a management plan which would restrict fishing to weekends only and included a household limit. However, as the season progressed and border sonar estimates indicated that spawning escapement objectives would not be met, TTC voluntarily curtailed all fishing for Chinook salmon with the exception of a small culture camp for youth. They experienced almost complete compliance by community members and reported a total of 24 Chinook salmon harvested, or 6% of the 2003–2012 average of 412 fish. Little Salmon Carmacks First Nation (LSCFN) did not report their salmon harvest in 2013; the harvest estimate for this First Nation is 463 Chinook salmon and is based on recent harvest totals (10-year average). The harvest of Chinook salmon for the Ross River Dena Council (RRDC) is estimated to be 186, also derived by using a 10-year average.

Upper Yukon Fall Chum Salmon

The preseason outlook for Canadian-origin fall chum salmon to the upper Yukon River in 2013 indicated an average to above average run of 226,000 to 288,000 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 2013 fall chum salmon harvest reported in the aboriginal fishery from the upper Yukon River was estimated to be approximately 500 chum salmon and is based on a 10-year average and limited information received to date (Appendices A6 and B8).

The THFN reported that there was no harvest of fall chum salmon in the Dawson City area in 2013. Average catches of 433 and 460 fall chum salmon were derived from a 7 year harvest study conducted by LGL Limited from 1996 to 2002 in the Pelly (SFN) and Carmacks (LSCFN) areas, respectively. Recent information from these 2 communities suggests that interest in fall chum salmon has been significantly reduced since that time.

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. VGG provided weekly updates and reported a season total of 242 Chinook salmon for 2013 (Appendix B7). The recent 10-year average (2003–2013) was 299 Chinook salmon.

A total of 2,283 fall chum salmon was harvested in the Old Crow aboriginal fishery (Appendix A6), which is 13% below the recent 10-year average harvest from 2003 to 2012 of 2,625 chum salmon. (Appendix B8).

There were 151 coho salmon harvested on the Porcupine River in 2013, compared to the 2003–2012 average of 150 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. The boundaries of the commercial fishing areas within the Yukon Territory are presented in Figure 7. 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 2013 Chinook salmon season. There were 2 Chinook salmon harvested incidentally during the early fall chum salmon opening in late August (Appendices A6 and B7).

The average commercial Chinook salmon catch for the 2003–2012 period, excluding years when the fishery was closed for conservation purposes, was 2,644 fish (Appendix B7). Since 1997, there has been a marked decrease in commercial catch of Chinook salmon in the upper Yukon River as a result of closures and/or very limited fishing opportunities.

Fall Chum Salmon Harvest

A strong return of fall chum salmon resulted in opportunities for commercial fishery openings throughout the fall season. A total of 3,369 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 as a result of a limited market as well as reduced fishing opportunities in some years due to below average run sizes.

The total 2013 commercial fall chum salmon catch of 3,369 fish was 38% below the 2003–2012 average of 5,459 fish and slightly above the 2008–2012 average of 3,012 fish (Appendix B8). Within the 2003–2012 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. There were 2 coho salmon harvested, both were caught during the third week of September, in the directed chum salmon fishery.

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 a total reported domestic catch of 18 fall chum salmon in 2013 (Appendices A6 and B8). This represents the first recorded catch of chum in the fishery since 2005 when 13 were reported and compares to a long term average of 487 from 1974 to 2013; domestic fishery catches were not recorded prior to 1974 (Appendices B7 and B8).

6.4 RECREATIONAL FISHERY

In 1999, the Salmon Sub-Committee 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 2013, 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 July 19. On August 2, 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. In addition, an area of the Teslin River from Johnson's Crossing to Muskrat Creek was closed to all angling from August 15th to September 2. This was a new management measure designed to provide for the protection of a local spawning population of Chinook salmon.

From catch card information received as of this publication, no Chinook salmon were either retained or caught and released in the Yukon River or its tributaries in the 2013 recreational fishery. The average number of retained Chinook salmon catch within the 2003–2012 period was 239 fish (Appendix B7).

For the 2013 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 2013

7.1 CHINOOK SALMON

Alaska

In Alaska, a suite of projects is used to assess the Chinook salmon run. Lower Yukon test fishery, which uses 8.5 inch mesh setnet gillnets, indicated that the run was likely dominated by age-6 fish. Chinook salmon age composition estimated from a sample of 581 fish collected in LYTF was 2% age-4, 21% age-5, 75% age-6, and 2% age-7 fish. The proportions of age-5 and age-6 fish were similar to those in 2012, and were close to the long-term averages (Larry DuBois, Fisheries Biologist, ADF&G, Anchorage, Alaska; personal communication). Females comprised about 62% of the samples, which was higher than historical averages. These samples represented fish that were potentially subject to harvest later, and thus do not represent age or sex composition of the escapement or spawning populations. Chinook salmon age composition estimated from samples collected in escapement projects on the Andreafsky, Gisasa, Chena, and

Salcha rivers, Henshaw Creek, and the Yukon mainstem at Eagle, Alaska comprised 4-48% age–4, 16–30% age-5, 29–69% age-6, and 0–5% age-7 fish. Female percentages in these escapement projects ranged from 34 to 52% (Appendix A10).

The actual 2013 Chinook salmon run came in below the low end of the preseason projection, making it difficult to achieve all escapement objectives. Chinook salmon escapement goals for the West Fork Andreafsky (aerial), Nulato (aerial), and Salcha (tower) rivers were achieved (Table 5; Appendices B9, B10, and C9). The East Fork Andreafsky River (weir) Chinook salmon counts were just below the escapement goal. The E.F. Andreafsky River weir installation was hindered by high water and it is likely early Chinook salmon were missed. The Anvik and Chena rivers escapement goals were not met (Table 5). Season cumulative counts on the Gisasa and Henshaw rivers were below historical averages (Appendix B10). The Chena River project operations were hindered by high water conditions for much of the season and sonar estimates were used for a portion of the season (Appendices B10, and C9).

Table 5.–Summary of 2013 Chinook salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2013 Chinook Salmon Escapement
E. Fork Andreafsky	Weir	2,100–4,900 (SEG)	1,998
W. Fork Andreafsky	Aerial survey	640–1,600 (SEG)	1,090
Anvik	Aerial survey	1,100–1,700 (SEG)	940
Nulato (Forks Combined)	Aerial survey	940–1,900 (SEG)	1,118
Gisasa	Weir	none	1,126
Henshaw	Weir	none	706
Chena	Tower	2,800–5,700 (BEG)	1,859
Salcha	Tower	3,300–6,500 (BEG)	5,465
Goodpaster	Tower	none	738

Note: Sustainable escapement goal (SEG) and biological escapement goal (BEG).

The preliminary Chinook salmon estimate based on the sonar project counts near Pilot Station was 117,159 fish (Appendix A2). Preliminary Chinook salmon passage at Eagle sonar in 2013 was 30,725 fish, and after subtracting estimated U.S. subsistence harvest above Eagle sonar, the estimated border passage was approximately 30,573 fish (Appendix B11).

Canada

The suite of inseason U.S. projects provide stock status information considered in management by DFO; the Rampart Rapids CPUE fish wheel project and the sonar operated at Eagle near the U.S./Canada border are particularly important inseason. Both projects provide timing information for 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 28,669[19] fish (Appendix B11). Aerial

[19] This is based on a sonar estimate of 30,725 fish, Eagle subsistence catch of 152, and Canadian Upper Yukon catch of 1,904 fish which included: 1,902 fish in aboriginal, 2 fish in commercial, 0 fish in domestic and 0 fish in the recreational catches.

surveys of the usual systems including Chinook salmon index areas of the Little Salmon, Big Salmon, and Wolf rivers were have not been conducted by DFO since 2012 (JTC 2012).

Escapement to the Big Salmon River has been monitored for the last 9 years using a DIDSON sonar. A total of 3,239 targets were identified as Chinook salmon. This estimate represents 11.3% of the Upper Yukon spawning escapement estimate of 28,669 fish. The Big Salmon average sonar estimate from 2003 to 2012 was 4,932 fish (Appendix B12).

The 2013 Whitehorse Rapids Fishway count of 1,139 Chinook salmon which was 89.3% of the 2003–2012 average count of 1,267 fish (Appendix B12), and 3.9% of the Yukon spawning escapement estimate of 28,669 fish. The overall sex ratio was 51% female and hatchery-produced fish accounted for 67% of the return.

In 2013, the Blind Creek weir count of 312 Chinook salmon of which 60% of the sampled fish were female. The 2003 to 2012 average count is 519 Chinook salmon (Appendix B12).

Multiple beam high resolution sonar was operated for the second full season on the Teslin River. A total of 9,916 Chinook salmon targets were enumerated (Appendix B12). This estimate represents 34.6% of the Upper Yukon spawning escapement estimate of 28,669 Chinook salmon.

7.2 SUMMER CHUM SALMON ALASKA

Most tributaries producing summer chum salmon experienced above average escapement in 2013 (Appendices B13 and C11). The East Fork Andreafsky River sustainable escapement goal (SEG) and Anvik River biological escapement goal (BEG) 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 above their historical averages (Appendix B13). The estimated cumulative passage of approximately 2,700,000 summer chum salmon at the sonar project near Pilot Station (Appendix A2), through July 18, exceeded the management threshold of 600,000 summer chum salmon.

Table 6.–Summary of 2013 summer chum salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2013 Summer Chum Salmon Escapement
E. Fork Andreafsky	Weir	>40,000 (SEG)	61,234
Anvik	Sonar	350,000–700,000 (BEG)	571,690
Gisasa	Weir	none	80,055
Henshaw	Weir	none	263,746
Chena	Tower	none	21,372
Salcha	Tower	none	60,980

Note: Sustainable escapement goal (SEG) and biological escapement goal (BEG).

7.3 FALL CHUM SALMON

Alaska

The preliminary 2013 Yukon River drainagewide total run size estimate of 1,211,000 fall chum salmon is based on the postseason expanded escapement and estimated harvest. This run size is

slightly above the upper end of the preseason forecast range of 906,000 to 1,152,000 salmon. Although final assessments of overall run size (escapement plus harvests), 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 abundance estimate based on the sonar project near Pilot Station until upriver monitoring projects can provide data. The preliminary fall chum salmon passage estimate, based on the sonar for the period July 19 through September 7, was 716,727 fish with a 90% confidence interval of 639,171 to 794,283 fish (Figure 5; Appendices A2 and B14). In 2013, references to inseason run size included estimates of harvest below the sonar near Pilot Station 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 964,000 fall chum salmon. The postseason method (2) of assessing run size was derived from individually monitored spawning escapement projects in the upper Yukon and Tanana River drainages (in 2013 both the Sheenjek and Tanana River preliminary estimates were derived from regressions to related stocks), including estimated U.S. and Canadian harvests, where appropriate, resulting in a preliminary estimate of 1,211,000 fall chum salmon.

The second method includes the sonar project that operated on Chandalar River with an escapement estimate of 253,000 fall chum salmon (Appendix B14). The Sheenjek River sonar was not operated in 2013 and the estimate of 109,000 fall chum salmon was based on the 2 bank relationship with the Fishing Branch River weir (1985–2012 excluding 2005; Appendix B14). The Canadian escapement to the upper Porcupine River was derived from the expanded border sonar estimate minus the estimated aboriginal harvest in Old Crow Yukon Territory and resulted in approximately 30,000 fall chum salmon spawners. 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 200,000 fish (Appendix B15). The project summary section of this report contains more detailed information on the operations at the sonar near Pilot Station, Chandalar, upper Porcupine River sonar and Mainstem Yukon River sonar 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 2013 was based on 9 replicate foot surveys conducted between October 1 and December 4. The Delta River escapement was estimated to be approximately 32,000 fall chum salmon, which was well above the upper end of the BEG range (Appendices B14 and C12). Escapement into the Delta River in 2013 was recorded as the second highest on record in 40 years, only slightly below that observed in 1991. The high population estimate is partly attributed to the relatively warm conditions allowing continued access particularly to the large middle channel (second latest timing behind 1990) while the east and west channels had more normal timing.

Initially, genetic mixed stock analysis (MSA) at the sonar project near Pilot Station 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 2013, MSA suggested the Tanana River component was approximately 330,000 fall chum salmon. Inseason assessment of the fall chum salmon run into the Tanana River drainage consisted of monitoring run timing and catch at 1 test fishery wheel

located near the village of Manley and monitoring subsistence and commercial harvest in the fisheries. The Tanana River run was assessed at 275,000 fall chum salmon based on its relationship to the Mainstem Yukon U.S./Canada border passage (1995–2012 excluding 2005; Appendix B14). This method for estimating the Tanana River was employed instead of using the relationship between the Tanana River (Upper Tanana and Kantishna rivers mark–recapture) and the Delta River because of the late entry pattern thought to be caused by the unseasonably warm fall weather. This estimate of escapement was above the upper end of 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 1,211,000 fish minus U.S. and Canada commercial harvest (241,000 fish) as well as estimated subsistence and aboriginal harvests (103,000 fish) of fall chum salmon. Hence, the 2013 drainagewide escapement of fall chum salmon is estimated to be approximately 866,000 fish which is well above the upper end of the SEG of 300,000 to 600,000 fish. All escapement goals were achieved in 2013 and most exceeded the upper end of the range (Table 7 and Appendices B14 and C12).

Table 7.–Summary of 2013 fall chum salmon escapement counts, in comparison with existing escapement goals.

Location	Assessment Method	Escapement Goal (type)	2013 Fall Chum Salmon Escapement
Drainagewide	Run Reconstruction	300,000–600,000 (SEG)	866,556
Chandalar River	Sonar	74,000–152,000 (BEG)	253,041
Sheenjek River [a]	Regression	50,000–104,000 (BEG)	109,000
Upper Tributary [b]	Sonar	212,000–441,000 (BEG)	392,041
Tanana River [c]	M/R regressions	61,000–136,000 (BEG)	274,611
Delta River	Ground Survey	6,000–13,000 (BEG)	31,955

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

[a] Sheenjek had 2 bank operations in 1985–1987, 2005–2009, and 2011–2012. The rest of the years were expanded using average 36% for second bank operations and regressed to Fishing Branch River weir excluding 2005.

[b] Upper tributary goal is Chandalar, Sheenjek and Fishing Branch rivers combined. Used Porcupine River sonar to estimate Fishing Branch River.

[c] The Tanana River escapement estimate was based on regression with Mainstem Yukon 1995–2012 (excluding 2005) minus Tanana River harvests.

Historically, fall chum salmon estimates based on the sonar project near Pilot Station 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 sonar estimates (1995, 1997–2005) and the collective escapement and harvest assessment projects. In 2013, the estimate based on collective projects was approximately 26% greater than the preliminary estimate using the sonar and harvest below. Because of the location of the project near Pilot Station (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. Additionally, interactions between species may affect apportionment to varying degrees. However, note that in 2013, with the lack of escapement projects, 34% of the run reconstruction was derived from other estimates thereby increasing the measurement error.

Fall chum salmon entered the Yukon River in 6 pulses in 2013 (Figure 5), the first pulse containing 46% summer chum salmon. 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 2008–2012, the sonar at Pilot Station was operated an additional week into September. In addition, LYTF operated later into the season, through September 20, 2013. No significant pulses of fall chum or coho salmon entered the river in September based on LYTF. All monitoring projects suggested the run was 2–8 days late in timing. Because most of the fall chum salmon came in late in the season the largest groups of fish merged together nearly completely as they migrated upriver.

In 2013, the proportion by age class for fall chum salmon include age-3 (<1%), age-4 (65.0%), age-5 (34.2%) and age-6 (<1%) fish. Age-4 and age-5 components were slightly above average and age-3 and age-6 were slightly below average when compared to LYTF weighted averages for the years 1977 to 2012. These levels of age-4 and age-5 fish were near the expected contribution based on the preseason forecast of 62.8% and 33.7%. Females contributed 42.3% to the samples and were below average (58.1%). Age, sex and length composition data were collected in 2013 from escapements in Toklat and Delta rivers and escapement into Canada from the Yukon River mainstem at Eagle (Appendix A23).

Canada

The preliminary fall chum salmon spawning escapement estimate based on the Eagle sonar program is 200,262[20] fish (details are presented in Section 8.1; Table 8 and Appendix B15). 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 spawning escapement of 437,733 fall chum salmon occurred in 2005.

Aerial surveys of the mainstem Yukon, Kluane and Teslin River index areas were not conducted between 2007 and 2013. Estimates of the relative abundance of fall chum salmon in these areas were developed from GSI collected in conjunction with the DFO tagging program (2007–2008) and the Eagle sonar program (2009–2013). Historical aerial survey data are presented in Appendices B15, C13 and C14.

A sonar program was operated on the Porcupine River immediately downstream of Old Crow in 2013. A total of 35,626 fall chum salmon were enumerated. The preliminary spawning escapement estimate developed by the sonar program was 34,246[21] fall chum salmon for the Porcupine River in Canada (details are presented in Section 8.2).

[20] This is based on a sonar estimate of 216,791 fish (expanded for fish passage after the cessation of the program), Eagle subsistence catch of 12,642 fish, and Canadian Upper Yukon catch of 3,887 fish which included: 500 fish in aboriginal, 3, 369 fish in commercial, 18 fish in domestic, and 0 fish in recreational catches.

[21] This is based on the sonar estimate of 35,626 minus the Old Crow harvest. Harvest upstream of the sonar was estimated at 2,500 fall chum salmon (Personal communications with William Josie of Vuntut Gwitchin Government).

The Fishing Branch River weir was not operated in 2013. Instead a combination of radio-tagging and the Porcupine sonar was used to estimate escapement. Based on the proportion of radio-tagged fish detected in the Fishing Branch River, the estimated Fishing Branch count is 25,376[22] fall chum salmon (Table 8; Appendices B15 and C14). This estimate falls within the lower end the escapement target range of 22,000 to 49,000 fall chum salmon. Details of the 2013 weir estimate are presented in Section 8.2.

Table 8.–Summary of 2013 fall chum salmon escapement counts to Canada, in comparison with existing interim management escapement goals (IMEG).

Location	Assessment Method	Escapement Goal (type)	2013 Fall Chum Salmon Escapement
Fishing Branch River	Sonar-Harvest-Telemetry	22,000–49,000 (IMEG)	25,376
Yukon River Mainstem	Sonar-Harvest	70,000–104,000 (IMEG)	200,262

8.0 PROJECT SUMMARIES

8.1 ALASKA

Sonar Project near Pilot Station

The goal of the sonar project near Pilot Station is to estimate the daily upstream passage of Chinook, chum, and coho salmon. The project has been in operation since 1986, and many refinements and enhancements to the project's sonar equipment and apportionment methodologies have been implemented over the years this project has operated (Lozori and McIntosh 2013). Both split-beam and dual frequency identification sonar (DIDSON) are currently used to estimate total fish passage.

Fish passage estimates by species are based on a sampling design in which sonar equipment is operated daily in three 3-hour intervals, and test fishing is conducted twice each day between sonar periods to apportion the sonar counts to species. The results of the sonar sampling periods are expanded to provide total daily passage estimates in each of 3 zones; a single zone on the right bank, and an inshore and offshore zone on the left bank. To estimate species composition, gillnets are drifted through each of these 3 zones. A total of 8 different mesh sizes are fished throughout the season to effectively capture all size classes of fish present and detectable by the hydroacoustic equipment. Gillnet mesh size ranges from 2.75- to 8.5-inch" (7.0 to 21.0 cm), with all nets constructed to be 25 fathoms (45.7 m) long and approximately 8 m deep. Since gillnets are size selective, the associated CPUE for the catch of each individual of each species is adjusted by applying a length-based selectivity parameter for the mesh size in which it was caught (Bromaghin 2004). Proportions, by species, are then calculated from this adjusted catch data and applied to the sonar estimate in the corresponding zone. Daily passage estimates by species are reported as the sum of these 3 zones.

During the 2013 season, sonar units on both banks were operational from June 15 through September 7. The later than normal start date during the 2013 season was due to the latest river

[22] This is based on the spawning escapement estimate of 34,246 and the radio-tagging data (74.1% to Fishing Branch Weir).

breakup date at Pilot Station in the last 10 years. River breakup occurred on May 31, according to National Weather Service[23] data. Test fishing began on June 11; the first Chinook and summer chum salmon were caught on June 14, and the first coho salmon were caught on July 23.

Drift gillnetting resulted in a catch of 8,367 fish including 294 Chinook, 3,917 summer chum, 1,997 fall chum, and 558 coho salmon; 1,601 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 local 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 the summer season and at or below average during the fall season compared to USGS[24] 2001–2012 data.

Cumulative passage estimates for each targeted species through September 7 were 105,433 ± 31,754 large Chinook (> 655mm), 11,726 ± 5,862 small Chinook (≤ 655 mm), 2,747,218 ± 119,519 summer chum, 716,727 ± 77,556 fall chum, and 84,795 ± 20,744 coho salmon. Additionally, passage estimates for non-target fish species include 4,624 ± 6,361 pink salmon and 1,029,900 ± 79,741 other fish species (whitefish, cisco, sheefish, burbot, longnose sucker, Dolly Varden, sockeye salmon, and northern pike). Comparable passage estimates were made in 1995 and 1997–2013 (Appendix A2).

In 2013, all project goals were met; passage estimates were provided to fisheries managers daily during the season. Information generated at the sonar project was also disseminated weekly through multi-agency international teleconferences and data-sharing with stakeholders in areas from the Yukon River mouth to the spawning grounds in Canada.

Yukon River Chinook Salmon Harvest Stock Identification 2012

Three region-of-origin groupings (also referred to as stock groups) have been identified for Chinook salmon within the Yukon River drainage. The Lower and Middle stock groups spawn in Alaska and the Upper stock group spawns in Canada. Scale pattern analysis, age composition estimates, and geographic distribution were used by ADF&G from 1981 through 2003 to estimate stock composition of Chinook salmon in Yukon River harvests. In 2004, genetic analysis replaced scale pattern analysis as the primary method for stock identification (DuBois et al. 2009). Tissue samples are collected from fish in mixed-stock harvests in Districts 1 through 5. Results from these analyses are combined with harvest age composition to provide stock composition of the various harvest components. Genetic stock estimates for Chinook salmon sampled in the incidental commercial and subsistence harvests are currently available for 2012; the 2013 estimates are still under review by the ADF&G Gene Conservation Laboratory and will be published in future reports. U.S. and Canada combined harvest estimates for 2012 were 13.4% Lower stock group, 34.9% Middle stock group, and 51.8% Upper stock group (Appendix A12). U.S.-only harvest estimates from the Lower, Middle, and Upper stock groups were 14.4%, 37.5%, and 48.2% (Appendix A13). U.S. and Canadian shares of the Upper stock group harvest

[23] http://aprfc.arh.noaa.gov/php/brkup/getbrkup.php?riverbasin=Yukon&river=Yukon+River.

[24] http://waterdata.usgs.gov/ak/nwis/uv?cb_00060=on&cb_00065=on&format=gif_stats&period=21&site_no=15565447

were 86.6% and 13.4% respectively (Appendix A14). Comparing the 2012 total Chinook salmon harvest (U.S. and Canada) percentage with the recent 5-year average (2007 through 2011), the Lower stock group was average, the Middle stock group was above average, and the Upper stock group was below average (Appendix A12). Comparing the 2012 Upper stock group harvest (U.S. and Canada) percentage with the average, both the U.S. and Canadian harvests were near average (Appendix A14).

Yukon River Chinook and Chum Salmon Genetic Sampling 2013

Chinook Salmon

ADF&G field crews, along with other collaborators, collected 2,036 samples (axillary process tissue preserved in ethanol) from Chinook salmon harvested by test, subsistence, and the incidental commercial harvest in 2013. These samples were from mixed-stock fisheries in the mainstem Yukon River in Districts 1, 2, 4 and 5. Samples from test fisheries totaled 1,332 fish: 699 from Big Eddy and Middle Mouth combined, 48 from the mesh size study in District 1, 290 from the sonar near Pilot Station, and 295 from the sonar near Eagle. Samples from the incidental commercial catch in District 1 were 28 fish. Samples from subsistence fisheries totaled 726 fish: 173 from District 1, 25 from District 2, 130 from District 4, and 398 from District 5 communities. Subsistence harvest samples were collected by several organizations: Association of Village Council Presidents, Spearfish Research, and Rapids Research Center. These organizations typically contract with individual fishermen in several locations to sample their harvest.

In Alaska, 37 baseline Chinook salmon samples were collected from the Coleen River. In Canada, a total of 181 baseline samples were collected: 4 from Klondike River, 9 from Nordenskiold River, 5 from Swift River, and 163 from mainstem Teslin 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 sonar project near Pilot Station test fishery from 3,909 summer and 1,993 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, 2013.

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 2013

Chum salmon were sampled from the sonar test fishery near Pilot Station from the beginning of June through the first week of September in 2013, to provide for stock composition estimates for most of summer and fall chum salmon runs. Results from analysis of these samples 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 81% of the run and the middle river stock group comprised 19%. The Tanana component of the middle river stock group comprised about 4% of the total summer chum run, and peaked in passage past Pilot Station sonar during the sampling period of July 12 to 18. For fall chum salmon, 64% of the run was of U.S.-origin and 36% of Canadian-origin. The composition of the U.S. contribution was 38% Tanana and 26% U.S. border (Chandalar, Sheenjek, and Black rivers). The composition of the Canadian contribution was 17% mainstem Yukon, 3% Porcupine, and 16% White rivers. 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 2004–2011 (Flannery et al. 2010; Flannery and Wenburg 2013). Postseason analysis is being conducted for the 2012 and 2013 data, and funding is being secured to continue the project for the 2014 season.

Salcha River Tower

The Salcha River is the largest contributor to the Chinook salmon stocks in the Tanana River drainage. In addition, the Salcha and 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 2012 was 9,189 fish (Appendix B10). Escapement has been assessed with mark–recapture (1987–1992, 1996) and counting tower (1993–1995, 1997–2013) 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 seven 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 2013, the Salcha River counting tower was in operation from July 9 to August 15; the estimated Chinook salmon escapement during that time was 5,465 fish (SE=282). The estimated chum salmon escapement during that time was 60,980 fish (SE=952). A total of 200 Chinook salmon carcasses were collected along the Salcha River from August 7 through August 18. The preliminary estimated proportion of females in the escapement from the carcass survey was 0.51 (SE=0.04) and the gender-bias adjusted estimate was 0.44 (SE=0.09). Age data were determined from 179 fish sampled. Age-6 was the dominant age class comprising about 69.3% of the sample, followed by age-5 (15.6%) fish and age-4 (11.2%) fish. Age-7 and age-3 fish represented 2.8% and 1.1% of the sample, respectively.

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 community of Eagle and just below the United States/Canada border using sonar. Both split-beam and dual frequency identification sonar (DIDSON) are used (Smith and Dunbar 2012; Carroll et al. 2007a; Carroll et al. 2007b).

In addition to operating the sonar, a drift gillnet program is 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, are 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 2013, the Chinook salmon passage estimate at the Eagle sonar site was 30,725 fish for the dates July 6 through August 18 (Table 10). After subtracting the preliminary Eagle area Chinook salmon subsistence harvest of 152 fish (Bonnie Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) from the sonar estimate, the resulting border passage estimate was 30,573 fish. Preliminary Canadian harvest of 1,904 Chinook salmon[25] was subtracted to obtain the estimate of mainstem Yukon River escapement of 28,669 fish, which was 33% below the low end of the interim management escapement goal (IMEG) of 42,500–55,000 fish.

A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 38,000[26] fish. This was below the lower end of the precautionary preseason outlook range of 49,000 to 72,000 (JTC 2013)[27] Chinook salmon.

Table 10.–Chinook salmon passage, border passage, and escapement estimates based on the Eagle sonar project, 2005–2013.

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	2,456	32,014
2011	51,271	370	50,901	4,594	46,307
2012	34,747	91	34,656	2,000	32,656
2013 [a]	30,725	152	30,573	1,904	28,669

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] Data and estimates are preliminary.

Fall Chum Salmon

The fall chum salmon passage estimate at the Eagle sonar site was 200,754 fish for the dates August 19 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 216,791 fish. The expansion was calculated using a second order polynomial calculated to the date October 18 (B. Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). After subtracting the preliminary Eagle area fall chum salmon subsistence harvest of 12,642 fish from

[25] Preliminary harvest estimates for Chinook salmon include 1,902 from the aboriginal fishery and 2 fish taken incidental during commercial fisheries (Mary Ellen Jarvis).

[26] As calculated by ADF&G.

[27] 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.

the sonar estimate, the resulting border passage estimate is 204,149 fall chum salmon (B. Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). After subtracting the preliminary Canadian harvest (3,887 fish)[28] the resulting escapement of 200,262 fall chum salmon was well above the upper end of the IMEG of 70,000–104,000 fish.

A preliminary reconstruction of the 2013 mainstem fall chum salmon run suggests the total Canadian-origin fall chum salmon run size was approximately 303,000 fish (B. Borba, ADF&G Div. of Commercial Fisheries, Fairbanks Alaska, personal communication). This reconstruction is slightly above the preseason outlook range of 226,000 to 288,000 Upper Yukon fall chum salmon. The 2013 preseason outlook range was based on the ADF&G drainage wide outlook range of 906,000 to 1,152,000 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 based on the Eagle sonar project, 2006–2013.

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	265,871	265,008	18,691	246,317	9,330	236,987
2008	171,347	185,409	11,381	174,028	6,130	167,898
2009	95,462	101,734	6,995	94,739	1,113	93,626
2010	125,547	133,413	11,432	121,981	3,709	118,272
2011	212,162	224,355	12,477	211,878	6,312	205,566
2012	147,710	153,248	11,681	141,567	3,905	137,662
2013[b]	200,754	216,791	12,642	204,149	3,887	200,262

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] Data is preliminary.

8.3 CANADA

Upper Yukon River Salmon Assessment Programs (Yukon Territory)

Blind Creek Weir

A weir was operated in Blind Creek in 2013 to enumerate the Chinook salmon escapement and obtain biological information from the stock. This was the eleventh year a weir has been operated in Blind Creek with funding by the Yukon River Panel, Restoration and Enhancement Fund. Camp set up and weir construction was initiated on July 19. The weir was located at the same site used for the past 10 years, approximately 1 km upstream of the confluence with the

[28] Preliminary harvest estimates for fall chum salmon include 500 fish caught in aboriginal, 18 in domestic and 3,369 in commercial fisheries (M.E. Jarvis, DFO, Whitehorse, Yukon Territory, personal communication).

Pelly River. Operation of the weir began on July 24 and continued through to August 19. The first fish passed through the counting chamber on July 29 which was similar timing to previous late run years in Blind Creek. A total of 312 Chinook salmon was counted in 2013 which was 60% of the 10-year average escapement of 519 into Blind Creek. The midpoint of the run occurred on August 9 and 90% of the run had passed through the weir by August 14. Migrating Chinook salmon were sampled randomly throughout the period of weir operation to obtain information on the age-sex-length structure of the run. A total of 149 Chinook salmon (48% of the run) was live sampled. Of these, 89 (60%) were female and 60 (40%) were male. The mean mideye to fork (MEF) length of females and males sampled was 806.4 mm and 714.1 mm, respectively. Scale samples are currently undergoing analysis by the Pacific Biological Station, fish ageing lab in Nanaimo, British Columbia for DFO Whitehorse.

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 2013. The sonar was operated on the Big Salmon River for its ninth year at the same site used for the 2005 to 2012 projects; approximately 1.5 km upstream of the confluence of the Yukon River. Sonar operation began on July 16 and continued without interruption through August 25. A total of 3,231 targets identified as Chinook salmon was counted during the period of operation. Extrapolation of the final 8 days of the run yielded an additional 8 fish to bring the total estimated escapement to 3,239 Chinook salmon. The first Chinook salmon passing the Big Salmon sonar station was observed on July 21. The peak daily count of 264 fish occurred on August 3, at which time 33% of the run had passed the sonar station; 90% of the run had passed the station by August 14. The 2013 Big Salmon escapement of 3,239 Chinook salmon was 66% of the 8-year average escapement into the system of 4,936 fish. Genetic stock identification sampling indicated the Big Salmon River stock group comprised 6.6% (sd=2.7%) of upper Yukon River Chinook salmon escapement in 2013.

A carcass pitch was conducted over approximately 145 km of the Big Salmon River, yielding 74 sampled Chinook salmon. Of these, 45 (60.8%) were female and 29 (39.2%) were male. The mean fork length (tip of nose to fork of tail) of females and males sampled was 833 mm and 823 mm, respectively. All sampling data and scale cards were submitted to DFO Whitehorse stock assessment upon completion of the project. At the time of publication of this report, analysis of scale samples was in progress but not yet complete.

Teslin River Sonar

Multiple beam high resolution sonars were used to enumerate the 2013 Chinook salmon escapement to the Teslin River system. This was the second year the project was conducted at this site. The sonars were operated on the mainstem Teslin River at the site identified during the 2011 feasibility study; approximately 12 km upstream of the confluence of the Teslin and Yukon rivers at Hootalinqua. Sonar operation began on July 17 and operated continuously through to September 3. A total of 9,916 targets identified as Chinook salmon were counted during the period of operation. Of this total, the north bank sonar counted 6,215 (63%)) and the south bank 3,701 (37%) of the passing Chinook salmon. Daily 24 hour counts ranged from 0 to 547 with a mean of 230 targets. The peak daily count of 547 occurred on August 11 at which time 50% of the run had passed the sonar station. Genetic stock identification sampling indicated the Teslin stock group comprised 25.6% (sd=5.2%) of upper Yukon River Chinook salmon escapement in 2013.

A carcass pitch was conducted over approximately 120 km of the mainstem Teslin River from August 31 to September 2 and from September 6 to 9. This yielded 220 Chinook salmon were sampled for age, sex and length. Of these, 108 (49%) were female and 112 (51%) were male. The mean fork length (tip of nose to fork of tail) of females and males sampled was 849 mm and 736 mm, respectively. A total of 166 tissue samples were collected for GSI analysis, to be included in the baseline. At the time of publication of this report, analysis of scale samples was in progress but not yet complete.

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. Fishway staff enumerated 1,139 Chinook salmon at the Whitehorse Rapids Fishway between August 4 and September 2, 2013. Of the adult Chinook salmon counted at the Fishway, 764 were of hatchery origin, comprising 67% of the return. The hatchery component included 352 females (46%) and 412 males. The wild component included 226 females (60%) and 149 males. Female Chinook salmon made up 51% of the total run.

The Whitehorse Rapids Fishway program is a joint Yukon Fish and Game Association, Yukon Energy Corporation, and DFO initiative. Students count all fish moving upstream through the Fishway, record the sex and relative size of each fish, and identify hatchery-origin fish based on the absence of the adipose fin; this information on run composition supports the Whitehorse Rapids Hatchery coded wire tagging program. Students also assist the Whitehorse Rapids Hatchery with brood stock collection at the Fishway.

Hatchery personnel collected biological samples from 56 male and 42 female Chinook salmon taken from the Whitehorse Rapids Fishway for broodstock. Additional samples were collected from 1 female and 5 male Chinook salmon carcasses at Wolf Creek. No weirs (Wolf or Michie Creek) were operated in the drainage upstream of the Whitehorse Rapids Fishway in 2013.

Whitehorse Hatchery Operations

The Whitehorse Rapids Hatchery has a current annual release target of 150,000 2-gram Chinook salmon fry. This target has been in place since 2002; releases since that time have ranged from 85,306 fry in 2008 to 176,648 fry in 2003; the 10-year average (2003–2012) is 142,333 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 2013. As in 2012, the tagging procedure in 2013 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; the Regional Marking Committee directed that the use of Agency only wire be discontinued in 2012. 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 2013 release was the seventeenth year in which all fit fish released from the Whitehorse Rapids Hatchery into the Yukon River were marked, i.e., the 1995–2011 brood years (BY). With the exception of all fish released from the 1998 BY, which were adipose-clipped but not tagged, all of the fry released from 1995–2011 brood years were coded wire tagged as well as adipose-clipped. 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); 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, although none have been reported for 2012 or 2013 (see Northern Bering Sea Pelagic Trawl Surveys Section 9.4; Appendix A19).

All 142,392 Chinook salmon fry reared and marked (clipped and/or tagged) at the Whitehorse Rapids Hatchery from the 2012 brood year were released between May 27 and June 4, 2013. The fry[29] were released to various locations upstream of the Whitehorse Rapids hydroelectric dam (Appendix A15). Average fry weight at time of release was 2.5 grams; average sizes ranged from fry released to Wolf Creek fry that averaged 2.2 grams to fry released to Michie Creek that averaged 2.6 grams.

The estimated tag retention 5 days after tagging for the 2013 release (2012 BY) was 98.6%. The total 2013 release included an estimated 137,074 adipose-clipped fish with coded wire tags, 1,950 fish estimated to have lost their tags, and 3,368 small (or unfit) fish that were clipped but not tagged.

Brood stock collection began on August 11, after 77 Chinook salmon had migrated through the Whitehorse Rapids Fishway, and ended on September 2, 2013. 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 25 years in an effort to maintain genetic diversity. A total of 69 males were used for the brood stock program; 46 of these fish were adipose-clipped (hatchery) and 23 had intact adipose fins (wild). Fifty-six of these males were removed from the run, while 13 males were released back to the Fishway after milt collection. The hatchery removed 10% of the total returning Chinook salmon males, and used a total of 12% for brood stock purposes.

In total, 38 females Chinook salmon, including 6 partially spent fish, were spawned for the Whitehorse Rapids Hatchery program between August 28 and September 11. There were also 4 mortalities during holding. The preliminary estimated total egg take was 146,500 green eggs. The fertilization rate was estimated to be 92%. Shocking and second inventory of the eggs began on October 15 and was completed by November 1, 2013. The estimated total egg take was then revised to 192,146, calculated from the eyed egg inventory of 160,491 and the 31,655 mortalities that had been removed. The overall survival from green egg to eyed egg was estimated to be 83.5% survival.

On November 7, 2013, an estimated 23,542 eyed eggs were transferred from the Whitehorse Rapids Hatchery to the McIntyre Creek Salmon Incubation Facility. These eggs, including 1,000 for classroom incubation projects, will be raised to the fry stage for the Fox Creek salmon restoration program, funded by the Yukon River Panel Restoration and Enhancement fund. After subsequent removal of eyed egg and alevin mortalities, Whitehorse Rapids inventory on December 10 was 131,886 Chinook salmon alevins.

[29] 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.

Porcupine River Investigations

Fishing Branch River Fall Chum Salmon Weir

Fall chum salmon returns to the Fishing Branch River were assessed annually from 1971 to 2012 (aerial survey or weir). The weir, established to enumerate fall chum salmon escapement to the Fishing Branch River, operated during the following periods; 1972–1975; 1985–1989; and 1991–2012 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[30] fall chum salmon in 2000, to 353,300[31] fall chum salmon in 1975 (Appendix B15).

In 2013, the Fishing Branch River weir was not operated. A spawning escapement estimate was calculated using the Porcupine River sonar counts, Old Crow harvest and the proportion of radio-tags that reached the Fishing Branch River weir site. The total estimated 2013 Fishing Branch River escapement was 25,376 fall chum salmon which is just over the lower end of the Fishing Branch River interim management goal (IMEG) range of 22,000 to 49,000 fish. The 2013 escapement was 71% of the 2003–2012 average of 32,846 fall chum salmon (Appendix B15).

Porcupine River Sonar

In 2013, stock assessment of chum salmon on the Porcupine River was transitioned from the Fishing Branch River enumeration weir to Porcupine River sonar site, located approximately 2 km downstream of Old Crow. Multi-beam sonar (ARIS and DIDSON sonars) was used to enumerate chum salmon passing the sonar site from August 24 to October 12, 2013 In conjunction with sonar counts, drift gillnetting was conducted downstream of the sonar site to apportion the sonar counts between chum salmon and other adult, resident fish species present at the site. The field component of this project was conducted primarily by Vuntut Gwitch'in First Nation (VGFN) technicians, who received employment and training related to the operation of multi-beam sonar, hydro-acoustic data analysis and drift gillnetting.

A total of 33,042 fish targets were counted during the operational period of the sonar project; 98% (51 of 52) of fish captured in the drift netting fishery were chum salmon. Test netting data from 2013, supported by 2011 and 2012 drift netting data, and historical gill netting data (2003 to 2010) from previous chum salmon stock assessment programs (mark–recapture and CPUE indices), show that the numbers of adult fish other than chum salmon are negligible in comparison to migrating chum salmon. The total interpolated upstream passage estimate of chum salmon for the operational period of Porcupine River sonar site in 2013 was 35,626 fish.

The 2013 sonar counts showed a bi-modal distribution, but the single highest daily passage rate occurred on September 17, similar to the pattern of counts observed during the 2012 run. As in 2011 and 2012, data from 2013 show that nearly all detected chum salmon migrated within 20 m of the sonar transducer on both river banks, indicating a bank oriented distribution. This behavioral pattern facilitates the enumeration of these fish with multi-beam sonar. Bathymetric data collection and mapping conducted in 2013 show that the bottom profile at the Porcupine River sonar site appears to be similar to the profile that was mapped in 2010 (Snow 2011).

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[30] 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.

[31] Estimate expanded from a count of 301,296 at the weir, which was out of operation due to high water for a 3 day period at the peak of the run.

Porcupine River Telemetry

In 2013, the Department of Fisheries and Oceans transitioned the stock assessment of chum salmon in the Porcupine River from an enumeration weir on the Fishing Branch River to a sonar program located approximately 2 km downstream of Old Crow, YT. In 2011 and 2012, the weir and sonar programs were operated together and direct comparisons of the counts from the 2 programs were possible. The weir was not operated in 2013; however, additional comparative data were desired to allow for a better understanding of the relationship between weir and sonar counts. As such, EDI Environmental Dynamics (EDI) captured and applied dorsal implant coded radio tags to 94 chum salmon near Old Crow and conducted telemetry tracking flights to track tagged chum salmon in areas of the Porcupine River watershed upstream of the sonar site. Tags were applied at the sonar site and at 2 locations downstream of the site, between August 24 and October 4, 2013; telemetry tracking flights were conducted on October 12 and 17, and October 26–28, 2013.

In total, 90 of 94 tags were successfully relocated. A considerable number of tags (29 or 32%) were captured in the VGFN chum salmon subsistence fishery and were turned into the VGG Natural Resources Department. Seven additional tags were located in the vicinity of Old Crow and were thought to have been captured in the local fishery and not turned in to VGG or died near the tagging site. These 36 tags were removed from the pool of deployed tags that were successfully relocated; of the remaining 54 tags, 74.1% (40 of 54) were relocated in the Fishing Branch River upstream of the weir location. This proportion is similar to the 2011 and 2012 proportions of chum salmon that spawned upstream of the weir, as determined by floy tag recoveries. Of the remaining radio tagged chum salmon, 5 tags were relocated in the Fishing Branch River downstream of the weir site, 6 tags were relocated in the upper Porcupine River mainstem, 1 tag was relocated in David Lord Creek, and 1 in the Bluefish River. One tag was also captured by a subsistence fisher on the Porcupine River in Alaska, approximately 50 km downstream of the Canada/U.S. border.

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

Chinook Salmon

Genetic stock identification of the 2013 Chinook salmon migration bound for Canada was developed using genetic samples collected from the drift gillnet test fishing program conducted in conjunction with the sonar project at Eagle. Variation of 16 microsatellite loci was surveyed from 292 Chinook salmon sampled through August 28 (including the transition time while counting all targets as fall chum salmon after August 19).

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 15 to August 19, 2013.

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, 2013.

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 2013 Eagle sonar estimate were: Carmacks Area Tributaries (18.5%); Teslin River (25.6%); Pelly River (11.5%); Mid-mainstem Tributaries (28.6%); Stewart River (5.3%); North Yukon Tributaries (0.7%); White River (3.2%); and Upper Yukon River tributaries (6.7%; Table 13).

Table 13.–Estimated proportions of Chinook salmon stock composition migrating past the Eagle sonar site in 2013.

	Jul 15–28 n=160		Jul 30–Aug 28 n=132		Season n=292	
Region	Est.	SD	Est.	SD	Est.	SD
Upper Yukon Tributaries	3.7	(1.6)	9.7	(2.8)	6.7	(1.6)
Teslin River	25.8	(5.6)	33.9	(11.2)	25.6	(5.2)
Carmacks Area Tributaries	20.4	(5.2)	11.0	(5.8)	18.5	(3.9)
Mid-Mainstem	15.0	(5.2)	39.7	(11.3)	28.6	(5.4)
Pelly River	18.9	(3.9)	3.5	(2.1)	11.5	(2.4)
Stewart River	10.6	(3.4)	0.6	(1.2)	5.3	(2.0)
North Yukon Tributaries	1.4	(1.1)	0.0	(0.2)	0.7	(0.6)
White River	4.2	(1.8)	1.6	(1.2)	3.2	(1.3)

Note: Eagle sonar switched from enumerating Chinook to fall chum salmon on August 19, 2013.

The estimated abundance for the 2 sample periods (i.e. July 15–28 and July 30–August 28) 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 9). 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 2013.

Region	Jul 15–28 n=160	Jul 30–Aug 28 n=132	Total n=292
Upper Yukon Tributaries	690	1,037	2,062
Teslin River	4,808	3,623	7,867
Carmacks Area Tributaries	3,805	1,178	5,672
Mid-Mainstem	2,796	4,246	8,784
Pelly River	3,516	370	3,535
Stewart River	1,973	62	1,626
North Yukon Tributaries	255	1	201
White River	791	167	978
Total	18,633	10,684	30,725

Note: Eagle sonar switched from enumerating Chinook to fall chum salmon on August 19, 2013. The season estimate of stock abundances includes periods where tissue samples were not collected.

The estimated abundances from 2013 for most stocks correspond to the 2007–2012 average stock percentages estimated from samples obtained at the Eagle sonar site[32] (Appendices B17 and C17). However the Stewart and North Yukon Tributaries were the lowest proportion and the lowest escapement estimate obtained to date, although the Yukon wide escapement in 2013 was also the lowest during this time period. Estimated Chinook salmon spawning escapement for tributaries represented in the genetic baseline for 2005 to 2013 is calculated by the year's pooled genetic analysis multiplied by the spawning escapement estimate for the corresponding year (Appendix C17).

Fall Chum Salmon

Genetic stock identification of the 2013 fall chum salmon migration bound for Canada was developed using genetic samples collected from the drift gillnet test fishing program conducted in conjunction with the sonar at Eagle. Variation of 14 microsatellite loci was surveyed for 890 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 2 to September 30 (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, 2013.

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

[32] Previous to 2009, samples were collected from BioIsland and are not considered directly comparable.

spawning populations, and 48.9% were from the White River aggregate (Table 16). The 2 remaining reporting groups contributing to the run were the Teslin River (0.4%) and the Yukon Early group, which is represented by the Chandindu River population (0.2%).

The estimated abundance for the 4 sample periods (August 2 to September 13, September 14 to 19, September 20 to 25, September 26 to 30 and August 2 to September 30) 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 10).

Table 16.–Estimated proportions of fall chum salmon stock composition migrating past the Eagle sonar site in 2013.

Period	Aug 2–Sep 13		Sep 14–Sep 19		Sep 20–Sep 25		Sep 26–Sep 30		Season	
Sample Size	n=247		n=246		n=206		n=191		n=890	
Region	Est.	SD	Est.	SD	Est.	SD	Est.	SD	Est.	SD
Mainstem	41.6	(6.6)	45.6	(18.4)	47.2	(6.9)	68.7	(3.7)	50.5	(2.1)
White	55.4	(6.4)	52.0	(18.5)	51.2	(7.0)	31.1	(3.6)	48.9	(2.1)
Teslin	0.1	(0.3)	2.3	(1.2)	1.5	(1.2)	0.1	(0.3)	0.4	(0.4)
Yukon Early	3.0	(1.5)	0.1	(0.3)	0.0	(0.2)	0.2	(0.5)	0.2	(0.2)

Table 17.–Estimated relative abundance of fall chum salmon migrating past the Eagle sonar site in 2013.

Region	Aug 2–Sep 13 [a]	Sep 14–19	Sep 20–25	Sept 26–30	Season [b]
Mainstem	11,424	18,915	23,375	30,370	101,448
White	15,200	21,562	25,355	13,745	98,089
Teslin	15	933	741	30	845
Yukon Early	815	37	6	82	372
Total	27,453	41,447	49,477	44,227	200,754

[a] Eagle sonar did not switch to enumerating chum until August 19.

[b] The relative abundance estimate is for the entire fall chum salmon season including time periods where Mixed Stock Analysis is not available and periods where Chinook salmon were being enumerated and fall chum salmon samples were obtained.

The estimated abundances from 2013 are close to the averages obtained from the Eagle sonar samples. Prior to 2009, samples were collected from BioIsland and are not considered directly comparable. Estimated fall chum salmon spawning escapement for tributaries represented in the genetic baseline for 2005 to 2013 is calculated by the year's pooled genetic analysis multiplied by the spawning escapement estimate for the corresponding year (Figure 10; Appendix C18).

Yukon Education Program 2013

Fisheries and Oceans Canada Whitehorse received a second year of R&E funding to contract personnel to support the Stream to Sea education program in Yukon Territory schools. The program engages students in learning about salmon and salmon habitat. Activities include classroom lessons, presentations, salmon incubation, and fry releases. Services for the 2013-14 project were secured via a competitive tender process. One consultant was contracted as the lead

Salmon Stewardship Coordinator to deliver and/or oversee the delivery of the Stream to Sea program support services to Yukon Territory schools.

In anticipation of the project, DFO staff collected salmon eggs from Chinook salmon at Tatchun River and Blind Creek (from weir staff) in August. In October, DFO staff and a Yukon College Fisheries class captured chum salmon broodstock and took eggs for schools along the North Alaska Highway. DFO fertilized some of these eggs at the Kluane Lake School; Yukon College personnel planted the remaining eggs at the McIntyre Creek facility for later use by other schools. Whitehorse Rapids Hatchery and the McIntyre Salmon incubation facility agreed to provide Chinook salmon eggs to schools in the Whitehorse area: Chinook salmon eggs for this purpose were collected from Whitehorse Rapids Fishway Chinook salmon by hatchery personnel in August and transferred to McIntyre Creek facility at the end of October.

The lead Salmon Stewardship Coordinator and assistants delivered salmon eggs to 15 schools between October and December 2013. Blind Creek eyed Chinook salmon eggs were provided to 2 schools, 1 in Faro and 1 in Ross River. Tatchun River eyed Chinook salmon eggs were provided to 3 schools, 1 in Dawson, 1 in Pelly Crossing, and on in Carmacks. Whitehorse Rapids Fishway eyed Chinook salmon eggs were given to 6 Whitehorse area schools, 1 Carcross School and 1 school in Teslin. Kluane chum salmon eggs were given to 2 schools, 1 in Destruction Bay and 1 in Haines Junction. Old Crow and Mayo schools may also participate later. Updates and details of the education support project will be provided in an R&E Report to be submitted to the YR Panel in July 2014.

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 the 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 number of rearing streams. Annual surveys throughout these widespread spawning and rearing habitats is not effectively possible, nor is it attempted, so as a substitute, this brief summary attempts to record significant weather conditions and resulting influences on stream conditions 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 brief summary results should be handled as such. In order to provide an environmental condition report, various weather records and stream discharge measurements from other government agencies are used and applied as a means to determine if conditions were within normal ranges on record or if there were unusual trends and events. Conditions reported are also informed through observations made by the public, fishermen, consultants, DFO staff and relevant projects or studies. Through scientific evidence, experience, and professional judgment this information is applied to fish habitat to determine general conditions experienced for the year.

The 2012–2013 winter snowpack was variable across the Yukon drainage as of May 2013, mostly at or above normal to 130% of the snow water equivalent. Accumulations greater than 130% were present in the Pelly River drainage. Snowpack proportions are compared to the 1971–2000 average record. Over the course of the winter, above normal snowfall occurred in November through to January, and then snowfall was well below normal until April. April had unusually cold temperatures and higher than normal snowfalls. Cooler temperatures persisted for the spring preserving the majority of the snowpack until as late as the end of May in the majority of the Yukon drainage.

Temperatures in winter 2012–2013 were below normal with an abrupt start to cold temperatures beginning in October and continuing to December. January and February months were above normal and at times quite mild causing significant brief melts to occur. Temperature comparisons are based on the 1971–2000 average record. March through May conditions were cooler and prolonged winter conditions into the spring period. There was an absence of significant melt into late April and significant melt and runoff began in late May and early June with the majority of the year's snowpack still in place, resulting in very strong and high spring freshet conditions. The significant melt occurred approximately a week later than normal on most rivers and 2 weeks later on some. This developed from an abrupt increase in temperatures mobilizing the persistent snowpack during mid-May. The large snowpack present fed the streams cool water and in some cases resulted in cooler water temperatures into the month of June based on limited temperature record information available.

Summer conditions were very warm (2nd warmest season on record for the northern BC/Yukon region) and had below average precipitation based on Environment Canada records since 1948. Stream levels approached near minimum levels recorded by Water Survey of Canada sites by late July and early August. Significantly high summer precipitation and above normal spring snowpack within the drainage over the past 2 years supplemented flows in summer 2013, likely preventing detrimental low water periods and elevated temperatures in many systems, particularly smaller rearing habitat systems. The typical juvenile Chinook salmon rearing season, throughout most riverine habitats in the Yukon drainage, occurs from late May to late September. The late spring conditions experienced this year delayed the rearing season by approximately 1–3 weeks however the fall season was mild and favorable temperatures may have prolonged the rearing conditions into early October.

Adult Chinook salmon migration was likely delayed and was evident in some Canadian salmon run survey operations. Ice out at the mouth of the Yukon River was late and mainstem Yukon River flows were average to above average as recorded at the USGS Eagle survey site, near the border, during the migration period up to that location. Late summer temperatures were recorded above normal at several spawning sites surveyed. Chinook salmon were observed holding in natal pool habitats until water temperatures declined before spawning in some locations surveyed. In a few instances where site visits to spawning sites were repeated, salmon were observed holding and began spawning approximately 1 week later than normal timing based on previous experience.

8.4 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; and

(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 29 projects were selected for R&E funding, of which, 23 (79%) were on-going multi-year projects and 6 (21%) were new. Two projects were withdrawn prior to initiation. Funds in the amount of $1.228M were allocated to projects. Sixty-one and a half percent of the funds were directed towards Conservation projects; 20.5% towards Stewardship; 9% towards Communications; and 9% to Restoration. As of mid-January 2014, 5 projects have completed on time and on budget (Table 18). The remaining projects are on track to complete as scheduled in the coming months. Three projects have passed their contractual end dates having final reports still outstanding.

Status of 2013 R&E Projects

Table 18.–Restoration and enhancement fund projects, cost and status for completion, listed by envelope/category type, 2013.

Project #	Project Title	Amount (U.S.$)	Status & Due date
CRE-03-13N	*Collection of tissue samples and ASL data from adult Chinook in the Upper Teslin watershed*	*$21,331*	*Withdrawn*
CRE-78-13a	Collection and Analysis of Yukon River DNA Baseline Samples in Alaska and Canada. Year 7	$35,227	31-Mar-14
CRE-78-13b	Collection and Analysis of Yukon River DNA Baseline Samples in Alaska and Canada. Year 7	$35,228	15-Mar-14
CRE-79-13	Yukon River Salmon Stock Identification. Year 12	$30,195	30-Jun-14
URE-02-13	Lower Yukon River Subsistence Chinook Harvest Stock Composition. Year 2	$71,799	31-Mar-14
URE-08-12	Technical Assistance, Development, and Support to the Yukon River Fish Wheel Salmon Monitoring. Year 9	$5,000	31-Jan-14
URE-09-13	Rampart Rapids all season video monitoring. Year 14	$46,100	31-Jan-14
URE-03-13	Yukon River Chinook Salmon Subsistence Sampling: (Holy Cross, Anvik, Galena, Ruby, Fort Yukon) Year 2	$41,400	31-Mar-14
CRE-08-13N	*Investigation of egg retention in female Chinook salmon carcasses – Teslin River near Johnson's Crossing*	*$7,407*	*Withdrawn*
CRE-01-13	Mainstem Teslin River sonar project - 2013. Year 3	$113,634	Completed
CRE-10-13	Acoustic tracking of chum salmon in the Porcupine River	$63,072	31-Jan-14
CRE-37-13	Blind Creek Chinook Salmon Enumeration Weir. Year 11	$49,587	15-Feb-14
CRE-41-13	Sonar Enumeration Chinook Salmon on the Big Salmon River. Year 9	$80,330	15-Feb-14
CRE-114-13	Porcupine River Sonar Program – Fall Chum Salmon. Year 4	$132,772	31-Jan-14
CRE-63-13	Whitehorse Rapids Hatchery (Decimal) Coded Wire Tagging and Recovery. Year 18	$29,516	28-Feb-14
CRE-20-13N	Temperature monitoring of Yukon River Chinook Salmon spawning and migration habitats in Canada	$6,039	Completed
CRE-51-13	KDFN Michie Creek Salmon and Habitat Monitoring. Year 15	$16,205	31-Dec-13
	Conservation Total	**$756,104**	
CRE-22-13N	Fishing Branch River Chum Salmon Habitat Assessment	$48,660	30-May-14
CRE-54-13	Ta'an Kwach'an Council Community Restoration Program. Year 7	$35,761	31-Oct-14
CRE-24-13N	McIntyre Creek Streambank Stabilization	$16,374	Completed
CRE-25-13N	Fox Creek Stream Channel Restoration Project	$6,117	31-Dec-13
	Restoration Total	**$106,911**	
CRE-02-13	Salmon Stewardship Coordinators for Yukon Schools. Year 2	$44,341	30-Aug-14
CRE-06-13	Yukon River North Mainstem Stewardship. Year 8	$30,948	Completed
CRE-07-13	Tr'ondëk Hwëch'in First Fish Culture Camp. Year 13	$10,065	Completed
CRE-26-13N	Yukon River International Salmon Summit	$100,424	31-May-14
CRE-64-13	Whitehorse Rapids Fishway Salmon Stewardship Program. Year 18	$14,917	01-Oct-13
CRE-65-13	McIntyre Creek Salmon Incubation Project. Year 11	$41,546	31-Mar-14
CRE-67-13	Yukon Schools Fry Releases & Habitat Studies. Year 11	$4,026	30-Jun-14
CRE-128-13N	Ta'an Kwäch'än Council (TKC) Family Fish Camp. Year 3	$6,039	15-Feb-14
	Stewardship Total	**$252,306**	
CC-01-13	Yukon River Inseason Management Teleconferences. Year 10	$10,000	31-Mar-14
CC-02-13	Yukon River Educational Exchange. Year 10	$35,000	31-Mar-14
CC-03-13	Yukon River Preseason Planning Process. Year 4	$67,681	31-May-14
	Communications Total	**$112,681**	
	Grand Total	**$1,228,003**	

Note: CRE=Canadian Restoration and Enhancement Proposal, URE=U.S. Restoration and Enhancement Proposal, N=New proposal, and CC=Communications Committee.

9.0 MARINE FISHERIES INFORMATION

9.1 INTRODUCTION

Yukon River salmon migrate into the Bering Sea during the spring and summer after spending 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 A19).

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 were 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 2012. Bycatch of Chinook and non-Chinook salmon (principally chum salmon) in the BSAI and GOA remained at relatively low levels in 2013 (Appendices A20 and A21). Bycatch of Chinook salmon was lower in BSAI groundfish fisheries (n=15,999) than GOA groundfish fisheries (n=23,807) during 2013. Consistent with previous years, bycatch levels of Chinook salmon were higher in the A-season (n=9,183) than the B-season (n=6,816) in the BSAI groundfish fisheries. Bycatch of non-Chinook salmon species (predominately chum salmon) increased significantly in the BSAI groundfish fisheries from 2012 levels during 2013 (A and B seasons; n=126,999).

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 A22). 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 A22).

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. 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. Northern Bering Sea pelagic trawl surveys were completed in 2012 and 2013 as part of

Arctic Eis, a multi-disciplinary Arctic research program led by the University of Alaska and the Alaska Fisheries Science Center. Salmon catch data collected during these fisheries and oceanographic surveys provide a unique opportunity to evaluate the status of salmon stocks during their juvenile life-history stage. Yukon River Chinook salmon are the predominate stock group in the northern Bering Sea (Murphy et al. 2009); therefore juvenile abundance in the Northern Bering Sea provides an early indicator of production for Yukon River Chinook salmon (Figure 11). The juvenile index in 2010 and 2011 will be the primary contributors to the 2014 return (Chinook salmon typically return after 3 to 4 years in the ocean). Although juvenile numbers increased in 2011, their size was below average and uncertainty in the juvenile index was higher than average, requiring more caution when applying juvenile-based forecasts to pre-season management decisions.

9.5 ENFORCEMENT OF HIGH SEAS DRIFTNET FISHING MORATORIUM

The following summary, submitted by Commander, U.S. Coast Guard District 17 (Juneau, Alaska), is a summary of U.S. Coast Guard enforcement efforts, multilateral coordination, results, and future plans addressing the threat of large-scale high seas driftnet (HSDN) fishing in the North Pacific Ocean.

Effort, Multilateral Coordination, and Results in 2013

In 2013 the U.S. Coast Guard once again implemented Operation North Pacific Guard, the U.S. Coast Guard's high seas fisheries enforcement operation to detect, deter, and eliminate illegal, unreported, and unregulated (IUU) fishing activity on the high seas of the North Pacific Ocean. The focus of Operation North Pacific Guard included large-scale HSDN activity and any high seas capture of anadromous species (salmon). Operation North Pacific Guard is planned and executed by Commander, U.S. Coast Guard District Seventeen in harmonization with the multilateral enforcement focus of the North Pacific Anadromous Fisheries Commission's (NPAFC) Enforcement Coordination Committee. In addition, Operation North Pacific Guard implements the *Memorandum of Understanding Between the Government of the United States of America and the Government of the People's Republic of China on Effective Cooperation and Implementation of United Nations General Assembly Resolution 46/215 of December 20, 1991*, known more generally as the U.S.-PRC Agreement (http://www.nmfs.noaa.gov/ia/agreements/bilateral_arrangements/us_china.pdf) on Fisheries Enforcement and Shiprider Cooperation.

North Pacific Guard operations commenced in June 2013 with U.S. Coast Guard HC-130 maritime surveillance aircraft deploying out of Shemya, Alaska. In addition, U.S. Coast Guard Cutter (CGC) MUNRO (WHEC-724) patrolled the NPAFC Convention Area from June 27 through September 15 for a total of 81 days. To achieve effective multilateral coordination, 2 Canadian Department of National Defense (DND) officers and 1 DFO officer were assigned under the tactical control of the U.S. Coast Guard's Seventeenth District office in Juneau, Alaska to facilitate CP-140 aircraft mission employment with United States, Russian, Japanese, and Korean enforcement assets. The CP-140 deployment was executed from Hakodate, Japan in late August and early September, also under the tactical control of Commander, U.S. Coast Guard District Seventeen. During this Canadian deployment the CP-140 provided air reconnaissance with real time sighting reports of commercial merchant vessel and high seas fishing fleet activity. In addition, Japan Coast Guard (JCG) aircraft patrolled the NPAFC Convention Area and coordinated surveillance efforts with MUNRO in late August. The U.S. Coast Guard sent an

officer to Japan to participate in both JCG flights as a technical advisor. These flights continued joint U.S.-Japan HSDN aircraft patrol operations that have been occurring since 2006.

CGC MUNRO hosted 6 People's Republic of China (PRC) Fisheries Law Enforcement Command (FLEC) law enforcement officers during its patrol. These PRC FLEC officials were instrumental in facilitating communications between U.S. Coast Guard and PRC FLEC as well as with Chinese fishing vessels encountered on the high seas of the North Pacific Ocean. Although the flag state authority of PRC FLEC officials was not called upon in 2013 as it had been in previous years, having PRC FLEC "shipriders" onboard U.S. Coast Guard patrol vessels effectively expands the jurisdictional reach of both enforcement agencies.

In July 2013, CGC MUNRO conducted a 3-day joint patrol with the Russian Border Guard Patrol Vessel VOLGA on the high seas of the North Pacific. Later in CGC MUNRO's patrol, specific sighting information of a cargo vessel operating on the high seas just outside the Russian EEZ was passed to Russian fisheries enforcement authorities. Further investigation by Russian authorities identified suspicions that the cargo vessel might be illegally receiving transshipment of fish product from within the Russian EEZ.

On September 2, 2013, CGC MUNRO boarded 2 Japanese-flagged fishing vessels pursuant to the Western and Central Pacific Fisheries Commission's (WCPFC) Conservation and Management Measure (CMM) 2006-08 - High Seas Boarding and Inspection Procedures. The vessels were the F/V SIHOU MARU (JA) and F/V RYUKI MARU (JA). Both vessels were found to be in compliance with WCPFC CMMs, including the WCPFC prohibition against the use of large-scale driftnets on the high seas of the WCPFC Convention Area.

While this year's operations did not result in the detection of any fishing vessels suspected of employing large-scale high seas driftnets, the coordinated multilateral enforcement efforts covered a significant portion of the high seas of the North Pacific Ocean and visually identified 581 vessels determined to be operating in compliance with international standards.

Planned Future Efforts for 2014

In 2014, the U.S. Coast Guard plans to continue to patrol the U.S. EEZ and on the high seas of the North Pacific Ocean within the NPAFC Convention Area with available aircraft and patrol vessels in order to detect, deter, and eliminate illegal, unreported, and unregulated (IUU) fishing activity including large-scale high seas driftnet activity and any high-seas capture of anadromous species (salmon). Commander USCG Pacific Area and Commander USCG Seventeenth District are committed to provide up to 200 aircraft hours and a minimum of 90 cutter days in support of Operation North Pacific Guard in 2014.

The U.S. Coast Guard intends to continue issuing Local Notices to Mariners prior to and during the high threat season; encouraging mariners and fishing fleets to report sightings of suspected HSDN activity to the U.S. Coast Guard. The United States continues to encourage other Parties to establish similar systems for educating mariners and encouraging the submission of informative sighting reports of suspected large-scale HSDN activity on the world's oceans.

10.0 RUN OUTLOOKS 2014

10.1 YUKON RIVER CHINOOK SALMON

Canadian-Origin Upper Yukon Chinook Salmon

The Canadian-origin upper Yukon River Chinook salmon spawning escapements in 2008 and 2009, the brood years producing the age-6 and age-5 fish returning in 2014, were 33,883 and 65,278 fish, respectively, which were below and above average escapements (Appendix A9, Figure 12). The 2014 run of Canadian-origin upper Yukon River Chinook salmon is expected to be poor; the average run size for 2004–2013 was 81,687 fish (S. Schmidt, ADF&G Division of Commercial Fisheries, personal communication).

Stock-recruitment (S/R) and sibling models predict the 2014 run size of Canadian-origin Chinook salmon to be as high as 100,159 and 53,287 fish, respectively (Table 19). However, these models do not include uncertainty associated with lower productivity observed in recent years. Over the past seven years, observed returns were approximately 39% lower than preseason outlooks developed with the stock-recruitment (S/R) model, 40% lower than preseason outlooks developed with the sibling model, and 39% 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 projections from each of the 2 models (100,159 and 53,287 fish for S/R and sibling models, respectively) were adjusted by the recent seven year model performance. Based on this adjustment, the resulting preseason outlook range is 32,000 to 61,000 fish[33]. In the past 7 years, odd-year returns (2007, 2009 and 2011) have been better than even-year returns, due to a stronger age-6 component (Figure 13). However, the 2013 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 2014. These outlooks suggest that the 2014 Canadian-origin upper Yukon River Chinook salmon run may be a poor run.

Development of Revised Canadian-origin Chinook Salmon Database

The current methods of determining border passage estimates were developed from a combination of mainstem sonar estimates (2005–2007) and radiotelemetry data (2002–2004). Total spawning escapements for 2002 to 2007 were calculated by subtracting the Canadian catch from these estimates. Linear regression of the estimated total spawning escapements for these years against a 3-area aerial survey index of Big Salmon, Little Salmon, and Nisutlin rivers was used to reconstruct historical Canadian spawning escapement estimates back to 1982 (Appendix B11). These estimates corrected for the earlier border and spawning escapement estimates, derived from the DFO Chinook salmon mark–recapture program. Information from a number of sources, reviewed in 2008, indicated that the earlier mark–recapture derived border and spawning escapement estimates were likely biased low.

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-

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

recruitment model. Sonar estimates from the project near Eagle have been used from 2005 to present.

The JTC is pursuing further statistical run reconstruction analyses to improve historic run size estimates. A recent analysis has confirmed that the test fishery samples from the sonar project near Eagle represent border passage age composition (S. Smith, DFO Yukon and Transboundary Rivers Area, personal communication, November 2012). A further analysis to correct bias in historical age composition derived from samples collected in the fish wheel mark–recapture project was reviewed by the JTC (analysis completed by T. Hamazaki, ADF&G Division of Commercial Fisheries; personal communication, February 2014).

Performance of Stock-Recruitment Models for the Years 2001–2013

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. Revised historical Canadian run size estimates were used to reconstruct the 2000 and 2001 runs. 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 2014 is 76,723 Chinook salmon. As stated previously, the preseason estimates derived from each model are multiplied by the 7-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 2013. 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, or 77% above the actual run. It will be important to determine if the low run sizes observed in the 2007 to 2013 period develop into a long-term trend.

Table 19.–Preseason upper Yukon River Chinook salmon outlooks for 2001 to 2014 and the observed run sizes for 2000 to 2013.

	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	103,541	101,000			87,000	1.16
2010	109,797	116,346	113,000			60,000	1.88
2011	102,831	113,323	108,000			72,000	1.50
2012	106,090	87,167	98,000	73,000	54,000	49,000	2.00
2013	109,984	79,160	95,000	72,000	49,000	39,000	2.44
2014	100,159	53,287	77,000	61,000	32,000		
Average 2000-2013	114,524	105,805	110,357			84,929	1.46

Note: Run size estimates incorporate: radiotelemetry data (2002–2004); Eagle sonar estimates (2005–2013); 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 64,000–121,000 Chinook salmon. Thus, the 2014 Yukon River Chinook salmon run will likely be poor.

During the winter and spring of 2014, ADF&G and USFWS fisheries managers are traveling to stakeholder meetings such as the YRDFA annual meeting in Fort Yukon 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 2014 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 2007–2013.

10.2 YUKON RIVER SUMMER CHUM SALMON

The strength of the summer chum salmon run in 2014 will be dependent on production from the 2010 (age-4 fish) and 2009 (age-5 fish) escapements, as these age classes generally dominate the run. The total runs during 2009 and 2010 were approximately 1.4 and 1.5 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 2014 total run in the Yukon River will be below the 2013 run of approximately 3.0 million fish.

The 2014 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 11 years (2003–2013). 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 500,000 to 800,000 summer chum salmon. Similar to the last couple years, the actual commercial harvest of summer chum salmon in 2014 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 escapement of fall chum salmon for the period 1974 through 2007 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 1.9 for all years combined (1974–2007).

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). With the dissipation of the even/odd cycles in the past 15 years the trend is not as clear in the dataset therefore the maturity schedule for all completed brood years 1974–2007 (Appendix A17) was used to determine the point estimates in 2013 and 2014.

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 2014 run will be composed of brood years 2008 to 2011 (Table 20). Estimates of returns per spawner (R/S) were used to estimate production for 2008 and 2009. An auto-regressive Ricker spawner-recruit model was used to predict returns from 2010 and 2011. The point projection estimates for 2014 used the 1974 to current complete brood year returns applied to the odd/even maturity schedule. The result is an estimate of 921,000 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 2013. Therefore, the 2014 forecasted run size is expressed as a range from 802,000 to 1,040,000 fall chum salmon. This forecasted run size is above average, for an even-numbered year run (1974–2012).

Table 20.–Forecasted 2014 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, 2008–2011.

Brood Year	Escapement	Estimated Production (R/S)	Estimated Production	Age	Contribution based on age	Current Return
2008	680,784	1.76	1,198,181	6	1.6%	14,377
2009	483,408	2.20	1,063,498	5	27.3%	250,953
2010	526,756	1.82	958,783	4	67.6%	622,163
2011	882,808	1.21	1,068,023	3	3.6%	33,399
Total expected run (unadjusted)						921,000
Total 2014 run size expressed as a range based on the forecasted vs. observed returns from 1987 to 2013 (80% CI):						802,000 to 1,040,000

The contributing dominate parent year escapements from 2009 and 2010 both exceeded the midpoint of the drainagewide escapement goal range of 300,000 to 600,000 fall chum salmon while both 2008 and 2011 exceeded the upper end (Appendix C16). All parent years are estimated to be exceeding 1.0 return per spawner. The 2009 parent year R/S is estimated to be the highest since the 2005 record. The major contributor to the 2014 fall chum salmon run is anticipated to be age-4 fish returning from 2010 parent year (Appendix A17). The combination of good sized escapements and improved production has produced above average runs since 2011 and appears to be maintaining the trend in 2014.

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=0.36). Brood year returns of age-3 fish range from zero to 150,000 chum salmon. Returns of age-4 fish from even-numbered brood years during the time period 1974 to 2007 typically averaged 400,000 fall chum salmon, and ranged from a low of 165,000 for brood year 1996 to a high of 646,000 for brood year 1992. Return of age-5 fish from the same time period typically averaged 185,000 fall chum salmon, and ranged from a low of 58,000 for brood year 1998 to a high of 405,000 for brood year 1990.

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 completed brood years, 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 through 2009 are estimated to increase each year respectably.

During the 2014 fall fishing season, estimated strength of the projected run will be adjusted using summer chum salmon run abundance, and assessed based on various inseason monitoring projects data. With a projected run size range from 802,000 to 1,040,000 fall chum salmon, it is anticipated that escapement goals would be met while supporting normal subsistence fishing activities, and potential commercial harvest levels of 300,000 to 540,000 fall chum salmon (Appendix A5). 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 2013 period, documents the fluctuations observed in fall chum salmon estimates (Table 21).

Table 21.–Preseason Yukon River drainagewide fall chum salmon outlooks 1998–2014 and observed run sizes 1998–2013.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	880,000	322,000	0.37
1999	1,197,000	41,500	0.03
2000	1,137,000	239,000	0.21
2001	962,000	381,000	0.40
2002	646,000	424,000	0.66
2003	647,000	773,000	1.19
2004	672,000	613,000	0.91
2005	776,000	2,280,000	2.94
2006	1,211,000	1,161,000	0.96
2007	1,106,000	1,127,000	1.02
2008	1,057,000	899,000	0.85
2009	791,000	577,000	0.73
2010	690,000	607,000	0.88
2011	737,000	1,208,000	1.64
2012	1,114,000	969,000	0.87
2013	1,026,000	1,211,000	1.18
2014	921,000		
Avg. (1998-2013)	916,000	802,000	0.93

Canadian-Origin Upper Yukon River Fall Chum Salmon

The drainagewide outlook range of 802,000 to 1,040,000 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 2014 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, applying an assumed 25% contribution, the upper Yukon outlook range is 200,000 to 260,000 fall chum salmon. The average upper Yukon River fall chum salmon run size for 1998–2013 is approximately 210,000 fish (Table 22).

Table 22.–Preseason upper mainstem Yukon River fall chum salmon outlooks for 1998 to 2014 and observed run sizes for 1998–2013.

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	303,000	0.85
2014	230,000		
Average (1998-2013)	200,000	210,000	1.61

Note: Run sizes are rounded to nearest one thousand. The 2009 through 2014 preseason expected run sizes 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 (Appendix B15). 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 2008–2011 brood year escapements will contribute to the 2014 run (Table 23). The even year average proportional contribution of each age class to the total returns from a brood year is estimated at 57.9% age-4 and 39.0% age-5 fish.

Table 23.–Summary of upper mainstem Yukon fall chum salmon brood year spawning escapements for the 2008–2011 period and the average contribution for age-3 to age-6 fish returning in 2014.

Brood Year	Escapement	Age	Contribution based on age
2008	175,886	6	0.8%
2009	93,626	5	39.0%
2010	117,789	4	57.9%
2011	205,566	3	2.3%

Given the uncertainty associated with the 2014 Upper Yukon fall chum salmon return, it is prudent to enter the 2014 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[34] 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 2008–2011 brood year escapements will contribute to the 2014 run with age 3–6 fish returning in 2014 from these contributing brood years (Table 24). The average age composition of offspring produced is 65.2% age-4 fish and 30.0% age-5 fish.

[34] The counting fence was inoperable due to high water levels for a full week in late September, 2000. Passage during this time is considered negligible.

Table 24.–Summary of Fishing Branch River fall chum salmon brood year spawning escapements for the 2008–2011 period and the average contribution for age-3 to age-6 fish returning in 2014.

Brood Year	Escapement	Age	Contribution based on age
2008	19,086	6	1.8%
2009	25,828	5	30.0%
2010	15,773	4	65.2%
2011	13,085	3	3.0%

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 2013 run which indicates poor production from the 2010 brood year escapement of 15,773 fall chum salmon, a return/spawner value of 2.5 is unlikely.

The 2014 Porcupine River outlook range is from 40,000 to 52,000 fall chum salmon. This is based on the drainagewide outlook range of 802,000 to 1,040,000 fish and an assumption that approximately 5% of the drainagewide outlook will be Porcupine River fish. Fishing Branch River 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 fall chum salmon spawning in other Canadian tributaries of the Porcupine River. 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 River 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 2014 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 site will be reduced by catches in U.S. and Canadian fisheries prior to the fish reaching the weir[35]. It has been difficult to accurately estimate the U.S. harvest rate (and catch) of upper Porcupine River stocks, although genetic mixed stock analyses may improve this situation in the future. However, the 2014 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 2014 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 upper Porcupine[36] River fall chum salmon run sizes were consistently below preseason

[35] Fishing Branch River Weir was not operated in 2013; however an estimate can be obtained based off the Porcupine Sonar and Telemetry projects.

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

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 fall chum salmon run to the upper Porcupine drainage consistently exceeded preseason outlooks from 2003 to 2005 while the 2006–2012 postseason estimates were lower than the preseason estimates. In 2013, the postseason estimate was higher than the preseason estimate for the first time in 8 years.

Table 25.–Preseason upper Porcupine River fall chum salmon outlooks for 1998 to 2014 and observed run sizes for 1998–2013.

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	53,000	0.98
2014	46,000		
Average (1998-2013)	67,000	44,000	2.51

Note: Run sizes are rounded to nearest one thousand. The 2009 through 2014 preseason expected run sizes 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 2014 coho salmon run will be age-4 fish returning from the 2010 parent year. Based on the run reconstruction index the 2010 escapement was estimated to be 147,000 coho salmon which was near average (145,000). In 2010 only a small amount of coho salmon directed commercial fisheries occurred resulting in extremely low harvests. Subsistence harvest of coho salmon was only slightly below the recent 5-year average.

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 5,867 fish in 2010 was

above the lower end of the sustainable escapement goal (SEG) range of 5,200 to 17,000 coho salmon. However, this escapement count is considered a minimum as the survey was likely conducted early and may not represent a peak spawning count. Coho salmon escapements in 2 of the larger systems, Richardson Clearwater and Lost Slough of the Nenana River, were near average in 2010 but smaller systems were less than half of average. Assuming average survival, the 2014 coho salmon run is anticipated to be average based on escapements observed in 2010.

10.5 Spawning Escapement Target Options in 2014: 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 and 2013 by YRP and DFO included it in the Integrated Fisheries Management Plan (IFMP) for the Yukon River Chinook salmon in Canada (Appendix A18). In 2014, the JTC also recommends retaining this IMEG range, while acknowledging that the 2013 run size and projected 2014 run size make achieving that goal unlikely even in the absence of harvest.

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 one 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 (Appendix A18), just upstream of the international border, until the sonar program at Eagle 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 A18). This goal was achieved 19 times during the period from 1982–2013. The DFO fall chum salmon mark–recapture program was conducted from 1982 to 2008 while the joint U.S./Canada sonar program at Eagle was conducted for fall chum salmon from 2006 to 2013. The mark–recapture estimates generally agreed with Eagle sonar estimates for fall chum salmon when the 2 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 2014, 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 A18). 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 437,498 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 from 1974 to 2012 and only 5 times from 1985 to 2012 when the weir program was back in 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 2 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 for the 2008 to 2010 period. This IMEG range was extended in 2010 for another 3 years, 2011–2013 (Appendix A18). 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 JTC recommends extending the Fishing Branch IMEG range (22,000 to 49,000 fall chum salmon) for another 3 years, 2014–2016.

The analysis used to determine the IMEG was based on an assumption (Bue and Hasbrouck, unpublished report[37]) 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

[37] 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.

the Fishing branch River fall chum salmon 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.

11.0 STATUS OF ESCAPEMENT GOALS

11.1 ESCAPEMENT GOALS FOR ALASKA STOCKS

Escapement goals in Alaska were reviewed and discussed and recommendations were made and adopted in conjunction with the 2013 Alaska Board of Fisheries process for the Arctic-Yukon-Kuskokwim (AYK) region (JTC 2013; Conitz et al. 2012). The next review will begin in the spring of 2014 and conclude during the 2016 Alaska Board of Fisheries cycle.

11.2 ESCAPEMENT GOALS FOR CANADIAN (TRANSBOUNDARY) STOCKS

Chinook Salmon

The current goal for Chinook salmon in Canada is an interim management escapement goal (IMEG) based on negotiations and agreement between U.S. and Canadian representatives, and has remained the same since 2010. The JTC has begun work on development of a new, biologically based escapement goal for upper mainstem Yukon River Chinook salmon in Canada.

In order to develop a biologically based escapement goal, a spawner-recruitment analysis for Canadian-origin Yukon River Chinook salmon is necessary. The Canadian Chinook salmon brood table currently published and annually updated by the JTC (Appendix A9) requires critical review and evaluation of uncertainties in Canadian border passage and age composition estimates. Border passage and spawning escapement estimated by means of the mainstem sonar project at Eagle, which began in 2005, are considered reliable. Estimates of age composition using samples collected in the test fishing project at the Eagle sonar site since 2005 have been evaluated and are also considered to be sufficiently reliable for use in further analysis (S. Smith, DFO Whitehorse, DFO Yukon and Transboundary Rivers Area, personal communication, November 2012). However, older historic estimates of border passage, spawning escapement, and associated age composition are suspected to be inaccurate. Originally, border passage was estimated by means of a mark–recapture project in which fish were sampled and marked in fish wheels just upriver of the border. Comparisons between passage estimates derived from the mark–recapture and current sonar programs suggested that the mark–recapture program underestimated Chinook salmon abundance. The first border passage estimates considered to be accurate were produced from a radio tagging mark–recapture study in 2002–2004 (Spencer et al. 2009). These estimates and the first 3 years' estimates from the Eagle sonar project formed a short time series which was used in a linear regression against 3 historical aerial survey data sets (Little Salmon, Big Salmon, and Nisutlin rivers) to derive the so-called 3-area index. The 3-area index passage estimates for 1982–2001 replaced the older fish wheel mark–recapture estimates (Appendix B11), but these estimates are questionable and further refinement of historical passage and spawning escapement estimates for these years is necessary.

In 2013, reconstructed historical border passage estimates were developed using a maximum-likelihood method incorporating all available historical data, and a draft report was provided to the JTC (T. Hamazaki, ADF&G Division of Commercial Fisheries and B. Bue, Bue Consulting LLC, Palmer Alaska, personal communication). Another reconstruction of historical border

passage was estimated using a Bayesian state space model, and is documented in a presentation to the JTC at their Fall 2011 meeting (S. Fleischman, ADF&G Division of Sport Fish, Anchorage, personal communication). Both border passage reconstructions will be evaluated by the JTC as they proceed with spawner-recruitment analysis and Chinook salmon escapement goal discussions. Various methods for reconstructing the age composition of the upper Yukon River mainstem Chinook salmon run in Canada have been reviewed by the JTC (analysis presented by T. Hamazaki, ADF&G Division of Commercial Fisheries, Anchorage at the February 2014 JTC meeting). The analysis indicated that the age composition estimates produced by all methods had similar effects on spawner-recruitment estimates. The JTC approved of a reconstructed age composition for 1982–2004 that averages the results from all candidate methods. Once the run reconstructions are also finalized and approved by the JTC, the JTC will begin consideration of options for a biologically based escapement goal.

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FIGURES

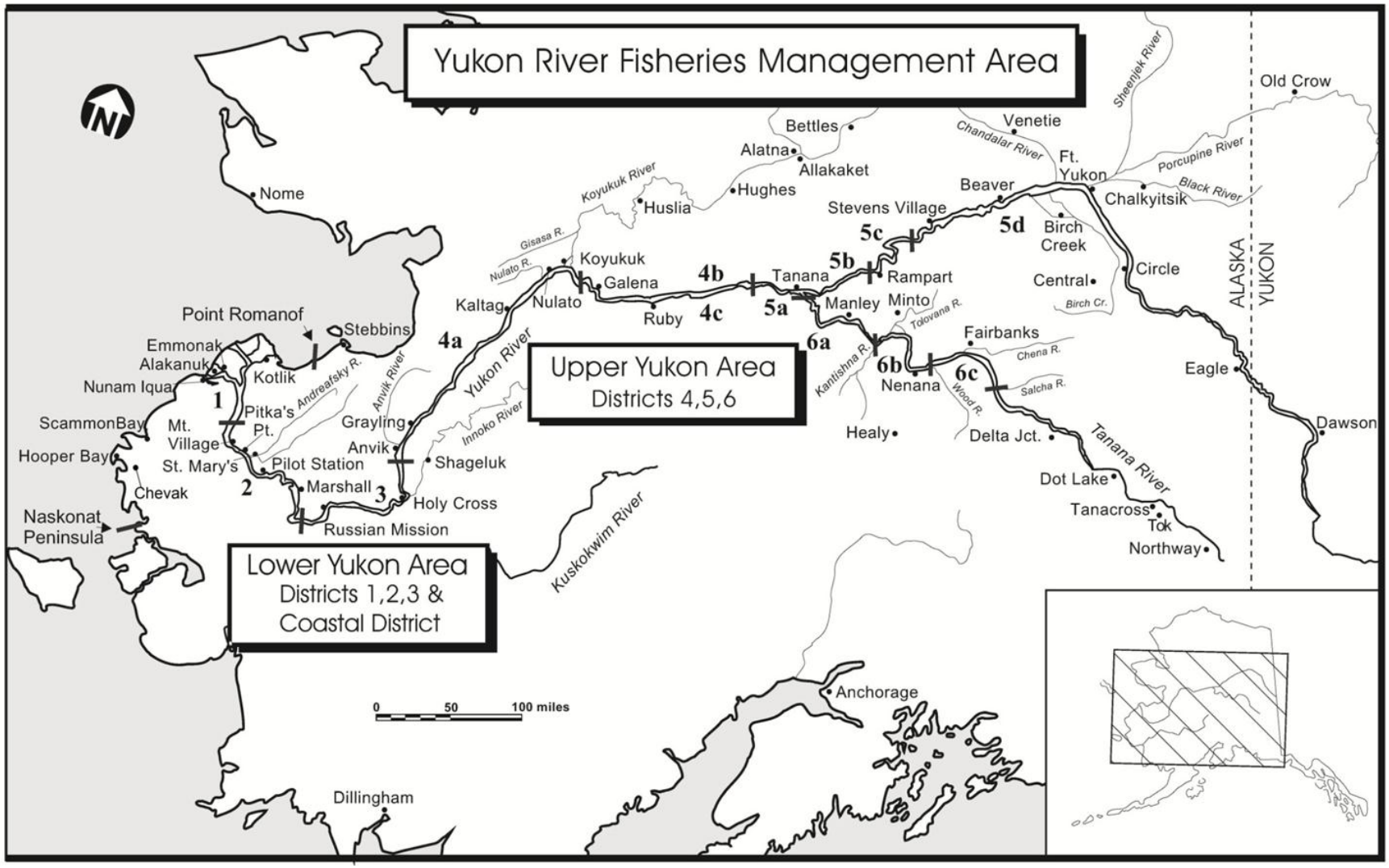
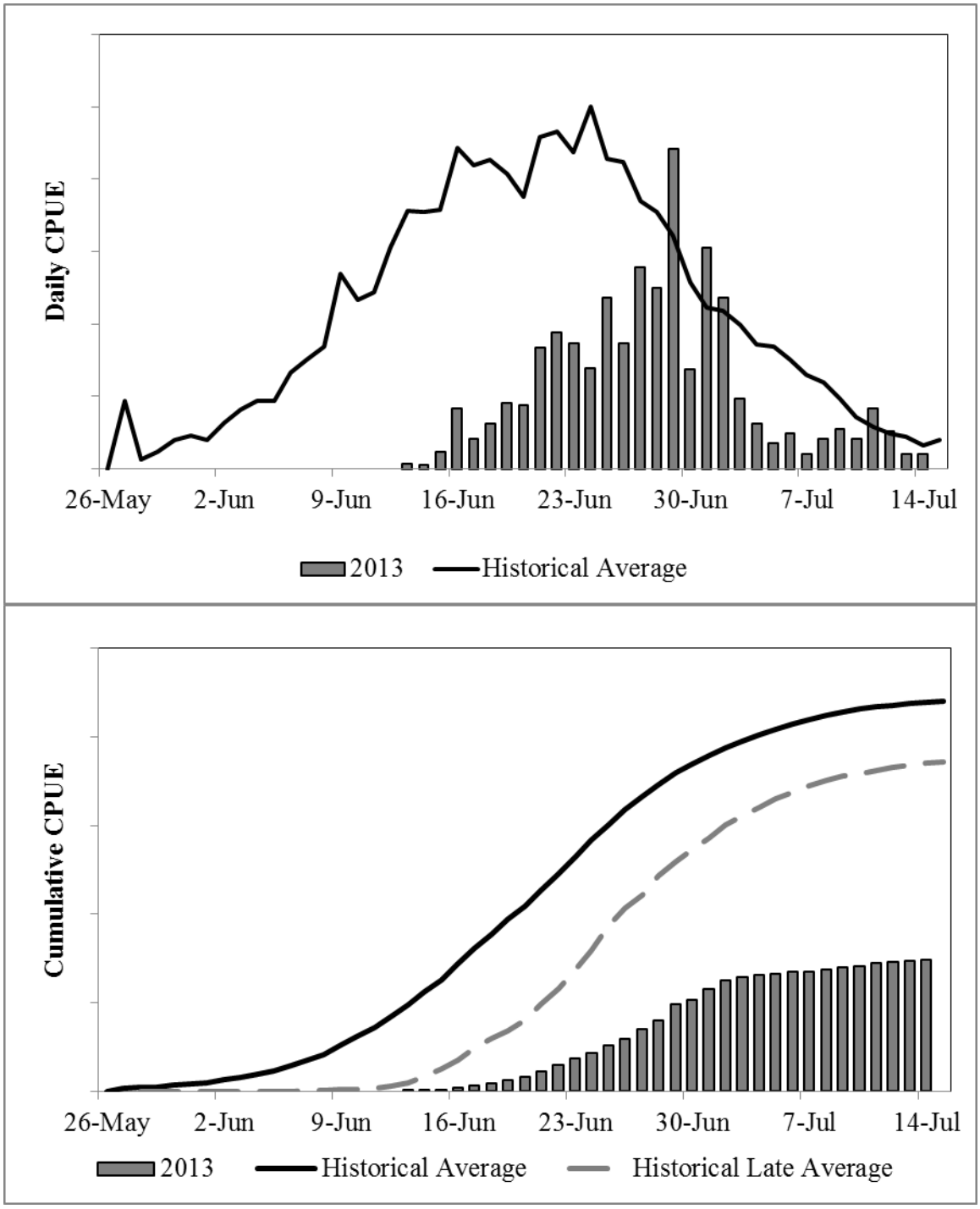


Figure 1.–Map of the Alaska portion of the Yukon River drainage showing communities and fishing districts.



Note: Historical average includes 1989–2012, excluding 2009. Historical late average includes only 1992, 1999, 2001, 2006, 2010, and 2012.

Figure 2.–Daily (upper graph) and cumulative (lower graph) CPUE for Chinook salmon in 8.5 inch set gillnet test fishery sites in 2013, compared to historic and late year average run timing, 1989–2012.

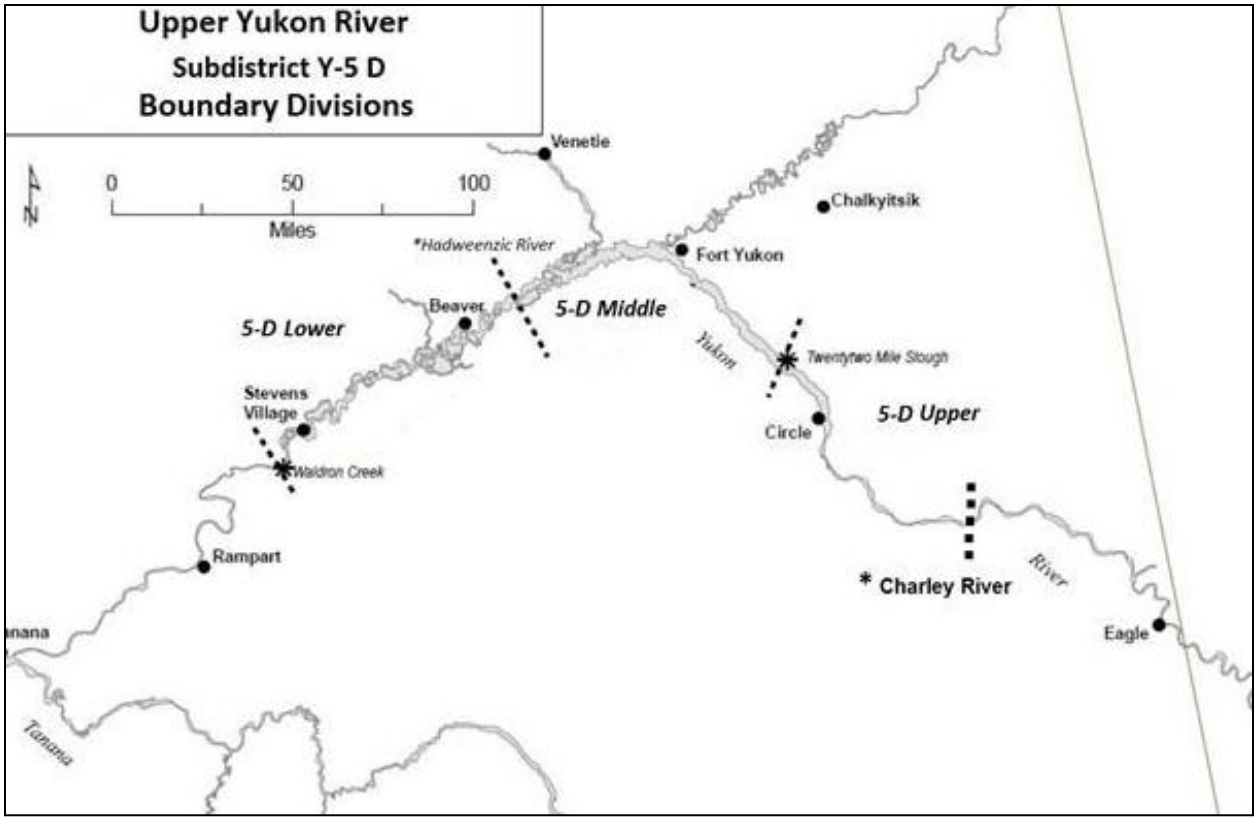
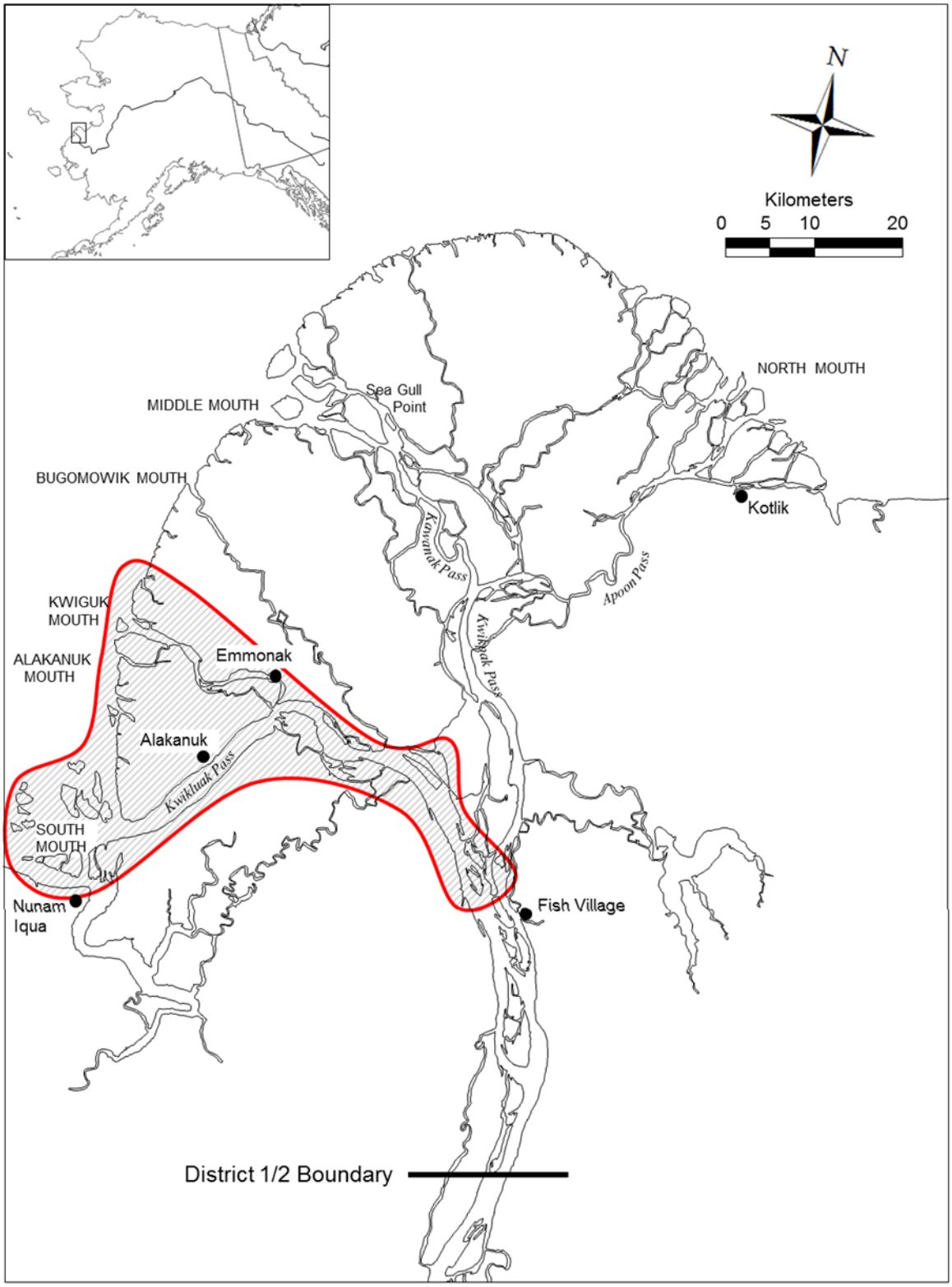


Figure 3.–Subdistrict 5-D was divided into 4 smaller areas during the 2013 season in order to implement Chinook salmon pulse protections.



Note: The outlined area (red line) indicates the boundary of the South Mouth area that was open for summer chum commercial fishing in 2013.

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

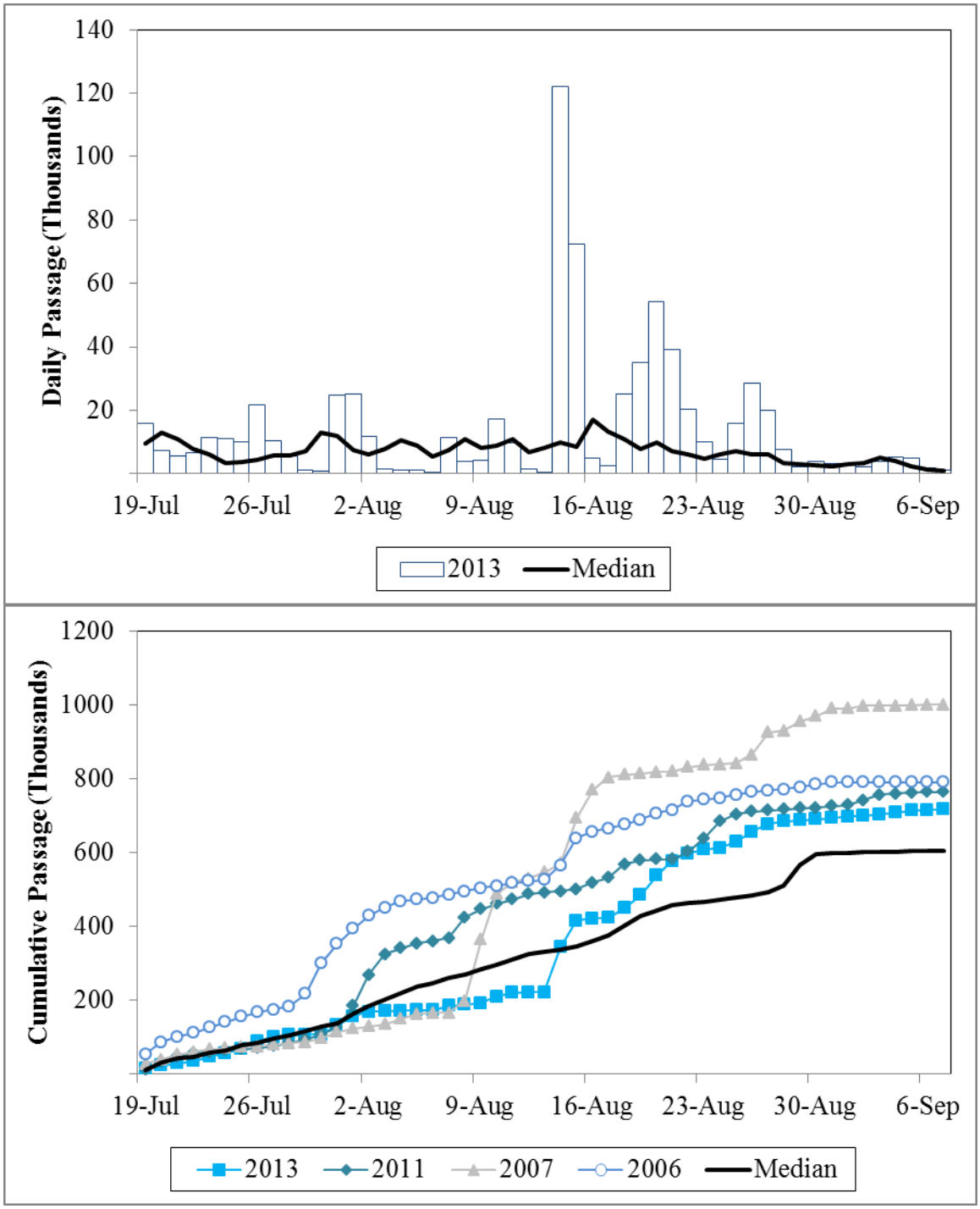


Figure 5.–Daily Pilot Station sonar passage estimates attributed to fall chum salmon 2013 (top), compared to median and cumulative passage estimates (bottom), compared to other runs of similar size.

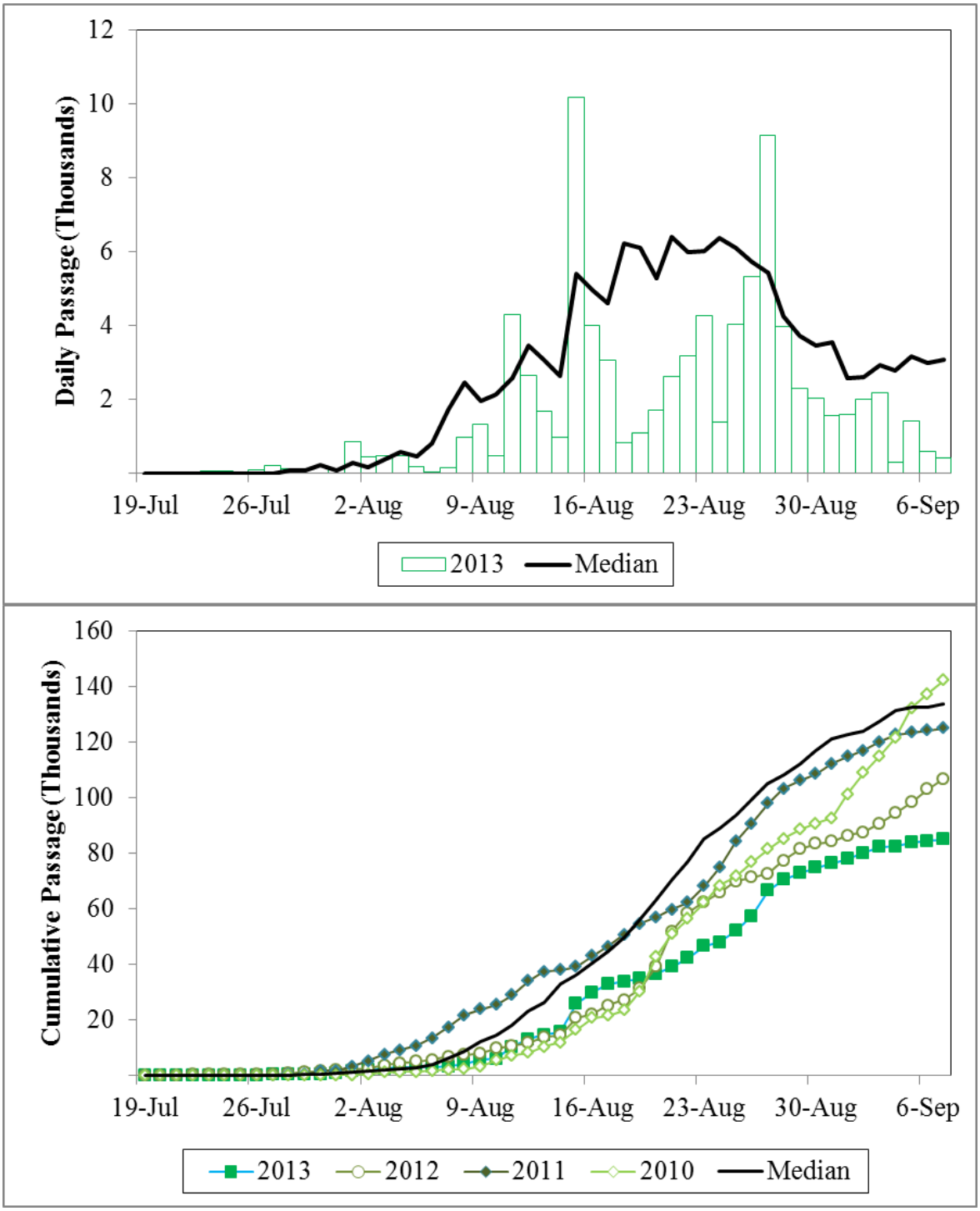


Figure 6.–Daily Pilot Station sonar passage estimates attributed to coho salmon 2013 (top), compared to median and cumulative passage estimates (bottom), compared to median and other select years.

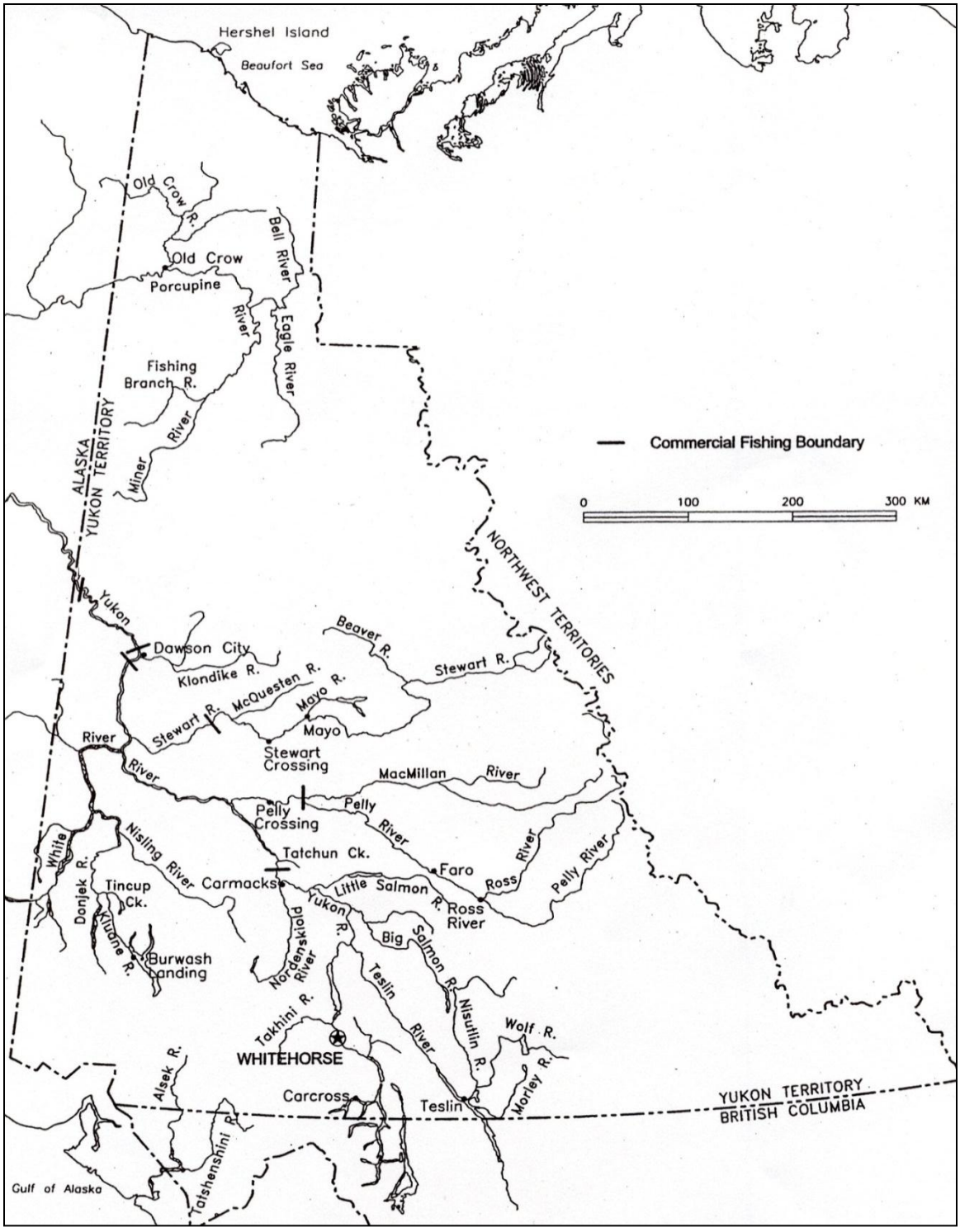


Figure 7.–Commercial fishing boundaries, tributaries, and major towns within the Yukon Territory, Canada.

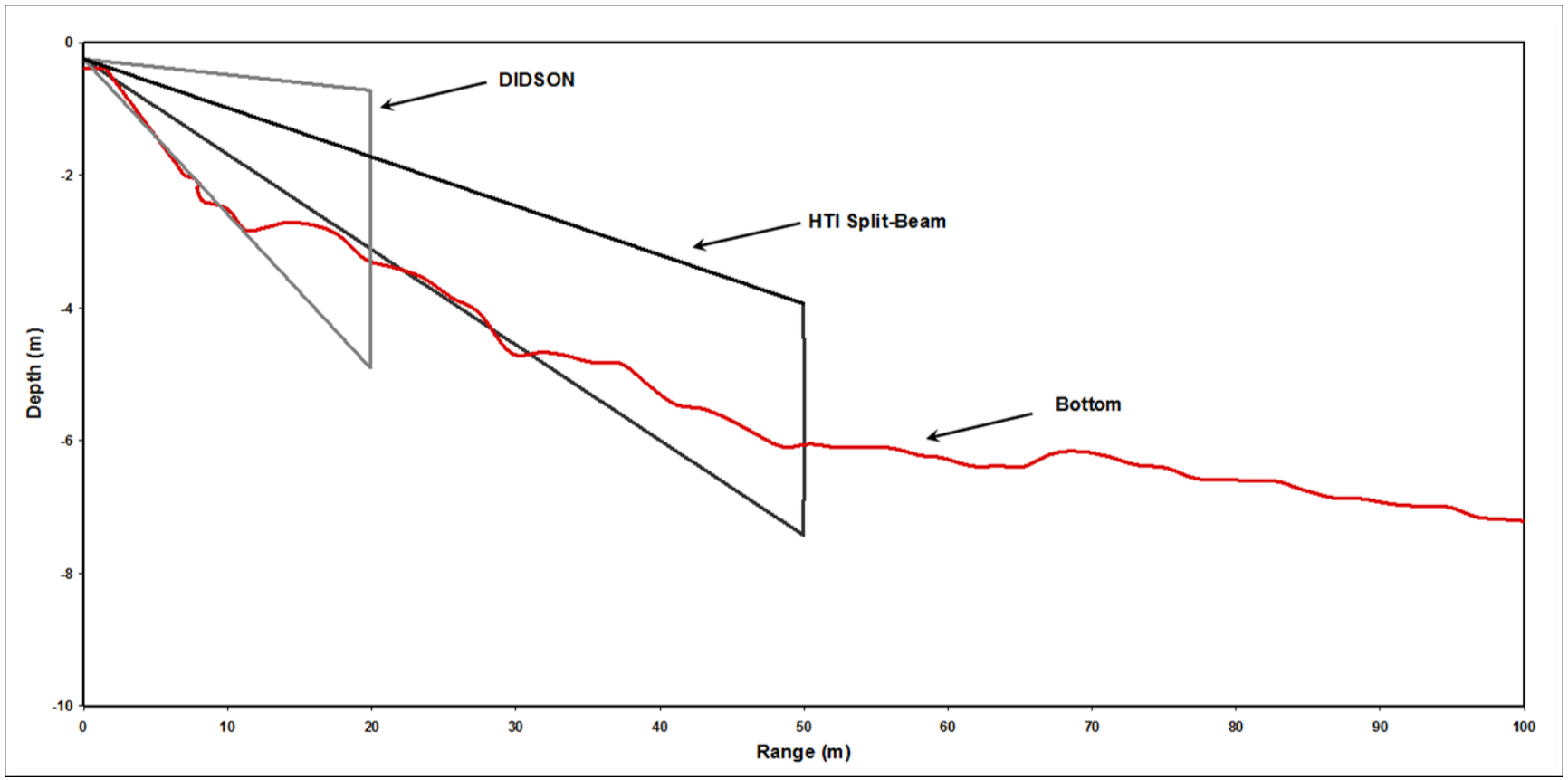
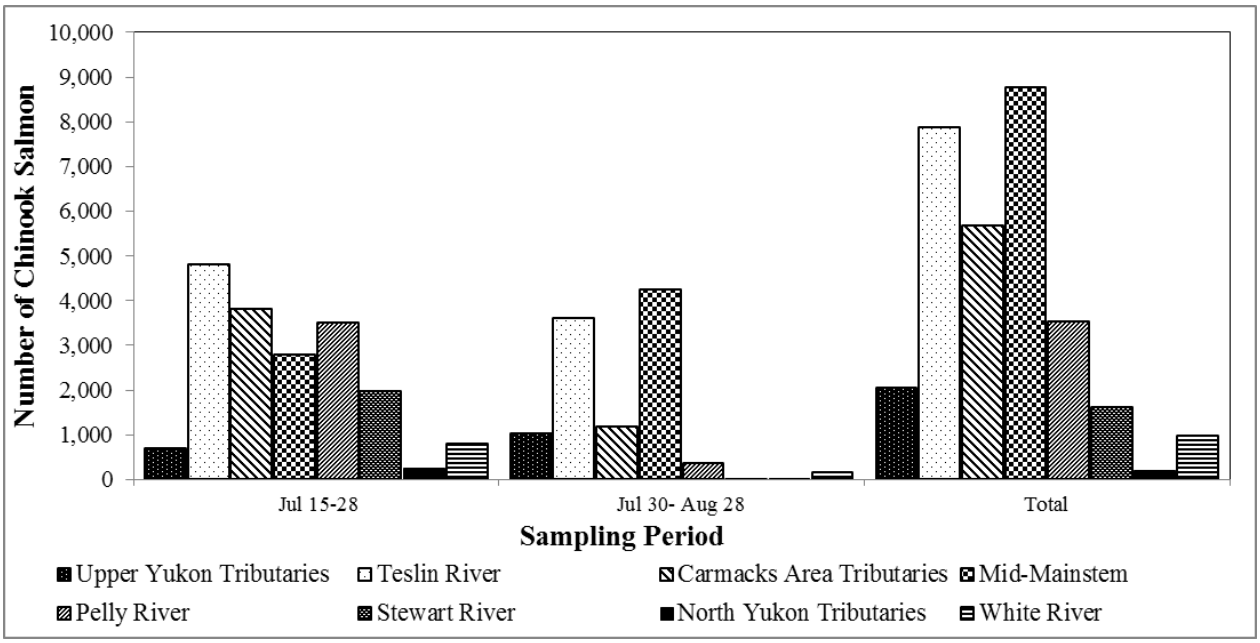
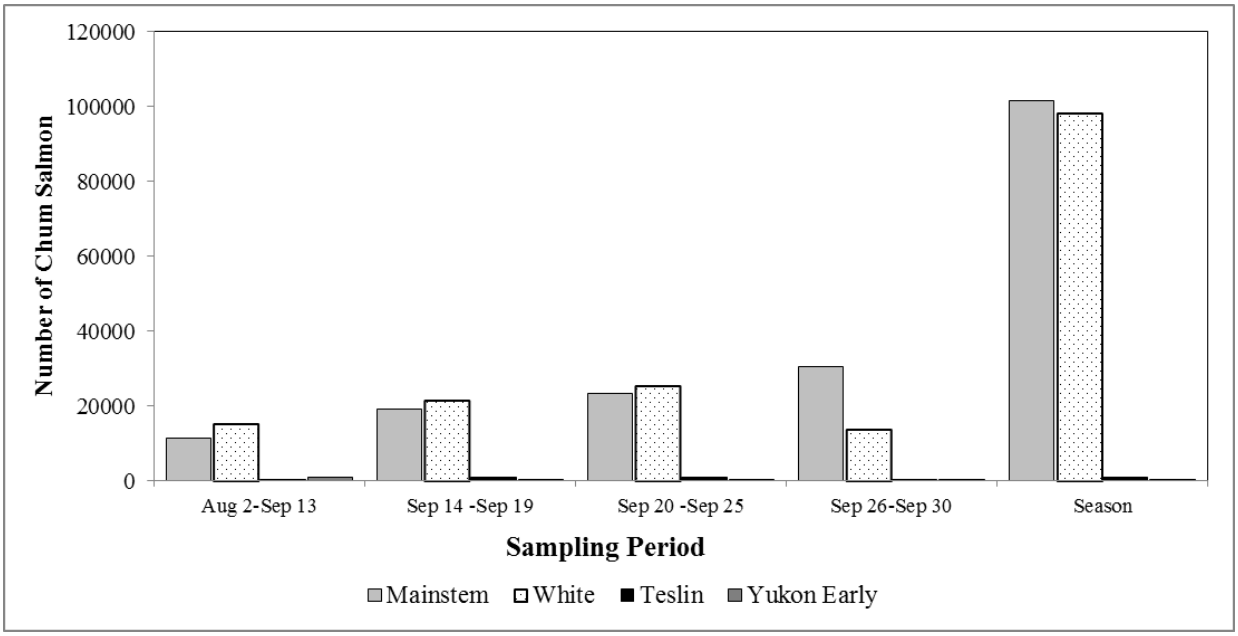


Figure 8.–Schematic representation of the approximate Yukon River profile in 2005 and associated nominal beam-width of the DIDSON and split-beam sonar of the first sampling stratum on the left bank at Pilot Station sonar used from 2005 to present.



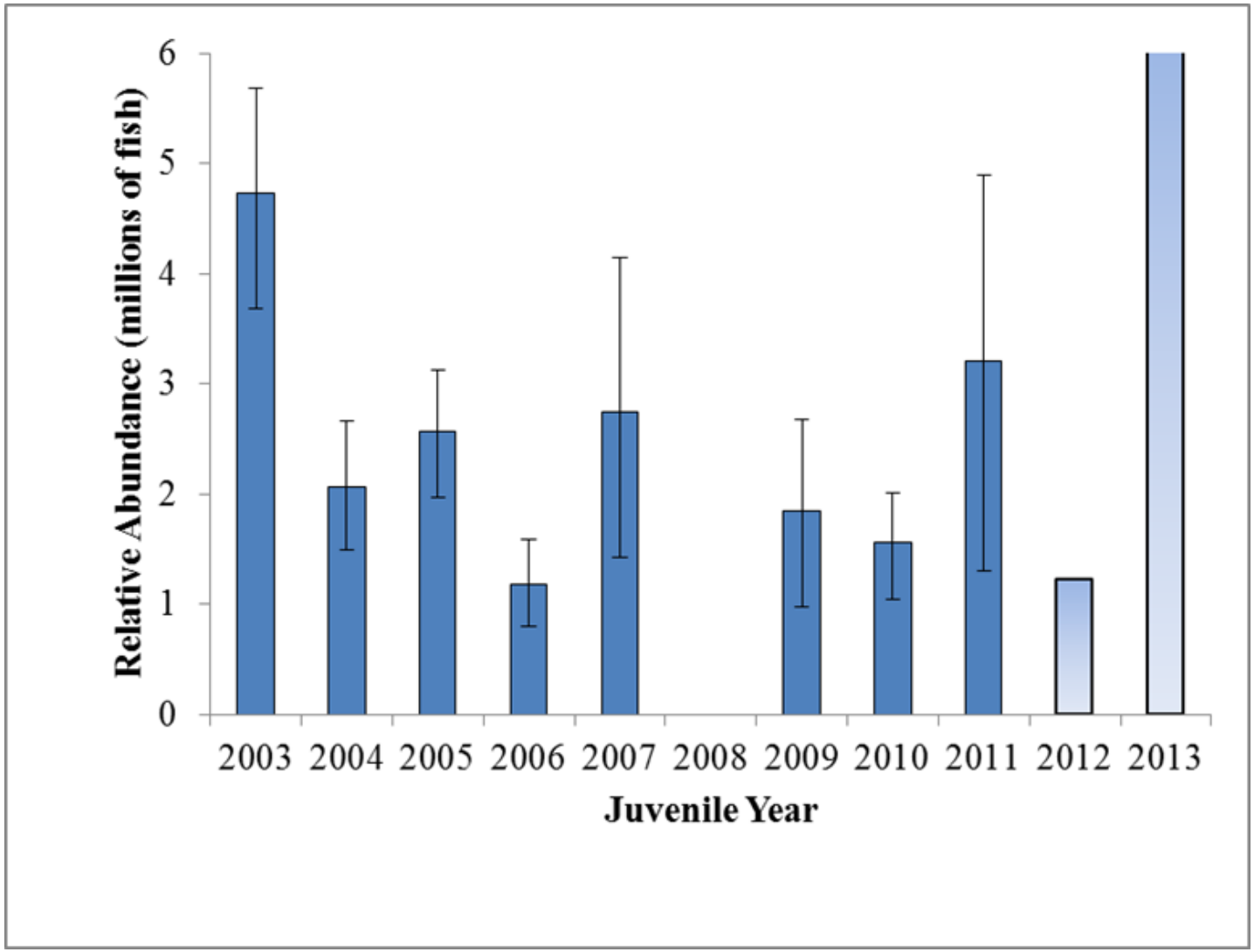
Note: This figure shows total seasonal abundance for 8 regional stock aggregates.

Figure 9.–Estimated abundance of Upper Yukon Chinook salmon stocks at Eagle sonar site in 2013 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 10.–Estimated abundance of Upper Yukon fall chum salmon stocks at Eagle sonar site in 2013 determined by Genetic Stock Identification analyses.



Note: Error bars identify the 80% confidence interval of the abundance estimates. The 2012 and 2013 estimates are preliminary and subject to change.

Figure 11.–Relative abundance of juvenile Chinook salmon estimated from catch rates in pelagic trawl research surveys in the northern Bering Sea (60N-65N), 2003–2013.

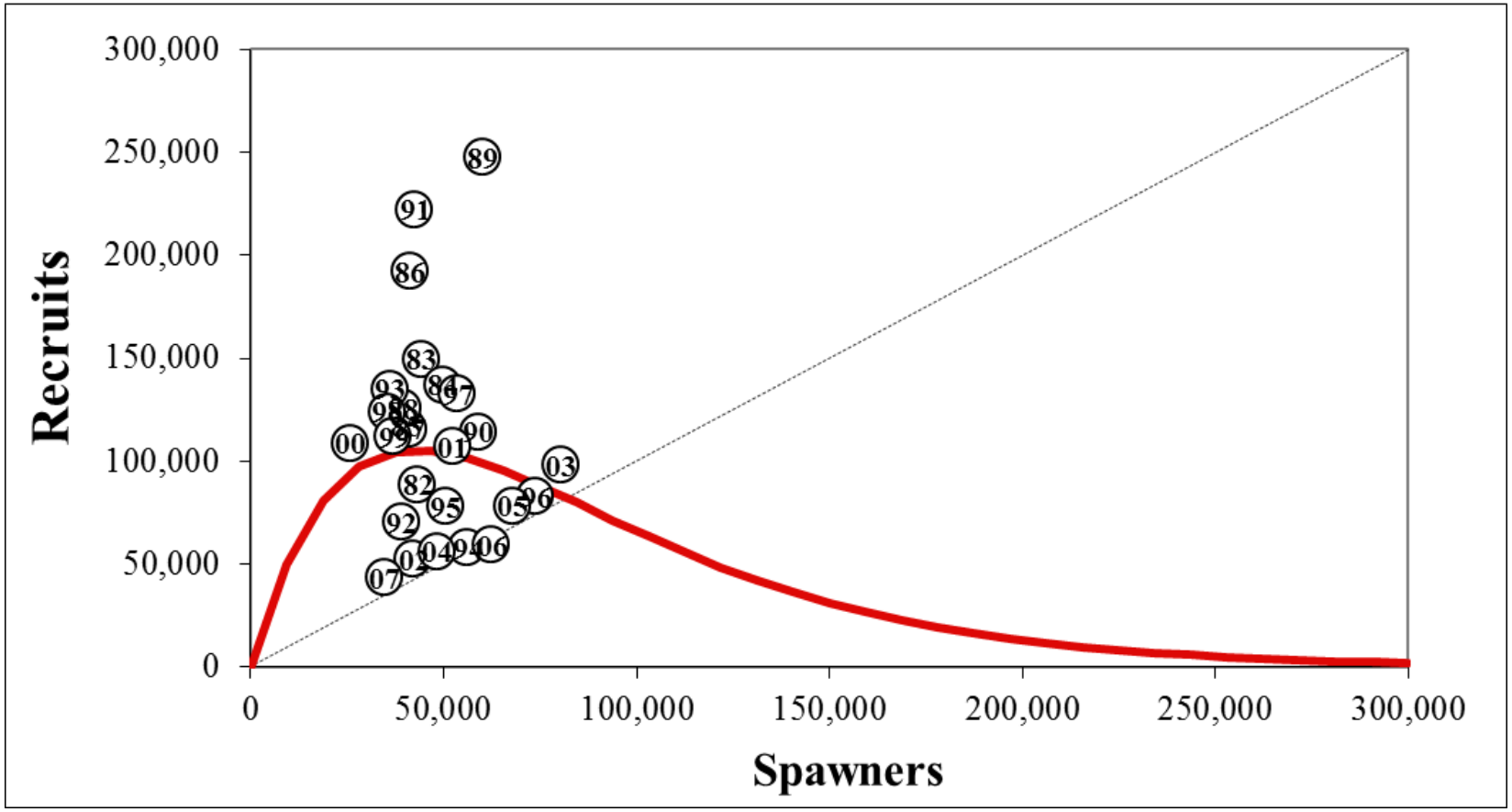


Figure 12.–Yukon River Canadian-origin Chinook salmon recruits versus spawners, Ricker curve, and 1:1 replacement line.

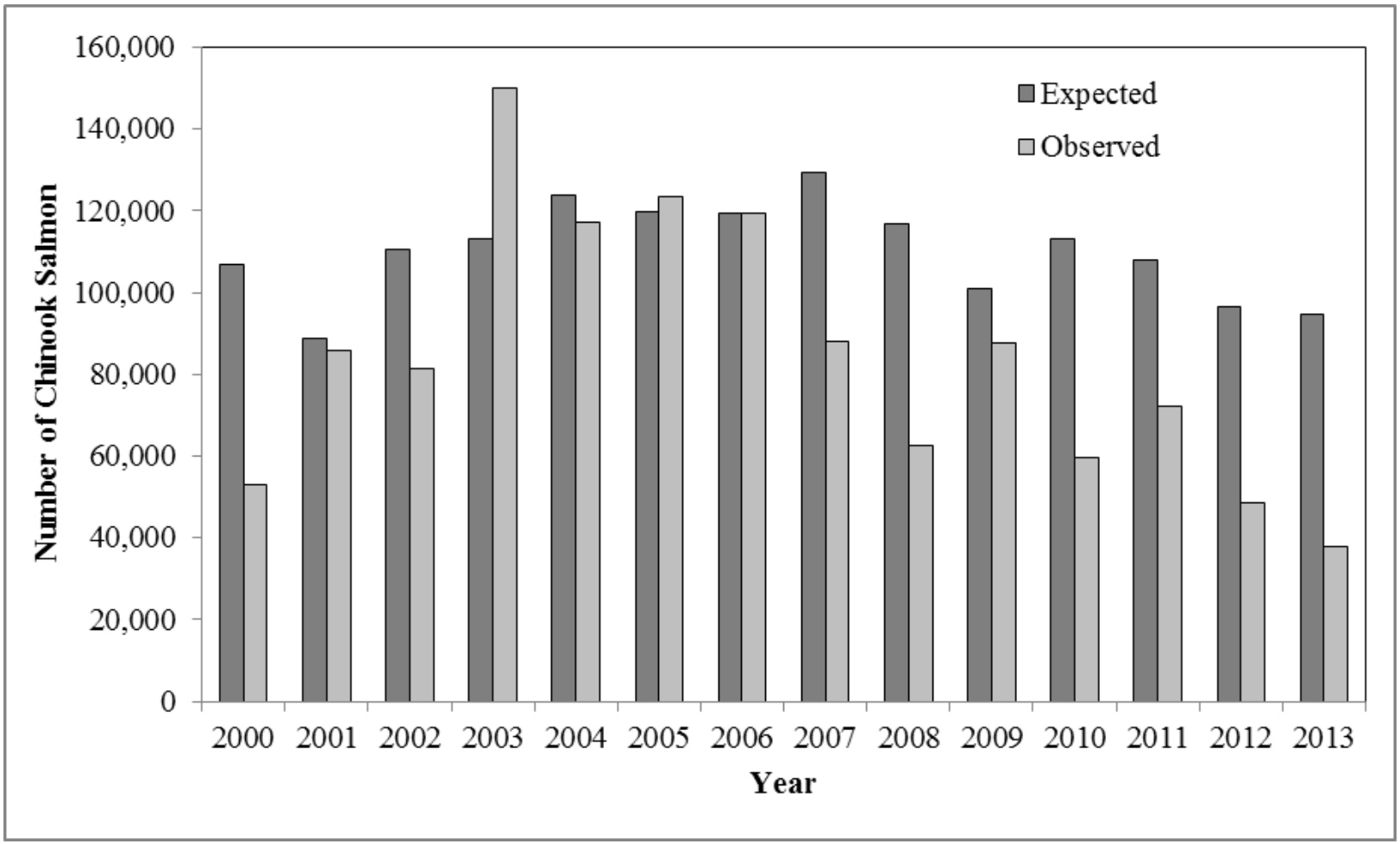


Figure 13.–Expected versus observed number of Canadian-origin Chinook salmon returning to spawn, 2000–2013.

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.–Passage estimates based on the sonar project near Pilot Station, Yukon River drainage, 1995 and 1997–2013.

	Chinook			Chum						
Year [a]	Large [b]	Small	Total	Summer	Fall [c]	Total	Coho [c]	Pink	Other [d]	Total
2013	105,433	11,726	117,159	2,747,218	716,727	3,463,945	84,795	4,624	1,029,900	4,700,423
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

[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 this year.

Appendix A3.–Alaska commercial salmon sales and estimated harvest by district, 2013.

District/Subdistrict	Number of Fishermen [a]	Chinook [b]	Summer Chum	Fall Chum	Coho
1	264	0	207,871	106,588	27,306
2	211	0	171,272	106,274	31,456
Subtotal Districts 1 and 2	451	0	379,143	212,862	58,762
3	-	-	-	-	-
Total Lower Yukon	451	0	379,143	212,862	58,762
Anvik River	-	-	-	-	-
4-A	9	-	100,507	-	-
4-BC	-	-	-	-	-
Subtotal District 4	9	0	100,507		
5-ABC	1	-	-	1,041	0
5-D	-	-	-	-	-
Subtotal District 5	1	0	0	1,041	0
6	6	0	5,937	24,148	7,439
Total Upper Yukon	16	0	106,444	25,189	7,439
Total Alaska	467	0	485,587	238,051	66,201

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.

Appendix A4.–Number of commercial salmon fishing gear permit holders making at least one delivery by district and season, Yukon Area, 1990–2014.

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
2013	220	174	0	384	9	0	2	11	395
2003-2012 Average	307	198	1	489	4	7	6	17	506

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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
2013	251	197	0	436	0	1	6	7	443
2003-2012 Average	167	89	0	253	1	1	6	8	261

-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
2013	264	211	0	451	9	1	6	16	465
2003-2012 Average	325	206	1	505	4	8	9	21	526

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, 5 AAC 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 2013.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number of Fishermen	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
29	20-Jul			closed					
30	27-Jul			closed					
31	3-Aug			closed					
32	10-Aug			closed					
33	17-Aug			closed					
34	24-Aug			closed					
35	31-Aug	25-Aug	31-Aug	3.0	0.0	0.0		0	
36	7-Sep	1-Sep	7-Sep	6.0	0.3	1.8		193	
37	14-Sep	8-Sep	14-Sep	7.0	1.0	7.0		421	
38	21-Sep	15-Sep	21-Sep	7.0	1.1	7.7		824	
39	28-Sep	22-Sep	28-Sep	7.0	1.0	7.0		606	
40	5-Oct	29-Sep	5-Oct	7.0	1.6	11.2		884	
41	12-Oct	6-Oct	12-Oct	7.0	0.7	4.9		311	
42	19-Oct	13-Oct	19-Oct	7.0	0.6	4.2		98	
43	26-Oct	20-Oct	26-Oct	7.0	0.6	4.2		32	
44	2-Nov	27-Oct	2-Nov	0.0	0.0	0.0		0	
Dawson Area Commercial				58		48	2	3,369	0
Upriver Commercial							0	0	0
Total Commercial Harvest							2	3,369	0
Domestic							0	18	0
Recreational							0	0	0
Aboriginal Fishery							1,902 [a]	500 [a]	0
Total Upper Yukon Harvest							1,904	3,887	0
Old Crow Aboriginal Fishery							242	2,283	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 2013.

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 postseason 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 Delta Smolt	Yukon Delta (mouths and delta platform)	1) Describe catch rates and distribution of juvenile Chinook; update juvenile life-history information on size and timing of marine entry. 2) Describe fish communities in Yukon Delta tributary, tidal channel, and delta front/prodelta habitats and investigate prey consumption by potential juvenile salmon competitors and predators. 3) Describe temporal and spatial patterns in juvenile Chinook nutritional status.	May-August	All aspects	All aspects
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

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Appendix A7.–Page 2 of 5.

Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
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
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
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
Pilot Inseason Monitoring of Subsistence Salmon Harvests	Grayling, Yukon RM 336	Test methods for inseason data collection by conducting door-to-door salmon harvest surveys during the fishing season with reference to: 1) local research assistant capacity with staff oversight; 2) financial costs; 3) community response; provide regular updates to managers; and 4) produce report outlining results.	May – Jan.	ADF&G	All aspects
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

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
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
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
Tanana River Sonar	Mainstem Tanana River, RM 765	1) Estimate daily passage of Chinook, chum and coho salmon in the mainstem Tanana River using both split-beam and DIDSON and; 2) Estimate age, sex, and size composition of salmon captured in the test nets and fish wheel.	Jul. – Sept.	ADF&G	All aspects
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

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
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
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
ATC = Asacarsarmiut Tribal Council
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
OSM = Office of Subsistence Management
R&E =Yukon River Panel Restoration and Enhancement Program
R&M =Research and Management Fund

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TCC = Tanana Chiefs Conference, Inc.
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 2013.

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
Commercial Catch Monitoring	Yukon River mainstem	1) To determine weekly catches and effort in the Canadian commercial fishery (Chinook and chum) and; 2) to collect other information as required	July – Oct.	DFO	All aspects
Escapement Surveys and Biological Sampling	Throughout upper Yukon River drainage	1) To conduct surveys of spawning fish by foot, boat, air etc.; 2) To collect ASL and genetic tissue samples from spawning population, and; 3) To enumerate and recover tags in terminal areas.	July – Oct.	R&E Projects DFO YFNs AFS	All aspects
Porcupine River Chum Salmon Radio Tagging and Telemetry	Porcupine River and tributaries (Including Fishing Branch) upstream of Old Crow.	1) To estimate the % of Porcupine River chum salmon spawning upstream of the Fishing Branch weir site, to allow comparison of Old Crow hydroacoustic estimates to historic weir counts; and 2) To identify chum spawning locations in the Porcupine River upstream of Old Crow.	Aug. – Oct.	VGG & EDI & DFO	Joint Project
Porcupine River Sonar	Old Crow	1) Installation and operation of 2 ARIS sonar program for chum salmon, 2) Conduct biological sampling for species apportionment, age, sex and length, and; 3) To provide inseason projections of run strength.	Aug. – Oct.	DFO & VGG	Joint Project
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

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Project Name	Location, River Mile (RM)	Primary Objective(s)	Duration	Agency	Responsibility
Teslin River Sonar	Teslin River	Installation and operation of a DIDSON sonar program for Chinook salmon enumeration.	July – Oct.	BM&A	All aspects
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 1982–2004 based on 3-Area Index, Eagle sonar (2005–2013), and radiotelemetry (2002–2004).

Brood	Age								
Year	3	4	5	6	7	8	Return	Spawners	R/S
74						634			
75					33,080	175			
76				88,405	22,026	40			
77			19,491	111,771	19,734	801	151,797		
78		4,443	22,845	63,235	29,424	1,493	121,439		
79	1,534	3,388	21,422	100,503	48,253	1,175	176,274		
80	15	6,604	13,510	70,415	33,978	4,240	128,763		
81	0	1,122	33,220	114,180	54,845	1,841	205,208		
82	0	5,141	17,169	37,883	27,763	376	88,330	43,538	2.03
83	560	7,558	35,117	89,449	16,408	162	149,253	44,475	3.36
84	69	13,368	34,379	75,041	13,782	138	136,778	50,005	2.74
85	223	10,738	38,956	62,142	4,756	91	116,906	40,435	2.89
86	347	20,408	45,928	109,067	15,843	138	191,731	41,425	4.63
87	0	2,368	33,542	67,697	11,700	18	115,325	41,307	2.79
88	0	6,641	34,323	75,396	8,937	68	125,366	39,699	3.16
89	75	13,517	78,826	128,851	25,841	0	247,109	60,299	4.10
90	56	6,343	24,873	71,641	10,816	9	113,737	59,212	1.92
91	501	7,107	82,332	121,590	10,182	0	221,712	42,728	5.19
92	6	2,608	23,981	41,677	1,831	0	70,103	39,155	1.79
93	14	5,313	36,363	86,880	5,880	0	134,450	36,244	3.71
94	0	755	19,932	30,683	6,175	0	57,545	56,449	1.02
95	34	1,784	15,989	52,720	7,026	10	77,562	50,673	1.53
96	20	276	23,201	44,462	14,610	2	82,571	74,060	1.11
97	14	3,567	26,386	94,406	7,828	14	132,216	53,821	2.46
98	0	3,478	39,260	76,502	4,357	0	123,598	35,497	3.48
99	134	1,692	30,110	76,649	2,870	0	111,455	37,184	3.00
00	0	2,798	40,704	63,414	1,509	0	108,424	25,870	4.19
01	8	1,813	50,877	51,785	2,205	0	106,688	52,564	2.03
02	75	2,262	28,704	20,725	227	9	52,003	42,359	1.23
03	63	5,898	37,236	52,339	2,261	2	97,798	80,594	1.21
04	3	2,462	26,833	21,936	4,796	1	56,032	48,469	1.16
05	9	8,268	29,475	38,632	1,763	1	78,148	67,985	1.15
06	15	6,008	25,726	25,800	1,669	0	59,218	62,630	0.95
07	47	2,856	17,810	22,260			42,973	34,904	1.23
08	1	3,092	11,864					33,883	
09	174	2,109						65,278	
10	11							32,009	
11								46,307	
12								32,656	
13								28,669	
Average		(1982-2006)					114,162	49,067	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, 2013.

Location	Sample Size		Age 3	4	5	6	7	Total
Chena River [a]	176	Males	1.1	29.0	15.3	13.6	0.6	59.7
		Females	0.0	0.0	6.8	33.0	0.6	40.3
		Total	1.1	29.0	22.1	46.6	1.2	100.0
East Fork Andreafsky River [b]	447	Males	0.6	40.5	14.0	4.6	0.0	59.7
		Females	0.0	7.4	7.6	24.7	0.6	40.3
		Total	0.6	47.9	21.6	29.3	0.6	100.0
Gisasa River [b]	459	Males	0.3	28.5	24.3	12.9	0.0	65.9
		Females	0.0	0.3	6.0	26.7	1.2	34.1
		Total	0.3	28.7	30.3	39.6	1.2	100.0
Henshaw Creek [b]	225	Males	0.7	29.2	19.2	6.2	0.0	55.2
		Females	0.0	1.3	12.0	31.2	0.3	44.8
		Total	0.7	30.5	31.1	37.4	0.3	100.0
Yukon Mainstem [c] at Eagle, Alaska	265	Males	0.0	4.2	19.6	23.0	1.5	48.3
		Females	0.0	0.0	7.9	40.4	3.4	51.7
		Total	0.0	4.2	27.5	63.4	4.9	100.0
Salcha River [a]	179	Males	1.1	11.2	10.1	26.8	0.6	49.8
		Females	0.0	0.0	5.6	42.5	2.2	50.3
		Total	1.1	11.2	15.6	69.3	2.8	100.0

[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, 2013.

Location	Sample Size		Age 3	4	5	6	7	Total
Anvik River [a]	582	Males	0.0	13.5	34.2	0.8	0.0	48.5
		Females	0.0	14.6	36.1	0.8	0.0	51.5
		Total	0.0	28.1	70.3	1.6	0.0	100.0
East Fork Andreafsky River [b]	616	Males	0.0	8.8	42.7	0.0	0.0	51.6
		Females	0.0	10.9	37.4	0.2	0.0	48.4
		Total	0.0	19.7	80.1	0.2	0.0	10.0
Gisasa River [b]	710	Males	0.0	15.3	30.3	0.1	0.0	45.7
		Females	0.0	20.6	32.9	0.9	0.0	54.3
		Total	0.0	35.9	63.1	1.0	0.0	100.0
Henshaw Creek [b]	447	Males	0.0	25.1	18.0	0.0	0.0	43.0
		Females	0.0	38.9	18.0	0.1	0.0	57.0
		Total	0.0	64.0	35.9	0.1	0.0	100.0
Salcha River [c]	160	Males	0.0	21.3	25.6	4.4	0.6	51.9
		Females	0.0	23.1	23.1	1.9	0.0	48.1
		Total	0.0	44.4	48.7	6.3	0.6	100.0

[a] Samples were collected by beach seine, structure is scales.

[b] Samples were collected from a weir trap, structure is scales.

[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	17.8	32.7	49.5
2011	13.9	29.8	56.3
2012	13.4	34.9	51.8
Average			
1981-2011	20.2	24.0	55.7
2007-2011	14.6	30.5	54.9

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

[b] Estimates for 2013 have not yet been finalized.

Appendix A13.–Total U.S. Yukon River Chinook salmon harvest proportion by stock group, 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	35.8	51.6
2010	18.7	34.3	47.0
2011	15.6	33.3	51.1
2012	14.4	37.5	48.2
Average			
1981-2011	22.5	26.6	50.9
2007-2011	15.8	33.1	51.1

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

[b] Estimates for 2013 have not yet been finalized.

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

	Upper Stock Group	
Year [a]	U.S.	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	86.6	13.4
Average		
1981-2011	82.1	17.9
2007-2011	85.8	14.2

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

[b] Estimates for 2013 have not yet been finalized.

Appendix A15.–Summary of releases for coded wire tagged Chinook salmon from Whitehorse Hatchery, 1985–2013.

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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Appendix A15.–Page 3 of 7.

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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Appendix A15.–Page 4 of 7.

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	5/28-30/04	01-01-70	28,946	292		29,238	2.90	0	29,238
Wolf	22-Jun-04							2,514	2,514
Mainstem	5/28-29/04	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 -11/06	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	5/24-6/3/07	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	6/01-26	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
Wolf	27-May-13	18-60-25	10,377	3,473	1.003	13,850	2.24	0	13,850
Michie	4-Jun-13	18-25-79	46,625	952	2.000	47,577	2.7	0	47,577
Michie	4-Jun-13	18-17-82	32,358	660	2.000	33,018	2.46	0	33,018
Mainstem	4-Jun-13	18-36-08	9,192	93	1.000	9,285	2.44	0	9,285
Mainstem	4-Jun-13	18-36-09	6,857	140	2.000	6,997	2.44	0	6,997
McClintock	4-Jun-13	18-27-64	31,665	0	0.000	31,665	2.35	0	31,665
SUM	2013		137,074	5,318		142,392		0	142,392
AVERAGE	2003-2012		138,384	3,697		142,081	2.82	-	142,333
TOTAL			4,571,657	317,110		4,888,767		1,180,189	6,068,956

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 1991–2013.

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
McIntyre Ck.	2006	Takhini R.	02-01-02-03-07	Spring Fry	Takhini R.	7/17/2007	7/20/2007	10108	645	185	10938	1.6a
McIntyre Ck.	2006	Takhini R.	02-01-02-03-08	Spring Fry	Takhini R.	7/17/2007	7/20/2007	10080	420	183	10683	1.6a
McIntyre Ck.	2006	Takhini R.	02-01-02-04-01	Spring Fry	Takhini R.	7/17/2007	7/20/2007	8881	567	688	10136	1.6a
McIntyre Ck.	2006	Takhini R.	02-01-02-04-04	Spring Fry	Takhini R.	7/17/2007	7/20/2007	1500	131	55	1686	1.6a

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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	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
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	1.2a

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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/ 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
McIntyre/ Fox	2012	Whitehorse Fishway	02-01-02-07-09	Spring Fry	Fox Creek	7/8/2013	7/8/2013	9940	246	0	10186	1.4
McIntyre/ Fox	2012	Whitehorse Fishway	02-01-02-08-01	Spring Fry	Fox Creek	7/8/2013	7/8/2013	11288	410	0	11698	1.4
McIntyre/ Fox	2012	Whitehorse Fishway	02-01-02-08-02	Spring Fry	Fox Creek	7/8/2013	7/8/2013	241	51	0	292	1.4

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 1974–2013.

				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	0.81	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	0.77	0.19	0.02	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	685,274	33,807	0.05	0.72	0.23	0.01	3,006,370	8.94
2002	396,901	27,411	424,312	0	450,814	238,116	15,009	0.00	0.64	0.34	0.02	703,939	1.77
2003	693,967	79,529	773,496	24,607	854,987	499,245	16,610	0.02	0.61	0.36	0.01	1,395,449	2.01
2004	536,344	76,296	612,640	0	381,871	150,641	2,184	0.00	0.71	0.28	0.00	534,696	1.00
2005	1,990,251	290,183	2,280,434	2,606	384,216	99,388	5,317	0.01	0.78	0.20	0.01	491,527	0.25
2006	890,208	270,486	1,160,694	25,261	417,270	342,361	27,188	0.03	0.51	0.42	0.03	812,080	0.91
2007	921,244	205,667	1,126,911	87,920	850,766	170,523	6,650	0.08	0.76	0.15	0.01	1,115,859	1.21
2008	680,784	217,947	898,731	10,030	760,697	410,710	14,286	0.01	0.64	0.34		1,195,723 [d]	>1.76
2009	483,408	93,319	576,727	10,831	791,478	258,973						1,061,282 [e]	>2.20
2010	526,756	80,005	606,761	1,940									
2011	882,808	325,666	1,208,474										
2012	572,649	396,589	969,238										
2013	866,556	344,221	1,210,777										
Average-12	569,740	303,611	873,351										
Min-07	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-07	1,990,251	683,391	2,280,434	150,451	2,151,589	685,274	33,807	0.14	0.85	0.53	0.03	3,006,370	8.94
	560,984	All Brood Years (1974-2007)		30,620	593,568	216,265	7,987	0.03	0.69	0.27	0.01	848,440	1.94
	410,429	Even Brood Years (1974-2007)		19,417	389,213	185,524	7,452	0.03	0.65	0.31	0.01	601,606	1.78
	711,539	Odd Brood Years (1974-2007)		41,823	797,924	247,006	8,522	0.03	0.72	0.24	0.01	1,095,274	2.10

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 2008 was at least 1.76. Recruits estimated for incomplete brood year.

[e] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2009 was at least 2.20. Recruits estimated for incomplete brood year.

Appendix A18.–Escapement, rebuilding and interim goals for Canadian origin Chinook and fall chum salmon stocks, 1985–2014.

	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]
2014	33,000-43,000	42,500-55,000 [f]	80,000	70,000-104,000 [f]		

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 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] JTC recommendations in 2014, pending approval by Panel.

Appendix A19.–Recoveries of Chinook salmon coded wire tags from the Whitehorse Rapids Fish hatchery in the U.S. domestic groundfish fisheries and research trawl surveys.

Gear Type	Brood Year	Tag Code	Release Location	Release Date	Recovery Date	Age (yrs)	Length (mm)	Latitude	Longitude
Domestic	1988	2006	Michie Cr.	6/6/1989	3/25/1992	4	620	56° 44’°	173° 15’
Trawl	1988	--	McClintock R.	6/6/1989	3/19/1994	6		Area 513	
	1990	180322	Wolf Cr.	6/8/1991	3/14/1994	4	687	60° 06’	178° 58’
	1991	180830	Michie Cr.	6/4/1992	2/24/1995	4		55° 19’	164o 43’
	1992	181215	Wolf Cr.	6/6/1993	12/6/1994	2	400	56° 52’	171° 18’
	1992	181216	Yukon R.	6/15/1993	6/2/1997	5	833	59° 29’	167° 49’
	1993	181428	Michie Cr.	6/1/1994	3/10/1998	5	760	59° 26’	178° 05’
	1995	182823	Fox Cr.	6/4/1996	3/29/1998	3	650	58° 56’	178° 06’
	1995	183348	Judas Cr.	6/4/1996	3/30/1999	4	660	57° 43’	173° 34’
	1996	182554	Michie Cr.	6/11/1997	3/16/2000	4	550	55° 56’	168° 52’
	1997	183159	Judas Cr.	6/12/1998	3/28/2001	4	550	56° 18’	170° 33’
	1999	182353	Wolf Creek	6/10/2000	3/3/2003	4	650	56° 26’	169° 55’
	2000	184412	McClintock R.	6/8/2001	2/15/2002	2	230	56° 10’	166° 00’
	2001	185107	Michie Cr.	6/10/2002	2/8/2003	2	250	56° 44’	167° 00’
	2001	185101	Wolf Cr.	5/23/2002	10/8/2004	3	590	54°01’	166° 29’
	2001	185061	Michie Cr.	6/10/2002	3/15/2005	4	640	57° 21’	171° 39’
	2001	185101	Wolf Cr.	5/23/2002	2/21/2006	5	800	55° 42’	168° 53’
	2005	080166	Wolf Cr.	6/11/2006	2/7/2009	4	630	56° 29’	168° 12’
	2005	080173	McClintock R.	6/14/2006	3/2/2009	4	650	56° 22’	169° 21’
	2005	080169	Mitchie Cr.	6/14/2006	3/26/2010	5	900	57° 07’	172° 26’
	--	18	Yukon R.	--	3/6/2010	--	650	57° 05’	171° 43’
	--	18	Yukon R.	--	3/13/2010	--	580	56° 43’	172° 27’
	--	18	Yukon R.	--	3/13/2010	--	630	56° 43’	172° 27’
	--	18	Yukon R.	--	3/19/2010	--	660	56° 46’	172° 20’
	--	18	Yukon R.	--	3/23/2010	--	640	57° 02’	171° 38’
	--	18	Yukon R.	--	3/24/2010	--	680	57° 02’	172° 17’
	--	18	Yukon R.	--	3/25/2010	--	630	56° 55’	172° 24’
	--	18	Yukon R.	--	3/29/2010	--	680	Area 509	
	--	8	Yukon R.	--	3/9/2011	--	650	Area 521	
	--	8	Yukon R.	--	10/15/2011	--	590	55° 13’	165° 49’
Research	2001	185106	Michie Cr.	6/10/2002	10/3/2002	1	193	64° 06’	164° 31’
Trawl	2001	185102	Wolf Cr.	6/2/2002	10/3/2002	1	153	64° 06	164° 31’
	2001	185061	Michie Cr.	6/10/2002	10/4/2002	1	155	63° 00’	165° 58’
	2003	--	Yukon R.	--	9/11/2004	1	154	64° 01’	166° 01’
	2006	18	Yukon R.	--	9/13/2007	1	176	65° 12’	168° 06’
	2006	18	Yukon R.	--	9/13/2007	1	179	65° 12’	168° 06’
	2006	18	Yukon R.	--	9/13/2007	1	125	65° 12’	168° 06’
	2009	18	Yukon R.	--	9/24/2010	1	190	63° 49’	162° 47’
	2011	181374	Michie Cr.	6/6/2012	9/22/2012	1	138	61° 29’	167° 00’
	2011	181779	Michie Cr.	6/6/2012	9/24/2012	1	160	64° 06’	163° 33’
	2011	181779	Michie Cr.	6/6/2012	9/24/2012	1	138	60° 59’	168° 00’
	2011	--	Yukon R.	--	9/12/2012	1	185	64° 24’	166° 04’

Appendix A20.–Estimated bycatch (numbers) of Pacific salmon by species, and year in United States groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) management area, 1991–2013.

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	26,672	--	--	--	--	192,902
2012	12,937	--	--	--	--	24,320
2013	15,999	--	--	--	--	126,999

Sources: Berger 2010; NMFS 2013.

Appendix A21.–Estimated bycatch (numbers) of Pacific salmon by species and year in United States groundfish fisheries in the Gulf of Alaska (GOA) management area, 1991–2013.

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	18,795	--	--	--	--	4,226
2007	40,609	--	--	--	--	3,421
2008	16,153	--	--	--	--	2,156
2009	8,483	--	--	--	--	2,355
2010	54,621	--	--	--	--	NA
2011	21,724	--	--	--	--	NA
2012	22,551	--	--	--	--	NA
2013	23,807	--	--	--	--	NA

Sources: Berger 2010; NMFS 2013.

Appendix A21.–Estimated bycatch (numbers) of Chinook and non-Chinook salmon in the Bering Sea-Aleutian Islands (BSAI) groundfish fisheries by season, 1991–2013.

	BSAI Chinook Salmon Bycatch				BSAI Non-Chinook Salmon Bycatch			
	A-season		B-season		A-season		B-season	
Year	Pollock Fisheries	All Fisheries	Pollock Fisheries	All Fisheries	Pollock Fisheries	All Fisheries	Pollock Fisheries	All Fisheries
1991	38,791 [a]	46,392 [a]	2,114 [a]	2,488 [a]	2,850 [a]	3,016 [a]	26,101 [a]	27,246 [a]
1992	25,691	31,419	10,259	10,536	1,951 [a]	2,120 [a]	38,324 [a]	39,329 [a]
1993	17,264	24,688	21,252	21,326	1,594 [a]	1,848 [a]	240,597 [a]	241,422 [a]
1994	28,451	38,921	4,686	4,900	3,991	5,599	88,681	88,949
1995	10,579	18,939	4,405	4,497	1,708	3,033	17,556	18,842
1996	36,068	43,316	19,554	19,888	222	665	77,014	77,395
1997	10,935	16,401	33,973	34,129	2,083	2,710	63,904	64,285
1998	15,193	18,930	36,130	36,501	4,002	4,520	60,040	61,177
1999	6,352	8,794	5,627	5,805	362	393	44,810	46,739
2000	3,422	6,568	1,539	1,655	213	350	58,358	58,977
2001	18,484	24,871	14,961	15,676	2,386	2,903	54,621	57,828
2002	21,794	26,277	12,701	13,407	1,377	1,698	79,404	80,785
2003	32,609	40,044	12,977	13,527	3,834	4,113	185,351	187,037
2004	23,093	30,716	28,603	29,248	422	1,028	440,038	449,513
2005	27,331	33,633	40,030	40,632	595	1,030	704,993	708,358
2006	58,391	62,582	24,304	24,502	1,328	2,312	308,318	322,871
2007	69,420	77,119	52,350	52,450	8,524	9,639	85,264	87,709
2008	16,638	18,996	4,842	5,109	322	517	14,947	16,360
2009	9,711	11,010	2,658	2,786	48	163	46,227	46,967
2010	7,630	9,466	2,067	2,917	40	222	13,240	14,201
2011	7,137	7,652	18,362	19,020	297	415	191,144	192,487
2012	7,765	8,985	3,578	3,952	11	308	22,266	24,012
2013	8,234	9,183	4,796	6,816	218	454	125,100	126,545

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 2013.

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

Appendix A23.–Fall chum salmon age and sex percentages from selected Yukon River escapement projects, 2013.

Location	Sample Size		Age 3	4	5	6	7	Total
Yukon Mainstem [a] at Eagle, Alaska	671	Males	0.0	38.5	21.0	0.3	0.0	59.8
		Females	0.0	28.6	11.5	0.1	0.0	40.2
		Total	0.0	67.1	32.5	0.4	0.0	100.0
Toklat River [b]	160	Males	0.0	21.9	13.1	1.9	0.6	37.5
		Females	0.0	40.0	20.0	2.5	0.0	62.5
		Total	0.0	61.9	33.1	4.4	0.6	100.0
Delta River [c]	160	Males	0.0	26.9	31.3	3.8	0.0	62.0
		Females	0.0	22.5	14.4	1.3	0.0	38.2
		Total	0.0	49.4	45.7	5.1	0.0	100.0

[a] Samples were from test fishing with drift gillnets, structure is scales.
[b] Samples were handpicked carcasses, structure is vertebra.
[c] 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, 1961–2013.

	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	148,421	2,325,377	2,473,798	21,427	33,915	55,342	169,848	2,359,292	2,529,140
1989	157,616	2,289,501	2,447,117	17,944	23,490	41,434	175,560	2,312,991	2,488,551
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	168,191	863,575	1,031,766	17,903	21,312	39,215	186,094	884,887	1,070,981
1993	160,289	341,593	501,882	16,611	14,150	30,761	176,900	355,743	532,643
1994	170,829	551,743	722,572	21,198	38,342	59,540	192,027	590,085	782,112
1995	177,663	1,437,870	1,615,533	20,884	46,109	66,993	198,547	1,483,979	1,682,526
1996	139,284	1,121,273	1,260,557	19,612	24,395	44,007	158,896	1,145,668	1,304,564
1997	174,886	545,066	719,952	16,528	15,900	32,428	191,414	560,966	752,380
1998	99,369	199,735	299,104	5,937	8,168	14,105	105,306	207,903	313,209
1999	124,316	236,464	360,780	12,468	19,736	32,204	136,784	256,200	392,984
2000	45,304	106,936	152,240	4,879	9,283	14,162	50,183	116,219	166,402
2001	53,738	116,523	170,261	10,144	9,872	20,016	63,882	126,395	190,277
2002	68,118	122,360	190,478	9,258	8,567	17,825	77,376	130,927	208,303
2003	99,150	199,917	299,067	9,619	11,435	21,054	108,769	211,352	320,121
2004	112,332	206,099	318,431	11,238	9,930	21,168	123,570	216,029	339,599
2005	85,521	478,749	564,270	11,371	18,583	29,954	96,892	497,332	594,224

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Year	Alaska [a,b]			Canada [c]			Total		
	Chinook	Other Salmon	Total	Chinook	Other Salmon [d]	Total	Chinook	Other Salmon	Total
2006	95,184	528,606	623,790	9,072	11,908	20,980	104,256	540,514	644,770
2007	89,555	532,103	621,658	5,094	14,332	19,426	94,649	546,435	641,084
2008	48,870	481,407	530,277	3,713	9,566	13,279	52,583	490,973	543,556
2009	34,206	355,516	389,722	4,758	2,011	6,769	38,964	357,527	396,491
2010	53,792	393,233	447,025	2,706	5,891	8,597	56,498	399,124	455,622
2011	40,856	762,109	802,965	4,884	8,226	13,110	45,740	770,335	816,075
2012	28,727	912,395	941,122	2,200	7,033	9,233	30,927	919,428	950,355
2013 [e]	11,026	1,012,927	1,023,953	2,146	16,115	18,261	13,172	1,029,042	1,042,214
Average									
1961-2012	122,235	853,737	975,972	11,146	17,413	28,559	133,381	871,150	1,004,531
2003-2012	68,819	485,013	553,833	6,466	9,892	16,357	75,285	494,905	570,190
2008-2012	41,290	580,932	622,222	3,652	6,545	10,198	44,942	587,477	632,420

[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, 1961–2013.

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	8,515	-	75	597	276	45,304	45,867
2001	52,937	- [l]	-	122	-	679	53,738	56,620
2002	42,620	24128	230	126	528	486	68,118	69,240
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	28,311	-	0	71	0	345	28,727	30,486
2013	10,984 [n]	-	0	42 [n]	0	[o]	11,026	12,568

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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								
1961-2012	36,008	86,365	320	554	906	1,012	122,235	122,821
2003-2012	45,141	22,302	0	134	345	898	68,819	70,124
2008-2012	37,675	2,987	0	115	0	513	41,290	42,535

[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 expected to be less than average.

Appendix B3.–Alaska catch of Yukon River summer chum salmon, 1970–2013.

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	103,751	319,575	0	321	2,412	271	426,330	446,376
2013	91,979 [m]	485,587	0	138 [m]	2,304	459 [n]	580,467	603,602

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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								
1970-2012	123,861	373,817	156,429	708	2,302	701	618,614	627,828
2003-2012	76,814	151,776	0	250	343	540	229,723	246,580
2008-2012	76,710	229,816	0	305	498	459	307,788	326,127

[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, 1961–2013.

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	250,766	32,324	863	1,121	415,580	415,934
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	99,298 [l]	289,692	0	410 [l]	166	389,566	389,577
2013	112,925 [l]	238,051	0	383 [l]	97	351,456	351,605

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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							
1961-2012	105,470	155,851	3,673	1,563	2,730	245,684	245,836
2003-2012	79,783	113,694	0	549	17	194,042	194,244
2008-2012	80,515	135,272	0	845	33	216,666	216,877

[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 (Tanana River), 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, 1961–2013.

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	21,440 [m]	74,789	0	100 [m]	39	131	96,499	96,592
2013	14,127 [m]	66,199	0	109 [m]	1	569 [n]	81,005	81,005

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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								
1961-2012	22,890	30,586	360	378	1,104	994	52,269	52,378
2003-2012	18,932	41,215	0	282	4	817	61,249	61,420
2008-2012	15,830	39,769	0	303	8	659	56,478	56,605

[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 (Yukon River) 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. Estimate based on the previous 5-year average.

Appendix B6.–Alaska and Canadian total utilization of Yukon River Chinook and fall chum salmon, 1961–2013.

	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	415,580	461,180
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	45,304	50,183	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	67,118	77,376	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	2,200	28,727	30,927	7,023	389,566	396,589
2013 [g]	2,146	11,026	13,172	6,170	351,456	357,626
Averages						
1961-2012	11,146	122,235	133,381	17,222	245,684	262,906
2003-2012	6,466	68,819	75,285	9,740	194,042	203,783
2008-2012	3,652	41,290	44,942	6,510	216,666	223,176

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, 1961–2013.

	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	-	-	2,000 [d]	-		2,000	2,000	200	2,200
2013[f]	2	0	1,902	0		1,902	1,904	242	2,146
Averages									
1961-2012	5,595	393	5,312	342	608	5,846	10,903	257	11,146
2003-2012	2,644 [g]	74	4,459	239	390	4,844	6,167	299	6,466
2008-2012	364 [g]	17	3,136	55	513	3,275	3,349	303	3,652

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, 1961–2013.

	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	Total Canadian
Year	Commercial	Domestic	Aboriginal Fishery	Test Fishery	Combined Non-Commercial [a]	Total [a]	Harvest	Harvest
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	3,205	0	700 [d]		700	3,905	3,118	7,023
2013 [e]	3,369	18	500 [d]		518	3,887	2,283	6,170
Averages								
1961-2012	10,310	487	2,430	1,701	2,745	12,650	4,448	17,013
2003-2012	5,459	1	1,656	1,917	1,657	7,116	2,625	9,740
2008-2012	3,012	0	1,222	na	1,222	4,234	2,276	6,510

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, 1961–2013.

	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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Year	Andreafsky River		Anvik River		Nulato River			Gisasa River
	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]
2013	1,441	1,090	940	656	586	832	1,118	201 [c]
SEG [f]	[g]	640-1,600		1,100-1,700			940-1,900	[g]
Averages								
1961-2012	1,302	1,122	1,216	1,097	882	566	1,327	746
2003-2012	1,064	1,129	1,477	1,256	1,118	471	1,380	662
2008-2012	380	989	832	618	1,002	553	1,333	543

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, 1986–2013.

	Andreafsky River Weir		Nulato River Tower	Henshaw 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
2013	1,998	40.4 [l]	[j]	706	44.8 [l]	1,126	34.1 [l]	1,859 [b]	40.3	5,465 [b]	50.5
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	Henshaw 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											
1986-2012	3,850	36.4	1,946	982	35.5	2,387	28.8	6,604	31.8	9,189	38.3
2003-2012	4,298	39.8	1,716	1,088	36.6	2,046	28.0	5,069	31.6	9,304	38.6
2008-2012	3,478	35.5	-	1,196	40.6	1,844	22.2	3,266	30.3	7,738	36.4

[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, 1982–2013.

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

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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
2013	-	30,573 [e]	1,904	28,669
Averages				
1982-2012	40,136	60,401	12,816	47,475
2003-2012	NA	56,638	6,167	50,472
2008-2012	NA	45,377	3,349	42,027

[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 to 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, 1961–2013.

Year	Tatchun Creek		Blind Creek Weir	Chandindu River Weir		Big Salmon Sonar	Klondike River Sonar	Teslin 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	[b]							563		0	
1967									533		0	
1968									414		0	
1969									334		0	
1970	100								625		0	
1971	130								856		0	
1972	80								391		0	
1973	99								224		0	
1974	192								273		0	
1975	175								313		0	
1976	52								121		0	
1977	150								277		0	
1978	200								725		0	
1979	150								1,184		0	
1980	222								1,383		0	
1981	133								1,555		0	
1982	73								473		0	
1983	264								905		0	
1984	153								1,042		0	
1985	190								508		0	
1986	155								557		0	
1987	159								327		0	
1988	152								405		16	
1989	100								549		19	
1990	643								1,407		24	
1991									1,266	[c]	51	[c]
1992	106								758	[c]	84	[c]
1993	183								668	[c]	73	[c]
1994	477								1,577	[c]	54	[c]
1995	397								2,103		57	
1996	423								2,958		35	
1997	1,198		957						2,084		24	
1998	405		373	132					777		95	
1999	252		892	239					1,118		74	
2000	276	[d]		4	[e]				677		69	
2001				129	[f]				988		36	

-continued-

Year	Tatchun Creek [a]	Blind Creek Weir	Chandindu River Weir	Big Salmon Sonar	Klondike River Sonar	Teslin River Sonar	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution
2002			[g]				605	39
2003		1,115	185 [h]				1,443	70
2004		792					1,989	76
2005		525		5,584			2,632	57
2006		677		7,308			1,720	47
2007		304		4,450			427	56
2008		276		1,329			399	54
2009		716		9,261	5,147		828	47
2010		270		3,817	803		672	49
2011		360		5,156	1,181		1,534	48
2012		157		2,553		3,396	1,030	59
2013[i]		312		3,239		9,916	1,139	67
Averages								
1961-2012	235	570	138	4,932	-	-	937	25
2003-2012	-	519	-	4,932	-	-	1,267	56
2008-2012	-	356	-	4,423	2,377	-	893	51

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

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

[c] 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.

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

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

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

[g] RBW tested for 3 weeks.

[h] Combination RBW and conduit weir tested and operational from July 10-30.

[i] 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, 1973–2013.

	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]
2013	10,965	61,234	9,685	-	571,690	-	- [j]	13,695	13,230	- [j]
GOAL			>116 [m]		350-700 [l]				>53 [n]	
Average										
1973-2012	45,636	79,593	58,126		616,994		26,176	11,666	22,558	
2003-2012		57,539	12,949		430,397			10,819	8,957	
2008-2012	6,227	59,204	16,032		418,140			9,227	7,152	

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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	95,796	3,665	- [j]	11,351	[d]	[r]	[d]	[r]
2012	292,082	[d]	83,423	23,022	- [j]	11,045	[d]	6,882	[d]	46,252
2013	263,746	9,300 [d]	80,055	- [j]	- [d]	- [j]	[j]	21,372	[j]	60,980
GOAL				>17 [s]					>3.5 [m]	
Average										
1973-2012	114,808		68,742		32,710	6,568	908	8,240	3,095	43,037
2003-2012	143,349		83,340		16,687 [t]	16,028		10,114		59,348
2008-2012	179,842		57,946			9,991		8,065		33,649

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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 to 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, January 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, 1971–2013.

	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			9,377 [d]			102,096	205,404	104,701 [n, w, y]
2013	716,727 [y]			31,955 [j]	5,554 [l]		275,000 [z]	253,041 [y]	109,000 [aa]
Escapement [ab]	300,000 [ac]	15,000 [ad]		6,000		46,000 [ae]	61,000	74,000	50,000
Objective	600,000	33,000		13,000		103,000	136,000	152,000	104,000
Averages									
1971-2012	655,651 [af]	31,243	61,398	14,428	5,446	158,040	189,040	162,342	91,598
2003-2012	803,018 [af]	24,917	84,844	19,595	5,885	235,706	242,331	239,795	119,861
2008-2012	613,789 [af]	-	-	17,499	2,091	-	201,926	209,351	65,842

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[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 1 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 1 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] Tanana River estimate is based on regression with Mainstem Yukon 1995–2012 (excluding 2005). The relationship with Delta was not used because of conditions resulting in protracted period of fish entering the system.

[aa] Sheenjek River was estimated using the relationship between its 2 bank operations (1985–2012), adjusting one bank only years by 36%, to Fishing Branch River weir.

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

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

[ad] EG discontinued in 2010.

[ae] 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.

[af] 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, 1971–2013.

	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 [f]	Harvest	Spawning Escapement Estimate [g]
1971	312,800 [h]								
1972	35,230 [i]				198 [i, k]				
1973	15,991		383		2,500				
1974	31,841				400				
1975	353,282		7,671		362 [k]				
1976	36,584 [h]				20				
1977	88,400 [h]				3,555				
1978	40,800 [h]				0 [k]				
1979	119,898 [h]				4,640 [k]				
1980	55,268 [h]				3,150		39,130	16,218	22,912
1981	57,386 [l]				25,806		66,347	19,281	47,066 [m]
1982	15,901 [h]		1,020 [n]		5,378		47,049	15,091	31,958
1983	27,200 [h]		7,560		8,578 [k]		118,365	27,490	90,875
1984	15,150 [h]		2,800 [o]	1,300	7,200	200	81,900	25,267	56,633 [m]
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 [j]	55,861	20,111	35,750
1990	35,000 [p]		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 [j]	20 [j]	10,734	209 [j]	133,712	35,354	98,358
1995	51,971 [q]		4,701	0	16,456	633	198,203	40,111	158,092

-continued-

Appendix B15.–Page 2 of 3.

	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 [f]	Harvest	Spawning Escapement Estimate [g]
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 [r]	13,636	58,552
2000	5,057		933 [j]		1,442	204	57,978 [r]	4,246	53,732
2001	21,737		2,453		4,884	5	38,769 [r]	5,278	33,491
2002	13,600		973		7,147	64	104,853 [r]	6,174	98,679
2003	29,713		7,982		39,347	390	153,656 [r]	10,523	143,133
2004	20,417		3,440		18,982	167	163,625 [r]	9,545	154,080
2005	119,058		16,425		34,600	585	451,477	13,979	437,498
2006	30,954		6,553		18,208	620	227,515 [s, t]	6,617	220,898
2007	32,150						246,317 [s, t]	9,330	236,987
2008	19,086 [q]						174,028 [s, t]	6,130	167,898
2009	25,828 [u]						94,739 [s]	1,113	93,626
2010	15,773 [u]						121,981 [s]	3,709	118,272
2011	13,085 [u,q]	12,438					211,878 [s]	6,312	205,566
2012	22,399 [u]	29,824					141,567 [s]	3,905	137,662
2013[v]	25,376 [w]	29,824					204,149 [s]	3,887	200,262
Goal[x]	50,000-120,000								>80,000
IMEG	22,000-49,000 [y]								70,000-104,000 [z]
Averages									
1971-2012	51,230		4,480	223	8,982	317	120,880	16,871	104,009
2003-2012	32,846		8,600	-	27,784	441	198,678	7,116	191,562
2008-2012	19,234		-	-	-	-	148,839	4,234	144,605

-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] Border Passage Estimate is based off of a mark-recapture estimate unless otherwise indicated.

[g] Excludes Fishing Branch River escapement (estimated border passage minus Canadian mainstem harvest).

[h] Total escapement estimated using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.

[i] 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.

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

[k] Foot survey, unless otherwise indicated.

[l] Initial aerial survey count doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[m] Escapement estimate based on mark–recapture program unavailable. Estimate based on assumed average exploitation rate.

[n] Boat survey.

[o] Total index not surveyed. Survey included the mainstem Yukon River between Yukon Crossing to 30 km below Fort Selkirk.

[p] 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.

[q] Incomplete count caused by late installation and/or early removal of project or high water events.

[r] 1999 to 2004 border passage estimates were revised using a Stratified Population Analysis System (Arnason et. al 1995).

[s] 2006 to present border passage estimate is based on sonar minus harvest from Eagle residents upstream of deployment.

[t] Mark–recapture border passage estimates include 217,810, 235,956, and 132,048 from 2006 to 2008 respectively, during transition to sonar.

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

[v] Data are preliminary.

[w] Fishing Branch River weir did not operate and escapement was estimated from a sonar operated on the upper Porcupine River minus Old Crow harvest and the proportion of radio-tags to Fishing Branch River.

[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, 1972–2013.

		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)

-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
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)
2012	106,782		106 (h)		405 (h)	5,230 (b)	396 (h)	515 (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
2013	84,795 [o]	721 (h)		55 (h)	425 (h)	6,222 (b)	2,221 (h)	647 (h)
SEG [p]						5,200-17,000 [p]		
Averages								
1972-2012	143,345 [n]	845	923	1,392	1,518	15,734	2,210	1,321
2003-2012	164,150 [n]	469	505	944	1,981	24,767	3,030	2,022
2008-2012	130,767 [n]	808	642	463	874	8,325	2,005	502

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 B17.–Stock percentage estimates of Chinook salmon migrating across the mainstem U.S./Canada border, Yukon River, 2005–2013.

Year	Region							
	Upper Yukon Tributaries	Teslin River	Carmacks Tributaries	Mid-Mainstem	Pelly River	Stewart River	North Yukon Tributaries	White River
2005 [a, b]	5.6%	19.2%	24.6%	11.1%	17.5%	9.1%	12.5%	0.5%
2006 [a, b]	6.1%	13.0%	33.0%	10.2%	12.4%	13.4%	10.3%	1.7%
2007 [a, c]	2.4%	19.0%	21.7%	9.2%	20.9%	14.2%	11.5%	1.1%
2008 [a, d]	0.0%	14.7%	20.4%	11.6%	23.9%	13.1%	14.6%	1.7%
2008 [c, d]	1.6%	16.4%	10.8%	33.5%	12.1%	7.2%	8.3%	10.1%
2009 [c, d]	3.3%	25.6%	16.0%	10.5%	16.2%	9.3%	12.7%	6.4%
2010 [c, d]	7.5%	33.0%	13.1%	19.6%	9.3%	7.5%	4.6%	5.4%
2011 [c, d]	4.8%	25.3%	9.6%	22.9%	17.2%	6.0%	8.1%	6.3%
2012 [c, b]	6.4%	37.8%	13.0%	18.8%	9.7%	6.4%	3.6%	4.3%
2013 [c, b]	6.7%	25.6%	18.5%	28.6%	11.5%	5.3%	0.7%	3.2%
Average (2007 - 2012) [c]	4.3%	26.2%	14.0%	19.1%	14.2%	8.4%	8.1%	5.6%

[a] Samples from BioIsland site collected from fish wheels.

[b] Samples were run against the current year's baseline.

[c] Samples from Eagle sonar site collected from the drift test fishery.

[d] Samples were run against the 2011 baseline.

Appendix B18.–Stock percentage estimates of fall chum salmon migrating across the mainstem U.S./Canada border, Yukon River, 2005–2013.

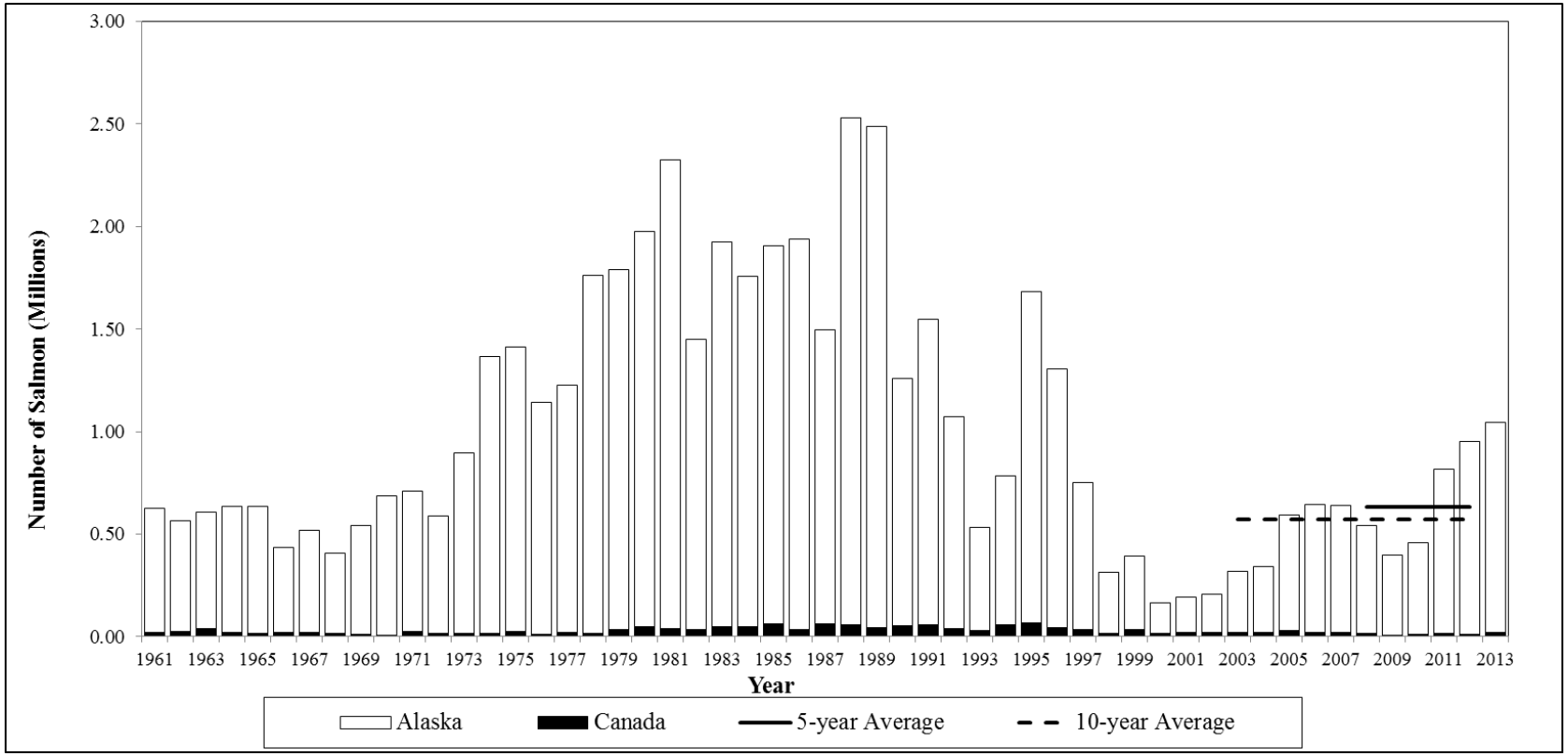
	Region			
Year	Mainstem	White	Teslin	Yukon Early
2005 [a]	67.7%	29.8%	0.4%	2.1%
2006 [a]	41.0%	54.9%	3.1%	1.0%
2007 [a]	46.9%	52.1%	0.5%	0.5%
2008 [a]	48.0%	49.9%	2.1%	0.1%
2009 [b]	68.3%	30.6%	1.0%	0.1%
2010 [b]	52.8%	46.3%	0.2%	0.7%
2011 [b]	51.2%	48.0%	0.7%	0.1%
2012 [b]	47.3%	52.6%	0.1%	0.1%
2013 [b]	50.5%	48.9%	0.4%	0.2%
Average (2009 - 2012)	54.9%	44.4%	0.5%	0.3%

Note: Samples were run against the current year's baseline (ex. 2005 samples were run against the 2005 baseline).

[a] Samples from BioIsland site collected from fish wheels.

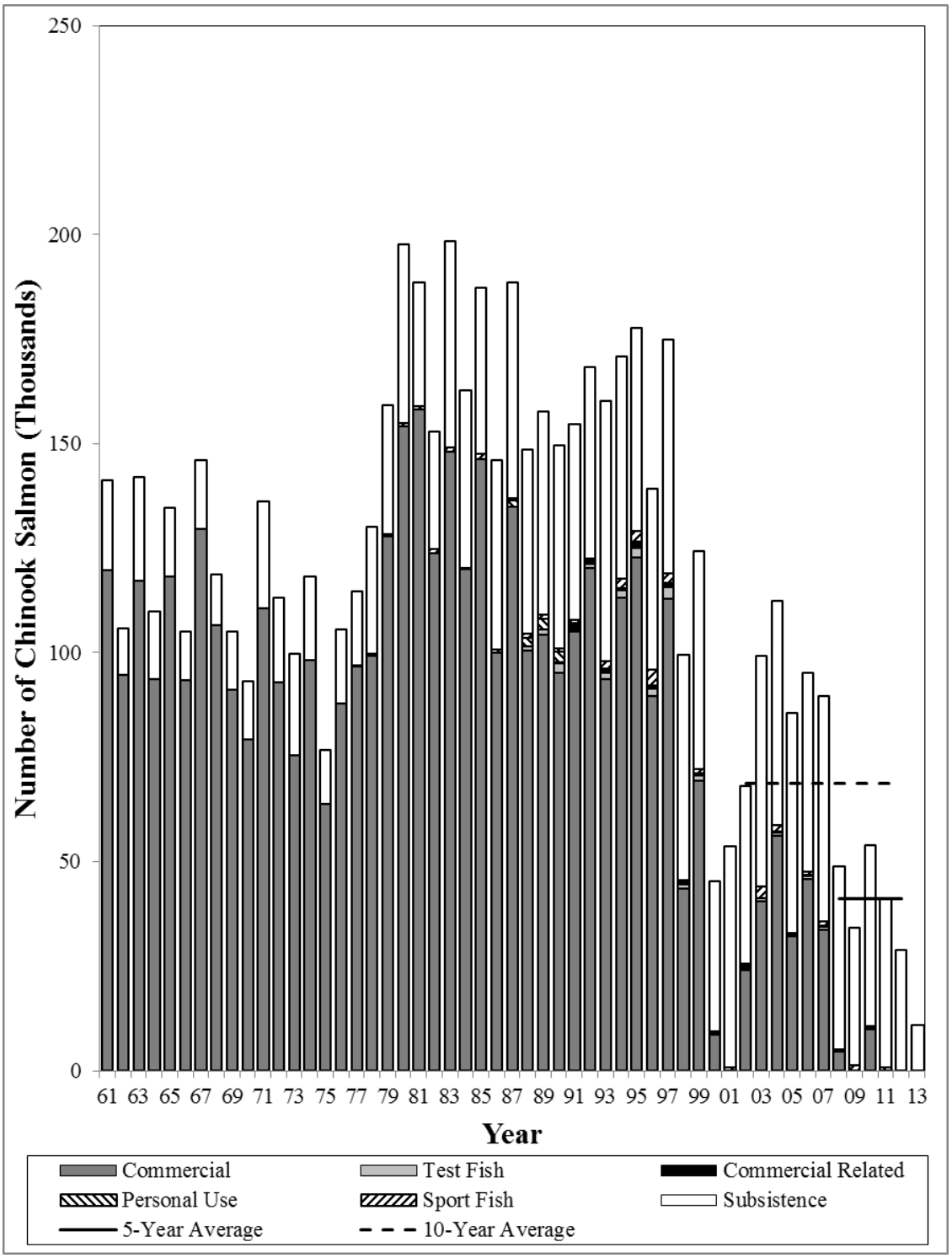
[b] Samples from Eagle sonar site collected from the drift test fishery.

APPENDIX C: FIGURES



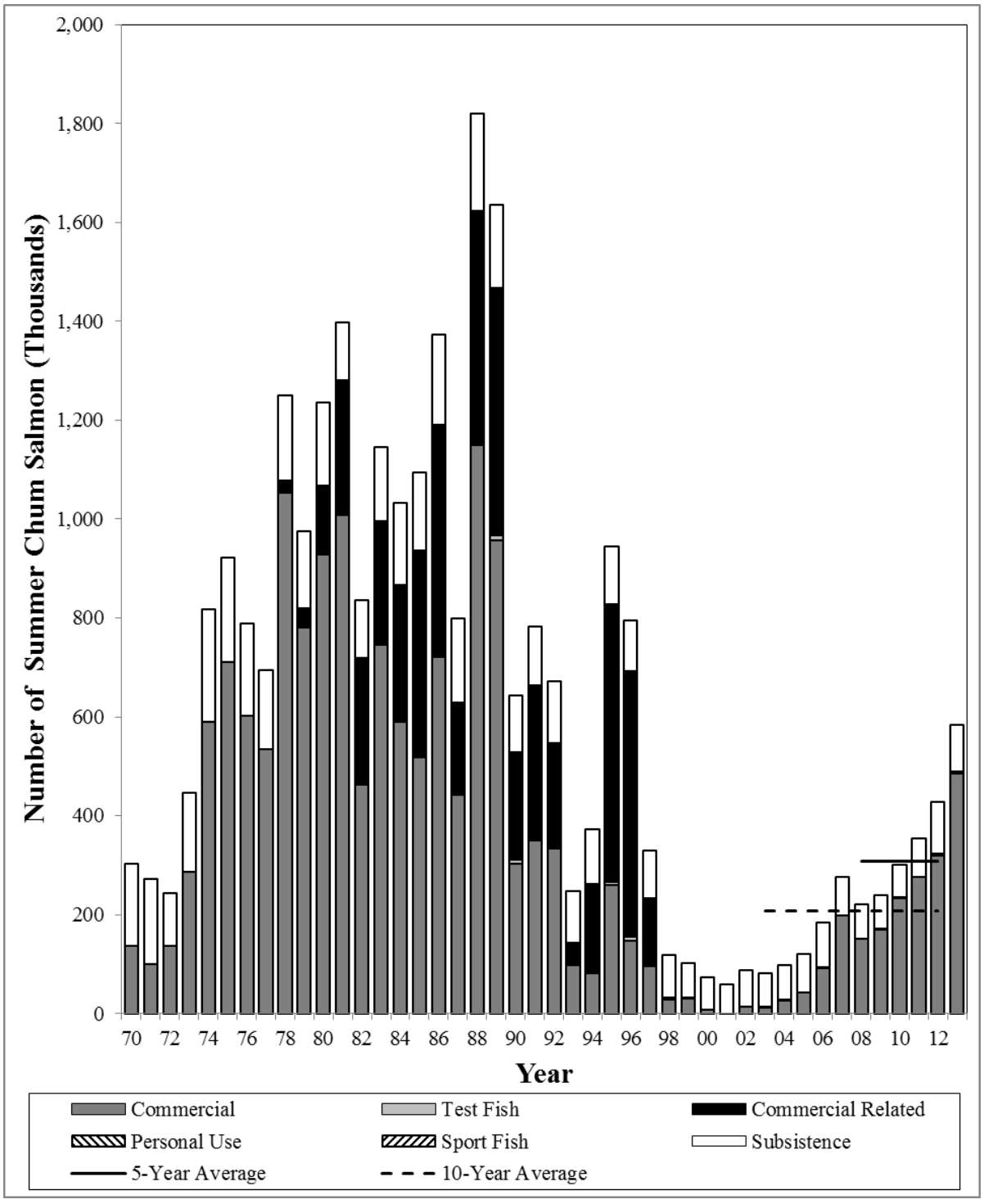
Note: Subsistence harvest estimates of fall chum and coho salmon are minimal prior to 1979 because of timing of harvest surveys. The 2012–2013 harvest estimates are preliminary.

Appendix C1.–Total utilization of Chinook, chum and coho salmon, Yukon River, 1961–2013.



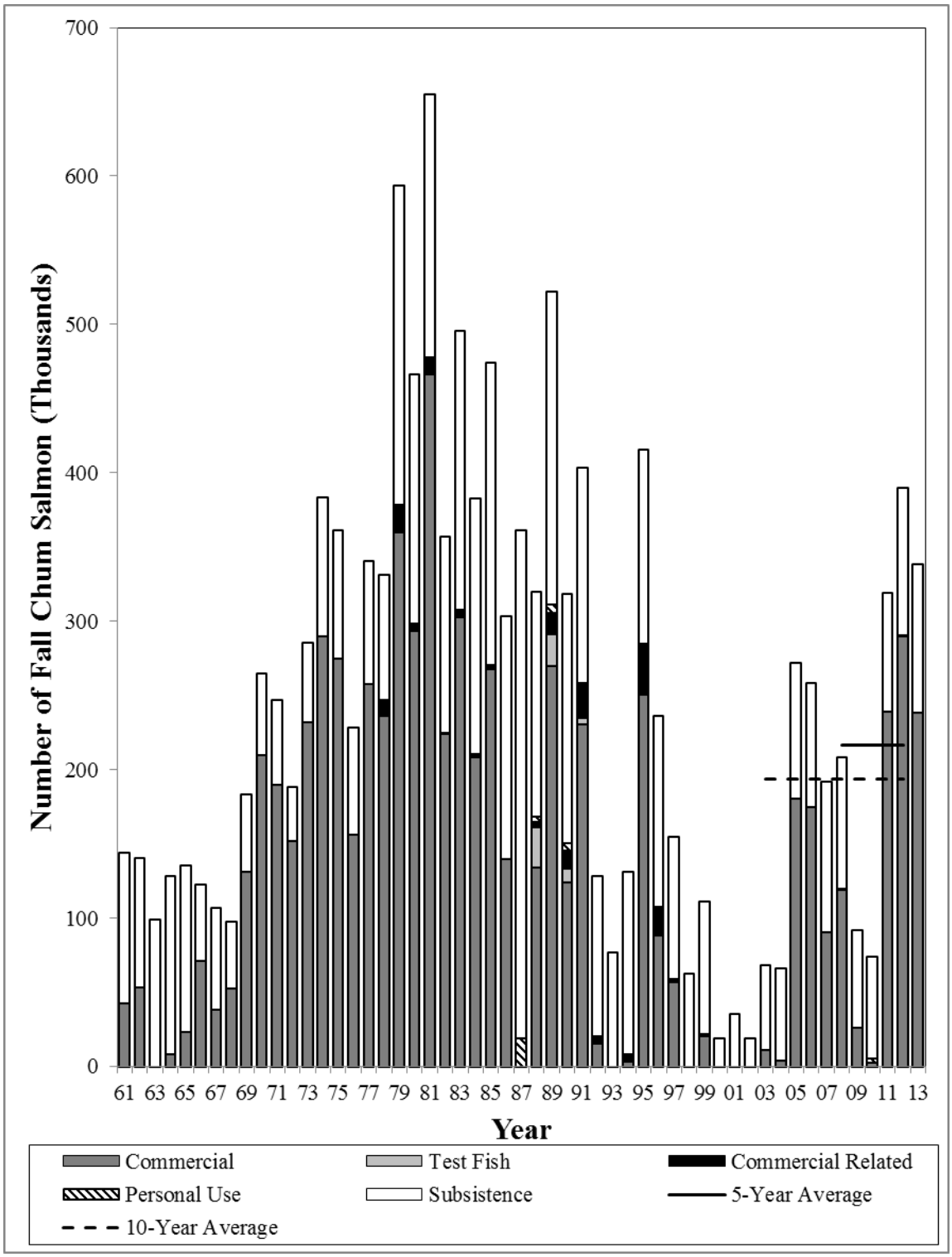
Note: No commercial fishery occurred in 2001. The 2012–2013 harvest estimates are preliminary.

Appendix C2.–Alaska harvest of Chinook salmon, Yukon River, 1961–2013.



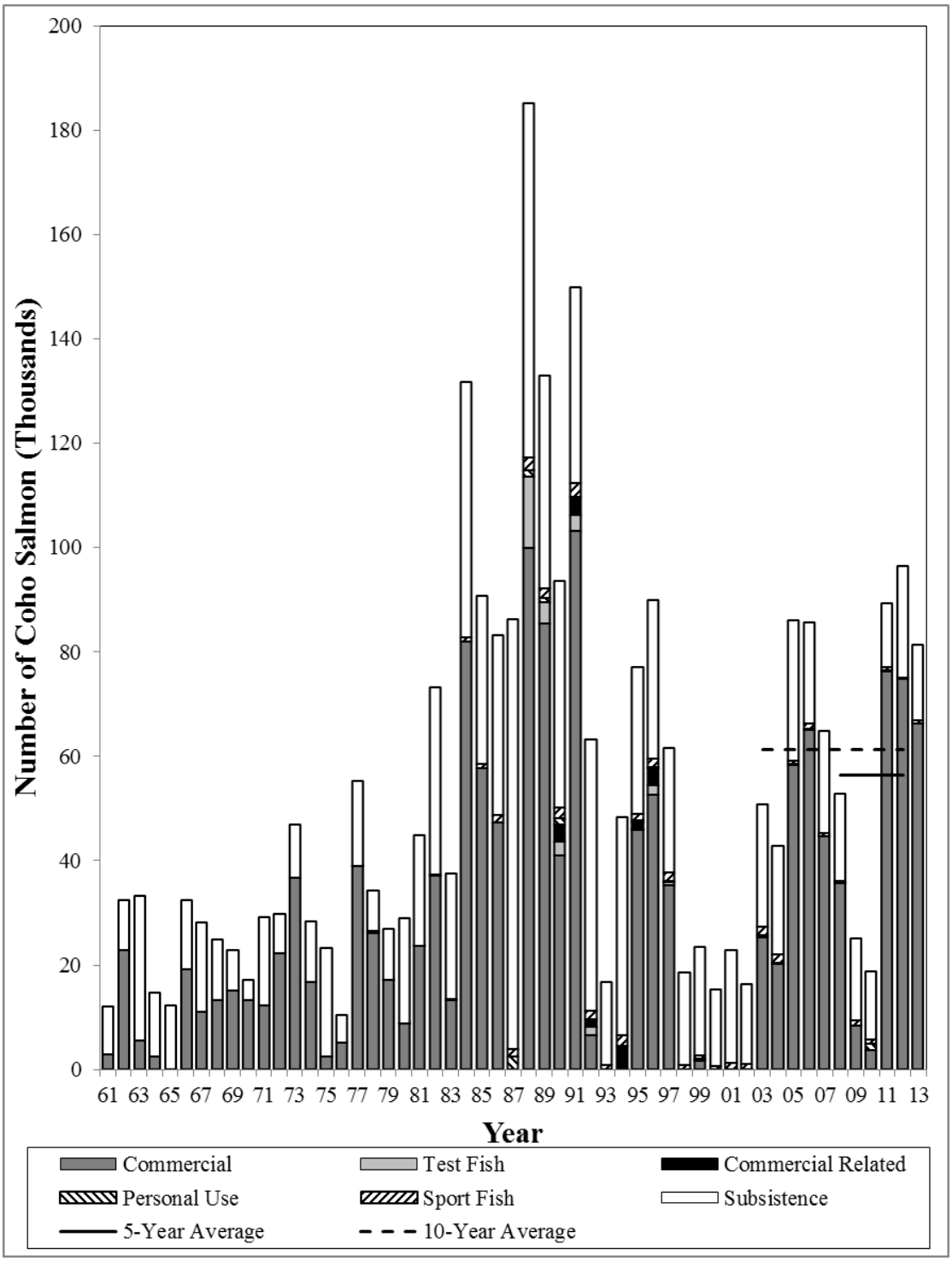
Note: The 2012–2013 harvest estimates are preliminary.

Appendix C3.–Alaska harvest of summer chum salmon, Yukon River, 1970–2013.



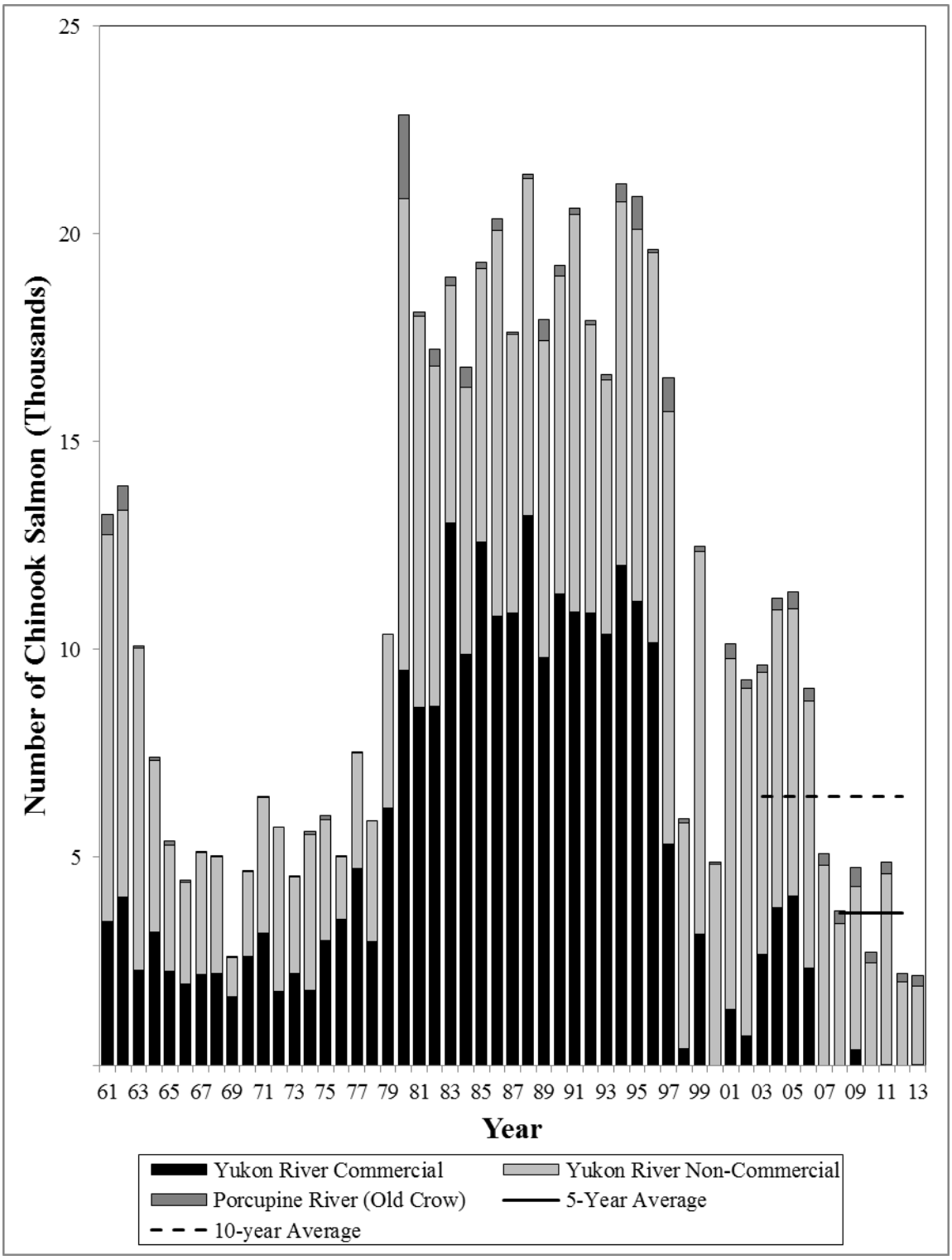
Note: Subsistence harvest estimates of fall chum salmon are minimal prior to 1979 because of timing of harvest surveys The commercial fishery was closed 2000–2002. The 2012–2013 harvest estimates are preliminary.

Appendix C4.–Alaska harvest of fall chum salmon, Yukon River, 1961–2013.

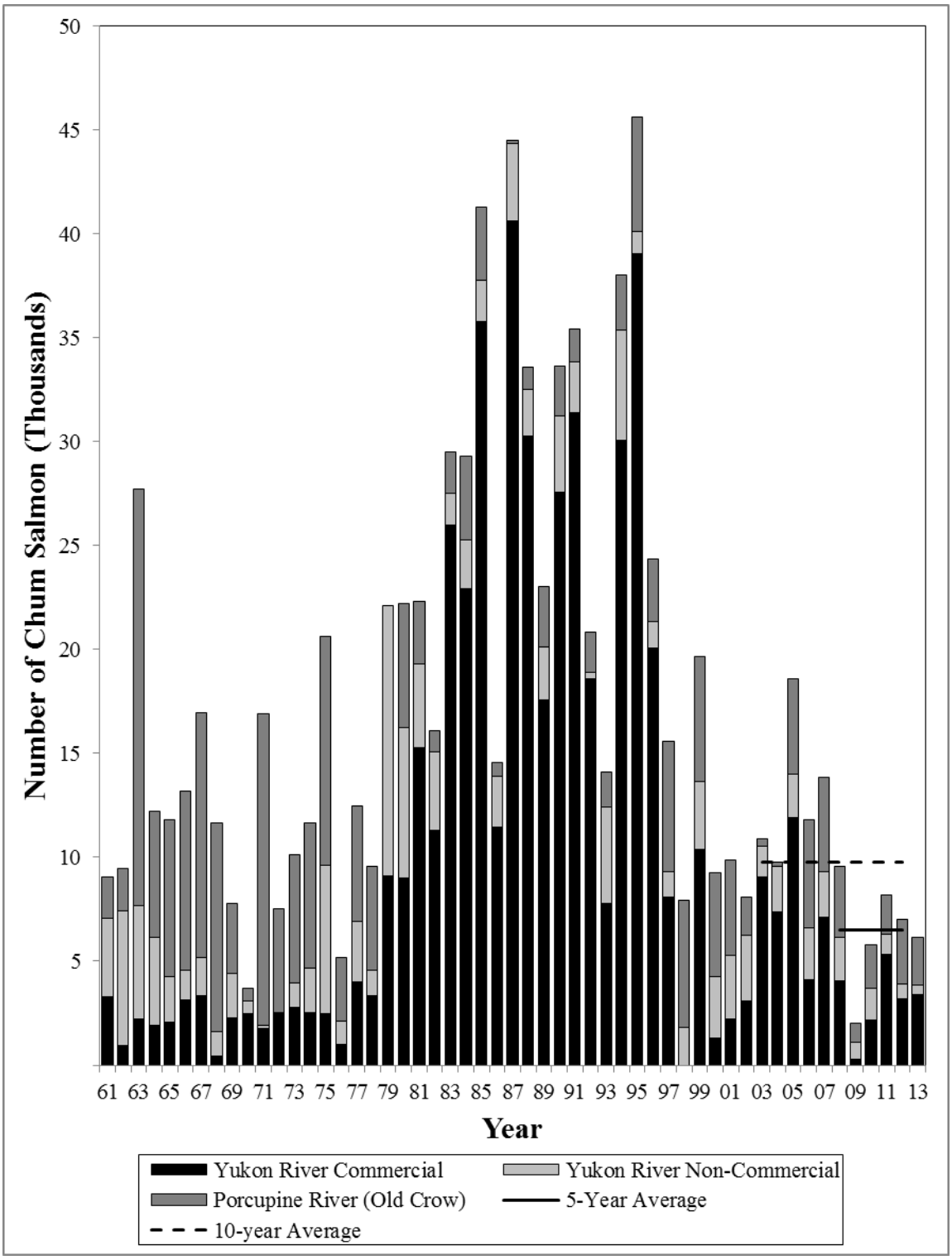


Note: Subsistence harvest estimates of coho salmon are minimal prior to 1979 because of timing of harvest surveys The commercial fishery was closed 2000–2002. The2012– 2013 harvest estimates are preliminary.

Appendix C5.–Alaska harvest of coho salmon, Yukon River, 1961–2013.

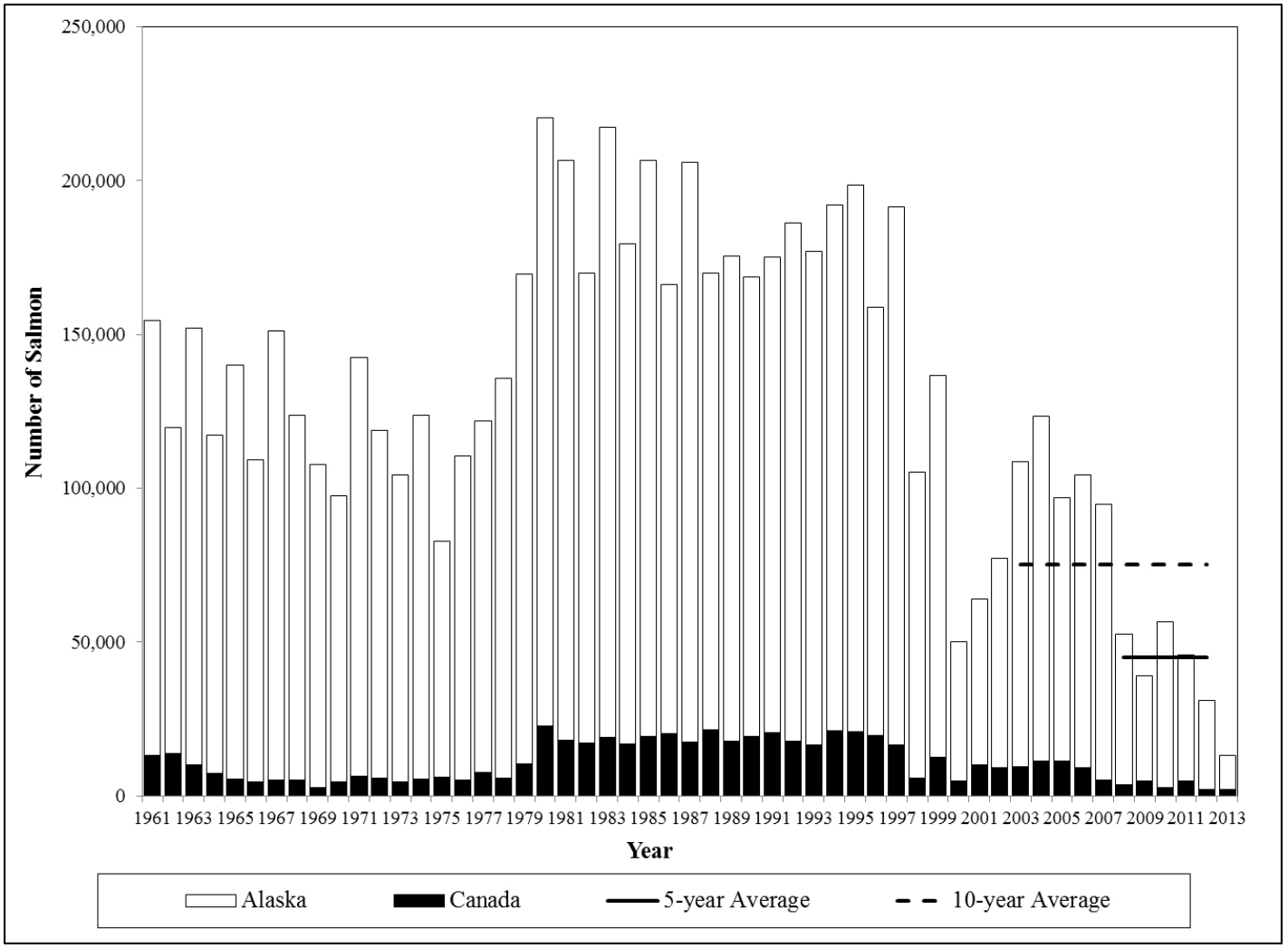


Appendix C6.–Canadian harvest of Chinook salmon, Yukon River, 1961–2013.



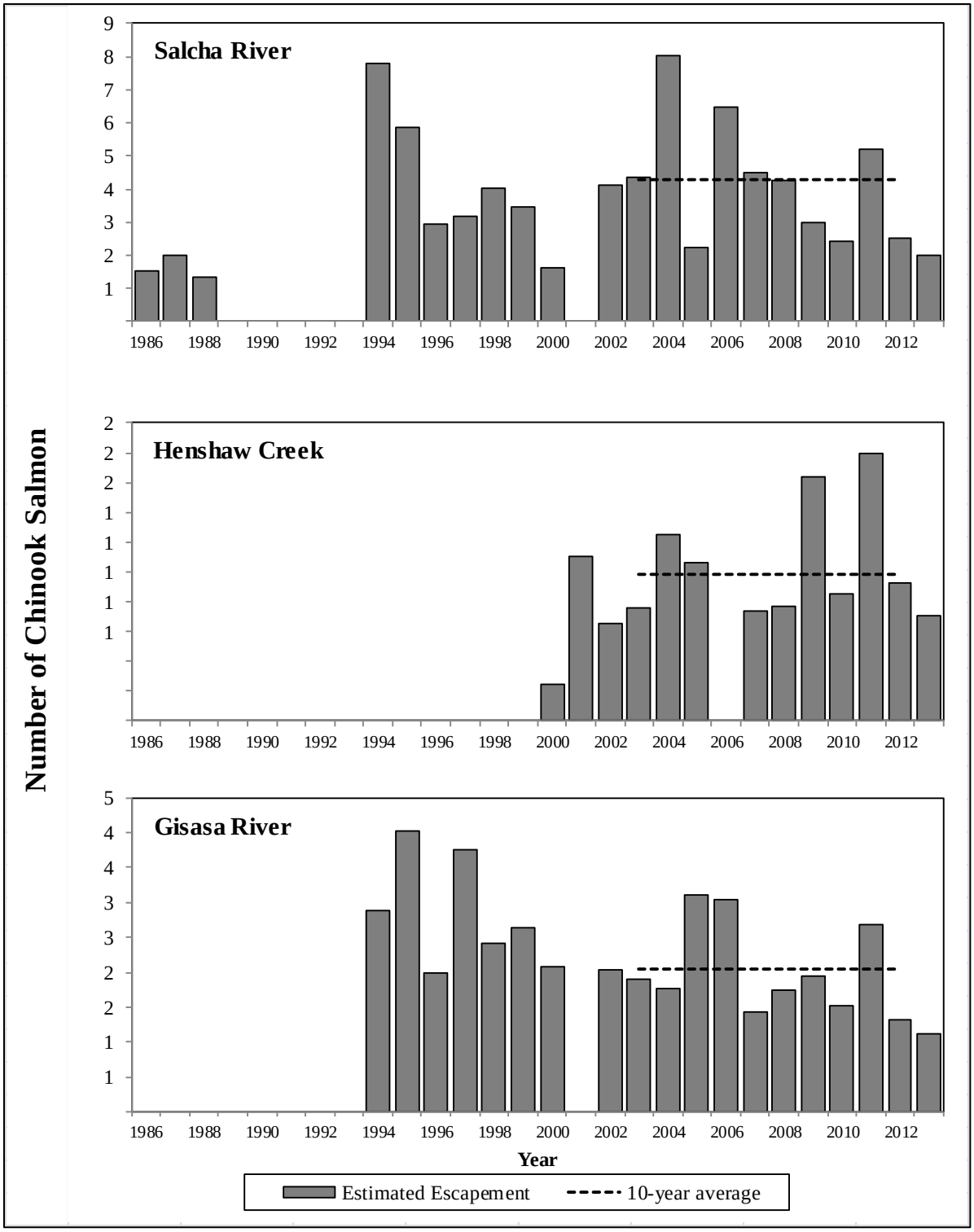
Note: The 2012–2013 harvest estimates are preliminary.

Appendix C7.–Canadian harvest of fall chum salmon, Yukon River, 1961–2013.



Note: The 2012–2013 harvest estimates are preliminary.

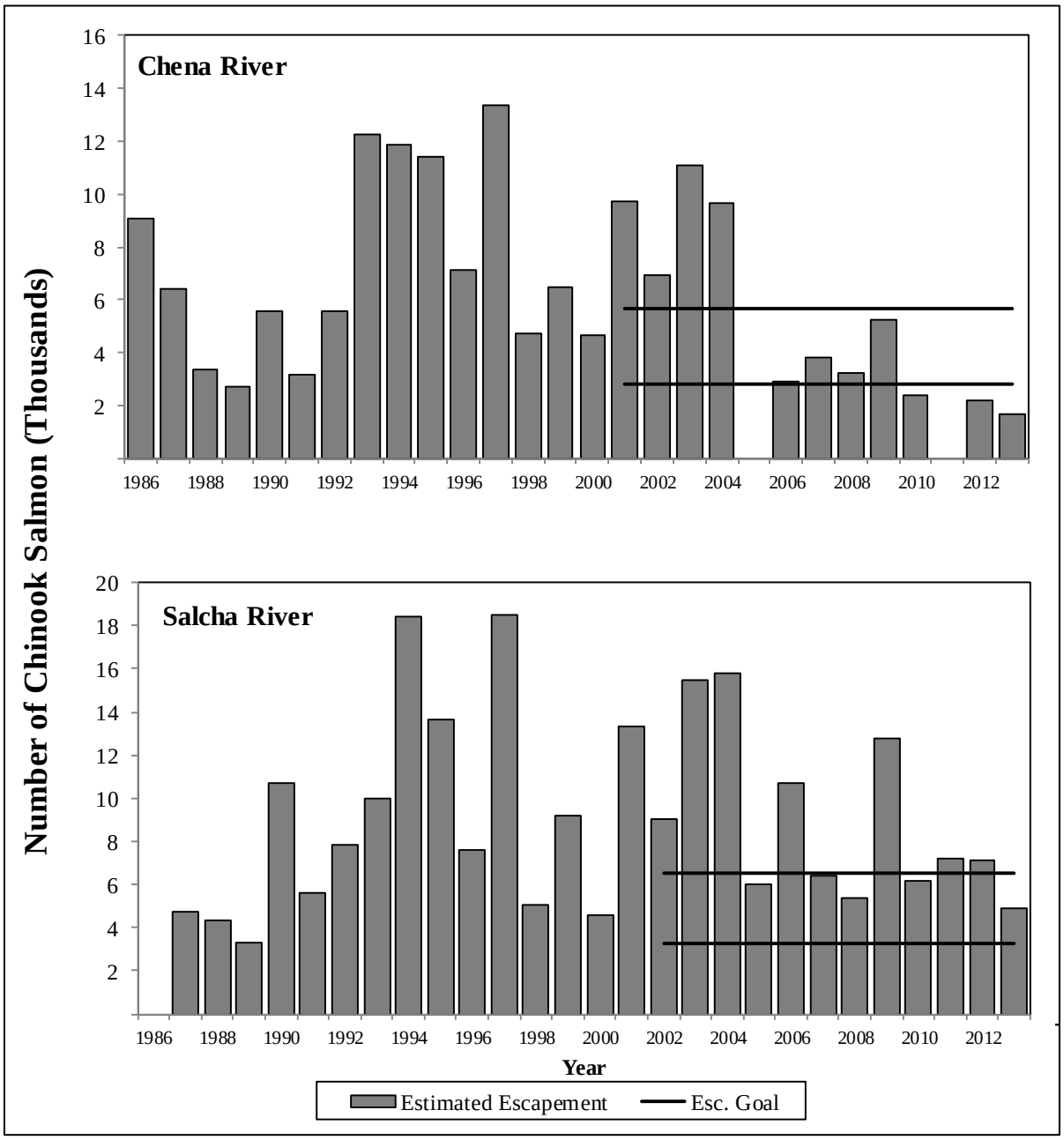
Appendix C8.–Total utilization of Chinook salmon, Yukon River, 1961–2013.

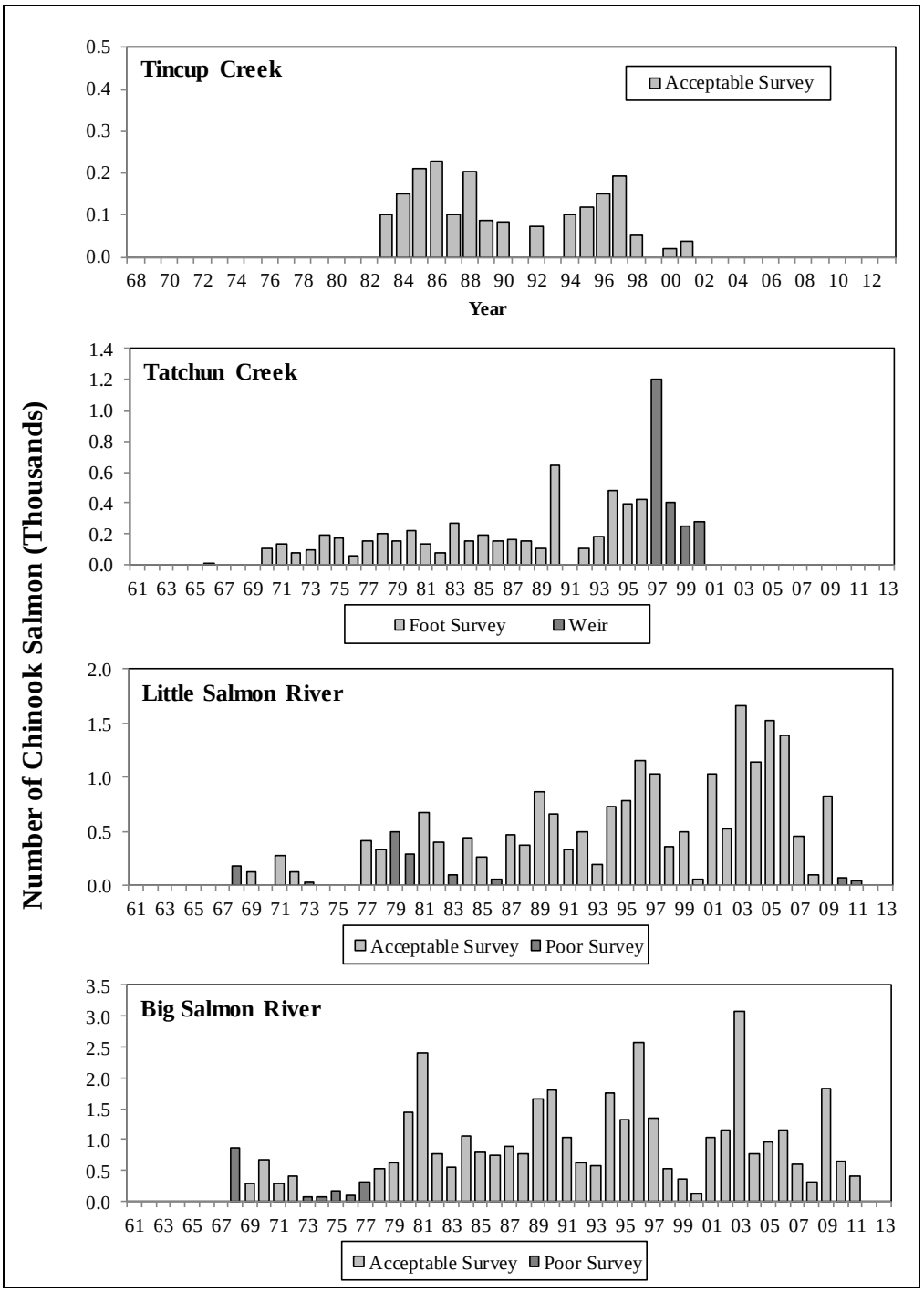


Note: Incomplete counts caused by late installation and/or early removal of project or high water events are excluded from the graphs. Vertical scale is variable.

Appendix C9.–Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2013.

-continued-

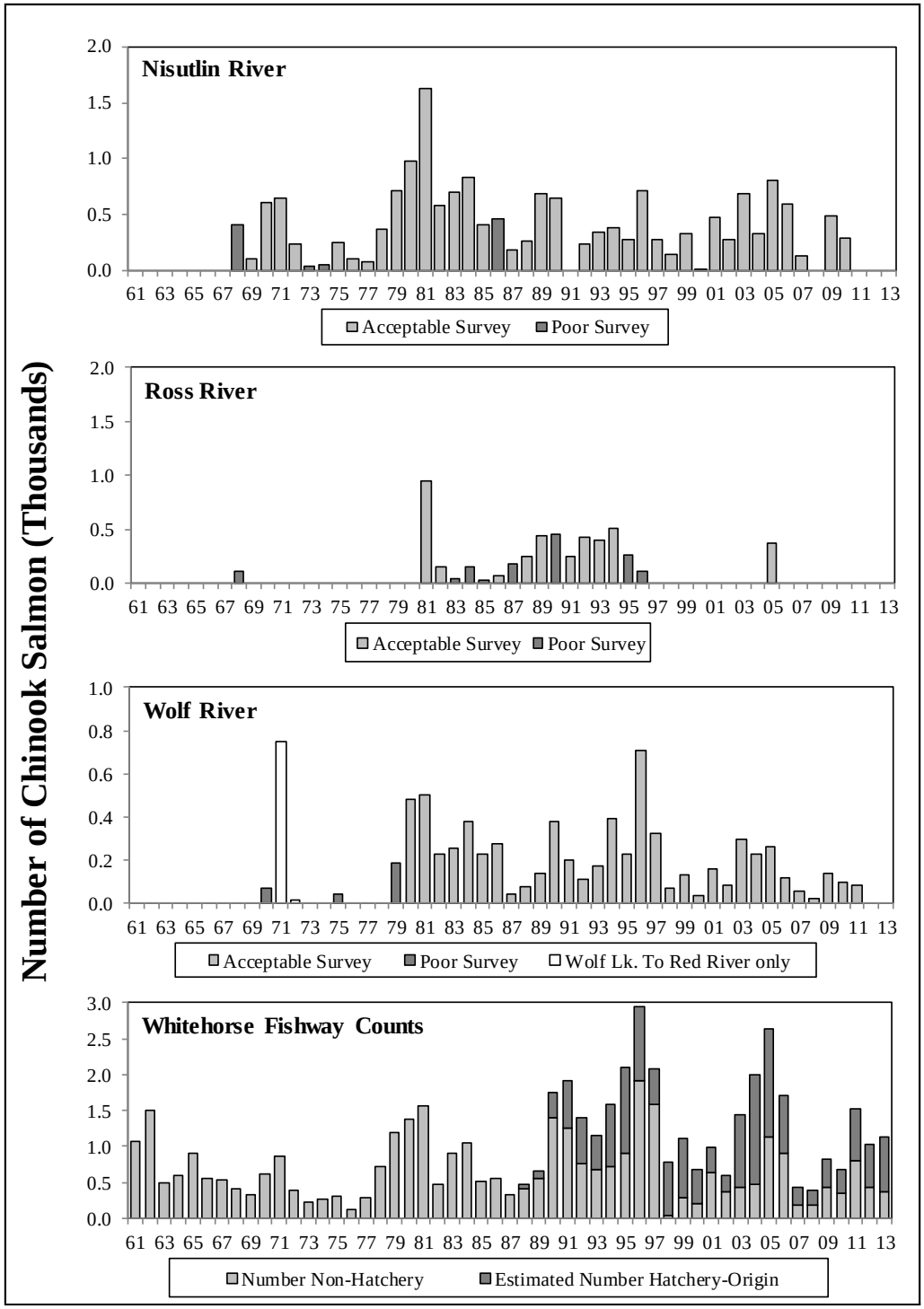

Chena River
Salcha River
Number of Chinook Salmon (Thousands)
Year
Estimated Escapement
Esc. Goal

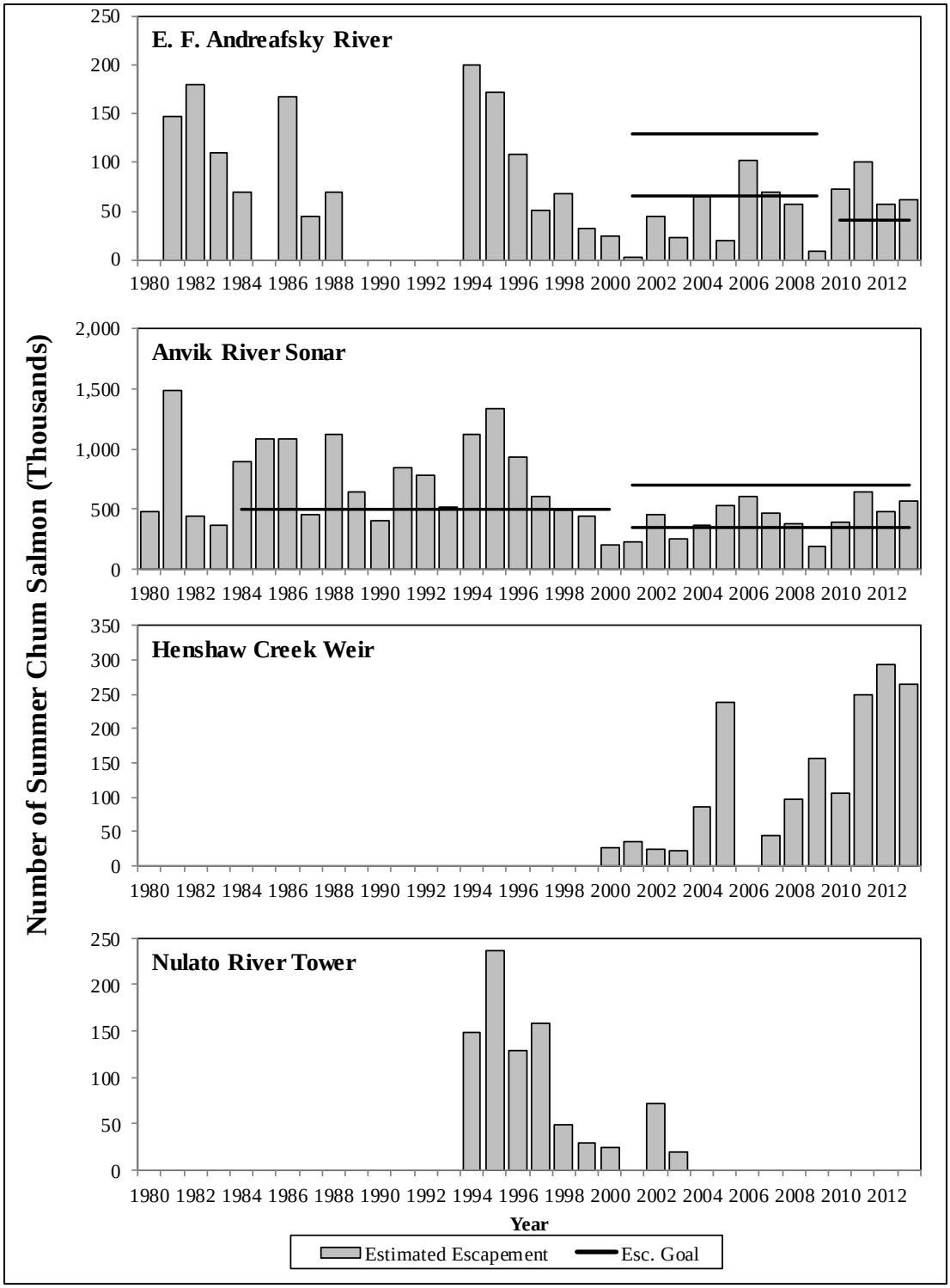


Note: Estimates are aerial survey observations unless noted otherwise. Vertical scale is variable.

Appendix C10.–Chinook salmon escapement estimates for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2013.

-continued-

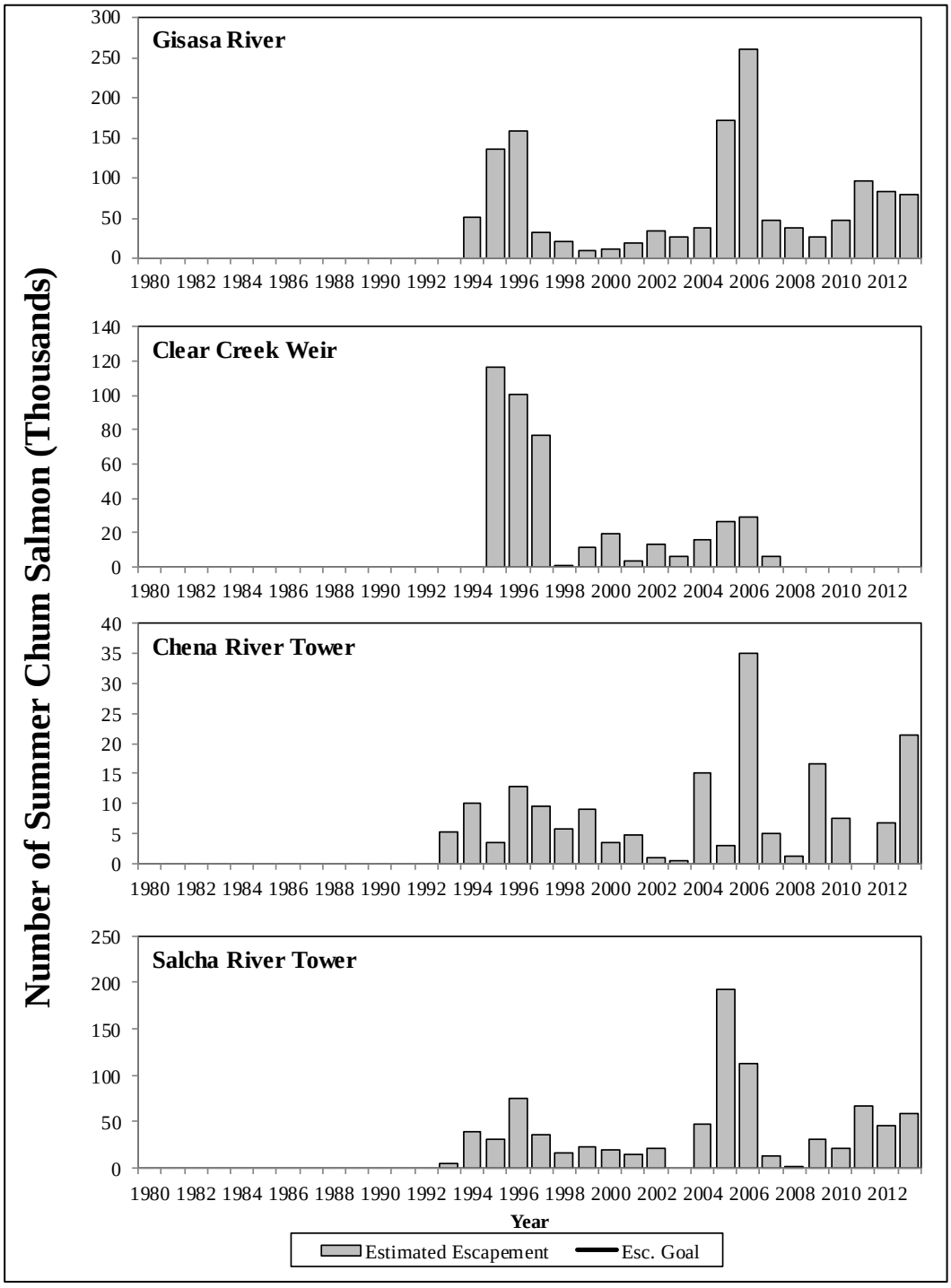

Number of Chinook Salmon (Thousands)
Nisutlin River
2.0
1.5
1.0
0.5
0.0
61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 01 03 05 07 09 11 13
Acceptable Survey
Poor Survey
Ross River
2.0
1.5
1.0
0.5
0.0
61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 01 03 05 07 09 11 13
Acceptable Survey
Poor Survey
Wolf River
1.0
0.8
0.6
0.4
0.2
0.0
61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 01 03 05 07 09 11 13
Acceptable Survey
Poor Survey
Wolf Lk. To Red River only
Whitehorse Fishway Counts
3.0
2.5
2.0
1.5
1.0
0.5
0.0
61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 01 03 05 07 09 11 13
Number Non-Hatchery
Estimated Number Hatchery-Origin

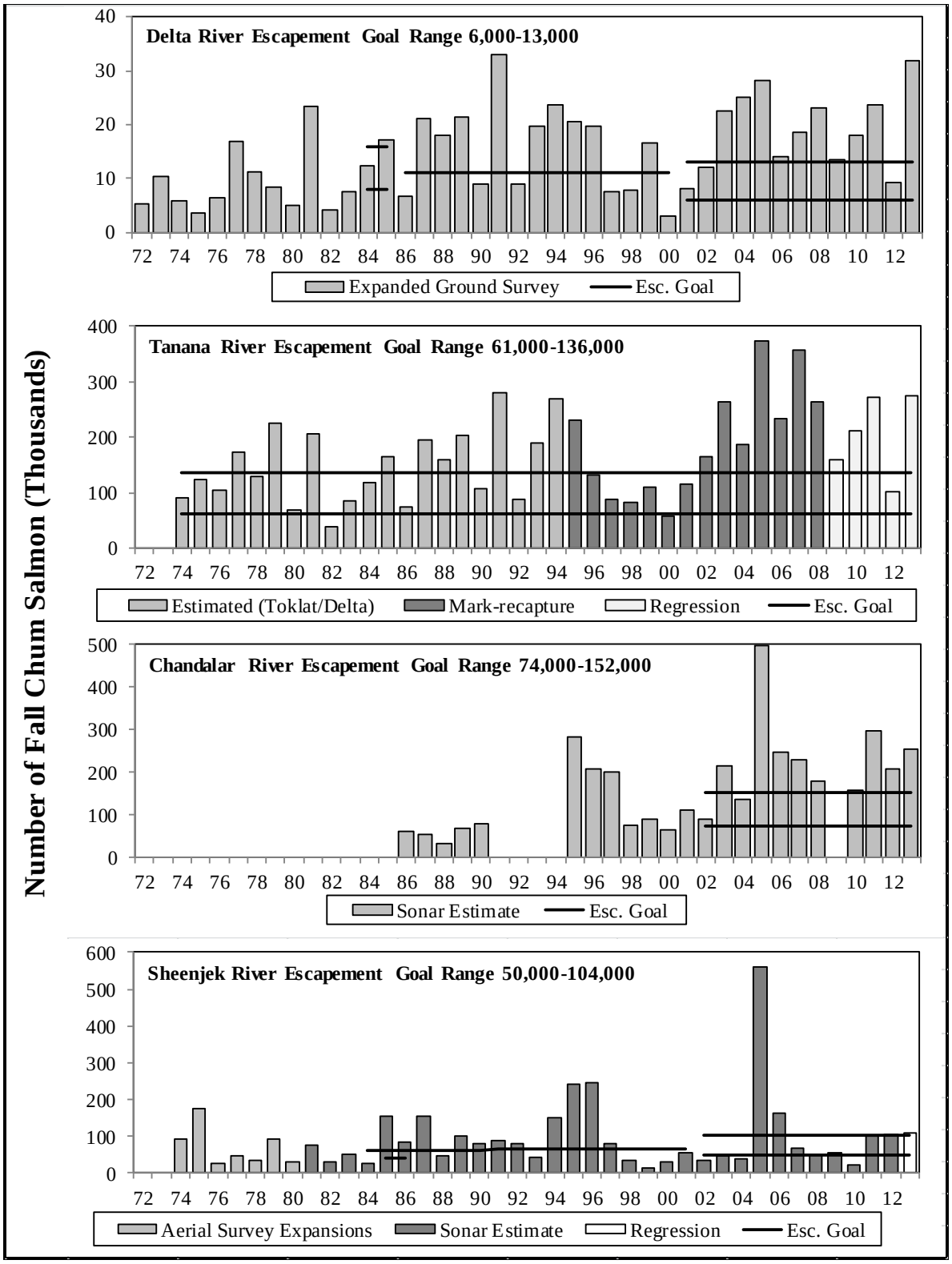


Note: Incomplete counts caused by late installation and/or early removal of project or high water events are excluded from graphs. The vertical scale is variable.

Appendix C11.–Summer chum salmon ground based escapement estimates for selected tributaries in the Alaska Yukon River drainage, 1980–2013.

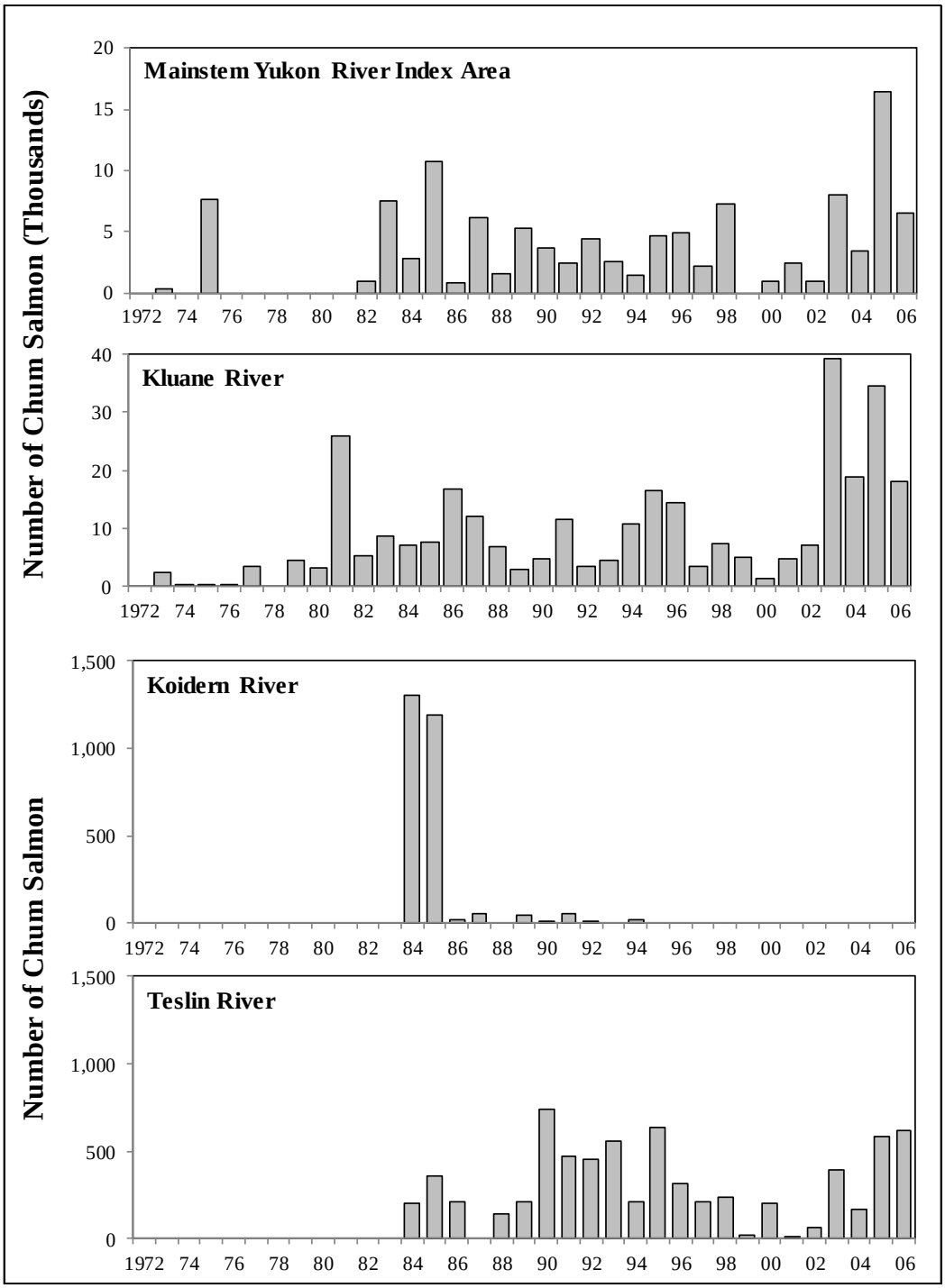
-continued-


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



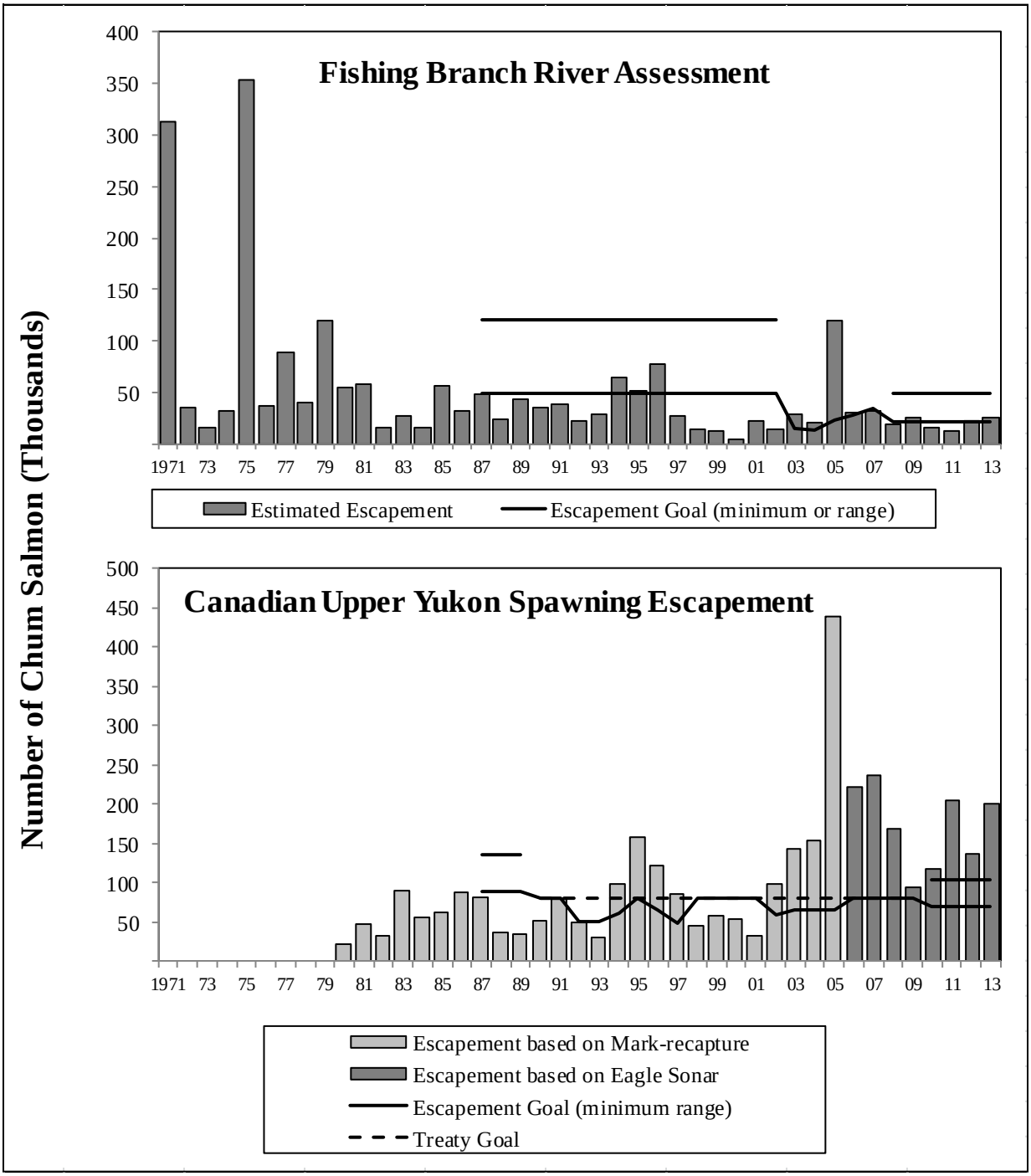
Note: Horizontal lines represent escapement goals or ranges. Vertical scale is variable.

Appendix C12.–Fall chum salmon escapement estimates for selected spawning areas in the Alaska portion of the Yukon River drainage, 1972–2013.



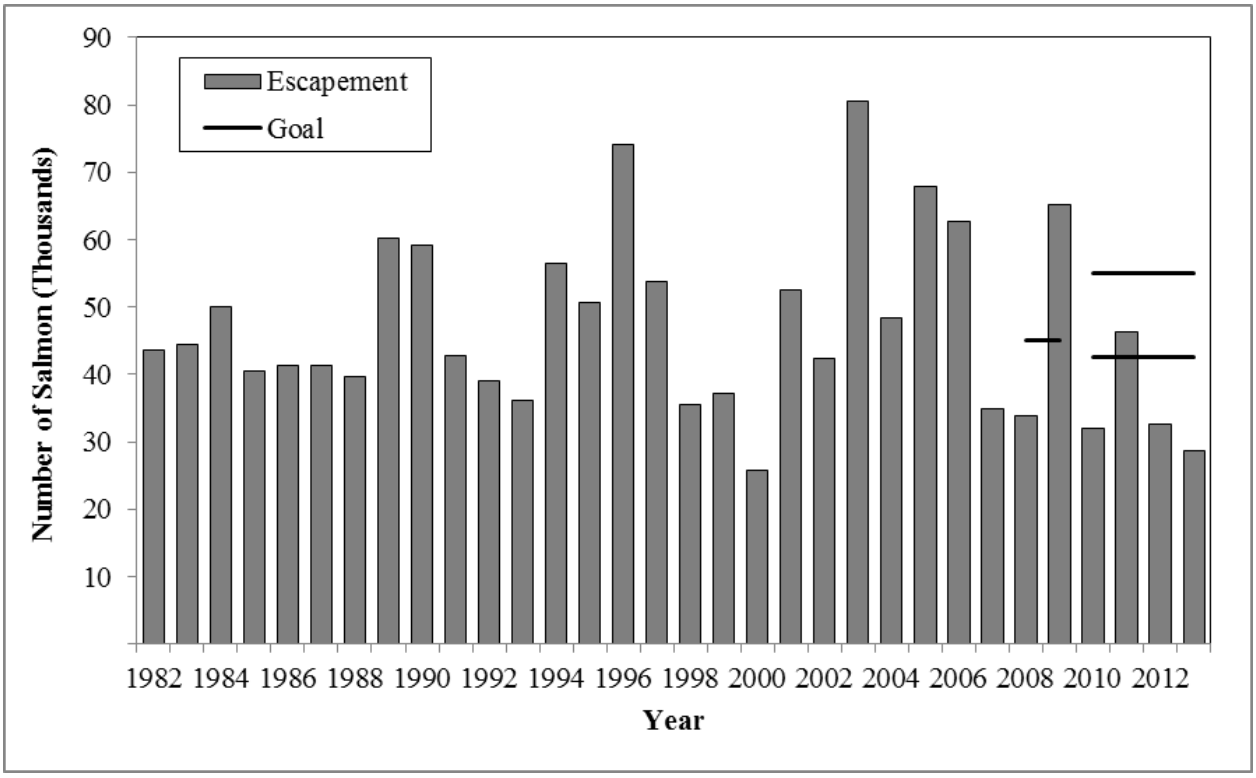
Note: The vertical scales vary. Genetic stock identification was used to determine relative tributary spawning abundance from 2007 to present (not depicted).

Appendix C13.–Fall chum salmon aerial survey estimates for selected spawning areas in the Canadian portion of the Yukon River drainage, 1972–2006.



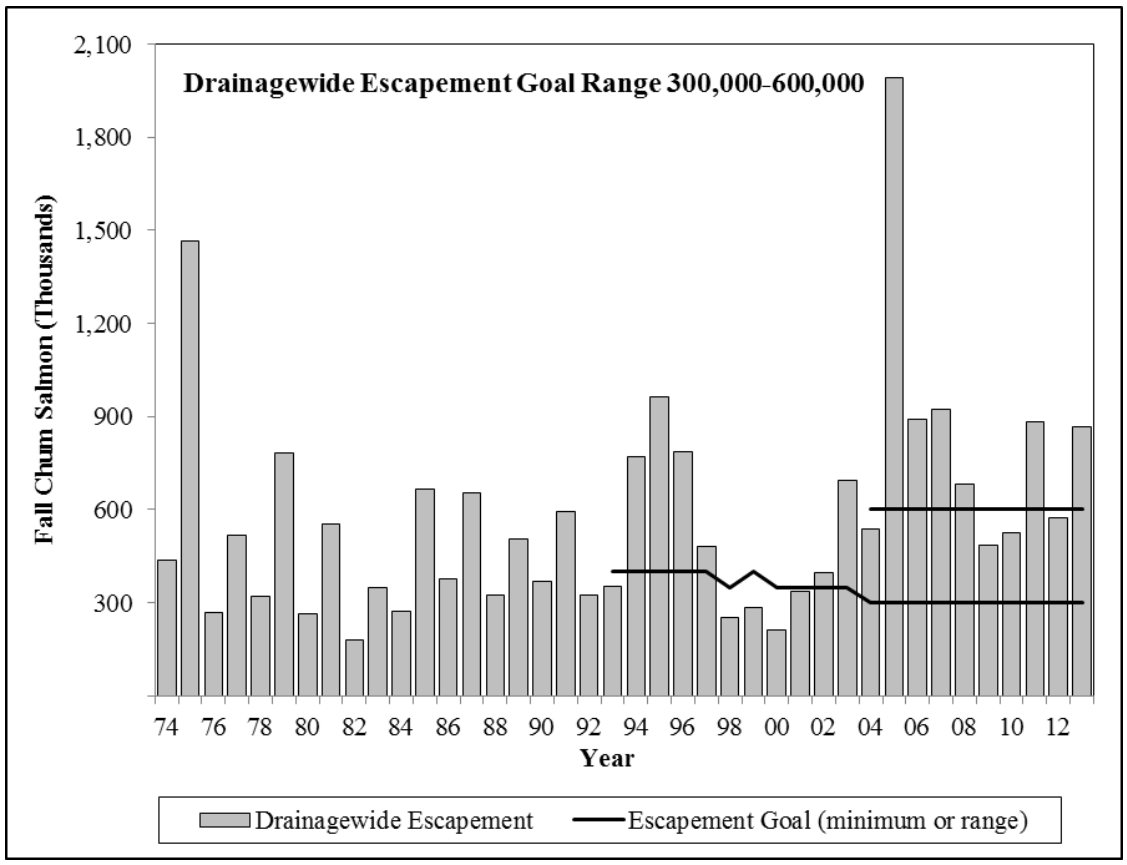
Note: Horizontal lines represent escapement goals which include treaty, rebuilding, and interim stabilization goals.

Appendix C14.–Fall chum salmon spawning escapement estimates for Canadian portion of the Yukon River drainage, 1971–2013.

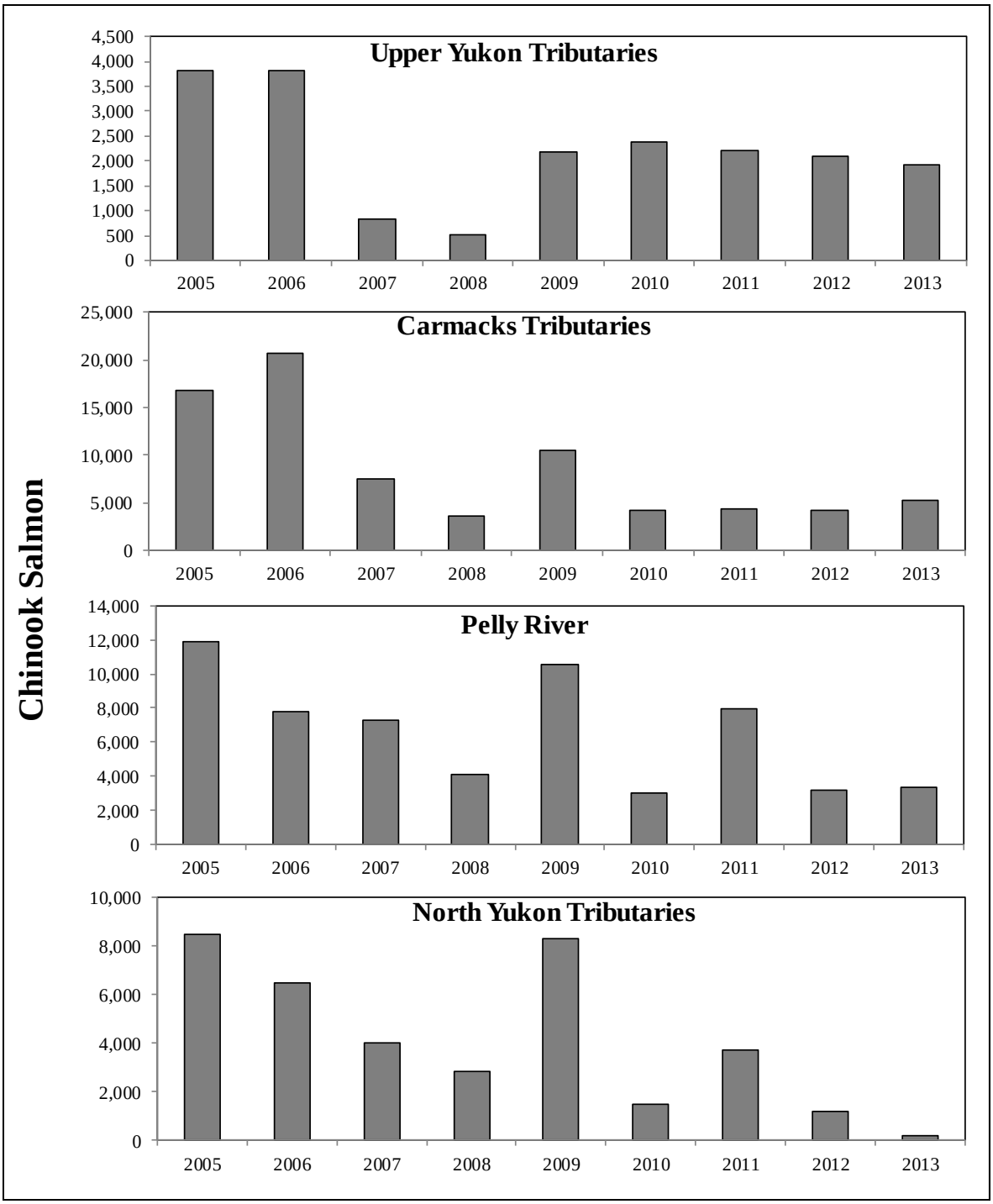


Note: The JTC adopted a revised escapement database in March 2008. The 2008 and 2009 interim management escapement goal (IMEG) was set at 45,000. The IMEG for 2010–2013 was 42,500 to 55,000 salmon.

Appendix C15.–Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982–2013.



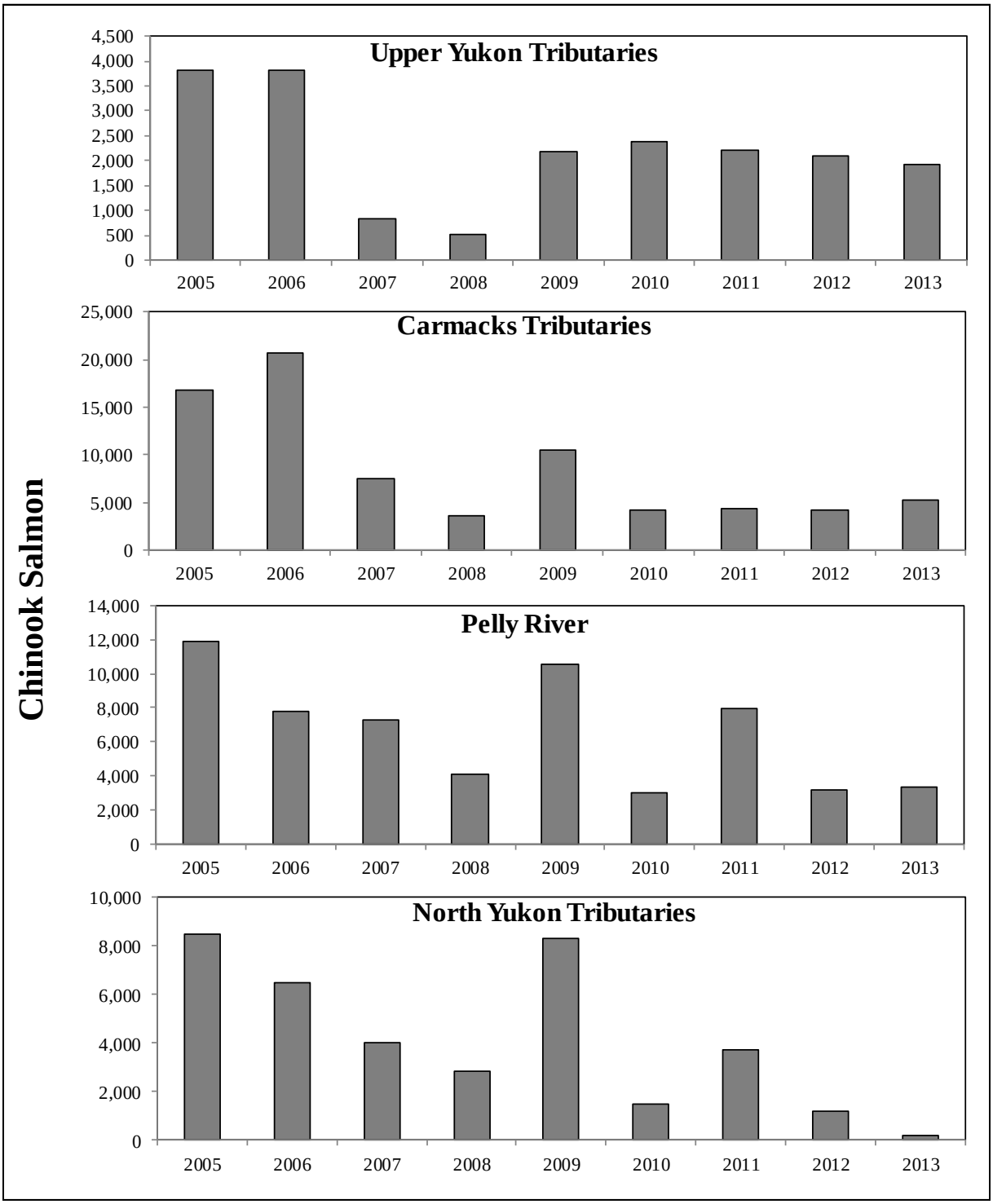
Appendix C16.–Estimated drainagewide escapement of fall chum salmon, Yukon River, 1974–2013.

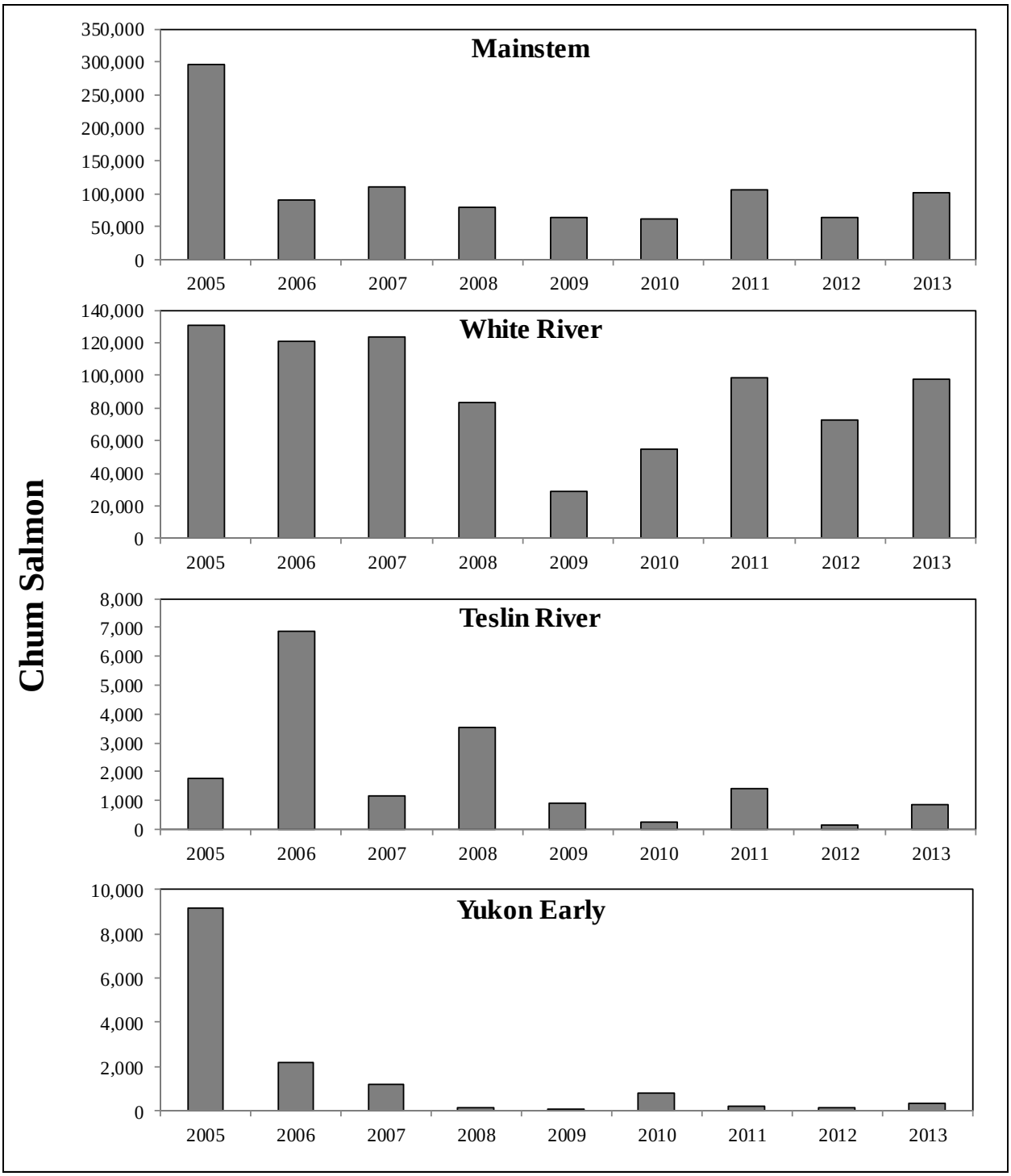


Note: Genetic estimates are based on samples from fish wheels at BioIsland, 2005–2008, all other years genetic estimates are from the drift test fishery associated with the sonar program at Eagle.

Appendix C17.–Estimated Chinook salmon spawning escapement to regions represented in the genetic baselines, Yukon River, 2005–2013.

-continued-

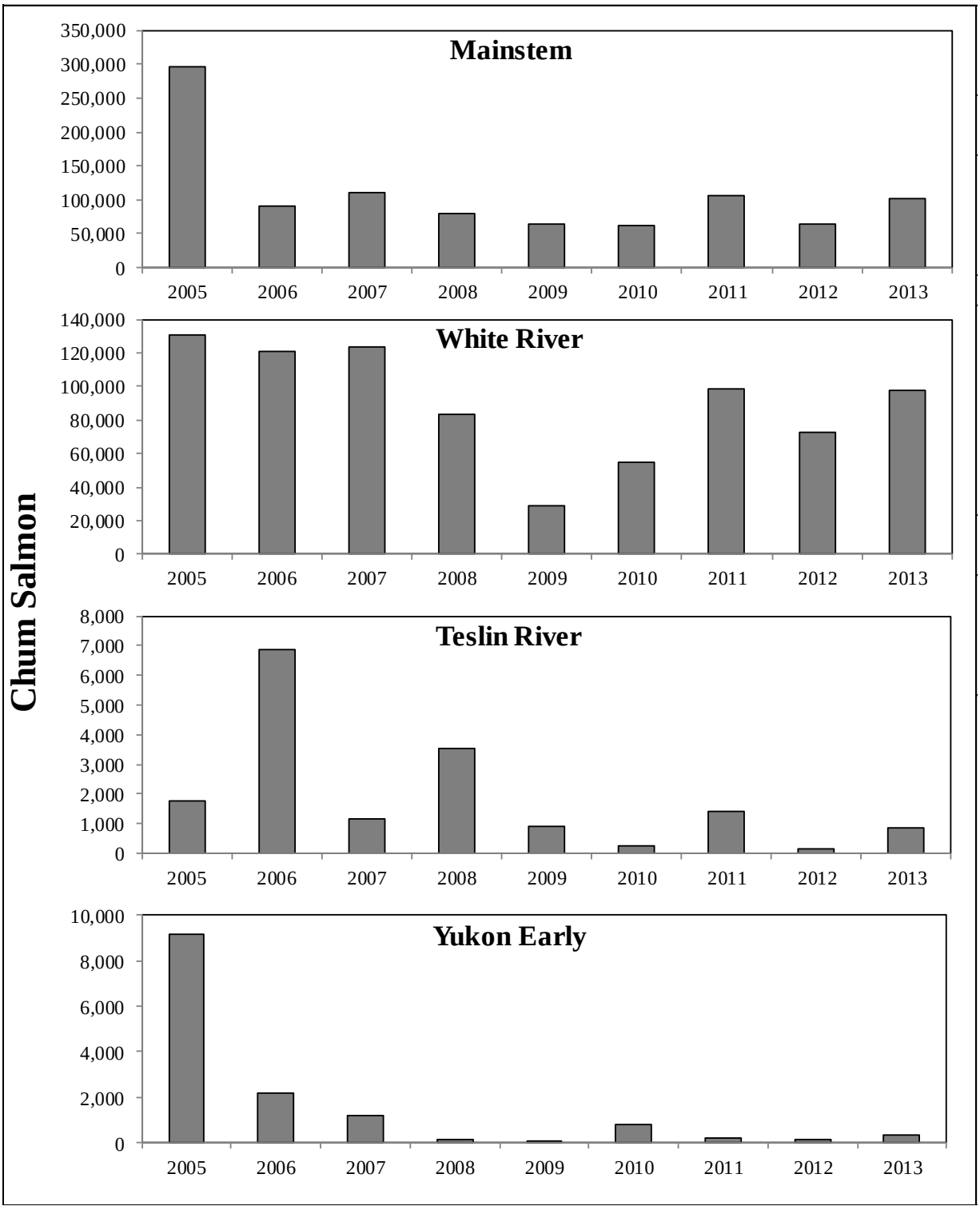

Chinook Salmon
Upper Yukon Tributaries
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2005 2006 2007 2008 2009 2010 2011 2012 2013
Carmacks Tributaries
25,000
20,000
15,000
10,000
5,000
0
2005 2006 2007 2008 2009 2010 2011 2012 2013
Pelly River
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2005 2006 2007 2008 2009 2010 2011 2012 2013
North Yukon Tributaries
10,000
8,000
6,000
4,000
2,000
0
2005 2006 2007 2008 2009 2010 2011 2012 2013



Note: Genetic estimates are based on samples from fish wheels at BioIsland, 2005–2008, all other years genetic estimates are from the drift test fishery associated with the sonar program at Eagle.

Appendix C18.–Estimated fall chum salmon spawning escapement to regions represented in the genetic baselines, Yukon River, 2005–2013.

-continued-



Note: Genetic estimates are based on samples from fish wheels at BioIsland, 2005–2008, all other years genetic estimates are from the drift test fishery associated with the sonar program at Eagle.

APPENDIX D: JTC 2013 SEASON MANAGEMENT REVIEW AND 2014 OUTLOOKS

Appendix D1.–Summary of Joint Technical Committee information on fisheries management, escapement, other assessment programs, and harvests for the 2013 season and outlooks for the 2014 season.

Duties delegated to the Yukon River Joint Technical Committee (JTC) include the review of research, assessment methods, and other information relating to salmon migration, abundance, escapement, and status of individual stocks; fishery performance, harvest rates, and management programs. The JTC produces this annual postseason summary and preseason outlook report to provide summaries of preseason and inseason management strategies, preliminary harvest amounts, and assessment and other research programs focused on salmon stocks which spawn in the upper Yukon River drainage in Canada. This appendix to the report is provided at the request of the Yukon River Panel (Panel) to summarize specific information about management strategies and outcomes. The JTC reminds readers that this appendix is a brief summary of information contained in the report, and further details, context, and background information can be found in the main body of the report, along with Appendices A–C which contains numerous tables and figures. The JTC also cautions readers that the management targets presented here do not comprise biological information concerning the status or health of Chinook or other salmon stocks, but are based on the Yukon River Salmon Agreement and Panel decisions.

JOINT TECHNICAL COMMITTEE MANAGEMENT AND RESEARCH REVIEWS IN 2013-2014

The JTC met in November 2013 and February 2014. In the fall meeting, postseason reviews of management and harvests, stock assessment, escapement, and marine fisheries and surveys were provided by research and management biologists and other specialists in both Alaska and Canada, as is typical for the fall JTC meeting. In November, the field portions of most seasonal projects and assessments had been completed but detailed, quality controlled data were not yet available so reports focused on activities and preliminary results. In the February meeting, more definitive postseason reviews were provided; project and assessment information was in the process of being finalized, and in many cases preliminary estimates were available. However, readers are cautioned that information provided in this report and during spring JTC and Yukon River Panel meetings must be regarded as preliminary and subject to change as further refinements and levels of review occur. In addition to routine management and assessment reports, the JTC considers certain special topics related to assessment and monitoring, conservation, and research interests necessary to support the Yukon River Salmon Agreement. In November 2013, the JTC reviewed and discussed the process of estimating salmon passage at the Pilot Station sonar project, including various sources of uncertainty. They also reviewed and discussed trends and possible causes of apparent declines in Chinook salmon size at age and size and age at maturity.

2013 CHINOOK SALMON MANAGEMENT, HARVEST, AND ESCAPEMENT SUMMARY IN ALASKA AND CANADA

The preseason outlook for Chinook salmon abundance in 2013 was 98,000–144,000 fish. Achieving escapement objectives was expected to be extremely challenging with a run of this size, and severe conservation measures were deemed necessary. Extensive preparations were made by U.S. management agencies for implementation these measures, through numerous public and advisory group meetings, individual conferences with community leaders and resource users, and publicity by mail, email, broadcast and print media, and teleconferences. These efforts continued

throughout the 2013 fishing season in Alaska. With all commercial harvest or sale of Chinook salmon prohibited, management focused on the subsistence fishery. Based on the expectation that the 2013 Chinook salmon run could potentially be weaker than the run observed in 2012, the subsistence fishing schedule was reduced even further than in previous years. Fishermen were strongly encouraged to voluntarily reduce their Chinook salmon harvest to not exceed 25% of their average annual historical harvest to help ensure adequate escapement.

Additional conservation measures were put into place as the run progressed. Pulse closures were extended through the third pulse, and opportunity was limited between pulses. Fishing time was further reduced in the upper river districts. Opportunities for fishermen to harvest summer chum salmon from a run of nearly 3 million fish were strongly curtailed whenever Chinook salmon were likely to be present, and special gear and regulatory measures were used to ensure that any incidentally caught Chinook salmon would be released alive.

Subsistence harvest in Alaska is estimated through an extensive village by village postseason survey, conducted in person. Over 1,100 households were interviewed in 2013, out of an estimated total of 2,500 households in 31 subsistence fishing communities throughout the Alaskan portion of the Yukon River drainage. Preliminary estimates indicate that about 7,200 Canadian origin Chinook salmon were harvested for subsistence purposes. The 2013 harvest level represents a 47% reduction over the 2012 harvest of about 13,800 Chinook salmon. This subsistence harvest was the lowest on record and represents an 84% reduction from the average harvest levels recorded for 2001-2007, when some commercial harvest of Chinook salmon was still occurring and fewer subsistence fishing restrictions were in place (Appendix D2).

In Canada, a decision matrix guides management strategies, based on the projected run size, and with the low forecast at the outset for 2013, these strategies included closure of commercial, domestic, and recreational fisheries. Additionally, DFO conducted a series of regular teleconferences with First Nation managers to update them on run projections scenarios and to advise a precautionary approach be adopted. Based on a preseason outlook for a below average run of 49,000 to 71,000 Upper Yukon Chinook salmon, conservation measures were expected to be required in First Nation fisheries. Using the decision matrix, DFO recommended that Yukon First Nations develop individual community harvest plans to address conservation concerns for Chinook salmon. First Nations accepted the need for conservation and implemented harvest monitoring measures in order to stay below normal harvest levels, including reduced effort and reduced fishing periods.

In Canada, inseason harvest information for the Upper Yukon River was collected in 2013 by First Nations within their respective Traditional Territories, as part of the implementation of the First Nation Final Agreements. 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 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.

In 2013, the Upper Yukon River aboriginal Chinook salmon catch was estimated to be 1,902 fish; including 1,253 fish reported by First Nations and an adjustment of 649 fish to account for 2 communities that did not report their harvest. The estimated 2013 harvest level represents a 56%

reduction from the 2012 harvest of 4,594 Chinook salmon, and is the lowest on record. The 2013 harvest level is also 78% reduction from the average harvest levels recorded for 2001–2007, when some commercial harvest of Chinook salmon was still occurring and fewer subsistence fishing restrictions were in place (Appendix D3). The 2013 harvest recorded by Tr'ondëk Hwëch'in (THFN) in the Dawson area was 602 Chinook salmon. A harvest of 237 Chinook salmon was reported by the First Nation of Na-Cho Nyäk Dun (NNDFN) on the Stewart River. The harvest reported by Selkirk First Nation (SFN) was 350 fish. The Ta'an Kwach'an Council (TKC), fishing in the vicinity of Lake Laberge near Whitehorse, reported a catch of approximately 40 Chinook salmon. Most of the harvest taken by TKC was during a culture camp. In each case, harvests were reduced by about 25-65% of each First Nation's average harvest over the past 10 years. Little Salmon Carmacks First Nation (LSCFN) did not report their salmon harvest in 2013; the harvest estimate for this First Nation is 463 Chinook salmon and is based on recent harvest totals. The harvest of Chinook salmon for the Ross River Dena Council (RRDC) is estimated to be 186, also derived by using a 10-year average. Prior to the season, the Teslin Tlingit Council (TTC) approved a management plan which would restrict fishing to weekends only and included a household limit. However, as the season progressed, TTC voluntarily curtailed all fishing for Chinook salmon with the exception of a small culture camp for youth. They experienced almost complete compliance by community members and reported a total of only 24 Chinook salmon harvested, representing a 94% reduction over their past 10 year average harvest.

In 2013, the Chinook salmon passage estimate at the Eagle sonar site was 30,725 fish. After subtracting the preliminary Eagle area Chinook salmon subsistence harvest of 152 fish, the resulting border passage estimate was 30,573 fish. Subsequently subtracting the preliminary Canadian harvest of 1,904 Chinook salmon, the estimate of mainstem Yukon River escapement was 28,669 fish, about 33% below the low end of the interim management escapement goal (IMEG) of 42,500–55,000 fish (Appendix D2). A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 38,000 fish. This was below the lower end of the precautionary preseason outlook range of 49,000 to 72,000 (JTC 2013) Chinook salmon. An implication of the 2013 Chinook salmon run reconstruction is that the IMEG could not have been met even if Chinook salmon harvest had been reduced to zero in both countries.

2013 Fall Chum Salmon Management, Harvest, and Escapement Summary in Alaska and Canada

The Alaska fall chum salmon plan incorporates Yukon River Salmon Agreement objectives for border passage of fall chum salmon and is intended to align management objectives with 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 threshold number of fall chum salmon needed to prosecute a commercial fishery is 500,000 fish and commercial fishing is generally allowed only on the surplus above that level.

In Alaska, summer chum, fall chum, and coho salmon runs were strong enough to support escapement, subsistence, and commercial fishing, but the fisheries were subject to restrictions to conserve Chinook salmon. Fall chum salmon harvests are not currently separated into major

stock groups by genetic analysis. The total U.S. commercial harvest of U.S. and Canadian fall chum salmon combined stocks was about 238,000 fish. The preliminary subsistence harvest estimate is about 103,000 fall chum salmon from U.S. and Canadian stocks combined.

The 2013 preseason outlook for the Canadian-origin fall chum salmon run to the upper Yukon River was an average to above average run of 226,000 to 288,000 fish. DFO used a decision matrix to manage Upper Yukon chum salmon fisheries and determined that a projection greater than 88,000 fish at the Eagle sonar site was required to meet the border escapement objective. The preseason outlook for the Porcupine River fall chum salmon run in 2013 was an average to above average run of 45,300 to 57,600 fish. Inseason information indicated that run strength would likely be sufficient to meet escapement. Information from the Porcupine sonar assessment program, in its third year of operation, suggested that the run was coming in lower than the preseason outlook, but in sufficient numbers to allow for a harvest of chum salmon by VGG citizens.

In Canada, the total 2013 commercial and domestic fall chum salmon harvest was about 3,400 fish. 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. In aboriginal fisheries, approximately 500 fall chum salmon were harvested on the mainstem upper Yukon River, and approximately 2,300 fall chum salmon were harvested in the Porcupine River near Old Crow.

The total drainagewide fall chum salmon run in the Yukon River was estimated to be about 1,211,000 fish. The drainagewide escapement estimate was approximately 866,000 fish, well above the upper end of the SEG of 300,000 to 600,000 fish. The preliminary spawning escapement estimate for the upper Yukon River basin, based on counts at the Eagle sonar project, is 200,262 fish.

The Fishing Branch River passage estimate for 2013 was 25,376 fall chum salmon, which fell within the escapement goal range of 22,000 to 49,000 fish. The preliminary run reconstruction estimate for the Porcupine River was approximately 53,000 fish, which was just above the preseason outlook. Note that this report does not contain management summary tables for upper Yukon River fall chum salmon, but the JTC plans to include them in the future.

PROJECTS CONTRIBUTING TO SALMON MANAGEMENT DECISIONS IN ALASKA AND CANADA

A suite of assessment projects extending from the Yukon River delta to headwater tributaries in the upper Yukon basin provides essential information which is used to assess run strength and timing and guide inseason fishery management decisions. Escapement counting and sampling projects also provide critical information on stock status and condition after fishing has occurred. Without these projects and programs to estimate run timing, abundance, stock apportionment, and escapement, fisheries managers would have no way to determine whether salmon runs were sufficient to support and sustain fisheries or to meet objectives of the Yukon River Salmon Agreement.

One of the largest and most important assessment programs is the sonar project near Pilot Station. The goal of the sonar project near Pilot Station is to estimate the daily upstream passage of Chinook, chum, and coho salmon. The project has been in operation since 1986, and many

refinements and enhancements to the project's sonar equipment and apportionment methodologies have been implemented over the years this project has operated. Both split-beam and dual frequency identification sonar (DIDSON) are currently used to estimate total fish passage. A test fishery is operated to estimate the species apportionment of the sonar counts. For Chinook salmon, contributions of U.S. and Canadian stocks are also estimated from DNA samples collected in the test fishery. DNA is also sampled in several other projects for mixed-stock analysis (MSA) of fisheries in the lower and middle Yukon River, in order to determine U.S. and Canadian components of harvests inseason and postseason. Other test fisheries are operated in the Yukon River delta and near Rampart Rapids, providing additional run timing information within the respective portions of the river. The sonar program near Eagle provides critical information on salmon passage into Canada. Chinook salmon counts from the Eagle sonar program have been accepted by the JTC as the basis for estimating total run size and escapement of the upper Yukon River (Canadian) stock since 2005.

In Canada, escapement projects operated on Blind Creek (Pelly River), Big Salmon, Teslin, and Porcupine Rivers, and at the Whitehorse fishway, provide escapement counts and in some cases, age, sex, and size information for specific upper Yukon River salmon stocks. Apportionment of Chinook salmon passage at the border into major upper Yukon River stock groups is also estimated using DNA samples collected at the Eagle sonar site.

2014 Outlooks and Escapement Goal Recommendations

For Chinook salmon, the preseason outlook range is 32,000 to 61,000 fish, suggesting that the 2014 Canadian-origin upper Yukon River Chinook salmon run may be a poor run. The summer chum salmon outlook indicates the run could provide for escapements, a normal subsistence harvest, and a surplus for commercial harvest. Similar to the last several years, actual commercial harvest of summer chum salmon in 2014 will likely be affected by conservation measures on a potentially poor Chinook salmon run. The drainagewide projection for fall chum salmon is 802,000 to 1,040,000 fish. With this expected run size, escapement goals would be met while supporting normal subsistence fishing activities, and potential commercial harvest levels of 300,000 to 540,000 fall chum salmon. The upper Yukon (Canadian) outlook range is 200,000 to 260,000 fall chum salmon, close to the average 1998–2013 run size of approximately 210,000 fish. The 2014 Porcupine River outlook range is 40,000 to 52,000 fall chum salmon.

Management strategies and plans for the 2014 season are being developed through many meetings and discussions with stakeholders throughout the Yukon River area. The purpose of these meetings is to work cooperatively to address the potentially poor Chinook salmon run, should it be similar to those in 2007–2013.

In 2010, the Panel 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 and 2013 by the Panel and DFO included it in the Integrated Fisheries Management Plan (IFMP) for the Yukon River Chinook salmon in Canada. In 2014, the JTC also recommends retaining this IMEG range, while acknowledging that the 2013 run size and 2014 outlook indicate the goal could be unachievable even in the absence of harvest.

For fall chum salmon, 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. For Fishing Branch River, the JTC recommends extending the IMEG range of 22,000 to 49,000 fall chum salmon for another 3 years (2014–2016).

The JTC is making progress toward development of a biological escapement goal recommendation for Chinook salmon. The first step in this effort is to review existing data and reconcile older data, collected using different gear or methods, with more recent information. At their February 2014 meeting, the JTC accepted a reconstructed Chinook salmon age composition estimate, which will be used in brood tables and spawner-recruit estimates. A total Canadian run reconstruction is in progress and will be reviewed again by the JTC in November 2014. Analysis of biologically based escapement goal ranges will then be possible. For fall chum salmon, certain data limitations have made it difficult to re-analyze spawner-recruit relationships and biologically based escapement goal ranges. The JTC escapement goal subcommittee will continue to examine other data that may be used in recommending a revised escapement goal for future years.

Appendix D2.–Yukon River Panel escapement goals and total allowable catch targets and estimated run size and spawning escapement for upper Yukon River Chinook salmon, 2001–2012.

Year	Yukon River Panel or Interim Management Escapement Goal (IMEG)[b]		Estimated upper Yukon Chinook run size[c]	Total allowable catch (TAC)		Estimated spawning escapement[d]
	from	to		from	to	
2001	18,000	28,000	75,583	47,583	57,583	52,559
2002	28,000	28,000	79,492	51,492	51,492	42,358
2003	25,000	28,000	117,212	89,212	92,212	80,591
2004	28,000	28,000	105,962	77,962	77,962	48,469
2005	28,000	28,000	87,058	59,058	59,058	67,985
2006	28,000		84,816		56,816	62,630
2007	33,000	43,000	70,480	27,480	37,480	34,904
2008	45,000		62,637		17,637	33,883
2009	45,000		87,682		42,682	65,278
2010	42,500	55,000	59,736	4,736	17,236	32,009
2011	42,500	55,000	72,013	17,013	29,513	46,307
2012	42,500	55,000	48,640	0	6,140	32,656
2013[a]	42,500	55,000	37,915	0	0	28,669

[a] Important note: 2013 estimates are preliminary.

[b] The IMEGs are not biologically based escapement goals.

[c] Fish wheel mark–recapture estimates were used for assessments in 2001–2007; Eagle sonar counts have been used since 2008 through 2013 and continuing.

[d] Gray shaded boxes indicate years when escapement goal was not achieved.

Appendix D3.–Summary of Chinook salmon harvests (Canadian origin fish) and conservation measures implemented in the U.S., 2001–2013.

Year	US Allowable Catch		US harvest [b]	US exploitation rate	US average harvest 2001-2007	Management Actions (Commercial)	Management Actions (Subsistence)
	74%	80%					
2001	35,211	46,066	23,325	0.31	44,586	Chinook commercial fishing shifted to midpoint of run and later	Subsistence fishing schedule implemented (and continued in following years)
2002	38,104	41,194	30,058	0.38		Chinook commercial fishing shifted to midpoint of run and later	
2003	66,017	73,770	59,939	0.51		Chinook commercial fishing shifted to midpoint of run and later	
2004	57,692	62,370	57,832	0.55		Chinook commercial fishing shifted to midpoint of run and later	
2005	43,703	47,246	44,650	0.51	Percent reduction in harvest from 2001-2007 avg	Chinook commercial fishing shifted to midpoint of run and later	
2006	42,044	45,453	48,097	0.57			
2007	20,335	29,984	48,201	0.68			
2008	13,051	14,110	25,328	0.40	43.2%	Chinook commercial fishing closed	Protection on 2nd and 3rd pulses
2009	31,585	34,146	17,646	0.20	60.4%	Chinook commercial fishing closed and no sale of incidental catch; summer chum fishing delayed.	1st and 2nd pulse closure
2010	3,505	13,789	25,271	0.42	43.3%	Chinook commercial fishing closed; summer chum fishing delayed	
2011	12,590	23,610	20,823	0.29	53.3%	Chinook commercial fishing closed and no sale of incidental catch; summer chum fishing delayed; summer chum fishing restricted to certain areas of low Chinook abundance.	1st and 2nd pulse closure; additional fishing time reductions in upper districts; 7.5" mesh size restriction all season
2012	4,544	4,912	13,841	0.28	69.0%	Chinook commercial fishing closed and no sale of incidental catch; summer chum fishing delayed and restricted to areas of low Chinook abundance; chum fish wheels attended at all times and Chinook released alive.	1st and 2nd pulse closure; additional fishing time reductions in upper districts; 6" mesh size restriction after closures
2013[a]	0	0	7,262	0.19	83.7%	Chinook commercial fishing closed and no sale of incidental catch. Summer chum fishing with beach seines and dipnets, all Chinook released alive. Gillnet summer chum fishing restricted to 5.5" and 30 meshes; delayed and restricted to areas of low Chinook abundance; chum fish wheels attended at all times and Chinook released alive.	1st, 2nd and 3rd pulse closures - limited opportunity in between pulses; additional fishing time reductions in upper districts; 6" mesh size restriction all season

[a] Important note: 2013 estimates are preliminary.

[b] Gray shaded boxes indicate years when allowable harvest range was exceeded.

Appendix D4.–Summary of Chinook salmon harvests and conservation measures implemented in Canada, 2001–2013.

Year	CDN Allowable Catch 20% from	26% to	CDN harvest[b]	2001-2007 average harvest[b]	Management Actions by Canada (Commercial, Domestic, recreational)	Management Actions by Canada (Subsistence)
2001	9,517	14,972	9,774	9,109	Test fishery implemented in early season; commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2002	10,298	13,388	9,070		Test fishery implemented in early season; commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2003	17,842	23,975	9,446		Test fishery implemented in early season; commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2004	15,592	20,270	10,946		Test fishery implemented in early season; commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2005	11,812	15,355	10,977		Commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2006	11,363	14,772	8,758	Percent reduction in harvest from 2001-2007 avg	Commercial/domestic openings determined by weekly estimates of abundance, recreational open	Unrestricted
2007	5,496	9,745	4,794		Chinook commercial/domestic fishing closed; varied to non-retention in the recreational fishery, angling closure at Tatchun River	Unrestricted
2008	3,527	4,586	3,399	62.7%	Chinook commercial/domestic fishing closed; varied to non-retention in the recreational fishery, angling closure at Tatchun River	Voluntary reduction in harvest
2009	8,536	11,097	4,297	52.8%	Commercial/domestic openings determined by weekly estimates of abundance, recreational open	Voluntary reduction in harvest in early season
2010	947	4,481	2,456	73.0%	Chinook commercial/domestic fishing closed; varied to non-retention in the recreational fishery.	Voluntary reduction in harvest
2011	3,403	7,673	4,594	49.6%	Chinook commercial/domestic fishing closed; recreational fishing varied to non-retention in the recreational fishery, angling closure at Tatchun River, recreational restrictions lifted late in the season	Voluntary reduction in harvest in early season
2012	1,228	1,596	2,000	78.0%	Chinook commercial/domestic fishing closed; varied to non-retention in the recreational fishery, angling closure at Tatchun River	Voluntary reduction in harvest
2013a	0	0	1,904	79.1%	Chinook commercial/domestic fishing closed; varied to non-retention in the recreational fishery, angling closure at Tatchun River and Teslin River	Voluntary reduction in harvest

[a] Important note: 2013 estimates are preliminary.

[b] Light gray shaded boxes indicate years when allowable harvest range was exceeded.