YUKON RIVER SALMON 2010 SEASON SUMMARY AND 2011 SEASON OUTLOOK

Prepared by

THE UNITED STATES AND CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

March 2011
Regional Information Report No. 3A11-01
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 2006 to meet the Division of Commercial Fisheries regional need for publishing and archiving information such as project operational plans, area management plans, budgetary information, staff comments and opinions to 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.sf.adfg.ak.us/statewide/divreprots/htlm/intersearch.cfm.

This document should be cited as:

JTC (Joint Technical Committee of the Yukon River US/Canada Panel). 2011. Yukon River salmon 2010 season summary and 2011 season outlook. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A11-01, Anchorage.

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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 and preseason outlooks, and results of cooperative research projects. The report summarizes the status of salmon stocks (Chinook, coho, summer and fall chum salmon) in 2010 with reference to historical data, presents an outlook for the 2011 season, and provides data on the utilization of salmon species by commercial, subsistence, aboriginal, personal use, domestic and sport/recreational fisheries. The report further compiles summaries of Yukon River projects (e.g., mark–recapture, sonar, stock identification) and a review of salmon bycatch in the groundfish and pollock fisheries of the Bering Sea and the Gulf of Alaska. Recommended Yukon River escapement goals for Chinook, chum and coho salmon remained unchanged from 2010.

Keywords: Yukon watershed, Yukon River Salmon Agreement, Chinook salmon, chum salmon, coho salmon, escapement, season outlook.

2.0 INTRODUCTION

The United States 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 8–10, 2010 at the Canadian Department of Fisheries and Oceans (DFO) Board Room in Whitehorse, Yukon Territory. Topics discussed included: the 2010 season summary (Bonnie Borba, Jeff Estensen, Steve Hayes, Katie Howard, Trix Tanner); an environmental conditions summary (Sean Collins); a marine update that included Bering Sea and Aleutian Islands (BSAI) salmon bycatch and the Bering-Aleutian Salmon International Survey (BASIS) studies (Jim Murphy); a review of the conceptual proposals for the Restoration and Enhancement Fund (R&E) which was initially conducted by the R&E sub-committee; a summary of new research done at Pilot Station including testing the side-scan sonar for fish detection and preliminary acoustic tag work to determine the detection range at the site (Carl Pfisterer); a summary of the *Ichthyophonus* sampling activities in 2010 by Lara Dehn; a brief discussion on the status of the Upper Yukon Chinook and the Upper Yukon and Fishing Branch fall chum salmon escapement goals and what analysis is needed prior to the spring discussion. The write-up of previous work involving historical run reconstructions of Upper Yukon Chinook salmon and subsequent stock-recruitment analyses is ongoing. Although DFO's effort examining habitat-based escapement goals has stalled, the Alaska Department of Fish and Game (ADF&G) is reexamining the historical Chinook border passage estimates using Bayesian techniques that should incorporate more data while also providing error bounds on the estimates. A Salmon Size subcommittee was formed and tasked with developing a study plan for identifying the impacts of the upcoming mesh size restrictions going into place in the 2011 season.

The spring JTC meeting was held February 22-24, 2011 at Pikes Waterfront Lodge in Fairbanks, Alaska. The 2011 preseason outlooks for system-wide and/or Canadian-origin stocks were summarized for Chinook salmon (Katie Howard and Trix Tanner), fall chum salmon (Bonnie Borba and Trix Tanner) and coho salmon (Bonnie Borba). Steve Hayes outlined the current plan for Alaskan preseason meetings. Jim Murphy gave an update on the BSAI and GOA salmon bycatch. The JTC had a short round table discussion where each member gave a brief update on their organization's project plans for the upcoming season. As a group, the JTC discussed escapement goal recommendations for the upcoming season. Following a presentation by Katie Howard that summarized the current Chinook salmon data, the JTC reached consensus that since

there is no new data or analysis to support changing the goal, the group recommended maintaining the current range of 42,500 to 55,000 Chinook salmon as the escapement goal. It was recognized that this range is consistent with escapement that maximizes return based on the best available data. The discussion on fall chum salmon escapement goals yielded similar results; the new data does not change the spawner-recruit model sufficiently to warrant a change to either goal. The JTC recommended maintaining the current range of 70,000 to 104,000 fall chum salmon to the upper Yukon and 22,000 to 49,000 for the Fishing Branch. For the Fishing Branch, the JTC further recommended keeping this goal for a period of 3 years, at which point it should be reevaluated. Due to a concern about a lack of sampling for *Ichthyophonus* for the upcoming season, the *Ichthyophonus* subcommittee was tasked with determining the sampling that would be necessary for the upcoming year, the cost, and entities that would undertake the sampling. The subcommittee was to report to the co-chairs within a week and a half so that they could explore funding options. The Salmon Size subcommittee reported the results of their discussions to the entire JTC. They concluded that it would take multiple years before any change could be observed that could be attributed to the net size restriction. Detecting a change will not be easy, fast, or maybe even conclusive. The best projects to monitor will be weirs and carcass surveys (such as Chena and Salcha). Katie Howard and Elizabeth MacDonald reported on the deliberations by the R&E subcommittee and presented an overview of preliminary recommendations regarding the detailed project proposals and these were discussed by the JTC as a whole. The meeting concluded with a discussion of research priorities, a status update on the 2011 JTC report and the development of the list of presentations to be given at the upcoming Panel meeting to be held March 21-March 25.

Meeting participants and affiliations:

Meeting Attended:

* Fall only
# Spring only

Fisheries and Oceans Canada (DFO)

Steve Smith (JTC Co-Chair)	Mary Ellen Jarvis*
Sean Collins	Bonnie Huebschwerlen
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Tanana Chiefs Conference (TCC)

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Bering Sea Fishermen's Association (BSFA)

Chris Stark

Yukon River Drainage Fisheries Association (YRDFA)

Shelley Woods

3.0 COMMERCIAL FISHERY–ALASKA

3.1 CHINOOK AND SUMMER CHUM SALMON

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

3.1.1 Chinook Salmon

The drainagewide 2010 run size was projected to be between 155,600 and 226,200 Chinook salmon. Due to poor production since 2007, the upper end of this range was deemed unlikely and Alaskan fishery management was based on the lower end of this preseason projection. Thus, the 2010 Yukon River Chinook salmon run size was expected to be below average to average.

Before the 2010 season, ADF&G developed a preseason management strategy with input from United States Fish and Wildlife Service (USFWS), fishermen, tribal council representatives, and other stakeholders to prepare for the event of a low run. ADF&G and USFWS staff distributed the inseason management approaches as the 2010 Yukon River Salmon Fisheries informational flyer. The resulting preseason strategy was to enter the 2010 season with the prospect that subsistence conservation measures, much less severe than those used in 2009, may be necessary to share the available subsistence harvest and meet escapement goals. Conservation measures, if required, were to include promoting voluntary reductions, such as encouraging a shift in harvest to other species, spreading harvest out over the duration of the run, reductions in extended sharing, and keeping fish harvested within the village or local area.

It was unlikely that there would be a directed Chinook salmon commercial fishery in 2010 on the mainstem Yukon River. However, because the Tanana River is managed independently as a terminal fishery, there could have been opportunity to commercially harvest less than 1,000 Chinook salmon.

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

Inseason run strength assessment of Chinook and summer chum salmon was based on the lower river test fisheries at Emmonak/Middle Mouth and Mountain Village, the Pilot Station sonar, and subsistence fishermen catch reports. In addition, genetic samples collected in the lower river test fisheries and at Pilot Station sonar were analyzed inseason to determine stock contribution and to project abundance of the Canadian Chinook salmon stocks.

The summer season began with a near average ice breakup in the lower river. However, shorefast sea ice lingering outside the mouth of the river contributed to the late migration of Chinook salmon. The first pulse of Chinook salmon was observed at the Lower Yukon Test Fishery (LYTF) project on June 16–21, a second pulse on June 23–25, and a third on June 27–28 (Figure 2). The first quarter point, midpoint, and third quarter point were June 19 (4 days late), June 25 (5 days late), and July 1 (4 days late), respectively. The LYTF finished with a cumulative CPUE of 18.67, approximately 15% below the historical average. The preliminary Pilot Station sonar estimate was approximately 113,410 Chinook salmon as compared to the 1995–2009 average passage of 142,200 fish. The first quarter point, midpoint, and third quarter point were on June 22, June 26, and June 30 respectively.

Through the month of June, the Chinook salmon run was assessed to be large enough to provide for escapement and subsistence uses based on the preseason outlook and late run timing. Most subsistence salmon fishermen delayed their fishing effort due to gas prices and low fish abundance early in the season. The regulatory "windowed" subsistence salmon fishing schedule was initiated on June 7 in District 1 and was implemented chronologically upriver as the run progressed upstream. Persistent wet and cold weather conditions around the Yukon Delta led many subsistence fishermen to abstain from harvesting the first pulse of Chinook salmon due to the poor processing conditions. Throughout the drainage there were episodes of high water with heavy debris loads which preempted subsistence fishing.

In Subdistrict 5-D, when it became evident that the Chinook salmon run would fall short of the U.S./Canada Yukon Treaty obligation, fishermen were asked to consider conservation measures such as voluntary harvest reductions, shifting harvest to other species, spreading harvest over the duration of the run, reducing extended sharing, and keeping fish within the village or local area they were harvested. It was understood that fishing had been difficult this year due to water conditions and high fuel costs. Imposing fishing restriction at the time would have increased hardships. The intent of the management strategy was to provide fishermen the flexibility within their localized fishing conditions to effectively conserve Chinook salmon where they could.

No directed Chinook salmon commercial fishery occurred in 2010. However, based on the projected run estimate for summer chum salmon, the ADF&G initiated short chum salmon directed commercial periods in the lower river districts beginning in District 1 on June 28. Fishing gear was restricted to 6-inch maximum mesh size. Additionally, the ADF&G attempted to schedule these chum salmon-directed commercial periods when Chinook salmon abundance was low. A total of 9,897 Chinook salmon were incidentally harvested in Districts 1 and 2 combined. The Yukon Area total commercial harvest was 64% below the 2000–2009 average harvest of 27,298 fish (Appendix B2).

The actual 2010 Chinook salmon run was much weaker than the preseason projection and early inseason assessment projects indicated. Preliminary Chinook salmon passage at Eagle sonar was 35,074 fish, yielding a border passage of approximately 34,500 fish (Appendix B16). This was below the 42,500–55,000 escapement goal and did not provide for the Canadian harvest share.

3.1.2 Summer Chum Salmon

The strength of the summer chum salmon run in 2010 was dependent on production from the 2006 (age-4 fish) and 2005 (age-5 fish) escapements, as these age classes dominate the run. The total run during 2005 and 2006 was approximately 2.6 and 4.0 million summer chum salmon, respectively, though tributary escapements were highly variable.

Yukon River summer chum salmon generally exhibit strong run size correlations among adjacent years, and it was expected that the total run in the Yukon River would be similar to the 2009 run of approximately 1.3 million fish. The high seas Bering Arctic Subarctic Integrated Surveys (BASIS) study indicated a decline in chum salmon in 2004 and 2005, but 2006 and 2007 results showed an increase. Juvenile chum salmon collected in the BASIS study in 2006 and 2007 would correspond to dominant age class returns (age-5 and 4, respectively) in 2010.

The 2010 summer chum salmon run was anticipated to provide for escapements, support 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 7 years (2003–2009). If inseason indicators of run strength developed as anticipated, the commercially harvestable surplus in Alaska was expected to range from 250,000 to 500,000 summer chum salmon. The actual commercial harvest of summer chum salmon in 2010 was expected to be affected by a poor Chinook salmon run, as Chinook salmon are incidentally harvested in chum salmon-directed fisheries.

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 provides for escapement needs and subsistence use priority before other consumptive uses such as commercial, sport, and personal use fishing. The plan allows for varying levels of harvest opportunity depending on the run size projection. ADF&G uses the best available data to assess the run including: preseason run outlooks, Pilot Station sonar passage estimate, test fishing indices, age and sex composition, subsistence and commercial harvest reports, and information from escapement monitoring projects.

The summer chum salmon run passage at the Pilot Station sonar project was approximately 1.33 million fish (Appendix A2). The first quarter point, midpoint, and third quarter point were on June 23, June 28, and July 1, respectively.

Summer chum salmon management decisions were delayed until the third quarter point of the Chinook salmon run at LYTF. At this point, the summer chum salmon run was peaking and a total run size of 1.4 million fish was projected.

The total commercial harvest for Districts 1, 2, 6, and Subdistrict 4-A combined was 232,888 summer chum salmon, which is 195% above the 2000-2009 average harvest of 78,924 fish (Appendix B3).

3.1.3 Harvest and Value

A total of 450 permit holders participated in the summer chum salmon commercial fishery, which was approximately 17% below the 2000–2009 average of 545 permit holders (Appendix A4). The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 440 permit holders fished in the Lower Yukon Area in 2010, which was approximately 16% below the 2000–2009

average of 526. In the Upper Yukon Area, 10 permit holders fished, which was approximately 45% below the 2000–2009 average of 18.

Yukon River fishermen in Alaska received an estimated $1.5 million for their Chinook and summer chum salmon harvest in 2010, approximately 16% below the 2000–2009 average of $1.8 million (Appendix A5). Two buyer-processors operated in the Lower Yukon Area. Lower Yukon River fishermen received an estimated average of $5.00 per pound for incidentally harvested Chinook salmon and $0.70 per pound for summer chum salmon. The average income for Lower Yukon Area fishermen in 2010 was $3,325. Two buyer-processors operated in the Upper Yukon Area. Upper Yukon Area fishermen received an estimated average of $0.23 per pound for summer chum salmon. No Chinook salmon were sold in the Upper Yukon Area. The average income for Upper Yukon Area fishermen that participated in the 2010 fishery was $5,594.

3.1.4 Results by District

3.1.4.1 Districts 1–3

No directed Chinook salmon commercial fishery occurred in 2010. However, based on the projected average run estimate for summer chum salmon, ADF&G initiated short summer chum salmon directed commercial periods restricted to 6-inch maximum mesh size in the lower river districts. A short commercial fishing period was announced for June 26 in District 1 to assess the chum to Chinook salmon catch ratio. At this late point in the Chinook salmon run, it was expected that incidental harvest would be low and any Chinook salmon caught would be small and bound for lower river tributaries. However, test fishery information showed an abrupt drop in summer chum salmon entering the river. ADF&G took an unprecedented action, with cooperation of the primary fish buyer, to cancel the commercial period on short notice to avoid harvesting Chinook salmon. The commercial period was delayed until June 28, which landed a catch of 2,109 Chinook and 30,295 chum salmon. Commercial fishing was again delayed until July 1 after which a more regular schedule was resumed in Districts 1 and 2.

ADF&G scheduled fifteen summer chum salmon directed commercial fishing periods in Districts 1 and 2. The preliminary cumulative commercial harvest was 183,215 summer chum salmon.

A total of 5,744 Chinook salmon were incidentally harvested in District 1 and 4,153 in District 2. The combined total harvest of all openings in Districts 1 and 2 was 9,897 Chinook salmon. No Chinook salmon were sold in the fall season.

Chinook salmon age composition from the District 1 restricted (6 inch or smaller mesh size) commercial harvest (n=890) was <1% age-3, 36% age-4, 47% age-5, 16% age-6, and less than 1% age-7 fish and females comprised 30%.

Chinook salmon age composition from the District 2 restricted (6 inch or smaller mesh size) commercial harvest (n=474) was <1% age-3, 31% age-4, 52% age-5, 16% age-6, 1% age-7 fish and females comprised 34%.

Summer chum salmon age composition from the District 1 restricted (6 inch or smaller mesh size) commercial harvest (n=1,259) was 4% age-3, 67% age-4, 28% age-5, and 1% age-6 fish and females comprised 42%.

Summer chum salmon age composition from the District 2 restricted (6 inch or smaller mesh) commercial harvest (n=625) was 5% age-3, 71% age-4, 23% age-5, and 1% age-6 fish and females comprised 42%.

3.1.4.2 Districts 4–6

Limited salmon markets resulted in lower effort and subsequently lower harvest rates in District 4. The Anvik River had an escapement of approximately 394,604 summer chum salmon. The projection required to allow an inriver commercial fishery was 500,000 fish, and the Anvik River Management Area remained closed to commercial fishing in 2010.

A market for summer chum salmon existed in Subdistrict 4-A. Management of the summer chum salmon commercial fishery was dependent on the available surplus, fishing effort, and buyer input. Based on contacts preseason with potential buyers in Subdistrict 4-A, directed commercial fishing for summer chum salmon began July 7 and was concurrent with subsistence salmon fishing periods. During concurrent subsistence and commercial openings, Chinook salmon were kept for subsistence use or released alive.

Because of low effort during the first four 12-hour commercial fishing periods in Subdistrict 4-A, commercial fishing was allowed to continue for 21 days until the end of the summer fishing season. Thus ADF&G scheduled 8 commercial fishing periods in Subdistrict 4-A resulting in a preliminary cumulative harvest of 44,207 summer chum salmon (Appendix A3).

In the Subdistrict 4-A summer chum salmon commercial harvest, 636 fish were aged. The summer chum salmon age composition was 22.9% age-3, 70.2% age-4, and 6.9% age-5 and females comprised 60.7%.

There were no buyers interested in purchasing salmon from Subdistricts 4-B and 4-C. Additionally, no commercial fishing periods were announced for District 5 in an effort to pass adequate numbers of Canadian-origin Chinook salmon to the spawning grounds.

District 6 was managed using inseason assessment information from projects operated in the Tanana River drainage. Information from the Nenana test fish wheel and escapement estimates from the Chena and Salcha Rivers' counting tower were used as indicators of run strength and timing. By July 24, a harvestable surplus of summer chum salmon was identified. Based on the available surplus and market interest, ADF&G scheduled the first commercial fishing period in District 6 on July 19 to target chum salmon. ADF&G scheduled 7 total commercial fishing periods and the preliminary cumulative harvest was 5,466 summer chum salmon (Appendix A3). Approximately 162 Chinook salmon were reported as caught but not sold during commercial periods in District 6.

In the District 6 summer chum salmon commercial harvest, 589 fish were aged. The summer chum salmon age composition was 25.7% age-3, 66.2% age-4, and 8.1% age-5 and females comprised 50.6%.

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. Both the fall chum and coho salmon management plans were modified at the 2010 Alaska Board of Fisheries Arctic-Yukon-Kuskokwim finfish meeting. The threshold number of fall chum salmon needed to prosecute a commercial fishery was decreased from 600,000 to 500,000 fish in the fall chum salmon management plan. Modifications to the coho salmon plan

included decreasing the threshold number of fall chum salmon needed to prosecute a directed coho salmon commercial fishery from 550,000 to 500,000 fish. Also, the plan now 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.

The fall chum salmon plan incorporates U.S./Canada treaty obligations 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 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 (Appendix A6). Commercial fishing is generally allowed only on the surplus above 500,000 fall chum salmon. The pulsed entry pattern of fall chum salmon and the run size disparity between fall chum salmon with overlapping coho salmon runs adds complexity to the management of the Yukon River fall season.

3.2.1 Fall Chum Salmon Management Overview

The 2010 preseason projection was for a run size of 552,000 to 828,000 fall chum salmon. There was a considerable amount of uncertainty associated with this projection because of unexpected run failures from 1998 to 2002 that were followed by a high productivity from 2003 through 2007. Weak salmon runs prior to 2003 are generally attributed to decreased productivity in the marine environment, not to low levels of parental escapement. Similarly, increases in productivity from 2005 through 2007 may be attributed to an improved marine environment. Projections have been adjusted to reflect recent trends in production. Yukon River fall chum salmon return primarily as age-4 and age-5 old fish. The 2010 fall chum salmon run was produced from the parent years 2004 to 2007. Estimates of returns per spawner, based on brood year return, were used to estimate production from 2004 and 2005. An auto-regressive Ricker spawner-recruit model was used to predict returns from 2006 and 2007. The 2010 point projection applied the 1984 to current complete brood year returns to the odd/even maturity schedule because current production has declined from the pre-1984 level. The result was an estimate of 690,000 fall chum salmon. The 80% confidence bounds around the point estimate were calculated using deviation of point estimates and observed returns from 1987 through 2009. The projection was refined to 600,000 fish based on the 2010 summer chum salmon return and the summer chum/fall chum salmon historical relationship. That level of abundance was anticipated to be adequate to meet escapement goals while supporting normal subsistence fishing activities.

Management decisions made early in the fall season were based primarily on the adjusted preseason fall chum salmon outlook. As the fall chum salmon run progressed, management decisions started incorporating relative abundance and run timing information from Pilot Station sonar and the drift gillnet test fisheries located at Emmonak (operated by ADF&G and cooperators) and Mountain Village (operated by Asacarsarmiut Traditional Council). Pilot Station sonar provided the daily fall chum salmon passage estimates used to derive inseason run size projections. These projections triggered management actions in accordance with the fall chum salmon management plan. Relationships in run timing and run strength from the drift gillnet test fisheries, as well as subsistence fishing reports, were compared inseason for

consistency with the Pilot Station sonar estimates as a method to check that all projects were operating correctly. In 2010, fall chum salmon run timing past Pilot Station sonar correlated well with other assessment projects in the Lower Yukon Area, but less well for relative magnitude, particularly during the third pulse (Figure 3). Finally, individual pulses were tracked as they moved upriver and information from Pilot Station sonar was used to estimate the abundance of each pulse.

The fall season began by regulation on July 16 with subsistence fishing on the pre-2001 schedule: Districts 1–3, and Subdistrict 5-D were open 7 days a week, 24 hours a day, while District 4 and Subdistricts 5-A, 5-B, and 5-C were on a 5 days a week schedule. Subsistence fishing efforts in Districts 4 and 5 were hindered by high water level and debris early in the fall season. To mitigate poor fishing conditions, ADF&G liberalized the subsistence fishing schedule in Districts 4 and Subdistricts 5-A, 5-B, and 5-C to 7 days a week, 24 hours a day schedule to provide more fishing opportunity.

Around mid-August, the historical midpoint of the run past Pilot Station sonar, fall chum salmon management relied primarily on information from inseason assessment projects. At that point, two pulses of fall chum salmon (Figure 4) had passed Pilot Station sonar and assessment indicated a weaker than anticipated run, with projections less than 400,000 fish. At that abundance level, based on the fall chum salmon management plan (Appendix A6), commercial fishing was not allowed, and restrictions to subsistence fishing were possible. ADF&G placed the main river districts (excluding Subdistrict 5-D) on the regulatory windowed schedule of two 36-hour periods per week in Districts 1 through 3, and two 48-hour periods per week in Districts 4 and Subdistricts 5-A, 5-B, and 5-C. The third and largest of 4 pulses of fall chum salmon passed Pilot Station sonar on August 16. Inseason projections continued to show fall chum salmon abundance to be less than 400,000 fish. In addition, ADF&G began to have concerns about fall chum salmon passage at the Canadian border meeting the goal of 80,000 fall chum salmon (70,000 for escapement, plus harvest share). In response, ADF&G implemented subsistence restrictions by cancelling one subsistence fishing period in the main river districts (no restrictions were imposed in Subdistricts 5-A and 5-D). It became apparent in early September, based on passage information from the Eagle sonar project that the Canadian border passage goal was going to be met. As a result, no subsistence fishing restrictions were imposed in Subdistrict 5-D and the subsistence fishing schedules in the main river districts were liberalized. The last, and smallest of the 4 fall chum salmon pulses, passed Pilot Station sonar on August 31. There were two late season coho salmon directed commercial periods in District 1, one period in District 2, and 3 salmon directed commercial periods in District 6.

Subsistence and personal use fishing in District 6 were open for two 42-hour per week fishing periods throughout the season, and were open concurrent with the late season commercial fishing periods. By October 1, in accordance with the management plans at the close of the commercial fishing season, personal use periods in District 6-C remained on the two 42-hour fishing periods per week while subsistence fishing in Subdistricts 6-A and 6-B was relaxed to 7 days a week.

3.2.2 Coho Salmon Management Overview

The coho salmon outlook for 2010 was for an average run based on a slightly below average parent year escapement and the assumption of average survival to spawning. The coho salmon run is managed to provide for escapement needs, subsistence, personal use, and commercial harvests. The 2010 coho salmon run was late, had 3 pulses past Pilot Station sonar, with the last

and largest pulse occurring on August 30 (Figure 5). The cumulative passage estimate of 142,000 coho salmon past Pilot Station sonar in 2010 was below the historical average of 147,000 (Appendices A2 and B15).

3.2.3 Harvest and Value

A limited late season coho salmon directed commercial fishery was prosecuted in Districts 1 and 2 and salmon directed commercial fishery was prosecuted in District 6. There were two commercial periods in District 1, one period in District 2, and 3 periods in District 6. A total of 2,550 fall chum salmon were harvested commercially in the Alaskan portion of the drainage: 815 in the Lower Yukon Area and 1,735 in the Upper Yukon Area (Appendix A3). A total of 3,750 coho salmon were harvested in the Alaskan portion of the drainage: 2,050 in the Lower Yukon Area and 1,700 in the Upper Yukon Area. Commercial harvests for both species were below their respective 5 and 10-year averages, and among the lowest on record (Appendices B4 and B5). All salmon were sold in the round and no salmon roe was sold separately. In District 6, male salmon were selectively purchased.

A total of 94 individual permit holders participated in the 2010 fall chum and coho salmon fishery; 90 for Districts 1 and 2 combined, 4 in District 6 (Appendix A4). Overall, fishing effort in 2010 was below the 2003 to 2009 averages.

The average price per pound for fall chum salmon paid to fishermen in the Lower Yukon Area was $1.00 which was above the most recent 10-year average of $0.35/lb. Fishermen in the Upper Yukon Area were paid $0.23/lb for fall chum salmon which was above the most recent 10-year average of $0.16/lb. The average price for coho salmon in the lower river was $1.50/lb, while fishermen received $0.26/lb in the upper river. The exvessel value for the total harvest was $29,166: $8,189 for fall chum salmon and $20,977 for coho salmon (Appendix A5). All exvessel values were below their respective 10-year averages.

4.0 COMMERCIAL FISHERY–CANADA

4.1 CHINOOK SALMON

The commercial fishery was closed throughout the 2010 Chinook salmon season. The boundaries of the commercial fishing areas within the Yukon Territory are presented in Figure 6. The inseason Chinook salmon run status indicated that there would not be a sufficient run to support a commercial fishery. The average commercial Chinook salmon catch for the 2000–2009 period was 2,183 fish. Since 1997, there has been a marked decrease in commercial catch of Upper Yukon River[1] Chinook salmon, resulting from a limited market as well as reduced fishing opportunities in some years due to below average run sizes.

Canadian Upper Yukon River commercial harvests for the 1961 to 2010 period are presented in Appendix B7. In 2010, sixteen of 21 eligible commercial fishing licenses were issued. Eighteen commercial licenses were issued in 2008 and 2009, 17 in 2007, 20 in 2005 and 2006, and 21 in 2003 and 2004.

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

The total run of Upper Yukon River Chinook salmon in 2010 was expected to be below average to average. The preseason outlook range was 78,000 to 113,000 Chinook salmon, which included an adjustment to reflect a recent trend where actual runs were lower than the preseason outlooks.

4.1.1 Upper Yukon Chinook Salmon Escapement Goal

Upper Yukon Chinook salmon are managed under the umbrella of the Yukon River Salmon Agreement (YRSA). The Yukon River Panel adopted the Interim Management Escapement Goal (IMEG) range of 42,500–55,000 Upper Yukon Chinook salmon in 2010. This goal was adopted by DFO and included in the 2010 Integrated Fisheries Management Plan (IFMP) for Yukon River Chinook salmon in Canada. This is the first year that this IMEG has been used. In 2010, the success of achieving this goal, was to be assessed using the Eagle sonar estimate minus catches from fisheries occurring upstream of the sonar, namely U.S. subsistence catch near the community of Eagle, Alaska and the catch data from Canadian fisheries.

4.1.2 Upper Yukon Chinook Salmon Inseason Decision Matrix

Canadian fishing opportunities in 2010 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 IFMP. The decision matrix provided detailed guidance for the management of fisheries linked to specific inseason run abundance levels. The 2010 decision matrix summarized the management reference points, general allocation plans, and anticipated management responses under different run size scenarios (Table 1).

It is important to note that the incorporation of an escapement goal range of 42,500–55,000 in 2010 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 <51,000. A border escapement of this magnitude was sufficient to allow for an unrestricted First Nation fishery;
ii. Consideration would be given to restricting First Nation fisheries if the run size to the border was in the 30,000 to 51,000 range. All other fisheries would not be permitted to target Chinook salmon; and
iii. Closures in First Nation fisheries would be expected if the run projection was <30,000.

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

Table 1.–2010 Inseason fishery management decision matrix for Upper Yukon Chinook salmon.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	0–30,000	TF	0	Not required. Assessment using Eagle Sonar.
		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	TF	0	
		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	TF	0	Not required. Assessment data collected through Eagle Sonar.
		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	
Legend: TF = test fishery; FN = First Nation fishery; CF = commercial fishery; RF = recreational fishery; DF = domestic fishery.				

In recent years, the opening of the commercial fishery has frequently been delayed in response to conservation concerns and/or uncertainties concerning the status of the run. Assessment of the 2010 Chinook salmon run was based on information from the Eagle sonar program. The final year the DFO mark–recapture program was implemented was 2008.

4.1.3 Upper Yukon Chinook Salmon Decisions and Management

Early in the 2010 season, information from the U.S. test fishery at Emmonak and the Pilot Station sonar program on the lower Yukon River suggested that the 2010 Upper Yukon Chinook salmon run would be lower or at the low end of the adjusted preseason outlook range (78,000 to 113,000 Chinook salmon). Because the run was late entering the river, the early season run size projections, which are very sensitive to the run timing information used, were very uncertain. By the beginning of July, Pilot Station numbers indicated that the preseason forecast had been optimistic. Further upriver, as the run was migrating into Canada, border escapement run 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 average subsistence Alaskan harvest. Border escapement run projections are expanded based on what is 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 scenarios.

In 2010, the inseason Chinook salmon run projections remained primarily at the low end of the Yellow Zone, and at times dipped into the Red Zone. This prompted regular teleconferences with First Nation mangers to update them on run projections. Projections were well below the decision

threshold that would have triggered a commercial fishery; consequently, the Chinook salmon commercial fishery was closed throughout the 2010 season.

4.2 FALL CHUM AND COHO SALMON

Late run timing resulted in limited opportunities for commercial fishery openings during the fall chum salmon season. Only 2186 fall chum salmon were harvested during 4 commercial fishery openings (Appendix A7). Since 1997, there has been a marked decrease in commercial catches of Upper Yukon River fall chum salmon that have resulted from a limited market as well as reduced fishing opportunities in some years due to below average run sizes.

Upper Yukon River commercial fall salmon harvests for the 1961 to 2010 period are presented in Appendix B8. 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.

The preseason outlook for the Upper Yukon fall chum salmon run in 2010 was a run of 137,000 to 207,000 fish. A run near the lower end of this range would constitute a below average run, whereas, a run near the upper end of this range would constitute an above average run.

4.2.1 Upper Yukon Fall Chum Salmon

4.2.1.1 Escapement Goal

Similar to Chinook salmon, Upper Yukon fall chum salmon are also managed according to provisions of the YRSA. The Yukon River Panel meets annually to recommend the Upper Yukon fall chum salmon escapement goal. Since the brood year escapements achieved the level defined in the YRSA for a rebuilt Upper Yukon fall chum salmon stock, the Yukon River Panel maintained the longstanding escapement goal of >80,000 fall chum salmon for 2006 to 2009. For 2010, the Yukon River Panel adopted an escapement goal range of 70,000 to 104,000 fall chum salmon. (Appendix A20). The range was established to offer more flexibility with respect to uncertainties associated with management. Spawning escapement was to be measured using Eagle sonar estimates minus catch data from U.S. and Canadian fisheries occurring upstream of the sonar location.

4.2.1.2 Inseason Decision Matrix

The decision matrix adopted by DFO for the management of Upper Yukon chum salmon and included in the 2010 IFMP, provides detailed guidance for specific inseason decisions. The 2010 matrix (Table 2) takes into account the changeover from the mark–recapture program to the use of the Eagle Sonar and the escapement goal range, therefore differs slightly from the matrix 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 the 40,000 to 73,000 range; 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) 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 2.–Inseason fishery management decision matrix for Upper Yukon fall chum salmon, 2010.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	<40,000	FN	0	Closures considered.
		CF	0	Closed.
		CF	0	Closed, i.e. chum salmon quota varied to zero.
		RF	0	Closed.
		TF	0	Open- note-this is a live release fishery.
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.
		TF	0	Open-note- this is a live release fishery.
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; TF = test fishery.

4.2.1.3 Determination of Inseason Run Status

Genetic stock identification data were used in conjunction with the Pilot Station sonar counts to develop a preliminary index of the Canadian-origin fish 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. In 2010, projections from the Eagle sonar program were used for the third year for inseason management. Prior to 2008, the Canadian inseason management regime was based primarily on the DFO tagging program.

4.2.1.4 Decisions and Management

Inseason decisions on fishery openings/closures for Upper Yukon fall chum salmon were made in a similar way to those for Chinook salmon. Pilot Station estimates and historic run timing early in the 2010 fall chum salmon season indicated that the run would be unlikely to perform as well as the preseason forecast. There is much uncertainty associated with the chum salmon early inseason forecasts due to the unpredictable size, timing and destination of the pulses. Inseason forecasts of the Canadian fall chum salmon run are based on Eagle sonar estimates, and informed by run timing information from downstream indicators (Pilot Station and Rampart Rapids) as well as genetic estimates of run composition from the Pilot Station test fishery.

As per the decision matrix, a "border escapement" projection of >73,000 was required before fishing opportunities were provided in the commercial fishery. Since it was anticipated, based on harvest in recent years, that the Alaskan subsistence fishery upstream of the Eagle sonar program would take about 15,000 chum salmon, a projection of >88,000 at the Eagle sonar site was required to meet the border escapement objective. The average subsistence catch above the Eagle sonar program from 2006 to 2008 was close to 16,000, with a range from approximately 12,000 to 19,000.

The objective of management actions in 2010 was to ensure that the conservation objective (70,000–104,000 escapement goal range) was achieved. Eagle sonar-guided projections between mid August 18 and September 19 were in the Yellow Zone, and no commercial fisheries were opened. Projections then entered the Green Zone and continued to improve until the end of the Eagle sonar program on October 6. The commercial and domestic fisheries were opened for 24 hours from September 22–23, which is late in the season for the first opening of these fisheries.

The total 2010 commercial fall chum salmon catch of 2,186 fish was 43% of the 2000 to 2009 average of 5,047 (Appendix B8). Within the 2000–2009 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.

4.2.2 Coho Salmon

No coho salmon were recorded in the 2010 commercial fishery. The harvest of coho salmon is negligible within the Upper Yukon River commercial, domestic, recreational and aboriginal fisheries. This is thought to be related to a combination of low abundance and limited availability of this species based on migration timing.

5.0 SUBSISTENCE, PERSONAL USE, ABORIGINAL, DOMESTIC, AND SPORT FISHERIES

5.1 ALASKA

5.1.1 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. Fishing activities are usually based from a fish camp or a home community. Extended family groups, representing two or more households, often work together to harvest, cut, and preserve salmon for subsistence use. Some households from tributary communities travel to the mainstem Yukon River to harvest fish.

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, small Chinook (jack), 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, transportation, and drafting activities (Andersen 1992). Most

subsistence salmon used for dog food are dried (summer chum salmon) or frozen in the open air "cribbed" (fall chum and coho salmon) late in the fall.

In Alaska, subsistence fishing for Chinook and summer chum salmon was open 7 days a week prior to commencement of the *Yukon River King Salmon Management Plan* regulatory schedule on June 7. Breakup timing was near average in the lower river; however persistent shorefast sea ice contributed to the late migration of Chinook salmon. Wet and cold weather in the Yukon Delta made for poor processing conditions, and many fishermen did not harvest Chinook salmon from the first pulse (Hayes and Buckelew 2010). The schedules for the Coastal District and the Tanana, Koyukuk, and Innoko rivers remained open on their regulatory schedules (7 days a week), as these areas have less efficient fishing conditions and/or do not harvest Canadian-bound salmon.

Subsistence fishing closures were not enacted due to periods of high water and debris coinciding with Chinook salmon pulses. Managers decided to leave the regulatory windows in place, and to not force fishermen to take additional risks during openings or fish less efficiently. As the run progressed through Subdistrict 5-D, it became apparent that border passage goals would not be met. Fishermen were asked to consider voluntary harvest restrictions such as spreading harvest over the duration of the run, keeping salmon in their home community, reducing extended sharing, and harvesting other species. Managers understood that water conditions and high fuel costs made fishing difficult in 2010, and did not impose additional hardship on fishermen by reducing the regulatory schedule further. A commercial processor located in Emmonak, Kwikpak Fisheries, donated 2,600 Chinook salmon harvested in summer chum salmon directed commercial fisheries to Fort Yukon and Canada (Gene Sandone, personal communication).

The preseason run size projection and the inseason relationship between summer and fall chum salmon suggested that the fall chum salmon run would be sufficient to meet subsistence and escapement goals. Therefore, the inseason management strategy was to continue the pre-2001 subsistence summer fishing schedule during the fall season. However, high water and debris loads hindered subsistence fishing in the early part of the fall season, and the schedule was liberalized to 24 hours a day, 7 days a week in District 4 and Subdistricts 5-A, 5-B, and 5-C to provide more fishing opportunity.

Around the historic midpoint of the fall chum salmon run in mid-August, it became apparent that the run was weaker than anticipated. After the third and fourth pulses passed Pilot Station sonar, the fall chum salmon run was assessed at less than 400,000 fish prompting concerns about meeting the Canadian border passage goal of 80,000. In response, one subsistence fishing period was pulled in the mainriver districts, excluding Subdistricts 5-A and 5-D (Appendix A6). By early September, fall chum salmon passage numbers from Eagle sonar were on track to meet the border passage goal and subsistence schedules were liberalized in the mainriver districts (Table 4).

Coho salmon preseason abundance was assessed as being average, sufficient to meet escapement objectives, and able to provide for additional subsistence and commercial salmon fishing opportunities. Fall chum salmon restrictions should not have affected coho salmon harvests drastically as there was good presence both before and after the closers. District 6 is near the upper extent of coho salmon range and is managed separately as a terminal harvest area. Coho and fall chum salmon were harvested during subsistence openings, and a limited coho salmon directed commercial fishery also took place in District 6.

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 during closed salmon periods required the use of gillnets with 4 inch or less stretch mesh and prohibition of fish wheel operation. For more information and detail about the Alaskan fishery see Section 3 of this report.

Poor Chinook and fall chum salmon runs resulted in management actions that reduced subsistence salmon fishing opportunities during both fishing seasons. Of the households that answered survey questions in 2010 about whether their subsistence needs were met, between 21% and 43% of households reported meeting over 50% of their needs for Chinook, summer chum, fall chum, or coho salmon. The preliminary percentage of households meeting over 50% of their needs for each species in 2010 were greater than in 2009, but less than 2008.

Commonly cited reasons for not meeting needs: the fishing schedule conflicted with work opportunities, fishing periods were too short and families could not afford to travel back and forth to fish camps, and fishing took place during poor weather conditions for fish preservation. High water and debris occurred throughout the summer and fall seasons. Fishermen in some communities lost fish wheels or other gear or reduced their fishing time in response to poor conditions. Additional factors contributing to the inability to meet subsistence salmon needs included fuel shortages, high fuel prices, health, elders unable to fish, lack of fishing gear, participating on fire-fighting crews, and mechanical problems.

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. Most subsistence users in the Alaskan portion of the Yukon River drainage are not required to report their salmon harvest. The primary method of estimating this harvest is voluntary participation in the annual subsistence salmon harvest survey conducted by ADF&G (Busher et al. 2009). Typically 33 communities are surveyed following the salmon fishing season beginning in early September and continuing through early November. Community household lists are maintained and updated annually during the surveys to provide the most current information. All households in each community are assigned to 1 of 5 harvest use groups based on their recent historical harvest pattern. Households are preselected for survey and heads of households are targeted for interviews but another knowledgeable household member may be interviewed. Survey data are expanded to estimate total subsistence harvest in surveyed communities. In portions of the upper Yukon and Tanana River drainages that are road accessible, fishermen are required to obtain a household subsistence fishing permit. Data obtained from subsistence permits are added to the total estimate of the subsistence salmon harvest provided by the survey portion. Subsistence totals also include salmon that are harvested from test fishery projects and distributed to residents of communities near the projects. Subsistence surveys and fishing permits also include other information such as non-salmon harvest and demographic information. In addition to postseason surveys and permits, subsistence "catch calendars" are mailed to approximately 1,500 households annually in the non-permit portions of the Yukon River drainage. Calendar data supplements the survey information, assist households in recounting their catches when surveyed, and also provide harvest timing information by fish species.

Data compilation of the 2010 survey and subsistence permit information is ongoing. A summary of preliminary results as of March 2, 2011 is presented below. In 2010, just over 1,100 households were selected to be surveyed. A preliminary estimate of 1,105 households fished for salmon from 31 communities (does not include the Coastal District communities of Hooper Bay and Scammon Bay). In portions of the Yukon Area drainage requiring a permit, 459 subsistence permits were issued. As of March 2, 2011, about 85% of the permits have been returned, and 226 household subsistence permit holders reported fishing for salmon and other non-salmon fish species. The preliminary 2010 estimated subsistence salmon harvest in the Alaska portion of the Yukon River drainage totaled approximately 43,020 Chinook, 66,140 summer chum, 67,050 fall chum, and 12,510 coho salmon (Deena Jallen, Yukon Area Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication). Included in the estimated total subsistence harvest are 2,935 Chinook, 4,210 summer chum, 2,238 fall chum, and 558 coho salmon distributed for subsistence use from the various test fish projects distributed to Yukon River communities. The recent 5 year average (2005–2009) subsistence salmon harvest is estimated at 46,170 Chinook, 76,550 summer chum, 86,240 fall chum, and 19,670 coho salmon (Appendices B2–B5) from surveyed communities in the Alaskan portion of the Yukon River drainage.

5.1.2 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 and/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.

Data compilation of the 2010 personal use permit information is ongoing and preliminary results as of January 26, 2011 are as follows. In 2010, the personal use salmon fishery followed the regulatory fishing time of two 42-hour periods per week. Personal use fishing was closed in the Tanana River within a 1/2 mile radius of the mouth of the Chena River from 6:00 p.m. Friday, July 30 until 6:00 p.m. Friday, August 13 to conserve Chinook salmon. A total of 67 personal use salmon and 8 personal use whitefish and sucker household permits were issued. The 2010 preliminary harvest results based on 97% of the personal use household permits returned in Subdistrict 6-C included 162 Chinook, 355 summer chum, 3,222 fall chum, and 1,013 coho salmon. The recent 5 year (2005–2009) average personal use harvest was 123 Chinook, 209 summer chum, 180 fall chum, and 128 coho salmon (Appendices B2–B5) in the Yukon River drainage.

5.1.3 Sport Fishery

Sport fishing effort for anadromous salmon in the remainder of 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: 1) the run is much more abundant in tributaries where most sport fishing occurs, and 2) 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 2005–2009 the Tanana River made up 80% of the total Yukon River drainage Chinook salmon harvest, 35% of the summer chum salmon harvest, and 43% of the coho salmon harvest, on average. 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 2010, an Emergency Order was issued on July 26 that closed the Chena River to all sport fishing for Chinook salmon (including catch-and-release fishing) effective July 28. On August 17 two Emergency Orders were issued to close all waters of the Yukon and Tanana river drainages to the retention of chum salmon effective August 20. These actions remained in effect throughout the entire 2010 salmon season.

Alaskan 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 2010 harvest estimates will not be available in this report. The total 2009 sport harvest of salmon in the Alaskan portion of the Yukon River drainage (including the Tanana River) was estimated at 863 Chinook, 174 summer chum, and 964 coho salmon (Appendices B2, B3, and B5). The recent 5 year (2005–2009) average Yukon River drainage sport salmon harvest was estimated at 691 Chinook, 362 summer chum and 706 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 2006–2009, guided sport harvests in the Yukon River drainage (excluding the Tanana River drainage) averaged 97 Chinook and 414 coho salmon (Sigurdsson and Powers 2009).

5.2 CANADA

5.2.1 Aboriginal Fishery

In 2010, 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 fishers 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 to 3 times weekly. In most cases, weekly

summaries were completed by the surveyors and e-mailed to the DFO office in Whitehorse. Late or incomplete information was obtained post season and reviewed by First Nation staff in conjunction with DFO.

Based on a preseason outlook for a below average to average run of 78,000 to 113,000 Upper Yukon River Chinook salmon in 2010, the Yukon River Panel was advised that it was prudent to consider that conservation measures would likely be required in Canadian fisheries (i.e. commercial, domestic and recreational fisheries). DFO hosted frequent teleconferences with the First Nations throughout the Chinook salmon run to provide updated information on run timing and abundance, as well as to announce potential changes to fishing plans in other fisheries. Using the decision matrix described in Section 4.1.2 (Table 1), DFO recommended that Yukon First Nations develop individual community harvest plans to address conservation concerns for Chinook salmon. Approaches to reductions in harvest varied, but generally the First Nations accepted the need for conservation and implemented harvest monitoring measures in order to stay below what would be considered a normal harvest.

Given the preseason outlook and the inseason information, it was apparent prior to fishing season that the 2010 border escapement was unlikely to be met and that conservation measures would likely be required in the aboriginal fishery. In response to this information, the majority of fishers decided not to open their fish camps; the needs of Yukon aboriginal communities were not met in 2010.

In 2010, the Upper Yukon River aboriginal Chinook salmon catch was estimated to be 2,455, including 1,591 reported harvest, and an added adjustment of 864 Chinook salmon to account for underreporting; this was based on recent harvest averages during years of conservation. This estimate was 69 % below the 8000 Chinook salmon considered to be the harvest of a full unrestricted fishery (Appendix B7). While intensive surveys of First Nation communities regarding salmon harvest carried out between 1996 to 2001, provided accurate harvest data, recent data has been less robust, indicating the need to incorporate the adjusted harvest numbers. The total harvested (2,455) in the First Nation Fishery was 55% below the recent 10-year average (2000–2009) of 5,421 fish and is the lowest on record since the 1970's (Appendix B7).

The 2010 harvest recorded by Tr'ondëk Hwëch'in in the Dawson area was 525 Chinook salmon, approximately 52% of the recent 10-year average. Ross River Dena Council, fishing on the upper Pelly River, reported a harvest of 54, 81% below their 2000–2009 average. The Selkirk First Nation in the Pelly area and Little Salmon Carmacks First Nation (LSCFN) in the Carmacks area, are normally the 2 largest aboriginal fisheries in the mid-area of the upper Yukon River drainage. The harvest reported by Selkirk First Nation was 488, 64% below the 2000–2009 average of 1,374. Little Salmon Carmacks First Nation did not report a harvest for 2010, but 34 Chinook salmon were recorded by the locally hired fish surveyor and a DFO employee during a one day visit of area camps. The 2000–2009 average for LSCFN is 1,365 fish. A harvest of 310 Chinook salmon was reported by the First Nation of Na-Cho Nyäk Dun on the Stewart River; 39% of the 2000–2009 average of 799 fish. The Teslin Tlingit Council (TTC) voluntarily closed fishing completely for the 2010 season. They experienced 98% compliance by community members and reported a total of 41 Chinook salmon harvest, 93% below the 2000–2009 average of 560 fish. The Ta'an Kwach'an Council (TKC), fishing in the vicinity of Lake Laberge near Whitehorse, reported a catch of 139 Chinook salmon, more than 3 times the recent 10-year average of 38. The increase in harvest from TKC was largely due to the creation of a culture camp.

For Upper Yukon River fall chum salmon, there was uncertainty concerning the 2010 preseason run projection, but First Nation fishing restrictions were not expected. As inseason information became available it became apparent that the run was late, but 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 4.2.2 and presented in Table 2.

The 2010 Upper Yukon River fall chum salmon harvest reported in the aboriginal fishery totaled 1,523 (Appendix B8). An adjustment of 500 fall chum salmon was added to the reported value of 1,023 to account for underreporting. The chum salmon adjusted value was based on recent average harvests during conservation years.

The Tr'ondëk Hwëch'in First Nation fishery in the Dawson area reported 1,023 fall chum salmon, 41% lower than the previous 10-year average of 1,738 fall chum salmon. Little Salmon Carmacks First Nation did not report a harvest in 2010, but their 2000–2009 average was 210. The Selkirk First Nation at Pelly Crossing did not report a harvest either; their recent 10-year average was 316. Averages of fall chum salmon derived from a 7-year harvest study conducted by LGL Limited from 1996 to 2002 in the Pelly and Carmacks areas were 433 and 460, respectively. These data from the Yukon River Drainage Basin Harvest Study were used to calculate average catches for Pelly and Carmacks in the absence of complete harvest reports. There is an ongoing effort to finalize the 2010 fall chum salmon catch data.

Catch estimates of salmon on the Porcupine River near Old Crow are determined from locally conducted interviews using the catch calendar and a voluntary recording system described above. The Vuntut Gwitch'in Government (VGG) also conducted an intensive door to door survey, post season. There was significant flooding during the 2010 season and many community members were not able to fish, but 191 Chinook salmon were reported harvested. This data was finalized from the results of the survey. The 10-year average is 280 Chinook salmon.

Preseason run-size forecasts indicated that conservation measures might be required for Porcupine River chum salmon during the 2010 season. There was great uncertainty associated with the preseason forecast and with early inseason forecasts. While early genetics information from the lower Yukon test fishery indicated that the run might form a larger portion of the run than average, later genetics reports indicated the contrary. High water interfered with some downstream assessment projects (Sheenjek sonar), and made it difficult to develop better run size estimates until Fishing Branch weir counts and CPUE analysis indicated that the run would be either low in the yellow management zone or in the red zone. High water at this time prevented community members from fishing and therefore, no official restrictions were implemented.

Preliminary data suggests that VGG citizens were not able to fulfill their needs in 2010. Only 2078 fall chum salmon were harvested in the Old Crow aboriginal fishery, which is 32% below the 2000–2009 average harvest of 3,065 chum salmon. Data was finalized after the post season survey results.

There were 104 coho salmon harvested on the Porcupine River in 2010, compared to the 2000–2009 average of 238 fish.

5.2.1.1 Fishing Branch River Fall Chum Salmon Escapement Goal

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

Porcupine fall chum salmon are managed under the umbrella of the YRSA of the Pacific Salmon Treaty. 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 Fishing Branch River fall chum salmon for the 2008 to 2010 period. Following consultation with the YSSC, the IMEG was subsequently adopted by DFO and included in the IFMP

The analyses used to determine the IMEG was based on a technique that assumes when fishery exploitation has been low to moderate and the production regime has been somewhat stable, a sustainable escapement goal range (not necessarily the number of spawners at maximum sustained yield (Smsy)) tends to overlap with the historical spawning escapement range. This analyses uses escapement contrast (i.e. maximum/minimum escapement) and harvest rate information to determine what percentile range of the actual escapement is appropriate for the escapement goal range determination. In this analysis, escapements from 1985 to 2007 (excluding 1990) were incorporated along with the contrast ratio of 24:1. The IMEG reflects the approximated 25 and 75 percentiles of 22 years of Fishing Branch River weir counts. The 2010 Fishing Branch weir count and run size estimate did not provide any indication that the 2008 IMEG required revision.

5.2.1.2 Porcupine Chinook Salmon Decisions and Management

DFO and the VGG held regular teleconference calls to provide updated information on run timing, abundance and to address conservations concerns for Chinook salmon within the Porcupine River drainage. VGG developed their own management strategies accordingly, but high water prevented community members from fishing and therefore there were no official restrictions required in 2010 (Table 3).

5.2.1.3 Porcupine Fall Chum Salmon Inseason Decision Matrix

The Porcupine River Working Group (PRWG) of the YSSC met in Old Crow on December 1, 2009 prior to the Yukon Panel meeting which took place in March 2010. The decision matrix remained the same, as did the IMEG range adopted by the Yukon Panel for 2008 through 2010.

The following decision rules for the First Nation fishery in the Porcupine River were developed 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 the 10,000 to 22,000 range would constitute the YELLOW ZONE and restrictions may be required, the severity of which would depend upon how close the projections were to the lower end of the range;

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

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

Table 3.–Inseason fishery management decision matrix for Fishing Branch fall chum salmon.

	Border Escapement Projections	Fishery	Guideline Harvest	Anticipated Management Action
RED ZONE	<10,000	FN	0	Closures considered.
		RF	0	Closed, i.e. fall 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. fall 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.

5.2.1.4 Determination of Porcupine Inseason Run Status

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

Once fall chum salmon approached Old Crow, additional information was provided by the Catch per Unit Effort (CPUE[2]) assessment program operated by the VGG and Environmental Dynamics Incorporated (EDI), an environmental consulting firm. The CPUE index is still in development; although the index model was adjusted pre-season to be responsive to high and low water levels, there was still uncertainty about the utility of the model under the 2010 water conditions. As the fall chum salmon season progressed, all indications were that the Fishing Branch River run would likely be smaller than pre-season forecasts. The second batch of genetic samples from the Lower Yukon Test Fishery indicated low proportion of Fishing Branch chum salmon, and CPUE estimates were low. With this in mind, Canadian management then focused on using the most appropriate run timing scenarios to develop total season projections of the Fishing Branch River weir count.

The Fishing Branch River enumeration weir, approximately 2,560 km upstream of the mouth of the river, provided valuable run strength information after September 6 when installation was complete. The Fishing Branch River weir is approximately 550 km upstream of Old Crow, and

[2] An earlier version of the CPUE program involved inseason mark–recapture estimates which were available for the 2003 to 2008 period.

chum salmon commonly take 2 weeks to cover this distance, so much of the abundance data is available only after the bulk of the run has already passed through the Old Crow fishery.

5.2.1.5 Porcupine Fall Chum Salmon Decisions and Management

The Fishing Branch River escapement goal range of 22,000 to 49,000 fall chum salmon was not achieved. Water levels during the chum salmon run resulted in reduced fishing pressure on the stock, and this reduction was considered sufficient. During most of September, projections suggested the run would be in the Red or Yellow management zone. The final weir passage estimate of 15,773 is in the yellow zone.

5.2.1.6 Coho Salmon

Coho salmon were not recorded in the upper Yukon fisheries (aboriginal, commercial, domestic and recreational) but 12 coho were reportedly harvested in the Porcupine aboriginal fishery (Section 5.2.1). The harvest of coho salmon is usually negligible within the upper Yukon River fisheries. This is thought to be related to a combination of low abundance and limited availability of this species based on late migration timing. Within the Porcupine River drainage there is often some aboriginal fishing for coho salmon that occurs with nets set under the ice.

5.2.2 Domestic Fishery

The domestic fishery was closed during the Chinook salmon season and opened concurrently with the commercial fishery for 4 openings during the fall chum salmon season. In recent years domestic fishers have targeted Chinook salmon, although historically fall chum salmon were targeted in some years. There was no reported domestic fishing for fall chum salmon in 2010. The average domestic fishery catch of Chinook and fall chum salmon for the 1974 to 2009 period is 393 and 529, respectively; domestic fishery catches were not recorded prior to 1974 (Appendices B7 and B8).

5.2.3 Recreational Fishery

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

In 2010, due to conservation concerns, the daily catch and possession limits of Chinook salmon in the recreational fishery were reduced to zero effective 2400 hours July 9. Chinook salmon had not yet reached the areas where most recreational fishing normally occurs by this date. However, the 2010 recreational catch is one female Chinook salmon caught and retained, and one male Chinook salmon caught and released; both fish are considered illegal/accidental harvest. The average retained Chinook salmon catch within the 2000–2009 period was 306[3] fish.

Most recreational fishing occurs on the mainstem Yukon River in close proximity to the Tatchun Creek confluence. Of the two salmon caught; one was caught in the Tatchun area and the other in the Mayo River.

[3] This total excludes 2007; 2 Chinook salmon were caught in 2007, although the fishery was closed most of the season.

For the 2010 season, the daily catch and possession limits of fall chum salmon in the recreational fishery remained at 2 and 4, respectively. There are no reports of fall chum salmon caught.

6.0 STATUS OF SPAWNING STOCKS IN 2010

Alaskan and Canadian researchers have developed projects to monitor escapement and to determine genetic composition, relative abundance, run characteristics, and other information pertinent to the annual salmon migration. Main river sonar, tributary sonar, weir, and 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 gender and length composition, scales for age determination, samples for genetic stock identification, data on resident species, and information from the recovery of tagged fish from various projects. Various government agencies, non-government organizations, and private contractors operate projects throughout the drainage (Appendices A8 and A9).

6.1 CHINOOK SALMON

6.1.1 Alaska

In Alaska, a suite of assessment projects are used to better understand the Chinook salmon run. The Lower Yukon Test Fishery (LYTF) assessment project indicated that the run was likely dominated by age-5 fish: a phenomenon that has only been observed 3 other times on record. Chinook salmon age composition from the 8.5-inch mesh set gillnets in the LYTF was 4% age-4, 60% age-5, 34% age-6, and 2% age-7 fish. The sample size was 1,322 fish. Age-6 percentage was one-half of average and age-5 was twice the average. Females comprised 48% of the samples; 5 percentage points below average. Chinook salmon age and sex information collected from escapement projects in 2010 are presented in Appendix A11.

The actual 2010 Chinook salmon run was much weaker than the preseason projection and early inseason assessment projects indicated. Consequently, most escapement results were disappointing. Chinook salmon escapement goals for the East Fork Andreafsky, West Fork Andreafsky, and Salcha rivers were achieved. The Anvik and Chena river escapement goals were not achieved.

Typically, about 50% of the Chinook salmon production occurs in Canada; hence, the U.S./Canada Yukon River Panel agreed to a 1 year Canadian Interim Management Escapement Goal (IMEG) of 42,500–55,000 Chinook salmon based on the Eagle sonar program as a top priority. Preliminary Chinook salmon passage at Eagle sonar is 35,074 fish, yielding a border passage of approximately 34,500 fish. A summary of escapements can be found in Appendices B9 and B10 and Appendix C9.

6.1.2 Canada

The Yukon River Panel adopted an Interim Management Escapement Goal (IMEG) of between 42,500 and 55,000 for 2010, assessed using information from the Eagle sonar passage estimate. The estimated spawning escapement based on the Eagle sonar count and upstream harvest data is

32,010[4], approximately 25% lower than the low end of the IMEG (details are presented in Section 7.1.6).

Aerial surveys of the Little Salmon, Big Salmon, Nisutlin and Wolf river index areas were conducted by the Department of Fisheries and Oceans Canada (Appendix B11; Appendix C10). The Little Salmon aerial survey was flown on August 17. Survey conditions were rated as being poor, due to high winds and some turbidity; surveyors counted 63 Chinook salmon, 7% of the 2000–2009 (10-year) average count of 867 fish. The Big Salmon, Nisutlin and Wolf river index areas were surveyed on August 19 under good to excellent survey conditions. The Big Salmon count of 656 was 60% of the 10-year average 1,094 fish. The Nisutlin River count of 288 was 68% of the 10-year (excluding 2008 when survey was not completed) average count of 427 Chinook salmon. The Wolf River count of 94 was 69% of the 10-year average count of 137 fish. Single (or multiple) aerial surveys do not count the entire escapement within an aerial index area as runs are usually protracted with the early spawning fish disappearing before the late ones arrive. Weather and water conditions, the density of spawning fish, as well as observer experience and bias also affect survey accuracy. Index surveys are rated according to survey conditions. Potential ratings include excellent, good, fair and poor. Survey ratings that rank higher than poor are considered useful for inter-annual comparisons.

In 2010, a DIDSON sonar program was operated for the second time on the Klondike River. A total of 777 targets identified as Chinook salmon were counted at the sonar station between July 7 and August 17, 2010. This represents 2.4% of the Upper Yukon spawning estimate of 32,010 as compared with the 2009 estimate of was 4,725, which represented 7.2% of the respective Upper Yukon spawning estimate of 65,278.

DIDSON sonar was operated for the sixth year on the Big Salmon River. A total of 3,817 targets identified as Chinook salmon were counted between July 20 and August 26, 2010. This estimate represents 11.9% of the Upper Yukon spawning escapement estimate of 32,010. The Big Salmon sonar estimates average 5,586 2005 to 2009 (Appendix B11).

The 2010 Whitehorse Rapids Fishway Chinook salmon count of 672 was 57% of the 2000–2009 average count of 1,171 fish (Appendix B11), and 2.1% of the Yukon spawning escapement estimate of 32,010. The overall sex ratio was 21% female (143 fish). Hatchery-produced fish accounted for 48.7% of the return, and consisted of 269 males and 58 females. The non-hatchery count consisted of 345 fish, 260 wild males and 85 wild females. Historical fishway counts are presented in Appendix B11.

In 2010, 270 Chinook salmon, including 77 females, were counted at the Blind Creek weir; the average count for the 9 years of operation between 1998 and 2009 is 634 Chinook salmon.

More detailed information on the Klondike sonar program, Blind Creek weir, Big Salmon sonar program, and the Whitehorse Rapids Fishway are presented in sections 7.2.2 to 7.2.5, respectively.

[4] This is based on a sonar estimate of 35,074, Eagle subsistence catch of 609 and Canadian Upper Yukon catch of 2,455 which included: 2,455 aboriginal, 0 commercial, 0 domestic, and 0 recreational.

6.2 SUMMER CHUM SALMON ALASKA

Summer chum salmon escapements were variable, but most tributaries experienced good escapements. The Pilot Station sonar project exceeded the OEG of 600,000 summer chum salmon with a cumulative passage estimate through July 18 of 1,327,581 fish. Summer chum salmon escapements in Gisasa and Henshaw rivers were above expected levels. Anvik and East Fork Andreafsky river escapements successfully met their respective BEGs (Appendices B12 and C11). On Tanana River, summer chum salmon escapements were near expected counts for Chena River and below expected for Salcha River (Appendix B12).

Lower river test fishery indicators suggest the run was dominated by age-4 fish. Summer chum salmon age composition from the 5.5-inch mesh drift gillnets in the Hooper Bay Test Fishery was 3% age-3, 73% age-4, 23% age-5, and <1% age-6 fish. The sample size was 501 fish, 48% of which was female. Also, the summer chum salmon age composition from the 5.5-inch mesh drift gillnets in the Lower Yukon Test Fishery was 4% age-3, 65% age-4, 30% age-5, and 1% age-6 fish. The sample size was 1,211 fish, 57% of which was female. The age-4 percentage was 48% above average and the age-5 percentage was 44% below average. Age and sex composition data collected from escapement projects in 2010 are presented in Appendix A12.

6.3 FALL CHUM SALMON

6.3.1 Alaska

The preliminary 2010 Yukon River drainagewide total run size estimate of 489,000 fall chum salmon is based on the postseason expanded escapement and estimated harvests. This run size was below the preseason projection of 552,000 to 828,000 salmon and below the projection provided by the summer to fall chum salmon relationship of 600,000 fish. Although final assessments of overall run size, spawner distribution, and age composition are not available at this time, preliminary assessments of run size are made using 2 methods. Fishery management initially places a considerable amount of weight on the Pilot Station sonar abundance estimate until upriver monitoring projects can provide data. The preliminary fall chum salmon passage estimate, based on Pilot Station sonar for the period July 19 through September 7, was 350,981 fish with a 90% confidence interval of 313,664 to 388,298 fish (Figure 4; Appendix A2). In 2010, references to inseason run size included estimates of harvest below Pilot Station sonar and an adjustment factor of 10% for Pilot Station being conservative. This reconstruction of the run was used to provide projections for inseason management. In 2010, this method adjusted for late run timing, produced an estimated total run size of 391,000 fall chum salmon. Postseason this method provided a preliminary estimate of total run size of 395,000 fall chum salmon which was closer to the projection based on latest ever run timing. Because of the location of the project (river mile 123), the abundance estimate includes Koyukuk River drainage stocks.

A second method to calculate run size utilizes the individually monitored spawning escapements in the upper Yukon and Tanana River, including estimated U.S. and Canadian harvests where appropriate. In 2010, sonar projects were operated on Chandalar and Sheenjek rivers and provided escapement estimates of 158,000 and 22,000 respectively. A weir operated on Fishing Branch River in Canada's upper Porcupine River drainage provided an escapement estimate of 15,800 fall chum salmon. Mainstem Yukon River U.S./Canada passage of fall chum salmon is estimated using sonar just downstream of Eagle and provided an estimate that was adjusted for the passage between October 6 and October 18. The sonar estimate of 133,000 fall chum salmon

was used to represent passage into Canada at this location (to determine escapement goal 15,000 harvest from Eagle above the sonar and Canada must be subtracted). Genetic mixed stock analysis is used in part to estimate abundance of the late running Tanana River stock and resulted in 121,000 chum salmon after July 19 without an adjustment for harvest. The Pilot Station sonar estimates agree reasonably well with the reconstructed run size for most years. In the recent escapement goal analysis (Fleischman and Borba 2009) there was on average 10% disagreement between the Pilot Station sonar estimates (1995, 1997–2005) and the collective escapement and harvest assessment projects. In 2010, the estimate based on collective projects is approximately 20% higher than the estimate using Pilot Station sonar.

In 2010, the proportion of age-3 (14%) and age-6 (3.6%) fish were much higher than average, age-4 (68%) fish were average, and age-5 (16%) fish were below average when compared to the Lower Yukon Test Fishery weighted averages for the years 1977 to 2009. The run size in 2010 was lower than the preseason projection, with weak age-4 and age-5 components that had been expected to contribute up to 76% and 21% of the run respectively. Age and sex composition data collected from escapement projects in 2010 are presented in Appendix A26. Total return of fall chum salmon in 2010 was below average for even-numbered year runs. The summer and fall chum salmon runs are split by a calendar date (July 15, at the mouth of the Yukon River), where overlap is known to occur. In 2010, the monitoring projects in the Upper Yukon Area suggested the run was an average of 5 days late. Four groups of fish passed through the Lower Yukon Area (Figure 3). Collectively, projects in the lower river indicated that run timing of fall chum salmon was 3 days late. As in 2008 and 2009, Pilot Station sonar operated an additional week into September. Mt. Village test fishery was also operated later into the season, through September 19. No significant pulses of fall chum salmon were detected at either project late in the season.

Currently, the estimates of drainagewide escapement are based on preliminary U.S. and Canada commercial (5,000) as well as subsistence and Aboriginal (70,000) harvests of fall chum salmon subtracted from the total run size estimate of 489,000 fish. Based on these levels of harvest the drainagewide escapement is estimated to be approximately 414,000 fall chum salmon. The Sheenjek River Biological Escapement Goal (BEG) and the Fishing Branch River interim management escapement goal were not met, indicating weakness remains in the Porcupine River system. Goals were achieved in the Chandalar, Mainstem Yukon, Tanana and Delta rivers.

An interim management escapement goal (IMEG) of 22,000 to 49,000 fish was established for the Fishing Branch River to apply from 2008 through 2010. This goal uses percentiles based on weir data only, excluding all years with extrapolations based on other methods of measurement. In 2010 the operations of the Fishing Branch River weir began later than normal but the run was late, thus not affecting the count appreciably. The project operated from September 5 to October 12, however expansions were added to both ends of the operational periods to approximate the typical run. The 2010 estimated weir passage of approximately 15,773 fish is below the low end of the IMEG (Appendix C14).

The Sheenjek River escapement was monitored by a Dual-Frequency Identification Sonar (DIDSON) however installation was delayed by high water and the left bank sonar was not deployed because of changes to the cut bank caused by flooding. Both bank operations had occurred from 2005 to 2009. Most of the historical Sheenjek River escapement estimates were only derived from right bank operations with old technology, with counts ranging from 14,000 in 1999 to 247,000 fall chum salmon in 1996, and a high of 562,000 fish observed on both banks combined in 2005 (Appendix B13). The right bank estimated escapement of approximately

22,000 fish in 2010 was 56% below the lower end of the BEG range of 50,000 to 104,000 fall chum salmon, based on the historical right bank data (Appendix C12).

The Chandalar River sonar project operated from August 8 through September 26, 2010. Flooding also occurred during the first week of operations on this system, however they were able to keep at least one sonar operational. The cumulative count was 157,998 fish and was above the upper end of the BEG range of 74,000 to 152,000 fall chum salmon (Appendices B13 and C12).

The Yukon River mainstem sonar at Eagle operated into the fall season from August 20 through October 6 and was extrapolated through October 18, 2010. The resulting estimate of passage at Eagle was 132,930 fall chum salmon. An estimated harvest of 8,000 fall chum salmon from the community of Eagle, who fished upstream of the U.S./Canada border, resulted in a border passage estimate of 124,930 fall chum salmon. Conservative harvests in Canada resulted in an escapement estimate of approximately 120,430 fall chum salmon. In 2010 a one year IMEG of 70,000 to 104,000 fall chum salmon was established and the upper end of the IMEG was exceeded (Appendices B14 and C14).

The Delta River, a tributary in the upper Tanana River drainage, has a BEG range of 6,000 to 13,000 fall chum salmon. Evaluation of the run to the Delta River in 2010 was based on 8 replicate foot surveys conducted between October 5 and December 3. The Delta River escapement was estimated to be approximately 18,000 fall chum salmon based on the area under the curve method. This level of escapement was above the upper end of the BEG range (Appendices B13 and C12).

In 2010, inseason monitoring of the Tanana River drainage consisted of monitoring fall chum salmon run timing at the various test fish wheel locations near the villages of Tanana and Nenana, as well as monitoring subsistence and commercial harvest in the fisheries. Based on the historical mark–recapture estimates of fall chum salmon (1995–2007) within the Tanana River the drainage contributes approximately 30% to the overall run. In 2010, estimates of the Tanana River component based on MSA resulted in a conservative estimate of 121,000 chum salmon. An estimated harvest of the Tanana River component of 21,000 fall chum salmon would be expected to result in an escapement of 100,000 fish. The estimated escapement was within the Tanana River BEG range of 61,000 to 136,000 fall chum salmon (Appendix B13).

6.3.2 Canada

The preliminary fall chum salmon spawning escapement estimate based on the Eagle sonar program is 117,871[5] (details are presented in Section 7.1.6). The sonar program near Eagle has operated since 2006 for chum salmon; generally there was good agreement between the sonar estimates and estimates derived from the mark–recapture program for 2006–2008.

Mark–recapture estimates for the 1980 to 2008 period are presented in Appendix B14. The highest estimated fall chum salmon spawning escapement of 437,733 occurred in 2005.

[5] This was based on a sonar estimate of 125,547 through October 6 and an estimate of 7,383 additional fish missed for the October 7-18 period (after the sonar program ended), for a total sonar count of 132,930. After removing the upstream harvest of 11,350 fall chum salmon for Eagle subsistence fishery and 3,709 fish harvested in Canada- including 1,523 aboriginal, 2,186 commercial, 0 domestic, and 0 recreational- the spawning escapement was estimated at 117,871.

Aerial surveys of the mainstem Yukon, Kluane and Teslin River index areas were not conducted in 2007, 2008 or 2009. 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). Historical aerial survey data are presented in Appendices B14, C13 and C14.

In the Porcupine River drainage, the Fishing Branch River weir was operated from September 5 to October 12. The count through noon on October 12, the last day of operation, was 14,211 fall chum salmon and included 7,794 females and 6,417 males. An adjustment of 602 chum salmon was made to account for fish that had migrated past the weir site prior to installation. Since chum salmon were still present in low numbers at the weir when it was dismantled, an estimate of 961 chum salmon was made to account for fish that may have migrated after October 12. These estimates were developed by extrapolating the first and last full days' counts based on run timing data. Thus the total estimated 2010 Fishing Branch River escapement is 15,773 fall chum salmon (Appendices B14 and C14), which is below the lower end of the escapement target of 22,000 to 49,000 fall chum salmon. Details of the 2010 weir operation are presented in Section 7.2.5.1.

7.0 PROJECT SUMMARIES

7.1 ALASKA

7.1.1 Pilot Station Sonar

The goal of the Yukon River sonar project at Pilot Station is to estimate the daily upstream passage of Chinook, chum, and coho salmon. The project has been in operation since 1986. Sonar equipment is used to estimate total fish passage, and CPUE from the drift gillnet test fishing portion of the project is used to estimate species composition.

Prior to 1993, ADF&G used dual-beam sonar equipment that operated at 420 kHz. In 1993, ADF&G changed the existing sonar equipment to operate at a frequency of 120 kHz to allow greater ensonification range and to minimize signal loss. The newly configured equipment's performance was verified using standard acoustic targets in the field in 1993. Use of lower frequency equipment increased fish detection at long range.

Up until 1995, ADF&G attempted to identify direction of travel of detected targets by aiming the acoustic beam at an upstream or downstream angle relative to fish travel. This technique was discontinued in 1995. Significant enhancements that year included refinements to the species apportionment process and implementation of an aiming strategy designed to consistently maximize fish detection. Because of these changes in methodology, data collected from 1995 to 2010 are not directly comparable to previous years. In 2001, the equipment was changed from the dual-beam to the current split-beam sonar system. This technology allows better testing of assumptions about direction of travel and vertical distribution.

Early in the 2005 season, the Yukon River experienced high water levels and erosion in the river bottom profile, which, along with a combination of changes in fish movement and distribution, affected detection of fish with the split-beam sonar within 20 m of shore on the left (south) bank. On June 19, a Dual Frequency Identification Sonar (DIDSON) was deployed in this area to supplement estimates generated with the split-beam sonar. With its wider beam angle, the DIDSON system was able to detect fish passage within 20 m despite high water levels and problematic erosion nearshore, and was operated for the remainder of the season.

Starting in 2006, the DIDSON was integrated into the sampling routine on left bank for the whole season, operating side-by-side with the split-beam sonar. The DIDSON samples the first 20 m offshore; the remainder of the 250 m range is sampled by the split-beam (Figure 7). The use of the DIDSON has not been necessary on the right bank.

During the 2008 season, ADF&G implemented a feasibility study to validate a complete switch over from paper charts to electronic echograms for enumerating fish traces. Post season linear regression analysis comparing split beam data recorded both on electronic echograms and paper charts proved the overall effectiveness of using echograms was suitable to be integrated at the project. Electronic echograms replaced paper chart recorders for counting fish traces beginning in 2009.

In 2010, split-beam sonar was operated on both banks from June 2 through September 7. Test fishing began on June 1, eleven days before the first Chinook and chum salmon were caught at Pilot Station. Use of the DIDSON accounted for 0.62% of the Chinook salmon, 0.41% of the summer chum salmon, and 0.85% of the fall chum salmon total passage. The DIDSON estimate contributed 1.2% of the total passage, which is the lowest contribution since the DIDSON has been incorporated into the project's sampling plan.

Fish passage estimates at Pilot Station are based on a sampling design in which sonar equipment is operated daily in three 3-hour intervals, and drift gillnets are fished twice each day between sonar periods to apportion the sonar counts to species. In past seasons, on designated days, sonar sampling was expanded to a single 24-hour period as a simple qualitative assessment. Estimates obtained in the regular 3-hour intervals were then compared with those found when the sonar ran continuously. Between 1998 and 2007, 47 continuous 24-hour periods were conducted. Of the estimates produced in these periods, 39 agreed within +/- 10% of the three 3-hour estimates. This general agreement between the 24-hour estimates and the standard estimates indicate that continued testing of the performance of the sampling plan is unnecessary. Furthermore, the costs of running the 24-hour periods are high, and for these reasons have been discontinued at the project. During the 2010 season, 24-hour sampling was not implemented. However, all night sonar sampling periods were conducted during 2 separate fall chum salmon pulses, to determine if variability of passage occurred outside of normal sonar sampling periods.

The test fishing program, used to apportion the sonar counts to species, utilizes an assortment of gillnets, 25 fathoms long with mesh sizes ranging from 7.0 cm to 21.6 cm (2.75 in to 8.5 in), drifted through the sonar sampling areas twice daily between sonar data collection periods.

Drift gillnetting resulted in a catch of 9,808 fish including: 379 Chinook salmon, 2,499 summer chum salmon; 1,594 fall chum salmon; 1,591 coho salmon; and 3,745 other species. Chinook salmon were sampled for age, sex, and length, and genetic samples were taken from both Chinook and chum salmon. Any captured fish that were not successfully released alive were distributed daily to nearby residents in Pilot Station.

Water levels observed near Pilot Station during 2010 exhibited unseasonable fluctuations, with record low water levels recorded during the summer and record high levels observed during the fall compared to USGS 2001–2009 data.

Right bank bottom profiles remained similar to prior years with little or no change throughout the season. The left bank profiles at the sampling site remained linear throughout the field season, providing good sonar detection throughout the entire sampling range. Except for several

days of adverse weather during the fall season, target detection was not hampered by reverberation, which has commonly affected target strength and detection during previous seasons.

Cumulative passage estimates for each targeted species, through September 7, were: 95,913 large Chinook salmon; 17,497 small Chinook salmon; 1,327,581 summer chum salmon; and 350,981 fall chum salmon. Additionally, passage estimates for non-target fish species include: 142,149 coho salmon; 651,128 pink salmon; and 761,800 other fish species. Detailed historical passage estimates for 1995 and 1997–2010 are listed in Appendix A2. Historical passage estimates were revised in 2006 using the most current apportionment model to allow direct comparison between the years 1995 and 1997–2010.

Three continuing feasibility projects were initiated during the 2010 season: 1) exploratory test fishing, in which the primary objective is to increase the accuracy of salmon passage estimates generated at the Pilot Station sonar project by investigating and modifying current test fishing protocols, 2) a side-scan sonar study, to determine the feasibility of enumerating fish passage using down looking sonar, and 3) an acoustic tagging project, to help gain a better understanding of Chinook and chum salmon travel patterns past the ensonified portion of the sonar site. These studies will be continued in 2011 and results will be evaluated as more data becomes available.

In 2010 all project goals were met, with passage estimates given to fisheries managers daily during the season. Information generated at the Pilot Station Sonar project was also disseminated weekly through multi-agency international teleconferences and data-sharing with stakeholders in areas from the lower Yukon River all the way to the spawning grounds in Canada.

7.1.2 Yukon River Chinook Salmon Stock Identification

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

In 2004, genetic analysis replaced scale pattern analysis as the primary method for stock identification. Tissue samples were collected from fish in mixed-stock harvests in Districts 1 through 5 and these were paired with age data. Genetic analysis was performed by age class, age-1.3 and -1.4, when adequate samples were available or using all ages combined. Results from these analyses were combined with specific harvest age composition to provide the stock composition by harvest. Decovich and Howard (2010) provided genetic stock estimates for all ages combined for Chinook salmon sampled in test fisheries and subsistence harvests in 2009. These estimates, harvest age composition, and geographic location were used to apportion the annual harvest within the drainage to Lower, Middle, and Upper stock groups.

Historical percentages by stock group for the total Chinook salmon harvest (U.S. and Canada) are presented in Appendix A13, U.S.-only harvests are in Appendix A14, and Upper stock group harvests (U.S. and Canada) are in Appendix A15. Drainagewide harvest estimates for 2009 were 17.1% from the lower stock group, 29.1% from the middle stock group, and 53.7% from the Upper stock group (Appendix A13). Alaskan harvest estimates from the Lower, Middle, and Upper stock groups were 19.5%, 33.2%, and 47.3%; respectively (Appendix A14). The Upper stock group harvest estimates for 2009 were 77.3% in Alaska and 22.7% in Canada (Appendix

A15). Comparing the 2009 total Chinook salmon harvest (U.S. and Canada) percentage to the 1981 through 2008 average, the Lower stock group was above average, the Middle stock group was below average, and the Upper stock group was slightly above average. The 2010 estimates by stock group will not be available until the following year.

7.1.3 Alaska Drainage Yukon River Chinook and Chum Salmon Genetic Sampling

7.1.3.1 Chinook salmon

ADF&G field crews, along with other collaborators, collected 7,281 samples (axillary process tissue preserved in ethanol) from Chinook salmon harvested by test, commercial, and subsistence fisheries in 2010. These samples were from mixed-stock fisheries in the coastal area and mainstem Yukon River in Districts 1 through 5. Samples from test fisheries totaled 2,966 fish: 19 from Dall Point, 1,627 from Big Eddy and Middle Mouth combined, 476 from Mountain Village, 376 from Pilot Station, and 468 from Eagle Sonar. Samples from commercial fisheries in the lower river totaled 1,315. Samples from subsistence fisheries totaled 3,000 fish: 79 from Emmonak, 365 from Holy Cross by Tanana Chiefs Conference (TCC), 240 from Kaltag (City of Kaltag), 277 from Nulato (TCC), 113 from Bishop Rock (TCC), 427 from Galena (TCC), 235 from Ruby (Ruby Tribal Council), 350 from Tanana, 705 from Rampart Rapids (Rapids Research Center), and 209 from Fort Yukon (TCC). Baseline samples were collected from 3 locations; 5 from the Jim River and 10 from the Middle Fork Koyukuk by Jack Reakoff, and 10 from the Kandik River by Mark Richards. Chinook salmon genetic samples reside in the Gene Conservation Laboratory, ADF&G, Anchorage**.**

7.1.3.2 Chum salmon

ADF&G, in cooperation with USFWS, collected genetic tissue samples from the Pilot Station test fishery from 2,492 summer and 1,593 fall run chum salmon. Rapids Research Center collected 450 chum salmon samples (includes both summer and fall run) from a fish wheel in Rampart Rapids. Baseline samples from 198 fish were collected from Chandalar River fall chum salmon. Chum salmon genetic samples reside in the Conservation Genetics Laboratory, USFWS, Anchorage.

7.1.4 Yukon River Chum Salmon Mixed-Stock Analysis

From 2004 to 2007, the stock compositions of fall chum salmon were estimated from samples collected from Pilot Station sonar test fisheries for the period spanning July 1 through August 31. Since 2008, sampling has started at the beginning of June through the first week of September to estimate the stock compositions for the entire summer and fall chum salmon runs. A baseline of standardized data collected at 21 microsatellite loci was constructed from the following stocks (sample sizes in parentheses): Andreafsky River (261), Chulinak River (100), Anvik River (100), Nulato River (100), Gisasa River (200), Henshaw River (200), South Fork Koyukuk River (200), Jim Creek (160), Melozitna River (146), Tozitna River (200), Chena River (172), Salcha River (185), Big Salt River (71), Kantishna River (161), Toklat River (192), Delta River (80), Chandalar River (338), Sheenjek River (263), Black River (112), Fishing Branch River (481), Big Creek (200), Minto River (166), Pelly River (84), Tatchun River (175), Kluane River (462), Donjek River (72), and Teslin River (143). Results from this analysis were reported for each pulse or time stratum and distributed by email to fishery managers within 24-48 hours of receiving the samples. For summer chum salmon, the lower river stock group comprised 77% of the run while the middle river stock group comprised 23%. Within the middle river stock group,

the Tanana component comprised 3% and peaked in passage past Pilot Station sonar during the sampling period of July 13 to 18. For fall chum salmon, 59% of the run was of U.S.-origin and 41% of Canadian-origin. The composition of the U.S. contribution was 31% Tanana and 28% U.S. border. The composition of the Canadian contribution was 15% mainstem, 10% Porcupine, and 16% White. 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 2004–2008. However, the level of agreement of estimated abundance between the monitoring methods appeared to be related to the run timing of the summer and fall runs of chum salmon. There was better agreement in 2004 and 2005 when fall chum salmon comprised the majority of the run after the transition date. Less agreement was found in 2006–2008 when the fall run was late, which suggested that the sonar missed the late returning fish after it ended operations and that escapement projects counted summer chum salmon as fall. An analysis is ongoing for the 2009 and 2010 data, and preparations are underway to continue the project for the 2011 season.

7.1.5 Eagle Sonar

In 2003, ADF&G began investigating the feasibility of using sonar to estimate Chinook and fall chum salmon passage in the Yukon River near the United States/Canada border. This effort was initiated in response to concerns about assessment methodologies and the importance of accurate border passage information. A suitable section of river was identified near Eagle, Alaska for a potential sonar project. In 2004, ADF&G carried out a 2-week study to evaluate the performance of sonar at 2 preferred sites, Calico Bluff and Six-Mile Bend (Carroll et al. 2007a). It was found that Six-Mile Bend was the superior site, that Dual Frequency Identification Sonar (DIDSON) should be deployed on the shorter, steeper right bank, and split-beam sonar should be deployed on the longer, more linear left bank.

A full-scale project was initiated at Six-Mile Bend in 2005 to estimate Chinook salmon passage using sonar (Carroll et al. 2007b). Since 2006 both Chinook and fall chum salmon passage has been estimated at the same location (Crane and Dunbar 2009). DIDSON was the ideal system for the right bank, where the profile is steep and less linear than the left bank. The split-beam system worked well on the left bank and appeared to have a satisfactory detection rate nearshore, while still adequately detecting targets out to 150 m.

In 2010, the Chinook salmon passage estimate at the Eagle sonar site was 35,074 for the dates July 3 through August 19 (Table 4). When the preliminary Eagle area Chinook salmon subsistence harvest of 609 (Deena Jallen, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) is subtracted from the sonar estimate, the resulting border passage estimate is 34,465. The fall chum salmon passage estimate at the Eagle sonar site was 125,547 for the dates August 20 through October 6 (Table 4). Because of the high passage of chum salmon when the project was terminated the sonar estimate was subsequently adjusted to 132,930. The expansion was calculated using a 2^{nd} order polynomial calculated to the date October 18 (Bonnie Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). When the preliminary Eagle area chum salmon subsistence harvest of 11,350 (Deena Jallen, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication) is removed from the sonar estimate, the resulting border passage estimate is 121,580. This is 17% above the high end of the IMEG of 70,000-104,000.

In 2010 there were several high water events that included large amounts of woody debris and necessitated removal of the right bank weir from the river to prevent damage or loss. Sonar counts were subsequently adjusted to account for fish that may have been missed during periods of high water.

Table 4.–Eagle sonar project passage estimates, and border passage estimates, 2005–2010.

	Sonar Estimate		Eagle Area Subsistence Harvest[a]		U.S. Sonar Mainstem Border Passage Estimate	
Date	Chinook	chum	Chinook	chum	Chinook	chum
2005	81,528	NA	2,566	NA	78,962	NA
2006	73,691	236,386	2,303	17,775	71,388	218,611
2007	41,697	282,670[b]	1,999	18,691	39,698	263,979
2008	38,097	193,397[b]	815	11,755	37,282	181,642
2009	69,957	101,734[b]	382	6,995	69,575	94,739
2010	35,074	132,930[b]	609	11,350	34,465	121,580

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, and a few thousand for 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] Except for 2005 and 2008, subsistence estimates are preliminary.

[b] Expanded sonar estimate, includes expansion for fish that may have passed after operations ceased.

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

7.1.6 Sheenjek River Sonar

The Sheenjek River sonar project has estimated fall chum salmon escapement since 1981 and has undergone a number of changes throughout the years. The project originally operated Bendix single-beam sonar equipment and, although the Bendix sonar functioned well, the manufacturer ceased production in the mid-1990s and no longer supports the system. In 2000, ADF&G purchased a Hydroacoustic Technology Inc. model 241 split-beam digital echosounder system for use on the Sheenjek River. In 2000 and 2002, the new system was deployed alongside the existing single-beam sonar and it produced results comparable to the Bendix equipment (Dunbar 2004). In 2003 and 2004, the split-beam sonar system was used exclusively to enumerate fall chum salmon in the Sheenjek River.

The current biological escapement goal (BEG) is based only on right bank passage. Historically, due to unfavorable conditions for transducer placement on the left bank, only the right bank of the Sheenjek River has been used to estimate fish passage. Drift gillnet studies in the early 1980's suggested that distribution of the upstream migrant fall chum salmon was primarily concentrated on the right bank of the river at the sonar site, with only a small but unknown proportion passing on the left bank (Barton 1985).

In 2003, a dual frequency identification sonar (DIDSON) was deployed on the left bank to better understand the distribution of migrating chum salmon. Results showed that approximately 33% of the fish were migrating up the left bank (Dunbar 2006). Due to large numbers of fish observed on the left bank, ADF&G began operating DIDSON on both banks in 2005. The 2005 season marked a successful transition from a single split-beam system on the right bank to DIDSON systems deployed on both banks (Dunbar and Pfisterer 2009). The new equipment was both easier to use and produced more accurate estimates.

In 2009, 39% of the fish migrated on the formerly unmonitored left bank, compared to 16 % in 2008, 40% in 2007 and 39% in 2005 and 2006 (Dunbar 2010). It will take several more years of data collection to determine how best to treat the historical estimates, but in order to provide the best escapement number possible the left bank must continue to be monitored. Until then, only the right bank estimate will be used to evaluate whether the BEG is obtained. The transition from split-beam to DIDSON has gone smoothly and this equipment should continue to provide accurate escapement estimates in future years.

In 2010 there were several extreme high water events that necessitated removal of the sonar equipment from the river and relocation of the camp to prevent damage or loss. Extreme erosion prevented operation of the sonar on the left bank the entire season. Only the right bank sonar was operated when river conditions allowed. Right bank counts were subsequently adjusted to account for fish that may have been missed during periods of high water when the sonar was not in operation.

In 2010, the fall chum salmon passage estimate for the right bank at the Sheenjek River sonar site was 22,053 for the dates August 18 through September 24. This estimate was 56% below the low end of the Sheenjek River BEG of 50,000 to 104,000 fall chum salmon. Although sonar operations started late, and about 10 days of the early portion of the run was not counted, the estimate is most likely reasonable. As witnessed by projects down river, run timing was late and numbers of migrating salmon were low in the early part of the season. Numbers of migrating salmon were also low at the project site when the sonar was finally installed, and did not increase until more than 10 days later. It is highly unlikely that a big pulse of fall chum salmon passed while the sonar was not in operation.

7.1.7 *Ichthyophonus*

Ichthyophonus hoferi (*Ichthyophonus* here after) is a marine-derived protozoan parasite infecting a variety of marine and anadromous fish species including salmonids (Kocan et al. 2004; Tierney and Farrell 2004; Gavryuseava 2007). While the parasite is not harmful to humans, the effects on the fish host can be devastating and mass mortalities of herring have been attributed to infection with *Ichthyophonus* (Sindermann 1965; Mellergaard and Spanggaard 1997; Kocan et al. 1999). Prior research suggests that *Ichthyophonus* is a newly emerging parasite in the AYK region and may cause pre-spawning mortality of Yukon River Chinook salmon (Kocan et al. 2004, 2006, 2009).

In 2010, Chinook salmon *Ichthyophonus* sampling continued in Emmonak and Eagle, Alaska funded by the U.S./Canada Restoration and Enhancement Fund. Sampling in 2010 was successful and all sampling targets were reached. Chinook salmon tissues were collected near the community of Emmonak (close to the mouth of the Yukon River) as part of the Big Eddy test fishery operated by ADF&G. The Big Eddy test fishery project utilizes set gillnets with an 8.5 inch mesh size. Samples of cardiac muscle (n=150) were collected over the course of the

Chinook salmon run from June 9 to July 12. Collection of samples over the entire run is critical as Kocan et al. (2004) noted that salmon returning early in the season seem to be relatively free of the typical clinically observed *Ichthyophonus* lesions, while fish tend to be more severely infected with these lesions later in the season.

In addition, samples of Chinook salmon (n=199) were collected from subsistence fishermen in the community of Eagle near the U.S.-Canadian border. Samples were obtained over the course of the Chinook salmon run from July 9 to July 28. Subsistence fishing gear used at Eagle included fish wheels and set gillnets with 6 inch mesh. Fishing sites varied, however, most subsistence gear was located on the left bank of the Yukon River close to Calico Bluff.

Cardiac muscle samples were collected with extreme care using sterile, disposable supplies to avoid cross-contamination between samples. Morphometric data were recorded (i.e., length, sex, weight, and girth), scales were collected for age estimation, and axillary fin clips were taken for genetic analysis. Sex composition was 46.0% and 31.7% female for Emmonak and Eagle, respectively, as determined by internal examination of gonads. Fish sampled at Emmonak had a mean length of 804 ± 83 mm (mideye to tail fork), mean weight of 19.1 ± 5 lbs, and mean girth was 492 ± 48 mm. At Eagle, the mean length was 742 ± 91 mm, mean weight was 12.5 ± 5 lbs, and mean girth was 392 ± 56 mm. Scales have been collected for age estimates, but results are not yet available.

Clinical signs typical for *Ichthyophonus* infection were noted at the time of collection in 6.7% (10 of 150) of fish sampled in Emmonak. Clinical signs of *Ichthyophonus* infection were recorded in 4% (8 of 199) of Chinook salmon collected in Eagle. White, granulomatous lesions are a general inflammatory response of fish to foreign bodies and do not necessarily establish actual infection with the parasite (Corbel 1975). Generally, clinical disease is more advanced further up the river, so it is interesting to note that 7 fish sampled in Eagle did not show any signs of infection, but were later confirmed positive using tissue culture. In Eagle, only one fish showed signs of *Ichthyophonus* infection, but did not test positive.

PCR analysis is still in progress, but tissue culture indicated low infection prevalence of 8.7% in Emmonak (13 of 150) and 7% in Eagle (14 of 199). For Eagle, most collected cardiac tissues did not yield any DNA (only 19 of 199 had DNA yields >5ng/ul). This is the first time this problem has occurred and low quality ethanol for tissue preservation could be a possible explanation. DNA yields for tissues collected from Emmonak were of high quality. *Ichthyophonus* prevalence over time for both Emmonak and Eagle is provided in Figure 8. Cyclic *Ichthyophonus* epizootics have been described in herring (Sindermann 1965) and a similar cyclic pattern is suggested by Chinook salmon time series data from Emmonak.

The effect of *Ichthyophonus* on salmon health, egg quality, and juvenile survival remains poorly understood. Fish egg and embryo vitality is correlated to body condition of spawning females. Condition is, in turn, dependent on physiological status and energy demands, and generally fish exposed to stress or disease show an increase in energetic costs (King et al. 2003; Rand et al. 2006). Potentially, lipids could be re-routed from gonads of *Ichthyophonus*-positive fish to provide additional energy needed to complete the spawning migration. Such females could then produce either fewer or lower quality eggs. Samples from Eagle were therefore paired with egg counts and egg quality data (as determined by proximate analyses; %water, %lipid, %protein, and caloric value) to assess fecundity, gonadal energy storage, and potential links to *Ichthyophonus* infection. In 2010, 63 females (32% of sampled fish) were available for study and

of those 6 were positive for *Ichthyophonus*. Egg counts are still in progress and proximate composition of eggs from "healthy" and infected females are given in Table 5. While overall composition of eggs from "healthy" and infected females does not appear to differ, preliminary data on hatching success on the Salcha River using crosses of *Ichthyophonus*-infected and "healthy" parents indicated reduced survival of eggs from *Ichthyophonus*-infected Chinook salmon (Floyd, Dehn & Sutton, *unpublished*).

Table 5.–Proximate composition (%water, %lipid, %protein, and caloric density) of eggs from "healthy" and *Ichthyophonus*-infected fish harvested in Eagle.

	%water	%lipid	%protein	Energy density [cal/g]
Ich-negative	56.9 ± 3.1	22.3 ± 8.1	20.5 ± 2.5	6297 ± 441
Ich-positive	55.9 ± 2.9	33.0 ± 11.6	17.8 ± 3.1	6267 ± 305

Analyzes of blood chemistry profiles of "healthy" and *Ichthyophonus*-infected salmon harvested in Eagle indicate some differences in parameters associated with muscle injury and inflammation (e.g., Aspartate Transaminase (AST), Alanine Transaminase (ALT), Alkaline Phosphatase (ALP)) with infected fish generally showing higher levels of these enzymes. Data entry (for Emmonak) and analyzes of blood chemistry profiles are still in progress, but show promise for the development of a potentially minimally invasive tool to identify fish infected with *Ichthyophonus*. Similarly, tissues collected from Chinook salmon during their marine phase in Dutch Harbor in 2010, and analyzed using relatively new technology known as metabolomics, reveal that a number of metabolites (associated with inflammation and fatty acid metabolism) differ between "healthy" and infected fish (Nichols, Dehn, & Sepulveda, unpublished).

7.1.8 Juvenile Chinook salmon study near U.S./Canada border

The rearing of sub-yearling Chinook salmon in non-natal streams is well documented in the upper Canadian portion of the Yukon River drainage. Further downstream in U.S. waters, little information was available concerning the utilization of non-natal rearing habitat by juvenile salmon. In the summers of 2006 and 2007, a pilot study by USFWS, Fairbanks Fish and Wildlife Field Office, documented the use of U.S. streams by Canadian-origin Chinook salmon for rearing (Daum and Flannery 2011). Most of these juveniles originated from the Carmacks/mainstem regional genetic group, 300 to 400 km upstream of the U.S./Canada border, with some individuals moving downstream over 1,200 km. In 2008, a comprehensive 3-year study (funded by AKSSF) was initiated to inventory potential non-natal rearing streams for the presence of juvenile Chinook salmon between the U.S./Canada border and the Tanana River confluence. During the 2010 sampling period, 26 streams were visited between Rampart and Tanana villages. Twenty streams were sampled for juvenile Chinook salmon and 17 streams were found to contain juveniles. Over 217 genetic samples were collected in 2010 and were archived for future analysis (2010 R&E funded project). For the entire 3-year study, 96 streams were investigated, 56 streams were sampled, 44 streams contained juveniles, 41 streams are being nominated for inclusion in the ADF&G's Anadromous Waters Catalog, and 616 genetic samples have been collected. Genotyping and subsequent stock analysis of the genetic collection will take place this winter and a final report to the Panel will be completed by May 31, 2011.

7.2 CANADA

The lower Canadian commercial fishery area is located downstream of the Stewart River. The most intensive fishing activity and catch monitoring is conducted in this area, and if a commercial fishery takes place, the data are used for population estimates. Commercial fishers 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.

7.2.1 Upper Yukon River Salmon Assessment Programs (Yukon Territory)

7.2.1.1 Chinook Salmon

The Eagle sonar program was used to determine the Canadian Upper Yukon border passage estimate in 2010. The preliminary border passage estimate for 2010 is 34,465 Chinook salmon based on the Eagle sonar estimate of 35,074 minus an estimated Alaskan subsistence harvest upstream of the sonar site of 609 fish[6]. After subtracting the Canadian Upper Yukon River Chinook salmon harvest of 2,455 aboriginal, and 0 commercial, domestic, and recreational, a total of 32,010 Chinook salmon is estimated to have reached Canadian spawning areas. The spawning escapement is approximately 25% below the low end of the Interim Management Escapement Goal (IMEG) range of 42,500 to 55,000 adopted by the Yukon River Panel in 2010.

A preliminary reconstruction suggests that the total Canadian-origin Chinook salmon run size was approximately 64,500 fish. A run size of this magnitude is approximately 17% below the lower end of the precautionary preseason outlook range of 77,800 to 113,100. The precautionary outlook range was developed and presented to the Yukon Panel to demonstrate the uncertainty associated with the 2010 run outlook, because recent preseason outlooks based on the stock-recruitment (S/R) and sibling models had been higher than the observed returns. The estimate for the 2010 run size is approximately 41% to 44% lower than the unadjusted forecast of 110,000 to 117,000 based on these models.

7.2.1.2 Fall Chum Salmon

The Eagle sonar program was also used to determine the Upper Yukon chum salmon border passage estimate in 2010.

The preliminary 2010 estimate at the Eagle sonar program is 132,930 fall chum salmon. This estimate is based on the Eagle sonar estimate of 125,547 to October 6, plus an additional 7,383 chum salmon estimated to have migrated after October 7 when the sonar project ended (Bonnie Borba, Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication). A preliminary border passage estimate of 121,580 has been calculated by subtracting the estimated Alaskan subsistence harvest (11,350 fish[6]) upstream of the sonar site.

A total of 117,871 fall chum salmon is estimated to have reached Canadian spawning areas in the upper Yukon drainage. This estimate is derived by subtracting the Canadian harvest of 3,709 Upper Yukon River fall chum salmon, which includes 1,523 harvested in the aboriginal fishery and 2,186 harvested in the commercial fishery, from the border passage estimate of 121,580. The

[6] Eagle subsistence harvest of Chinook and fall chum salmon upstream of sonar site provided by ADF&G.

spawning escapement estimate is approximately 13% higher than the upper end of the spawning escapement goal range of 70,000 to 104,000 adopted by the Yukon River Panel in 2010.

A preliminary reconstruction of the 2010 fall chum salmon run suggests the total Canadian-origin fall chum salmon run size was approximately 142,000[7] fish. This reconstruction is within the preseason outlook range of 137,000 to 207,000 Upper Yukon fall chum salmon. The 2010 preseason outlook range was based on the ADF&G drainagewide outlook range of 552,000 to 828,000 fall chum salmon and an assumption that upper Yukon Canadian-origin fall chum salmon would constitute at least 25% of the drainagewide return. There was great uncertainly associated with the 2010 upper Yukon outlook due to the exceptionally high spawning escapement of 437,700 observed in 2005, the dominant year contributing to the 2010 return.

7.2.2 Klondike Sonar

A feasibility study for a Klondike River Chinook salmon sonar program was conducted in 2008. During the feasibility study, a suitable sonar site was found approximately 4.5 km upstream of the mouth of the Klondike River; this was used for a fully operational program in 2009 and 2010 (Appendix B11). The project was conducted by Mercer and Associates and funding for the 2008, 2009 and 2010 programs was provided by the Restoration and Enhancement Fund (project numbers CRE-16-08, -09, and -10).

The sonar site has a total wetted river width of approximately 53 m with a maximum depth of approximately 2 m. The profile of the cross-section at this location is conducive to providing complete ensonification of the water column with no acoustic shadows or blind spots. Two short weir structures were constructed on each side of the river to reduce the effective migration width to 38 m. The standard DIDSON sonar unit used the maximum ensonification range of 40 m and was fitted with an 8° concentrator lens.

The sonar program was operational from July 7 through August 17, 2010. With the exception of one 30.5 hour period and one 16 hour[8] period when the sonar unit was out of operation due to high water and technical difficulties, the sonar program was operational 24 hours per day. All files from each 24 hour period were examined and all Chinook salmon targets counted. A total of 777 targets identified as Chinook salmon were counted at the sonar station, representing 2.4% of the upper Yukon spawning estimate of 32,010. The dates when 10%, 50% and 90% of the fish had passed were July 18, July 22, and August 6, respectively. The Klondike River Chinook salmon run has one of the earliest migration timing patterns of upper Yukon River Chinook salmon stocks.

A carcass pitch survey of the upper Klondike River was conducted after sonar operations were completed. High water, low run size and sampling timing size resulted low sample numbers. Chinook salmon carcasses were sampled for age, length, sex and genetics.

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[7] Reconstructed run estimate of 142,000 Canadian Upper Yukon fall chum salmon comprised of 132,930 chum salmon from Eagle sonar, plus 20,300 estimated US subsistence harvest of Canadian upper Yukon fall chum salmon, plus 252 estimated commercial harvest (29% of 841 fall chum salmon from the mainstem Yukon US commercial harvest)

[8] The estimated Chinook salmon passage on days with incomplete sonar coverage was estimated by multiplying the number of fish per hour during the operational period by 24 hours.

7.2.3 Blind Creek Weir

A weir was operated in Blind Creek by J. Wilson and Associates to enumerate the 2010 Chinook salmon escapement and obtain information on stock characteristics. The weir site was located at the same site as in previous years, approximately 1 km upstream of the confluence with the Pelly River. Operation of the weir began on July 19 and continued until August 19. The first Chinook salmon passed through the weir on July 28. In total, 270 Chinook salmon were counted. This is approximately 42% of the average total count of 646, and is the lowest count recorded in 10 years of operation (Appendix B11). Fifty percent of the run had passed through the weir by August 11 and 90 % by August 16. The midpoint of the run was 7 days later, and the 90%-point in the run approximately 4 days later than average (of 9 years of operation). Age-sex-length samples were randomly collected from migrating Chinook salmon throughout the period of weir operation. A total of 185 Chinook salmon (68.5% of the run) was sampled, of which 77 (42%) were female and 108 (58%) were male. Jacks (males with a snout to fork length ≤630mm) comprised 10% of the males sampled. The mean fork length of females and males sampled was 855 mm and 765 mm respectively. The DFO scale lab determined ages of 126 of the Chinook salmon sampled. Of these, age-5 and age-6 fish were the predominant age classes, comprising 54% and 32.5% of the sample, respectively. Age-3,-4, and -7 represented 0%, 8.7% and 4.8 %, respectively.

7.2.4 Big Salmon Sonar

A long range dual frequency identification sonar (DIDSON-LR) was used to enumerate Chinook salmon returning to the Big Salmon River in 2010. This was the sixth year a sonar program has been conducted at this site by J. Wilson and Associates in partnership with B. Mercer and Associates with funding from the Restoration and Enhancement Fund (Project number CRE-41-10). The sonar site is located on the Big Salmon River approximately 1.5 km upstream of the Yukon River confluence, the same location used for the 2005 to 2009 programs. Partial weirs placed on both sides of the river were used to constrict fish movement through a 34 m opening. The sonar unit was configured to provide a 29º wide by 8º deep ensonified field. The start window was a distance of 5 m from the sonar unit and the ensonified area was set for 40 m. This resulted in the far end of the ensonified area being a distance of 45 m from the sonar unit.

The sonar device was installed on a submerged adjustable mounting platform and secured to a tree onshore using a 6 mm stainless steel safety cable. Recording began on July 20 and continued until August 26, 2010 with 24-hour recording periods; a total of 3,817 targets were identified as Chinook salmon. This estimate represents about 12% of the 32,010 upper Yukon spawning escapement estimate. The first Chinook salmon was observed on July 21. The peak daily passage of 248 fish was observed on August 9; 10%, 50% and 90% of the run had passed the station by July 31, August 7 and August 16, respectively. The dates for both the 50% and 90% passage were 3 days later than the 2005–2009 averages. The 2010 estimate is lower than the average from 2005 to 2009 (Appendix B11).

A carcass pitch was conducted over approximately 100 km of the Big Salmon River, yielding 71 Chinook salmon carcasses. Each carcass was sampled for age, sex and length (ASL data). Of the 71 fish sampled, 33 were female and 38 were male, about 47% and 54% respectively. The mean mideye to tail fork length of females and males sampled was 815 mm and 738 mm, respectively. Age data were determined from 61 fish sampled. Age-5 was the dominant age class comprising

about 44%, followed by age-6 (31%) fish. Age-4 and age-7 fish represented 2.8% and 8.5% of the sample, respectively.

7.2.5 Whitehorse Rapids Fishway Chinook Salmon Enumeration

A total of 672 Chinook salmon ascended the Whitehorse Rapids Fishway between August 3 and September 6, 2010. This total was 57% of the 2000–2009 average count of 1,171 fish (Appendix B11). The overall sex ratio was 21% female (143 fish). Hatchery-produced fish accounted for about 49% of the return, and consisted of 269 males and 58 females. The non-hatchery count consisted of 345 fish, 260 wild males and 85 wild females. The run midpoint occurred on August 20 and the peak daily count occurred on August 18 when 139 fish were counted. The midpoint of the 2010 run occurred 4 days later than the recent 10-year average (2000-2009).

In 2010, fish were not specifically removed from the fishway for coded wire tag sampling; however, several samples were obtained from the brood stock collected. No weirs, i.e. the Wolf or Michie creek weirs, were operated in the drainage upstream of the Whitehorse Rapids Fishway in 2010.

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

7.2.6 Whitehorse Hatchery Operations

Eight Capilano troughs were installed at the Whitehorse Rapids Hatchery when the facility was constructed in 1983. The recommended maximum loading capacity was 456,000 Chinook salmon fry (57,000 2 gm fry/trough) although the actual operational load was approximately 360,000 fry (45,000 2 gm fry/trough). As the hatchery program progressed, the longstanding release target became 300,000 fry at an average release weight of 2 grams, although the average release weight was higher than 2 grams. For example, the average release weight was 2.45 gm for the 1985–2001 period, and in many years it was approximately 3 grams. The average release for brood years 1984–2001 was approximately 250,200 fry. The highest fry releases were 400,449 released in 1992 and 441,455 released in 1993.

The Whitehorse Rapids Hatchery transitioned from rearing Chinook salmon fry in Capilano troughs to rearing them in circular tanks in brood year 2000, when the hatchery was modified to accommodate other species. As hatchery staff gained experience culturing Chinook salmon in the round tanks, it became apparent that the prevailing loading densities were too high. As a result, effective brood year 2002, the Chinook salmon release target was reduced from 300,000 to 150,000 fry at a 2 gram release weight. The reduced release target was based on a DFO analysis and was applicable to the circular tanks, the existing water delivery system, and a risk assessment. The average release for brood years 2002–2009 was approximately 142,620 fry with a range from 85,300 to 176,600.

Chinook salmon fry reared at the Whitehorse Rapids Hatchery were adipose fin-clipped and injected with “Agency-only” coded wire tags in the early summer of 2010. This was the fourth year the facility used an “Agency-only” coded wire tag. Tricaine methane sulphonate (MS222) was used to anaesthetize the fry prior to clipping and tagging.

All 126,225 Chinook salmon fry from the 2009 brood year reared at the Whitehorse Rapids Fish Hatchery were released between May 30 and June 1, 2010. All fish were marked with an adipose fin clip. The fry[9] were released into various locations upstream of the Whitehorse Rapids hydroelectric dam.

Included in the McClintock River release total was 1,369 fry that were considered to be too small or unfit for tagging. These fish had their adipose fins removed, and they were released untagged on June 1, 2010. A summary of Chinook salmon releases into the upper Yukon River from instream incubation and rearing sites is presented in Appendix A16. Average fry weight at time of release was 2.98 grams.

The 2010 release was the 15th year in which all fit fish released from the Whitehorse Rapids Fish Hatchery into the Yukon River were marked, i.e., the 1995–2009 brood years. With the exception of all fish released from the 1998 BY, which were adipose-clipped but not tagged, all of the 1995–2009 brood year releases involved adipose fin removal and application of coded wire tags to all fit fish. The initiative to mark all of the fish released from the hatchery provides an opportunity to accurately determine the hatchery contribution as adult fish migrate upstream through the Whitehorse Rapids Fishway and it is also helpful during brood stock collection. The marking is also consistent with a protocol required by the Pacific Salmon Commission to mark all artificially propagated salmon.

Tag retention for the fish tagged for the 2010 release (2009 brood year) was calculated to be 98.15%. This calculation is derived from information that suggests that 2,309 of the 124,856 tagged fish did not retain their tag. The total 2010 release includes 122,547 adipose-clipped fish with intact coded wire tags, 2,309 fish estimated to have lost their tags, and 1,369 small (or unfit) fish that were clipped but not tagged for a total release of 126,225 fish.

Brood stock collection began on August 15, after 30 Chinook salmon had migrated through the Whitehorse Rapids Fishway, and ended on September 2, 2010. 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 22 years in an effort to maintain genetic diversity.

A total of 61 males were retained for the brood stock program and an additional 5 males were milked and released; 30 of these fish were adipose-clipped (hatchery) and 31 had intact adipose fins (wild). This total represents 11.5% of the total male return of 529 Chinook salmon.

In total, 34 females were successfully spawned for the Whitehorse Rapids Hatchery program, producing a preliminary estimated total of 140,000 green eggs, which was revised to 176,631 at shocking stage. Two of the females perished during holding. Average fecundity was estimated at 5,352 eggs per female with a range from 3,794 to 7,433. Some of these fish were partials, i.e. fish with less than a full complement of eggs. The fertilization rate was estimated to be 97%. Shocking and second inventory of the eggs began on October 13 and was completed by October 30, 2010. An estimated total of 158,022 eyed eggs were on hand in October 2010. The overall survival from green egg-to-eyed egg was estimated to be 89%.

On November 2, 2010 a representative sample of an estimated 10,100 eyed eggs was transferred from the Whitehorse Rapids Hatchery to the McIntyre Creek Hatchery (Appendix A17). These

[9] 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.

eggs will be used for the Fox Creek restoration program funded by the Yukon River Panel Restoration and Enhancement fund (CRE-54-10). The remaining eggs had an estimated survival from green eggs to the hatch stage of 82%.

7.2.7 Porcupine River Investigations

7.2.7.1 Fishing Branch River Fall Chum Salmon Weir

Fall chum salmon returns to the Fishing Branch River have been assessed annually since 1971 when 115,000 chum salmon were counted on an October 12 survey. The 1971 count was later estimated to represent a return of approximately 312,800, based on the observed relationship between weir counts and aerial survey counts. A weir established to enumerate fall chum salmon escapement to the Fishing Branch River operated during the following periods: 1972–1975; 1985–1989; and has operated annually since 1991 in a cooperative effort between DFO and the Vuntut Gwitchin Government. Spawning escapement estimates for the Fishing Branch River, including aerial expansions for years lacking complete weir counts, have ranged from approximately 5,100[10] fall chum salmon in 2000, to 353,300[11] chum salmon in 1975 (Appendix B14).

The Fishing Branch River weir provides the primary assessment of the fall chum salmon return to the Porcupine River drainage. In 2010, the Fishing Branch River weir was operated from September 5 to October 12. The weir was installed approximately 1 week later than planned due to high water conditions. The count through noon on October 12, the last day of operation, was 14,211 fall chum salmon and included 7,794 females and 6,417 males. The daily Fishing Branch weir counts over the last 5 days of enumeration ranged from 155 (October 11) to 389 (October 7). Daily weir counts for the October 12–25 period were developed using a parabolic expansion function[12] provided by ADF&G (Bonnie Borba, Commercial Fisheries Biologist, ADF&G, Fairbanks, Alaska; personal communication); 961 chum salmon were added to the total. The parabolic expansion function was also used to expand the passage for 5 days prior to weir installation, adding 602 chum to the total passage. An aerial survey conducted 3 days after the weir became operational counted 490 chum salmon; applying the aerial survey adjustment factor produced an adjustment factor only slightly higher than the parabolic expansion[13]. After extending the daily counts from September 1 to October 25, the total estimated 2010 Fishing Branch escapement is 15,773 fall chum salmon. The 2010 escapement is 50% of the 2000–2009 average of 31,760 fall chum salmon.

The estimated midpoint of the run occurred on September 23, slightly later than the recent 5-year average midpoint in the run of September 22. The Fishing Branch River weir is usually removed before the run is completely over. Historical weir counts, expanded using the parabolic expansion function described, are presented in Appendix B14. Weir installation dates have ranged from as early as August 18, in 1996, to as late as September 23 in 1972. However, weir

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[10] Weir operations were interrupted due to flooding for an 8 day period following September 22 in 2005. Weir count prior to the flooding was 4993. Only 60 chum salmon were counted through the weir after operations resumed on October 1, 2005.

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

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

[13] Using the aerial survey count to adjust for preseason missed chum salmon would add 635 fish to the total, as compared with 602 estimated with the expansion formula: 490 times 2.72 (the aerial survey to weir adjustment factor) equals 1333. Subtracting the 698 weir count at survey time equals 635 additional chum salmon.

installation has been completed by September 6 in all but 3 years, and run data for projects that operated throughout September indicated that an average of only 3% of chum salmon have passed through the weir by this date. No consistent expansion method has been applied to estimate fish missed at the beginning of the project, but adjustments have been made when installation timing or first day's counts indicated that a significant portion of the run had been missed.

The 2010 Fishing Branch River escapement is 28% below the low end of the Fishing Branch River Interim Management Escapement Goal (IMEG) range of 22,000 to 49,000, which was established for the 2008–2010 period. Prior to the analyses which established the IMEG for 2008 to 2010, the longstanding spawning escapement goal for the Fishing Branch River was 50,000 to 120,000 chum salmon.

7.2.7.2 Porcupine River Fall Chum Salmon Catch Per Unit Effort Program

A mark–recapture program was conducted on the upper Porcupine River near the community of Old Crow from 2004 to 2008 with funding provided by the Yukon River Panel Restoration and Enhancement fund. Fall chum salmon captured with small mesh gillnets at a site located 23 km downstream of Old Crow were tagged with spaghetti tags. The tag recovery component of the program involved a test fishery and tag recoveries from the Vuntut Gwitchin aboriginal fishery. Tags were also observed and recovered at the DFO weir located on the Fishing Branch River.

In 2009, this program (CRE-27-09) was changed from a mark–recapture to a catch per unit effort (CPUE) index program. The relationship between test fishery CPUE data and Fishing Branch River weir counts for the 2004–2008 period was used to determine an index of abundance based on test fishery CPUE. Funding for the 2010 program (CRE-27-10) was provided by the Yukon River Panel and the principal objective was to provide an inseason estimate of the abundance of fall chum salmon passing the community of Old Crow.

The 2009 inseason CPUE index program underestimated the fall chum salmon run; passage estimates totalled 33% of the Fishing Branch weir counts for the corresponding (allowing 13 days for migration) period. Environmental Dynamics Inc. (EDI) then re-examined the data from the periods 2005 through 2009 and determined that high water levels corresponded with lower CPUE values. They subsequently developed one model for use when Porcupine River water levels (as reported by the Water Survey of Canada hydrological station near the Yukon/Alaska border) exceeded 8 metres, and an alternate model to be used when netting occurred during periods of lower water levels.

Using cumulative CPUE and cumulative weir counts for 2006 and 2009, a regression relationship was calculated for high water years with a R^2 value of 0.8903. The equation developed to express the relationship between CPUE and the Fishing Branch weir count was: $y = 45.922x + 3175.5$, where x is the cumulative CPUE at a given point in the program and y is the corresponding estimate of the expected cumulative Fishing Branch River weir count, recognizing a 13-day average travel time. Similarly, the equation developed to express the relationship for low water years was $y = 7.6747x + 2889.7$ ($R^2=0.8851$). Catches in 2005 were unusually high and did not relate well to either group when modelled, perhaps due to gear saturation. In years of exceptionally high returns, both models are expected to produce an underestimate of run strength.

In 2010, EDI again conducted the Porcupine chum CPUE project and captured 180 chum salmon between August 31 and September 25. EDI applied the high water model to the first 3 weeks of

the CPUE project and their low water model to the fourth week. The combined models yielded a preliminary chum salmon passage index estimate of 25,032[14]. Assuming a Fishing Branch contribution of 65%, based on project data from previous years, this indicated an expected return of 16,271 chum salmon at the Fishing Branch weir for the corresponding period. Allowing for a travel time of 13 days from the CPUE capture site to the Fishing Branch weir, the corresponding weir cumulative, including 602 adjustment to the count for fish passage prior to weir installation, was 14,164. However, approximately 5,000 chum salmon had arrived at the weir in the period prior to 13 days after the start of the CPUE project. EDI will submit a report to the Panel with the final results and analysis of the 2010 CPUE project.

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

7.2.8.1 Chinook Salmon

Genetic stock identification of the 2010 Chinook salmon migration bound for Canada was developed using genetic samples collected from the Eagle sonar test drift gillnet program. Variation of 16 microsatellite loci was surveyed for 467 Chinook salmon from the Eagle test drift gillnet program.

The populations and regional reporting groups for Chinook salmon are presented in Table 6. The estimated stock composition and the associated standard errors for the period from early July to August 16, 2010 are presented in Table 7. The estimated relative abundance by period is presented in Table 8 and Figure 9.

Table 6.–Baseline comprised of 24 stocks used to estimate stock compositions of Chinook salmon collected at the Eagle sonar test drift gillnet program, 2010.

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 Kalzas, Earn, Glenlyon, Hoole 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

For Chinook salmon, based on the composition estimates for the 8 regional reporting groups (stock aggregates) for specific time periods as summarized in Table 9 and the final corresponding sonar estimates, the estimated contributions of the stock aggregates to the total 2010 Eagle sonar estimate were as follows: Carmacks Area Tributaries (17.7%); Teslin River (21.3%); Pelly River (12.9%); Mid-mainstem Tributaries (22.2%); Stewart River (7.6%); North Yukon Tributaries (5.6%); White River (5.5%); and Upper Yukon River tributaries (7.2%).

[14] Based on Interim report for R&E project CRE 27-10 and personal communication from Ben Snow.

The estimated abundance for the 3 sample periods (i.e. to July 4-24, July 25–31 and Aug 1–21) presented in Table 10 and Figure 9 were derived from the analysis of individual genetic samples, pooled into these sample periods and multiplied by the final abundance estimates from the Eagle sonar program corresponding to these periods.

Table 7.–Estimated percentage stock composition of Chinook salmon migrating past the Eagle sonar site in 2010 by time period. Stock compositions were estimated using 15 microsatellite loci outlined in Table 7. The standard error (SE) of the estimates is also provided.

	July 4-24		July 25-31		Aug 1-21		Season Aggregate
Region	n=132	SE	n=179	SE	n=156	SE	n=467
N.Yukon Tributaries	12.7	3.0	1.4	1.0	2.1	1.3	5.6
Mid-Mainstem	9.4	6.5	12.3	4.3	47.1	7.1	22.2
Carmacks Tributaries	14.0	4.3	15.6	3.8	24.0	5.6	17.7
White River	11.2	3.4	3.8	1.7	0.9	1.3	5.5
Stewart River	6.4	3.2	15.4	3.8	0.6	1.1	7.6
Pelly River	20.5	4.4	11.3	3.1	6.2	2.9	12.9
Upper Yukon Tributaries	3.3	1.9	10.5	2.5	8.0	2.4	7.2
Teslin River	22.4	5.9	29.6	5.1	11.0	5.9	21.3

Table 8.–Estimated relative abundance of Chinook salmon migrating past the Eagle sonar site in 2010.

	July 4-24	July 25-31	Aug 1-21	Season passage n=467
Region	n=132	n=179	N=156	(∑of periods)
North Yukon Tributaries	1,565	164	236	1,965
Mid-Mainstem	1,161	1,456	5,176	7,792
Carmacks Tributaries	1,724	1,843	2,632	6,200
White River	1,375	450	97	1,922
Stewart River	792	1,820	65	2,678
Pelly River	2,516	1,333	680	4,529
Upper Yukon Tributaries	402	1,242	877	2,521
Teslin River	2,752	3,501	1,213	7,467
TOTAL	12,288	11,809	10,977	35,074

7.2.8.2 Fall Chum Salmon

Genetic stock identification of the 2010 fall chum salmon migration bound for Canada was developed using genetic samples collected from the Eagle sonar test drift gillnet program. Variation of 14 microsatellite loci was surveyed for 337 fall chum salmon from the Eagle test drift gillnet program.

The populations and regional reporting groups for fall chum salmon are presented in Table 9. The estimated percentage stock compositions for the various sampling periods from July 31 to October 4 are presented in Table 10. The estimated abundance by period is presented in Table 11 and Figure 10.

An estimated 52.7% of the return that passed the sonar site to October 4 originated from the Mainstem Yukon River reporting group, which includes a number of mainstem Yukon River spawning populations, and 44.7% were from the White River aggregate (Table 10). The 2 remaining reporting groups contributing to the run were the Teslin River (0.7%) and the Yukon Early group, which is represented by the Chandindu River population (2.0%). The estimated abundance for the 3 sample periods (i.e. August 19–September 18, September 20–25, and September 26–October 04) presented in Table 11 and Figure 10 were derived from the analysis of genetic samples for each of these sample periods multiplied by the final abundance estimates from the Eagle sonar program corresponding to these periods.

The number of samples (n=336) available from the test fishery is limited; future analyses should involve a larger sample size and there should be an effort to lower the number of sample periods.

Table 9.–Baseline comprised of 9 stocks used to estimate stock compositions of fall chum salmon collected at the Eagle sonar test netting program, 2010.

Stock Aggregate Name	Populations 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

Table 10.–Estimated percentage composition of fall chum salmon migrating past the Eagle sonar site in 2010. Stock compositions were estimated using 14 microsatellite loci outlined in Table 9. Standard error of the estimates is also provided.

Period	July 31–Sept 11		Sept 12–Sept 20		Sept 21–Sept 29		Sept 30–Oct 4		Season
Sample Size	n=42		n=146		n=135		n=14		n=337
Region	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate
Yukon Early	17.8	7.5	0.1	0.5	0	0.2	0.2	0.7	2.0
White	54.8	7.8	53.6	4.4	38.8	4.4	32	11.7	44.6
Mainstem	27.3	8.6	46.2	4.4	60.4	4.5	65.4	12.5	52.7
Teslin	0.1	1.2	0.1	0.6	0.8	1.1	2.3	5.5	0.7
	100		100		100		100		100.0

Table 11.–Estimated relative abundance of fall chum salmon migrating past the Eagle sonar site in 2010 to October 4. Genetic sampling did not occur for the final 2 days of the sonar program (October 5–6) or during the October 7–18 period; an additional 11,692 fall chum salmon were estimated to have passed the sonar site during these periods for a season total of 132,930.

Period	July 31–Sept 11	Sept 12–20	Sept 21–29	Sept 30–Oct 4	Season= ∑of periods (percentage of run)
Sample Size	n=42	N=146	n=135	n=14	n=337
Yukon Early	2,284	40	0	26	2,350
White	7,031	21,538	21,541	4,070	54,180
Mainstem	3,503	18,564	33,533	8,314	63,0914
Teslin	13	40	444	297	794
Total	12,831	40,182	55,518	12,707	121,238

7.2.9 Yukon Education Program 2009–2010

Fisheries and Oceans Canada continues to support the Stream to Sea program, and make classroom salmon incubation available in all Yukon Schools when eggs are available. Sixteen Yukon schools in 8 Yukon communities participated in classroom incubation projects in the 2009–2010 school year. Chinook and chum salmon fry releases occurred between May 3 and June 4, 2010. Releases were approximately 50 fish from each school that participated.

Six Whitehorse area classes reared Fox Creek project fry from Whitehorse Fishway Chinook salmon eggs collected in fall 2009. DFO injected elastomer to mark these fry released into Fox Creek between May 4 and June 4, 2010. This marking is to ensure ongoing studies of Fox Creek juveniles can distinguish school released fry from the annual Ta'an Kwachan First Nation transplant releases. Two schools released fish back into Tatchun Creek. Four schools released chum salmon fry into the Kluane River. Four schools released Chinook salmon fry from Morley River. One Whitehorse school participated in field trip to Wolf Creek to carry out their studies on salmon habitat.

The classroom incubation program has not been available in the 2010–2011 school year due to an unexpected vacancy in the Educational Coordinator position at DFO. This position provides required guidance and supervision necessary for the incubation portion of DFO's Stream to Sea education program. DFO plans to provide technical support to schools interested in carrying out aquatic studies field trips in May and June 2011. These field trips may include releasing some fry from other incubation projects.

7.2.10 Chinook Salmon Habitat Investigations

7.2.10.1 Klondike River Groundwater Channels: Juvenile Chinook Salmon Utilization

Development of ground water channels is a primary method of salmon habitat enhancement/stock restoration in the U.S. Pacific Northwest and the Canadian Pacific Southwest. There has been a single project of this type in the Yukon River Canadian sub-basin. An intermittently flowing side channel downstream of the Mayo hydro-electrical dam was deepened to provide additional habitat during low flows. The regulated nature of the Mayo River

does not reflect natural flow regimes. Findings from the monitoring of this project may not be entirely transferable to areas with non-regulated rivers. Additionally, seasonal use of natural groundwater channels by juvenile Yukon River Chinook salmon has received little investigation. To address these concerns, studies were initiated by DFO Oceans, Habitat and Enhancement Branch (OHEB) Salmon Enhancement Program (SEP) staff. The results of these studies are currently being reviewed by DFO SEP staff.

A pilot study commenced in 2004 on 2 groundwater channels in the Klondike River watershed near Dawson City. The Germaine Creek Groundwater Channel (GCGC) flows into a seasonally abandoned channel of the Klondike River. The channel intercepts both hyporheic (subsurface flow influenced by surface flow) and regional groundwater. The Viceroy Groundwater Channel (VGC) intercepts predominantly hyporheic flows from the North Klondike River and returns them to the river downstream. Data loggers were deployed in each channel in July 2005 and have been downloaded annually.

The waters of the channels are cooler than adjacent surface waters in the summer. The difference is greatest at the groundwater discharge sites, and least in the lowest sections of the channels. As air temperatures decline in the autumn, the water in the groundwater channels becomes warmer than the adjacent surface waters. Sampling in 2005 implied that 0+ juvenile Chinook salmon entered these channels in July. They then moved slowly upstream in the channels during the summer and autumn. By early October they were present at the extreme upstream end of the channels.

Sampling has been conducted annually to determine juvenile salmon behavior under a range of environmental and supply conditions. In 2006 a beaver dam was constructed across the VGC near the confluence with the North Klondike River. No juvenile Chinook salmon were captured in the channel in 2007 or 2008, implying that the dam was a complete obstruction to upstream migration. The dam was breached in August 2009. No juvenile Chinook salmon were captured in sampling conducted in mid-September 2009. However, sampling in the Klondike River watershed indicated low numbers of fry, and the lack of captures may be related to supply rather than access. In 2010 the site was visited and the dam had still not been rebuilt to the extent juvenile migration was hindered. Many juvenile Chinook salmon were observed and caught in the channel from mid July to mid September indicating important use.

Volumes of flow in the GCGC continued to decline in 2009. A second kill of juvenile Chinook salmon and slimy sculpin was documented in the extreme upstream end of the channel in May 2009. Very few juvenile Chinook salmon were captured in the GCGC or in the Klondike mainstem during the open water period of 2009. It is probable that there were multiple causes for this, including the supply of juveniles resulting from the low 2008 spawning escapement. High flows in the Klondike following spawning in 2008, and the early and extreme breakup of the river in late April 2009 may also have negatively affected incubating and emerging Chinook salmon fry. Water temperatures continue to be monitored.

7.3 RESTORATION AND ENHANCEMENT FUND

7.3.1 Status of R&E Projects 2010

Project No.	Project Title	Contractor	Funding $US/Cdn[15]	TC[16]
CRE-06-10	Yukon River North Mainstem Stewardship	DDRRC[17]	24,144 CAD	S
Project completed. Final report is received and approved.				
CRE-07-10	2010 'First Fish' Youth Camp	THFN[18]	10,000 CAD	S
Project completed, final report approved and received.				
CRE-09-10	Tr'ondek Hwech'in Student Steward	THFN[19]	5,290 CAD	S
Project completed. Final report is submitted and under review.				
CRE-16-10	Klondike River Chinook Sonar	B. Mercer[19]	78,251 CAD	T
Project completed. Final report is pending.				
CRE-27-10	Porcupine River Chum CPUE Project	VGG[20]	41,210 CAD	T
Project completed. Final report is pending.				
CRE-29-10	Chum Spawning Ground Recoveries	SRRC[21]	24,000 CAD	T
Project completed. Final report is pending.				
CRE-37-10	Blind Creek Chinook Salmon Weir	J. Wilson[22]	48,008 CAD	T
Project completed. Final report is submitted and under review.				
CRE-41-10	Chinook Sonar Big Salmon River	J. Wilson[23]	83,950 CAD	T
Project completed. Final report is submitted and under review.				

[15] The values noted are those approved by the Panel - $US and $Cdn respectively; while * indicates an adjustment to the approved project budget, with the appropriate detail noted.

[16] Technical Contact T/ Trix Tanner (DFO), S/ Sean Collins (DFO); K/ Kathrine Howard (ADF&G).

[17] Dawson District Renewable Resource Council.

[18] Tr'ondek Hwech'in FN.

[19] B. Mercer and Associates.

[20] Vuntut Gwitchin Government.

[21] Selkirk Renewable Resource Council.

[22] J. Wilson & Associates.

CRE-51-10	Michie Ck. Salmon & Habitat Monitoring	KDFN[23]	39,630 CAD	T/S
Project completed. Final report is submitted and under review.				
CRE-54-10	Ta'an Kwach'an Council Community Steward	TKC[24]	46,000 CAD	S
Project completed. Final report is pending.				
CRE-63-10	Whitehorse Rapids Hatchery Coded W. Tagging	YFGA[25]	42,042 CAD	T
Project completed. Final report is received and approved.				
CRE-65-10	McIntyre Creek Salmon Incubation Project	NRI[26]	49,738 CAD	S
Project is in progress.				
CRE-67-10	Yukon Schools Fry Releases & Habitat Study	SKNS[27]	5,000 CAD	S
Project is in progress.				
CRE-78-10	Collection of DNA Baseline Samples	DFO[28]	30,000 CAD	T
Project completed. Final report is pending.				
CRE-79-10	Stock ID Microsatellite Var.-Chin & Chum	DFO[29]	22,000 CAD	T
Project completed. Final report is received and approved.				
CRE-112N-10	Selective Fisheries-Implementation	Jake Duncan	21,000 CAD	T
Project has been extended.				
CRE-113N-10	Miner River Chinook Index	VGG[21]	12,300 CAD	T
Project completed. Final report approved and received.				
CRE-114N-10	Porcupine River Sonar Feasibility	VGG[21]	33,869 CAD	T
Project completed. Final report approved and received.				

[23] Kwanlin Dun First Nation.
[24] Ta'an Kwach'an Council.
[25] Yukon Fish and Game Association.
[26] Northern Research Institute.
[27] Streamkeepers North Society.
[28] Fisheries and Oceans Canada- Whitehorse.
[29] Fisheries and Oceans Canada- Genetics Lab, Nanaimo B.C.

CRE-119N-10 Fraser Falls Chinook Passage Investigation Project completed. Final report approved and received.	FNNND[15]	10,000 CAD	T
CRE-125N-10 Teslin Salmon Management Plan Project is complete. Final report is pending.	TTC[16]	9,008 CAD	T
CRE-127N-10 TH & TKC Viable Fisheries Project completed. Final report is received and under review.	THFN[19]	20,000 CAD	T
CRE-128N-10 TKC Culture Camp Project Completed. Final report is pending.	TKC	4,600 CAD	S
CRE-129N-10 Chinook Public Info Display Project is postponed.	TTC	7,200 CAD	S
CRE-130N-10 NND Youth Stewardship Project was cancelled. De-commitment of full amount.	FNNND	5,290 CAD	S
CRE-132N-10 Yukon Fisheries Field Assistant Program Project completed. Final report received and approved.	YC[30]	77,860 CAD	S/T
CRE-133N-10 Fox Creek Chinook Incubation Survival Project is in progress.	NRI	2,890 CAD	S/T
CRE-134N-10 Chinook Monitoring Upstream of Whitehorse Project completed. Final report is received and approved.	NRI	2,000 CAD	S
CRE-136N-10 Radio Tower Retrieval Project extended to 2012.	DFO	38,885 CAD	T
CRE-137N-10 Chinook ASL Collection & Comparison Project completed. Final report is received and under review.	DFO	34,700 CAD	T

[30] Yukon College.

CRE-141N-10	LSCFN Traditional Habitat Knowledge Study	LSCFN[31]	53,000 CAD	S/T
Project is in progress.				
CRE-142N-10	McQuesten Sonar Pilot Project	FNNND	31,467 CAD	T
Project completed. Report approved and received.				
CRE-143N-10	Chinook Spawning Grounds Survey	G. Sandone[32]	23,779 CAD	T
Project completed. Final report is received and under review.				
URE-04-10	Ruby Salmon Data Collection	Ruby Tribal Council	9,363 US	K
Project completed. Final report is pending.				
URE-08-10	Tech Assist, Dev & Support-Fish Wheel Video	USFWS[33]	5,500 US	K
Project completed. Final report is received and approved.				
URE-09-10	Rampart-Rapids Full Season Video Monitoring	Stan Zuray	46,100 US	K
Project completed. Final report received and approved.				
URE-13-10	Ichthyophonus Sampling- Emmonak & Eagle	L. Dehn[34]	50,395 US	K
Project completed. Final report is pending.				
URE-16-10	Eagle Sonar operations	ADF&G	135,757 US	K
Project completed. Final report is pending.				
URE-19N-10	In-Season Chin Stock ID Pilot	ADF&G	35,000 US	K
Project completed. Final report is pending.				
URE-22N-10	Mountain Village Coop Chin Drift Test Fishery	YDFDA[35]	20,100 US	K
Project completed. Final report is received and approved.				

[31] Little Salmon Carmacks First Nation.
[32] Gene Sandone Consulting.
[33] U.S. Fish and Wildlife Service.
[34] University of Alaska.
[35] Yukon Drainage Fisheries Development Association.

URE-23-10	Stock Comp Age 0 Chin Non-Natal Streams	USFWS	30,500 US	K

Project completed. Final report is pending.

URE-25N-10	Temp Monitoring Select YT R Tributaries	ADF&G	5,700 US	K

Project completed. Final report is pending.

Communications Committee Projects

CC-01-09 YRDFA Teleconference	YRDFA[36]	10,000

Project completed. Final report approved and received.

CC-02-09 YRDFA Educational Exchange	YRDFA[37]	30,000

Project is in progress.

CRE-140N-10 Yukon Biodiversity Working Group	YC[31]	6,000
CRE-126N-10 Whse Rapids Fishladder's Salmon Art	YEC[37]	5,200

8.0 YUKON RIVER SALMON RUN OUTLOOKS 2011

8.1 CHINOOK SALMON

8.1.1 Canadian-Origin Upper Yukon Chinook Salmon

The Canadian-origin upper Yukon River Chinook salmon spawning escapements in 2005 and 2006, the brood years producing the age-6 and age-5 fish returning in 2011, were above average at 68,551 and 62,933, respectively. However, the 2011 run of Canadian-origin upper Yukon River Chinook salmon is expected to be poor to below average; the average run size for the 2001–2010 period was 98,175.

Stock-recruitment (S/R) and sibling models suggest that the 2011 total run size of Canadian-origin Chinook salmon may be as high as 108,000[38]. However, this does not include the uncertainty associated with lower productivity observed in recent years. Observed returns have been lower than the preseason outlooks. For example, over the past 3 years, observed returns were approximately 32% lower than preseason outlooks developed with a stock-recruitment (S/R) model and 36% lower than preseason outlooks developed with a sibling model. It is important to note that neither model incorporates environmental variables such as oceanic or freshwater conditions.

The 2011 outlook has been adjusted to reflect the likelihood that low productivity may decrease the potential return based on the relative performance of the preseason run outlooks to actual run

[36] Yukon River Drainage Fisheries Association.

[37] Yukon Energy Corporation.

[38] This represents a rounded average (to nearest 1,000) of the two model estimates. The S/R unadjusted estimate for Canadian-origin Chinook salmon in 2011 is 102,831 while the sibling model yields an estimate of 113,239 fish. In recent years these estimates have been adjusted to account for what may be a short-lived lower productivity period, which is not inherent in the models.

sizes over the past 43 years; during this period, preseason run outlooks based on historical models have over-estimated the actual run size. The 2011 outlook has been adjusted to a range of 65,000 to 89,000[39]. These outlooks suggest that the 2011 Canadian-origin upper Yukon River Chinook salmon run may be a poor to below average run.

8.1.1.1 Development of Revised Canadian-origin Chinook Salmon Database

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

JTC members are pursuing further statistical analysis of mark–recapture project data to improve historic run size estimates.

8.1.1.2 Performance of Stock-Recruitment Models for the Years 2001–2010

The performance of run outlooks developed using S/R and sibling models for the 2001–2010 period is presented in Table 12. Revised historical Canadian run size estimates were used to reconstruct the 2000 and 2001 runs; border passage estimates for the 2002–2004 period were based on radiotelemetry estimates while border escapement estimates for the 2005–2010 period were based on Eagle sonar. 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. In Table 11, the average of the preseason outlooks derived using Ricker and sibling model projections is compared to postseason estimates of run size. The averaged model projection for 2011 is 108,100. Despite good brood year escapements, the observed run sizes were relatively low from 2000 to 2002 and from 2007 to 2010. The causes of low returns are unknown but likely involve a number of factors in the marine and/or freshwater environments. It will be important to determine if the low run sizes observed in the 2007 to 2010 period develop into a long-term trend.

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

Table 12.–Preseason upper Yukon River Chinook salmon outlooks for 2001 to 2011 and the observed run sizes for the 2000 to 2010 period. Run sizes incorporated: radiotelemetry data (2002–2004); Eagle Sonar estimates (2005–2010); and the relationship between telemetry/sonar to aerial surveys for 2000 and 2001. The average of the preseason S/R and sibling run sizes, and the postseason run sizes are rounded to nearest thousand.

Year	Expected Run Size S/R (Preseason)	Expected Run Size Sibling (Preseason)	Expected Run Size Avg. (S/R & Sib.) (Preseason)	Estimated Run Size (Postseason)	Performance of Preseason Outlooks
2000	127784	85,889	107,000	53,000	2.01
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	66,000	1.77
2009	98,172	103541	101,000	86,000	1.17
2010	109,797	116346	113,000	63,000	1.79
2011	102,831	113,323	108,000		
Avg. (2000–2010)	116,767	109,238	113,000	94,000	1.20

Example: the 2008 outlook of 117,000 overestimated the run size by a factor of 1.77; the preseason outlook was size 77% above the actual run.

8.1.2 Drainagewide Chinook Salmon

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%. Using this method, the expected total Yukon River run size is 216,200[40], using the unadjusted model estimate. As previously mentioned, there is a lot of uncertainty associated with this methodology and, due to apparent reductions in productivity in recent years, environmental factors and other phenomena not incorporated into the models, this estimate is unlikely. The drainage-wide run outlook based on the adjusted Canadian-origin model estimate, which attempts to account for low productivity since 2007, is 130,000–178,000 Chinook salmon. Thus, the 2011 Yukon River Chinook salmon run will likely be below average to poor.

Currently, the Yukon River Drainage Fisheries Association (YRDFA) is facilitating an in person meeting in April to provide managers, fishermen, tribal council representatives, and other stakeholders the opportunity to share information, provide input, and discuss management options. The purpose of this meeting is to work cooperatively to identify options and practical management strategies for 2011 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 2007–2010.

[40] Based on the averaged value for both sibling and Ricker models. Values for each model separately are 205,500 and 224,000 for Ricker and sibling models respectively.

8.2 SUMMER CHUM SALMON

The strength of the summer chum salmon run in 2011 will be dependent on production from the 2007 (age-4 fish) and 2006 (age-5-fish) escapements, as these age classes generally dominate the run. The total run during 2006 and 2007 was approximately 4.0 and 2.0 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, and it is expected that the total run in the Yukon River will be similar to the 2010 run of approximately 1.6 million fish. The high seas Bering Arctic Subarctic Integrated Surveys (BASIS) study indicated a decline in chum salmon in 2004 and 2005, but 2006 and 2007 results showed an increase (Figure 13). No BASIS survey was conducted in 2008. Chum salmon collected in the BASIS study in 2007 would correspond to the age-5 returns in 2011. A collaborative effort between ADF&G and NOAA is in progress to test the applicability of BASIS juvenile salmon indices for run size forecasting.

The 2011 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 8 years (2003–2010). If inseason indicators of run strength suggest sufficient abundance exists to allow for a commercial fishery, the commercially harvestable surplus in Alaska could range from 300,000 to 600,000 summer chum salmon. The actual commercial harvest of summer chum salmon in 2011 will likely be affected by a potentially poor Chinook salmon run, as Chinook salmon are incidentally harvested in chum salmon-directed fisheries.

8.3 FALL CHUM SALMON

8.3.1 Drainagewide Fall Chum Salmon

Yukon River drainagewide estimated escapements of fall chum salmon for the period 1974 through 2004 have ranged from approximately 180,000 (1982) to 1,500,000 (1975), based on expansion of escapement assessments for selected stocks to approximate overall abundance (Eggers 2001). Escapements in these years resulted in subsequent returns that ranged in size from approximately 311,000 (1996 production) to 3,000,000 (2001 production) fish, using the same approach of approximating overall escapement. Corresponding return per spawner rates ranged from 0.3 to 9.0, averaging 2.0 for all years combined (1974–2004).

A considerable amount of uncertainty has been associated with these run projections particularly in recent years because of unexpected run failures (1998 to 2002) followed by a 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 as a result of low levels of parental escapement. Similarly, the recent improvements in productivity may be attributed to the marine environment. Projections 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 (Table 13). 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 2008-2010 used 1984 to current year odd/even maturity schedules to represent years of lower production.

Table 13.–Preseason drainagewide fall chum salmon outlooks and observed run sizes for the Yukon River, 1998–2010.

Year	Expected Run Size (Preseason)	Estimated Run Size (Postseason)	Proportion of Expected Run
1998	880,000	334,000	0.38
1999	1,197,000	420,000	0.35
2000	1,137,000	239,000	0.21
2001	962,000	383,000	0.40
2002	646,000	425,000	0.66
2003	647,000	775,000	1.20
2004	672,000	614,000	0.92
2005	776,000	2,325,000	3.00
2006	1,211,000	1,144,000	0.94
2007	1,106,000	1,098,000	0.99
2008	1,057,000	760,000	0.72
2009	791,000	561,000	0.71
2010	690,000	484,000	0.70
Avg. (1998-2010)	905,538	735,538	0.86

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 A18). The 2011 run will be comprised of parent years 2005 to 2008 (Table 14). Estimates of returns per spawner (R/S) based on brood year return were used to estimate production for 2005 and 2006. An auto-regressive Ricker spawner-recruit model was used to predict returns from 2007 and 2008. The point projections in 2011 will use the 1984 to the current complete brood year returns applied to the odd/even maturity schedule, because current production is reduced from the pre-1984 level. The result is an estimate of 737,000 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 2010. Therefore, the 2011 run size projection is expressed as a range from 605,000 to 870,000 fall chum salmon. This projected run size is below average for odd-numbered year returns.

Table 14.–Projected 2010 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, 2005–2008.

Brood Year	Escapement	Estimated production (R/S)	Estimated Production	Contribution based on age	Current Return
2005	1,996,513	0.23	459,198	0.7%	4,814
2006	873,987	0.63	550,612	25.2%	185,871
2007	928,430	0.83	770,612	72,5%	534,093
2008	564,482	1.42	799,421	1.6%	11,857
Total expected run (unadjusted)					736,635
Total 2011 run size expressed as a range based on the forecasted vs. observed returns from 1987 to 2010 (80% CI):					605,000 to 870,000

The contributing parent year escapements from 2005 through 2007 all exceeded the upper end of the drainagewide escapement goal range while 2008 was within the drainagewide escapement goal range of 300,000 to 600,000 fall chum salmon. The 2005 through 2007 parent year's all contributed less than one return per spawner. The estimated return per spawner of 0.23 for the 2005 brood year was the worst on record. The 2006 return per spawner was nearly three times that of 2005 but still considered poor. The major contributor to the 2011 fall chum salmon run is anticipated to be age-4 fish returning from 2007 parent year (Appendix A18). In 2010 there was a good showing of age-3 fish from the 2007 brood year which may indicate an improved return per spawner and an upward trend in run sizes if the age-4 fish returning in 2011 are also above average. The northern Bering Sea shelf juvenile chum salmon index indicated declines in 2004 and 2005, followed by increases in 2006 and 2007 (Figure 13). Juvenile year 2008 was unmonitored and 2009 appeared to be similar to 2007 in abundance; 2010, although preliminary, may be more similar to 2006. At this time it is unknown if this measure of abundance correlates with future returns.

Typically the sibling relationship between the age-3 to age-4 fish (R^2=0.48) is slightly better than the age-4 to age-5 fish (R^2=0.40). Brood year returns of age-3 fish range from zero to 150,000 chum salmon. The age-3 components are not typically good indicators of future production levels, but nonetheless it was encouraging that the 2010 run was the sixth highest (70,000) on record (n=34) and second highest in the last 30 years with the most recent highest occurring in 2001 (136,000). Returns of age-4 fish from odd-numbered brood years during the time period 1974 to 2004 typically averaged 826,000 chum salmon, and ranged from a low of 245,000 for brood year 1997 to a high of 2,157,000 for brood year 2001. Return of age-5 fish from odd-numbered brood years during the time period 1974 to 2004 typically averaged 258,000 chum salmon, and ranged from a low of 61,000 for brood year 1975 to a high of 676,000 for brood year 2001. For fall chum salmon, the sibling relationship is best between the age-5 to age-6 component (R^2=0.63).

There is uncertainty as to how well returns from large escapements (>700,000) produce since 6 out of 7 failed to yield replacement values. Even in these years, production varied widely; age-4 fish comprised 88% of the run in 1979 but only 64% in 1999 from the exceptionally strong parent years of 1975 and 1995, respectively. Age-4 fish returning in 2009 only represented 67% of the return produced off of the large escapements in 2005 indicating poor survival. The most recent high production levels at 2.0 return/spawner (average R/S 1998 to 2003 excluding 2001) are well above the poor returns observed in 1994–1997 (average 0.49 R/S). Production in 2005 was at a record low of 0.23 R/S however, 2006 more than doubled the R/S.

The other method that was also reviewed to determine 2011 run-projection used a time lagged correlation from observed runs (2000–2010, excluding 2005), which resulted in a projection of only 536,000 fall chum salmon with a 95% confidence interval of 300,000 to 700,000 fish. This method effectively reduces the projections by 30%. Since the last 3 years projections have overestimated the run size by approximately that amount, the concern is that this method also assumes the stock is still in decline. With the amount of age-3 fish observed in 2010, the age-4 component would be expected to increase in 2011 and the run size should be closer to the projection of 700,000 fall chum salmon.

During the 2011 fishing season, strength of the run will be adjusted using the abundance of summer chum salmon run as a precursor of the fall chum salmon run, along with additional inseason monitoring projects that are used to determine appropriate management actions and

levels of harvest based on stipulations in the Alaska Yukon River Drainage Fall Chum Salmon Management Plan (Appendix A6). With a projected run size range from 605,000 to 870,000 fall chum salmon, it is anticipated that escapement goals would be met while supporting normal subsistence fishing activities. Based on the preseason outlook the commercial harvest would be between 50,000 and 300,000 fall chum salmon. However, commercial harvestable surpluses will have to be determined inseason and opportunity provided where commercial ventures exist.

Commercial harvestable surpluses will have to be determined inseason and the run is expected to provide limited commercial ventures where markets exist.

8.3.2 Canadian-Origin Upper Yukon River Fall Chum Salmon

The outlook for the 2011 upper Yukon River fall chum salmon run is for a below average to average run of 151,000 to 217,500 fish. The average upper Yukon River fall chum salmon run size for the 1998–2010 period was approximately 202,000 fish.

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. 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 is the highest observed within the 1982 to 2010 period, while the 2006 and 2007 escapements are the fourth and third highest observed, respectively (Table 15). 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 following table shows the brood year escapements which will contribute to the 2011 run. The average (for all years) proportional contribution of each age class to the total returns from a brood year is estimated at 62% age-4 and 35.8% age-5 fish.

Table 15.–Summary of upper Yukon fall chum salmon brood year spawning escapements for the 2004–2007 period and the average even-year contribution for age-3 to age-6 fish returning in 2010.

Brood Year	Escapement	Age	Estimated age proportion contributing to 2011 run
2005	437,498	6	1.2%
2006	211,994	5	35.8.0%
2007	254,649	4	62.0%
2008	174,267	3	1.5%

The base level spawning escapement for the 2011 run is approximately 240,000 fish; this is the weighted average (weighted by the average age composition) of the brood year production (Appendix A19). The potential 2011 preseason outlook was developed using two approaches.

1. Based on the S/R model for upper Yukon stocks which incorporated 1982–2005 data, the expected run size is approximately 151,700 fish. This estimate when multiplied by 1.05, the factor by which the S/R model underestimated the 2010 run, yields an outlook of 160,000 Upper Yukon fall chum salmon. A run size of this magnitude would be less than replacement but is consistent with the preliminary returns for the 2005 BY as observed in the age-4 return, and the return in 2010. Eagle 2010 test fishery data will lead to further modifications to this model.

2. The ADF&G drainage wide outlook range of 605,000 to 870,000 fall chum salmon was used to develop an upper Yukon fall chum salmon outlook due to the considerable uncertainty associated with the potential total return from the 2005 escapement. The analyses undertaken to develop the drainagewide outlook range is outlined in Section 8.3.1. 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. The JTC reported average for just the upper Canadian mainstem contribution (excluding Fishing Branch River) from 2004 to 2009 was 25%, with a range of 20 to 30%, and preliminary analysis of the 2010 run indicates that the Canadian contribution was closer to 35%. For the purpose of developing a 2010 outlook, it was assumed that the Upper Yukon Canadian-origin component is likely to be at least 25% of the drainagewide return while the Fishing Branch River component will be approximately 5% of the drainagewide return. Based upon the ADF&G drainagewide outlook range of 605,000 to 870,000 and an assumed 25% contribution, the upper Yukon outlook range is 151,000 to 217,500 fall chum salmon.

Given the uncertainty associated with the 2011 Upper Yukon fall chum salmon return, it is prudent to enter the 2011 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. In Canada, a decision matrix will be developed within the Integrated Fisheries Management Plan (IFMP) to provide detailed guidance for specific inseason run abundance levels.

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. A summary of preseason outlooks, postseason run size estimates and the proportion of the expected run size observed for the 1998 to 2010 period are presented in Table 16.

Table 16.–Preseason upper Yukon River fall chum salmon outlooks for 1998 to 2011 and observed run sizes for the 1998–2010 period. Run sizes are rounded to nearest one thousand. The 2009 through 2011 outlooks are the average of an outlook range.

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	160,000		
Avg. (1998-2010)	197,667	201,750	1.84

Example: the 1998 outlook of 198,000 overestimated the run size by a factor of 2.83; the preseason outlook was 183% above the actual run size.

8.3.3 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 year 2000 when the count through the Fishing Branch River weir was only 5,057[41] fish, the lowest recorded escapement for the system. However, run sizes improved somewhat within the 2001–2009 period when weir counts ranged from a low of 13,600 in 2002 to a high of 119,058 in 2005. 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.

Table 17 shows the brood year escapements which will contribute to the 2011 run and the age of fish returning in 2011 from each contributing brood year. The average age composition of offspring produced is 62.1% age-4 fish and 34.8% age-5 fish.

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

Table 17.–Summary of Fishing Branch River fall chum salmon brood year spawning escapements contributing to 2011 returns for the 2005–2008 period and the average (all years) age composition of offspring produced.

Brood Year	Escapement	Age	Avg. age proportion
2005	119,058	6	1.6%
2006	30,954	5	34.8%
2007	32,150	4	62.1%
2008	19,086	3	1.4%

The weighted average (by age) base level escapement for the 2011 Fishing Branch River fall chum salmon run is approximately 33,000 fish. For many years the preseason outlook for the Fishing Branch River fall chum salmon was based on an assumed return/spawner rate of 2.5. Based upon the low returns observed in the 2010 run which indicates poor production from the 2006 BY escapement of 30,954 chum salmon, a return/spawner value of 2.5 is unlikely.

The 2010 Fishing Branch River preseason outlook range was 28,000 to 41,000 chum salmon while the preliminary estimated reconstructed run was approximately 20,000 fish. The spawning escapement goal of 22,000–49,000 to the Fishing Branch River weir was not achieved; the post season estimate of the spawning escapement was 15,773.

The 2011 Fishing Branch River outlook range is from 30,250 to 43,500. This is based on the ADF&G drainagewide outlook range of 605,000 to 870,000 and an assumption that approximately 5% of the drainagewide outlook will be Fishing Branch River fall chum salmon. Preliminary stock recruitment analysis supports the upper end of this outlook range. Fishing Branch weir escapement alone, which does not include the component of the Fishing Branch run harvested during migration, has accounted for an average of 4% of the total Yukon fall chum salmon run since 1995. This percentage does not include Porcupine chum spawning in other Canadian tributaries. While analysis of genetic sampling taken in the Lower Yukon Test Fishery after July 19 between 2004 and 2010 produced an underestimation of the contribution of Porcupine stock to the total Yukon River fall chum salmon run, estimates may have been more accurate in 2010. Sampling indicated that approximately 26,000 of the 400,000 chum estimated to have passed the fishery during sampling between July 19 and September 7 were bound for the Canadian Porcupine River, and earlier sampling indicated that an additional 7,500 Porcupine fall chum salmon may have migrated past the fishery prior to July 19.

The 2011 outlook range is the estimated number of chum salmon entering the mouth of the Yukon River bound for the Fishing Branch River; hence, the number of fish reaching the Fishing Branch River weir will be reduced by any catches in U.S. and Canadian fisheries prior to the fish reaching the weir. It has been difficult to accurately estimate the U.S. harvest rate (and catch) of Porcupine stocks, although genetic mixed stock analyses may improve this situation in the future. However, the 2011 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 limited harvest that the projected 2011 Fishing Branch chum salmon run could sustain and that the Fishing Branch runs have been lower than preseason projections for the past 5 years, it is prudent to enter the 2011 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. In Canada, a decision matrix will be developed within the Integrated

Fisheries Management Plan (IFMP) to provide detailed guidance for specific inseason run abundance levels.

As was observed with the Upper Yukon River fall chum salmon stocks, the postseason estimates of the Porcupine[42] River fall chum salmon run sizes were consistently below preseason outlooks throughout the 1998–2002 period (Table 18). Canadian postseason estimates of the Porcupine drainage fall chum salmon return consistently exceeded preseason outlooks from 2003 to 2005 while the 2006–2010 postseason estimates were lower than the preseason estimates.

Table 18.–Preseason Porcupine River fall chum salmon outlooks for 1998 to 2011 and observed run sizes for the 1998–2010 period. Run sizes are rounded to nearest one thousand. The 2009 through 2011 outlooks are the average of an outlook range.

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		
Avg. (1998-2010)	72,000	44,000	2.82

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.

8.4 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-4 fish and overlap in run timing with fall chum salmon. The major contributor to the 2011 coho salmon run will be the age-4 fish returning from the 2007 parent year. Based on run reconstruction using Pilot Station sonar estimates, the 2007 passage estimate of 173,000 coho salmon is above average (148,000). The

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

commercial harvest in 2007 was the fourth highest since 1991, and the majority of the harvest occurred in the Lower Yukon Area while harvests in the Upper Yukon Area were below 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 15,000 fish in 2007 was near the upper end of the Sustainable Escapement Goal (SEG) range of 5,200 to 17,000 coho salmon. DCR escapement has increased since 1972, with substantial increases between 2001 and 2005, a time when fishing effort in river was low. During the most recent years, DCR escapement estimates have been fluctuating within the goal. Coho salmon escapements in the Nenana River complex were nearly average. Assuming average survival, the 2011 coho salmon run, is anticipated to be average based on escapements observed in 2007.

The Alaska *Yukon River Coho Salmon Management Plan* allows a directed commercial coho salmon fishery, but only under specific conditions. Directed coho salmon fishing is dependent on the assessed levels in the return of both coho and fall chum salmon, since they migrate together.

8.5 Spawning Escapement Target Options in 2011: Canadian Origin Chinook and Fall Chum Salmon

8.5.1 Upper Yukon River Chinook Salmon

Cooperative Canada/U.S. management of Canadian-origin Yukon River Chinook salmon was based on an agreed escapement goal range for rebuilt stocks of 33,000 to 43,000 fish for many years (Appendix A20). This goal was developed from, and was subsequently monitored by a mark–recapture program located just upstream of the international border on the Yukon River. Since 2005, the Parties have developed a new and improved technique, the Eagle sonar program, to assess the abundance of salmon migrating into Canada. Estimates derived from the mark–recapture program were consistently lower than those produced from the sonar program. Based on the disparity between the mark–recapture and sonar estimates of Canadian border passage, it was inappropriate to continue to apply the longstanding escapement goal based on mark–recapture to escapement estimates derived from the sonar program.

The JTC recommended using the Eagle sonar project in 2008 as the primary assessment tool for the border passage estimate and reviewed the best approach to transition from the mark–recapture based escapement goal to a new goal based on and assessed by the sonar program. Considerable analyses were conducted to construct a new database of stock and recruitment information that was not solely based on mark–recapture estimates. These have included examining the relationships between aerial survey indices (three scenarios: 3-area index; 4-area index; and a single index) and independent border passage estimates (two scenarios: Eagle sonar passage estimates; and passage estimates derived from a radiotelemetry program). A JTC working group reviewed extensive analyses undertaken by Gene Sandone and after thorough discussion at the March 2008 JTC meeting, made proposals to the JTC as a whole.

The JTC discussed recommendations provided by the Chinook Salmon Escapement Goal working group for a minimum Interim Management Escapement Goal (IMEG) in 2008. Although working group members could justify IMEG targets ranging from 45,000 to 50,000, consensus was eventually achieved. The JTC recommended that the Yukon River Panel adopt an IMEG of >45,000 Canadian-origin Yukon River Chinook salmon for 2008, to be 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.

In 2010, the JTC recommended that the IMEG be established as a range to allow for the uncertainty of information from assessment projects. The JTC reached consensus for an upper bound of 55,000, and agreed to adopt the lower bound of 42,500 after discussion with the Yukon River Panel. The JTC recommended retaining this IMEG range in 2011. The Chinook Salmon Escapement Goal working group will continue to examine other data that may be used in recommending a revised escapement goal for future years. Ongoing analysis includes the use of a habitat capacity approach, which may be useful in improving other analyses.

8.5.2 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 A20). This goal was achieved 15 times within the 28 year period from 1982–2010. The DFO fall chum salmon mark–recapture program was conducted from 1982 to 2008[43] while the joint U.S./Canada Eagle sonar program was conducted from 2006 to 2009. The mark–recapture estimates generally agreed with the Eagle sonar estimates within the 2006–2008 period when the two programs were conducted concurrently. The JTC recommended using the Eagle sonar project as the primary assessment tool for the Canadian border passage estimate starting in 2008.

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.

For 2010, the JTC recommended that the upper Yukon fall chum salmon escapement goal be established as a range from 70,000 to 104,000. This range was developed as 0.8 to 1.2 times the estimated spawners at maximum sustained yield (86,600) which was derived from data that included the 2009 returns from the exceptional 2005 spawning escapement of 477,498.

For 2011 the Interim Management Escapement Goal (IMEG) of 70,000 to 104,000 was maintained until further analysis can be conducted (Appendix A20). The JTC Escapement Goal Working Group will continue to examine other data that may be used in recommending a revised escapement goal for future years.

8.5.3 Fishing Branch River Fall Chum Salmon

The escapement goal specified within the Yukon River Salmon Agreement is a range of 50,000 to 120,000 fall chum salmon to the Fishing Branch River. This goal has been achieved only 10 times since 1974, and only 5 times since 1985 when the weir program went back into operation. The Fishing Branch escapement goal was reviewed in 2001 and after considerable analysis of the available data a recommendation was made for a biological escapement goal (BEG) of 27,000 to 56,000 fall chum salmon (Eggers 2001). However, due to concerns over the quality of the data

[43] Mark–recapture estimates were used to determine border passage and spawning escapement estimates from 1982 to 2007.

and analytical issues, the BEG recommendation was not accepted during a Pacific Scientific Advice Review Committee (PSARC) review.

The inability to reach the 50,000–120,000 goal, particularly when considering the goal was achieved once over the two fall chum salmon 4-year-cycles preceding 2008 when escapements to the upper Yukon River in Canada were rebuilding, led the JTC to question whether the lack of success was more related to an unrealistically high goal rather than other factors. As a result, a JTC Escapement Goal Working Group revisited the goal and attempted to address some of the issues raised during the PSARC review of the 2001 recommendation (Eggers 2001) which ultimately led to its rejection. Although there are some approaches that can improve data quality and analysis of a BEG, the working group recommended postponing this analysis until the returns from the recent high escapement of 119,058 fall chum salmon in 2005 were documented.

For the 2008–2010 period, the JTC recommended an Interim Management Escapement Goal (IMEG) range of 22,000 to 49,000 Fishing Branch River fall chum salmon. This recommendation is based on the Bue and Hasbrouck (*Unpublished*) method of determining a Sustainable Escapement Goal (SEG) and has been used in Alaska. The Fishing Branch River SEG analyses incorporated weir counts from 1985 to 2007 (22 years; excluding 1990) and the contrast in these escapements, i.e., the ratio of the highest to lowest count (24:1). The escapement goal range reflects the approximated 25 and 75 percentiles of the 22 years of weir counts. The JTC recommends maintaining the IMEG for an additional 3 years (2011–2013) before the next review (Appendix 20).

The SEG range encompasses the escapement levels that preliminary analysis of the stock recruitment information indicates will produce maximum returns and maximum sustainable yield, 22,188 and 39,400 respectively. However, while weir counts provide good estimates of spawning escapement, the stock specific harvest data necessary for robust stock recruitment estimates is lacking, lending a high degree of uncertainty to the current estimates.

9.0 STATUS OF ESCAPEMENT GOALS

ADF&G undertakes a triennial review of salmon escapement goals in preparation for its triennial Board of Fisheries (BOF) meeting. Chinook, summer chum, and fall chum salmon were reviewed for the 2010 BOF cycle. This review is governed by the state's Policy for the Management of Sustainable Salmon Fisheries (5AAC 39.222) and Policy for Statewide Salmon Escapement Goals (5AAC 39.223) adopted in 2001. Under these policies ADF&G sets either a biological escapement goal (BEG) or a sustainable escapement goal (SEG) (ADF&G 2004; Brannian et al. 2006). A BEG refers to a level of escapement that provides the highest potential to produce maximum sustainable yield. An SEG identifies a level of escapement known to provide for sustainable yield over a 5 to 10 year period.

Most Arctic-Yukon-Kuskokwim (AYK) Region escapement goals were originally set in the late 1970s or early 1980s. These goals were first documented by Buklis (1993) as required under ADF&G's original escapement goal policy signed in 1992. Changes to these goals were adopted in 2001 when BEGs were set for Yukon River fall chum salmon (Eggers 2001), Anvik River summer chum salmon (Clark and Sandone 2001), and Andreafsky River summer chum salmon (Clark 2001). These 2001 goals were adopted prior to passage of the policies, but were consistent with the policies.

Beginning in December of 2002, ADF&G undertook the first full review of its escapement goals following the adoption of the policies. An escapement goal review team, consisting of staff from the Divisions of Sport Fish and Commercial Fisheries, met 5 times over a 14-month period. Federal agency biologists and representatives of Tribal and fishing groups attended and participated in the meetings. The team's recommendations were presented to the Alaska Board of Fisheries in January 2004 and formally adopted by ADF&G in 2005. During this review, analyses for escapement goals established in 2001 were updated with the latest information and most goals were brought into compliance with the policies by making them ranges, rather than point goals. Because of the thorough review of escapement goals in 2001 and 2004 and only a couple of years of additional data collected, no changes to escapement goals were recommended for the February 2007 BOF meeting.

In preparation for the January 2010 Alaska Board of Fisheries meeting, ADF&G completed another review process for escapement goals. Formal meetings, open to agencies and the public, were held in October and December of 2008. Draft analyses were distributed to the public for review and comment in March 2009. A final document summarizing the escapement goal review was submitted in December 2009 (Volk et al. 2009). Three escapement goals were revised and two escapement goals were discontinued in the Yukon Management Area.

9.1 CHINOOK SALMON

Five Chinook salmon aerial survey goals were converted to escapement goal ranges and formally adopted in 2005, using the method devised by Bue and Hasbrouck (*Unpublished*). In the case of Nulato River, the goals for the two forks were combined into a single goal (Table 19). The escapement goal review team later recommended revision of the Chinook salmon SEG for the East Fork Andreafsky River from an aerial survey-based goal to a weir-based goal in 2010 (Volk et al. 2009). The new SEG is 2,100-4,900 Chinook salmon and was derived using the percentile approach (Bue and Hasbrouck *Unpublished*). The 2010 team recommended elimination of the Gisasa River aerial survey goal for Chinook salmon because, based on comparisons with recent weir counts, aerial surveys do not appear to track true abundance (Volk et al. 2009). All other existing goals continued without revision.

Table 19.–List of current BEGs and SEGs for Yukon River Chinook salmon.

Stream (Project Type)	Current Goal	Type of Goal
East Fork Andreafsky River (Weir)	2,100–4,900	SEG
West Fork Andreafsky River (Aerial)	640–1,600	SEG
Anvik River Index (Aerial)	1,100–1,700	SEG
Nulato River (Aerial) (Forks Combined)	940–1,900	SEG
Chena River (Tower)	2,800–5,700	BEG
Salcha River (Tower)	3,300–6,500	BEG

9.1.1 JTC Discussion of BEG for Upper Yukon River Chinook Salmon

A comprehensive Biological Escapement Goal for Canadian-origin Upper Yukon River Chinook salmon cannot be developed using available data and the Chinook Salmon Technical Committee criteria. At this time, the data are insufficient to warrant a Pacific Scientific Advice Review Committee (PSARC) review. The JTC will continue to reconcile minor differences in harvest and escapement estimates and investigate other methods to develop a less comprehensive BEG

or a Spawning Escapement Goal (not to be mistaken for Sustainable Escapement Goal (SEG)). Estimates of return per spawner for Yukon River Chinook salmon is presented in Appendix A10 and Figure 11. However, estimates of historic spawning escapement and historic total run size, and therefore return per spawner estimates, lack robustness.

9.1.1.1 Objective

Cooperative Canada/U.S. management of Canadian origin Yukon River Chinook salmon utilized an agreed upon escapement goal range for rebuilt stocks, which was monitored through the use of a mark–recapture program. Prior to 2008, the longstanding escapement goal range for rebuilt stocks was set at 33,000 to 43,000. Since 2005, the Parties have developed a new and improved estimation technique, the Eagle sonar program, to assess the abundance of Chinook salmon migrating into Canada. Comparisons between estimates derived from the mark–recapture and sonar programs suggest that the mark–recapture program underestimated Chinook salmon abundance. In progression towards the transition from mark–recapture to sonar based assessment, it is necessary to develop a new spawning escapement goal that: a) is applicable to sonar; and b) is biologically defensible with regard to data collected to date regarding escapement, returns, and factors known to limit production such as habitat capacity. At the present time, there are known technical concerns with the standard methodology used to assess escapement goals for Canadian-origin Yukon River Chinook salmon that may be addressed with additional habitat capacity evaluations.

9.1.1.2 Habitat Based Approach

Independent methods for assessing habitat capacity for Chinook salmon have been developed by Parken et al. (2006) based on relationships between various stock recruitment parameters (e.g., capacity) and watershed area for stream and ocean type Chinook salmon stocks along the Pacific Coast. There is potential to apply this methodology to Canadian-origin Yukon River Chinook salmon. The JTC recommends that this work be a high priority in refining a biologically-based escapement goal.

9.2 SUMMER CHUM SALMON

In 2009, the escapement goal review team evaluated the type, quality, and amount of data for each summer chum salmon stock to determine appropriate types of escapement goals as defined by the statewide salmon escapement goal policy (Volk et al. 2009). A lower bound SEG replaced the BEG range for the East Fork Andreafsky River stock, primarily because it would be difficult or undesirable to hold escapements below the upper bound of a range through inseason management actions (Fleischman and Evenson *In prep*). Because of Andreafsky River's geographic location, it is unlikely sufficient fishing power could be generated in a timely manner to prevent escapement from exceeding an upper limit, and a lower-bound SEG is most appropriate for this stock. Information garnered from run reconstruction and spawner-recruit analyses suggested that the escapement goal could safely be changed to a lower bound SEG of 40,000 (Table 20). This goal, first implemented in 2010, will improve yield potential and reduce disruptions to the lower Yukon River summer chum salmon fishery.

Table 20.–Current BEGs and SEGs for Yukon River summer chum salmon.

Stream (Project Type)	Current Goal	Type of Goal
East Fork Andreafsky River (Weir)	>40,000	SEG
Anvik River Index (Sonar)	350,000–700,000	BEG

9.3 FALL CHUM SALMON

There have been no changes to the Biological Escapement Goals (BEG's) established in 2001 for Alaskan fall chum salmon stocks (Table 21). However, the Toklat River escapement goal was discontinued in 2010 because the foot survey assessment project was terminated. The recent spawner-recruit analysis for fall chum salmon in the Yukon River drainage for the drainagewide goal was changed from a BEG to an SEG (Fleischman and Borba, 2009). The poor return from the record 2005 brood year will help further define this stock model in the future. There are no fall chum salmon BEG's for Canadian-origin stocks within the Upper Yukon River (mainstem) and Porcupine River drainages. The BEG's recommended by ADF&G in 2001 for the Upper Yukon (60,000–129,000) and Fishing Branch rivers (27,000–56,000) were not accepted by the Pacific Scientific Advice Review Committee (PSARC) review undertaken in 2002, due to concerns with the quality of the data. However, as is outlined in Sections 8.5.2 and 8.5.3, the JTC has recommended a Canadian Upper Yukon River escapement goal range of 70,000 to 104,000 for 2011 and a Fishing Branch River IMEG range of 22,000 to 49,000 beginning from 2008 extended to 2013. The development of the IMEG for Fishing Branch River is based on the Bue and Hasbrouck (*Unpublished*) method applied to those years the weir was fully operational.

Table 21.–Yukon River escapement goals from 2001 and recommendations for 2011.

Fall Chum Salmon Stock	Current Goal Established in 2001	Goal Type	Goal Recommended in 2011
Yukon Drainage	300,000–600,000	SEG	
Tanana River	61,000–136,000	BEG	No Change
Delta River	6,000–13,000	BEG	No Change
Toklat River	15,000–33,000	BEG	
Upper Yukon R. Tributaries	152,000–312,000	BEG	No Change
Chandalar River	74,000–152,000	BEG	No Change
Sheenjek River	50,000–104,000	BEG	No Change
Canadian Upper Yukon River	>80,000	Yukon Salmon Agreement	70,000–104,000
Fishing Branch River	50,000–120,000	Yukon Salmon Agreement	22,000–49,000

For Canadian stocks, the JTC will reanalyze the IMEG for the Fishing Branch River by 2014 and review the mainstem goal again for 2012.

9.4 COHO SALMON

The Delta Clearwater River boat survey goal was revised from >9,000 to a sustainable escapement goal range of 5,200 to 17,000 using the Bue and Hasbrouck (*Unpublished*) method, effective during the 2005 season. No changes were made to the escapement goal by the Alaska Board of Fisheries and, therefore, the existing goal will remain in effect for 2011.

10.0 MARINE FISHERIES INFORMATION

10.1 INTRODUCTION

Yukon River salmon migrate into the Bering Sea during the spring and summer after typically spending one winter rearing in fresh water. 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. In fact, it is the recovery of coded-wire tags in these fisheries that provides one of the key descriptors of the oceanic distribution of Yukon River Chinook salmon (Whitehorse Rapids Chinook salmon; Appendix A21).

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 chum and 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 chum and Chinook salmon.

10.2 SOUTH ALASKA PENINSULA SALMON FISHERIES

The first documented commercial harvests from the South Unimak and Shumagin Islands June fisheries occurred in 1911. During the early to mid 1960s, the South Unimak and Shumagin Islands fisheries were open to commercial salmon fishing 5 days per week. From 1967–1970, fishing occurred 7 days per week regardless of the Bristol Bay sockeye salmon run strength. Special regulatory meetings were held annually and resulted in different regulations every year from 1971–1974.

In 1975, the Alaska Board of Fisheries (BOF) implemented an allocation plan in which the South Unimak and Shumagin Islands June fisheries were granted an annual guideline harvest level (GHL) based on the projected Bristol Bay inshore sockeye salmon harvest. Based on historical catch data, 6.8% of the forecasted inshore Bristol Bay harvest was allocated to the South Unimak June fishery and 1.5% was allocated to the Shumagin Islands June fishery. Portions of the GHL were assigned to discrete time periods so the harvest would be spread throughout June. Concerns over large harvests of chum salmon in the early 1980s, and a weak fall Yukon River chum salmon run resulted in a chum salmon cap that, if reached, would result in closure of the fishery for the remainder of June. Between 1986 and 2000, the chum salmon cap was as high as 700,000 fish (1992–1997) and as low as 350,000 fish (1998–2000).

In January 2001, the BOF modified the South Unimak and Shumagin Islands June salmon fishery management plan. These modifications were in effect through the 2003 season and included the elimination of the sockeye salmon GHL and the chum salmon cap. Fishing time for any gear group was reduced to a maximum of 16 hours per day. Fishing time by seine and drift

gillnet gear was limited to a maximum of 48 hours in a floating 7 day period with no more than two 16-hour periods on consecutive days in any 7 day period. Purse seine and drift gillnet fishing periods through June 24 occurred at the same time in the South Unimak and Shumagin Islands fisheries.

From June 10 through June 24, in 2001 through 2003, set gillnet gear could be operated on consecutive days for 16-hour fishing periods as long as the set gillnet sockeye to chum salmon ratio was above the recent 10-year average in each fishery (Figure 12). If the set gillnet sockeye to chum salmon ratio fell below the recent 10-year average in either of the fisheries (South Unimak or Shumagin Islands), that fishery was closed for one period.

After June 24, in either the South Unimak or Shumagin Islands fisheries, if the ratio of sockeye to chum salmon, for all gear combined, was 2:1 or less on any day, the next fishing period was 6 hours in duration for all gear groups in that fishery. If the ratio of sockeye to chum salmon was 2:1 or less for two consecutive fishing periods in either fishery, the season was closed for the remainder of June for all gear groups. If the sockeye to chum salmon ratio was greater than 2:1, a 6-hour fishing period could be extended to a maximum of 16 hours.

Prior to the 2004 fishing season, many of the restrictions in place from 2001 to 2003 were replaced by a set fishing schedule, which is currently still in effect. Sockeye salmon harvests from 2004 through 2009 averaged 642,981 in the South Unimak and 649,701 in the Shumagin Islands June fisheries for an average total harvest of 1,292,682. This average total harvest was lower than the 1975–2000 average, but above the 2001–2003 average. Chum salmon harvests from 2004 through 2009 for the South Unimak and Shumagin Islands June fisheries average 168,168 and 267,701 respectively. The average chum salmon harvest was below the 1975–2000 average total harvest, and above the 2001–2003 average (Appendix A22).

10.3 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 2010). Bycatch of Chinook and non-Chinook salmon (principally chum salmon) in the BSAI remained near historic low levels in 2010, however a large number of Chinook salmon were captured as bycatch in the GOA groundfish fisheries (Appendices A23 and A24). Estimated bycatch of Chinook salmon during 2010 was 12,530 in BSAI groundfish fisheries and 54,183 in GOA groundfish fisheries. Estimated bycatch of non-Chinook salmon species during 2010 was 14,977 in BSAI groundfish fisheries and 2,008 in GOA groundfish fisheries.

Pollock directed fisheries in the Bering Sea have been the primary groundfish fishery of concern for salmon bycatch as they account for over 80% of the total Chinook salmon bycatch and over 90% of the non-Chinook salmon bycatch in the BSAI groundfish fisheries (Appendix A23). Harvests are managed in the BSAI pollock fishery by setting an annual total allowable catch (TAC) for pollock and allocating the catch to various sectors of the fishery as specified by the American Fisheries Act in 1998. These allocations are divided into two 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 (63%) and the summer/fall season; non-Chinook salmon are caught almost entirely during the summer/fall season (99%) (Appendix A24).

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 US 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 in-season 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 and 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 has been approved by the Secretary of Commerce and will be implemented by NMFS during the 2011 fishing season. Amendment 91 establishes 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 two 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.

10.4 Northern Bering Sea Pelagic Trawl Survey

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) has

continued pelagic trawl surveys in the northern Bering Sea in support of the Bering Sea Integrated Ecosystem Research Project (BSIERP) in 2009 and 2010. Salmon catches during these multi-disciplinary trawl surveys provide a unique opportunity to evaluate the status of salmon stocks during their juvenile life-history stage. Figures 13 and 14 summarize the relative abundance (abundance is relative to trawl catchability) of juvenile Chinook and chum salmon within the northern Bering Shelf (60N–65N). A different (smaller) trawl design was used during the first sampling year in the northern Bering Sea and it is unclear what effect this may have had on the relative abundance estimate. Relative abundance estimates from the survey in 2002 are not included in the abundance index. The northern Bering Shelf is the index area for Yukon River salmon based on genetic stock composition of the juvenile population (Murphy et al., 2009; Chris Kondzela personal communication). Juvenile salmon present in the northern Bering Sea in 2007 and 2008 will be the primary contributors to the 2011 return (Chinook and chum salmon primarily return after 3 to 4 years in the ocean). The increase in juvenile abundance in 2007 supports the expectation that the 6-year-old component of the Chinook salmon run and the 5-year-old component of the chum salmon run will be higher in 2011 than the previous 3 years.

10.5 Enforcement of High Seas Driftnet Fishing Moratorium

Provided by Captain Micheal Cerne of the U.S. Coast Guard.

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

Operation North Pacific Guard 2010 commenced in April with a HC-130 deployment out of Shemya Island, Alaska. USCG Cutter JARVIS commenced their deployment in early August. The Canadian Air Force and Department of Fisheries and Oceans also made an extended CP-140 deployment from Shemya Island, Alaska. During this deployment the CP-140 provided air support to the USCG Cutter JARVIS with real time sighting reports of fishing fleet activity. In addition, Japan Coast Guard aircraft patrolled the NPAFC Convention Area (www.npafc.org) and coordinated surveillance efforts with the USCG Cutter JARVIS. USCG aircraft flew a total of 115 dedicated mission hours in 2010, with 72 hours directly surveying the convention area for IUU fishing activity. The USCG cutter JARVIS conducted a 105-day patrol (38 patrol days in the Convention Area) in direct support of Operation North Pacific Guard. There was one HSDN vessel sighted by the USCG in 2010 but no HSDN vessels were boarded or seized by United States enforcement officials. (Appendix A25). However, NPAFC reported that Korean enforcement officials seized 28 tons of salmon carried by the Panamanian-flagged vessel, *Bellatrix* through its involvement in IUU fishing activities within the NPAFC Convention Area; and Russian enforcement officials seized a Cambodian-flagged ship, *Asadara,* suspected of engaging in IUU fishing activity in Russian waters within the NPAFC Convention Area (http://www.npafc.org/new/pub_newsletter.html). Similar levels of enforcement effort are planned for the United States in 2011 to reduce IUU fishing activities in the NPAFC Convention Area. The NPAFC Enforcement Committee will meet in Honolulu in February to plan and coordinate 2011 patrol efforts.

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FIGURES

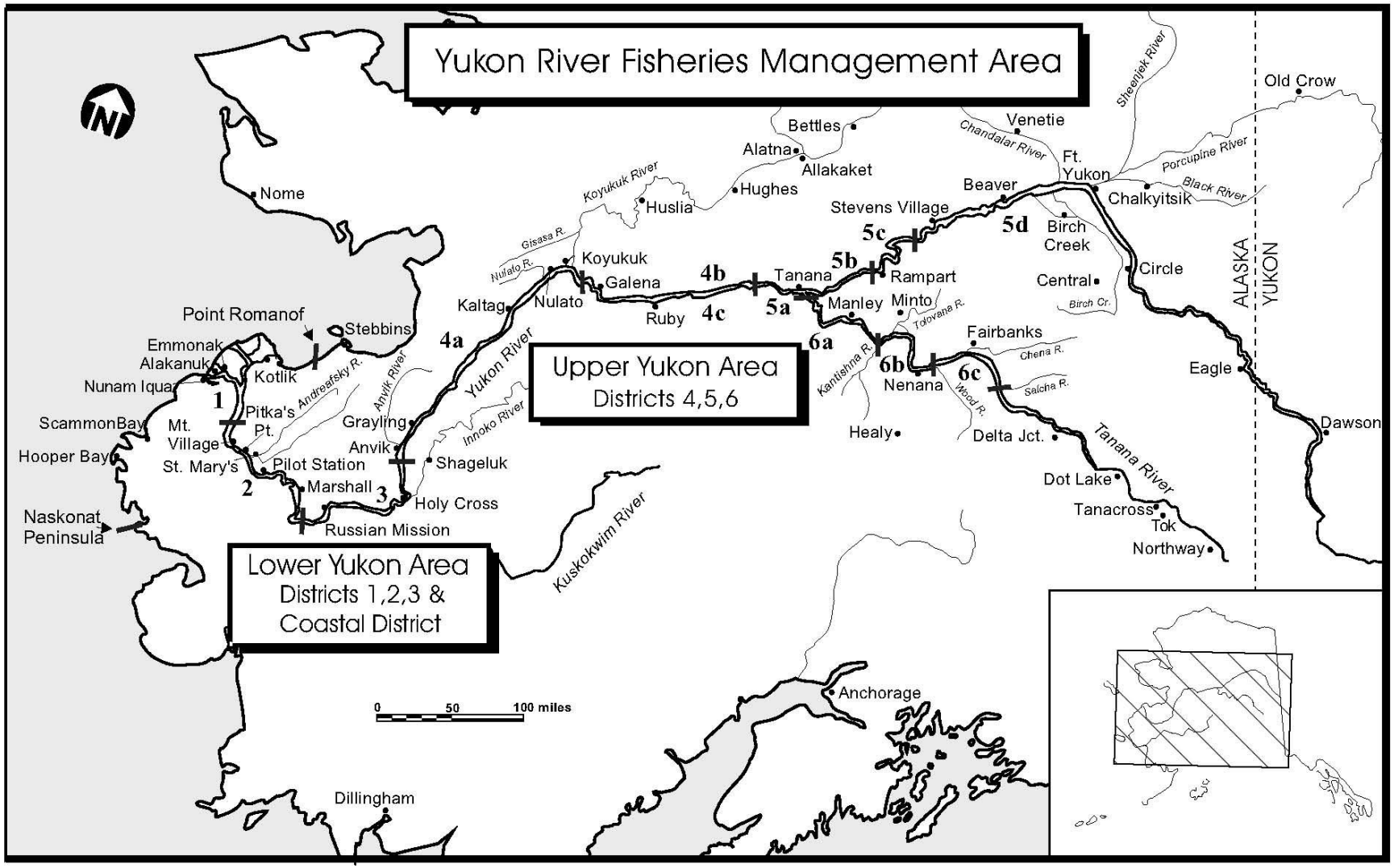
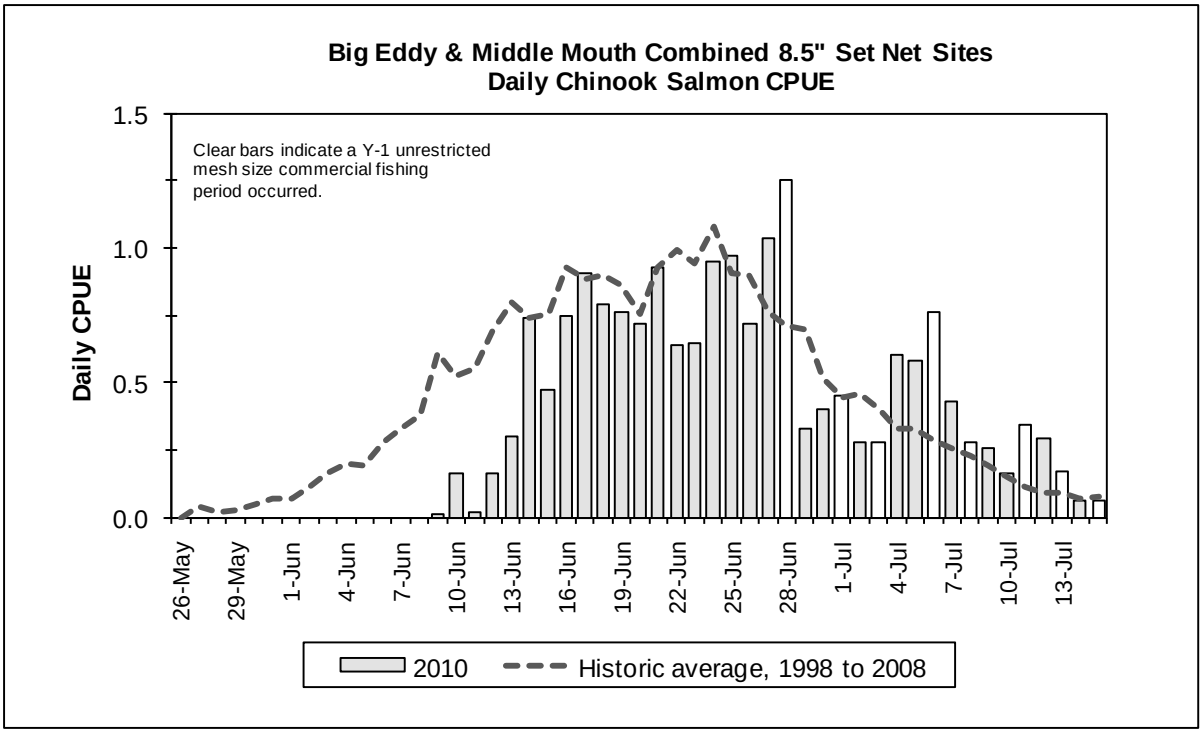
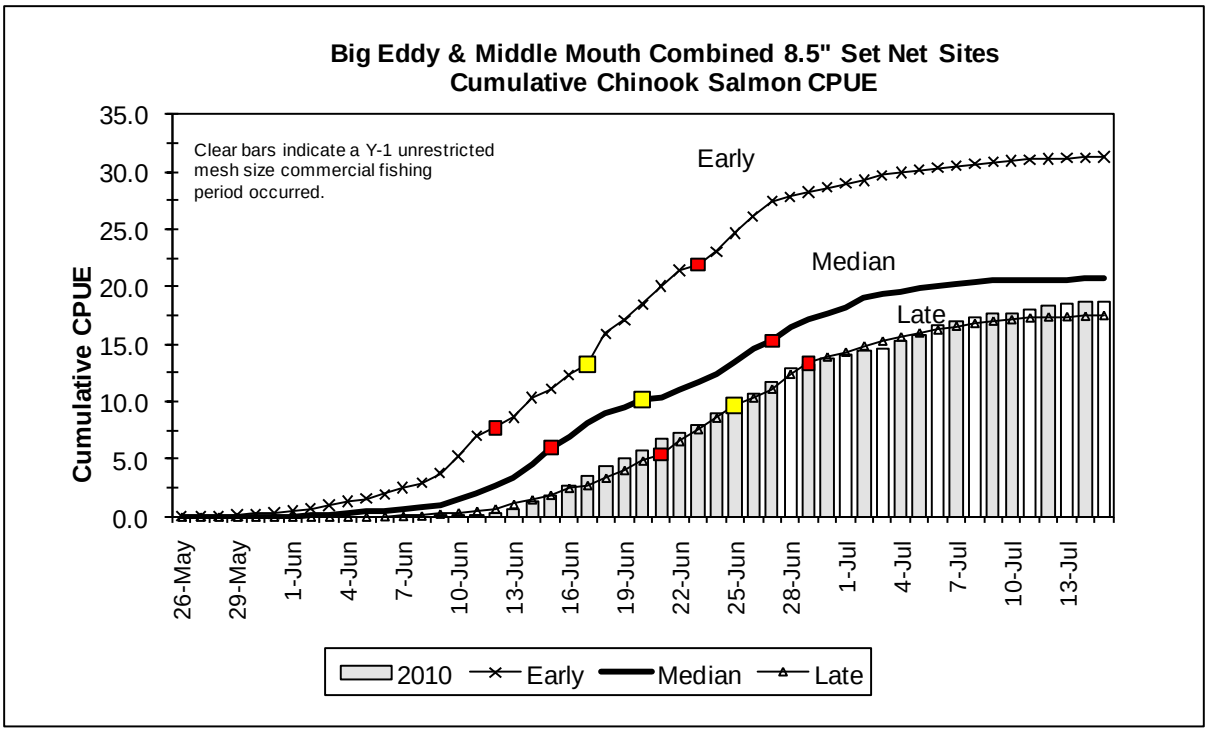


Figure 1.–Map of the Alaskan portion of the Yukon River drainage showing communities and fishing districts.





Note: The symbols located along the cumulative index lines represent the first to the third quartile of the cumulative index. The median date of the cumulative index is represented by the center symbol.

Figure 2.–Daily test fishery CPUE for Chinook salmon in 2010 compared to the 1989 to 2008 average (top). The 2010 cumulative CPUE compared to the 1989 to 2008 average early, and late run timing (bottom).

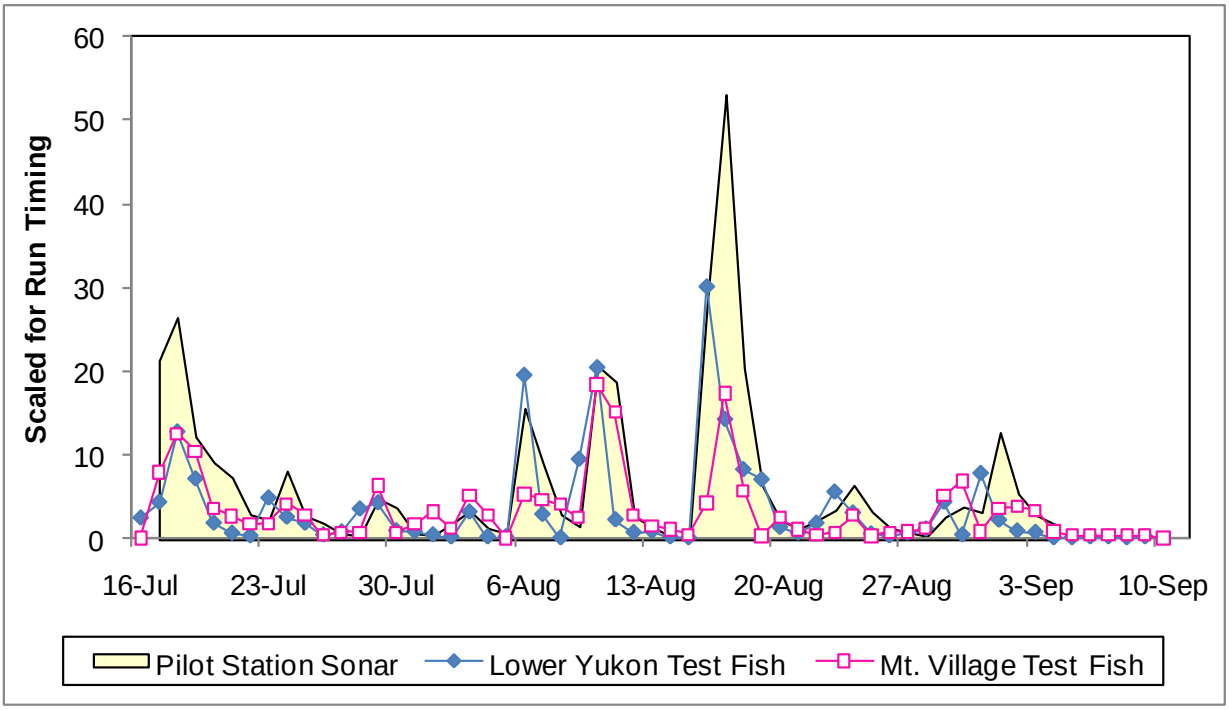
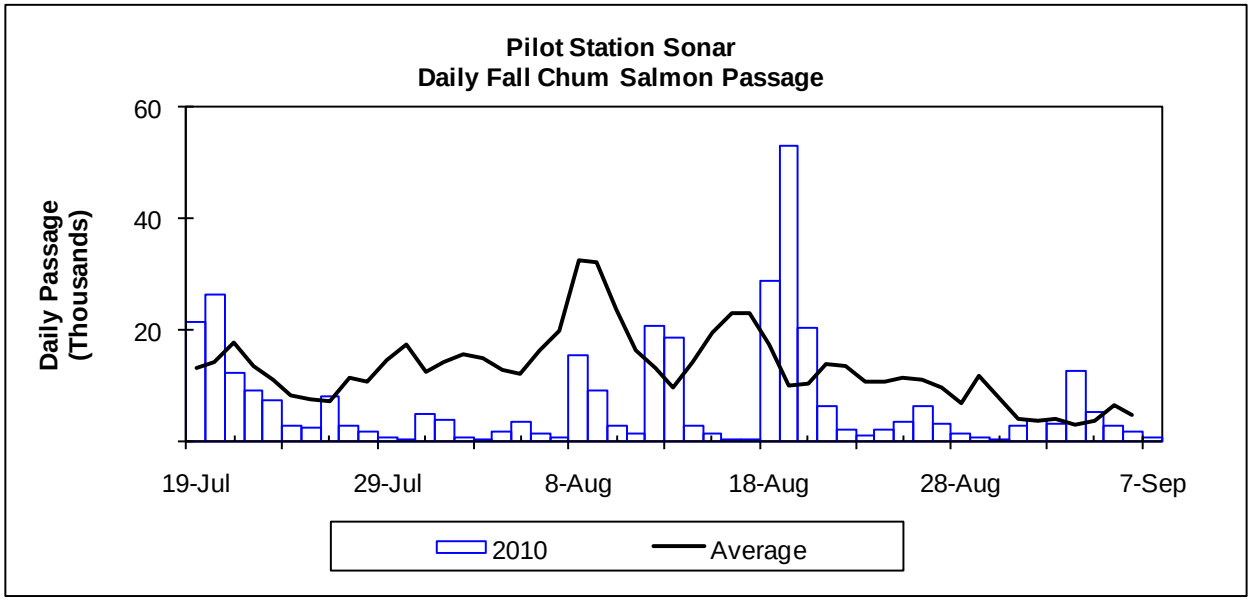


Figure 3.–Comparisons of assessment projects, Lower Yukon Test fish, Mt. Village Test Fish, and Pilot Station sonar, each lagged for run timing and scaled, 2010.



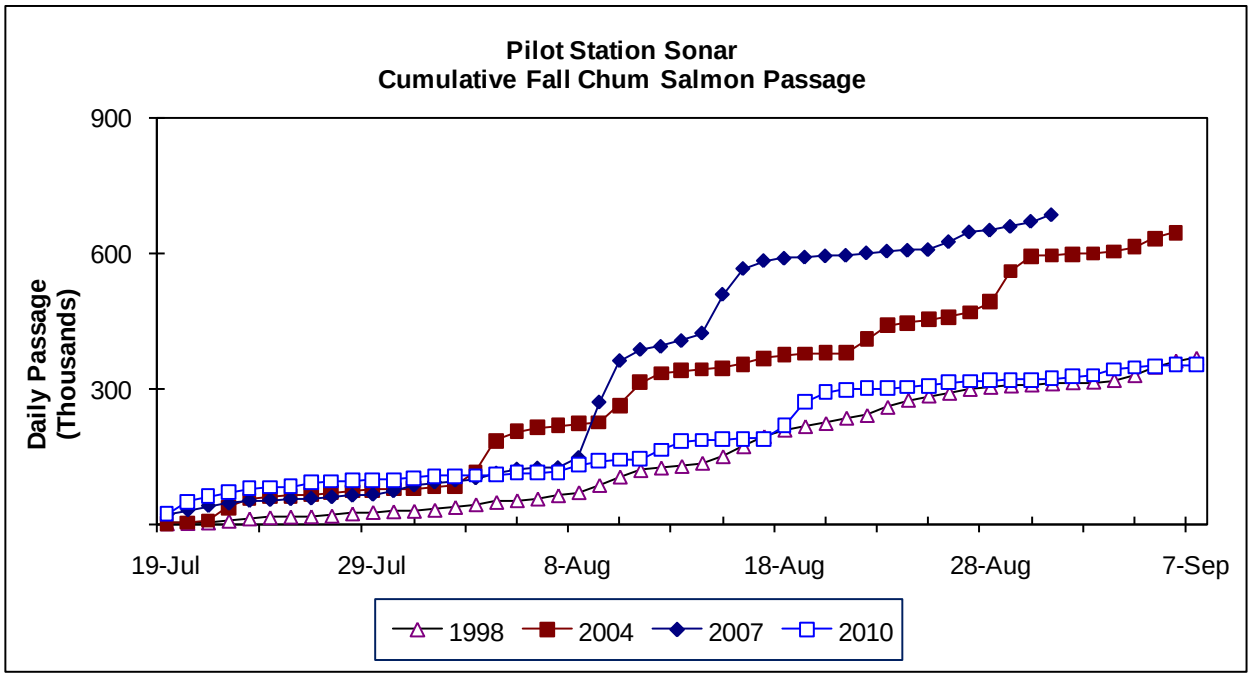


Figure 4.–Daily Pilot Station sonar passage estimates attributed to fall chum salmon in 2010 (top), compared to 1995 and 1997 through 2009 average. Cumulative Pilot Station sonar passage counts attributed to fall chum salmon in 2010 (bottom), compared to 1998, 2004, and 2007 (other late runs of similar size).

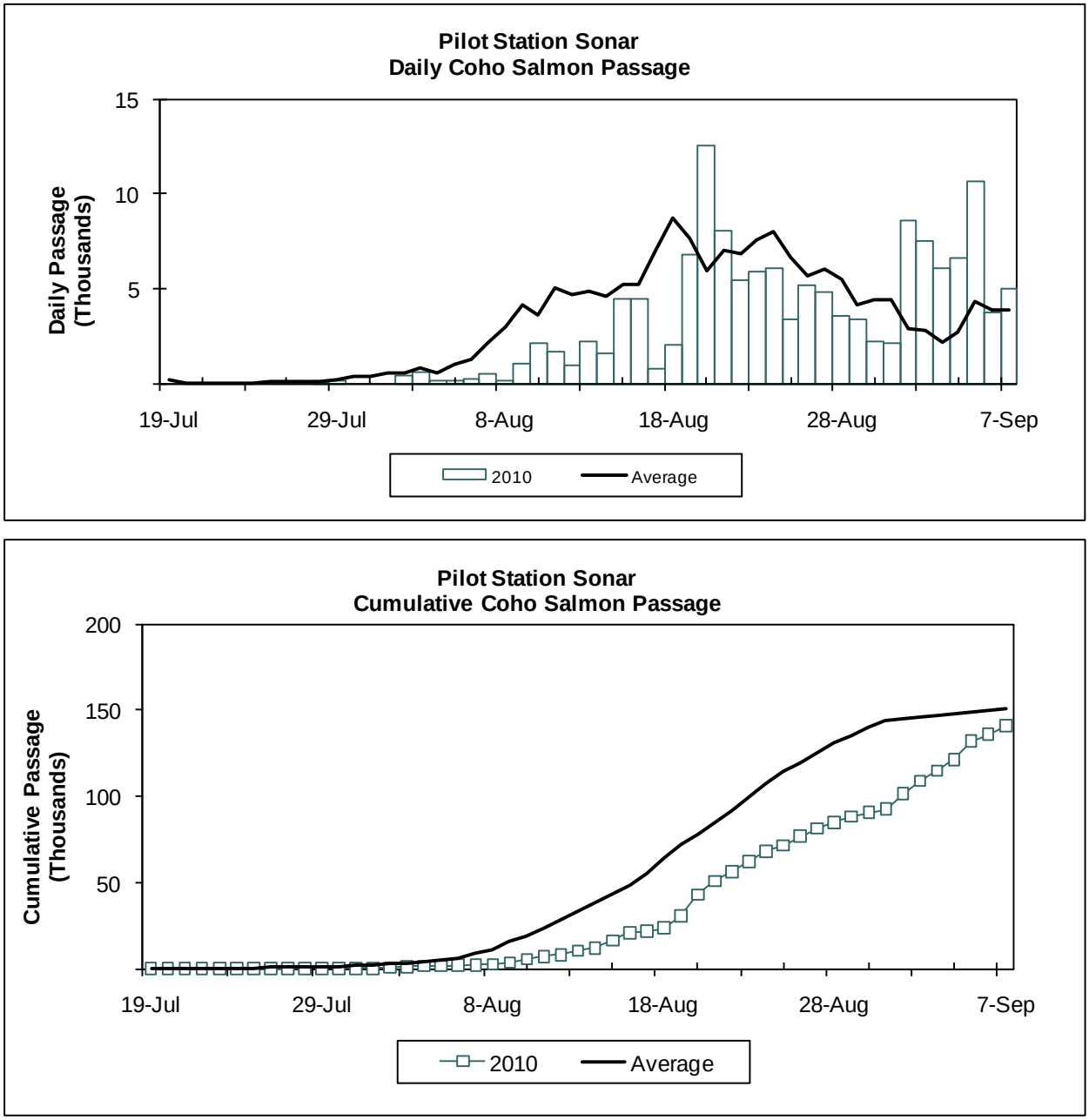


Figure 5.–Daily Pilot Station sonar passage estimates attributed to coho salmon in 2010 (top), compared to 1995 and 1997 through 2009 average. Cumulative Pilot Station sonar passage counts attributed to coho salmon in 2010 (bottom), compared to 1995 and 1997 though 2009 average.

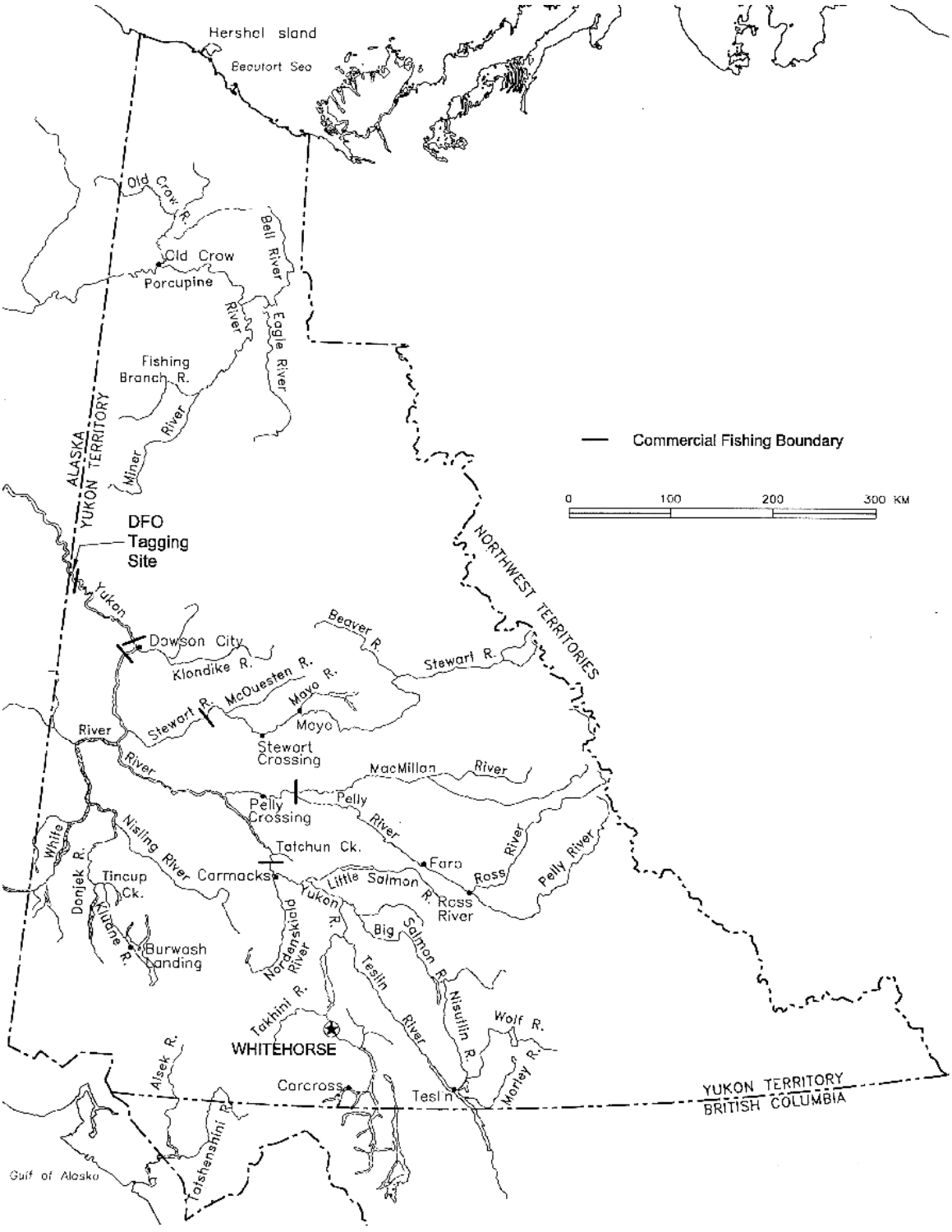


Figure 6.–Commercial fishing boundaries, tributaries, and major towns within the Yukon Territory, Canada.

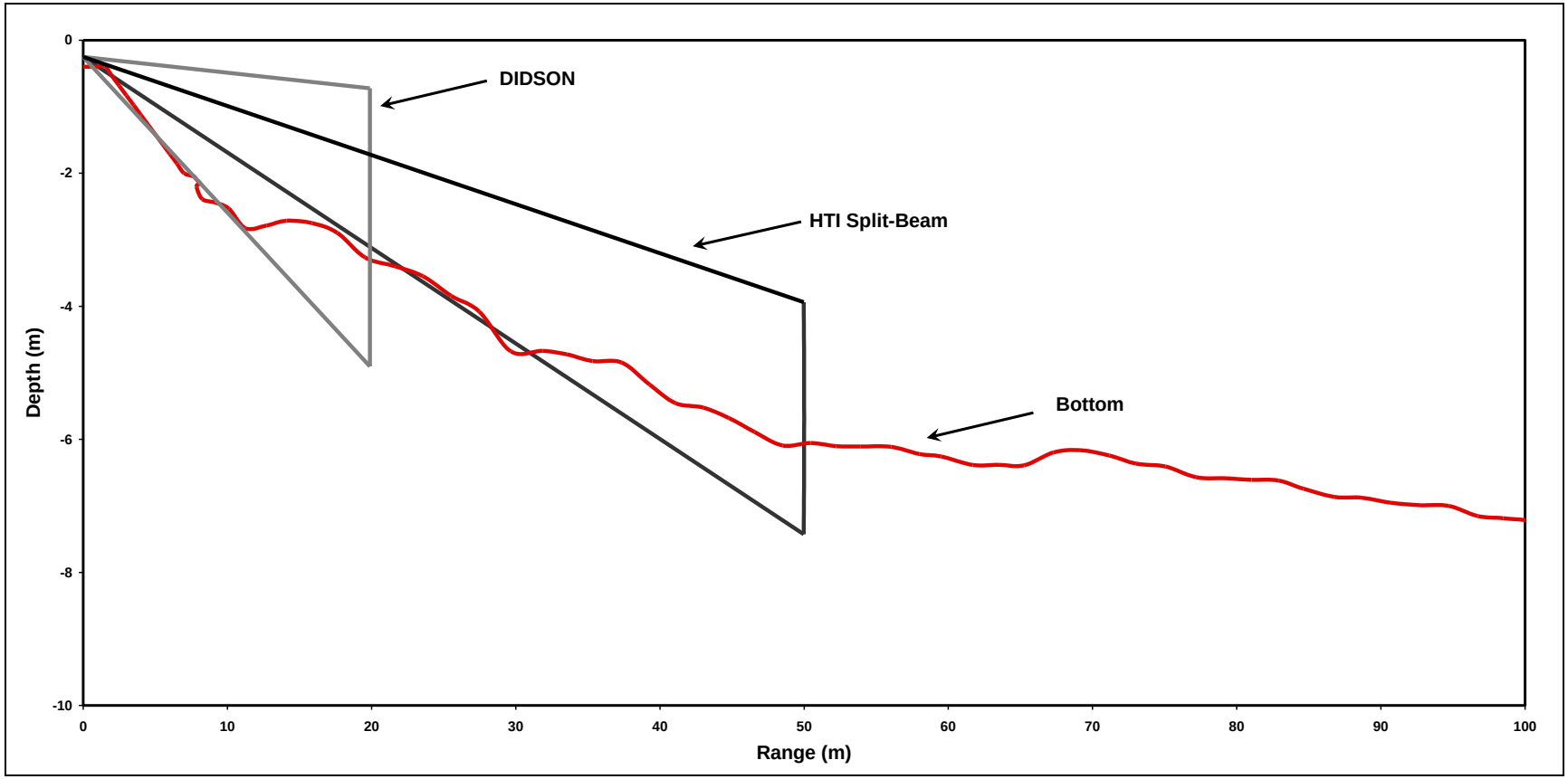


Figure 7.–Schematic representation of the approximate river profile in 2005 and associated nominal beam-width of the DIDSON and split-beam sonar of the first sampling stratum on the left bank at Pilot Station sonar used from 2005 through 2010.

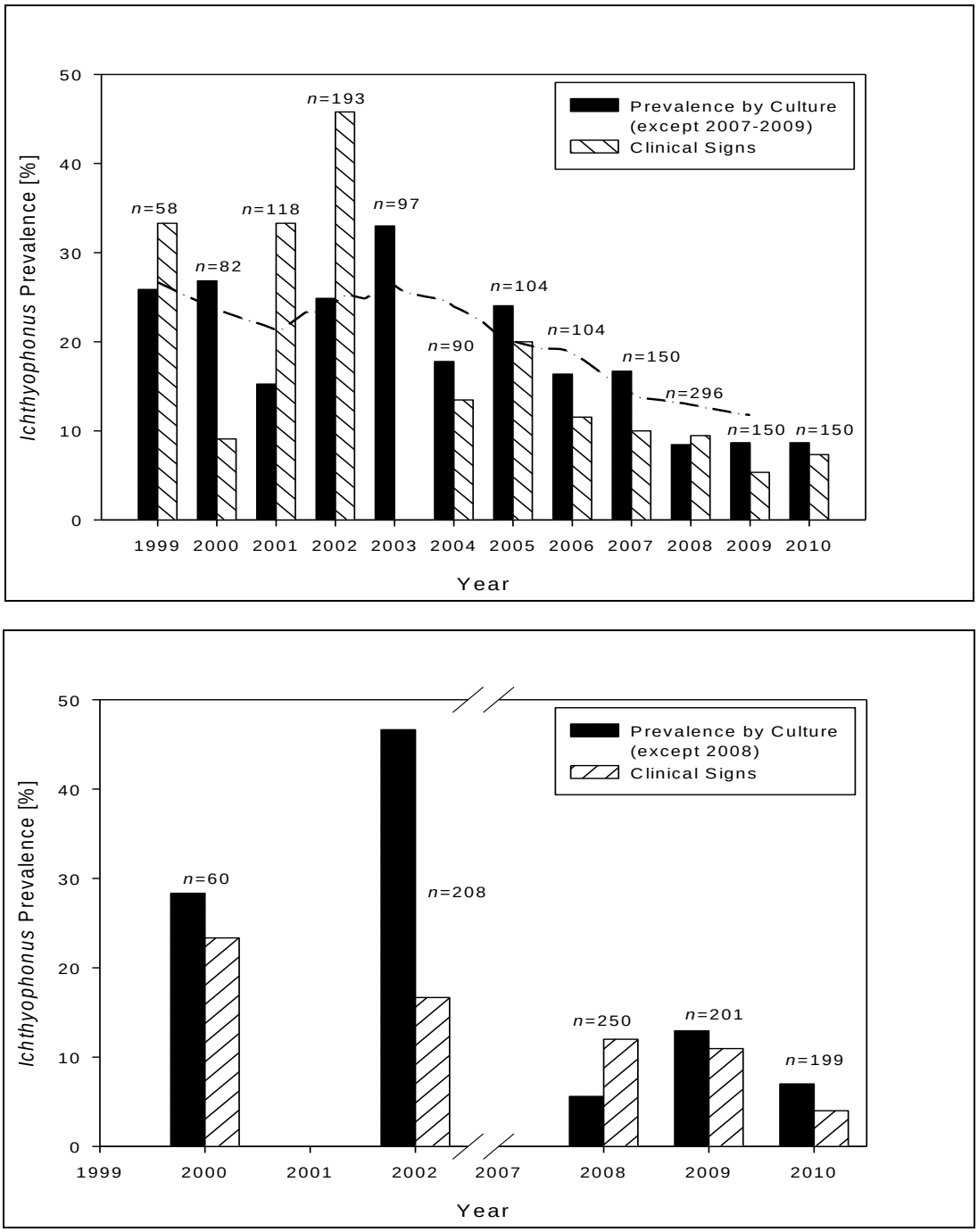


Figure 8.–Time series of *Ichthyophonus* prevalence at Emmonak (top) and Eagle (bottom) based on heart culture and PCR in Chinook salmon (n = sample size). LOESS non-parametric smoothing (dashed line) was applied to visualize temporal trends of parasite prevalence. Data from 1999 to 2003 is based on studies by Kocan et al. (2004), Kocan and Hershberger (2006) in Eagle and Emmonak and data from 2004–2006 in Emmonak after Kahler et al. (2007).

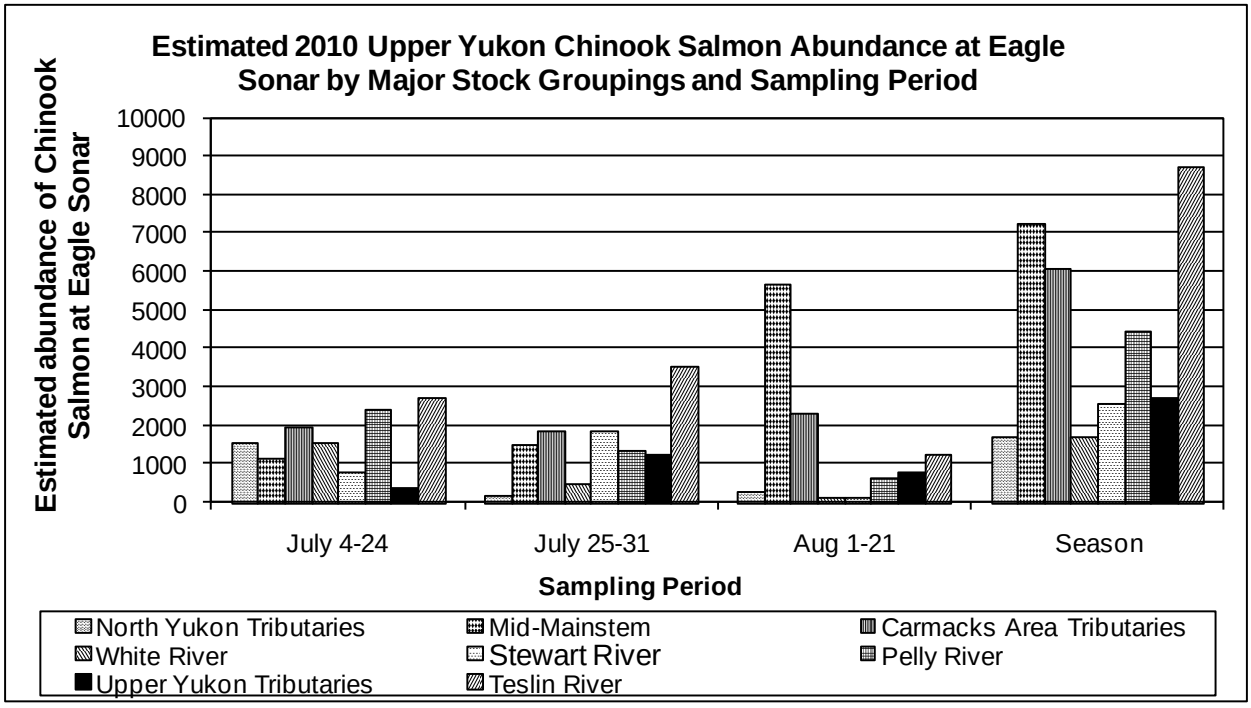


Figure 9.–Abundance of Upper Yukon Chinook salmon stocks at Eagle sonar site in 2010 determined by Genetic Stock Identification analyses. This figure shows the abundance for each sample period as well as total seasonal abundance for 8 regional stock aggregates.

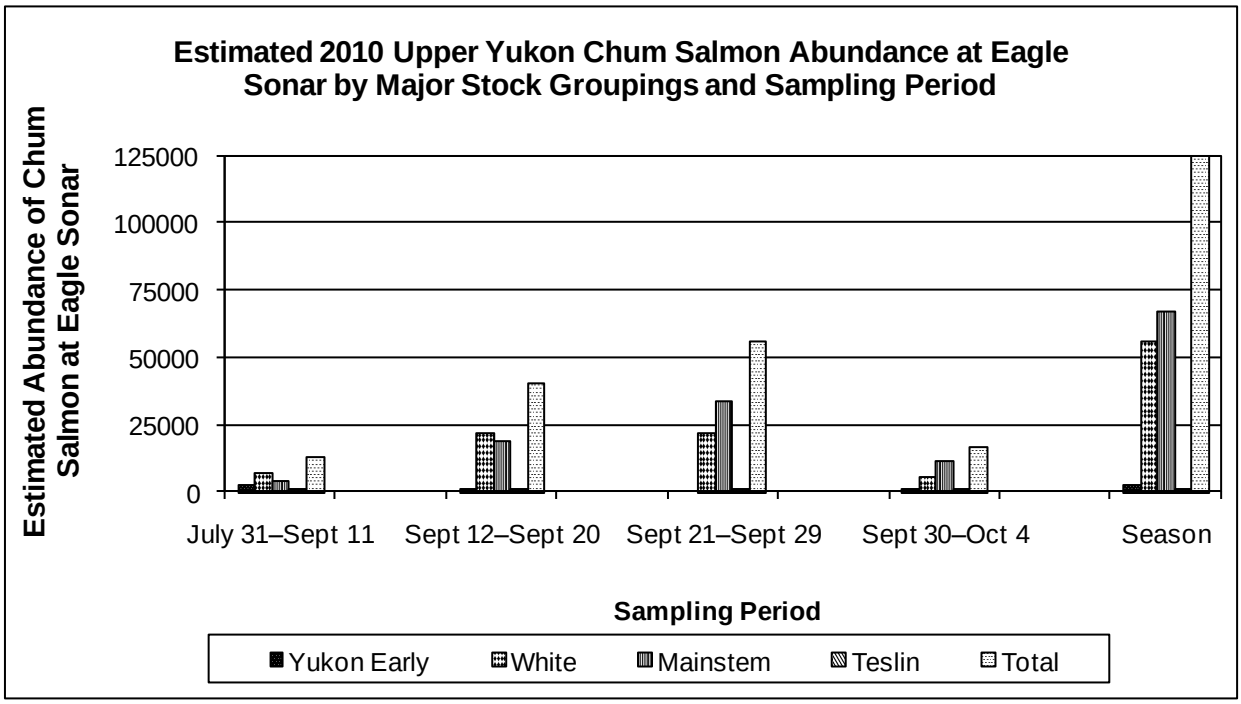


Figure 10.–Relative abundance of Upper Yukon fall chum salmon stocks at Eagle sonar site in 2010 to October 4 determined by Genetic Stock Identification analyses. This figure shows the abundance for each sample period as well as the total to October 4 for 4 regional stock aggregates.

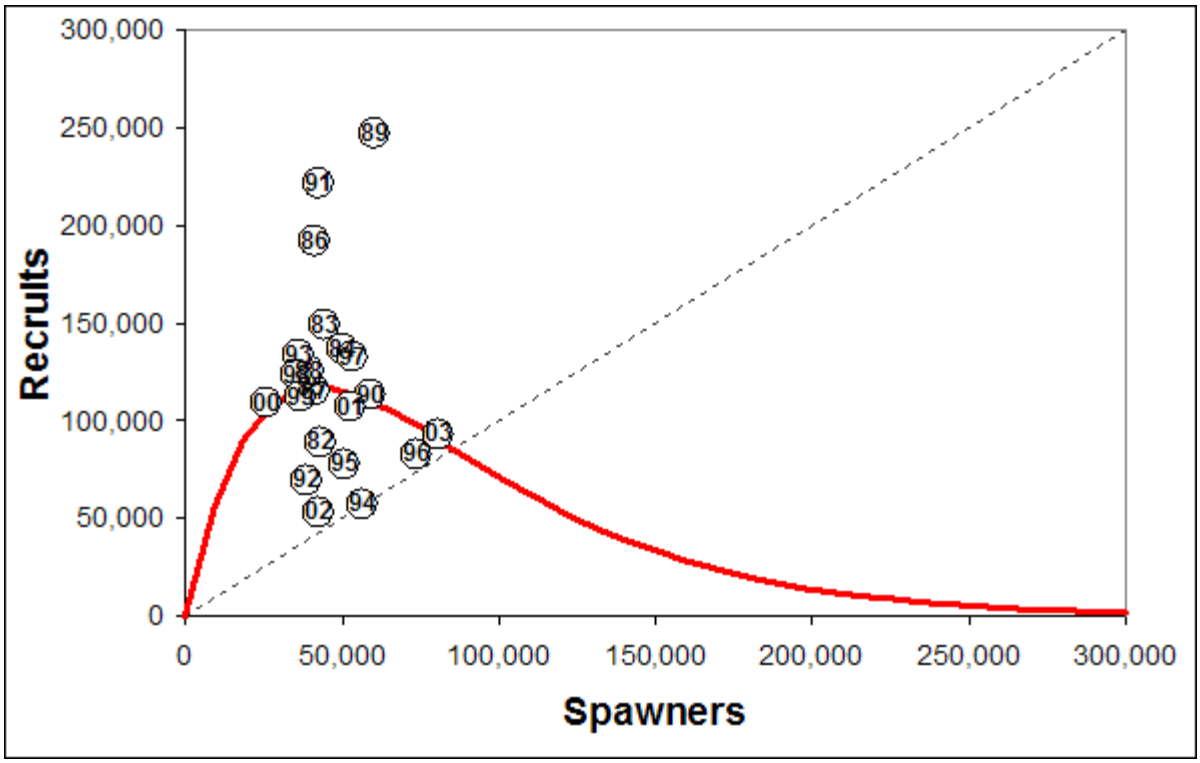


Figure 11.–Yukon River Canadian-origin Chinook salmon recruits versus spawners, Ricker curve, and 1:1 replacement line.

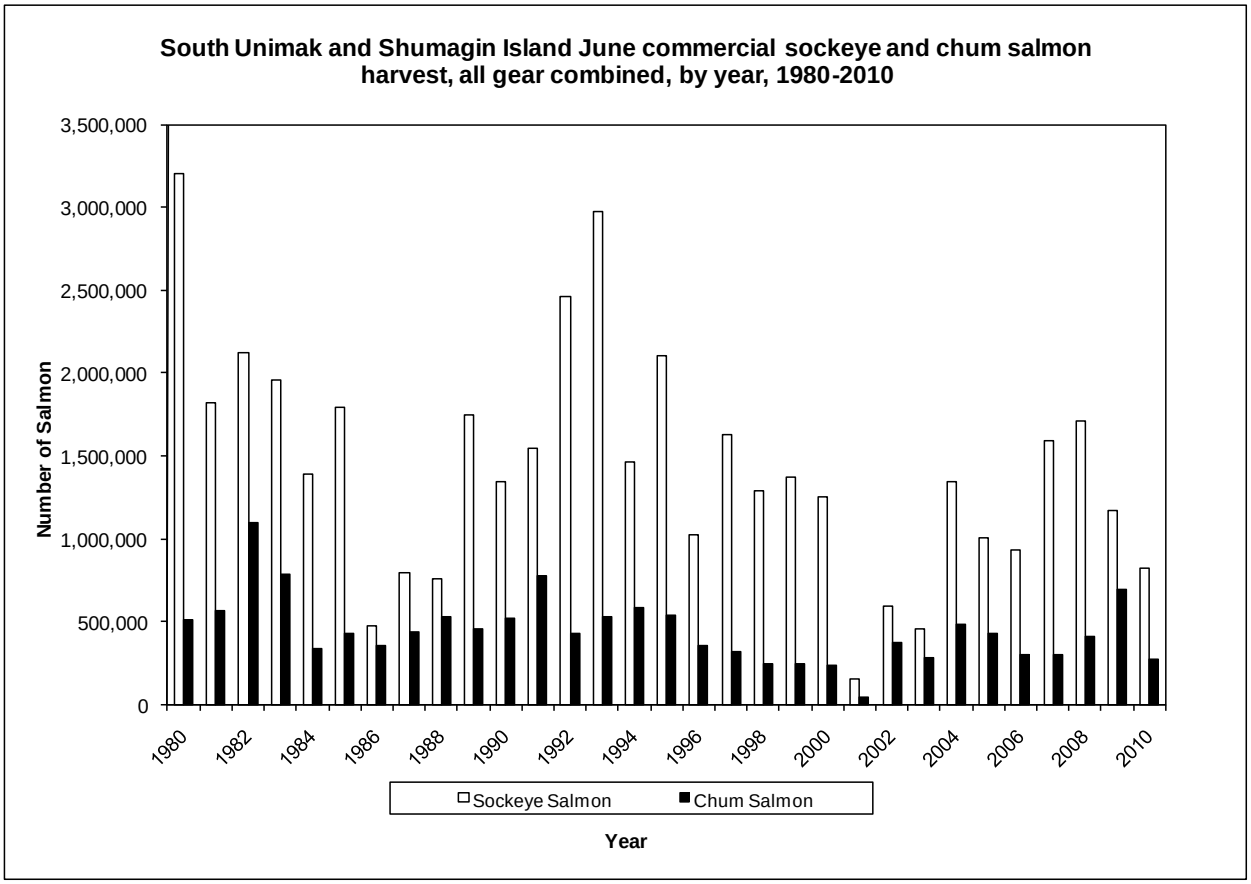


Figure 12.–South Unimak and Shumagin Islands, June commercial sockeye and chum salmon harvest, all gear combined, by year, 1980–2010.

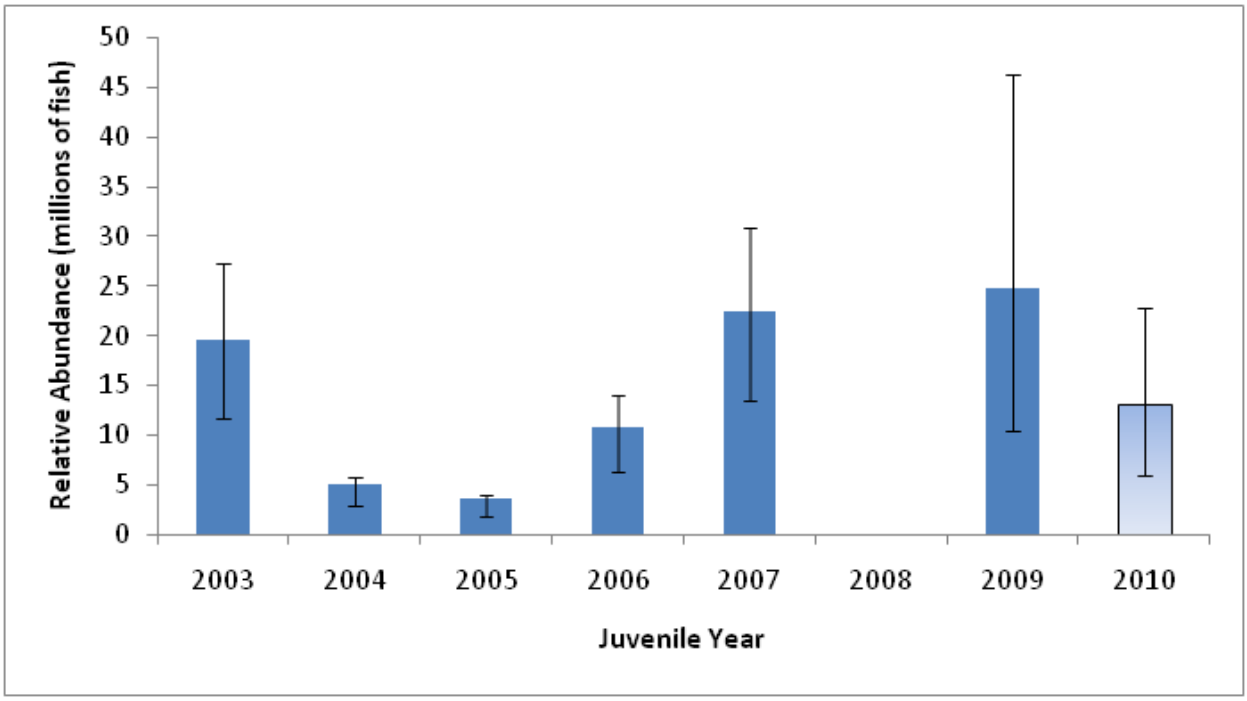


Figure 13.–Relative abundance of juvenile chum salmon estimated from catch rates in pelagic trawl research surveys in the northern Bering Sea (60N-65N). Error bars identify the 80% confidence interval of the abundance estimates.

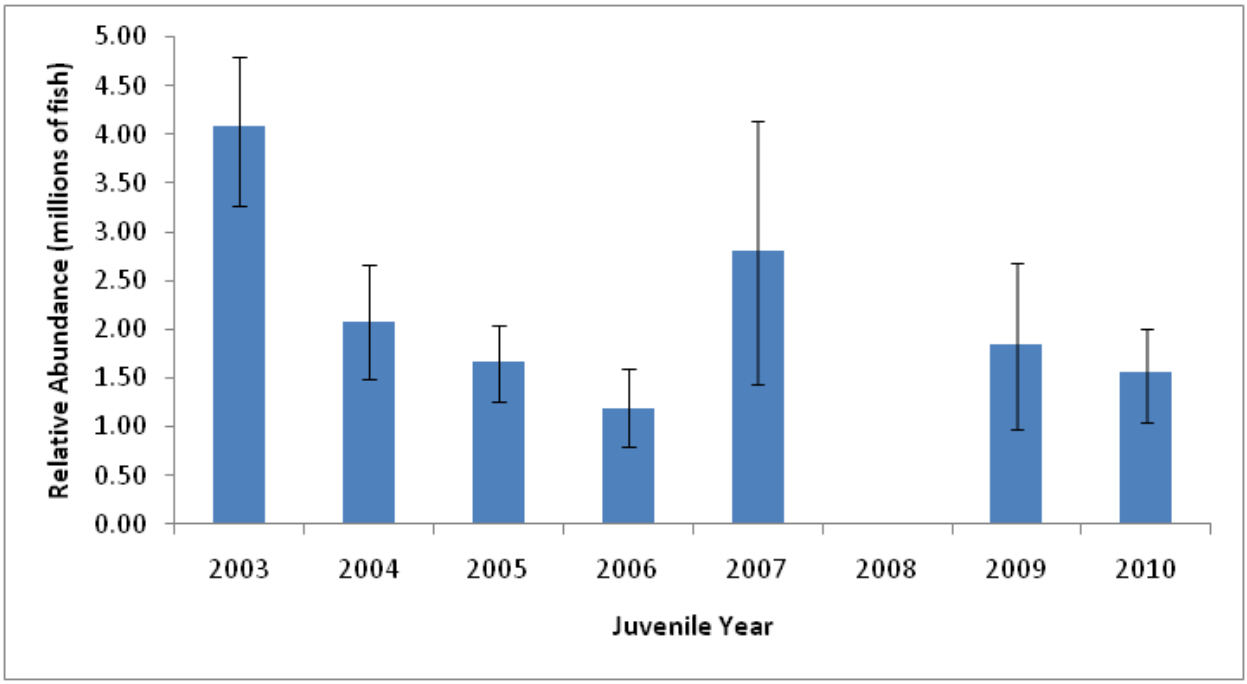


Figure 14.–Relative abundance of juvenile Chinook salmon estimated from catch rates in pelagic trawl research surveys in the northern Bering Sea (60N-65N). Error bars identify the 80% confidence interval of the abundance estimates.

APPENDIX A: TABLES

Appendix A1.–Yukon River drainage summer chum salmon management plan overview, 2010.

Projected Run Size [a]	Required Management Actions Summer Chum Salmon Directed Fisheries			
	Commercial	Personal Use	Sport	Subsistence
600,000 or Less	Closure	Closure	Closure	Closure [b]
600,000 to 700,000	Closure	Closure	Closure	Possible Restrictions [b]
700,001 to 900,000	Restrictions [b]	Restrictions [b]	Restrictions [b]	Normal Fishing Schedules
900,001 to 1,000,000	0-50,000	Open	Open	Normal Fishing Schedules
900,000 to 1,000,000	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 that 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..

Appendix A2.–Pilot Station sonar project passage estimates, Yukon River drainage, 1995 and 1997–2010 [a].

	Chinook			Chum						
Year [a]	Large [b]	Small	Total	Summer	Fall [c]	Total	Coho [c]	Pink	Other [d]	Total
2010	95,913	17,497	113,410	1,327,581	350,981	1,678,562	142,149	651,128	761,800	3,347,049
2009 [e]	92,648	30,342	122,990	1,285,437	240,449	1,525,866	205,278	16,380	677,860	2,548,394
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	169,945	3,556,445	1,053,245	4,609,690	101,806	24,604	1,011,855	5,917,900

[a] Estimates for all years were generated with the most current apportionment model (ca 2006) and may differ from earlier estimates

[b] Chinook salmon >655 mm .

[c] This estimate may not include the entire run. However, in 2008 through 2010, operations were extended to September 7 instead of the usual end date of August 31.

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

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

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

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

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

Appendix A3.–Alaskan commercial salmon sales and estimated harvest by district 2010[a].

District/ Subdistrict	Number of Fishermen[b]	Chinook Total Harvest [c]	Summer Chum Total Harvest [c]	Summer Chum Pounds of Roe Recovered [d]	Fall Chum Total Harvest [c]	Fall Chum Pounds of Roe Recovered [d]	Coho Total Harvest [c]	Coho Pounds of Roe Recovered [d]
1	274	5,744	102,267	0	545	0	1,027	0
2	183	4,153	80,948	0	270	0	1,028	0
3	0	0	0	0	0	0	0	0
Subtotal Lower Yukon	444	9,897	183,215	0	815	0	2,055	0
Anvik River	0	0	0	0	0	0	0	0
4-A	5	0	44,207	0	0	0	0	0
4-BC	0	0	0	0	0	0	0	0
Subtotal District 4	5	0	44,207	0	0	0	0	0
5-ABC	0	0	0	0	0	0	0	0
5-D	0	0	0	0	0	0	0	0
Subtotal District 5	0	0	0	0	0	0	0	0
6	6	0	5,466	0	1,735	0	1,700	0
Subtotal Upper Yukon	11	0	49,673	0	1,735	0	1,700	0
Total Alaska	455	9,897	232,888	0	2,550	0	3,755	0

Note: See Appendices B1-B5.

[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] Total commercial harvest, in numbers of fish, including carcasses used to produce roe recovered

[c] Pounds of roe recovered from total harvest in directed roe fishery.

Appendix A4.–Number of commercial salmon fishing gear permit holders by district and season, Yukon Area, 1971–2010[a].

Chinook and Summer Chum Salmon Season									
	Lower Yukon Area				Upper Yukon Area				Yukon Area
Year	District 1	District 2	District 3	Subtotal [b]	District 4	District 5	District 6	Subtotal	Total
1971	405	154	33	592	-	-	-	-	592
1972	426	153	35	614	-	-	-	-	614
1973	438	167	38	643	-	-	-	-	643
1974	396	154	42	592	27	31	20	78	670
1975	441	149	37	627	93	52	36	181	808
1976	453	189	42	684	80	46	29	155	839
1977	392	188	46	626	87	41	18	146	772
1978	429	204	22	655	80	45	35	160	815
1979	425	210	22	657	87	34	30	151	808
1980	407	229	21	657	79	35	33	147	804
1981	448	225	23	696	80	43	26	149	845
1982	450	225	21	696	74	44	20	138	834
1983	455	225	20	700	77	34	25	136	836
1984	444	217	20	613	54	31	27	112	725
1985	425	223	18	666	74	32	27	133	799
1986	441	239	7	672	75	21	27	123	795
1987	440	239	13	659	87	30	24	141	800
1988	456	250	22	678	95	28	33	156	834
1989	445	243	16	687	98	32	29	159	846
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 [c]									
2002	322	223	0	540	0	18	6	24	564
2003	351	217	0	556	3	16	7	26	582
2004		212	0	549	0	14	6	20	569
2005	370	228	0	578	0	12	5	17	595
2006	374	214	6	568	0	15	10	25	593
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		440	5	0	5	10	450
2000-2009 Average [d]	334	208	1	526	2	10	6	18	545

Fall Chum and Coho Salmon Season									
	Lower Yukon Area				Upper Yukon Area				Yukon
Year	District 1	District 2	District 3	Subtotal [b]	District 4	District 5	District 6	Subtotal	Area Total
1971	352	-	-	352	-	-	-	-	352
1972	353	75	3	431	-	-	-	-	431
1973	445	183		628	-	-	-	-	628
1974	322	121	6	449	17	23	22	62	511
1975	428	185	12	625	44	33	33	110	735
1976	422	194	28	644	18	36	44	98	742
1977	337	172	37	546	28	34	32	94	640
1978	429	204	28	661	24	43	30	97	758
1979	458	220	32	710	31	44	37	112	822
1980	395	232	23	650	33	43	26	102	752
1981	462	240	21	723	30	50	30	110	833
1982	445	218	15	678	15	24	25	64	742
1983	312	224	18	554	13	29	23	65	619
1984	327	216	12	536	18	39	26	83	619
1985	345	222	13	559	22	39	25	86	645
1986	282	231	14	510	1	21	16	38	548
1987	0	0	0	0	0	0	0	0	0
1988	328	233	13	563	20	20	32	72	635
1989	332	229	22	550	20	24	28	72	622
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	0	0	0	0	0	0	0	0	0
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 [c]									
2001 [c]									
2002 [c]									
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	218	71	0	285	0	5	12	17	302
2007	181	122	0	300	0	2	8	10	310
2008	251	177	0	428	0	3	9	12	440
2009	165	130	0	292	0	0	2	2	294
2010	72	18	0	90	0	0	4	4	94
2000-2009 Average [e]	122	56	0	176	0	1	5	6	182

-continued-

COMBINED SEASON									
	Lower Yukon Area				Upper Yukon Area				Yukon Area
Year	District 1	District 2	District 3	Subtotal [b]	District 4	District 5	District 6	Subtotal	Total
1971	473	154	33	660	-	-	-	27	687
1972	476	153	35	664	-	-	-	-	664
1973	529	205	38	772	-	-	-	47	819
1974	485	190	42	717	28	43	27	98	815
1975	491	197	39	727	95	57	46	198	925
1976	482	220	44	746	96	62	56	214	960
1977	402	208	54	609	96	53	39	188	797
1978	472	221	29	650	82	53	38	173	823
1979	461	230	33	661	90	49	40	179	840
1980	432	247	27	654	88	51	38	177	831
1981	507	257	26	666	94	56	31	181	847
1982	455	244	22	664	76	53	27	156	820
1983	458	235	26	655	79	47	31	157	812
1984	453	236	26	676	58	45	33	136	812
1985	434	247	24	666	76	48	33	157	823
1986	444	259	18	672	75	30	27	132	804
1987	440	239	13	659	87	30	24	141	800
1988	460	260	24	683	97	35	38	170	853
1989	452	257	23	687	99	38	32	169	856
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	350	214	0	562	0	0	0	0	562
2001 [c]									
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	582	0	12	9	21	603
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
2000-2009 Average	355	214	1	543	3	12	9	23	566

-continued-

[a] Number of permit holders which made at least one delivery.

[b] Since 1984 the subtotal for the Lower Yukon Area was the unique number of permits fished. Prior to 1984, the subtotals are additive for Districts 1, 2, and 3. Some individual fishers in the Lower Yukon Area may have operated in more than one district during the year.

[c] No commercial fishery was conducted.

[d] Average does not include data from 2001 due to no commercial fishery being conducted.

[e] Average does not include data from 2000, 2001 and 2002 due to no commercial fishery being conducted.

Appendix A5.–Value of commercial salmon fishery to Yukon Area fishermen, 1977–2010.

	Summer Season						
	Chinook			Summer Chum			
	Lower Yukon	Upper Yukon		Lower Yukon	Upper Yukon		Total
Year	Value	Value	Subtotal	Value	Value	Subtotal	Season
1977	1,841,033	148,766	1,989,799	1,007,280	306,481	1,313,761	3,303,560
1978	2,048,674	66,472	2,115,146	2,071,434	655,738	2,727,172	4,842,318
1979	2,763,433	124,230	2,887,663	2,242,564	444,924	2,687,488	5,575,151
1980	3,409,105	113,662	3,522,767	1,027,738	627,249	1,654,987	5,177,754
1981	4,420,669	206,380	4,627,049	2,741,178	699,876	3,441,054	8,068,103
1982	3,768,107	162,699	3,930,806	1,237,735	452,837	1,690,572	5,621,378
1983	4,093,562	105,584	4,199,146	1,734,270	281,883	2,016,153	6,215,299
1984	3,510,923	102,354	3,613,277	926,922	382,776	1,309,698	4,922,975
1985	4,294,432	82,644	4,377,076	1,032,700	593,801	1,626,501	6,003,577
1986	3,165,078	73,363	3,238,441	1,746,455	634,091	2,380,546	5,618,987
1987	5,428,933	136,196	5,565,129	1,313,618	323,611	1,637,229	7,202,358
1988	5,463,800	142,284	5,606,084	5,001,100	1,213,991	6,215,091	11,821,175
1989	5,181,700	108,178	5,289,878	2,217,700	1,377,117	3,594,817	8,884,695
1990	4,820,859	105,295	4,926,154	497,571	506,611	1,004,182	5,930,336
1991	7,128,300	97,140	7,225,440	782,300	627,177	1,409,477	8,634,917
1992	9,957,002	168,999	10,126,001	606,976	525,204	1,132,180	11,258,181
1993	4,884,044	113,217	4,997,261	226,772	203,762	430,534	5,427,795
1994	4,169,270	124,270	4,293,540	79,206	396,685	475,891	4,769,431
1995	5,317,508	87,059	5,404,567	241,598	1,060,322	1,301,920	6,706,487
1996	3,491,582	47,282	3,538,864	89,020	966,277	1,055,297	4,594,161
1997	5,450,433	110,713	5,561,146	56,535	96,806	153,341	5,714,487
1998	1,911,370	17,285	1,928,655	26,415	821	27,236	1,955,891
1999	4,950,522	74,475	5,024,997	19,687	1,720	21,407	5,046,404
2000	725,606	-	725,606	8,633	-	8,633	734,239
2001 [a]	-	-	-	-	-	-	-
2002	1,691,105	20,744	1,711,849	4,342	6,176	10,518	1,722,367
2003	1,871,202	40,957	1,912,159	1,585	6,879	8,464	1,920,623
2004	3,063,667	38,290	3,101,957	8,884	9,645	18,529	3,120,486
2005	1,952,109	24,415	1,976,524	11,004	13,479	24,483	2,001,007
2006	3,290,367	32,631	3,322,998	23,862	42,988	66,850	3,389,848
2007	1,939,114	27,190	1,966,304	220,715	34,421	255,136	2,221,440
2008	325,484	-	325,484	326,930	65,840	392,770	718,254
2009	20,970	-	20,970	514,856	20,430	535,286	556,256
2010	639,230	-	639,230	823,967	61,534	885,501	1,524,731
2005-2009 Average	1,505,606	28,079	1,522,453	219,473	35,432	254,905	1,777,358

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Appendix A5.–Page 2 of 2.

	Fall Season							
	Fall Chum			Coho				
	Lower Yukon	Upper Yukon		Lower Yukon	Upper Yukon		Total	Total
Year	Value	Value	Subtotal	Value	Value	Subtotal	Season	Value [b]
1977	718,571	102,170	820,741	140,914	2,251	143,165	963,906	4,267,466
1978	691,854	103,091	794,945	96,823	6,105	102,928	897,873	5,740,191
1979	1,158,485	347,814	1,506,299	83,466	6,599	90,065	1,596,364	7,171,515
1980	394,162	198,088	592,250	17,374	2,374	19,748	611,998	5,789,752
1981	1,503,744	356,805	1,860,549	87,385	4,568	91,953	1,952,502	10,020,605
1982	846,492	53,258	899,750	135,828	18,786	154,614	1,054,364	6,675,742
1983	591,011	128,950	719,961	17,497	11,472	28,969	748,930	6,964,229
1984	374,359	103,417	477,776	256,050	12,823	268,873	746,649	5,669,624
1985	634,616	178,125	812,741	176,254	26,797	203,051	1,015,792	7,019,369
1986	399,321	30,309	429,630	211,942	556	212,498	642,128	6,261,115
1987	0	0	0	0	0	0	0	7,202,358
1988	638,700	151,300	790,000	734,400	34,116	768,516	1,558,516	13,379,691
1989	713,400	223,996	937,396	323,300	33,959	357,259	1,294,655	10,179,350
1990	238,165	174,965	413,130	137,302	37,026	174,328	587,458	6,517,794
1991	438,310	157,831	596,141	300,182	21,556	321,738	917,879	9,552,796
1992	0	54,161	54,161	0	19,529	19,529	73,690	11,331,871
1993	0	0	0	0	0	0	0	5,427,795
1994	0	8,517	8,517	0	8,739	8,739	17,256	4,786,687
1995	185,036	167,571	352,607	80,019	11,292	91,311	443,918	7,150,405
1996	48,579	45,438	94,017	96,795	13,020	109,815	203,832	4,797,993
1997	86,526	7,252	93,778	79,973	1,062	81,035	174,813	5,889,300
1998	0	0	0	0	0	0	0	1,955,891
1999	35,639	876	36,515	3,620	0	3,620	40,135	5,086,539
2000	0	0	0	0	0	0	0	734,239
2001 [a]	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	1,722,367
2003	5,993	3,398	9,391	18,168	5,095	23,263	32,654	1,953,277
2004	1,126	848	1,974	2,774	6,372	9,146	11,120	3,131,606
2005	316,698	48,159	364,857	83,793	19,182	102,975	467,832	2,468,839
2006	202,637	33,806	236,443	50,299	11,137	61,436	297,879	3,687,727
2007	144,256	16,907	161,163	127,869	1,368	129,237	290,400	2,511,840
2008	428,969	22,089	451,058	216,777	3,717	220,494	671,552	1,389,806
2009	108,778	1,286	110,064	52,176	457	52,633	162,697	108,778
2010	5,428	2,761	8,189	20,535	442	20,977	29,166	1,553,897
2005-2009 Average	240,268	24,449	264,717	106,183	7,172	113,355	378,072	2,155,430

[a] No commercial salmon fisheries occurred in the Yukon River in 2001.

[b] Total value is the sum of the summer season and the fall season totals.

Appendix A6.–Yukon River drainage fall chum salmon management plan, 5AAC 01.249, 2010.

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 A7.–Canadian weekly commercial catches of Chinook, fall chum and coho salmon in the Yukon River in 2010.

Statistical Week	Week Ending	Start Date	Finish Date	Days Fished	Number of Fishers	Boat Days	Chinook Salmon	Chum Salmon	Coho Salmon
29	17-Jul			closed					
30	24-Jul			closed					
31	31-Jul			closed					
32	7-Aug			closed					
33	14-Aug			closed					
34	21-Aug			closed					
35	28-Aug			closed					
36	4-Sep			closed					
37	11-Sep			closed					
38	18-Sep			closed					
39	25-Sep	Sept 22	Sept 23	1	3	3		423	
40	2-Oct	Sept 27	Sept 30	3	4	8.5		1168	
41	9-Oct	Oct 4	Oct 9	5.7	4	8		540	
42	16-Oct	Oct 10	Oct 16	7				0	
43	23-Oct	Oct 17	Oct 23	7	1	3		55	
44	30-Oct	Oct 24	Oct 30	5.8				0	
Dawson Area Commercial				29.5		19.5	0	2,186	0
Upriver Commercial				29.5			0	0	0
Total Commercial Harvest							0	2,186	0
Chinook & Chum Test Fisheries									
Domestic							0	0	0
Recreational							1[a]	0	0
Aboriginal Fishery							2,455[b]	1,523[c]	0
Total Upper Yukon Harvest							2,456	3,709	0
Old Crow Aboriginal Fishery							191	2,078	104
Old Crow Live Release Test Fishery								NA	

Note: NA=not available.

[a] Recreational fishing was closed, 1 fish mistakenly caught.

[b] 2,455 is an adjusted value to account for under reporting.

[c] 1,523 is an adjusted value to account for under reporting.

Appendix A8.–Salmon fishery projects conducted in the Alaskan portion of the Yukon River drainage in 2010.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	-Document and estimate the catch and associated effort of the Alaskan Yukon River and -Commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon.	June - Oct.	ADF&G	All aspects
Commercial Catch Sampling and Monitoring	Alaskan portion of the Yukon River drainage	-Determine age, sex, and size of Chinook, chum and coho salmon harvested in Alaskan Yukon River commercial fisheries and -Monitor Alaskan commercial fishery openings and closures.	June - Oct.	ADF&G ADPS	All aspects enforcement
Subsistence and Personal Use Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	-Document and estimate the catch and associated effort of the Alaskan 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	All aspects
Sport Catch, Harvest and Effort Assessment	Alaskan portion of the Yukon River drainage	-Document and estimate the catch, harvest, and associated effort of the Alaskan Yukon River sport fishery via post-season mail-out questionnaires.	Postseason	ADF&G	All aspects
Yukon River Chinook Microsatellite Baseline	Yukon River drainage	-Survey standardized microsatellites and Yukon River Chinook salmon populations.	Ongoing	ADF&G USFWS DFO	U.S. populations Canada populations R&E Funding R&M Funding
Yukon River Salmon Stock Identification	Yukon River drainage	-Estimate Chinook salmon stock composition of the various Yukon River drainage harvests through genetic stock identification, age compositions, and geographical distribution of catches and escapements.	Ongoing	ADF&G	All aspects R&M Funding
Yukon River Chum Salmon Mixed-Stock Analysis	Pilot Station, RM 123	-Estimate the stock compositions of chum salmon using samples collected from Pilot Station sonar test fisheries	May - Aug.	USFWS OSM	All aspects R&M Funding-summer, OSM Funding - fall
YRDFA Weekly Teleconference	Yukon River drainage	-Acts as a forum for fishers 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	-Index Chinook salmon run timing and abundance using set gillnets and -Sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	All aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Hooper Bay Dall Point Offshore Test Fishing	Coastal Bering Sea south of Yukon River outlets	-Assess 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	All aspects
Lower Yukon River Drift Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	-Index Chinook, summer and fall chum, and coho salmon run timing and abundance using drift gillnets and -Sample captured salmon for age, sex, size composition information.	June - Aug.	ADF&G	All aspects
Mountain Village Drift Gillnet Test Fishing	Mainstem Yukon River, RM 87	-Index fall chum and coho salmon run timing and relative abundance using drift gillnets and -Sample captured salmon for age, sex, and size composition information.	July - Sept.	Asa'carsar miut Trad. Council BSFA	All aspects R&M funding
East Fork Weir, Andreafsky River	Mile 20 East Fork 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
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.	June - Aug.	ADF&G	All aspects YDFDA and R&M funded- extended operations
Anvik River Sonar	Mile 40 Anvik River, RM 358	-Estimate daily escapement of summer chum salmon to the Anvik River and -Estimate age, sex, and size composition of the summer chum salmon escapement.	June - July	ADF&G	All aspects
Chandalar River Sonar	RM 14 Chandalar River, RM 43 Chandalar River RM 996 Yukon River	-Estimate fall chum salmon passage using DIDSON sonar in the Chandalar River, -Estimate sex and size composition of fall chum salmon escapement, and -Collect ASL data including vertebrae.	Aug. - Sept.	USFWS	All aspects TI Funding R&M funding-ASL
Gisasa River Weir	Mile 3 Gisasa River, Koyukuk River drainage, RM 567	-Estimate daily escapement of Chinook and summer chum salmon into the Gisasa River and -Estimate age, sex, and size composition of the Chinook and summer chum salmon escapements.	June - Aug.	USFWS	All aspects OSM funding
Henshaw Creek Weir	Mile 1 Henshaw Creek, RM 976	-Estimate daily escapement of Chinook and summer chum salmon into Henshaw Creek and -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
Y5A Test Fish Wheel	Mainstem Yukon River RM 695	-Index the timing of fall chum and coho salmon on the south bank of the Yukon River bound for the Tanana River drainage, using test fish wheel equipped with video monitoring system.	Aug. - Oct.	ADF&G USFWS	R&M funded contract R&E funded tech support

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Sheenjek River Sonar	Mile 6 Sheenjek River Porcupine River drainage, RM 1,060	-Estimate daily escapement of fall chum salmon into the Sheenjek River using DIDSON sonar and counted both left and right banks and -Estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. - Sept.	ADF&G	All aspects
Eagle Sonar	Mainstem Yukon River Eagle, RM 1,213	-Estimate daily passage of Chinook and chum salmon in the mainstem Yukon River using both split-beam and DIDSON and -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 USFWS-OSM	All aspects
Nenana River Escapement Surveys	Nenana River drainage, above RM 860	-Aerial and ground surveys for numbers and distribution of coho and chum salmon in 10 tributaries of the Nenana below Healy Creek.	Sept. - Oct.	BSFA ADF&G	Field aspects Database
Rapids Test Fish Wheel	Mainstem Yukon River RM 730	-Index run timing of Chinook and fall chum salmon runs as well as non-salmon species using video monitoring techniques and -Characterize the sex, weight, and girth composition of Chinook salmon.	June - Sept.	Zuray USFWS	All aspects R&E funding
Nenana Test Fish Wheel	mainstem Tanana River Nenana, RM 860	-index the timing of Chinook, summer chum, fall chum, and coho salmon runs using a test fish wheel oufitted with video monitoring equipment.	June - Sept.	ADF&G USFWS	All aspects R&E funded tech support
Toklat River Escapement Sampling	Toklat River, between RM 848 and 860.	-Evaluate fall chum and coho salmon spawning distribution in Toklat River and -Sample fall chum salmon carcasses for age, sex, and size composition information.	Oct.	TCC ADF&G	Survey Aging
Biological Sampling of Yukon River Salmon	Middle Yukon (RM279-581) and Fort Yukon	-Collect genetics samples and age, sex, and length information from subsistence caught Chinook salmon.	July - Aug.	TCC	All aspects R&E funded
Delta River Ground Surveys	Tanana River drainage, RM 1,031	-Estimate fall chum salmon spawning escapement in Delta River and -Sample fall chum salmon carcasses for age, sex, and size composition information.	Oct. - Dec.	ADF&G	All aspects
Chena River Tower	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 AKSSF funding
Salcha River Tower	Salcha River, Tanana River drainage, RM 967	-Estimate daily escapement of Chinook and summer chum salmon into the Salcha River.	July - Aug.	BSFA	All aspects R&M funding

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Goodpaster River Tower	Goodpaster River, Tanana River drainage, RM 1,049	-Estimate daily escapement of Chinook and summer chum salmon into the Goodpaster River.	July	TCC	All aspects Pogo Mine funding
Upper Yukon River Chum Salmon Genetic Stock Identification	Yukon River drainage	-Establish the feasibility of using DNA marks for genetic stock identification of chum salmon in the Yukon River.	June - Oct.	USFWS	All aspects
Ichthyophonus Sampling	Emmonak, RM 20, Eagle RM 1,213	-Determine prevalence of Ichthyophonus in Chinook salmon in the lower Yukon at Emmonak and in the upperYukon at Eagle.	May - July	UAF ADF&G TCC	All aspects, TI funding, R&E funding
Yukon River Inseason Salmon Harvest Interviews	Emmonak, Holy Cross, Nulato, Huslia, Galena, and Beaver Primary	-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 ADF&G DFO OSM	All aspects
Juvenile Chinook Rearing in non-natal streams	Yukon River down stream of the Canadian border	-Capture juvenile Chinook salmon in non-natal Yukon River tributary streams, -Determine whether Canadian-origin juvenile Chinook salmon rear in Yukon River tributary streams of the United States using genetic techniques, and -Describe non-natal stream rearing habitat characteristics for habitat characteristics for Yukon River Chinook salmon.	July - Aug.	USFWS	All aspects AKSSF Funding

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Agency Acronyms:

ADF&G	= Alaska Department of Fish and Game
ADPS	= Alaska Department of Public Safety
AVCP	= Association of Village Council Presidents, Inc.
BSFA	= Bering Sea Fishermen's Association
DFO	= Department of Fisheries and Oceans (Canada)
NPS	= National Park Service
TCC	= Tanana Chiefs Conference, Inc.
UAF	= University of Alaska Fairbanks
USFWS	= United States Fish and Wildlife Service
USFWS-OSM	= United States Fish and Wildlife Service, Office of Subsistence Management
YRDFA	= Yukon River Drainage Fisheries Association

Appendix A9.–List of harvest/escapement monitoring and incubation/rearing projects involving salmon in the Canadian portion of the Yukon River drainage in 2010.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch Monitoring	Yukon River near Dawson City	-To determine weekly catches and effort in the Canadian commercial fishery (Chinook, chum and coho salmon), and -To collect other information as required.	July - Oct.	DFO	All aspects
Aboriginal Catch Monitoring	Yukon communities	-To determine weekly catches and effort in the aboriginal fishery, and -To implement components of the UFA and AFS.	July - Oct.	YFN's DFO	Joint project
Recreational Catch Monitoring	Yukon R mainstem and tributaries	-To determine the recreational harvest by species including the date, sex, whether released or retained, and fishing location, and -Salmon caught are reported through the Yukon Salmon Conservation Catch Card (YSCCC) program.	July - Oct.	DFO	All aspects
DFO Escapement Index Surveys	Chinook aerial index streams	-To obtain counts in index areas including: Big Salmon, L. Salmon Wolf, and Nisutlin rivers.	Aug.	DFO	All aspects
Escapement Surveys and DNA Collection	Throughout upper Yukon R. drainage	-To conduct surveys of spawning fish by foot, boat, air etc., -To collect DNA samples from spawning population, and -To enumerate and recover tags in terminal areas.	July - Oct.	R&E Projects DFO YFN's AFS	All aspects
Fishing Branch Chum Salmon Weir	Fishing Branch R.	-To enumerate fall chum salmon returning to the Fishing Branch River and obtain age, size, tag and sex composition data.	Aug. - Oct.	DFO VGG	Joint project
Whitehorse Rapids Fishway	Whitehorse	-To enumerate wild and hatchery reared Chinook salmon returns to the Whitehorse fishway area and obtain age, size, sex and tag data.	July - Aug.	YF&GA	All aspects
Blind Creek Weir	Pelly River	-To enumerate Chinook salmon escapement, recover tags and collect ASL data and DNA samples.	July - Aug.	JW&A	All aspects
Big Salmon Sonar	Big Salmon River	-Installation and operation of a DIDSON sonar program for Chinook salmon, and -Carcass survey, ASL, and genetic samples.	July - Aug.	JW&A	All aspects

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Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Klondike River Sonar	Klondike River	-Installation and operation of a DIDSON sonar program for Chinook salmon- this was a new program in 2009.	July - Oct.	BM&A	All aspects
Escapement Sampling	Various tributaries	-Collect ASL data and DNA samples.	Aug. - Oct.	DFO	All aspects
Porcupine Catch Per Unit Effort Program	Porcupine River	-To obtain CPUE data from a fall chum salmon test fishery and tag all fish caught, -To provide inseason projections of run strength from relationship Between CPUE and Fishing Branch River Weir counts, and -First year of program, previous program involved mark–recapture.	Aug. - Oct.	EDI & VGG	All aspects
Whitehorse Rapids Fish Hatchery and Coded-Wire Tagging Project	Whitehorse	-To rear and release ~150K Chinook salmon fry produced from Whitehorse Rapids Fishway broodstock, and -To mark fry with a CWT, adipose clip, and release upstream of the Whitehorse hydroelectric facility.	Ongoing	GY, YEC YF&GA	All aspects Coded-wire tagging
MacIntyre Incubation Box and Coded-Wire Tagging Project	Whitehorse	-To rear up to 120K Chinook salmon fry from brood stock collected from the Takhini River and/or Tatchun Creek, and -To mark fry with a CWT, adipose clip, and release at natal sites.	Ongoing	DFO YC NRI	Technical support field work, project monitoring
Fox Creek Restoration Program	Whitehorse Area	-Incubate CK eggs , mark fry with a CWT, and release into Fox CK.	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
DFO = Department of Fisheries and Oceans Canada
EDI = Environmental Dynamics Incorporated
GY = Government of Yukon-Environment Yukon
JW&A = Jane Wilson & Associates
NRI = Northern Research Institute
R&E = Yukon Panel Restoration and Enhancement Program

-continued-

VGG = Vuntut Gwitchin Government
YEC = Yukon Energy Corporation
YFN's = Yukon First Nation's
YF&GA = Yukon Fish and Game Association

Appendix A10.–Yukon River Canadian Chinook salmon total run by brood year, and escapement by year, 1983–2004 based on 3-Area Index, Eagle Sonar (2005–2010), and radiotelemetry (local) (2002–2004).

Brood	Age								
Year	3	4	5	6	7	8	Return	Spawners	R/S
1974						634			
1975					33,080	175			
1976				88,405	22,026	40			
1977			19,491	111,771	19,734	801	151,797		
1978		4,443	22,845	63,235	29,424	1,493	121,439		
1979	1,534	3,388	21,422	100,503	48,253	1,175	176,274		
1980	15	6,604	13,510	70,415	33,978	4,240	128,763		
1981	0	1,122	33,220	114,180	54,845	1,841	205,208		
1982	0	5,141	17,169	37,883	27,763	376	88,330	43,538	2.03
1983	560	7,558	35,117	89,449	16,408	162	149,253	44,475	3.36
1984	69	13,368	34,379	75,041	13,782	138	136,778	50,005	2.74
1985	223	10,738	38,956	62,142	4,756	91	116,906	40,435	2.89
1986	347	20,408	45,928	109,067	15,843	138	191,731	41,425	4.63
1987	0	2,368	33,542	67,697	11,700	18	115,325	41,307	2.79
1988	0	6,641	34,323	75,396	8,937	68	125,366	39,699	3.16
1989	75	13,517	78,826	128,851	25,841	0	247,109	60,299	4.10
1990	56	6,343	24,873	71,641	10,816	9	113,737	59,212	1.92
1991	501	7,108	82,332	121,590	10,182	0	221,712	42,728	5.19
1992	6	2,608	23,981	41,677	1,831	0	70,103	39,155	1.79
1993	14	5,313	36,383	86,880	5,880	0	134,450	36,244	3.71
1994	0	755	19,932	30,638	6,175	0	57,545	56,449	1.02
1995	34	1,784	15,989	52,720	7,026	10	77,562	50,673	1.54
1996	20	276	23,201	44,462	14,610	2	82,571	74,060	1.11
1997	14	3,567	26,386	94,406	7,026	14	132,216	53,821	2.46
1998	0	3,478	39,260	76,502	4,380	0	123,598	35,497	3.48
1999	134	1,692	30,110	76,649	2,870	0	111,455	37,184	3.00
2000	0	2,798	40,704	63,414	1,509	0	108,424	25,870	4.19
2001	8	1,813	50,877	51,785	2,339	0	106,822	52,564	2.03
2002	75	2,262	28,704	22,035	180	0	53,256	42,359	1.26
2003	63	5,898	39,178	51,013	2,135	0	98,287	80,594	1.22
2004	3	2,475	26,455	23,242	0	0	52,175	48,469	1.08
2005	9	8,097	35,089					68,551	
2006	15	4,104						62,933	
2007	9							34,903	
2008								34,008	
2009								68,500	
2010								32,010	
Average	(1982-2003)						122,107	46,048	2.65
							Contrast	**3.12**	

Note: Data highlighted in grey are preliminary.

Appendix A11.–Chinook salmon age and sex percentages from selected Yukon River escapement projects, 2010.

Location	Sample Size		Age 2	3	4	5	6	7	8	Total
Anvik River [a]	94	Males	0.0	0.0	33.0	42.6	5.3	0.0	0.0	80.9
		Females	0.0	0.0	0.0	11.7	7.4	0.0	0.0	19.1
		Total	0.0	0.0	33.0	54.3	12.7	0.0	0.0	100.0
Chena River [a]	90	Males	0.0	0.0	15.6	37.8	12.2	1.1	0.0	66.7
		Females	0.0	0.0	6.7	13.3	12.2	1.1	0.0	33.3
		Total	0.0	0.0	22.3	51.1	24.4	2.2	0.0	100.0
East Fork Andreafsky River [b]	624	Males	0.0	0.3	31.1	18.8	1.3	0.0	0.0	51.4
		Females	0.0	0.0	10.3	28.0	9.2	1.0	0.0	48.6
		Total	0.0	0.3	41.4	46.8	10.5	1.0	0.0	100.0
Gisasa River [b]	492	Males	0.0	0.3	41.3	27.8	1.6	0.0	0.0	71.0
		Females	0.0	0.0	2.4	19.0	7.1	0.5	0.0	29.0
		Total	0.0	0.3	43.7	46.8	8.7	0.5	0.0	100.0
Salcha River [a]	419	Males	0.0	0.5	30.5	35.6	3.6	0.0	0.0	70.2
		Females	0.0	0.0	1.2	17.7	9.8	1.2	0.0	29.8
		Total	0.0	0.5	31.7	53.3	13.4	1.2	0.0	100.0

[a] Samples were collected from carcasses.

[b] Samples were collected from a weir trap.

Appendix A12.–Summer chum salmon age and sex percentages from selected Yukon River escapement projects, 2010.

			Age					
Location	Sample Size		3	4	5	6	7	Total
Anvik River [a]	572	Males	2.5	38.9	5.9	0.0	0.0	47.3
		Females	4.9	45.6	2.3	0.0	0.0	52.8
		Total	7.3	84.5	8.2	0.0	0.0	100.0
East Fork Andreafsky River [b]	836	Males	3.1	42.0	2.9	0.2	0.0	48.2
		Females	3.2	47.3	1.3	0.1	0.0	51.9
		Total	6.2	89.3	4.2	0.3	0.0	100.0
Gisasa River [b]	952	Males	7.1	30.2	8.6	1.2	0.0	47.0
		Females	12.1	34.5	6.2	0.2	0.0	53.0
		Total	19.2	64.7	14.7	1.3	0.0	100.0
Salcha River	160	Males	0.6	14.4	18.1	5.0	0.6	38.8
		Females	4.4	32.5	21.3	3.1	0.0	61.3
		Total	5.0	46.9	39.4	8.1	0.6	100.0

[a] Samples were collected by beach seine.

[b] Samples were collected from a weir trap.

[c] Samples were handpicked carcasses.

Appendix A13.–Total (U.S. and Canada) Yukon River Chinook salmon harvest percent by stock group, 1981–2010.

	Stock Group		
Year [a]	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	12.4	31.3	56.3
2008	17.0	28.0	55.0
2009[b]	17.1	29.1	53.7
2010[c]			
Average (1981-2008)	20.3	23.8	55.9

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

[b] 2009 estimates are preliminary.

[c] 2010 estimates are not available until the following year.

Appendix A14.–Yukon River Chinook salmon harvest percent by stock group in Alaska, 1981–2010.

	Stock Group		
Year [a]	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	43.4
2002	22.1	33.2	44.7
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	13.1	33.1	53.8
2008	18.2	30.0	51.8
2009[b]	19.5	33.2	47.3
2010[c]			
Average (1981-2008)	22.5	26.4	51.0

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

[b] 2009 estimates are preliminary.

[c] 2010 estimates are not available until the following year.

Appendix A15.–Upper stock group percent, by country, from the Yukon River Chinook salmon harvest, 1981–2010.

	Upper Stock Group	
Year [a]	Alaska	Canada
1981	78.1	21.9
1982	83.5	16.5
1983	83.7	16.3
1984	72.7	27.3
1985	81.6	18.4
1986	82.7	17.3
1987	86.7	13.3
1988	79.8	20.2
1989	82.9	17.1
1990	79.2	20.8
1991	74.8	25.2
1992	84.5	15.5
1993	82.6	17.4
1994	81.8	18.2
1995	82.4	17.6
1996	81.9	18.1
1997	84.8	15.2
1998	88.8	11.2
1999	83.0	17.0
2000	81.9	18.1
2001	69.8	30.3
2002	76.3	23.5
2003	86.2	13.8
2004	83.7	16.3
2005	80.1	19.9
2006	84.1	15.9
2007	90.4	9.6
2008	88.1	11.9
2009 [b]	77.3	22.7
2010[c]		
Average (1981-2008)	82.3	17.7

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

[b] 2009 estimates are preliminary.

[c] 2010 estimates are not available until the following year.

Appendix A16.–Summary of releases for coded wire tagged Chinook salmon from Whitehorse Hatchery, 1985–2010.

Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss		Days [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	25-May-85	02-32-48	26,670	518	0.019	[b]		27,188		0	
Michie	25-May-85	02-32-26	28,269	518	0.018	[b]		28,787		0	
Michie	25-May-85	02-32-47	43,325	518	0.012	[b]		43,843		0	
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	05-Jun-87	02-48-12	47,644	1,361	0.028	[b]		49,005	2.50	9,598	58,603
Michie	05-Jun-87	02-48-13	49,344	808	0.016	[b]		50,152	2.50	9,141	59,293
Michie	05-Jun-87	02-48-14	51,888	559	0.011	[b]		52,447	2.50	9,422	61,869
Michie	05-Jun-87	02-48-15	43,367	2,066	0.045	[b]		45,433	2.50	7,868	53,301
Michie	05-Jun-87	02-42-58	25,945	245	0.009	[b]		26,190	2.50	4,171	30,361
Wolf	30-May-87	02-42-59	26,752	123	0.005	[b]		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		15	79,661	2.80	84,903	164,564
Michie	10-Jun-88	02-555-0	78,013	1,592	0.020		11	79,605	2.70	85,288	164,893
Wolf	05-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	06-Jun-89	02-60-04	26,161	326	0.012	[b]		26,487	2.30	0	26,487
Michie	06-Jun-89	02-60-05	24,951	128	0.005	[b]		25,079	2.30	0	25,079
Michie	06-Jun-89	02-60-06	25,098	291	0.011	[b]		25,389	2.40	0	25,389
Michie	06-Jun-89	02-60-07	25,233	156	0.006	[b]		25,389	2.20	95,724	121,113
Fishway	06-Jun-89	02-60-08	25,194	357	0.014	[b]		25,551	2.70	0	25,551
Fishway	06-Jun-89	02-60-09	25,190	351	0.014	[b]		25,541	2.70	0	25,541
SUM	1989		151,827	1,609				153,436		118,112	271,548
Wolf	06-Jun-90	no-clip	0	0				0		11,969	11,969
Michie	02-Jun-90	02-02-38	24,555	501	0.020	[b]		25,056	2.30	0	25,056
Michie	02-Jun-90	02-02-39	24,345	753	0.030	[b]		25,098	2.30	0	25,098

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Day[s] [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Fishway	02-Jun-90	02-02-60	24,508	501	0.020	[b]	25,009	2.20	0	25,009
Fishway	02-Jun-90	02-02-63	25,113	254	0.010	[b]	25,367	2.20	0	25,367
SUM	1990		98,521	2,009			100,530		11,969	112,499
Wolf	08-Jun-91	18-03-22	49,477	793	0.016	[b]	50,270	2.30	0	50,270
Fishway	06-Jun-91	18-03-23	52,948	193	0.004	[b]	53,141	2.30	0	53,141
Michie	06-Jun-91	18-03-24	50,020	176	0.004	[b]	50,196	2.30	87,348	137,544
SUM	1991		152,445	1,162			153,607		87,348	240,955
Wolf	04-Jun-92	18-08-29	48,239	0	0.000	[b]	48,239	2.40	0	48,239
Fishway	04-Jun-92	18-08-28	49,356	99	0.002	[b]	49,455	2.30	0	49,455
Michie	04-Jun-92	18-08-30	52,946	643	0.012	[b]	53,589	2.20	249,166	302,755
SUM	1992		150,541	742			151,283		249,166	400,449
Wolf	06-Jun-93	18-12-15	50,248	0	0.000	[b]	50,248	2.30	0	50,248
Fishway	06-Jun-93	18-12-16	49,957	434	0.009	[b]	50,391	2.30	0	50,391
Michie	06-Jun-93	18-12-17	50,169	0	0.000	[b]	50,169	2.30	290,647	340,816
SUM	1993		150,374	434			150,808		290,647	441,455
Wolf	02-Jun-94	18-14-27	50,155	270	0.005	[b]	50,425	2.30	0	50,425
Michie	02-Jun-94	18-14-28	50,210	127	0.003	[b]	50,337	2.30	158,780	209,117
Fishway	02-Jun-94	18-14-29	50,415	125	0.002	[b]	50,540	2.30	0	50,540
SUM	1994		150,780	522			151,302		158,780	310,082
Wolf	06-Jun-95	18-12-46	10,067	164	0.016	3	10,231	1.67	0	10,231
Wolf	06-Jun-95	18-12-47	9,122	0	0.000	3	9,122	1.53	0	9,122
Michie	06-Jun-95	18-18-26	25,231	337	0.013	3	25,568	2.47	4,552	30,120
Michie	06-Jun-95	18-18-27	25,187	141	0.006	3	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	5	10,233	2.30	0	10,233
Fox	4-Jun-96	18-28-23	35,452	0	0.000	5	35,452	2.43	0	35,452
Byng	4-Jun-96	18-10-41	25,263	516	0.020	5	25,779	2.37	0	25,779
Michie	5-Jun-96	18-33-45	50,082	1,022	0.020	5	51,104	2.51	0	51,104
Michie	5-Jun-96	18-33-46	50,260	508	0.010	5	50,768	2.43	0	50,768
Michie	5-Jun-96	18-33-47	49,985	505	0.010	5	50,490	2.32	0	50,490

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Day[s] [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Judas	4-Jun-96	18-33-48	49,798	1,016	0.020	5	50,814	2.43	0	50,814
McClintock	4-Jun-96	18-33-49	49,991	302	0.006	5	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	2	15,000	2.30	0	15,000
Wolf	1-Jun-97	18-23-26	20,334	0	0.000	4	20,334		0	20,334
Wolf	8-Jun-97	18-29-06	10,158	0	0.000	8	10,158		0	10,158
Fox	11-Jun-97	18-25-54	25,242	0	0.000	3	25,242	2.43	0	25,242
Fox	11-Jun-97	18-25-55	24,995	253	0.010	3	25,248		0	25,248
Byng	11-Jun-97	18-29-07	10,029	0	0.000	1	10,029	2.37	0	10,029
Byng	11-Jun-97	18-29-05	10,155	0	0.000	1	10,155		0	10,155
Michie	11-Jun-97	18-28-59	49,657	502	0.010	3	50,159	2.51	0	50,159
Michie	11-Jun-97	18-28-60	50,130	0	0.000	3	50,130	2.43	0	50,130
Judas	7-Jun-97	18-23-27	19,951	202	0.010	3 to 7	20,153	2.43	0	20,153
Judas	11-Jun-97	18-25-53	25,146	0	0.000	11	25,146	2.43	0	25,146
McClintock	11-Jun-97	18-25-51	25,399	0	0.000	3	25,399	2.27	0	25,399
McClintock	11-Jun-97	18-25-52	24,792	251	0.010	3	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	5	50,247	2.84	0	50,247
Michie	12-Jun-98	18-41-21	49,197	1,004	0.020	5	50,201	2.81	0	50,201
Byng	12-Jun-98	18-31-60	24,518	1,022	0.040	5	25,540	3.00	0	25,540
McClintock	12-Jun-98	18-40-43	49,810	503	0.010	5	50,313	2.76	0	50,313
Judas	13-Jun-98	02-54-17	19,018	1,432	0.070	5	20,450	2.55	0	20,450
Judas	12-Jun-98	18-31-59	25,331	256	0.010	5	25,587	2.60	0	25,587
Wolf	6-Jun-98	02-19-58	10,104	421	0.040	5	10,525	1.95	0	10,525
Wolf	4-Jun-98	02-46-06	34,813	710	0.020	5	35,523	2.63	0	35,523
SUM	1998		262,034	6,352			268,386		0	268,386
Michie	6-Jun-99			80,393			80,393	3.13	0	80,393
Byng	6-Jun-99			64,430			64,430	2.92	0	64,430
McClintock	6-Jun-99			64,169			64,169	2.95	0	64,169
Wolf	6-Jun-99			31,048			31,048	3.07	0	31,048

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Day[s] [a]	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	5	25,368	2.80	0	25,368
Michie	8-Jun-00	18-31-29	25,037	253	0.010	5	25,290	2.80	0	25,290
Michie	8-Jun-00	18-43-03	10,907	110	0.010	5	11,017	2.84	0	11,017
McClintock	8-Jun-00	18-13-54	25,041	254	0.010	5	25,295	2.70	0	25,295
McClintock	8-Jun-00	18-13-55	25,016	253	0.010	5	25,269	2.68	0	25,269
Wolf	4-Jun-00	18-23-53	25,071	253	0.010	5	25,324	2.67	0	25,324
Wolf	4-Jun-00	18-23-54	25,012	254	0.010	5	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	5	25,574	2.68	0	25,574
Michie	8-Jun-01	18-44-17	27,293	276	0.010	5	27,569	2.68	0	27,569
Michie	8-Jun-01	18-44-18	27,337	276	0.010	5	27,613	2.60	0	27,613
Michie	8-Jun-01	18-44-19	11,629	117	0.010	5	11,746	2.60	0	11,746
McClintock	8-Jun-01	18-44-12	24,526	248	0.010	5	24,774	3.13	0	24,774
McClintock	8-Jun-01	18-44-13	25,033	253	0.010	5	25,286	3.13	0	25,286
McClintock	8-Jun-01	18-36-50	10,840	110	0.010	5	10,950	3.13	0	10,950
Byng	8-Jun-01	18-44-14	25788	260	0.010	5	26,048	2.84	0	26,048
Byng	8-Jun-01	18-44-15	25,136	254	0.010	5	25,390	2.84	0	25,390
Wolf	28-May-01	18-44-10	26,205	265	0.010	5	26,470	3.34	0	26,470
Wolf	28-May-01	18-44-11	23,902	241	0.010	5	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	5	25460	3.30	0	25460
Wolf	02-Jun-02	18-51-02	25,079	177	0.007	5	25256	3.10	0	25256
McClintock	10-Jun-02	18-51-03	24,769	505	0.020	5	25274	3.60	0	25274
Byng	10-Jun-02	18-51-04	24,907	0	0.000	5	24907	3.00	0	24907
Byng	10-Jun-02	18-51-05	24,925	125	0.005	5	25050	3.00	0	25050
Michie	10-Jun-02	18-51-06	27,114	191	0.007	5	27305	3.20	0	27305
Michie	10-Jun-02	18-51-07	26,854	0	0.000	5	26854	3.02	0	26854
Michie	10-Jun-02	18-50-61	27,850	281	0.010	5	28131	3.20	0	28131
Michie	10-Jun-02	18-50-62	27,241	0	0.000	5	27241	3.04	0	27241

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Day [s a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Michie	10-Jun-02	18-50-63	8,481	86	0.010	5	8567	3.20	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	0.003	5	27,572	2.72	0	27,572
Wolf	25-May-03	18-47-49	26,704	161	0.006	5	26,865	2.69	0	26,865
Byng	2-Jun-03	18-47-47	23,483	71	0.003	5	23,554	3.01	0	23,554
Byng	2-Jun-03	18-47-46	27,058	54	0.002	5	27,112	2.98	0	27,112
Michie	2-Jun-03	18-49-58	28,485	0	0.000	5	28,485	3.05	0	28,485
Michie	2-Jun-03	18-49-59	27,519	0	0.000	5	27,519	2.98	0	27,519
Michie	2-Jun-03	18-49-60	15,541	0	0.000	5	15,541	3.07		15,541
Judas Lake	6-Jun-03								2,500	
SUM	2003		176,279	369			176,648		0	176,648
Wolf	5/28-30/2004	01-01-70	28,946	292		5	29,238	2.90	0	29,238
Wolf	22-Jun-04								2,514	2,514
Mainstem	5/28-29/2004	02-01-69	24,920	431		5	25,351	3.10	0	25,351
Byng	8-Jun-04	02-01-68	24,401	626		5	25,027	3.36	0	25,027
McClintock	8-Jun-04	02-01-67	24,246	879		5	25,125	3.20	0	25,125
Michie	8-Jun-04	02-01-66	24,609	554		5	25,163	3.12	0	25,163
Michie	8-Jun-04	02-01-65	13,594	306		5	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	5	10,860	2.50	0	10,860
Wolf	5/31-6/05	18-56-17	5,835	59	1.000	5	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	5,972	2.50	0	5,972
Byng	13-Jun-05	18-56-19	4,369	89	2.000	5	4,458	2.50	0	4,458
McClintock	13-Jun-05	18-44-19	10,632	0	0.000	5	10,632	2.50	0	10,632
Michie	13-Jun-05	02-01-64	4,870	0	0.000	5	4,870	2.50	0	4,870
Michie	13-Jun-05	02-01-65	5,983	0	0.000	5	5,983	2.50	0	5,983
Michie	13-Jun-05	08-01-65	28,082	284	1.000	5	28,366	2.50	0	28,366
Michie	13-Jun-05	18-56-20	5,906	0	0.000	5	5,906	2.50	0	5,906

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Days [a]	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Mainstem	6/02,6/14,07/7	08-01-68	28,991	293	1.000	5	29,284	2.50	0	29,284
SUM	2005		111,272	1,567			112,839			112,839
Wolf	6/4 - 6/11	08-01-66	26,412	0	0.000	2	26,412	2.66	0	26,412
Wolf	6/4 - 6/11	08-01-71	8,718	88	1.000	2	8,806	2.66	0	8,806
Mainstem	8-Jun-06	08-01-72	6,761	427	1.500	2	7,188	2.63	0	7,188
Mainstem	8-Jun-06	08-01-67	28,045	103	1.500	2	28,148	2.63	0	28,148
Michie	14-Jun-06	08-01-69	39,164	596	1.500	2	39,760		0	39,760
Michie	14-Jun-06	08-01-74	3,692	56	1.500	2	3,748	2.41	0	3,748
McClintock	14-Jun-06	08-01-70	29,282	296	1.000	5	29,578	2.58	0	29,578
McClintock	14-Jun-06	08-01-73	5,426	55	1.000	5	5,481	2.89	0	5,481
Wolf	11-Jun-06		0	7,658	0.000		7,658	3.02	0	7,658
SUM	2006		147,500	9,279			156,779			156,779
Wolf	5/24-6/3	Agency Tags 18	37,781	771	2.000	2	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	2	35,609	2.87	0	35,609
Michie	8-Jun-07	Agency Tags 18	50,084	506	1.000	2	50,590	3.22	0	50,590
McClintock	8-Jun-07	Agency Tags 18	38,383	388	1.000	2	38,771	3.22	0	38,771
SUM	2007		161,501	4,653			166,154			166,154
Wolf	6/01-6/26	Agency Tags 08	10,939	0	0.000		10,939	2.97	0	10,939
Wolf	26-Jun-08			2,618			2,618		0	2,618
Mainstem	5-Jun-08	Agency Tags 08	20,498	418	2.000		20,916	2.84	0	20,916
Michie	5-Jun-08	Agency Tags 08	24,615	502	2.000		25,117	2.71	0	25,117
McClintock	5-Jun-08	Agency Tags 08	24,687	1,029	4.000		25,716	2.89	0	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	0	19,851
Wolf	11-Jun-09			2,672			2,672		0	2,672
Mainstem	6-Jun-09	Agency Tags 08	42,648	258	0.600		42,906	3.00	0	42,906
Michie	6-Jun-09	Agency Tags 08	77,048	778	0.100		77,826	2.87	0	77,826
McClintock	6-Jun-09	Agency Tags 08	26,338	53	0.020		26,391	2.52	0	26,391
SUM	2009		165,686	3,960			169,646			169,646

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Release Location	Release Date*	Code	# Tagged & Clipped [c]	Adipose Clipped Only	%Tag-Loss	Days [a]	Sample Size	Total Clipped	Weight (grams)	Total Unclipped	Total Released
Wolf	30-May-10	Agency Tag 18	12,000	0	0.00			12,000	2.89	0	12,000
Michie	1-Jun-10	Agency Tag 18	66,848	2,067	3.00			66,848	3.00	0	68,915
McClintock	1-Jun-10	Agency Tag 18	19,714	0	0.00			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	1.00			23,985	2.98	0	24,227
SUM	2010		122,547	3,678			0	123,916		0	126,225
TOTAL			4,034,438	302,302				4,336,740		1,180,189	5,516,929

[a] The number of days refers to the period of the fish were held to determine tag loss.

[b] Unknown period.

[c] Usually corresponds to "tagged" category on MRP release forms.

CWT Data recorded from CWT release sheets 1989-1994.

CWT Data prior to 1987 not verified against SEP records.

Appendix A17.–Summary of releases of Chinook salmon from Yukon Territory in stream incubation/rearing sites 1991–2010.

Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
Klondike R, Nor	1990	Tatchun Ck.	02-01-01-02-12	Spring Fry	Tatchun Ck.	91/06/28	91/06/28	13593	21	650	14264	0.74
Klondike R, Nor	1990	Tatchun Ck.	02-01-01-02-09	Spring Fry	Tatchun Ck.	91/06/28	91/06/28	15247	173	750	16170	0.74
Klondike R, Nor	1991	Tatchun Ck.	18-06-45	Spring Fry	Tatchun Ck.	NA	92/08/31	11734	0	817	12551	2.47
Klondike R, Nor	1991	Tatchun Ck.	02-33-56	Spring Fry	Tatchun Ck.	NA	92/08/31	6453	0	852	7305	2.47
Klondike R, Nor	1991	Tatchun Ck.	18-06-44	Spring Fry	Tatchun Ck.	NA	92/08/31	11585	0	320	11905	2.47
Klondike R, Nor	1991	Yukon R	NOCN9148	Spring Fry	Pothole Lk	92/06/	92/06/	0	0	1500	1500	0
Klondike R, Nor	1993	Klondike R Nor	02-01-01-05-03	Spring Fry	Klondike R Nor	94/06/30	94/06/30	6174	10	54	6238	0.88
Klondike R, Nor	1993	Tatchun Ck.	02-01-01-04-07	Spring Fry	Tatchun Ck.	94/06/30	94/06/30	12077	246	71	12394	0.99
Klondike R, Nor	1993	Tatchun Ck.	02-01-01-05-05	Spring Fry	Tatchun Ck.	94/06/30	94/06/30	9982	0	61	10043	0.99
Klondike R, Nor	1994	Klondike R Nor	02-01-01-06-03	Spring Fry	Klondike R Nor	95/07/04	95/07/04	2159	11	190	2360	0.75
Klondike R, Nor	1994	Klondike R Nor	02-01-01-06-02	Spring Fry	Klondike R Nor	95/07/04	95/07/04	1809	16	56	1881	0.75
Klondike R, Nor	1994	Tatchun Ck.	02-01-01-05-11	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	12431	100	686	13217	0.81
Klondike R, Nor	1994	Tatchun Ck.	02-01-01-05-15	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	2490	33	177	2700	0.81
Klondike R, Nor	1994	Tatchun Ck.	02-01-01-06-01	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	1476	19	155	1650	0.81
Klondike R, Nor	1994	Tatchun Ck.	02-01-01-05-13	Spring Fry	Tatchun Ck.	95/07/04	95/07/04	11649	238	413	12300	0.81
Klondike R, Nor	1995	Klondike R Nor	02-01-01-04-08	Spring Fry	Klondike R Nor	96/06/22	96/06/22	11423	1707	0	13130	0.76

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
Mayo River	1991	Mayo R	NOCN9147	Spring Fry	Mayo R	92/06/	92/06/	0	0	13000	13000	0
Mayo River	1992	Mayo R	NOCN9292	Spring Fry	Mayo R	93/07/	93/07/	0	0	500	500	0
McIntyre Cr	1990	Takhini R	02-33-55	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	7967	80	39	8086	3.2
McIntyre Cr	1990	Takhini R	02-33-54	Fall Fry 5-8 gm	Takhini R	91/09/13	91/09/13	10789	109	101	10999	3.2
McIntyre Cr	1991	Takhini R	02-01-01-03-08	Spring Fry	Flat Ck.	NA	92/07/04	12141	143	3425	15709	0.98
McIntyre Cr	1991	Takhini R	02-01-01-03-09	Spring Fry	Flat Ck.	NA	92/07/04	13102	466	1398	14966	0.98
McIntyre Cr	1991	Takhini R	02-01-01-03-10	Spring Fry	Flat Ck.	NA	92/07/04	4955	261	601	5817	0.98
McIntyre Cr	1992	Klondike R Nor	02-01-01-04-04	Spring Fry	Klondike R Nor	93/07/01	93/07/01	12832	240	144	13216	1.14
McIntyre Cr	1992	Klondike R Nor	02-01-01-04-05	Spring Fry	Klondike R Nor	93/07/01	93/07/01	7546	256	167	7969	1.14
McIntyre Cr	1992	Takhini R	02-34-24	Spring Fry	Flat Ck.	93/08/17	93/08/17	9532	823	95	10450	2.71
McIntyre Cr	1992	Takhini R	02-34-23	Spring Fry	Flat Ck.	93/08/17	93/08/17	9822	850	218	10890	2.71
McIntyre Cr	1992	Takhini R	18-14-54	Spring Fry	Flat Ck.	93/08/17	93/08/17	10925	567	227	11719	2.71
McIntyre Cr	1992	Takhini R	18-14-53	Spring Fry	Flat Ck.	93/08/17	93/08/17	10658	865	226	11749	2.71
McIntyre Cr	1992	Takhini R	02-02-17	Spring Fry	Flat Ck.	93/08/17	93/08/17	2291	114	37	2442	2.71
McIntyre Cr	1992	Takhini R	02-34-22	Spring Fry	Flat Ck.	93/08/17	93/08/17	10355	314	40	10709	2.71
McIntyre Cr	1992	Tatchun Ck.	02-01-01-04-02	Spring Fry	Tatchun Ck.	93/06/17	93/06/17	4654	633	335	5622	0.76
McIntyre Cr	1993	Takhini R	18-17-51	Spring Fry	Flat Ck.	94/08/26	94/08/31	7410	46	222	7678	2.6

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	1993	Takhini R	18-17-50	Spring Fry	Flat Ck.	94/08/26	94/08/31	11227	40	87	11354	2.6
McIntyre Cr	1993	Takhini R	18-17-49	Spring Fry	Flat Ck.	94/08/26	94/08/31	11071	159	142	11372	2.6
McIntyre Cr	1993	Takhini R	18-17-48	Spring Fry	Flat Ck.	94/08/26	94/08/31	11375	0	104	11479	2.6
McIntyre Cr	1993	Takhini R	18-17-52	Spring Fry	Flat Ck.	94/08/26	94/08/31	10668	21	198	10887	2.6
McIntyre Cr	1993	Takhini R	02-02-16	Spring Fry	Takhini R	94/08/30	94/08/30	9343	271	36	9650	2.8
McIntyre Cr	1993	Takhini R	02-01-63	Spring Fry	Takhini R	94/08/30	94/08/30	10899	222	62	11183	2.8
McIntyre Cr	1994	Takhini R	02-01-01-04-15	Spring Fry	Takhini R	95/08/14	95/08/14	9887	0	410	10297	2.2
McIntyre Cr	1994	Takhini R	02-01-01-04-13	Spring Fry	Takhini R	95/08/14	95/08/14	14452	0	365	14817	2.2
McIntyre Cr	1994	Takhini R	02-01-01-04-12	Spring Fry	Flat Ck.	95/08/14	95/08/14	14193	59	281	14533	2.2
McIntyre Cr	1994	Takhini R	02-01-01-04-14	Spring Fry	Flat Ck.	95/08/14	95/08/14	13586	130	295	14011	2.2
McIntyre Cr	1995	Takhini R	02-01-01-05-08	Spring Fry	Takhini R	96/08/12	96/08/12	15731	251	496	16478	2.1
McIntyre Cr	1995	Takhini R	02-01-01-05-09	Spring Fry	Takhini R	96/08/12	96/08/12	8085	41	293	8419	2.1
McIntyre Cr	1995	Takhini R	02-01-01-05-10	Spring Fry	Flat Ck.	96/08/07	96/08/07	10727	65	170	10962	2.01
McIntyre Cr	1995	Tatchun Ck.	02-01-01-02-10	Spring Fry	Tatchun Ck.	96/06/27	96/06/27	14530	49	62	14641	0.81
McIntyre Cr	1995	Tatchun Ck.	02-01-01-02-11	Spring Fry	Tatchun Ck.	96/06/27	96/06/27	13526	91	294	13911	0.81
McIntyre Cr	1996	Takhini R	02-01-01-06-14	Spring Fry	Flat Ck.	97/07/02	97/07/04	15622	158	382	16162	0.8
McIntyre Cr	1996	Takhini R	02-01-01-04-06	Spring Fry	Flat Ck.	97/07/02	97/07/04	14845	37	280	15162	0.8
McIntyre Cr	1996	Tatchun Ck.	02-01-01-07-03	Spring Fry	Tatchun Ck.	97/06/27	97/06/27	1521	15	148	1684	1

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	1997	Tatchun Ck.	02-01-01-06-08	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	9284	150	74	9508	1.1
McIntyre Cr	1997	Tatchun Ck.	02-01-01-06-09	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	10318	211	188	10717	1.1
McIntyre Cr	1997	Tatchun Ck.	02-01-01-07-02	Spring Fry	Tatchun Ck.	98/06/19	98/06/19	2536	52	0	2588	1.1
McIntyre Cr	1997	Takhini R	02-01-01-07-09	Spring Fry	Flat Ck.	98/06/22	98/06/22	11374	115	115	11604	1.1
McIntyre Cr	1997	Takhini R	02-01-01-06-11	Spring Fry	Takhini R	98/06/23	98/06/23	12933	334	118	13385	1.1
McIntyre Cr	1997	Takhini R	02-01-01-06-10	Spring Fry	Takhini R	98/06/23	98/06/23	12186	37	115	12338	1.1
McIntyre Cr	1997	Takhini R	02-01-01-07-08	Spring Fry	Takhini R	98/06/23	98/06/23	12341	253	148	12742	1.1
McIntyre Cr	1998	Tatchun Ck.	02-01-01-06-12	Spring Fry	Tatchun Ck.	NA	99/07/08	10363	0	67	10430	
McIntyre Cr	1998	Tatchun Ck.	02-01-01-06-13	Spring Fry	Tatchun Ck.	NA	99/07/08	4733	0	82	4815	
McIntyre Cr	1998	Takhini R.	02-01-01-07-10	Spring Fry	Takhini R.	NA	99/07/14	13753	28	148	13929	
McIntyre Cr	1998	Takhini R.	02-01-01-07-11	Spring Fry	Flat Ck.	NA	99/07/15	11273	23	206	11502	
McIntyre Cr	1999	Takhini River	02-01-0-07-07	Spring Fry	Flat Ck.	NA	06/23/00	11333	114	219	11666	0.8
McIntyre Cr	1999	Takhini River	02-01-01-07-12	Spring Fry	Flat Ck.	NA	06/23/00	12246	0	214	12460	0.8
McIntyre Cr	1999	Takhini River	02-01-01-06-04	Spring Fry	Takhini River	NA	06/24/00	11105	0	147	11252	0.9
McIntyre Cr	1999	Takhini River	02-01-01-06-05	Spring Fry	Takhini River	NA	06/24/00	12044	0	88	12132	0.9
McIntyre Cr	1999	Takhini River	02-01-01-06-06	Spring Fry	Takhini River	NA	06/24/00	4561	0	0	4561	0.9
McIntyre Cr	1999	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	06/19/00	12239	188	409	12836	1
McIntyre Cr	1999	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	06/19/00	987	10	0	997	1

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	2000	Takhini River	02-01-01-08-01	Spring Fry	Takhini River	NA	07/25/01	11724	163	123	12010	1.1
McIntyre Cr	2000	Takhini River	02-01-01-08-02	Spring Fry	Flat Ck.	NA	07/26/01	9995	101	60	10156	1.1
McIntyre Cr	2000	Tatchun Ck.	02-01-01-07-05	Spring Fry	Tatchun Ck.	NA	07/09/01	11654	360	10	12024	1.1
McIntyre Cr	2000	Tatchun Ck.	02-01-01-07-06	Spring Fry	Tatchun Ck.	NA	07/09/01	6321	329	14	6664	1.1
McIntyre Cr	2001	Takhini River	02-01-01-08-04	Spring Fry	Takhini River	NA	06/29/02	10109	314	301	10724	1
McIntyre Cr	2001	Takhini River	02-01-01-08-05	Spring Fry	Takhini River	NA	06/29/02	9814	100	405	10319	1
McIntyre Cr	2001	Takhini River	02-01-01-08-07	Spring Fry	Flat Ck.	NA	06/28/02	4161	42	0	4203	1
McIntyre Cr	2001	Tatchun Ck.	02-01-01-08-03	Spring Fry	Tatchun Ck.	NA	06/27/02	6432	415	279	7126	1
McIntyre Cr	2002	Takhini River	02-11-22-31-41	Spring Fry	Takhini River	NA	07/21/03	8431	0	55	8486	1.7
McIntyre Cr	2002	Takhini River	02-11-22-31-42	Spring Fry	Takhini River	NA	07/21/03	14017	0	76	14093	1.7
McIntyre Cr	2002	Takhini River	02-01-01-07-01	Spring Fry	Takhini River	NA	07/21/03	11589	13	104	11706	1.7
McIntyre Cr	2002	Takhini River	02-11-21-38-46	Spring Fry	Flat Ck.	NA	07/22/03	6426	65	0	6491	1.7
McIntyre Cr	2002	Tatchun Ck.	02-01-01-07-14	Spring Fry	Tatchun Ck.	NA	07/04/03	10746	50	79	10875	1.4
McIntyre Cr	2002	Tatchun Ck.	02-01-01-07-15	Spring Fry	Tatchun Ck.	NA	07/04/03	13261	0	166	13427	1.4
McIntyre Cr	2003	Tatchun Cr.	02-01-02-01-05	Spring Fry	Tatchun Ck.	NA	06/27/04	10701	805	0	11506	1.1
McIntyre Cr	2003	Tatchun Cr.	02-01-02-01-04	Spring Fry	Tatchun Ck.	NA	06/27/04	9919	556	0	10475	1.1
McIntyre Cr	2003	Tatchun Cr.	02-01-02-01-03	Spring Fry	Tatchun Ck.	NA	06/27/04	5249	395	0	5644	1.1
McIntyre Cr	2003	Takhini River	02-01-02-02-01	Spring Fry	Takhini River	NA	07/12/04	10449	268	0	10717	1.3

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	2003	Takhini River	02 01 02 01 06	Spring Fry	Takhini River	NA	07/12/04	11685	178	0	11863	1.3
McIntyre Cr	2003	Takhini River	02-01-02-01-08	Spring Fry	Flat Ck.	NA	08/16/04	7785	95	0	7880	1.1
McIntyre Cr	2003	Tatchun Ck.	02-01-01-09-01	Spring Fry	Tatchun Ck.	NA	08/20/04	9381	143	0	9524	1.3
McIntyre Cr	2003	Tatchun Ck.	02-01-01-08-08	Spring Fry	Tatchun Ck.	NA	08/20/04	5216	79	0	5295	1.5
McIntyre Cr	2003	Takhini River	02-01-01-09-03	Spring Fry	Takhini River	NA	08/21/04	10112	154	0	10266	1.2
McIntyre Cr	2003	Takhini River	02-01-01-09-02	Spring Fry	Takhini River	NA	08/21/04	10180	155	0	10335	1.2
McIntyre Cr	2003	Takhini River	02-01-02-01-03	Spring Fry	Takhini River	NA	08/21/04	5390	82	0	5472	1.2
McIntyre Cr	2004	Tatchun Cr.	02-01-01-08-09	Spring Fry	Tatchun Ck.	NA	06/27/05	2361	426	0	2787	1.3
McIntyre Cr	2004	Takhini River	02-01-02-02-02	Spring Fry	Takhini River	NA	07/14/05	23068	2175	1100	26343	1.3
McIntyre Cr	2004	Takhini River	02-01-02-02-03	Spring Fry	Takhini River	NA	07/14/05	9146	1016	1100	11262	1.3
McIntyre Cr	2004	Takhini River	02-01-02-01-08	Spring Fry	Flat Ck.	NA	07/07/05	5592	233	0	5825	1.3
McIntrye Cr	2005	Takhini River	02-1-2-2-5	Spring Fry	Takhini River	NA	07/10/06	10766	748	0	11514	1.3
McIntrye Cr	2005	Takhini River	02-1-2-1-9	Spring Fry	Takhini River	NA	07/10/06	10952	534	0	11486	1.6
McIntrye Cr	2005	Takhini River	02-1-2-2-6	Spring Fry	Takhini River	NA	07/10/06	11108	394	0	11502	1.6
McIntrye Cr	2005	Takhini River	02-1-2-3-4	Spring Fry	Takhini River	NA	07/18/06	2520	152	0	2672	1.6
McIntrye Cr	2005	Tatchun Ck.	02-1-2-1-7	Spring Fry	Tatchun Ck.	NA	07/07/06	9243	182	0	9425	2.4
McIntrye Cr	2005	Tatchun Ck.	02-1-2-3-3	Spring Fry	Tatchun Ck.	NA	07/23/06	26094	847	0	26941	2.4
McIntyre Cr	2006	Takhini River	02-01-02-03-09	Spring Fry	Takhini River	07/17/07	07/20/07	8422	936	552	9910	~1.6*

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	2006	Takhini River	02-01-02-03-07	Spring Fry	Takhini River	07/17/07	07/20/07	10108	645	185	10938	~1.6*
McIntyre Cr	2006	Takhini River	02-01-02-03-08	Spring Fry	Takhini River	07/17/07	07/20/07	10080	420	183	10683	~1.6*
McIntyre Cr	2006	Takhini River	02-01-02-04-01	Spring Fry	Takhini River	07/17/07	07/20/07	8881	567	688	10136	~1.6*
McIntyre Cr	2006	Takhini River	02-01-02-04-04	Spring Fry	Takhini River	07/17/07	07/20/07	1500	131	55	1686	~1.6*
McIntyre Cr	2006	Tatchun Ck.	02-01-02-04-02	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	9775	182	185	10142	>2.4**
McIntyre Cr	2006	Tatchun Ck.	02-01-02-04-03	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	9450	476	113	10039	>2.4**
McIntyre Cr	2006	Tatchun Ck.	02-01-02-03-05	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	8972	955	196	10123	>2.4**
McIntyre Cr	2006	Tatchun Ck.	02-01-02-03-06	Spring Fry	Tatchun Ck.	07/21/07	07/26/07	6261	261	101	6623	>2.4**
McIntyre Cr	2007	Tatchun Ck.	Tatchun Ck.	Spring Fry	Tatchun Creek	06/27/08	06/27/08	10170	103	145	10418	1.6
McIntyre Cr	2007	Tatchun Ck.	Tatchun Ck.	Spring Fry	Tatchun Creek	06/27/08	06/27/08	10056	311	228	10595	1.6
McIntyre Cr	2007	Tatchun Ck.	Tatchun Ck.	Spring Fry	Tatchun Creek	06/27/08	06/27/08	4345	44	328	4717	1.6
McIntyre Cr	2007	Takhini R.	Takhini R.	Spring Fry	Takhini River	07/02/08	07/02/08	6756	209	197	7162	1.4
McIntyre Cr	2007	Takhini R.	Takhini R.	Spring Fry	Takhini River	07/02/08	07/02/08	9490	293	119	9902	1.4
McIntyre Cr	2008	Tatchun Ck.	02-01-02-05-06	Spring Fry	Tatchun Creek	06/30/09	06/30/09	2576	136	37	2749	1.3
McIntyre/Fox	2008	Whitehorse Fishway	02-01-02-05-01	Spring Fry	Fox Creek	07/03/09	07/03/09	10141	459	0	10600	1.4
McIntyre/Fox	2008	Whitehorse Fishway	02-01-02-05-02	Spring Fry	Fox Creek	07/03/09	07/03/09	10019	459	0	10478	1.4
McIntyre/Fox	2008	Whitehorse Fishway	02-01-02-05-03	Spring Fry	Fox Creek	07/03/09	07/10/09	9739	1253	0	10992	1.4
McIntyre/Fox	2008	Whitehorse Fishway	02-01-02-05-04	Spring Fry	Fox Creek	07/09/09	07/10/09	9194	1417	0	10611	1.4
McIntyre/Fox	2008	Whitehorse Fishway	02-01-02-05-05	Spring Fry	Fox Creek	07/09/09	07/10/09	9747	1126	0	10873	1.4

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Project	Brood Year	Stock	Mark	Stage	Release Site	Start Date	End Date	# Tagged	# Ad Only	# Un-Marked	Total Rel.	WT. (gm)
McIntyre Cr	2009	Tatchun Ck.	02-1-2-5-7	Spring Fry	Tatchun Creek	6/21/2010	6/21/2010	1373	131	0	1504	1.3
McIntyre/Fox	2009	Whitehorse Fishway	02-1-2-59	Spring Fry	Fox Creek	6/18/2010	6/18/2010	7930	1251	0	9181	1.1

Notes for 2003 Brood Year Releases:

02-01-02-01-03	11506	thermal marked.
02-01-02-01-04	10475	not thermal marked.
02-01-02-01-03	5644	not thermal marked.
02-01-02-01-08	7880	a portion actually released July 12.
02-01-01-09-01	9524	not thermal marked.
02-01-01-08-08	5295	thermal marked.
02-01-02-01-03	5472	error resulted in having the same code as some Tatchun fry.

NA= Not Available.

* WT. Not taken at release, but were on similar growth curve to 2006.

** WT. Not taken at release, but averaging slightly larger size than in 2006.

Appendix A18.–Yukon River fall chum salmon estimated brood year production and return per spawner estimates 1974–2010.

				Estimated Brood Year Return								(R)	(R/P)
	(P)	Estimated Annual Totals		Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Return	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	0.139	0.756	0.104	0.000	658,199	1.51
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,401	123	0.105	0.853	0.043	0.000	1,437,415	0.98
1976	268,841	339,043	607,884	102,062	587,479	137,039	4,316	0.123	0.707	0.165	0.005	830,895	3.09
1977	514,843	447,918	962,761	102,660	1,075,198	175,688	4,189	0.076	0.792	0.129	0.003	1,357,735	2.64
1978	320,487	434,030	754,517	22,222	332,230	90,580	0	0.050	0.747	0.204	0.000	445,032	1.39
1979	780,818	615,377	1,396,195	41,114	769,496	274,311	3,894	0.038	0.707	0.252	0.004	1,088,814	1.39
1980	263,167	488,373	751,540	8,377	362,199	208,962	3,125	0.014	0.622	0.359	0.005	582,663	2.21
1981	551,192	683,391	1,234,583	45,855	955,725	278,386	8,888	0.036	0.742	0.216	0.007	1,288,853	2.34
1982	179,828	373,519	553,347	11,327	400,323	166,754	679	0.020	0.691	0.288	0.001	579,083	3.22
1983	347,157	525,485	872,642	12,569	875,355	223,468	2,313	0.011	0.786	0.201	0.002	1,113,704	3.21
1984	270,042	412,323	682,365	7,089	408,040	174,207	8,516	0.012	0.683	0.291	0.014	597,852	2.21
1985	664,426	515,481	1,179,907	46,635	874,819	270,984	3,194	0.039	0.732	0.227	0.003	1,195,632	1.80
1986	376,374	318,028	694,402	0	429,749	368,513	4,353	0.000	0.535	0.459	0.005	802,614	2.13
1987	651,943	406,143	1,058,086	12,413	617,519	290,767	7,720	0.013	0.665	0.313	0.008	928,418	1.42
1988	325,137	353,685	678,822	41,003	175,236	152,368	10,894 [c]	0.108	0.462	0.401	0.029	379,501	1.17
1989	506,173	545,166	1,051,339	2,744	282,905	345,136 [c]	20,290	0.004	0.435	0.530	0.031	651,075	1.29
1990	369,654	352,007	721,661	710	579,452 [c]	418,448	30,449	0.001	0.563	0.407	0.030	1,029,059	2.78
1991	591,132	439,096	1,030,228	3,663 [c]	1,024,800	369,103	12,167	0.003	0.727	0.262	0.009	1,409,733	2.38
1992	324,253	148,846	473,099	6,763	653,648	197,073	3,907	0.008	0.759	0.229	0.005	861,392	2.66
1993	352,688	91,015	443,703	7,745	451,327	102,420	3,235	0.014	0.799	0.181	0.006	564,727	1.60
1994	769,920	169,225	939,145	4,322	225,243	149,527	1,603 [c]	0.011	0.592	0.393	0.004	380,695	0.49
1995	1,009,155	461,147	1,470,302	2,371	266,955	68,918 [c]	383	0.007	0.788	0.204	0.001	338,627	0.34
1996	800,022	260,923	1,060,945	420	165,691 [c]	136,906	8,295	0.001	0.532	0.440	0.027	311,312	0.39

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	(P)	Estimated Annual Totals		Estimated Brood Year Return: Number of Salmon [a]				Estimated Brood Year Return: Percent				(R)	(R/P)
Year	Escapement [b]	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Total Brood Year Return[a]	Return/ Spawner
1997	494,831	170,059	664,890	3,087 [c]	244,801	118,343	3,332	0.008	0.662	0.320	0.009	369,563	0.75
1998	263,121	70,820	333,941	651	269,653	57,962	6,694	0.002	0.805	0.173	0.020	334,960	1.27
1999	288,962	131,175	420,137	29,097	705,152	174,424	13,721	0.032	0.764	0.189	0.015	922,392	3.19
2000	210,756	28,543	239,299	8,446	297,012	115,488	0	0.020	0.706	0.274	0.000	420,937	2.00
2001	337,765	44,976	382,741	136,038	2,157,674	675,688	33,600	0.045	0.718	0.225	0.011	3,003,179	8.89
2002	397,977	27,411	425,388	0	444,507	239,154	13,067	0.000	0.638	0.343	0.019	696,728	1.75
2003	695,363	79,529	774,892	24,263	858,714	434,639	15,995	0.018	0.644	0.326	0.012	1,333,611	1.92
2004	537,873	76,296	614,169	0	332,454	145,066	1,743	0.000	0.694	0.303	0.004	479,263	0.89
2005	1,996,513	290,183	2,286,696	2,269	369,995	79,298	**4,784**	0.005	0.811	0.174		456,346 [d]	>0.23
2006	873,987	270,471	1,144,458	24,326	332,924	**193,832**						551,082 [e]	>0.63
2007	928,430	203,393	1,131,823	70,148									
2008	564,482	217,947	782,429										
2009	462,063	93,319	555,382										
2010	409,353	74,759	484,112										
Average-09	560,863	306,563	867,426										
	495,664	All Brood Years (1974-2004)		29,866	598,270	215,819	7,453	0.0309	0.6872	0.2726	0.0093	851,409	2.04
	382,121	Even Brood Years (1974-2004)		19,072	385,042	176,671	6,103	0.0318	0.6557	0.3020	0.0105	586,887	1.82
	616,777	Odd Brood Years (1974-2004)		41,380	825,714	257,578	8,893	0.0299	0.7209	0.2412	0.0080	1,133,565	2.28
	512,803	All Brood Years (1974-1983)		58,839	708,120	168,528	2,753	0.0611	0.7401	0.1960	0.0027	938,239	2.20
	293,762	Even Brood Years (1974-1983)		47,148	435,997	134,406	1,624	0.0692	0.7045	0.2239	0.0023	619,175	2.28
	731,845	Odd Brood Years (1974-1983)		70,530	980,243	202,651	3,881	0.0530	0.7757	0.1681	0.0031	1,257,304	2.11
	487,503	All Brood Years (1984-2004)		16,069	545,961	238,339	9,691	0.0165	0.6620	0.3091	0.0124	810,061	1.97
	422,284	Even Brood Years (1984-2004)		6,309	361,881	195,882	8,138	0.0148	0.6334	0.3376	0.0142	572,210	1.61
	559,244	Odd Brood Years (1984-2004)		26,805	748,449	285,042	11,399	0.0183	0.6935	0.2777	0.0105	1,071,696	2.36

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[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 11.10.

[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 2005 was at least 0.23. Recruits estimated for incomplete brood year age-6.

[e] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2006 was at least 0.63. Recruits estimated for incomplete brood year age-5.

Appendix A19.–Canadian Yukon River mainstem fall chum salmon estimated brood year production and return per spawner estimates 1982–2010.

Brood Year	Return by Age 3	4	5	6	Escapement	Total Brood Year	Return/ Spawner (R/S)
1982	4098	142640	30840	719	31,958	178296	5.58
1983	2,355	165,499	66,390	637	90,875	234,881	2.58
1984	6,566	70,181	28,367	212	56,633	105,325	1.86
1985	2,712	111,346	26,190	689	62,010	140,938	2.27
1986	141	120,963	82,832	629	87,940	204,565	2.33
1987	1,015	118,092	36,000	2,839	80,776	157,946	1.96
1988	394	60,209	24,764	1,656	36,786	87,023	2.37
1989	1,258	27,678	56,516	4,507	35,750	89,959	2.52
1990	299	101,440	79,702	5,041	51,735	186,482	3.60
1991	207	201,389	87,223	2,893	78,461	291,712	3.72
1992	9,251	96,723	54,264	742	49,082	160,980	3.28
1993	306	71,619	18,395	746	29,743	91,066	3.06
1994	231	41,537	35,079	1,642	98,358	78,490	0.80
1995	742	61,762	47,115	363	158,092	109,982	0.70
1996	840	13,895	18,977	397	122,429	34,108	0.28
1997	189	24,909	60,130	948	85,419	86,177	1.01
1998	757	49,025	27,495	0	46,252	77,276	1.67
1999	520	142,025	93,080	0	58,552	235,626	4.02
2000	758	85,513	19,855	1,187	53,732	107,314	2.00
2001	2,775	490,800	181,032	13,385	33,491	687,991	20.54
2002	4,325	99,419	122,373	4,322	98,679	230,439	2.34
2003	3,561	165,203	154,568	3,759	143,133	327,091	2.29
2004	2,677	79,572	34,088	2,897	154,080	119,234	0.77
2005	0	86,942	23,173		437,498		
2006	5,716	98,487			211,994		
2007	20,277				254,649		
2008					174,267		
2009					93,626		
2010					117,871		
Average(1982-2004)					72,268	177,439	3
			Contrast (up to 2003):		5.32		

Note: Data in grey-shaded boxes are from Eagle Sonar project test fishery samples; earlier data is from fish wheel mark–recapture samples.

Appendix A20.–Escapement, rebuilding and interim goals for Canadian origin Chinook and fall chum salmon stocks, 1985–2011.

	Canadian Origin Stock Targets					
	Chinook Salmon		Fall Chum Salmon			
Year	Escapement Goal	Stabilization/ Rebuilding	Mainstem Escapement Goal	Stabilization/ Rebuilding	Fishing Branch Escapement Goal	Fishing Branch 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	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	80,000	50,000-120,000	
1999	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2000	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2001	33,000-43,000	28,000	80,000	80,000	50,000-120,000	
2002	33,000-43,000	28,000	80,000	60,000	50,000-120,000	
2003	33,000-43,000	28,000 [a]	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	80,000	50,000-120,000	28,000
2007	33,000-43,000	33,000-43,000	80,000	80,000	50,000-120,000	34,000
2008	45,000 [b]	45,000 [b]	80,000	80,000	50,000-120,000	22,000-49,000 [c]
2009	45,000 [b]	45,000 [b]	80,000	80,000	50,000-120,000	22,000-49,000 [c]
2010	42,500-55,000 [d]		70,000-104,000 [e]			22,000-49,000 [c]
2011	42,000-55,000 [e]		70,000-104,000 [e]			22,000-49,000 [c]

[a] 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.

[b] Interim Management Escapement Goal (IMEG) using Eagle sonar estimates of Canadian border passage, previous years were measured by mark–recapture abundance estimates.

[c] Interim Management Escapement Goal (IMEG) established for 2008–2013.

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

[e] The IMEGs from 2010 were recommended to continue in 2011..

Appendix A21.–Recoveries of Chinook salmon coded wire tags from the Whitehorse Rapids Fish hatchery in the U.S. domestic groundfish fisheries and research trawl surveys.

Brood Year	Release Location	Release Date	Recovery Date	Age (yrs)	Latitude	Longitude	Gear Type
1988	Michie Cr.	06/06/89	03/25/92	4	56° 44’	173° 15’	Domestic Trawl
1988	McClintock R.	06/06/89	03/19/94	6	Area 513		Domestic Trawl
1990	Wolf Cr.	08/08/91	03/14/94	4	60° 06’	178° 58’	Domestic Trawl
1991	Michie Cr.	06/04/92	02/24/95	4	55° 19’	164° 43’	Domestic Trawl
1992	Wolf Cr.	06/06/93	12/06/94	2	56° 52’	171° 18’	Domestic Trawl
1992	Yukon R.	06/15/93	06/02/97	5	59° 29’	167° 49’	Domestic Trawl
1993	Michie Cr.	06/01/94	03/10/98	5	59° 26’	178° 05’	Domestic Trawl
1995	Fox Cr.	06/04/96	03/29/98	3	58° 56’	178° 06’	Domestic Trawl
1995	Judas Cr.	06/04/96	03/30/99	4	57° 43’	173° 34’	Domestic Trawl
1995	Michie Cr.	06/11/97	03/16/00	4	55° 56’	168° 52’	Domestic Trawl
1997	Judas Cr.	06/12/98	03/28/01	4	56° 18’	170° 33’	Domestic Trawl
1999	Wolf Creek	06/10/00	03/03/03	4	56° 26’	169° 55’	Domestic Trawl
2000	McClintock R.	06/08/01	02/15/02	2	56° 10’	166° 00’	Domestic Trawl
2001	Michie Cr.	06/10/02	10/03/02	1	64° 06’	164° 31’	Research Trawl
2001	Wolf Cr.	06/02/02	10/03/02	1	64° 06	164° 31’	Research Trawl
2001	Michie Cr.	06/10/02	10/04/02	1	63° 00’	165° 58’	Research Trawl
2001	Michie Cr.	06/10/02	02/08/03	2	56° 44’	167° 00’	Domestic Trawl
2001	Wolf Cr.	05/23/02	10/08/04	3	54°01’	166° 29’	Domestic Trawl
2001	Michie Cr.	06/10/02	03/15/05	4	57° 21’	171° 39’	Domestic Trawl
2003	Yukon R.	--	09/11/04	1	64° 01’	166° 01’	Research Trawl
2006[1,2]	Yukon R.	--	09/13/07	1	65° 12’	168° 06’	Research Trawl
2006[1,2]	Yukon R.	--	09/13/07	1	65° 12’	168° 06’	Research Trawl
2006[1,2]	Yukon R.	--	09/13/07	1	65° 12’	168° 06’	Research Trawl
2009[1,2]	Yukon R.	--	09/24/10	1	63° 49’	162° 47’	Research Trawl
2009[1,2]	Yukon R.	--	09/25/10	1	64° 04’	162° 43’	Research Trawl
Unknown[1]	Yukon R.	--		--	56°	172°	Domestic Trawl[3]
Unknown[1]	Yukon R.	--		--	56°	172°	Domestic Trawl[3]

1 Agency only tag code (code 18).

2 Brood year inferred from size.

3 Reported in (Celewycz et al. 2010).

Appendix A22.–South Unimak and Shumagin Islands June commercial sockeye and chum salmon harvest, all gear combined, by year, 1980–2010.

	Sockeye [a]			Chum [a]		
Year	South Unimak	Shumagin Islands	Total	South Unimak	Shumagin Islands	Total
1980	2,731,148	475,127	3,206,275	458,499	50,366	508,865
1981	1,470,393	350,572	1,820,965	509,876	54,071	563,947
1982	1,668,153	450,548	2,118,701	933,728	161,316	1,095,044
1983	1,545,075	416,494	1,961,569	616,354	169,277	785,631
1984	1,131,365	256,838	1,388,203	227,913	109,207	337,120
1985	1,454,969	336,431	1,791,400	324,825	109,004	433,829
1986	315,370	156,027	471,397	252,721	99,048	351,769
1987	652,397	140,567	792,964	405,955	37,064	443,019
1988	474,457	282,230	756,687	464,765	61,946	526,711
1989	1,347,547	396,958	1,744,505	407,635	47,528	455,163
1990	1,088,944	255,585	1,344,529	455,044	63,501	518,545
1991	1,215,658	333,272	1,548,930	670,103	102,602	772,705
1992	2,046,022	411,834	2,457,856	323,891	102,312	426,203
1993	2,366,573	607,171	2,973,744	381,941	150,306	532,247
1994	1,001,250	460,013	1,461,263	374,409	207,756	582,165
1995	1,451,490	653,831	2,105,321	342,307	195,126	537,433
1996	572,495	456,475	1,028,970	129,889	229,931	359,820
1997	1,179,179	449,002	1,628,181	196,016	126,309	322,325
1998	974,628	314,097	1,288,725	195,454	50,165	245,619
1999	1,106,208	269,191	1,375,399	186,886	58,420	245,306
2000	892,016	359,212	1,251,228	168,888	70,469	239,357
2001	121,547	29,085	150,632	36,099	12,251	48,350
2002	356,157	234,949	591,106	201,211	177,606	378,817
2003	335,903	117,244	453,147	121,169	161,269	282,438
2004	531,955	816,118	1,348,073	130,626	351,683	482,309
2005	437,443	566,952	1,004,395	143,799	284,031	427,830
2006	491,053	441,238	932,291	96,016	203,811	299,827
2007	737,642	852,198	1,589,840	153,334	144,205	297,539
2008	1,064,570	649,005	1,713,575	284,449	126,483	410,932
2009	595,221	572,697	1,167,918	200,783	495,992	696,775
2010	487,880	330,985	818,865	100,427	171,273	271,700
1989-2010 Average	898,245	446,228	1,344,473	221,885	171,100	392,985
1999-2010 Average	515,937	461,047	976,984	146,791	212,860	359,652

Source: Poetter et al. 2010.

[a] Does not include test fish harvest.

Appendix A23.–Estimated bycatch (numbers) of Pacific salmon by species, year, and region in United States groundfish fisheries in the Bering Sea-Aleutian Islands (BSAI) and Gulf of Alaska (GOA) management areas, 1991–2010 (Berger, 2010; NMFS 2010).

Region	Year	Chinook	Chum	Coho	Sockeye	Pink	Total Non-Chinook
BSAI	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	63,204	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	59,967	--	--	--	--	450,553
	2005	74,267	--	--	--	--	709,386
	2006	87,084	--	--	--	--	325,181
	2007	129,567	--	--	--	--	97,352
	2008	23,133	--	--	--	--	16,901
	2009	14,088	--	--	--	--	47,497
	2010	12,530	--	--	--	--	14,977
GOA	1991	38,894	13,711	1,133	46	64	14,954
	1992	16,794	11,140	55	21	0	11,216
	1993	24,465	55,268	306	15	799	56,388
	1994	13,613	36,782	42	96	306	37,226
	1995	14,647	64,067	668	41	16	64,792
	1996	15,761	3,969	194	2	11	4,176
	1997	15,119	3,349	41	7	23	3,420
	1998	16,984	--	--	--	--	13,544
	1999	30,600	--	--	--	--	7,529
	2000	26,705	--	--	--	--	10,995
	2001	15,104	--	--	--	--	6,063
	2002	12,920	--	--	--	--	3,219
	2003	15,369	--	--	--	--	9,530
	2004	17,745	--	--	--	--	5,809
	2005	31,270	--	--	--	--	6,608
	2006	19,003	--	--	--	--	4,226
	2007	40,356	--	--	--	--	3,421
	2008	15,939	--	--	--	--	2,156
	2009	7,898	--	--	--	--	2,355
	2010[b]	54,183	--	--	--	--	2,008

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

[b] Bycatch estimates provided by NMFS Catch Accounting Division. Available at: (http://alaskafisheries.noaa.gov/2010/car260_psc_salmon.csv)

Appendix A24.–Estimated bycatch (numbers) of Chinook and non-Chinook salmon in the Bering Sea-Aleutian Islands (BSAI) groundfish fisheries by season, 1991-2010 (NMFS 2010). 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.

	BSAI Chinook Salmon Bycatch				BSAI Non-Chinook Salmon Bycatch			
	A-season		B-season		A-season		B-season	
Year	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries	Pollock Fisheries	Other Fisheries
1991	38,791[a]	7,601[a]	2,114[a]	374[a]	2,850[a]	166[a]	26,101[a]	1,145[a]
1992	25,691	5,728	10,259	277	1,951[a]	169[a]	38,324[a]	1,005[a]
1993	17,264	7,424	21,252	74	1,594[a]	254[a]	240,597[a]	825[a]
1994	28,451	10,470	4,686	214	3,991	1,608	88,681	268
1995	10,579	8,360	4,405	92	1,708	1,325	17,556	1,286
1996	36,068	7,248	19,554	334	222	443	77,014	381
1997	10,935	5,466	33,973	156	2,083	627	63,904	381
1998	15,193	3,737	36,130	371	4,002	518	60,040	1,137
1999	6,352	2,442	5,627	178	362	31	44,810	1,929
2000	3,422	3,146	1,539	116	213	137	58,358	619
2001	18,484	6,387	14,961	715	2,386	517	54,621	3,207
2002	21,794	4,483	12,701	706	1,377	321	79,404	1,381
2003	32,609	7,435	12,977	550	3,834	279	185,351	1,686
2004	23,093	7,624	28,603	647	422	606	440,037	9,488
2005	27,331	6,305	40,030	601	595	443	703,991	4,367
2006	58,391	4,191	24,305	197	1,326	985	308,318	14,552
2007	69,409	7,699	52,349	110	8,523	1,116	85,263	2,450
2008	16,647	2,366	4,853	267	319	197	14,823	1,562
2009	9,688	1,387	2,736	197	48	115	46,081	1,253
2010	7,651	1,852	2,084	943	48	182	13,258	1,489

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

Appendix A25.–U.S. Coast Guard and NOAA/NMFS high seas driftnet (HSDN) enforcement effort.

	Cutter (Days)	Aircraft (Days)	HSDN Vessels Apprehended
1999	50	236	3
2000	10	151	1
2001	0	117	0
2002	0	125	0
2003	60	195	6
2004	0	109	0
2005	46	138	0
2006	31	123	0
2007	66	121	3
2008	97	115	2
2009	70	93	0
2010	75	115	0

Appendix A26.–Fall chum salmon age and sex percentages from selected Yukon River escapement projects, 2010.

Location	Sample Size		Age 3	4	5	6	7	Total
Chandalar River [a]	177	Males	4.0	18.6	6.2	1.1	0.0	29.9
		Females	17.0	39.5	10.7	2.3	0.6	70.1
		Total	21	58.1	16.9	3.4	0.6	100.0
Delta River [b]	165	Males	9.7	27.3	14.5	4.8	1.2	57.6
		Females	7.9	21.8	10.3	1.8	0.6	42.4
		Total	17.6	49.1	24.8	6.7	1.8	100.0
Sheenjek [c]	64	Males	6.3	26.6	9.4	3.1	1.6	46.9
		Females	10.9	34.4	7.8	0.0	0.0	53.1
		Total	17.2	60.9	17.2	3.1	1.6	100.0

[a] Samples were handpicked carcasses by USFWS.

[b] Samples were handpicked carcasses from each of the 3 main channels.

[c] Samples were collected by beach seine throughout the run.

APPENDIX B: TABLES

Appendix B1.–Alaskan and Canadian total utilization of Yukon River Chinook, chum and coho salmon, 1961–2010.

	Alaska [a, b]			Canada [c]			Total		
Year	Chinook	Other Salmon	Total	Chinook	Other Salmon	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	12,187	19,595	117,226	516,607	633,833
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	13,192	17,644	109,339	322,694	432,033
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	16,911	23,358	142,638	564,359	706,997
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	10,135	14,657	104,192	789,293	893,485
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	1,090,771	1,205,265	7,527	12,479	20,006	122,021	1,103,250	1,225,271
1978	129,988	1,632,875	1,762,863	5,881	9,566	15,447	135,869	1,642,441	1,778,310
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 [d]	46,564	220,511	1,754,678	1,975,189
1981	188,477	2,097,871	2,286,348	18,109	22,781 [d]	40,890	206,586	2,120,652	2,327,238
1982	152,808	1,265,457	1,418,265	17,208	16,091 [d]	33,299	170,016	1,281,548	1,451,564
1983	198,436	1,678,597	1,877,033	18,952	29,490 [d]	48,442	217,388	1,708,087	1,925,475
1984	162,683	1,548,101	1,710,784	16,795	29,767 [d]	46,562	179,478	1,577,868	1,757,346
1985	187,327	1,657,984	1,845,311	19,301	41,515 [d]	60,816	206,628	1,699,499	1,906,127
1986	146,004	1,758,825	1,904,829	20,364	14,843 [d]	35,207	166,368	1,773,668	1,940,036
1987	188,386	1,276,035	1,464,421	17,614	44,786 [d]	62,400	206,000	1,320,821	1,526,821
1988	148,421	2,364,048	2,512,469	21,427	33,915 [d]	55,342	169,848	2,397,963	2,567,811
1989	157,606	2,292,352	2,449,958	17,944	23,490 [d]	41,434	175,550	2,315,842	2,491,392
1990	149,433	1,055,515	1,204,948	19,227	34,302 [d]	53,529	168,660	1,089,817	1,258,477
1991	154,651	1,335,111	1,489,762	20,607	35,653 [d]	56,260	175,258	1,370,764	1,546,022
1992	168,191	880,535	1,048,726	17,903	21,310 [d]	39,213	186,094	901,845	1,087,939
1993	160,289	362,551	522,840	16,611	14,150 [d]	30,761	176,900	376,701	553,601
1994	170,829	567,074	737,903	21,198	38,342	59,540	192,027	605,416	797,443
1995	177,663	1,455,703	1,633,366	20,884	46,109	66,993	198,547	1,501,812	1,700,359
1996	138,562	1,143,900	1,282,462	19,612	24,395	44,007	158,174	1,168,295	1,326,469
1997	174,625	560,590	735,215	16,528	15,880	32,408	191,153	576,470	767,623

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Year	Alaska[a,b] Chinook	Alaska[a,b] Other Salmon	Alaska[a,b] Total	Canada[c] Chinook	Canada[c] Other Salmon	Canada[c] Total	Total Chinook	Total Other Salmon	Total Total
1998	99,369	201,480	300,849	5,937 [e]	8,165	14,102	105,306	209,645	314,951
1999	124,316	250,197	374,513	12,468	19,736	32,204	136,784	269,933	406,717
2000	45,307	120,424	165,731	4,879 [f]	9,273	14,152	50,186	129,697	179,883
2001	53,738	131,646	185,384	10,144	9,822	19,966	63,882	141,468	205,350
2002	67,888	122,142	190,030	9,258	8,493	17,750	77,145	130,635	207,780
2003	99,150	199,798	298,948	9,619	11,885	21,501	108,766	211,683	320,449
2004	112,332	205,882	318,214	11,238	9,930	21,168	123,570	215,812	339,382
2005	85,521	493,455	578,976	11,371	18,348	29,719	96,892	511,803	608,695
2006	95,184	553,345	648,529	9,072	11,907	20,979	104,256	565,252	669,508
2007	89,537	548,513	638,050	5,094	14,309	19,403	94,631	562,822	657,453
2008 [g]	48,870	491,055 [i]	539,925	3,426	9,409	12,835	52,296	500,464	552,760
2009	34,206	362,307	396,513	4,758	2,011	6,769	38,964	364,318	403,282
2010 [h]	53,770	390,496 [i]	444,265	2,647	5,787	8,434	56,397	391,999	448,396
Average									
2005-2009	70,664	489,735	560,399	6,744	11,197	17,941	77,408	500,932	578,340
2000-2009	73,173	322,857	396,030	7,886	10,539	18,424	81,059	333,395	414,454
1961-2009	127,175	870,217	997,392	11,623	18,029	29,652	138,798	888,246	1,027,044

[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 the Old Crow Aboriginal fishery harvest of coho salmon.

[e] Catch includes 761 Chinook salmon taken in the mark–recapture test fishery.

[f] Catch includes 737 Chinook salmon taken in the test fishery.

[g] Catch includes 3 sockeye and 14,100 pink salmon commercially harvested in Districts 1 and 2 in 2008..

[h] Includes the previous 5 year average of Sport Fish harvest data..

[i] Data are preliminary.

Appendix B2.–Alaskan catch of Yukon River Chinook salmon, 1961–2010.

Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total
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 [g]		1,706		502	188,386	192,007
1988	43,907	100,364		2,125	1,081	944	148,421	150,009
1989	48,446	104,198		2,616	1,293	1,053	157,606	157,622
1990	48,587	95,247 [h]	413	2,594	2,048	544	149,433	149,433
1991	46,773	104,878 [i]	1,538		689	773	154,651	154,651

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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
1992	45,626	120,245 [j]	927		962	431	168,191	169,642
1993	62,486	93,550	560	426	1,572	1,695	160,289	161,718
1994	53,077	113,137	703		1,631	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	3,151	138,562	140,927
1997	55,978	112,841	769	313	2,811	1,913	174,625	175,764
1998	53,733	43,618	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	8,518	0	75	597	276	45,307	45,870
2001	52,937	- [k]	0	122	0	679	53,738	56,620
2002	42,620	24,128	0	126	528	486	67,888	69,010
2003	55,109	40,438	0	204	680	2,719	99,150	101,000
2004	53,675	56,151	0	201	792	1,513	112,332	114,370
2005	52,561	32,029	0	138	310	483	85,521	86,369
2006	47,710	45,829	0	89	817	739	95,184	96,067
2007	53,958	33,634	0	136	849	960	89,537	90,735
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 [l]	43,020 [m]	9,897	0	162	0	691 [m]	53,770	54,835 [m]
Average								
2005-2009	46,165	23,290	0	123	395	691	70,664	71,729
2000-2009	47,101	27,298	0	134	457	913	73,173	74,551
1961-2009	35,931	91,555	356	621	1,029	1,035	127,175	127,793

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[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. These data are only available since 1990.

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

[e] ADF&G test fish that were sold commercially.

[f] Sport fish harvest for the Alaskan portion of the Yukon River drainage. Most of this harvest is taken within the Tanana River drainage (see Brase 2009 and Burr 2009).

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

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

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

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

[k] Summer season commercial fishery was not conducted.

[l] Data are preliminary.

[m] Data are preliminary.

Appendix B3.–Alaska catch of Yukon River summer chum salmon, 1970–2010.

Year	Subsistence [a]	Commercial [b]	Commercial Related [c]	Personal Use [d]	Test Fish Sales [e]	Sport Fish [f]	Yukon River Total	Yukon Area Total
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	1,266,630
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 [g]	496,934	1,891	10,605	2,132	1,634,523	1,636,864
1990	115,609	302,625 [h]	214,552	1,827	8,263	472	643,348	643,348
1991	118,540	349,113 [i]	308,989		3,934	1,037	781,613	781,613
1992	125,497	332,313 [j]	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

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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
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	1,854	794,804	817,039
1997	97,109	95,242	133,010	391	2,590	475	328,817	344,528
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	- [k]	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	90,922	92,116	0	262	456	583	184,339	208,510
2007	76,770	198,201	0	184	10	245	275,410	291,531
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 [l]	66,140 [m]	232,888	0	355	0	362 [m]	299,745	316,858 [m]
Average								
2005-2009	76,546	130,608	0	209	136	362	207,860	224,973
2000-2009	71,610	78,924	2	177	188	428	143,437	158,405
1970-2009	126,965	381,351	171,094	760	2,507	704	637,996	646,802

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[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 used for subsistence. In prior JTC reports subsistence plus commercial related harvests are notes as subsistence "use".

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

[e] ADF&G test fish that were sold commercially.

[f] The majority of the sport fish harvest is taken in the Tanana River Drainage (see Brase (2009) and Burr (2009)). Division of Sport Fish does not differentiate between the two races of chum salmon. Sport fish harvest is assumed to be primarily summer chum salmon caught incidental to directed Chinook salmon fishing.

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

[h] Does not include 1,233 female summer chum salmon sold in Subdistrict 6-C with roe extracted and roe sold separately.

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

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

[k] Summer season commercial fishery was not conducted.

[l] Data are preliminary.

[m] Data are preliminary.

Appendix B4.–Alaskan harvest of Yukon River fall chum salmon, 1961–2010.

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	101,772 [h, i]	42,461	0				144,233	144,233
1962	87,285 [h, i]	53,116	0				140,401	140,401
1963	99,031 [h, i]		0				99,031	99,031
1964	120,360 [h, i]	8,347	0				128,707	128,707
1965	112,283 [h, i]	23,317	0				135,600	135,600
1966	51,503 [h, i]	71,045	0				122,548	122,548
1967	68,744 [h, i]	38,274	0				107,018	107,018
1968	44,627 [h, i]	52,925	0				97,552	97,552
1969	52,063 [h, i]	131,310	0				183,373	183,373
1970	55,501 [h, i]	209,595	0				265,096	265,096
1971	57,162 [h, i]	189,594	0				246,756	246,756
1972	36,002 [h, i]	152,176	0				188,178	188,178
1973	53,670 [h, i]	232,090	0				285,760	285,760
1974	93,776 [h, i]	289,776	0				383,552	383,552
1975	86,591 [h, i]	275,009	0				361,600	361,600
1976	72,327 [h, i]	156,390	0				228,717	228,717
1977	82,771 [i]	257,986	0				340,757	340,757
1978	84,239 [i]	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

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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]
1987	342,375 [j]		[k]	19,066			361,441	361,663
1988	154,813	133,763	3,227	3,881	27,663		323,347	325,609
1989	211,147	270,195	14,749	5,082	20,973		522,146	522,302
1990	167,900	124,174	12,168	5,176	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 [l]	3,301	0	1,407		128,031	128,237
1993	76,762	[k]		163	0		76,925	77,045
1994	123,218	3,631	4,368	0	0		131,217	131,564
1995	130,506	250,733	32,324	863	1,121		415,547	415,901
1996	128,866	88,342	17,288	356	1,717		236,569	236,961
1997	95,141	56,713	1,474	284	867		154,479	154,479
1998	62,867	[k]		2	0		62,869	62,903
1999	89,736	20,371	0	261	1,171		111,539	111,743
2000	19,306	[k]		1	0		19,307	19,396
2001	35,144	[k]		10	0		35,154	35,713
2002	19,390	[k]		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	83,800	174,542	0	333	0		258,675	258,862
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	66,039 [m]	25,269	0	78 [m]	0		91,386	91,544
2010	67,050 [m]	2,550	0	3,222 [m]	0		72,772	72,772

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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]
Average								
2005-2009	86,252	118,000	0	180	0		204,432	204,639
2000-2009	62,409	86,444 [n]	0	154	0		123,074	123,317
1961-2009	106,936	154,320 [n]	3,929	1,594	3,095		244,796	244,947

[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 Brase 2009 and Burr 2009). Includes ADF&G test fish prior to 1988. Beginning in 1999 commercial harvest may include some commercial related harvest (see footnote c).

[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 1990, 1991, and 1994 personal use was considered part of subsistence.

[e] ADF&G test fish sales.

[f] The majority of the sport-fish harvest is taken in the Tanana River drainage (see Brase 2009 and Burr 2009). Angler surveys conducted by Division of Sport Fish do not differentiate between the two races of chum salmon and most harvests are believed to be summer chum salmon (Appendix B3).

[g] Yukon Area includes harvest from the Coastal District communities of Scammon Bay and Hooper Bay (1978, 1987-89 and 1992-2009)..

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

i Minimum estimates because surveys were conducted prior to the end of the fishing season.

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

[k] Commercial fishery was not conducted.

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

[m] Data are preliminary.

[n] Averages do not include data from years no commercial fishery was conducted.

Appendix B5.–Alaskan harvest of Yukon River coho salmon, 1961–2010.

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			125	55,321	55,321
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

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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]
1985	32,264	57,672	0			808	90,744	90,744
1986	34,468	47,255	0			1,535	83,258	83,258
1987	82,429 [j]	[k]		2,523		1,292	86,244	86,377
1988	67,933	99,907	0	1,250	13,720	2,420	185,230	187,079
1989	40,852	85,493	0	872	3,945	1,811	132,973	133,186
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	15,854 [m]	8,026	0	70	0	964	24,914	25,136

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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]
2010	12,510 [m]	3,750	0	1,013 [m]	0	706 [n]	17,979	
Average								
2005-2009	19,690	42,309	0	128	0	706	62,833	63,045
2000-2009	19,434	36,717 [o]	0	148	0	952	46,236	46,475
1961-2009	23,348	29,145 [o]	385	366	1,253	1,038	51,299	51,411

[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 (see footnote c).

[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 1990, 1991, and 1994 personal use was considered part of subsistence.

[e] ADF&G test fish sales.

[f] The majority of the sport-fish harvest is taken in the Tanana River drainage (see Schultz et al. 1993; 1992 Yukon Area AMR).

[g] Yukon Area includes harvest from the Coastal District communities of Scammon Bay and Hooper Bay (1978, 1987-89 and 1992-2009).

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

[i] Minimum estimates because surveys were conducted before the end of the fishing season.

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

[k] Commercial fishery was not conducted.

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

[m] Data are preliminary.

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

[o] Averages do not include data from years where no commercial fishery was conducted.

Appendix B6.–Alaskan and Canadian total utilization of Yukon River Chinook and fall chum salmon, 1961–2010.

	Chinook			Fall Chum		
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	82,883	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	136,357	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	209,621	44,480	361,441 [d]	405,921
1988	21,427	148,421	171,436	33,565	323,347	356,912
1989	17,944	157,606	175,566	23,020	522,146	545,166
1990	19,227	149,433	168,660	33,622	318,642	352,264
1991	20,607	154,651	175,258	35,418	403,678	439,096
1992	17,903	168,191	186,094	20,815	128,031 [e]	148,846
1993	16,611	160,289	176,900	14,090	76,925 [d]	91,015
1994	21,198	170,829	192,027	38,008	131,217	169,225
1995	20,884	177,663	198,547	45,600	415,547	461,147
1996	19,612	138,562	158,174	24,354	236,569	260,923
1997	16,528	174,625	191,153	15,600	154,479	170,059
1998	5,937	99,369	105,306	7,954	62,869	70,820
1999	12,468	124,316	136,784	19,636	111,539	131,175
2000	4,879	45,307	50,186	9,246	19,307 [d]	28,543
2001	10,139	53,738 [f]	63,882	9,872	35,154 [d]	44,976
2002	9,257	67,888	77,145	8,092	19,393 [d]	27,411
2003	9,619	99,150	108,766	10,905	68,174	79,529
2004	11,238	112,332	123,570	9,750	66,546	76,296
2005	11,371	85,521	96,892	18,572	271,846	290,183
2006	9,072	95,184	104,256	11,796	258,675	270,471
2007	5,094	89,537	94,631	13,830	189,563	203,672
2008	3,426	48,870	52,296	9,566	208,417	217,826

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Year		Chinook			Fall Chum		
		Canada	Alaska	Total	Canada	Alaska	Total
2009	[g]	4,758	34,206	38,964	2,011	91,386	93,397
2010		2,647	53,770	56,417	5,787	69,811	75,598
Average							
1961-2009		11,623	127,175	138,918	17,576	244,750	262,598
2000-2009		7,886	73,173	81,059	10,364	122,846	133,210
2005-2009		6,744	70,664	77,408	11,155	203,977	215,132

Note: Canadian managers 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.

[d] Commercial fishery did not operate within the Alaskan 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, 1961–2010.

	Mainstem Yukon River Harvest							Porcupine River	Total
			Aboriginal		Test	Combined		Aboriginal	Canadian
Year	Commercial	Domestic	Fishery	Sport[a]	Fishery	Non-Commercial	Total	Fishery 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
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

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	Mainstem Yukon River Harvest							Porcupine River	Total
Year	Commercial	Domestic	Aboriginal Fishery	Sport[a]	Test Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian Harvest
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[b]			4,068		761	4,829	4,829	50	4,879
2001	1,351	89	7,421	146	767	8,423	9,769	370	10,144
2002	708	59	7,139	128	1,036	8,362	9,069	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	617	4,794	4,794	300	5,094
2008	1		2,885		513	3,398	3,399	27	3,426
2009[c]	364	17	3,791	125		3,933	4,297	461	4,758
2010[c, d]			2,455	1[f]		2,456	2,456	191	2,647
Average									
1961-2009	5,595	393	5,453	366	608	6,019	11,386	252	11,623
2000-2009	2,183[e]	76	5,422	268	589	6,101	7,628	257	7,886
2005-2009	2,254[e]	60	4,597	292	565	5,092	6,445	299	6,744

[a] Sport fish harvest unknown before 1980.

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

[c] An aboriginal fishery took place, but all other fisheries were closed.

[d] Data are preliminary.

[e] 2008 was not included in the average.

[f] Fishery was closed, 1 fish mistakenly caught.

Appendix B8.–Canadian catch of Yukon River fall chum salmon, 1961–2010.

	Mainstem Yukon River Harvest						Porcupine River	Total
Year	Commercial	Domestic	Test	Aboriginal Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian 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
1994	30,035	0		5,319	5,319	35,354	2,654	38,008

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	Mainstem Yukon River Harvest						Porcupine River	Total
Year	Commercial	Domestic	Test	Aboriginal Fishery	Combined Non-Commercial	Total	Aboriginal Fishery Harvest	Canadian Harvest
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[a]				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	1 [b]	3,077	3,080	5,278	4,594	9,872
2002	3,065	0	2,756 [b]	3,167	3,167	6,232	1,860	8,092
2003	9,030	0	990 [b]	1,493	1,943	10,523	382	10,905
2004	7,365	0	995 [b]	2,180	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	3,765	2,221	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[c]	2,186	0		1,523	1,523	3,709	2,078	5,787
Average								
1961-2009	10,732	514	2,127	2,478	2,806	13,319	4,624	17,848
2000-2009	5,047	2	2,127	2,251	2,253	7,299	3,065	10,364
2005-2009	5,498	3	3,765	1,933	1,936	7,434	3,721	11,155

[a] A test fishery and aboriginal fisheries took place, but all other fisheries were closed.
[b] The chum salmon test fishery is a live-release test fishery.
[c] Test fishery was not included in totals as it was live-release.
[d] Data are preliminary.

[e] 2001 was not included in the average.

Appendix B9.–Chinook salmon aerial survey indices for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–2010.[a]

	Andreafsky River		Anvik River			Nulato River			
Year	East Fork	West Fork	Drainagewide Total	Index Area		North Fork	South Fork	Both Forks	Gisasa River
1961	1,003		1,226			376 [b]	167	543	266 [b]
1962	675 [b]	762 [b]							
1963									
1964	867	705							
1965		355 [b]	650 [b]						
1966	361	303	638						
1967		276 [b]	336 [b]						
1968	380	383	310 [b]						
1969	231 [b]	231 [b]	296 [b]						
1970	665	574 [b]	368						
1971	1,904	1,682							
1972	798	582 [b]	1,198						
1973	825	788	613						
1974		285	471 [b]			55 [b]	23 [b]	78 [b]	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 [b]
1979	1,180	1,134	1,484			1,093	414	1,507	484
1980	958 [b]	1,500	1,330	1,192		954 [b]	369 [b]	1,323 [b]	951
1981	2,146 [b]	231 [b]	807 [b]	577 [b]			791	791	
1982	1,274	851							421
1983			653 [b]	376 [b]		526	480	1,006	572
1984	1,573 [b]	1,993	641 [b]	574 [b]					
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 [b]	212 [b]					
1990	2,503	1,545	2,347	1,595		568 [b]	430 [b]	998 [b]	884 [b]
1991	1,938	2,544	875 [b]	625 [b]		767	1,253	2,020	1,690
1992	1,030 [b]	2,002 [b]	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 [b]	213 [b]		913 [b]		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 [b]
1998	1,027	1,249 [b]	709 [b]	648 [b]		507	546	1,053	889 [b]

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	Andreafsky River		Anvik River		Nulato River			
Year	East Fork	West Fork	Drainage Wide Total	Index area	North Fork	South Fork	Both Forks	Gisasa River
1999		[b] 870 [b]		[b] 950 [b]		[b]	[b]	[b]
2000	1,018	427	1,721	1,394		[b]	[b]	[b]
2001	1,059	565	1,420	1,177	1,116	768	1,884 [d]	1,298
2002	1,447	917	1,713	1,329	687	897	1,584	506
2003	1,116 [b]	1,578 [b]	1,100 [b]	973 [b]		[b]	[b]	
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 [b]	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 [b]	262 [b]	992 [b]	827 [b]	922	-	922	487 [a]
2009	84 [b]	1,678	832	590	2,260	-	2,260	515
2010	537	858	974	721	356	355	711	264
SEG	[f] 960-1,900	640-1,600		1,100-1,700			940-1,900	420-1,100
Average								
All Years	1,319	1,121	1,241	1,168	774	564	1,456	740
2000-2009	1,195	1,004	1,728	1,570	-	-	1,549	741
2005-2009	885	1,046	1,529	1,472	-	-	1,520	679

[a] Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.

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

[c] Anvik index area includes mainstem counts between Yellow River and McDonald Creek.

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

[e] Index area expanded to include counts of the mainstem betweenBeaver Creek to McDonald Creek.

[f] Sustainable Escapement Goal.

Appendix B10.–Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1986–2010.

	Andreafsky River		Nulato River Tower	Henshaw Cr. Weir		Gisasa River Weir		Chena River w/adjusted percent females		Salcha River w/adjusted percent females	
Year	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.
1986	1,530	23.3 [b]						9,065 [c]	25		
1987	2,011	56.1 [b]						6,404 [c]	48	4,771 [c]	52
1988	1,339	38.7 [b]						3,346 [c]	34	4,562 [c]	45
1989		13.6						2,666 [c]	45	3,294 [c]	44
1990		41.6						5,603 [c]	36	10,728 [c]	36
1991		33.9						3,025 [c]	32	5,608 [c]	41
1992		21.2						5,230 [c]	22	7,862 [c]	36
1993		29.9						12,241 [b]	12	10,007 [b]	24
1994	7,801	35.5 [d, e]	1,795 [e]			2,888	[e]	11,877 [b]	32	18,399 [b]	39
1995	5,841	43.7 [d]	1,412			4,023	46.0	9,680 [c]	52	13,643 [b]	49
1996	2,955	41.9 [d]	756			1,991	19.5	7,153 [c]	27	7,570 [b]	26
1997	3,186	36.8 [d]	4,766			3,764	26.0	13,390 [c]	26	18,514 [b]	43
1998	4,034	29.0 [d]	1,536			2,414	16.2	4,745 [b]	28	5,027 [b]	26
1999	3,444	28.6 [d]	1,932			2,644	26.4	6,485 [b]	45	9,198 [b]	47
2000	1,609	54.3 [d]	908	244	29.7	2,089	34.4	4,694 [c]	22	4,595 [b]	38
2001		[e]		[e] 1,103	36.3	3,052	49.2 [e]	9,696 [b]	30	13,328 [b]	33
2002	4,123	21.1 [d]	2,696	649	30.8	2,025	20.7	6,967 [c]	27	9,000 [b,f]	30
2003	4,336	45.3 [d]	1,716 [e]	763	38.4	1,901	38.1	11,100 [b,g]	32	15,500 [b,f]	34
2004	8,045	37.3		[h] 1,248	21.3	1,774	30.1	9,645 [b]	44	15,761 [b]	55
2005	2,239	50.2		[h] 1,059	41.4	3,111	34.0	[b,e]	31	5,988 [b]	47
2006	6,463	42.6		[h]	[e]	3,030	28.2	2,936 [b]	32	10,679 [b]	38
2007	4,504	44.7		[h] 740	24.9	1,425	39.0	3,806 [b]	27	6,425 [b]	31
2008	4,242	34.8		[h] 766	27.7	1,735	16.2	3,208 [b]	29	5,415 [b,f]	34
2009	3,004	46.0		[h] 1,637	[j]	1,955	29.3 [i]	5,253 [b]	40	12,774 [b]	
2010	2,413	[i]		[h] 857	[i,j]	1,516	[i]	2,301 [b]	[j]	5,907 [b]	[j]
BEG [k]								2,800-5,700		3,300-6,500	
Average											
All Years	3,928	37.0	1,946			2,489		6,879	0.32	9,506	0.39
2000-2009	4,285	41.8	1,773		905	2,210		6,367	0.31	9,947	0.38
2005-2009	4,090	43.7	-		1,034	2,251		3,801	0.32	8,256	0.38

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[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] Weir counts.

[f] 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.

[g] 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.

[h] Project did not operate..

[i] Data are preliminary

[j] Data not available..

[k] Biological Escapement Goals (BEG) established by the Alaska Board of Fisheries, January 2001.

Appendix B11.–Chinook salmon escapement counts for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2010. Canadian mainstem border passage and spawning escapement estimates are based on a 3-Area escapement index, Eagle Sonar (2005–2007), and radiotelemetry (local) (2002–2004).

												Whitehorse Fishway		Canadian Mainstem		
Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a, c]	Nisutlin River [a, d]	Ross River [a, e]	Wolf River [a, f]	Blind Creek	Chandindu River	Big Salmon Sonar	Klondike River Sonar	Count	Percent Hatchery Contribution	Border Passage Estimate [g]	Harvest	Spawning Escapement Estimate [h]
1961												1,068	0			
1962												1,500	0			
1963												483	0			
1964												595	0			
1965												903	0			
1966		7 [i]										563	0			
1967												533	0			
1968			173 [i]	857 [i, c]	407 [i]	104 [i]						414	0			
1969			120	286	105							334	0			
1970		100		670 [c]	615		71 [i]					625	0			
1971		130	275	275 [c]	650		750 [l]					856	0			
1972		80	126	415	237		13 [l]					391	0			
1973		99	27 [i]	75 [i]	36 [i]							224	0			
1974		192		70 [i]	48 [i]							273	0			
1975		175		153 [i]	249		40 [i]					313	0			
1976		52		86 [i]	102							121	0			
1977		150	408	316 [i]	77							277	0			
1978		200	330	524	375							725	0			
1979		150	489 [i]	632	713		183 [i]					1,184	0			
1980		222	286 [i]	1,436	975		377					1,383	0			
1981		133	670	2,411	1,626	949	395					1,555	0			
1982		73	403	758	578	155	104					473	0	60,346	16,808	43,538
1983	100	264	101 [i]	540	701	43 [i, j]	95					905	0	63,227	18,752	44,475
1984	150	153	434	1,044	832	151 [i]	124					1,042	0	66,300	16,295	50,005
1985	210	190	255	801	409	23 [i]	110					508	0	59,586	19,151	40,435
1986	228	155	54 [i]	745	459 [k]	72 [i]	109					557	0	61,489	20,064	41,425

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Year	Tincup Creek [a]	Tatchun Creek [b]	Little Salmon River [a]	Big Salmon River [a, c]	Nisutlin River [a, d]	Ross River [a, f]	Wolf River [a, g]	Blind Creek	Chandindu River weir	Big Salmon Sonar	Klondike River Sonar	Whitehorse Fishway Count	Whitehorse Fishway Percent Hatchery Contribution	Canadian Mainstem Border Passage Estimate	Canadian Mainstem Harvest	Canadian Mainstem Spawning Escapement Estimate [j]
1987	100	159	468	891	183	180 [k]	35					327	0	58,870	17,563	41,307
1988	204	152	368	765	267	242	66					405	16	61,026	21,327	39,699
1989	88	100	862	1,662	695	433 [p]	146					549	19	77,718	17,419	60,299
1990	83	643	665	1,806	652	457 [k]	188					1,407	24	78,192	18,980	59,212
1991			326	1,040		250	201 [r]					1,266 [h]	51 [h]	63,172	20,444	42,728
1992	73	106	494	617	241	423	110 [r]					758 [h]	84 [h]	56,958	17,803	39,155
1993		183	184	572	339	400	168 [r]					668 [h]	73 [h]	52,713	16,469	36,244
1994	101 [k]	477	726	1,764	389	506	393 [r]					1,577 [h]	54 [h]	77,219	20,770	56,449
1995	121	397	781	1,314	274	253 [k]	229 [r]					2,103	57	70,761	20,088	50,673
1996	150	423	1,150	2,565	719	102 [k]	705 [r]					2,958	35	93,606	19,546	74,060
1997	193	1,198	1,025	1,345	277		322 [r]	957				2,084	24	69,538	15,717	53,821
1998	53	405	361	523	145		66	373	132			777	95	41,335	5,838	35,497
1999		252	495	353	330		131	892	239			1,118	74	49,538	12,354	37,184
2000	19 [n]	276 [o]	46	113	20		32		4 [p]			677	69	30,699	4,829	25,870
2001	39 [n]		1,035	1,020	481		154		129 [q]			988	36	62,333	9,769	52,564
2002			526	1,149	280		84		[r]			605	39	51,428	9,069	42,359 [q]
2003			1,658	3,075	687		292	1115	185 [s]			1,443	70	90,037	9,443	80,594
2004			1,140	762	330		226	792				1,989	76	59,415	10,946	48,469
2005			1,519	952	807	363	260	525		5,584		2,632	57	78,962	10,977	67,985
2006			1,381	1,140	601		114	677		7,308		1,720	47	71,388	8,758	62,630
2007			451	601	137		54	304		4,450		427	56	39,698	4,794	34,904
2008			93	303			22	276		1,329		399	54	37,282	3,399	33,883
2009			821	1,827	497		134	716		9,261	4,725	828	47	69,575	4,297	65,278
2010 [t]			63 [i]	656	288		94	270		3,817	777			34,465	2,455	32,010
Interim Management Escapement Goal																42,500-55,000 [u]
Averages																
1961-2009	120	235	545	911	439	284	221	663	138			931	23	62,586	14,347	48,598
2000-2009	29	276	867	1,094	427	363	137	629	106			1,200	58	59,082	8,434	51,454
2005-2009			853	965	510	363	117	500		5,586	4,725	1,433	58	59,381	7,775	52,936

-continued-

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

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

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

[d] One Hundred Mile Creek to Sidney Creek.

[e] Big Timber Creek to Lewis Lake.

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

[g] Estimated total border passage excluding Porcupine River based on Eagle sonar for 2005 to 2010, on radio tagging proportion study for 2002 to 2004, on 3 area index (Little Salmon, Big Salmon and Nisutlin aerial survey) plus Canadian harvest for 1982 to 2001..

[h] Estimated total spawning escapement excluding Porcupine River based on 3 area index for 1982 to 2001, and on border passage estimate minus Canadian harvest for 2002-2010..

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

[j] Information on area surveyed is unavailable.

[k] Counts for Big Timber Creek to Sheldon Lake.

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

[m] 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 a

[n] Foot survey.

[o] Foot survey.

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

[q] Conventional weir July 01-September 08, but was breached from July 31-August 07

[r] RBW tested for 3 weeks.

[s] Combination RBW and conduit weir tested and operational from July 10-30.[t] Data are preliminary.

[u] Interim Management Escapement Goal (IMEG) range of 42,500-55,000 was established in 2010. This replaced the IMEG of 45,000 used in 2008 and 2009. These goals are based on Eagle sonar program estimates.

Appendix B12.–Summer chum salmon ground based escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1973–2010.

	East Fork Andreafsky R.			Anvik R. Sonar			Kaltag Creek Tower		Nulato R. Tower			Henshaw Creek Weir			Gisasa R. Weir			Clear Crk. Weir			Chena R. Tower		Salcha R. Tower	
Year	No. Fish	% Fem.		No. Fish	% Fem.		No. Fish		No. Fish	% Fem.		No. Fish	% Fem.		No. Fish	% Fem.		No. Fish	% Fem.		No. Fish		No. Fish	
1980				482,181	60.7																			
1981	147,312	51.8	a	1,479,582	54.7																			
1982	181,078	64.6	a	444,581	69.4																			
1983	110,608	57.4	a	362,912	56.5																			
1984	70,125	50.7	a	891,028	60.9																			
1985		58.1	d	1,080,243	55.8																			
1986	167,614	55.4	b	1,085,750	57.8																			
1987	45,221	58.6	b	455,876	65.1					44.9														
1988	68,937	49.3	b	1,125,449	66.1					60.9														
1989				636,906	65.7																			
1990				403,627	51.3																			
1991				847,772	57.9																			
1992				775,626	56.6																			
1993		48.6		517,409	53.7																5,400		5,809	
1994	200,981	65.2	c	1,124,689	59.1	d	47,295		148,762	47.7	d				51,116		d				9,984		39,450	
1995	172,148	48.9	c	1,339,418	40.1		77,193		236,890	55.6					136,886	45.7		116,735	62.1		3,519	d	30,784	
1996	108,450	51.4	c	933,240	59.5		51,269		129,694	51.9					158,752	49.3		100,912	59.0		12,810	d	74,827	
1997	51,139	56.8	c	605,752	57.0		48,018		157,975	49.1					31,800	50.5		76,454	42.5		9,439	d	35,741	
1998	67,720	57.3	c	487,301	60.2		8,113		49,140	62.9					21,142	50.8		212		d	5,901	d	17,289	
1999	32,587	56.4	c	437,356	57.8		5,300		30,076	64.7					10,155	53.1		11,283		d	9,165	d	23,221	
2000	24,785	48.2	c	196,349	63.9		6,727		24,308	62.6		27,271	64.4		11.410	49.9		19,376	43.6		3,515		20,516	
2001		52.0	d	224,058	54.4			d			d	35,031	65.8		17,946	50.3	d	3,674	43.6		4,773	d	14,900	
2002	44,194	54.3		459,058	60.0		13,583		72,232	29.2		25,249	60.6		33,481	47.7		13,150	51.6		1,021	d	20,837	d
2003	22,461	44.8		256,920	55.3		3,056	d	19,590	42.2	d.e	22,556	51.9		25,999	45.1		6,159	40.5		573	d		d
2004	64,883	51.4		365,353	53.3		5,247				f	86,474	54.6		37,851	44.9		15,661	44.7		15,162		47,861	
2005	20,127	44.0		525,391	48.0		22,093				f	237,481	42.6		172,259	46.3		26,420	45.8		2,928	d	193,085	

-continued-

Year	East Fork Andreafsky R. No. Fish	% Fem.	Anvik R. Sonar No. Fish	% Fem.	Kaltag Crk. Tower No. Fish	Nulato R. Tower No. Fish	% Fem.	Henshaw Creek Weir No. Fish	% Fem.	Gisasa R. Weir No. Fish	% Fem.	Clear Crk. Weir No. Fish	% Fem.	Chena R. Tower No. Fish	Salcha R. Tower No. Fish
2006	102,260	48.6	605,485 [g]	50.7	[f]	[f]				261,305	52.2	29,166	43.4 [h]	35,109 [d]	111,869
2007	69,642	46.8	460,121	58.2	[f]	[f]		44,425	44.0	46,257	55.6	6,029	30.5 [h]	4,705	11,196
2008	57,259	47.8	374,928	54.9	[f]	[f]		96,731	47.4	36,938	49.3	[e]		1,333 [d]	1,251 [d]
2009	8,770	39.8 [h]	193,099	54.7	[f]	[f]		156,933		25,904	53.8 [h]	[e]		16,516	30,490
2010	72,893	[i k]	396,173	[i,k]	[f]	[f]		100,670		47,669	[i,k]	[f]		7,580 [i]	23,863 [i]
BEG	[j] >40,000		350-700												
Average															
All Years	82,951	52.1	631,908	56.6	26,172	96,321	53.0			63,945	49.6	32,639	45.3	8,302	41,352
2000-2009	45,703	47.6	366,076	55.2	10,141	38,118	44.8	81,330		63,385	49.6	14,838	41.5	8,564	50,223
2005-2009	51,612	4534	431,805	53.3	22,093	-	-	133,847		101,266	51.4	20,538	39.9	12,118	69,578

[a] Sonar count.

[b] Tower count.

[c] Weir count.

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

[e] Number extrapolated.

[f] Project did not operate..

[g] HTI and DIDSON sonar equipment were both used in 2006. The estimate reported is DIDSON derived while the % female was calculated using the previously reported HTI estimate.

[h] Videography count.

[i] Data are preliminary.

[j] Biological Escapement Goals (in thousands of fish) established by the Alaska Board of Fisheries, January 2001..

[k] Data unavailable at this time.

Appendix B13.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Alaskan portions of the Yukon River Drainage, 1971–2010.

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

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	Alaska									
		Tanana River Drainage					Upper Yukon River Drainage			
Year	Yukon River Mainstem Sonar Estimate	Toklat River [a]	Kantishna River Abundance Estimate [b]	Delta River [c]	Bluff Cabin Slough [d]	Upper Tanana River Abundance Estimate [e]	Chandalar River [f]	Sheenjek River [g]	
1996		18,264		19,758 [i]	7,074 [k]	134,563	208,170	246,889	
1997	506,621	14,511		7,705 [i]	5,707 [k]	71,661	199,874	80,423 [p]	
1998	372,927	15,605		7,804 [i]	3,549 [k]	62,384	75,811	33,058	
1999	379,493	4,551	27,199	16,534 [i]	7,037 [k]	97,843	88,662	14,229	
2000	247,935	8,911	21,450	3,001 [i]	1,595	34,844	65,894	30,084 [q]	
2001	376,182	6,007 [r]	22,992	8,103 [i]	1,808 [k]	96,556 [s]	110,971	53,932	
2002	326,858	28,519	56,719	11,992 [i]	3,116	109,970	89,850	31,642	
2003	889,778	21,492	87,359	22,582 [i]	10,600 [k]	193,418	214,416	44,047 [t]	
2004	594,060	35,480	76,163	25,073 [i]	10,270 [k]	123,879	136,706	37,878	
2005	1,813,589	17,779 [q]	107,719	28,132 [i]	11,964 [k]	337,755	496,484	561,863 [m,u,v]	
2006	790,563		71,135	14,055 [i]		202,669	245,090	160,178 [m,u]	
2007	684,011		81,843	18,610 [i]		320,811	228,056	65,435 [m,u]	
2008 [x]	615,127			23,055 [i]	1,198 [k]		178,278 [w]	50,353 [m,u,w]	
2009 [x]	240,449 [y]			13,492 [i]	2,900 [k]			54,126 [m,u,w]	
2010	350,981			17,933	1,610 [k]		157,998	22,053	
EG [z]	300,000-600,000	15,000-33,000 [aa]		6,000-13,000		46,000-103,000 [ab]	74,000-152,000	50,000-104,000	EG
Average									
1971-2009	665,415	31,243	61,398	14,246	5,683	158,284	94,099	94,099	
2000-2009	671,760	17,293	61,398	16,267	5,682	158,013	175,474	98,427	
2005-2009	975,823	26,630	84,215	21,785	7,811	246,279	256,923	175,141	

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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; two located 8 miles upstream of the mouth of the Toklat River (1999–2005) and one fish wheel on the Kantishna River (2000–2002, 2006–2007) and two 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] 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 (two fish wheels in 1995) located just upstream of the Kantishna River and recaptures are collected from one fish wheel (two fish wheels in 1995) located downstream from the village of Nenana.

[f] Single-beam sonar estimate for 1986 to 1990, split-beam sonar estimate 1995 to 2006. DIDSON in 2007 and 2008, project was aborted in 2009.

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

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

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

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

[k] Aerial survey count, unless otherwise indicated.

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

[m] Sonar counts include both banks in 1985-1987 and 2005-2009.

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

[o] 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.

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

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

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

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

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

[u] In addition to the historical right bank count, the left bank was enumerated with DIDSON (right bank count for 2005-2009 was 266,963, 106,397, 39,548, 35,912, and 28,480 respectively, not including expansions by bank)..

[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..

[x] Data are preliminary.

[y] 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.

[z] Escapement Goal (EG) includes individual tributary BEGs and drainagewide SEG from 2010..

[aa] EG discontinued in 2010.

[ab] 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.

Appendix B14.–Fall chum salmon abundance estimates or escapement estimates for selected spawning areas in Canadian portions of the Yukon River Drainage, 1971–2010.

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

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Year	Porcupine Drainage: Fishing Branch River [a]	Mainstem Yukon River Index [b]	Koidern River [b, c]	Kluane River [b, d]	Teslin River [b, e]	Canadian Mainstem: Border Passage Estimate	Canadian Mainstem: Harvest	Canadian Mainstem: Spawning Escapement Estimate [f]
1996	77,302	4,977		14,431	315	143,758	21,329	122,429
1997	27,031	2,189		3,350	207	94,725	9,306	85,419
1998	13,687	7,292		7,337	235	48,047	1,795	46,252
1999	12,958			5,136	19 [a]	72,188 [q]	13,636	58,552
2000	5,057	933 [a]		1,442	204	57,978 [q]	4,246	53,732
2001	21,737	2,453		4,884	5	38,769 [q]	5,278	33,491
2002	13,600	973		7,147	64	104,853 [q]	6,174	98,679
2003	29,713	7,982		39,347	390	153,656 [q]	10,523	143,133
2004	20,417	3,440		18,982	167	163,625 [q]	9,545	154,080
2005	119,058	16,425		34,600	585	451,477	13,979	437,733
2006	30,954	6,553		18,208	620	218,611 [r, s]	6,617	211,994
2007	32,150	no survey				263,979 [r, s]	9,330	254,649
2008	19,086 [p]	no survey				181,642 [r, s]	6,130	174,267 [t]
2009	25,828 [u]	no survey				94,739 [r]	1,115	93,626 [v]
2010 [w]	15,773 [u]					121,580 [s]	3,709	117,871
EO [x]	50,000-120,000							>80,000
IMEG	22,000-49,000 [y]							70,000-104,000 [z]
Average								
1971-2009	53,856	4,480	223	9,142	317	117,624	18,092	99,540
2000-2009	31,760	5,537	---	17,801	291	172,807	7,294	165,538
2005-2009	45,415	11,489	---	26,404	603	241,837	7,434	234,454

-continued-

[a] Weir count, unless otherwise indicated.

[b] Aerial survey, unless otherwise indicated.

[c] Index area includes Tatchun Creek to Fort Selkirk.

[d] Index area includes Duke River to end of spawning sloughs below Swede Johnston Creek.

[e] Index area includes Boswell Creek area (5 km below to 5 km above confluence).

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

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

[h] Weir installed September 22. Estimate consists of weir count of 17,190 after September 22, and tagging passage estimate of 17,935 before weir installation.

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

[j] Foot survey, unless otherwise indicated.

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

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

[m] Boat survey.

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

[o] Weir not operated. Although only 7,541 chum salmon were counted on a single survey flown October 26, a population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial-to-weir expansion of 28%. Actual population of spawners was reported by DFO as between 30,000-40,000 fish considering aerial survey timing.

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

[q] 1999 to 2004 border passage estimates were revised using a stratified "SPAS" analysis.

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

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

[t] The 2008 estimate was based on mark–recapture estimate.

[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] The 2009 estimate was based on the Eagle sonar estimate.

[w] Data are preliminary.

[x] Escapement Objective (EO) based on US/Canada Treaty Obligations, some years stabilization or rebuilding goals are applied.

[y] Interim Management Escapement Goal (IMEG) established for 2008-2010 based on percentile method.

[z] Interim Management Escapement Goal (IMEG) established for 2010 based on brood table of Canadian origin mainstem stocks (1982 to 2003).

Appendix B15.–Coho salmon passage estimates or escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River Drainage, 1972–2010.

								Upper Tanana River Drainage				
		Yukon	Kantishna									
	East	River	River						Delta			
	Fork	Mainstem	Drainage	Nenana River Drainage				Delta	Clearwater	Clearwater	Richardson	
	Andreafsky	Sonar	Geiger	Lost	Nenana	Wood	Seventeen	Clearwater	River	Lake and	Clearwater	
Year	River [a]	Estimate [b]	Creek [c]	Slough	Mainstem [d]	Creek	Mile Slough	River [e]	Tributaries [f]	Outlet	River [g]	
1972								632		417	454 [h]	
1973								3,322		551	375	
1974				1,388			27	3,954 [h]		560	652	
1975				943			956	5,100		1,575 [i]	4 [h]	
1976			25 [g, h]	118			281	1,920		1,500 [i]	80 [h]	
1977			60	524 [g]		310 [c]	1,167	4,793		730 [i]	327	
1978				350		300 [c]	466	4,798		570 [i]		
1979				227			1,987	8,970		1,015 [i]	372	
1980			3 [g, h]	499 [g]		1,603 [c]	592	3,946		1,545 [i]	611	
1981	1,657 [g]			274		849 [a, j]	1,005	8,563 [k]		459 [g]	550	
1982			81			1,436 [a, j]		8,365 [k]				
1983			42	766		1,042 [a]	103	8,019 [k]		253	88	
1984			20 [g, h]	2,677		8,826 [a]		11,061		1,368	428	
1985			42 [g, h]	1,584		4,470 [a]	2,081	6,842		750		
1986			5	794		1,664 [a]	218 [i]	10,857		1,800	146 [h]	
1987			1,175	2,511		2,387 [a]	3,802	22,300		4,225 [i]		

-continued-

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		Yukon	Kantishna					Upper Tanana River Drainage			
	East Fork	River Mainstem	River Drainage	Nenana River Drainage				Delta	Delta Clearwater	Clearwater	Richardson
	Andreafsky	Sonar	Geiger	Lost	Nenana	Wood	Seventeen	Clearwater	River	Lake and	Clearwater
Year	River [a]	Estimate [b]	Creek [c]	Slough	Mainstem [d]	Creek	Mile Slough	River [e]	Tributaries [f]	Outlet	River [g]
1988	1,913 [l]		159	348		2,046 [a]		21,600		825 [i]	
1989			155			412 [a]	824 [g]	12,600		1,600 [i]	483
1990			211	688	1,308		15 [g]	8,325		2,375 [i]	
1991			427	564	447		52	23,900		3,150 [i]	
1992			77	372			490	3,963		229 [i]	500
1993			138	484	419	666 [a, m]	581	10,875		3,525 [i]	
1994			410	944	1,648	1,317 [a, n]	2,909	62,675	17,565	3,425 [i]	5,800
1995	10,901	100,664	142	4,169	2,218	500 [a]	2,972 [g]	20,100	6,283	3,625 [i]	
1996	8,037		233	2,040	2,171	201 [g, h]	3,666 [i]	14,075	3,300	1,125 [h]	
1997	9,472	105,956	274	1,524 [o]	1,446	[p]	1,996	11,525	2,375	2,775 [i]	
1998	7,193	129,076	157	1,360 [h]	2,771 [h]	[p]	1,413 [q]	11,100	2,775	2,775 [i]	
1999	2,963	60,886	29	1,002 [h]	745 [h]	370	662 [h]	10,975	2,805		
2000	8,451	169,392	142	55 [g, h]	68 [g, h]	[p]	879 [g, h]	9,225	2,358	1,025 [i]	2,175
2001	15,896	132,283	578	242	859	699	3,753	46,875	11,982	4,425 [i]	1,531
2002	3,577	117,908	744	0	328	935	1,910	38,625	9,873	5,900	874
2003	8,231	265,119	973	85	658	3,055	4,535	105,850	27,057	8,800	6,232
2004	11,146	199,884	583	220	450	840	3,370	37,950	9,701	2,925	8,626
2005	5,303	184,071	625	430	325 [h]	1,030	3,890	34,293	8,766	2,100	2,024
2006		131,919		194	160 [h]	634	1,916	16,748	4,281	4,375	271

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Year	East Fork Andreafsky River [a]	Yukon River Mainstem Sonar Estimate [b]	Kantishna River Drainage	Nenana River Drainage				Upper Tanana River Drainage			
			Geiger Creek [c]	Lost Slough	Nenana Mainstem [d]	Wood Creek	Seventeen Mile Slough	Delta Clearwater River [e]	Delta Clearwater River Tributaries [f]	Clearwater Lake and Outlet	Richardson Clearwater River [g]
2007		173,289		63	520	605	1,733	14,650	3,961	2,075	553
2008		135,570	183	1,342	1,539	578	1,652	7,500	1,917	1,275	265
2009		205,278 [s]	137	410		470	680	16,850	4,307	5,450	155
2010 [r]		142,149		1,110	280	340	720	5,867		813	1,002
SEG [t]								5,200-17,000 [z]			
Average											
1972-2009	8,288	150,807	270	859	1,004	1,433	1,593	17,203	7,457	2,253	1,34393
2000-2009	8,767	171,471	496	304	545	986	2,432	32,857	8,420	3,835	2,271
2005-2009	-	166,025	315	488	636	663	1,974	18,008	4,646	3,055	654

Note: Only peak counts presented. Survey rating is fair to good, unless otherwise noted.

[a] Weir count, unless otherwise indicated.

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

[c] Foot survey, unless otherwise indicated.

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

[e] Boat survey counts of index area (lower 17.5 river miles), unless otherwise indicated.

[f] Helicopter surveys counted tributaries of the Delta Clearwater River, outside of the normal mainstem index area, from 1994 to 1998, after which an expansion factor was used to estimate the escapement to the areas.

[g] Aerial survey, fixed wing or helicopter.

[h] Poor survey.

[i] Boat Survey.

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

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

[l] The West Fork Andreafsky was also surveyed and 830 chum salmon were observed.

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

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

[o] Survey of western floodplain only.

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

[q] Combination foot and boat survey.

r Data preliminary.

[s] 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.

[t] 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 B16.–Historic Canadian border fish wheel mark–recapture passage, reconstructed mainstem border passage, and escapement estimates of Chinook salmon, from 1982 to 2008.

Year	Historic Wheel Mark–recapture Border Passage Esimtate [a]	Revised Canadian Mainsten Border Passage Estimate [b]	Canadian Harvest	Spawning Escapement Estimate
1982	36,598	60,346	16,808	43,538
1983	47,741	63,227	18,752	44,475
1984	43,911	66,300	16,295	50,005
1985	29,881	59,586	19,151	40,435
1986	36,479	61,489	20,064	41,425
1987	30,823	58,870	17,563	41,307
1988	44,445	61,026	21,327	39,699
1989	42,620	77,718	17,419	60,299
1990	56,679	78,192	18,980	59,212
1991	41,187	63,172	20,444	42,728
1992	43,185	56,958	17,803	39,155
1993	45,027	52,713	16,469	36,244
1994	46,680	77,219	20,770	56,449
1995	52,353	70,761	20,088	50,673
1996	47,955	93,606	19,546	74,060
1997	53,400	69,538	15,717	53,821
1998	22,588	41,335	5,838	35,497
1999	23,716	49,538	12,354	37,184
2000	16,173	30,699	4,829	25,870
2001	52,207	62,333	9,769	52,564
2002	49,214	51,428	9,069	42,359
2003	56,929	90,037	9,443	80,594
2004	48,111	59,415	10,946	48,469
2005	42,245	78,962	10,977	67,985
2006	36,748	71,388	8,758	62,630
2007	22,120	39,698	4,794	34,904
2008	14,666	37,282	3,399	33,883

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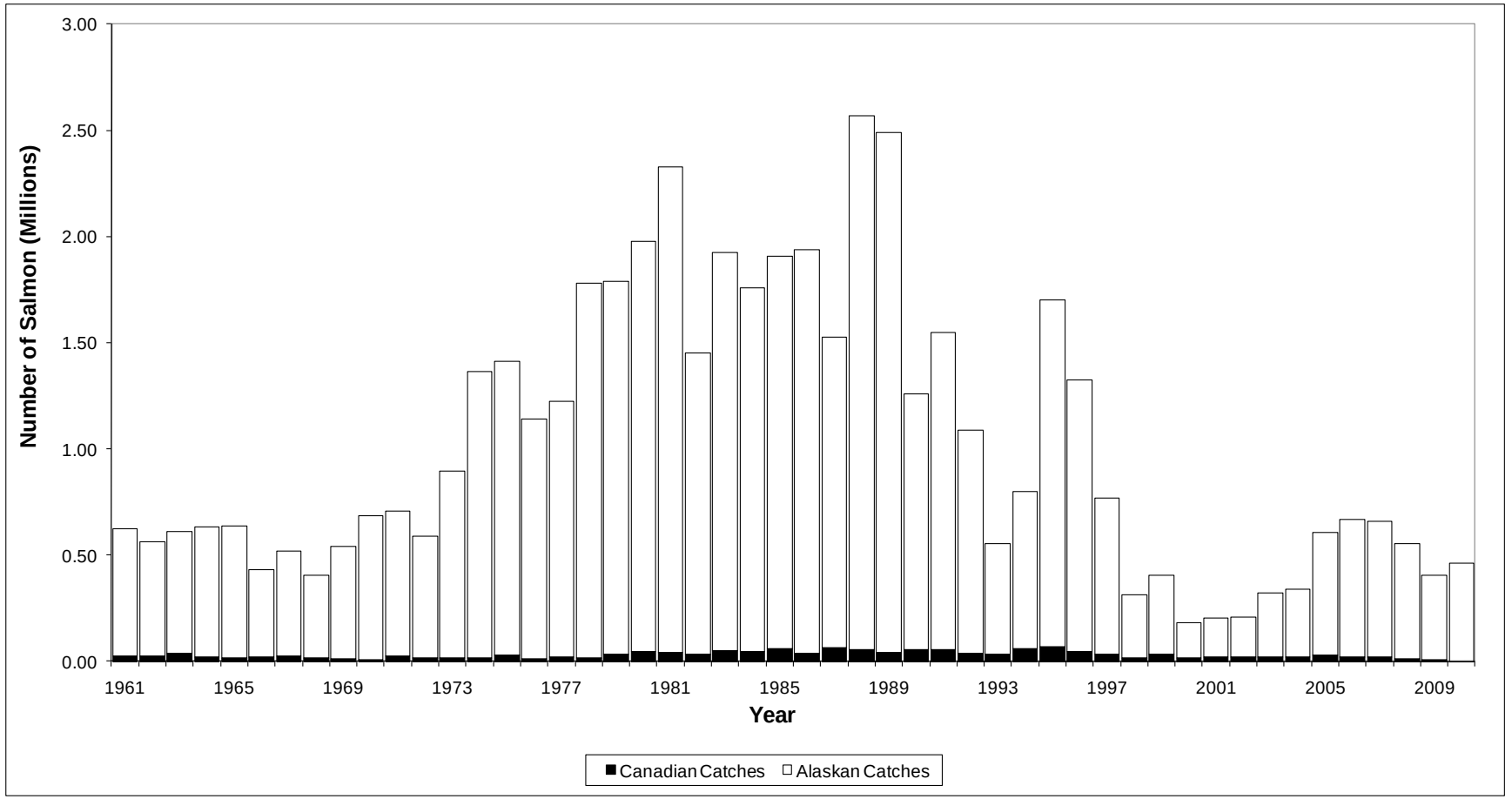
Year	Historic Wheel Mark–recapture Border Passage Esimtate [a]	Revised Canadian Mainsten Border Passage Estimate [b]	Canadian Harvest	Spawning Escapement Estimate
2009		69,575	4,297	65,278
2010		34,465	2, 647	32,010
Averages				
1982-2009	40,136	62,586	13,988	48,598
2000-2009	37,601	59,082	7,628	51,454
2005-2009	4,725	59,381	6,445	52,936

[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 be based on Eagle sonar passage estimates.

[b] Revised database adopted by JTC in 2008. Canadian mainstem border passage estimate based on 3-Area escapement index, Eagle sonar (2005–2010), and radiotelemetry (local) (2002–2004).

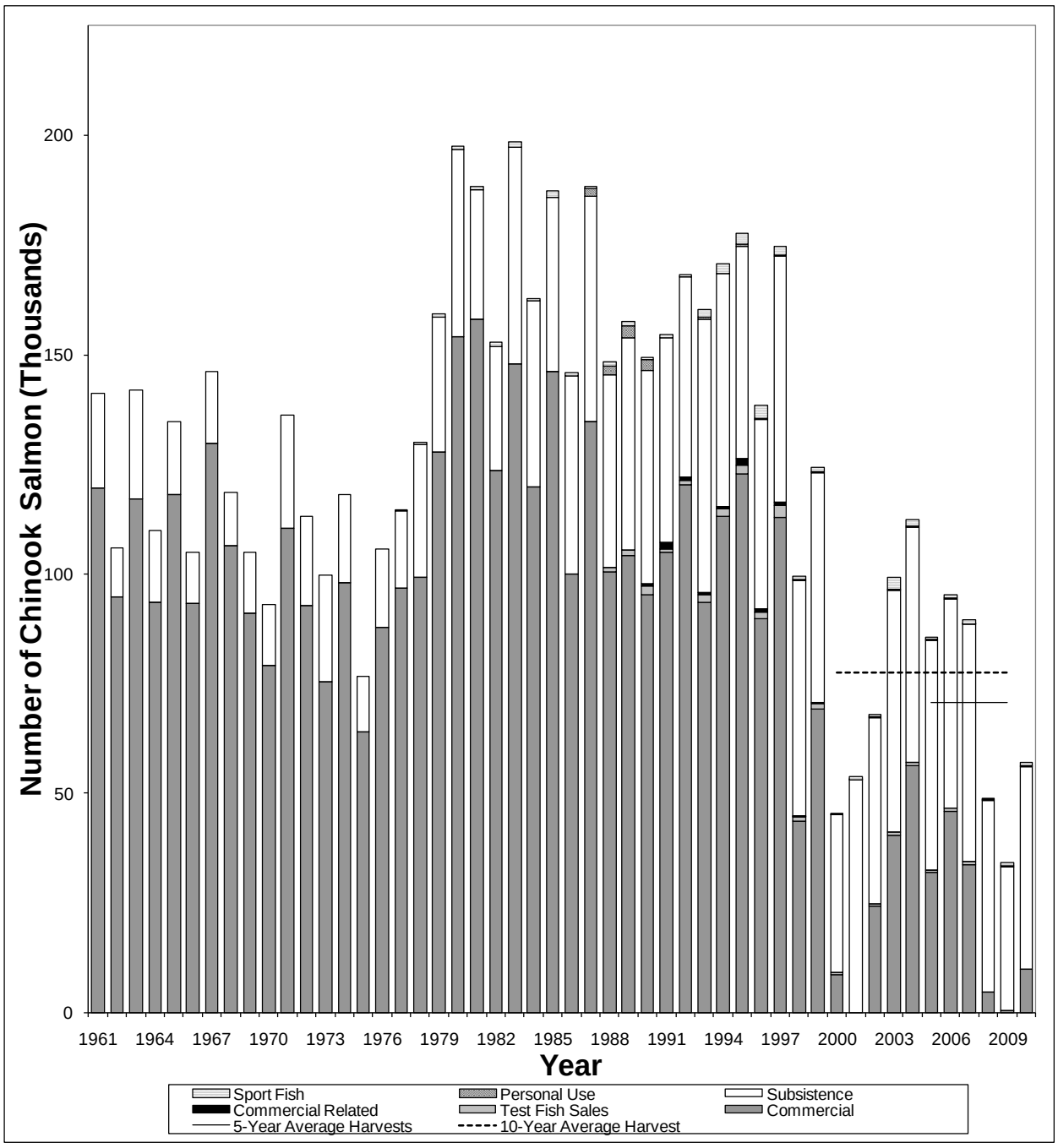
[c] Estimated total spawning escapement, excluding Porcupine River, based on revised database (estimated border passage minute the Canadian harvest).

APPENDIX C: FIGURES



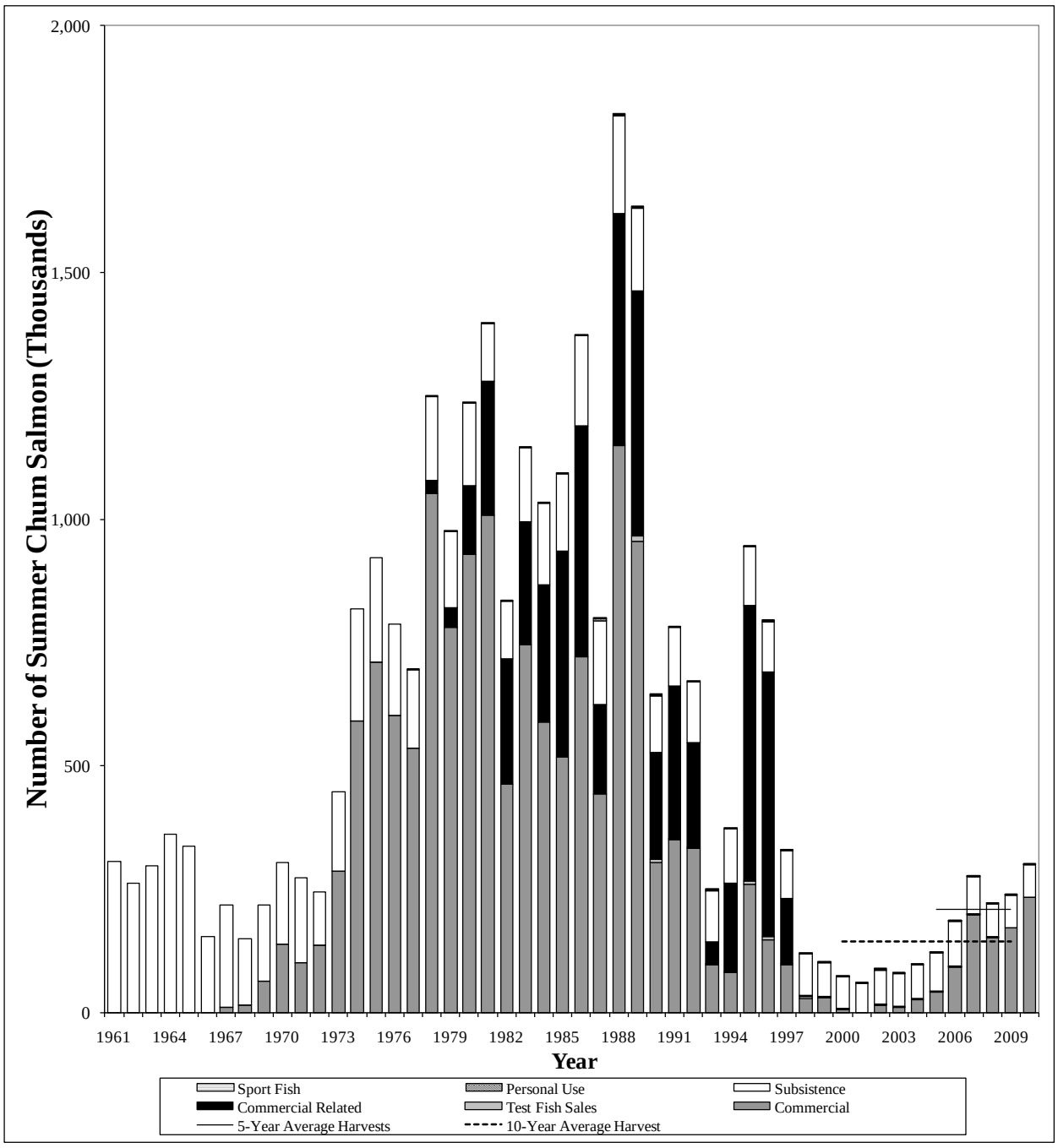
Note: The 2010 Alaskan harvest estimates are preliminary.

Appendix C1.–Total utilization of salmon, Yukon River, 1961–2010.



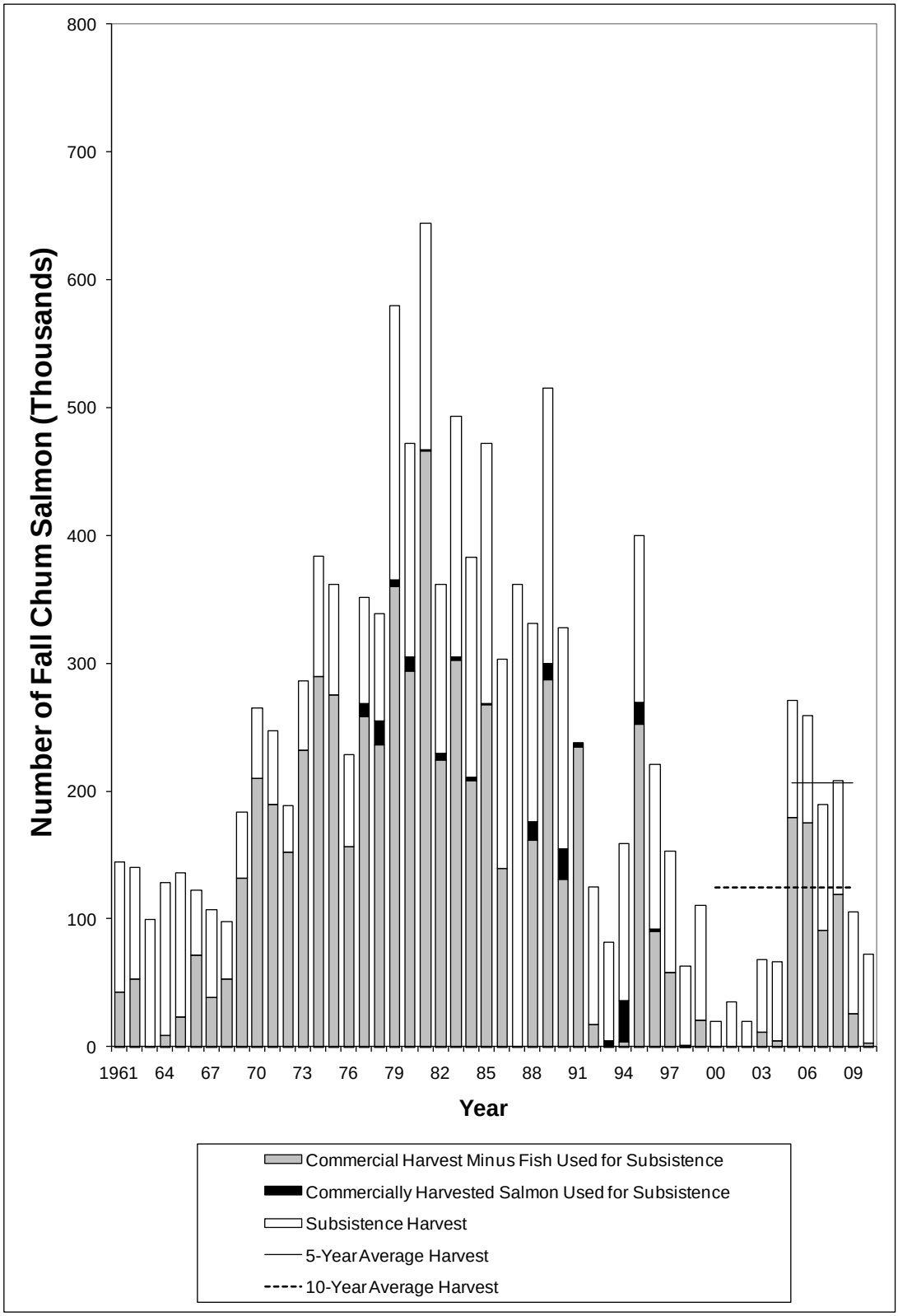
Note: The 2010 Alaskan harvest estimates are preliminary.

Appendix C2.–Alaskan harvest of Chinook salmon, Yukon River, 1961–2010. No commercial fishery occurred in 2001.



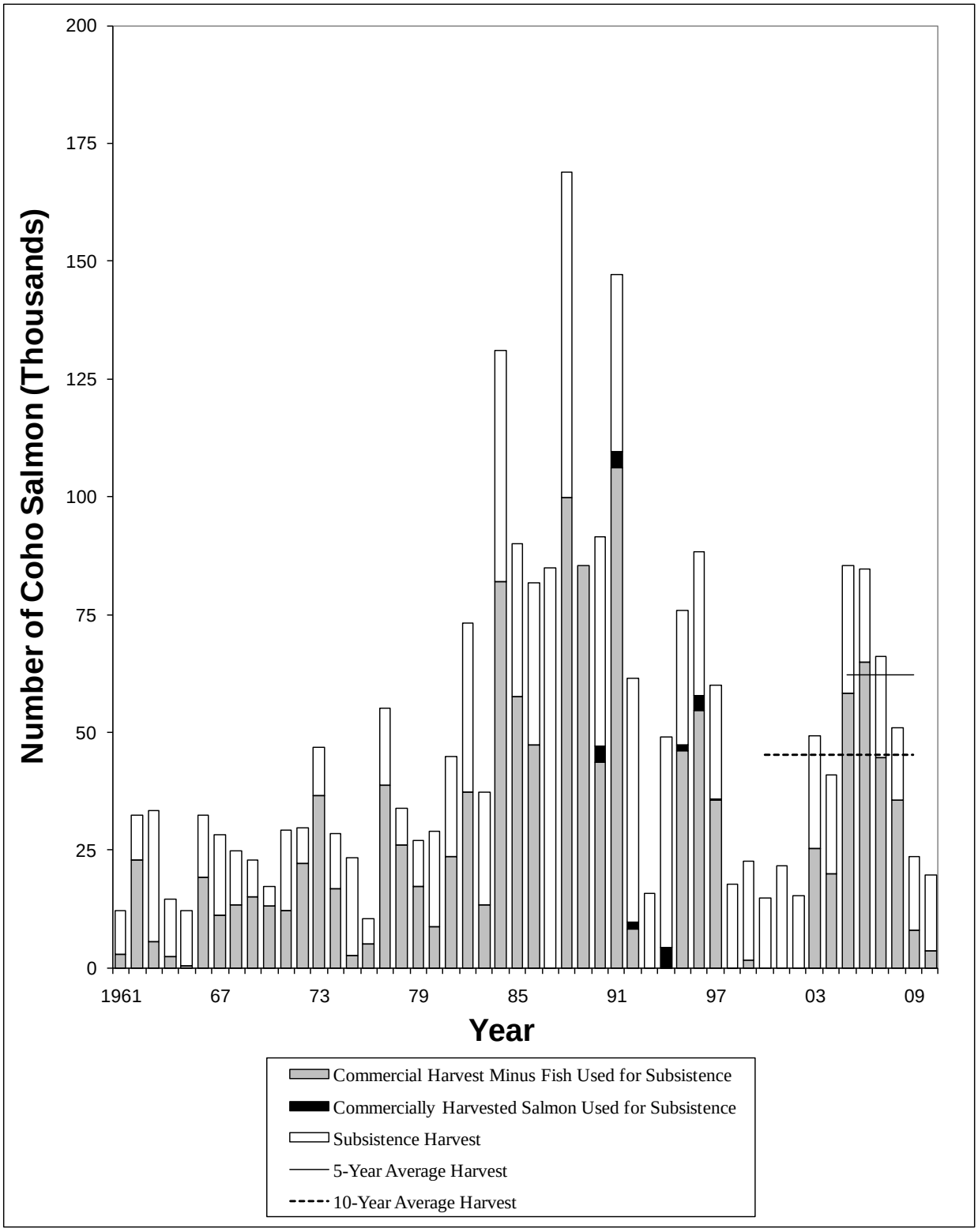
Note: The 2010 Alaskan harvest estimates are preliminary.

Appendix C3.–Alaskan harvest of summer chum salmon 1961–2010.



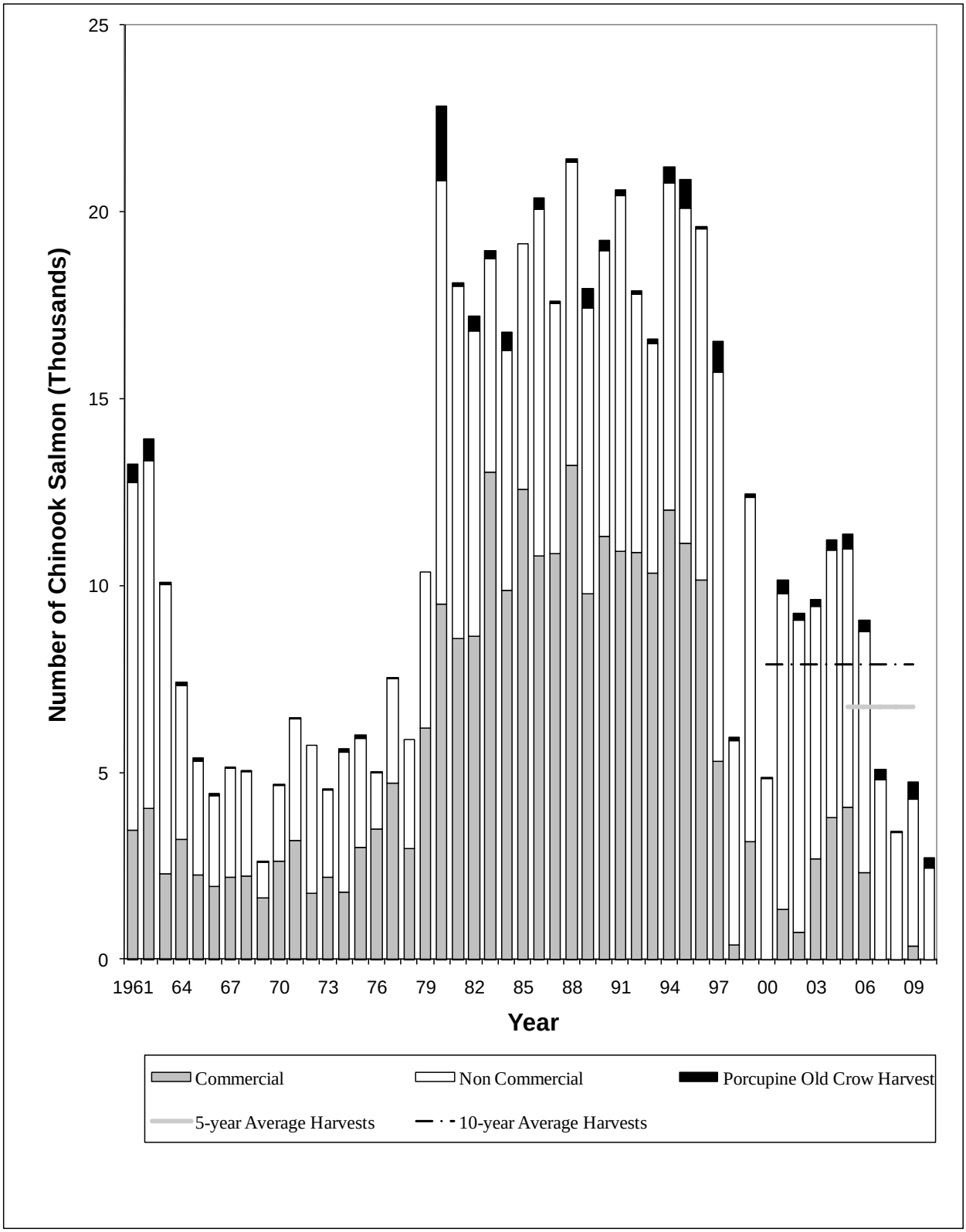
Note: The commercial fishery was closed 2000–2002. The 2006, 2007, 2009 and 2010 subsistence harvest estimates are preliminary.

Appendix C4.–Alaskan harvest of fall chum salmon, Yukon River, 1961–2010.



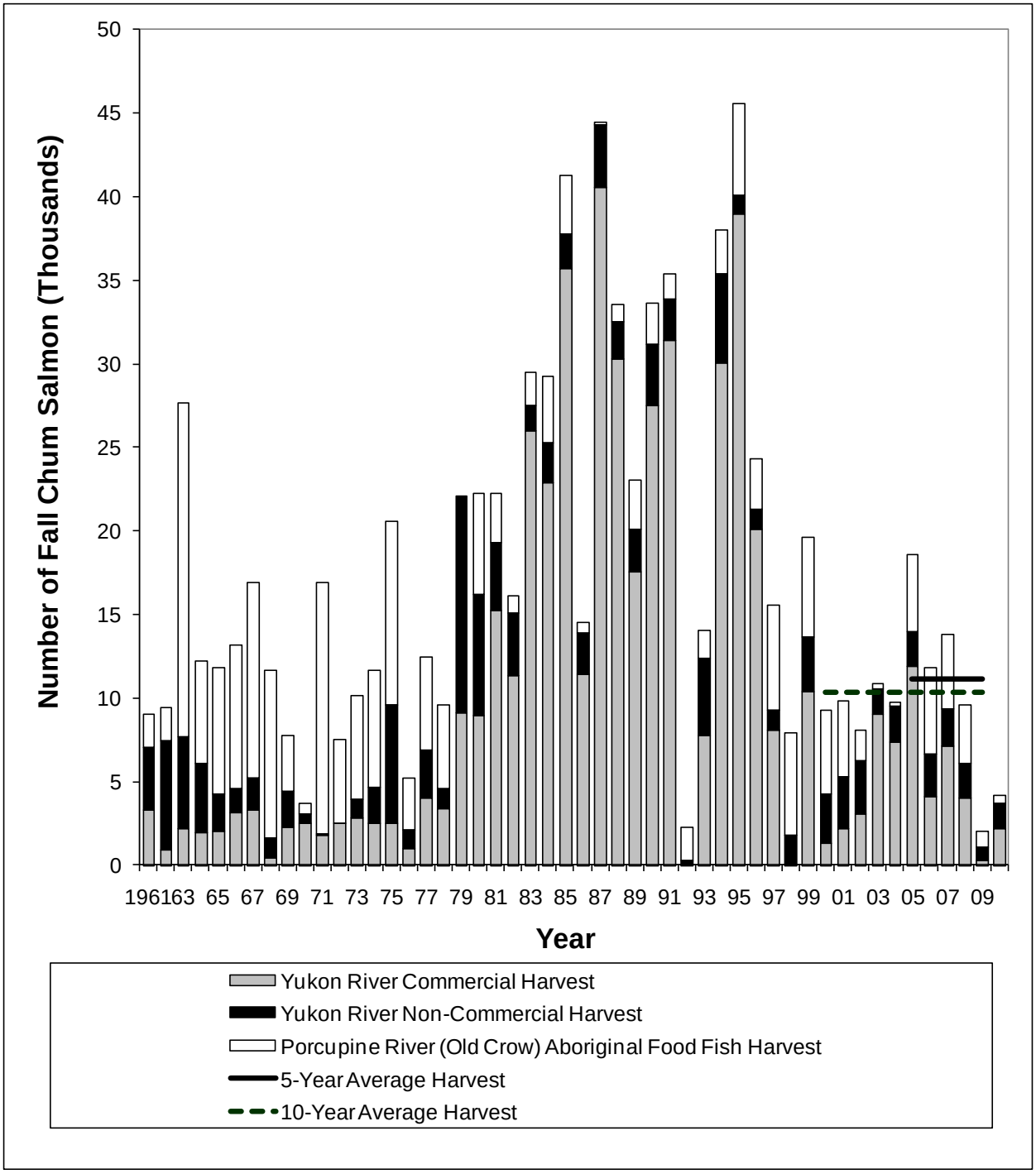
Note: The 2006, 2007, 2009 and 2010 subsistence harvest estimates are preliminary. Commercial harvest is not adjusted for subsistence use of commercially caught fish.

Appendix C5.–Alaskan harvest of coho salmon, Yukon River, 1961–2010. The commercial fishery was closed 2000–2002.



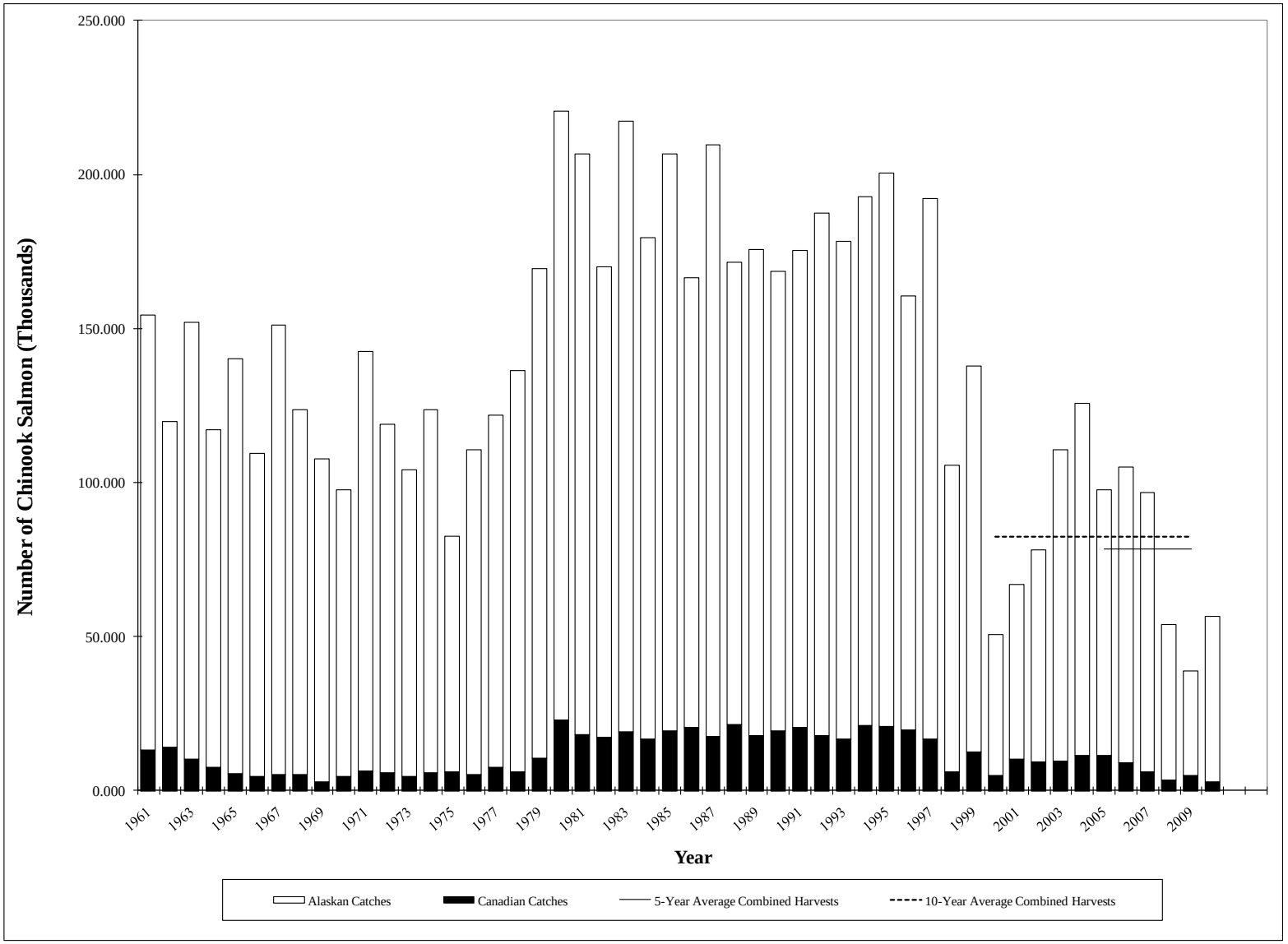
Note: Catch data for 2010 are preliminary.

Appendix C6.–Canadian harvest of Chinook salmon, Yukon River, 1961–2010.



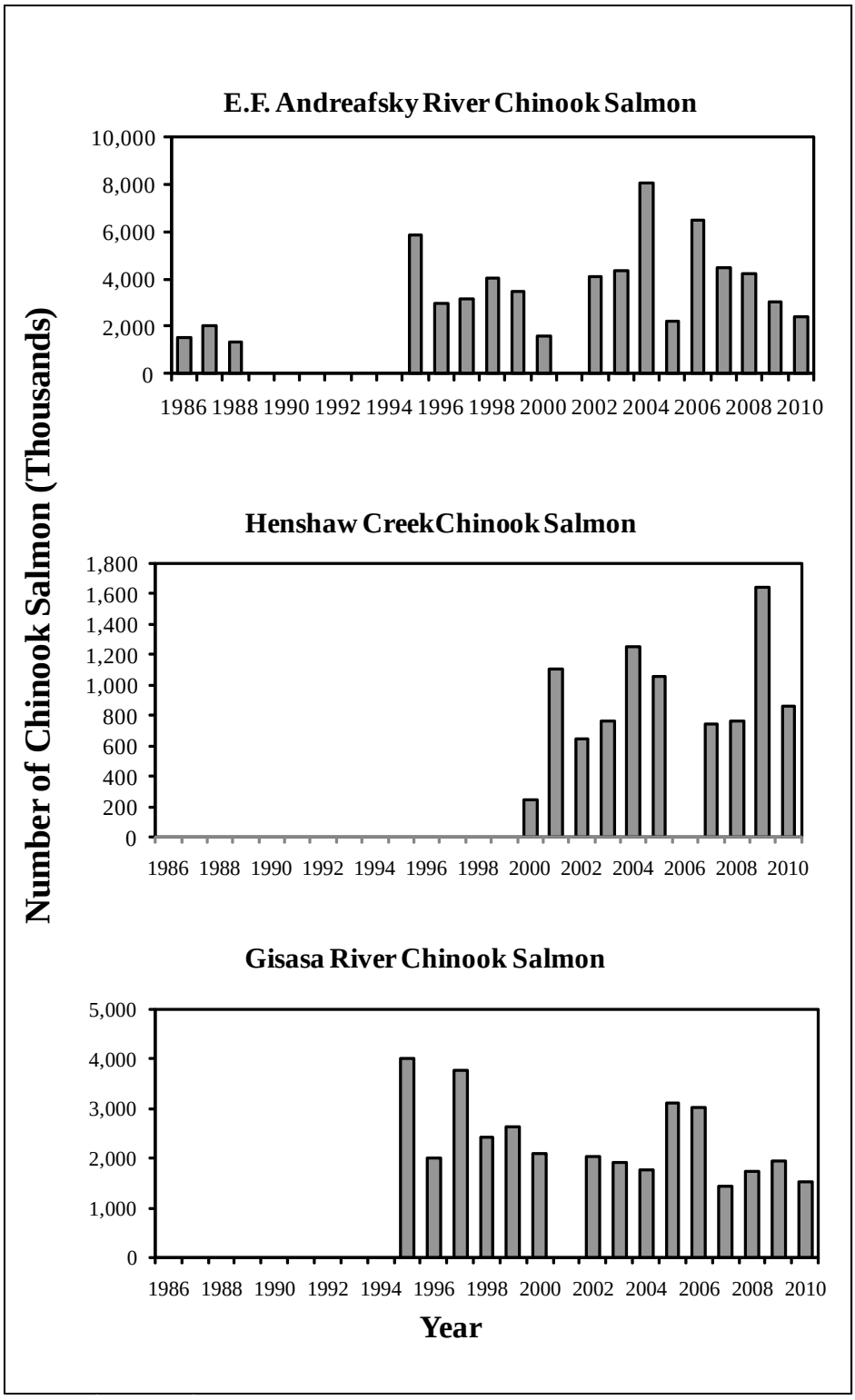
Note: Catch data for 2010 are preliminary.

Appendix C7.–Canadian harvest of fall chum salmon, Yukon River, 1961–2010.



Note: Catch data for 2010 are incomplete and preliminary.

Appendix C8.–Total utilization of Chinook salmon, Yukon River, 1961–2010.



Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

Appendix C9.–Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2010.

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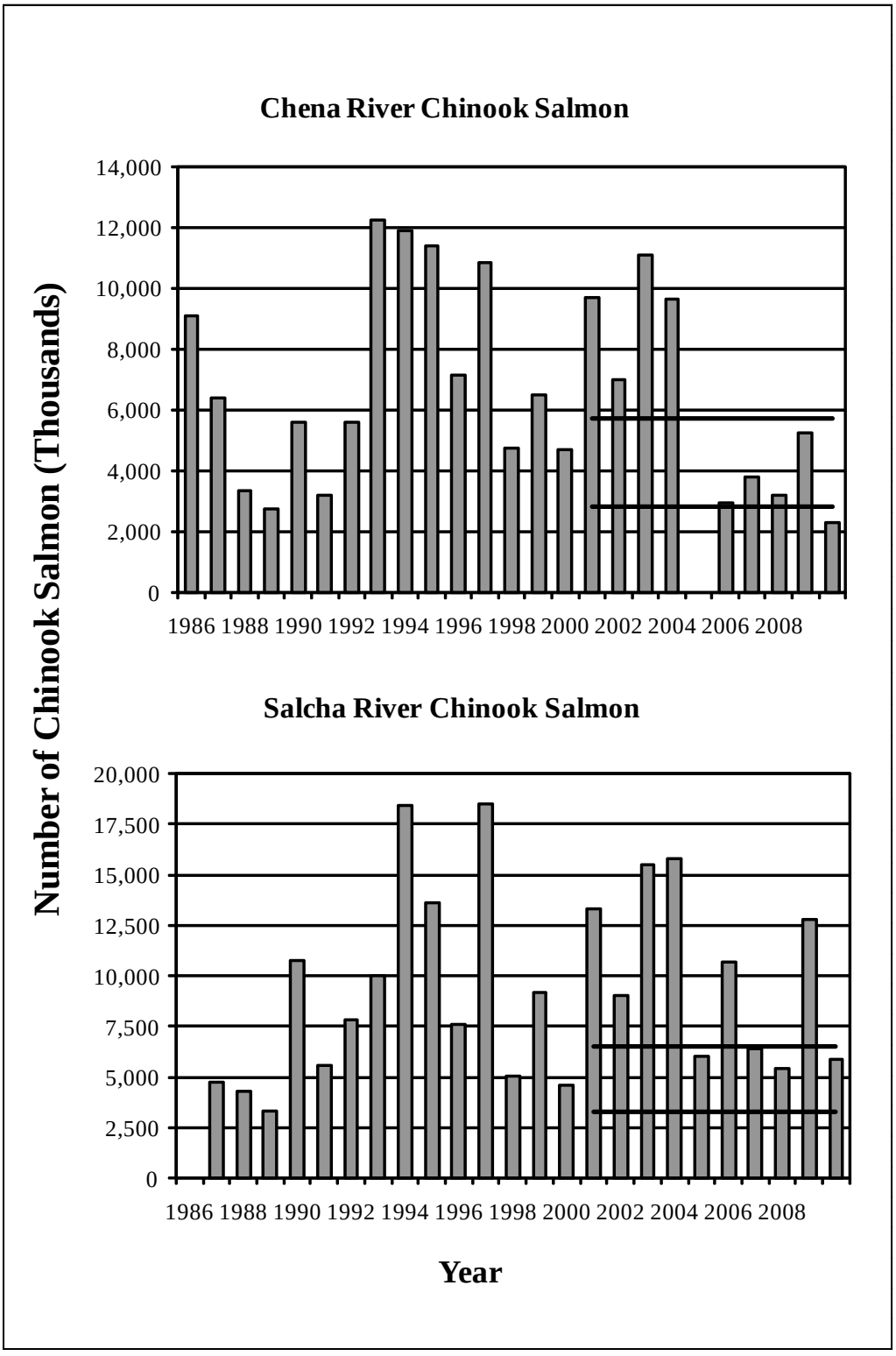
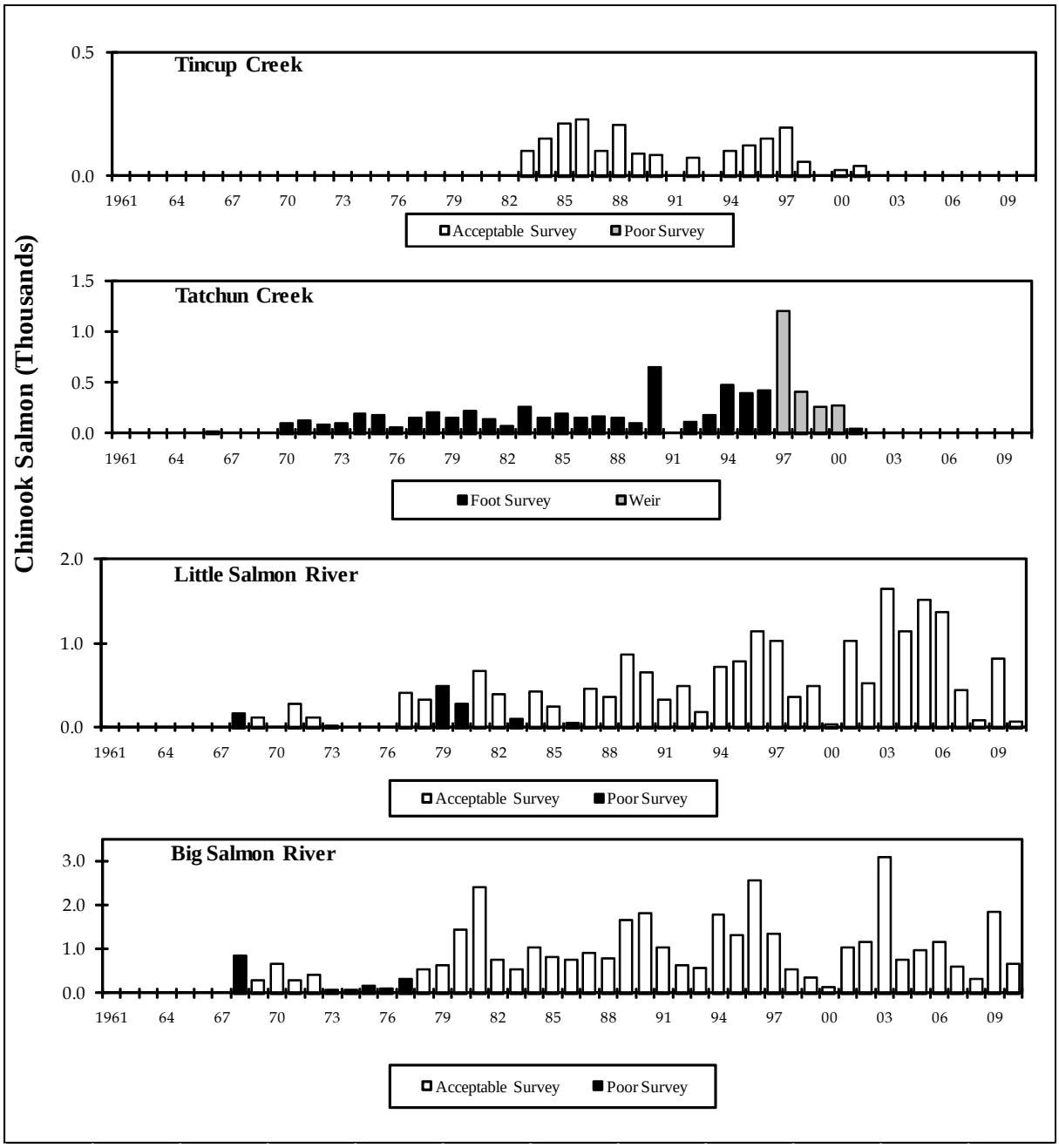


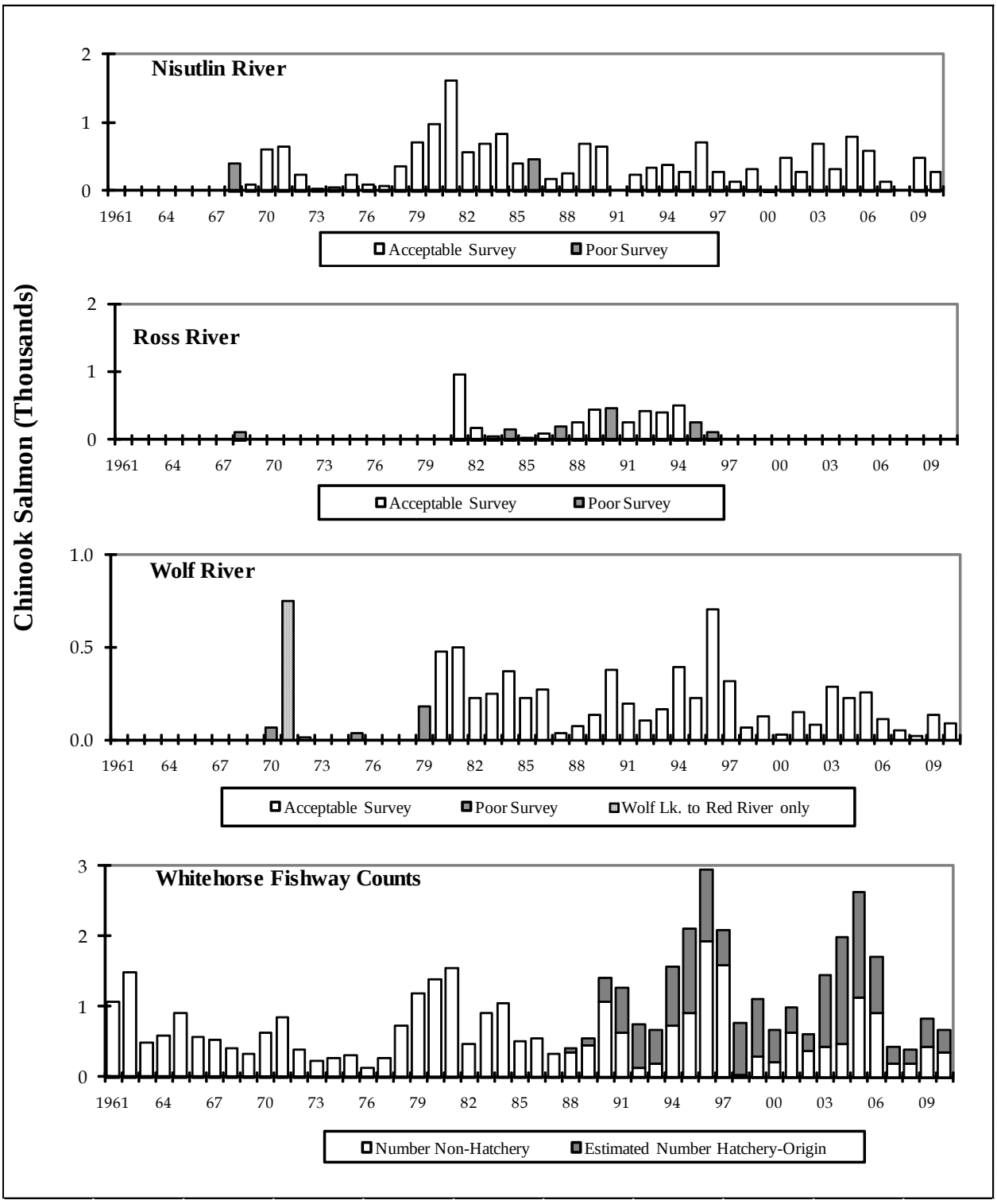
Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.



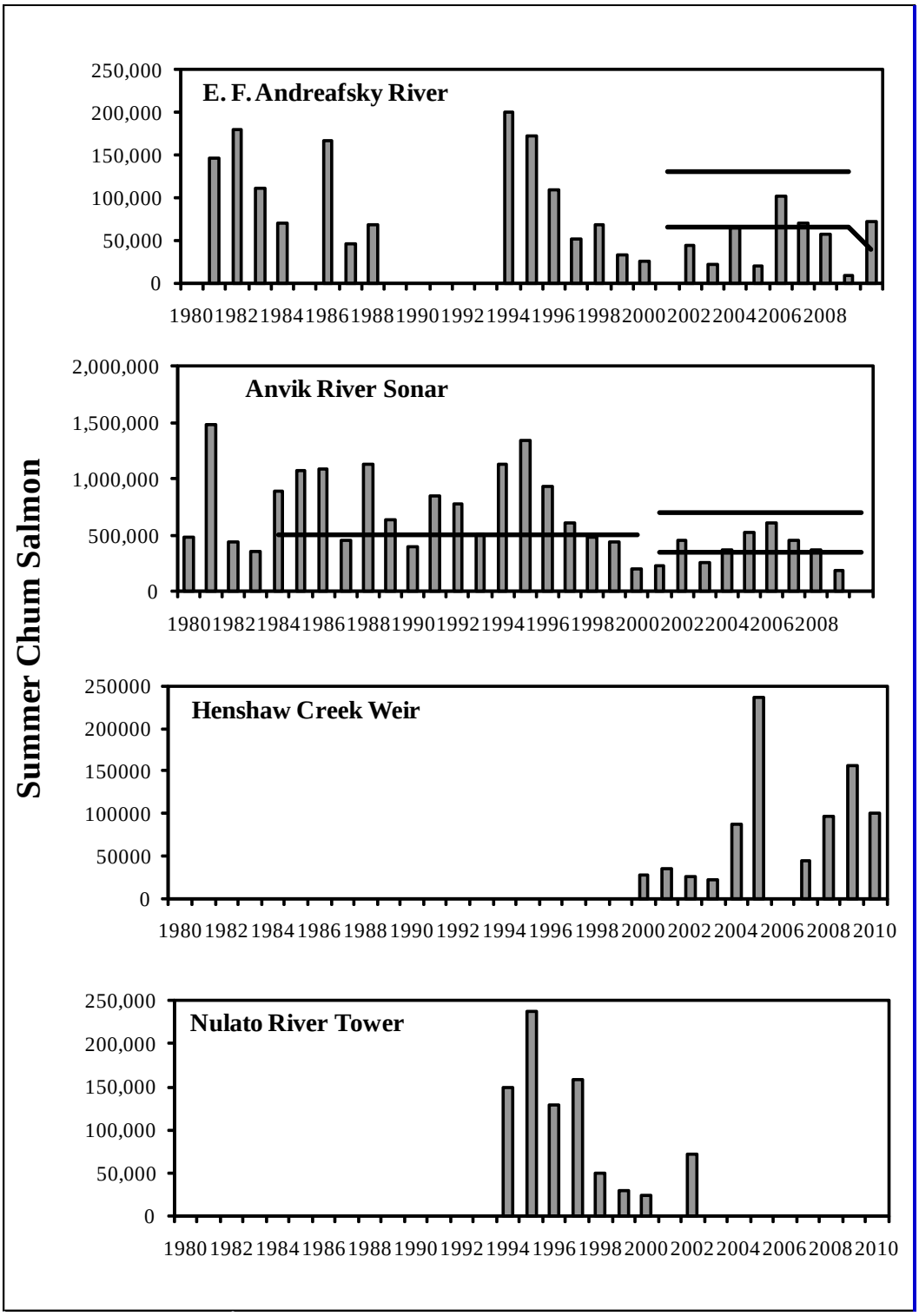
Note: Data are aerial survey observations unless noted otherwise. The vertical scale is variable.

Appendix C10.–Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2010.

-continued-



Note: Data are aerial survey observations unless noted otherwise. The vertical scale is variable.



Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

Appendix C11.–Summer chum salmon ground based escapement estimates for selected tributaries in the Alaskan Yukon River drainage, 1980–2010.

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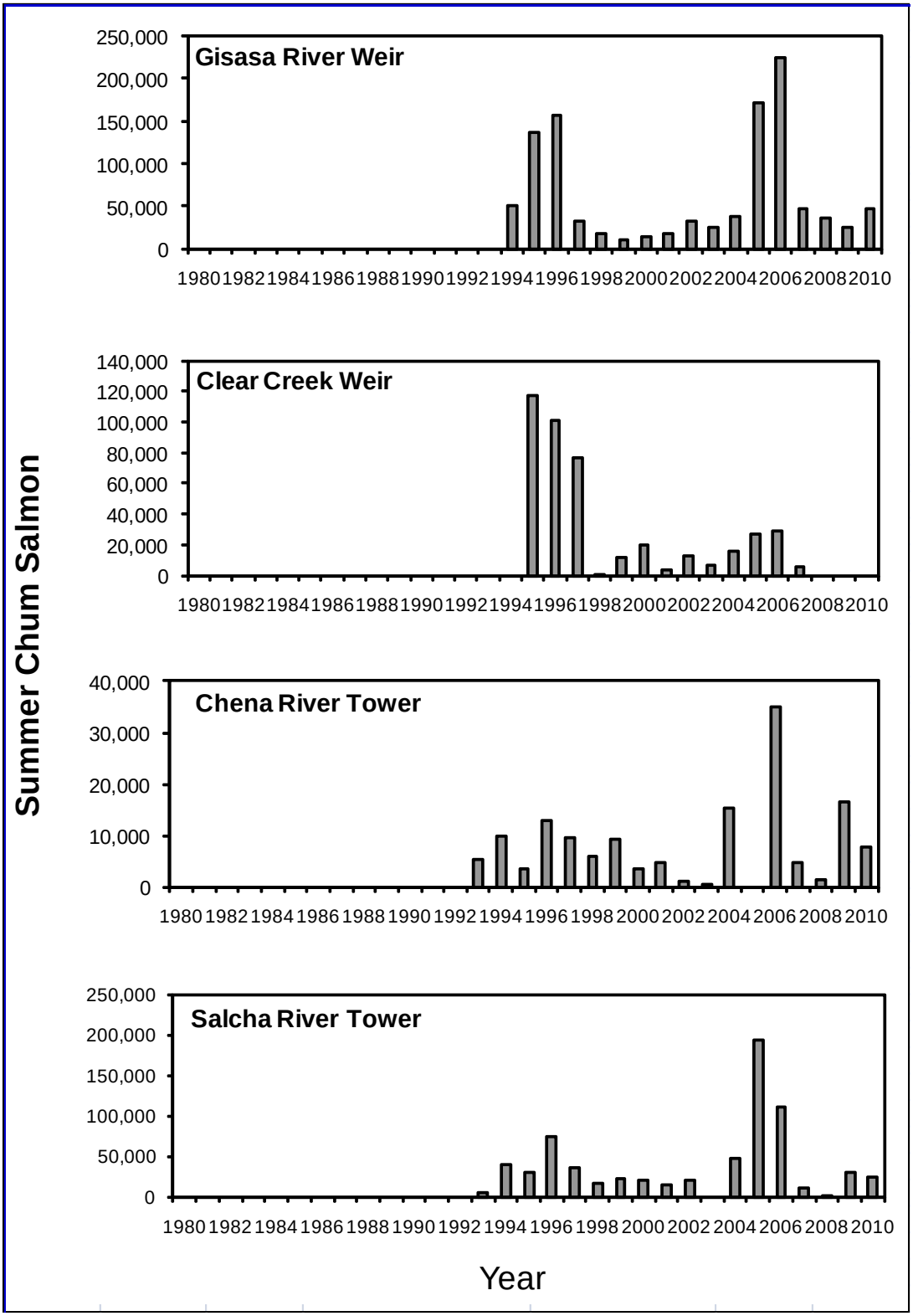
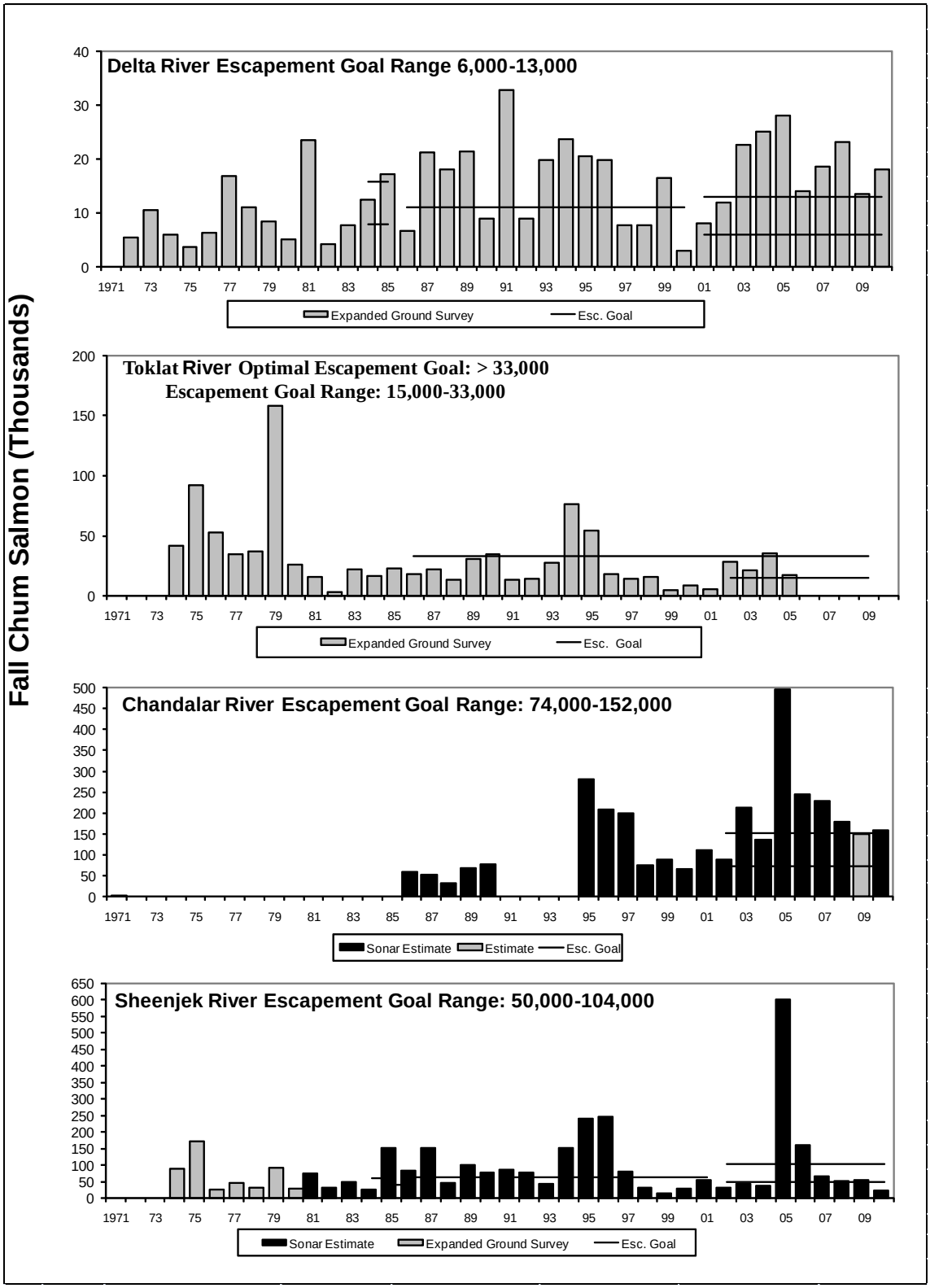
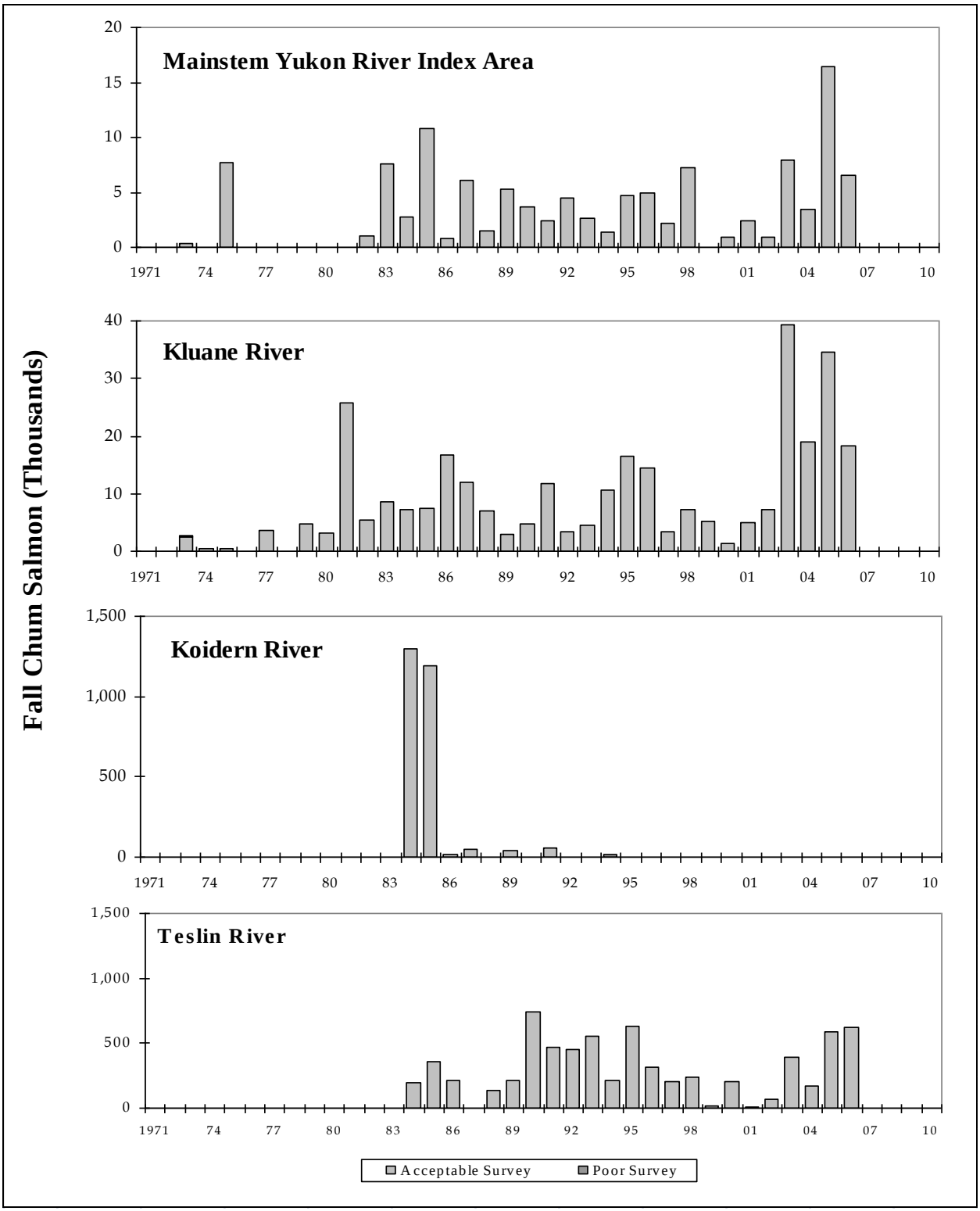


Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.



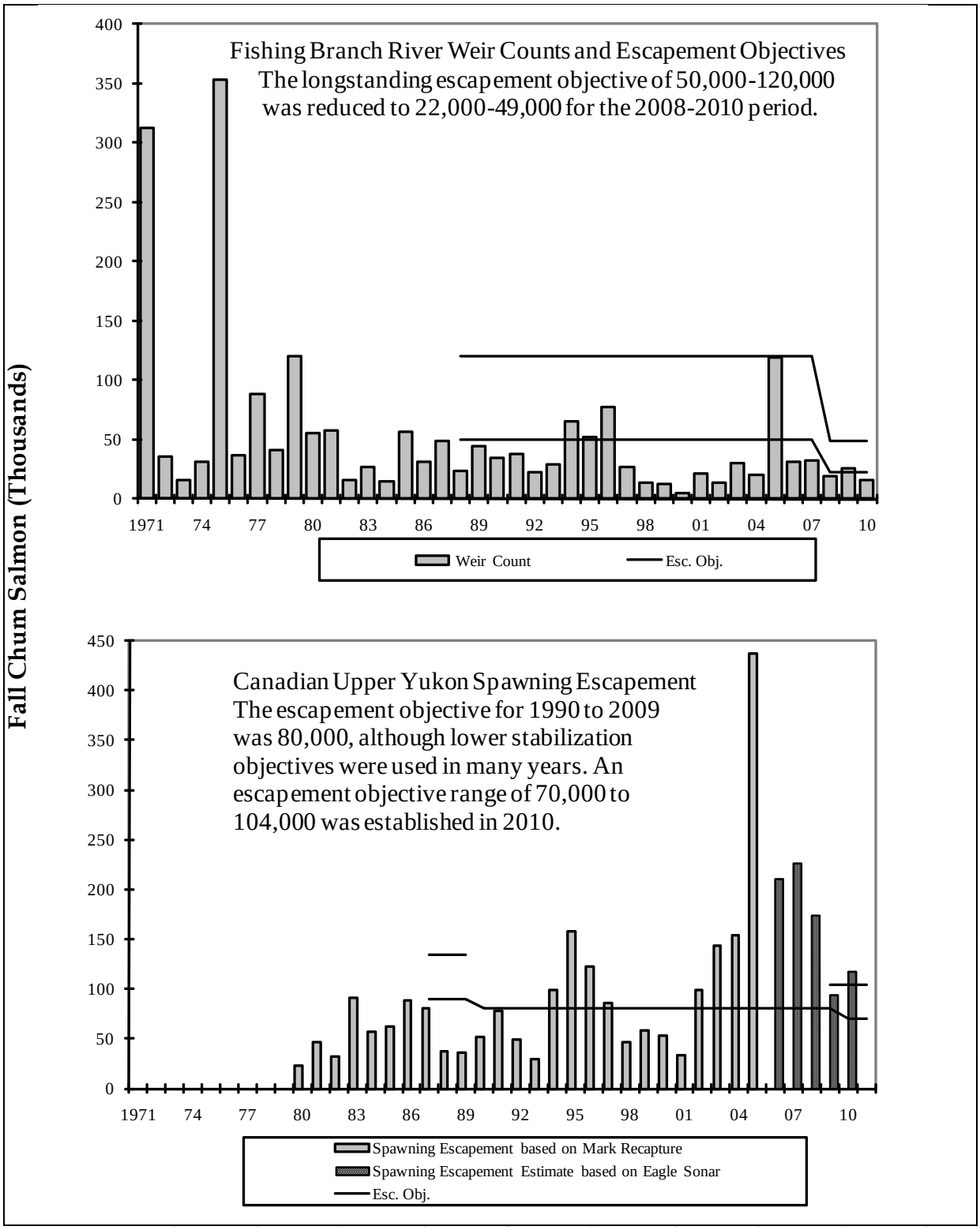
Note: Horizontal lines represent biological escapement goals or ranges. The vertical scale is variable.

Appendix C12.–Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971–2010.



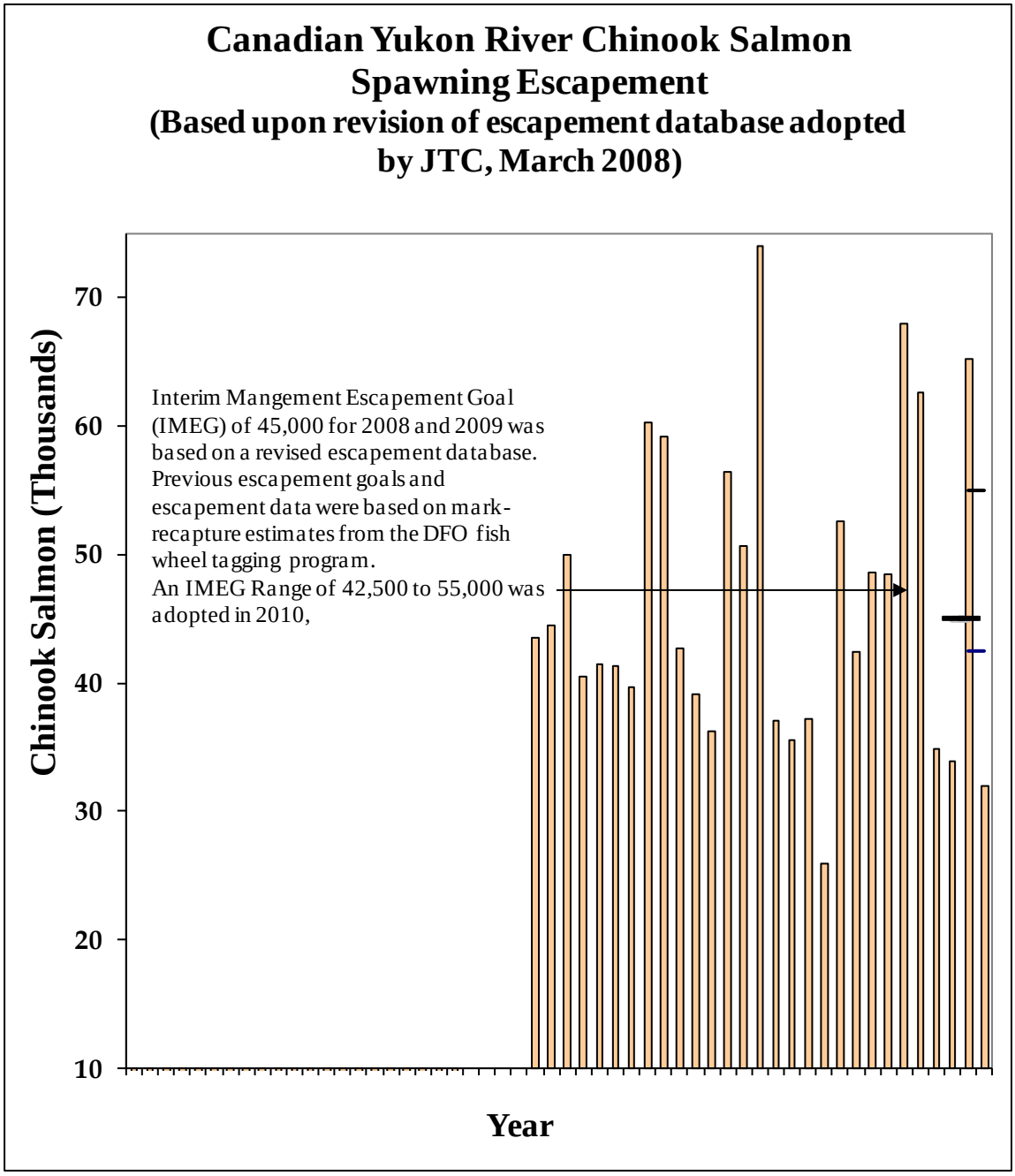
Note: The vertical scale of Mainstem and Kluane is shown in thousands, while the Koidern and Teslin are in hundreds. Genetic stock identification was used to determine relative tributary spawning abundance from 2007 to 2010.

Appendix C13.–Chum salmon aerial survey data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1971–2006.



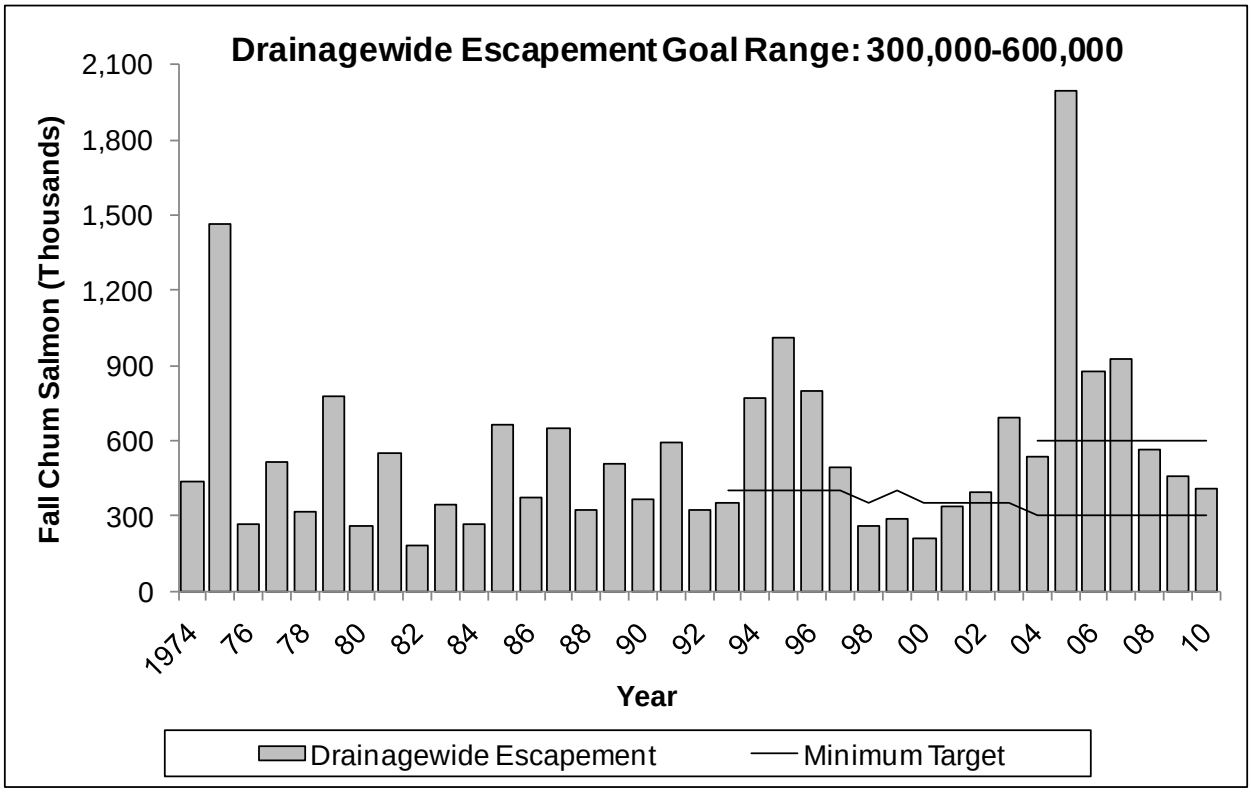
Note: Sonar estimates have been used since 2006. Horizontal lines represent escapement goal objectives or ranges. The interim stabilization or rebuilding objectives are also shown.

Appendix C14.–Chum salmon spawning escapement estimates for Canadian portion of the Yukon River drainage, 1971–2010.



Note: The JTC adopted a revised escapement database in March 2008. The 2008 and 2009 Interim Management Escapement Goal was set at 45,000.

Appendix C15.–Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage, 1982–2010.



Appendix C16.–Estimated drainagewide escapement of fall chum salmon, Yukon River, 1974-2010.