Special Publication 10-02

Run Forecasts and Harvest Projections for 2010 Alaska Salmon Fisheries and Review of the 2009 Season

Edited by

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February 2010

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

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, and Special Publications. 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
fathom *spell out*	
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm
metric ton mt (*spell out)*	

Weights and measures (English)

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

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	©
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.
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
United States Code	U.S.C.
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour (*spell out for 24-hour time of day*)	h
minute	min
second	s
week	*spell out*
year	*spell out*

Measures (fisheries)

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

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
chi-square	χ^2
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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By

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February 2010

The Special Publication series was established by the Division of Sport Fish in 1991 for the publication of techniques and procedures manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Special Publications are intended for fishery and other technical professionals. Special Publications are available through the Alaska State Library, Alaska Resources Library and Information Services (ARLIS) and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm. This publication has undergone editorial and peer review.

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This document should be cited as:
Eggers, D. M., M. D. Plotnick, and A. M. Carroll. 2010. Run forecasts and harvest projections for 2010 Alaska salmon fisheries and review of the 2009 season. Alaska Department of Fish and Game, Special Publication No. 10-02, Anchorage.

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DEFINITION OF TERMS

Biological escapement goal	The number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum yield (human use). This determination is based on biological information about the fish stock in question. (Also see optimum escapement goal.)
Commercial harvest	Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery (see below) and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.
Commercial common property harvest	Harvests taken by traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and sale of confiscated fish.
Common property harvest	Harvests taken by the commercial common property fisheries (see above), as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost recovery harvests.
Cost recovery harvest	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
Enhancement of runs	Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques.
Escapement, spawning population, or brood stock	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.
Harvest projections or harvest outlooks	Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts, when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.
Optimum escapement goal	The number of salmon in a particular stock that should be allowed to spawn to achieve sustainable runs based on biological needs of the stock, as well as consideration of social and allocative needs.
Run forecast	Forecasts of a run (harvest + escapement) are estimates of the fish that will return in a given year based on such information as parent-year escapements, subsequent fry abundance, and spring seawater temperatures. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.
Salmon run	Run refers to the total number of mature fish returning in a given year from ocean-rearing areas to spawn.
Return	Return refers to an aggregation of salmon over several or more years that represent the surviving adult offspring from a single brood year.

NAMES FOR ALASKA'S PACIFIC SALMON SPECIES

Common Name	Vernacular Name	Scientific Name
Chinook	king	*Oncorhynchus tshawytscha*
sockeye	red	*Oncorhynchus nerka*
coho	silver	*Oncorhynchus kisutch*
pink	humpy, humpback	*Oncorhynchus gorbuscha*
chum	dog	*Oncorhynchus keta*

ABSTRACT

This report contains a detailed review of Alaska's 2009 commercial salmon season as well as run forecasts and harvest projections for 2010. The Alaska all-species salmon harvest for 2009 totaled 162.5 million, which was about 12.4 million less than the preseason forecast of 174.9 million and the 12th largest salmon harvest since 1960. This combined harvest was composed of 359,000 Chinook salmon *Oncorhynchus tshawytscha*, 43.3 million sockeye salmon *O. nerka*, 4.1 million coho salmon *O. kisutch*, 96.7 million pink salmon *O. gorbuscha*, and 18.0 million chum salmon *O. keta*. The Alaska Department of Fish and Game is expecting a decrease in commercial salmon catches in 2010 due to the projected decrease in pink harvests. The 2010 total commercial salmon catch (all species) projection of 138 million is expected to include 143,000 Chinook, 45.8 million sockeye, 4.4 million coho, 69.1 million pink, and 18.0 million chum salmon. The projected pink harvest is about 28% lower than the harvest experienced in 2009 (96.7 million). The projected sockeye harvest is higher the harvest in 2009. This projected increase is from the expected increase in the sockeye salmon harvest in Bristol Bay. Chum harvests are expected to be similar to those of 2009.

When the appropriate data were available, harvest projections were arrived at through quantitative projections based on information on previous spawning levels, smolt outmigrations, returns of sibling age classes, and recent survival rates observed for hatchery releases. Other projections were based on averages of recent catch levels. Fishing effort influences average catch levels, and effort is partly determined by market conditions in addition to the size of salmon runs. Therefore these projections may not be indicative of potential harvest levels.

Key words: pink salmon, *Oncorhynchus gorbuscha,* sockeye salmon, *O. nerka,* chum salmon, *O. keta*, Chinook salmon, *O. tshawytscha*, coho salmon, *O. kisutch*, catch projection, run forecast, harvest projection, smolt outmigrations, sibling age classes, hatchery releases, fishing effort, exvessel value, salmon management

INTRODUCTION

This report contains salmon run forecasts and harvest projections for 2010 as well as a detailed review of Alaska's 2009 commercial salmon season. Salmon escapement and harvest estimates reported in this document were summarized from the Alaska Department of Fish and Game (ADF&G) escapement and fish ticket databases. Data provided in this report are preliminary and supersede any data previously published.

ADF&G is expecting a decrease in commercial salmon catches in 2010 due to the projected decrease in pink salmon *Oncorhynchus gorbuscha* harvests. The 2010 total commercial salmon catch (all species) projection of 138 million is expected to include 143,000 Chinook salmon, 45.8 million sockeye salmon, 4.4 million coho salmon, 69.1 million pink salmon, and 18.0 million chum salmon. The projected pink salmon harvest is about 28% lower than the harvest experienced in 2009 (96.7 million). The projected sockeye harvest is higher than the harvest in 2009, and is due to the expected increase in the sockeye harvest in Bristol Bay. Chum harvests are expected to be similar to those of 2009.

Table 1 shows specific harvest projection numbers by species and fishing area. These projections reflect potential harvests for most of the major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon to the Southeast Alaska, Kodiak, and Prince William Sound areas. Fishing effort influences average catch levels, and effort is partly determined by market conditions in addition to the size of salmon runs. Therefore these projections may not be indicative of potential harvest levels. With the exception of the Southeast Alaska Chinook salmon fisheries and the South Peninsula June fisheries, Alaska salmon management will be based on in season estimates of salmon run strength. Alaska managers have the primary goal of maintaining spawning population sizes—not of reaching preseason catch projections.

Table 1.–Projections of 2010 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook[a]	Sockeye	Coho	Pink	Chum	Total
Southeast Alaska						
Natural Production		1,037		18,499	2,100	21,636
Hatchery Production[b]		204		501	7,271	7,976
Southeast Region Total	n/a [c]	1,241 [d]	2,435 [d]	19,000	9,371	32,047
Prince William Sound						
Natural Production	25	1,264 [e]	353 [f]	801	155	2,598
Hatchery Production[g]		1,333	195	29,231	3,550	34,309
Upper Cook Inlet	17 [d]	2,300	179 [d]	305 [h]	70 [d]	2,871
Lower Cook Inlet						
Natural Production	3 [d]	92 [i]	34 [d]	567	85 [d]	782
Hatchery Production		319 [j]				
Bristol Bay	42	30,530	76 [d]	87 [d]	1,641 [d]	32,377
Central Region Total	87	35,838	837	30,991	5,501	73,255
Kodiak						
Natural Production	20	2,220 [k]	249 [l]	5,748 [m]	734 [d]	8,971
Hatchery Production[n]		271	164	5,700	274	6,409
Chignik[n]	2	1,299	96	1,550	151	3,098
South Alaska Peninsula	5 [d]	2,117 [d]	187 [d]	5,874 [p]	1,019 [h]	9,202
North Alaska Peninsula[q]	5	2,600 [q]	70	10	50	2,735
Westward Region Total	32	8,507	766	18,882	2,228	30,415
Arctic-Yukon-Kuskokwim Region Total	24	175	320	225	870	1,614
Statewide Total	143	45,762	4,358	69,098	17,970	137,330

Note: Columns and rows may not total exactly due to rounding.

[a] The estimated 2009 Chinook salmon harvest of 512,000 fish includes an estimate of 372,000 for Southeast Alaska. The forecasted Chinook harvest in for Southeast Alaska is an approximate value based on recent 3-year average catch. The allowable catch of Chinook salmon in Southeast Alaska is determined by the Pacific Salmon Commission and the Commission has not published the quota for 2010. Release of the 2010 Chinook quota for Southeast Alaska is expected in late March or early April.

[b] Hatchery projections made by Southern Southeast Regional Aquaculture Association, Northern Southeast Regional Aquaculture Association, Douglas Island Pink and Chum , Armstrong-Keta, Inc., Kake Nonprofit Fishereis Corporation, and Metlakatla Indian Community less broodstock (500,000)

[c] Southeast Alaska Chinook salmon harvests are primarily driven by the all-gear harvest allocation determined by the Chinook Technical Committee of the Pacific Salmon Commission. The all-gear harvest allocation will be available in late March or early April and will be announced via News Release at that time.

[d] Average harvest for the 5-year, 2005–2009, period.

[e] Includes harvest estimates for Coghill and Eshamy lakes, Unakwik District and Copper River sockeye salmon.

[f] 10-year average harvest (2000–2009) in the Copper River and Bering River districts.

[g] Hatchery projections made by Prince William Sound Aquaculture Corporation (PWSAC) and Valdez Fisheries Development Association (VFDA).

[h] Average previous 5 even-year harvests, 2000–2008 period.

[i] Average harvest for the 1989–2008 period.

[j] Includes common property plus cost recovery harvests.

[k] Total Kodiak harvest of 2.2 million sockeye includes projected harvests from formally forcasted systems, projected harvest from additional minor systems totalling 709,000 fish and projected harvest at Cape Igvak of 205,000 sockeye.

[l] Based on 10-year average of harvests, 2000–2009 period.

[m] See formal pink forecast.

[n] Hatchery projections made by Kodiak Regional Aquaculture Association (enhanced Spiridon sockeye run harvest forecast of 176,000 was developed by department staff).

[o] Chignik Chinook, coho, pink, and chum harvests based on 4-year (2006–2009) average harvests (postcooperative fishery) Chignik sockeye based on a formal forecast with projected harvest at Igvak and Stepovak excluded..

[p] Average harvest during the past 5 even-numbered years.

[q] 10-year average (2000–2009); sockeye includes formal forecasts for Bear late run (423,000) and Nelson stocks (492,000).

The Alaska all-species salmon harvest for 2009 totaled 162.5 million, which was about 12.4 million less than the preseason forecast of 174.9 million and the 12th largest harvest since 1960. This combined harvest was composed of 359,000 Chinook *Oncorhynchus tshawytscha*, 43.3 million sockeye *O. nerka*, 4.1 million coho *O. kisutch*, 96.7 million pink *O. gorbuscha*, and 18.1 million chum salmon *O. keta*. Table 2 shows 2009 harvest numbers by salmon species and fishing area, in units of fish harvested, and Table 3 provides this information in units of pounds harvested. Tables 4–7 provide detailed information on the 2009 harvest by species and area.

Table 2.–Preliminary 2009 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	268	925	2,635	38,054	9,654	51,537
Prince William Sound	11	1,919	301	18,582	3,221	24,033
Upper Cook Inlet	9	2,046	153	214	83	2,505
Lower Cook Inlet	0	280	3	989	74	1,346
Bristol Bay	30	30,899	59	1	1,366	32,356
Central Region Total	50	35,144	516	19,786	4,744	60,240
Kodiak Area	7	1,727	289	27,649	956	30,600
Chignik	3	1,198	110	1,408	256	2,977
South Peninsula & Aleutians	6	1,725	249	9,547	1,687	13,214
North Peninsula	3	2,427	68	275	106	2,879
Westward Region Total	19	7,077	716	38,879	3,005	49,670
AYK Region Total	22	171	257	17	603	1,061
Total Alaska	359	43,317	4,124	96,736	18,006	162,508

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.
[a] Total commercial harvest of Chinook salmon for the October 1, 2008–September 30, 2009 catch accounting period.

Table 3.–Preliminary 2009 Alaska commercial salmon harvests, by fishing area and species, in thousands of pounds.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	3,788	5,498	16,760	119,765	70,781	216,682
Prince William Sound	202	11,942	2,662	55,957	24,194	94,957
Upper Cook Inlet	152	12,472	999	716	581	14,920
Lower Cook Inlet	2	1,497	20	3,037	599	5,155
Bristol Bay	532	182,307	406	2	8,609	191,855
Central Region Total	888	208,218	4,087	59,712	33,983	306,887
Kodiak Area	67	9,847	1,928	91,576	7,381	110,799
Chignik	32	8,262	732	4,503	1,923	15,452
South Peninsula & Aleutians	96	10,181	1,578	30,775	11,690	54,320
North Peninsula	48	14,419	518	885	742	16,612
Westward Region Total	243	42,709	4,756	127,739	21,736	197,183
AYK Region Total	294	1,110	1,950	17	4,283	7,654
Total Alaska	5,200	257,500	27,600	307,200	130,800	728,300

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.

Look for inseason harvest information, postseason statistics, and other information about salmon in Alaska on the World Wide Web at http://www.cf.adfg.state.ak.us/.

The ADF&G's 4 major fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) are shown in Figure 1. These regions supersede any references to the department's former statistical regions.

Though the department does not produce formal run size forecasts for all salmon runs in the state, local salmon biologists prepare harvest projections or harvest outlooks for all areas. Projections are based on formal forecasts when available. When the formal forecasts are not available, local biologists use average historical catches and local knowledge of recent events to develop these outlooks.

This report contains a detailed review of Alaska's 2009 commercial salmon season. We normally release it before final catch figures are available to provide preliminary information to the Alaska Board of Fisheries, the fishing industry, and the public.

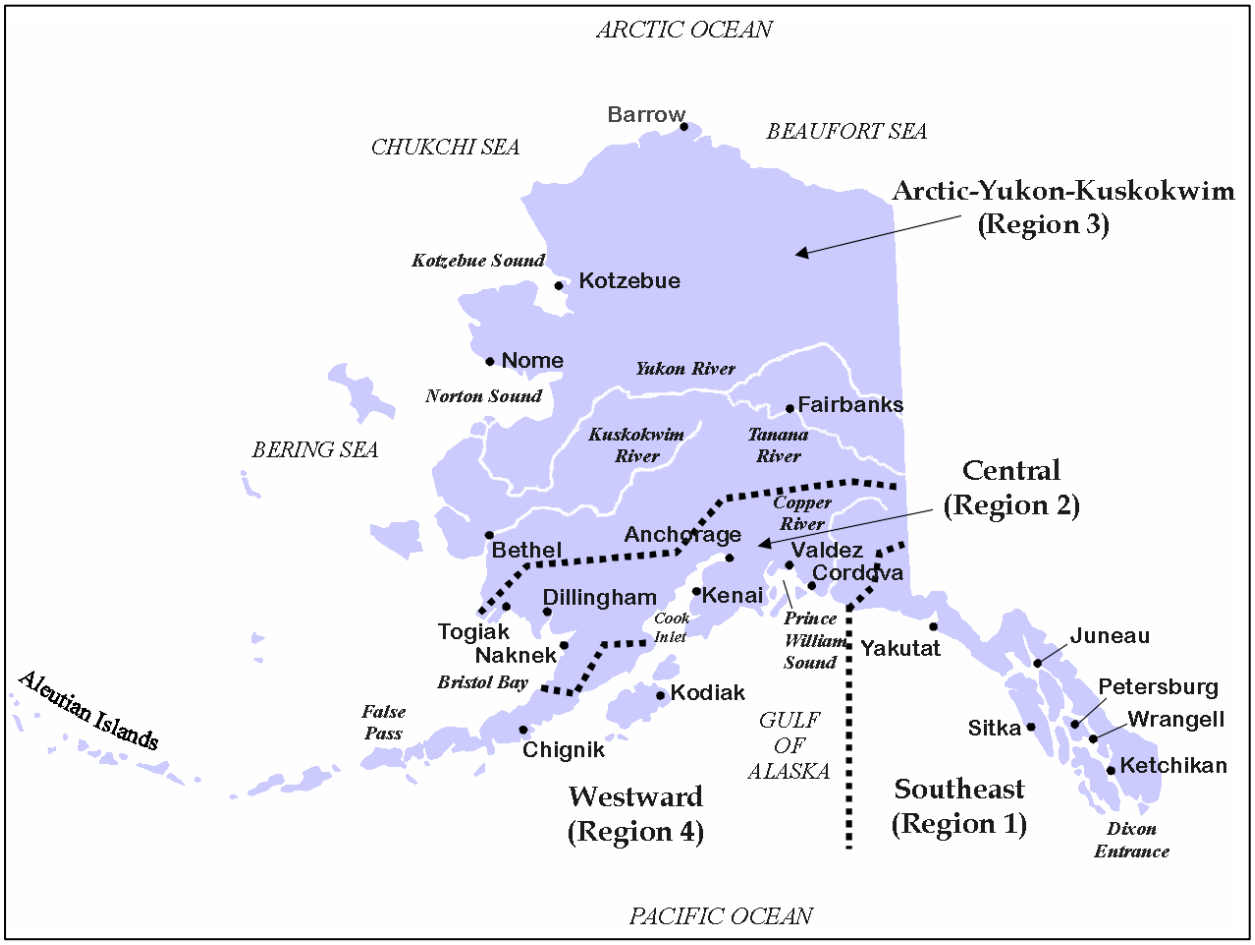

Figure 1.–The 4 fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Alaska Department of Fish and Game, Division of Commercial Fisheries.

PRELIMINARY REVIEW OF THE 2009 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

Region I salmon harvests totaled 51.5 million salmon and 217 million pounds in 2009 (Tables 2, 3, and 4). The estimated exvessel value based on prices reported on fish tickets is $99 million; however, this initial estimate should increase following Commercial Fisheries Entry Commission analysis after Commercial Annual Operator Reports are submitted by fish buyers. The total harvest in 2009 was between the recent 10-year average harvest of 59.6 million and the long-term average harvest since 1962 of 38.3 million. The total harvest increased 83% from 28.1 million and increased 34% from 162 million pounds in 2008. Increases compared with 2008 are attributable a recent cycle of weaker even-year pink salmon returns. Total harvests included 268,000 Chinook, 925,000 sockeye, 2.6 million coho, 38.1 million pink, and 9.7 million chum salmon. The proportional harvest composition by species included <1% Chinook, 2% sockeye, 5% coho, 74% pink, and 19% chum salmon, consistent with recent 10-year averages. Exvessel value declined from a recent-year high of $117 million in 2008 due to falling prices. A total of 1,915 limited entry permit holders participated in the 2009 salmon fisheries, up 2% from the previous year.

Chinook Salmon

The regional Chinook harvest was 268,500 (including 265,000 large fish) for the October 1, 2008 to September 30, 2009 catch accounting year. This harvest was below the long-term average harvest of 301,000 and the recent 10-year harvest of 339,000. In 2009 the all-gear treaty Chinook quota for Southeast Alaska was 218,800—based on the coastwide Chinook model under the newly renegotiated Pacific Salmon Treaty. Quota allocations of treaty fish included 161,638 to troll fisheries, 9,408 to purse seine fisheries, 7,345 to drift and set gillnet fisheries, and 40,409 to sport fisheries. Also under the Pacific Salmon Treaty a small directed Transboundary river fishery took place to harvest Taku River Chinook salmon. There was no directed fishery on the Stikine River in 2009 due to low forecast returns. Spring troll fisheries are managed throughout the region to harvest additional Alaska hatchery-produced Chinook along with treaty fish. The total Chinook harvest of 268,500 apportioned by commercial fisheries included 66% to troll gear, 13% to hatchery cost recovery, 11% to purse seine, and 9% to drift gillnet. The initial exvessel value of the total Chinook harvest is estimated at $11.5 million based on harvests of 3.8 million pounds and an average price of $3.05 per pound. Troll harvests of 175,000 included 24,889 during the winter season, 32,584 during the spring season, and 125,254 during the summer season. Troll price for winter-caught Chinook averaged $7.17 per pound.

Sockeye Salmon

The 2009 sockeye harvest of 925,000 was two-thirds of both the long-term and recent 10-year average harvests, but rebounded to more than double the unusually poor harvest of just 422,000 in 2008. Harvests included 408,000 (44%) from the drift gillnet fisheries, 307,000 (33%) from the purse seine fisheries, and 106,000 (11%) from the Yakutat set gillnet fisheries. Sockeye

escapement goals were not met for 6 out of 13 stocks that have goals. Sockeye salmon contributed $6.8 million to regional exvessel value based on a harvest of 5.5 million pounds and an average price of $1.24 per pound.

Coho Salmon

The 2009 regional coho harvest was 2.6 million, and was 127% of the long-term average harvest of 2.1 million and close to the recent 10-year average harvest of 2.7 million. Troll fisheries harvested 1.6 million coho salmon (60%), followed by drift gillnet (12%), purse seine (11%), hatchery cost recovery (10%) and Yakutat set gillnet (5%). All coho escapement goals in the region were either met or exceeded in 2009. The initial fish ticket value for the coho harvest was $16.6 million, based on harvests of 16.8 million pounds and an average price of $0.99 per pound. Troll fisheries received an average of $1.21 per pound, and coho accounted for 55% of the seasonal troll fishery exvessel value of $20.4 million.

Pink Salmon

The 2009 pink harvest of 38.1 million was above the long term average of 29.4 million (1962–2008), but below the recent 10-year average of 44.0 million (1999–2008). The harvest came in 7% below the preseason ADF&G harvest forecast of 41.0 million. Pink salmon are predominantly harvested by the purse seine fishery. The Southeast purse seine fishery accounted for 92% of the harvest, and Annette Island Reservation seine fishermen harvested an additional 4% of the harvest. Pink salmon were small in 2009 averaging around 3.1 pounds per fish. Based on an average price of around $0.21 per pound, the 120 million pounds harvested produced an initial exvessel value of $25 million. Seine harvest distribution included 24.0 million in southern districts and 10.0 million in northern districts. Harvests of returns to District 1, the southern southeast mainland systems, were strong at 9.4 million and well-above average. Escapements in the region were well distributed—the 3 sub-region biological escapement goals were met, escapement targets were met in all districts, and 41 of 46 stock group escapement targets were met or exceeded.

Chum Salmon

The 2009 total commercial chum harvest was 9.7 million—89% of the recent 10-year average harvest. The major harvests included 3.5 million (36%) in purse seine fisheries, 2.9 million (30%) in hatchery cost recovery harvests, and 2.7 million (28%) in drift gillnet fisheries. A total of 60% of chum harvests took place in terminal areas in either cost recovery or common property terminal area fisheries. A large portion of chum harvests in the region result from hatchery production, including harvest outside of terminal areas as hatchery returns pass through traditional fisheries. The regional chum salmon harvest of 9.6 million was 96% of the projected return of around 10.0 million based on forecasts by the 3 major hatchery operators. Total enhanced chum salmon returns included 2.5 million to Southern Southeast Regional Aquaculture Association release sites, 3.1 million to Northern Southeast Regional Aquaculture Association release sites, and 3.5 million to Douglas Island Pink and Chum release locations. Douglas Island Pink and Chum chum returns were stronger than expected—60% above the preseason forecast. Wild summer chum escapements, based on 3 recently established sustainable escapement goal thresholds, were each below goal. Fall chum escapements were good in most systems monitored. The chum harvest, based on 71.0 million pounds landed, and an average price $0.52 per pound, was worth $37.0 million exvessel. Chum salmon were the most valuable species for the Southeast Alaska region in 2009.

Table 4.–Preliminary 2009 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

Fishery	Chinook[a]	Sockeye	Coho	Pink	Chum	Total [b, c]
Purse Seine						
Southern Seine[d] Total	12	240	246	24,302	962	25,762
Northern Seine[e] Total	1	62	35	9,952	408	10,459
Hatchery Terminal	17	5	2	692	2,133	2,849
Total Purse Seine	30	307	283	34,946	3,503	39,070
Drift Gillnet						
Tree Point	1	70	67	171	263	572
Prince of Wales	2	112	145	144	288	690
Stikine	3	37	31	27	191	288
Taku-Snettisham	7	62	37	56	918	1,080
Lynn Canal	1	115	35	81	542	774
Hatchery Terminal	12	13	6	87	528	647
Total Drift Gillnet	26	409	321	566	2,730	4,051
Set Gillnet	2	106	134	77	1	319
Troll						
Hand Troll						
Traditional	9	<1	97	5	4	116
Hatchery Terminal	<1	<1	<1	<1	<1	0
Spring Areas	4	<1	1	<1	1	6
Total Hand Troll	13	<1	98	<1	5	122
Power Troll[f]						
Traditional	133	2	1,474	63	106	1,779
Hatchery Terminal	<1	0	1	0	189	191
Spring Areas	28	0	12	8	42	91
Total Power Troll	161	2	1,487	71	337	2,061
Total Troll	174	2	1,585	71	342	2,183
Annette Island Reservation						
Seine	<1	7	15	1,612	38	1,674
Drift Gillnet		8	30	113	120	272
Troll						
Hand Troll	<1	<1	6	<1	<1	6
Power Troll						
Trap						
Total Annette Island Reservation	<1	15	45	1,725	158	1,952
Hatchery Cost Recovery	35	85	260	635	2,907	3,922
Miscellaneous[g]	<1	1	<1	27	12	41
Southeast Region Total	268	925	2,635	38,054	9,654	51,537

[a] Chinook adults and jacks are totaled.

[b] Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.

[c] Columns may not total exactly due to rounding error.

[d] Districts 101–108. Harvest codes 11 (traditional fishery).

[e] Districts 109–114. Harvest code 11 (traditional fishery).

[f] Catch accounting period for the 2009 Chinook salmon season goes from October 1, 2008 to September 30, 2009.

[g] Includes salmon that were confiscated or caught in sport fish derbies or commercial test fisheries and sold.

CENTRAL REGION

PRELIMINARY 2009 PRINCE WILLIAM SOUND SALMON SEASON SUMMARY

The 2009 Prince William Sound Area commercial salmon harvest was 24 million. The harvest was composed of 18.6 million pink, 1.9 million sockeye, 3.2 million chum, 300,000 coho, and 11,000 Chinook salmon. The 2009 harvest was composed of 15.9 million (66%) commercial common property fishery (CPF), and 8.2 million (34%) hatchery cost recovery fish.

Gillnet Fisheries

Copper River District

The 2009 preseason commercial harvest forecast for the Copper River District was 30,700 Chinook, 510,000 sockeye, and 297,000 coho salmon. Gulkana Hatchery was expected to contribute 150,000 sockeye salmon to the 2009 CPF harvest. The commercial salmon fishing season in the Copper River District began on Thursday, May 14. The 2009 sockeye harvest of 897,000 was below the previous 10-year harvest average of 1.2 million. The preliminary harvest composition was 833,000 (92.9%) wild, 60,000 (6.7%) Gulkana Hatchery, and 3,400 (0.4%) Main Bay Hatchery sockeye salmon. The CPF harvest of 9,500 Chinook salmon was below the previous 10-year average harvest of 37,000, and was the smallest harvest in over 40 years. The coho commercial harvest of 208,000 was below the previous 10-year average harvest of 295,000. The 2009 inriver goal for salmon passing the Miles Lake sonar site was set at 592,000 to 792,000. The 2009 sonar escapement estimate was 710,000. Spawning escapement to lower Copper River systems based on aerial survey indices was 69,000 sockeye salmon, and was within the sustainable escapement goal (SEG) range (55,000–130,000). Coho spawning escapement to the Copper River Delta based on aerial survey indices was 41,000 and was within the SEG range (32,000–67,000).

Bering River District

Opening in early June, the Bering River District is managed concurrently with the Copper River District. The 2009 CPF harvest of 4,200 sockeye salmon was below the previous 10-year average of 18,400. The sockeye escapement index based on aerial surveys (17,000) was below the SEG range (20,000–35,000). The coho salmon commercial harvest of 45,000 was below the previous 10-year harvest average of 48,200. Aerial surveys of coho salmon produced an escapement index of 22,000 that was within the SEG range (13,000–33,000).

Coghill District (Drift Gillnet)

The CPF chum harvest in the Coghill District was 1.34 million—1.32 million by drift gillnet gear and 13,000 by purse seine gear. Prince William Sound Aquaculture Corporation (PWSAC) harvested 605,000 chum salmon for corporate cost recovery. The Coghill River weir passed 19,000 sockeye salmon prior to washout on July 22. Adding the 1,000 sockeye salmon estimated below the weir at that time puts escapement within the SEG range (20,000–40,000). The total CPF harvest of sockeye salmon in the Coghill District was 105,000, of which 55,000 were of enhanced stock (predominately Main Bay Hatchery) origin and 50,000 were of wild stock origin. The majority of the sockeye salmon (103,000), were harvested by the drift gillnet fleet. The coho harvest of 21,000 was below the PWSAC preseason harvest forecast of 130,000. The majority (19,000), were harvested by the drift gillnet fleet. A small portion of the Coghill District coho salmon harvest was likely of wild stock origin.

Eshamy District

The department's preseason forecast for Eshamy Lake was 76,000 wild sockeye salmon. PWSAC forecasted a run of 1.1 million Main Bay Hatchery enhanced sockeye salmon. The CPF harvest of sockeye salmon in the Eshamy District was 692,000, and was composed of 134,000 (16%) hatchery cost recovery, 8,800 (1%) hatchery broodstock, 153,000 (18%) set gillnet CPF and 539,000 (65%) drift gillnet CPF. Enhanced sockeye contribution to the Eshamy District CPF harvest was 628,000 (91%). PWSAC harvested 131,000 Main Bay Hatchery enhanced sockeye salmon for corporate cost recovery. Additionally, Main Bay Hatchery sockeye salmon were harvested in the Copper River (3,000) and Coghill (55,000) districts. Sockeye salmon escapement to Eshamy Lake was 24,025 when the weir was removed on August 28. This was within the new BEG range (13,000–28,000) adopted in 2008.

Unakwik District

The department's preseason harvest forecast for the Unakwik District was 7,268 sockeye salmon. The Unakwik District CPF harvest was 3,100 sockeye salmon (2,000 taken by the drift gillnet fleet and 1,200 taken by the purse seine fleet) and was below the 10-year average of 7,382 sockeye salmon.

Montague District, Port Chalmers Subdistrict

PWSAC forecasted a run of 1.0 million chum salmon to the Port Chalmers remote release site. The drift gillnet harvest was 673,000. This was the first year that drift gillnet gear was given access to the Port Chalmers Subdistrict under the existing Allocation Plan. The harvest was above the 5-year CPF average of 600,000. Approximately 1% of the chum salmon harvested in the Port Chalmers Subdistrict were of wild stock origin.

Purse Seine Fisheries

Coho Salmon

The 2009 Valdez Fisheries Development Association (VFDA) coho salmon run was anticipated to be 238,000, and 1,000 salmon were needed to meet VFDA broodstock objectives. VFDA harvested 20,900 coho salmon, of which 3,500 were utilized for broodstock and 17,400 were sold. In 2009 the purse seine fleet harvested 6,700 in the Southwestern (2,600), Coghill (1,800), and Eastern (1,200) districts. The majority of coho salmon harvested in the Eastern and Coghill districts are assumed to be of enhanced stock origin.

Pink Salmon

The 2009 total run forecast for Prince William Sound (PWS) was 54.9 million, and included 14.3 million wild stock, 17.9 million VFDA hatchery fish, and 22.7 million PWSAC hatchery fish. Approximately 5.5 million (24%) of the 22.7 million run forecast to the PWSAC hatcheries were projected for cost recovery and broodstock; the remaining 17.2 million would be available for CPF harvest. Approximately 4.0 million (22%) of the projected 17.9 million pink run forecast to VFDA's Solomon Gulch Hatchery were projected for cost recovery and broodstock. The remaining 13.9 million VFDA fish would be available for CPF harvest. A total harvest of 12.3 million wild stock pink salmon was forecasted for CPF, leaving 2.0 million for escapement.

The 2009 pink harvest of 18.6 million, composed of approximately 5% wild and 95% hatchery fish, was the third lowest PWS harvest in 20 years. Overall harvest by gear type was 10.8 million by purse seine, 4,000 by set gillnet, 401,000 by drift gillnet, and 7.6 million (1.2 million VFDA and 6.5 million PWSAC) for hatchery cost recovery and broodstock. Estimated pink salmon contributions by aquaculture associations were 7% VFDA and 93% PWSAC. VFDA cost recovery and broodstock harvest represented approximately 97% of the total run to Solomon Gulch Hatchery, while PWSAC cost recovery and broodstock harvest was approximately 39% of the total run to PWSAC hatcheries.

Despite limited fishing opportunity, inseason aerial survey escapement estimates were below cumulative anticipated levels in all but Southwestern and Montague districts. The 2009 PWS wild stock escapement of 1.8 million was below the odd-year SEG midpoint of 2.0 million, but within the SEG range (1.25–2.75 million), and was the 12th largest escapement in the last 30 years. The preliminary PWS wild stock pink salmon total run of 3.4 million (1.6 million CPF and cost recovery harvest, and 1.8 million escapement) was the 13th lowest wild stock total run by number (11th lowest by percent of total run) in the last 50 years.

Chum Salmon

The 2009 total run forecast for PWS was 4.6 million. The majority of the forecast, 4.3 million (92%), was of PWSAC hatchery origin. PWSAC forecasted a run of 2.8 million to Wally Noerenberg Hatchery, 1.0 million to Port Chalmers, and 409,000 to Armin F. Koernig Hatchery. Approximately 699,000 (25%) of the forecast 2.8 million Wally Noerenberg Hatchery run was required for corporate cost recovery and broodstock. All Port Chalmers and Armin F. Koernig hatchery chum salmon were available for harvest in the CPF. Based on the department's wild chum forecast of 376,000, there was a potential CPF harvest of 176,000.

The 2009 CPF harvest in PWS was 2.6 million, which was 1.1 million below the CPF preseason forecast. The 2009 purse seine CPF chum harvest of 269,000 was composed of approximately 4% wild and 96% hatchery fish. The purse seine chum harvest was predominantly from the Armin F. Koernig hatchery terminal harvest area and special harvest area (SHA) and was composed of 230,000 enhanced and 4,000 wild chum salmon. Coghill District had a purse seine harvest of 13,000 and a drift gillnet harvest of 1.3 million. Inseason aerial survey escapement estimates were below cumulative anticipated levels in all districts. The 2009 total PWS wild stock chum salmon escapement index of 209,000 in districts with SEGs (237,000 in all districts) was roughly 2.3 times the SEG lower bound of 91,000; however, Northern and Coghill districts had escapement indices below their SEG thresholds.

COOK INLET

Lower Cook Inlet

The preliminary 2009 Lower Cook Inlet (LCI) all-species commercial salmon harvest of 1.35 million was the fourth lowest during the past decade, falling short of both the recent 10- and 20-year averages. However, the overall harvest fell short of the revised preseason forecast of 1.4 million by less than 3%. Additionally, a second consecutive season of strong prices for all species yielded an estimated exvessel value of over $3.3 million, the second highest since 1988 and the third highest on record since statehood.

With the shutdown of Tutka Bay Hatchery after the 2004 season, and no production from Port Graham Hatchery, the 2009 LCI commercial pink salmon harvests were once again completely

the result of natural production. On the other hand, an estimated 60% of the sockeye salmon catch was attributed to Cook Inlet Aquaculture Association (CIAA) lake stocking and fertilization projects at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District, and a remote saltwater release project at Tutka Bay Lagoon in the Southern District. All these fish were taken by CIAA for hatchery cost recovery. An additional 3% of the sockeye catch (all taken for hatchery cost recovery) was attributed to the Port Graham Hatchery return. Private nonprofit agencies normally harvest a significant portion of the LCI salmon returns for hatchery cost recovery, and this season was no exception. An estimated 13% of the total all-species salmon catch was taken by CIAA and Port Graham Hatchery Corporation as hatchery cost recovery to support the stocking programs and hatchery operations. However, because of the high proportion of the sockeye catch that was utilized for hatchery cost recovery, this volume equated to almost 50% of the entire exvessel value of the 2009 LCI salmon fishery.

Runs of naturally produced sockeye salmon in LCI were reasonably good, with SEGs attained at 5 of 6 major systems in the management area. The sixth sockeye system fell just short of its SEG as assessed by aerial surveys, but late-season surveys to assess this system were precluded by poor weather, and since late-season surveys at this system frequently produce the highest estimates for the year, actual escapement was felt to be greater than documented and believed to be within the SEG range. The run to one sockeye system with a combination of natural and enhanced production also achieved its established goal. Natural returns of pink salmon in LCI were in general very good, with a number of Outer and Kamishak Bay District systems experiencing strong runs this season. Conversely, returns of pink salmon to Southern District systems were mostly poor. Nonetheless, all of the monitored pink salmon systems in the Outer and Kamishak Bay Districts met or exceeded their SEGs, while most pink returns to Southern District systems failed to achieve SEGs. Chum salmon runs and resultant harvests were reasonably strong throughout the management area, and chum salmon SEGs were achieved at all but 3 systems. LCI commercial chum salmon harvests totaled approximately 74,000, close to the recent 10-year average for this species. The LCI chum salmon harvest in 2009 represented the ninth year of good catches during the past decade. Chinook and coho salmon catches in LCI represented the lowest totals for the management area in the past 30 years.

Chinook Salmon

Chinook salmon are not a commercially important species in LCI. The 2009 LCI commercial harvest of only 84 Chinook salmon represented the lowest total since 1971 and was well short of the recent 10- and 20-year averages. Virtually all of the catch came from the Southern District commercial set gillnet fishery, which primarily targets sockeye salmon.

Sockeye Salmon

A major change occurred in LCI with the adoption of a Trail Lakes Hatchery Sockeye Salmon Management Plan by the Alaska Board of Fisheries in March 2009. This new plan directs the department to manage all CIAA hatchery SHAs associated with Trail Lakes Hatchery sockeye enhancement programs to achieve hatchery financial and broodstock objectives. With a preseason sockeye revenue goal established at $1.5 million, CIAA projected that all sockeye salmon returning to their various LCI enhancement sites in 2009 would be required to achieve the goal and none would likely be available for common property harvest. This factored heavily into the staff's management strategy this season, and further resulted in no common property

commercial salmon seine openings in Resurrection Bay (Eastern District) and in the Southern District for the first time in many seasons.

The 2009 commercial harvest of 280,000 represents the fourth lowest catch for the LCI management area over the past decade and was over 13% less than the recent 10-year average. Sockeye salmon accounted for a relatively low percentage (approximately 21%) of the landings in numbers of fish this season, but due to the higher price, comprised an estimated 70% of the exvessel value of the fishery. Natural runs of sockeye salmon were considered relatively good, with 5 of 6 major systems achieving their respective SEGs. The sixth system is believed to have achieved its goal since the peak aerial count showed an escapement just under the SEG range, but surveys were cut short by poor late-season weather. In the Outer District, Delight Lake exceeded its SEG range with an aerial count of about 12,700. It should be noted that LCI's lone remaining weir project at Delight Lake was rendered inoperable this season by heavy rainfall, continuously high water, and high winds during the second half of July; thus, aerial surveys were utilized to obtain escapement counts at that location this year. At nearby Desire Lake, escapement fell within the SEG range with a peak aerial estimate of 16,000. Marine waters around both Delight and Desire Lakes remained closed to commercial fishing for the entire season to protect fish for escapement. The sockeye salmon run to Mikfik Lake in the Kamishak Bay District experienced no directed effort in 2009, while aerial assessment estimated escapement at 15,100, slightly exceeding the SEG range (6,000–12,000). A video escapement project at Mikfik Lake showed a total escapement of around 21,000. Also in the Kamishak Bay District, the sockeye return to Chenik Lake was strong for a seventh straight season, with an aerially estimated escapement slightly exceeding the SEG of approximately 15,200 (video estimate was 15,300), while additionally providing seiners with a harvest totaling nearly 66,000. At Aialik Lake in the Eastern District, no commercial openings were allowed; thus, the entire run entered the system as escapement. With an estimate of 3,100, the documented escapement at Aialik Lake fell short of the SEG range (3,700–8,000). However, as previously stated, the actual escapement into the lake was likely higher because late-season aerial surveys to assess this system were prevented by poor weather.

With a preseason forecast of only 26,000 sockeye salmon returning to Leisure and Hazel Lakes in the Southern District, actual commercial harvests (all for CIAA hatchery cost recovery) were an even more disappointing 200. At Bear Lake in Resurrection Bay of the Eastern District, the actual catch of 138,000 (hatchery cost recovery) also fell short of the revised harvest forecast of 174,000. In the Kamishak Bay District, the enhanced return to Kirschner Lake produced a CIAA hatchery harvest of nearly 19,000—almost 10 times the preseason forecast of 2,000. The sockeye return to English Bay Lakes in the Southern District was quite strong, with escapement estimated at 18,200 (SEG 6,000–13,500). At nearby Port Graham Hatchery, about 8,300 sockeye returning to that saltwater release site were taken for hatchery cost recovery, far short of the preseason harvest forecast of 23,000. Local commercial setnetters in the vicinity of English Bay Lakes and Port Graham Hatchery harvested approximately 9,500 from area waters. An additional unquantified number of sockeye salmn were also taken for subsistence purposes by Nanwalek and Port Graham village residents. The estimated sockeye run to the CIAA remote release site at Tutka Lagoon in the Southern District may have been as high as 17,000—after accounting for the CIAA cost recovery harvest of approximately 11,600, about 4,400 collected and placed in netpens for broodstock, and an unquantified number of fish that went unharvested or were harvested by recreational fishermen.

The 2009 commercial set gillnet harvest in the Southern District of about 38,000 sockeye salmon was the highest for this species and gear group since 2003 and was also about 22% greater than the recent 10-year average. The closure of the Port Graham Subdistrict set gillnet fishery for the month of June, to protect sockeye salmon returning to English Bay Lakes for escapement purposes, aided in the attainment of the SEG for English Bay Lakes. The forecasted weak sockeye salmon return to that system also forced a restriction of the local subsistence fishery for much of June, but that fishery was liberalized to its traditional regulatory level prior to the end of the month once attainment of the English Bay Lakes SEG was projected. The sockeye salmon enhancement/rehabilitation project at English Bay Lakes, originally initiated by ADF&G in the late 1980s and presently being overseen by Chugach Regional Resources Commission in conjunction with the village of Nanwalek, has experienced inconsistencies in funding and has contributed only minimal enhanced production in recent seasons.

Coho Salmon

Because the number and the magnitude of coho salmon stocks in LCI is small, little or no directed commercial effort traditionally occurs on this species. The commercial harvest (to date) of only 2,500 in 2009 represents the lowest total for this species in LCI since 1977 and was less than one-quarter of the recent 10-year average. The majority of the LCI harvest (62%) came from the Eastern District and was due to the Seward Silver Salmon Derby, where catches entered into that recreational contest are subsequently sold by the event's organizer (City of Seward) to a commercial processor. The Southern District contributed the remainder of the area-wide catches this season, entirely from the set gillnet fishery.

Although coho run assessment in LCI is limited, commercial, sport, and personal use harvests usually provide the best indicators of run strength. Runs during 2009 would be considered poor throughout the management area if judged solely on these indicators. However, aerial assessment surveys conducted for coho salmon on a major index stream at the head of Kachemak Bay in August and September showed excellent escapement into Clearwater Slough.

Pink Salmon

Naturally produced pinks comprised the entire LCI harvest for that species this season, and pink SEGs were achieved at all of the major monitored pink systems in the management area except for those in the Southern District, which were not commercially targeted. The harvest of pink salmon, the most numerous species in LCI, nearly achieved preseason forecasts in 2009, with an overall catch of approximately 989,000. Natural returns to major systems in the management area were considered good to excellent, especially to Port Dick, Rocky River, and Windy Bay in the Outer District, and catches from these locations dominated LCI commercial harvests this season. The strong pink runs to Outer District systems this season contributed to a combined district-wide catch totaling 853,000, exceeding the preseason harvest forecast of around 496,000 for that district. Commercial harvests of pink salmon would have undoubtedly been higher had fishermen targeted the very strong Kamishak Bay returns, where escapements exceeded SEGs by significant margins. As an example, pink salmon escapement into Bruin Bay River in Kamishak Bay District (SEG 19,000–156,000) was estimated by aerial surveys at over 1.0 million. Despite the good catches of pink salmon in LCI this season, the area-wide catch fell short of the most recent 10-year average of 1.3 million, primarily because operations at the 2 LCI hatcheries (Tutka Bay and Port Graham), both in the Southern District, have been suspended for a number of years.

Chum Salmon

Although the 2009 LCI commercial chum harvest of nearly 74,000 was below the recent 10-year average of 80,400, the catch was considered reasonably good when compared against the paltry catches between 1990 and 1999, which annually averaged only 10,000. This marked the ninth season out of the past 10 that produced relatively strong chum runs coupled with moderate-to-good catches. The majority of the chum catch was split almost evenly between the Kamishak Bay District (36,600) and the Outer District (35,100). The reasonable chum runs in the management area resulted in attainment of SEGs at a majority of streams. Although no targeted commercial fishing effort on chum salmon has been allowed for over 15 years in the McNeil River Subdistrict in Kamishak Bay District, chum salmon escapement into McNeil River failed to achieve the SEG for the 15th time in the past 20 years.

Upper Cook Inlet

The 2009 Upper Cook Inlet (UCI) commercial harvest of 2.5 million salmon was approximately 1.7 million below the average long-term harvest (Table 5). The 2009 UCI commercial exvessel value of approximately $14.5 million was 13% below the recent 10-year average of $16.7 million. While all 5 species of Pacific salmon are present in UCI, sockeye salmon are the most valuable, accounting for approximately 76% of the exvessel value in the commercial fishery since 1960 and more than 92% of the total value during the past 20 years. Sockeye escapement goals have historically been monitored in 6 systems in UCI. In 2009, the Yentna River sonar goal was discontinued because of its unreliability and replaced with weir goals (SEGs) monitored on 3 lake systems within the Susitna River, Judd and Chelatna Lakes in the Yentna River drainage and Larson Lake in the mainstem Susitna River drainage. The sonar escapement project at Crescent River was not conducted in 2009 due to safety concerns for staff as a result of Redoubt Volcano eruptions. For the 2009 season, 5 of 7 sockeye salmon goals were met, falling within the established goal range, while one exceeded and one fell below the goal objective.

Chinook Salmon

Approximately 9,000 Chinook salmon were harvested in 2009, which was about half of the long-term average harvest of 16,700. The 2 fisheries where Chinook salmon are harvested in appreciable numbers in UCI are the Northern District and Upper Subdistrict set gillnet fisheries. The Deshka River is the only system in northern Cook Inlet where Chinook escapement is monitored inseason with a weir. The Deshka River escapement exceeded the upper end of the escapement goal for 10 years in a row (1997–2006). In 2008 and 2009, the Deshka River Chinook run, which is generally the largest run in the region, was below average, failing to meet its escapement goal. The 2009 Deshka River forecast predicted a total run of 21,000, which would have provided for all fisheries to be prosecuted with no restrictions while still achieving the escapement goal. On April 20, 2009, just prior to the season, the Division of Sport Fish announced restrictions to the Deshka River sport fishery because of the uncertainty of the forecast, allowing catch and release fishing 4 days per week, with retention only on Saturdays, Sundays and Mondays. Because the management plan for this fishery directs ADF&G to take action in the commercial fishery only if the sport fishery is closed, no actions were anticipated in the commercial fishery unless inseason run strength assessment resulted in sport fishing closures. In response to sport fishing restrictions, the Alaska Board of Fisheries held a teleconference meeting on April 28, 2009. At this meeting, the board generated and passed their own emergency regulation reducing the first 2 commercial fishing periods from 12 hours to 6 hours. These

restrictions occurred for the commercial fishing periods scheduled on May 25 and June 1. The harvest from these fishing periods was extremely poor and the likely savings were insignificant. After fishing the third period (June 8) unrestricted, both the Deshka River sport fishery and the Northern District commercial fishery were closed for the remainder of the Chinook salmon season. The 2009 total harvest of 1,266 Chinook salmon in the Northern District was the third lowest harvest since 1986. The final Deshka River escapement count of 11,960 was approximately 1,000 below the lower end of the escapement goal range. The remainder of the Chinook salmon escapements in northern Cook Inlet are monitored by a single aerial survey conducted in mid-July. Aerial surveys are the least reliable index method of escapements.

Late run Kenai River Chinook runs have been relatively stable and escapement objectives have been consistently achieved or exceeded. Beginning in 1999, a 24-hour closed period per week was mandated for the set gillnet fishery in the Upper Subdistrict. Since that time, longer closed periods of 48 hours or 2 shorter closed periods each week, a 24- and a 36-hour closed period, have also been adopted into regulation. The stated purpose of these closed periods is to pass fish into the inriver recreational fishery for the weekends. However, when large numbers of sockeye salmon enter the Kenai and Kasilof Rivers during closed windows, additional fishing time is necessary to keep sockeye salmon escapements within their goal ranges, which possibly increases Chinook salmon commercial harvests. In 2009, the exvessel value for Chinook salmon was $260,000 which is approximately 1.8% of the total exvessel value.

Sockeye Salmon

The preseason sockeye forecast for the 2009 season projected a run of 4.3 million, with a harvest estimate (sport, personal use, and commercial) of 3.0 million. The total run to the Kenai River, generally the largest producer in UCI, was forecast to be 2.4 million. This resulted in managing for an inriver sonar goal range in the Kenai River of 750,000 to 950,000. Two regularly scheduled 12-hour fishing periods per week, plus up to 51 hours of additional fishing time in the Upper Subdistrict set gillnet fishery were allowed for a run this size under the abundance-based escapement goal for the Kenai River. In addition, this run strength mandated 2 closed periods (windows) per week in the Upper Subdistrict set gillnet fishery, one for 24 hours and a second for 36 hours.

While the fishing season opens in most of UCI in mid- to late June, participation and harvests remain fairly low until early July. In 2009, harvests in the Central District were relatively low through July 8, even for a return forecast of 4.3 million (winds and tides will sometimes have this effect). After July 9, harvests increased to reasonable levels through the regular period on July 16. Beginning July 20, indications from the Offshore Test Fish Program, coupled with commercial harvest data and escapements to date, began to indicate the return might not be as strong as forecast. After harvest figures from the regular fishing period on July 23 and Offshore Test Fish Program data were evaluated, the total run estimate continued to indicate a return less than the preseason forecast. This inseason assessment estimated that only 450,000 (plus or minus 400,000) additional sockeye salmon remained in the run. The total return to the Kenai River was then projected to be below 2.0 million, triggering a lower escapement goal (650,000–850,000). By July 24, only 420,000 sockeye salmon had passed the Kenai River sonar. Because of the declining total run projection and the large uncertainty associated with the estimated number of fish remaining in the run—and in light of the fact that an additional 230,000 were needed past the Kenai River sonar in order to achieve the minimum inriver goal—the commercial fishery targeting Kenai River sockeye salmon stocks in the Upper Subdistrict set gillnet fishery and

Central District drift gillnet fishery was closed after the July 23 fishing period. The fishery remained closed for the rest of July due to lagging sockeye salmon passage into the Kenai River. On August 1, ADF&G reopened the commercial fishery targeting Kenai River stocks, yet the harvest in the entire UCI management area for the remainder of the season was only 82,000, with approximately 60,000 of those bound for the Kenai River. The final Kenai River inriver sonar count was 745,170, near the middle of the inriver goal range.

The total sockeye run to UCI in 2009 was estimated to be 3.9 million, which was 10% less than forecast. Based on Offshore Test Fish Program data, the run was 2 days early. Runs to the Crescent River and to Fish Creek were better than forecast, while runs to the Susitna River and minor systems around the inlet were below forecast. Kenai and Kasilof River runs were very close to preseason expectations. The UCI commercial harvest of 2.0 million was 26% below the preseason forecast harvest estimate of 2.7 million and the 11th lowest harvest since 1966. Since 1999, when the abundance-based escapement goal to the Kenai River was developed, only 1 of the 11 years was managed in the correct tier for the entire season.

Sockeye salmon prices at the beginning of the season were in the range of $1.10 per pound. The total exvessel value in UCI for sockeye salmon was approximately $13.7 million, which was 94.2% of the total UCI exvessel value.

Coho Salmon

The 2009 coho harvest estimate of 153,000 was below the recent 10-year average harvest of 188,000 and approximately half of the 1966 to 2008 long-term average coho salmon harvest of 313,000. The 2009 harvest was the eighth lowest in the last 35 years. Reduced commercial harvests of coho salmon in 2009 were likely due to restrictions in fishing area and closures to the drift fleet and Upper Subdistrict set gillnets because of lagging Kenai River sockeye salmon passage, as well as several regular fishing period restrictions in the Northern District set gillnet fishery in compliance with the Susitna River Action Plan. The coho salmon run in 2009 was judged to be average. The only significant coho salmon return to UCI that is monitored with an escapement goal is the Little Susitna River. In 2009, the final escapement count of 9,523 was slightly below the lower end of the escapement goal range of 10,000. The exvessel value of coho salmon to the commercial fishery was approximately $397,000 or 2.7% of the total exvessel value in Upper Cook Inlet.

Pink Salmon

The estimated 2009 commercial pink harvest in UCI was 214,000. This figure is the fourth highest odd-year pink salmon harvest since 1966, and nearly double the odd-year average harvest in this time frame. Pink salmon escapements are not monitored in Upper Cook Inlet to an appreciable degree. Anecdotal information does indicate that escapements to most river systems were good. Prices paid for pink salmon were approximately $0.10 per pound, resulting in an exvessel value for this species of $71,500, less than 1% of the total exvessel value.

Chum Salmon

The 2009 chum harvest of 83,000 was well below the long-term average harvest of approximately 460,000. The 2009 harvest was approximately 30% less than the recent 10-year average harvest of 115,000. There is only one chum salmon escapement goal in UCI, which is an SEG in Chinitna Bay, and that goal was achieved in 2009. The exvessel value of chum salmon to the commercial fishery was approximately $115,400, or less than 1% of the total value.

BRISTOL BAY

The 2009 inshore Bristol Bay sockeye run of approximately 40.4 million is the 22nd highest since statehood, and preliminary catch of 30.9 million sockeye is the 7th highest since statehood. This year's total inshore run was 7% above the 20-year average (1989–2008) of 37.7 million and was 20% higher than the preseason forecast of 33.8 million. All districts came in above forecast—most notably the Ugashik (64% above) and Egegik Districts (33% above). The Nushagak District total run was 12% above, the Togiak district was 15% above, and Naknek/Kvichak District was 7% above forecast. The commercial harvest of sockeye salmon was 29% above the 24.0 million preseason forecast. Bay-wide total escapement was 9.5 million.

Approximately 30,000 Chinook salmon were harvested in Bristol Bay in 2009. This is 47% of the average harvest for the last 20 years and significantly below the forecasted preseason harvest of 70,000. The chum harvest of 1.4 million was 34% above the 20-year average of 1.0 million. The coho harvest of approximately 59,000 was 63% of the 20-year average of 93,000. The pink salmon harvest was 500, an expected low catch for an odd-year in their life cycle.

The 2009 harvest of all salmon species in Bristol Bay was approximately 32.4 million. To derive a preliminary estimate of the exvessel value of the fishery, the figures listed in Table 5 were used. These figures represent an estimate since the contribution of future price adjustments, loyalty bonuses, and differential prices for refrigerated versus non-refrigerated fish were not included. The calculated preliminary exvessel value of the 2009 Bristol Bay salmon fisheries is approximately $129.47 million, which is 8% above the 20-year average, and ranks 9th over that same period.

Chinook Salmon

Chinook harvests in Bristol Bay districts were below average in every district. There were 3 directed Chinook fishing periods in the Nushagak District with 10 fish harvested in the first period on June 7, 536 harvested in the second period on June 11, and 329 harvested in the third period on June 21. After the third Chinook period, the directed Chinook fishery remained closed and the department switched focus to active sockeye salmon management due to the increasing abundance of that species. Both Chinook catch and escapement increased in late June. Approximately 30,000 Chinook were harvested during the directed sockeye fishery with the majority harvested between June 22 and July 7. The final Nushagak River Chinook escapement of 81,480 was above the 75,000 inriver goal established in the Nushagak Mulchatna King Salmon Management Plan.

Sockeye Salmon

The 2009 inshore sockeye salmon run of 40.4 million was 20% higher than the preseason forecast of 33.8 million. Escapements into the Igushik, Togiak, and Ugashik Rivers were above established ranges. All other systems were within established ranges.

Potential processing capacity was the only major concern going into the 2009 Bristol Bay salmon season. Similar to the last 3 years, the winter of 2008–2009 was colder than the historic average, suggesting that run timing might be delayed by a few days. Given the projected harvest of 24.0 million, the department planned to allow more fishing time early in the run. A substantial component of the run appeared in fishing districts earlier than historic timing, with most districts fishing daily by June 17. The earlier-than-expected pulse of fish brought the harvest through June 27 to 6.42 million and prompted the beginning of processor limitations on June 28. On June

30, a harvest of 1.4 million prompted all districts except Togiak to see widespread processor suspensions and limits. Daily harvests remained strong, keeping many companies on limits and culminating with a July 3 harvest of 2.1 million sockeye, the largest of the season. Although daily harvests exceeded 1.6 million from July 4 to July 7, no limits or suspensions were reported after July 6. On July 13, daily harvests dropped below 500,000 and many permit holders began to put their boats up for the season. The total harvest was 29% above forecast, and the total inshore run was 20% above forecast. Also of significance in 2009, the Naknek River SHA was not opened for the second season since 1995.

In 2009, limitations in processor capacity began affecting Bristol Bay salmon fisheries on June 28, with some suspensions occurring in the Nushagak District. Although Togiak District saw no limits or suspensions in the 2009 salmon season, on June 29, limits or suspensions occurred in all other districts through July 1. Processors proactively managed the harvesting capabilities of their fleets according to their individual needs. Companies imposed control on harvest by district, tide, and gear group to varying degrees. On July 2 and July 3, some form of suspensions or limits were in place in half of the districts. Limits and suspensions continued in most districts through July 6. To respond to industry capacity issues, the department liberalized fishing times, allowing processors and permit holders to determine how to utilize their resources in the most efficient manner. While limits were in place, the department lost the ability to control escapement, resulting in a loss of harvestable yield in some districts as fish passed into the escapement.

Coho Salmon

The Bay-wide coho harvest of approximately 59,000 was 63% of the recent 20-year average of 93,000. The majority of the coho harvest was in the Nushagak District, where most fish were caught from mid-July to mid-August. In the absence of any coho enumeration projects in Bristol Bay, lower-than-historic harvest levels and effort are thought to be more indicative of market availability than an indication of run strength.

Pink Salmon

Pink salmon have strong runs during even years in Bristol Bay. Low demands for Bristol Bay pink salmon and 2009 being an off-cycle year produced an incidental harvest. A total of 500 pink salmon were harvested, with the majority being caught in the Nushagak District (310).

Chum Salmon

The total Bristol Bay chum salmon harvest in 2009 was approximately 1.4 million. All districts produced harvests above their 20-year average. The Nushagak District was the largest producer of chum salmon, where over 775,000 were harvested.

Table 5.– Preliminary 2009 Central Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Purse Seine						
Eastern	0.0	0.1	1.2	95.1	4.8	101.1
Northern	0.0	0.1	0.1	2,064.9	15.2	2,080.3
Coghill	0.0	1.3	1.8	1,028.8	12.9	1,044.8
Montague [a]	0.0	0.0	0.9	58.7	0.0	59.6
Southwestern [b]	0.0	67.8	2.6	7,481.9	233.7	7,785.9
Southeastern	0.0	0.0	0.2	36.7	2.9	39.8
Unakwik	0.0	1.2	0.0	0.0	0.0	1.2
Drift Gillnet						
Bering River [b]	0.0	4.2	45.5	0.0	0.0	49.7
Copper River [a, b]	9.5	896.6	207.8	16.8	8.6	1,139.2
Unakwik	0.0	2.0	0.0	0.0	0.4	2.4
Coghill	0.2	103.4	19.2	276.9	1,323.7	1,723.4
Eshamy	0.1	539.3	1.7	77.5	286.4	905.0
Pt. Chalmers (Montague Dist)	0.1	10.2	1.5	29.3	672.9	714.0
Set Gillnet						
Eshamy	0.0	152.6	0.0	4.3	50.7	207.7
Hatchery [c]	0.0	133.9	17.4	7,411.1	608.5	8,170.9
Misc. PWS [d]	0.9	6.6	0.8	0.1	0.1	8.4
Prince William Sound Total	10.8	1,919.2	300.6	18,581.9	3,220.8	24,033.4
Southern District	0	58	1	3	2	65
Kamishak District	0	85	0	133	37	254
Outer District	0	0	0	853	35	888
Eastern District	0	137	2	0	0	139
Lower Cook Inlet Total	0	280	3	989	74	1,346
Central District	7	2,005	116	208	80	2,415
Northern District	2	41	38	7	3	90
Upper Cook Inlet Total	9	2,046	153	214	83	2,505
Naknek-Kvichak District	1	8,519	1	0	258	8,779
Nushagak District	24	7,671	36	0	775	8,506
Egegik District	0	11,582	12	0	124	11,718
Ugashik District	1	2,553	3	1	65	2,623
Togiak District	4	574	9	0	143	731
Bristol Bay Total	30	30,899	59	1	1,366	32,356
Central Region Total	50	35,144	515	19,786	4,744	60,241

Note: Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

Note: Columns may not total exactly due to rounding.

[a] Totals include discarded sockeye, coho, pink and chum salmon.

[b] Does not include salmon taken for home use as reported on fish tickets.

[c] Hatchery sales for operating expenses. Includes meal production/roe salvage sales, processor discards. Excludes post egg-take roe sales at hatcheries.

[d] Some of these fish were donations landed by Coghill District and Copper River District drift gillnet permit holders.

ARCTIC-YUKON-KUSKOKWIM REGION

Arctic-Yukon-Kuskokwim Region salmon harvests totaled 1.1 million salmon and 7.7 million pounds in 2009. The exvessel value was estimated to be $4.0 million. Cumulative all-gear commercial harvest included 22,000 Chinook, 171,000 sockeye, 257,000 coho, 17,000 pink, and 603,000 chum salmon. The Chinook harvest was considerably below average. Generally poor chum and pink salmon markets resulted in substantially lower harvest than available surpluses, with the exception of strong chum salmon markets in the Yukon River. Landings were made by 1,099 limited entry permit holders in 2009.

KUSKOKWIM AREA

The Kuskokwim Area commercial salmon harvest in 2009 was 22,000 Chinook, 170,000 sockeye, 162,000 coho, and 185,000 chum, for a total of 540,000. A total of 434 permit holders participated and the exvessel value was estimated to be $1.5 million.

Overall Chinook, chum, sockeye, and coho salmon runs in Kuskokwim Area in 2009 were similar to what was anticipated, and provided for adequate escapement, subsistence uses, and commercial harvests. Generally, run timing for all species throughout Kuskokwim area was characterized as normal.

Kuskokwim River

Subsistence fishing in the Kuskokwim River was allowed 7 days a week throughout the season with the exception of closed periods associated with commercial fishing periods. Subsistence harvests, as indicated by inseason surveys, were primarily described as normal to very good for Chinook salmon, and normal for sockeye and chum salmon. Amounts necessary for subsistence use is expected to have been achieved.

There were 16 commercial fishing periods in District 1 between June 23 and August 22. Only one registered buyer purchased fish in Kuskokwim Area in 2009. Processing capacity limited all commercial openings to Subdistrict 1-B, and further limited 3 of those to the Lower Section of Subdistrict 1-B. Processing capacity did allow for seven 2-hour extensions of fishing time in the Lower Section of Subdistrict 1-B. Because registered catcher–sellers in the district had difficulties getting their harvests to market when commercial periods occurred on Saturdays, 2 commercial periods were prosecuted for catcher–sellers in August. Chinook catch rates from late June through early July were average. Chum and sockeye salmon catch rates from late June through mid-July were mostly average to above average. Coho catch rates from late July through August 22 were below average to average. Commercial salmon harvests in District 1 were 6,700 Chinook, 26,000 sockeye, 105,000 coho, and 77,000 chum, for a total of 215,000. The total number of permit holders participating was 342, and the exvessel value of the fishery was estimated to be $500,000.

Inseason indicators suggested Chinook salmon abundance in 2009 was comparable to 2008. Chinook salmon escapements were evaluated through aerial surveys on 5 index streams throughout the drainage and by weirs on 7 tributary streams. Achievement of tributary escapement goals was mixed with 3 of 7 streams falling below their established escapement goal ranges and 4 within their ranges.

Sockeye salmon escapements were monitored at each of the 7 tributary weir projects although sockeye are not a prominent species in many of these systems. Kogrukluk and Kwethluk rivers have the largest sockeye escapements and were characterized as above average in 2009.

As expected, chum abundance in 2009 was comparable to 2008. Escapements in the 2 largest chum salmon producing sub-basins were either within their established escapement goal range and comparable to 2008 (Aniak sub-basin), or well above their established range and twice the 2008 escapement (Kogrukluk River in the Holitna River sub-basin).

Coho escapements were evaluated at weirs on 7 tributary streams. Escapement at the Kogrukluk River weir was within the escapement goal range. At the other monitored locations, with the exception of Takotna River which was one of the lowest on record, escapement was characterized as good.

Kuskokwim Bay (Quinhagak) and District 5 (Goodnews Bay)

Subsistence fishing in Kuskokwim Bay area was allowed 7 days per week throughout the season with the exception of closed periods associated with commercial fishing periods. Subsistence harvests in 2009 were described as adequate and amounts necessary for subsistence use is expected to have been achieved.

Commercial salmon fishing season opened in District 4 on June 15, and District 5 opened on June 22. Both districts opened with management directed towards the harvest of Chinook salmon that allowed for 2 commercial periods per week, provided abundance and processing capacity were adequate. Chinook salmon harvests and catch rates were average to just below average throughout the season. Because of Chinook salmon abundance concerns, commercial fishing opportunity was reduced in both districts in late June to ensure adequate escapement into Kanektok and Goodnews Rivers. By July 6, the sockeye harvest in both districts had exceeded the Chinook harvest and, by regulation, management was directed towards sockeye salmon. Under sockeye salmon directed management, 3 commercial periods per week are allowed provided abundance and processing capacity are adequate. Both the District 4 sockeye and chum harvests in 2009 were the highest on record, while the sockeye harvest in District 5 was average. The coho harvest exceeded the sockeye harvest in District 4 on July 29 and in District 5 on August 12. On those dates, by regulation, both districts shifted to coho management which also allows 3 commercial periods a week—provided abundance is adequate.

In 2009, 179 individual permit holders recorded landings during 29 commercial periods in District 4. The total commercial harvest of 265,000 included 14,000 Chinook, 112,000 sockeye, 48,000 coho, and 91,000 chum salmon. The exvessel value of the District 4 commercial fishery was estimated to be $750,000.

A total of 39 individual permit holders recorded landings in District 5 during 26 commercial periods. The District 5 total commercial harvest of 59,000 included 1,500 Chinook, 33,000 sockeye, 8,400 coho, and 17,000 chum salmon. The exvessel value of the District 5 commercial fishery was estimated to be $192,000.

Kanektok River drainage is the primary salmon producing drainage in District 4. Fish passage through the Kanektok River weir during its operation from July 5 through August 11 was 6,841 Chinook, 272,483 sockeye, 51,652 chum, 2,336 coho, and 1,246 pink salmon, and 26,056 Dolly Varden. Escapement estimates for all species are incomplete because of late start-up and early

termination of the project. No formal escapement goals for any species have been established at the weir. Because of poor weather, no aerial enumeration surveys were conducted.

The Goodnews River drainage is the primary salmon-producing drainage in District 5. Fish passage through the weir located on Middle Fork Goodnews River was 1,630 Chinook, 25,465 sockeye, 20,000 coho, and 19,715 chum salmon, and 1,608 Dolly Varden. The weir was operational from June 28 through September 21. Chinook and sockeye escapement achieved the lower end of their escapement goal range, and chum and coho salmon escapement goal thresholds were achieved. Because of poor weather, no aerial enumeration surveys were conducted.

YUKON AREA

The 2009 Yukon River total commercial harvest was 316 Chinook, 170,000 summer chum, 25,000 fall chum, and 8,000 coho salmon for the Alaskan portion of the drainage. A total of 316 Chinook, 158,000 summer chum, 24,000 fall chum, and 7,600 coho salmon were harvested in the Lower Yukon River (Districts 1–3) and 0 Chinook, 12,400 summer chum, 1,300 fall chum, and 500 coho salmon were harvested in the Upper Yukon River (Districts 4–6). All salmon were reported as whole fish; however, portions of the fishery in the Upper Yukon selectively targeted females to produce a salmon roe product. A total of 403 permit holders sold fish in 2009 and the exvessel value was approximately $721,000.

The 2009 Yukon River Chinook salmon run was projected to be below average to poor—primarily a poor run of Canadian-origin fish. It was expected that subsistence conservation measures, beyond those used in 2008, would be required to share the available subsistence harvest and meet escapement goals. Before the 2009 season, ADF&G developed a preseason management strategy—with input from the U.S. Fish and Wildlife Service, fishermen, tribal council representatives, and other stakeholders—to prepare for the event of a low run. The resulting preseason strategy included delaying the subsistence fishing schedule, reducing subsistence fishing time by half, complete subsistence closures during the first Chinook pulse, no directed Chinook commercial fishing, Federal Special Actions limiting the harvest of Chinook salmon to federally qualified rural users, and the bag and possession limit reduced in the sport fishery in Yukon River tributaries, excluding the Tanana River.

Subsistence closures started in District 1 on June 15 to protect the first pulse of Chinook salmon. Two subsistence fishing periods were pulled and similar actions were taken in upriver fishing districts and subdistricts based on migratory timing. Following the pulse closures, each fishing district was returned to the reduced subsistence salmon fishing schedule and remained on the reduced schedule until approximately 80% of the Chinook salmon had passed through that district. In an effort to further conserve Chinook salmon while allowing for the opportunity to target summer chum salmon, gillnets were restricted to a maximum of 6-inch mesh size when Districts 1–3 returned to the reduced fishing schedule. This gear restriction was in place for 2 fishing periods in Districts 1 and 2 and one period in District 3.

Effective July 1, due to the conservation concern for Chinook salmon and to provide opportunity for a directed summer chum commercial fishery, the Alaska Board of Fisheries adopted an emergency regulation specifying that during the commercial summer chum season in Districts 1–5, Chinook salmon taken may be retained but not sold. This emergency regulation was discontinued effective July 16 when the majority of the Chinook salmon run had passed the lower river districts.

Chinook salmon reported as caught but not sold on fish tickets totaled 944 in District 1, 2,600 in District 2, 200 in Subdistrict 4-A and 12 in District 6. A total of 131 Chinook salmon were incidentally harvested and commercially sold during the seventh directed summer chum period in District 2. Total commercial harvest was 316 Chinook salmon for the Alaska portion of the drainage, which includes 185 harvested during the fall season. This range of commercial catch for Chinook salmon is 99% below the recent 10-year (1999–2008) average of 35,000.

ADF&G delayed summer chum-directed commercial periods until more than 85% of the Chinook salmon run had passed the lower river districts. The emergency regulation previously mentioned allowed summer chum commercial periods to occur earlier. A total of 13 commercial fishing periods targeting summer chum salmon were allowed in Districts 1 and 2 and 157,906 summer chum salmon were harvested. In Subdistrict 4-A, directed commercial fishing for summer chum salmon began July 5 and was concurrent with subsistence salmon fishing periods. Four commercial fishing periods were established in Subdistrict 4-A with a harvest of 4,600 summer chum salmon.

A total of 7,777 summer chum salmon was harvested during 6 commercial fishing periods in District 6. The total commercial harvest for the Yukon River drainage was 170,272, which was 140% above the 1999–2008 average harvest of 63,341.

A total of 387 permit holders participated in the summer chum fishery, which was approximately 33% below the 1999–2008 average of 575 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission permit areas. A total of 376 permit holders fished in the Lower Yukon Area in 2009, which was approximately 32% below the 1999–2008 average of 555. In the Upper Yukon Area, 11 permit holders fished, which was approximately 52% below the 1999–2008 average of 23.

Yukon River fishermen in Alaska received an estimated $556,000 for their Chinook and summer chum salmon harvest in 2009, approximately 76% below the 1999–2008 average of $2.3 million. Two buyer-processors operated in the Lower Yukon Area. Lower Yukon River fishermen received an estimated average price of $5.00 per pound for incidentally harvested Chinook and $0.50 for summer chum salmon. The average income for Lower Yukon Area fishermen in 2009 was $1,425. Two buyer-processors and one catcher–seller operated in the Upper Yukon Area. Upper Yukon Area fishermen received an estimated average price of $0.26 per pound for summer chum sold in the round and $3.00 per pound for summer chum roe. The average price paid for summer chum sold in the round in the Upper Yukon Area was approximately 7% above the 1999–2008 average of $0.24 per pound. No Chinook salmon were sold in the Upper Yukon Area. The average income for Upper Yukon Area fishermen that participated in the 2009 fishery was $1,857.

Conservative management of the 2009 Chinook salmon fishery enabled most escapement goals to be met, despite a poor run. Chena River escapement counts were near the upper end of the BEG, while Salcha River escapement counts were double the upper end of the BEG. Chena and Salcha rivers are the largest producing tributaries of Chinook salmon in the Alaska portion of the range. Typically, about 50% of the Chinook salmon production occurs in Canada; hence, the U.S./Canada Yukon River Panel agreed to one-year Canadian Interim Management Escapement Goal of more than 45,000 Chinook salmon based on the Eagle sonar program is a top priority. Eagle Sonar passage was almost 70,000 Chinook salmon, which more than satisfied the escapement and harvest sharing obligations mandated by the U.S./Canada Yukon River Agreement.

Summer chum escapement was variable among projects despite an adequate run size in 2009. The Pilot Station sonar project exceeded the optimal escapement goal of 600,000 summer chum salmon with a below average cumulative passage estimate through July 18 of 1.3 million. Summer chum salmon escapements in Gisasa and Tozitna rivers were below expected levels. East Fork Andreafsky and Anvik River escapements experienced historic lows and failed to meet their respective BEGs. Henshaw Creek escapement, however, had twice the expected counts, and attained the second highest escapement recorded for this project. On the Tanana River, summer chum salmon escapements exceeded expected counts for the Chena and Salcha rivers. These escapement patterns seem to signal a shift in summer chum salmon production.

The 2009 Yukon River fall chum salmon run was weaker than the preseason projection, but stronger than the mainstem sonar assessment project at Pilot Station indicated. Commercial harvests occurred at the beginning of the season during the transition of summer to fall chum salmon as fish quality was good. Commercial fishing was curtailed when the first quarter point became extremely late and the run appeared weak, and subsistence fishing time was reduced to conserve fall chum salmon. The fall commercial season was extended into September to fish for coho salmon after the majority of fall chum salmon had passed. The fall chum commercial fishery anticipated a harvest of 50,000 to 300,000 based on brood year returns and recent production levels. However, commercial harvest of 25,000 fall chum salmon was approximately 57% below the 1999–2008 average of 60,000, and the harvest of 8,000 coho salmon was 68% below the 10-year average of 25,000.

The commercial fall chum and coho salmon season value for the Yukon Area was estimated to be $165,000 ($163,000 for the Lower Yukon Area, $1,700 for the upper Yukon Area). The value was below the previous 10-year average of $181,000 ($164,000 for Lower Yukon Area, $17,000 for Upper Yukon Area). For fall chum salmon, Yukon River fishermen received an average price of $0.70 per pound in Lower Yukon Area and $0.19 per pound in Upper Yukon Area in 2009. The recent 10-year (1999–2008) average was $0.28 per pound in the Lower Yukon Area and $0.16 per pound in the Upper Yukon Area. For coho salmon, fishermen received an average price of $1.00 per pound in the Lower Yukon Area, and $0.15 per pound in Upper Yukon Area. The recent 10-year average price was $0.39 per pound in the Lower Yukon Area and $0.12 per pound in the Upper Yukon Area. An average of 162 permit holders fished the fall chum and coho salmon fishery (156 for the Lower Yukon Area, 6 for the Upper Yukon Area) during the previous 10 fall seasons as compared to 294 who participated in 2009 (292 for the Lower Yukon Area, 2 for the Upper Yukon Area).

Overall fish quality was reported as exceptional with the highest prices paid per pound in the last 20 years for fall chum salmon in the lower river. Commercial fishing occurred in Districts 1, 2 and 6 based on available commercial outlets.

The total 2009 fall chum salmon run size was estimated to be 560,000 which was below the preseason projection (600,000–980,000). Parent-year escapements were 538,000 in 2004 and in 2.0 million in 2005. The drainage-wide escapement was estimated to be near 460,000 in 2009 and within the BEG goal (300,000–600,000). Tributary stock escapement goals and management objectives were within or exceeded for the Chandalar River, the Canadian mainstem, Fishing Branch River, and Tanana River, while escapements fell slightly below the goal for Sheenjek River.

There is only one established escapement goal for coho salmon in Yukon River drainage, which is a SEG for Delta Clearwater River. The 2009 boat count survey of 16,850 was near the upper end of the SEG range (5,200–17,000). Due to difficulties assessing the run at Pilot Station sonar, there is no index of coho salmon run size for 2009; however, upriver assessment projects and escapements indicated the run strength was average to below average and run timing was 2 days early.

NORTON SOUND AREA

Highlights of the 2009 Norton Sound District commercial salmon fishery included another top 10 harvest of coho salmon for the fifth year in a row, a record Subdistrict 3 (Moses Point) coho salmon harvest, the best chum salmon harvest in over a decade and second highest average value of salmon catch per permit holder on record without adjusting for inflation. Disappointments in 2009 included one of the poorer runs of chum salmon to northern Norton Sound and the collapse of the sockeye run that resulted in no commercial fishing being allowed in Port Clarence District.

The Norton Sound District coho harvest of 87,000 was nearly 15% below the recent 5-year average, but 45% above the recent 10-year average. The chum harvest of 34,000 was nearly triple the 5-year average and was over triple the 10-year average. Increased buyer interest in chum and pink salmon also resulted in a pink salmon harvest of 17,400—the highest odd-numbered year harvest since 1995.

Commercial salmon fishing began with a 24-hour opening on July 8 in Subdistrict 5 (Shaktoolik) and Subdistrict 6 (Unalakleet) directed at pink salmon; the second 24-hour fishing period on July 10 allowed fishermen to target chum salmon. The following week there were three 24-hour fishing periods in Subdistricts 5 and 6 allowing fishermen to target chum salmon. Subdistrict 4 (Norton Bay) was opened on July 14, to two 36-hour fishing periods a week to target chum salmon. Poor runs of chum salmon to northern Norton Sound kept Subdistricts 2 and 3 closed to pink and chum salmon fishing by regulation.

On July 19, the department increased fishing time to two 48-hour fishing periods a week in Subdistricts 5 and 6 because of good catches of chum salmon and another early showing of coho salmon in the commercial catch indicating a good run of coho salmon was again likely in 2009. Beginning July 28, the department extended fishing time to two 48-hour fishing periods a week in Subdistrict 4 because of increasing coho salmon catches. The department delayed opening coho salmon fishing in Subdistricts 2 and 3 to protect chum salmon and on August 7, opened both subdistricts to two 48-hour fishing periods per week.

Subdistricts 5 and 6 have experienced strong coho runs since 2004, and 2009 was another above average run. The Subdistrict 5 commercial coho salmon harvest (13,000) was the ninth highest, and the Subdistrict 6 harvest (60,000) ranked eighth. Commercial fishing in Subdistrict 4 resumed in 2008 after a decade of no buyer interest and the 2009 coho harvest of 1,700 was the fourth highest on record. Subdistrict 3 had a record coho harvest of 9,600 and exceeded the previous record harvest by 60%. In Subdistrict 2 (Golovin) the coho harvest of 2,500 was the fourth highest on record.

Commercial chum salmon catches in Subdistrict 5 (11,000) and Subdistrict 6 (21,000) were the best since 1995. Improving market conditions also allowed for commercial chum salmon fishing in Norton Bay and the chum harvest of 1,850 was the highest since 1988. However, chum fishing in Subdistrict 4 has only occurred in 5 seasons since 1988.

Cumulative Unalakleet River test net catch and tributary North River tower escapement were record highs for coho salmon. Chum catch at the test net was the second highest and the North River tower counts were the fifth best out of 15 years of counts. Failure to meet chum salmon escapement in northern Norton Sound at the Niukluk River and Kwiniuk River counting tower projects did not allow for commercial fishing in Subdistricts 2 and 3 until coho season.

The Norton Sound District combined commercial harvest of all salmon species ranked fifth in the last 10 seasons. The number of commercial permits fished (88) was the second highest since 1997, but twelfth lowest on record. The 2009 fishery value to permit holders of $722,000 was well above the recent 5-year average of $428,000 and the third highest in 20 years. The average value per permit holder of $8,206 was the second highest on record without adjusting for inflation.

The average price paid was $0.56 per pound for sockeye, $0.77 per pound for coho, $0.23 per pound for pink, and $0.34 per pound for chum salmon.

KOTZEBUE SOUND AREA

The 2009 chum run to Kotzebue Sound was estimated to be average to above average based on the commercial harvest rates, subsistence fishermen reporting good catches, the Kobuk test fish index being the tenth best in the 17-year project history, and aerial surveys in Kobuk and Noatak River drainages. The commercial chum harvest of 188,000 was the third highest this decade. Also harvested during the commercial fishery and kept for personal use were 11 Chinook salmon, 17 sockeye salmon, 47 pink salmon, 31 coho salmon, 953 Dolly Varden and 181 sheefish. There were likely some additional fish kept for personal use that did not get reported on fish tickets.

The department opened the commercial fishery on July 10 from 6 AM to 2 PM Monday through Saturday. Fifteen times the buyer shortened the period from 8 hours because of capacity limits. Also, on Mondays the buyer often requested the department change the opening to noon to 8 PM because of airline schedules. The department extended one period to 10 hours because of weather concerns. There were 62 permit holders who sold fish to the buyer, including one catcher–seller who sold fish to the buyer and also sold some of his catch to Kotzebue area residents. This was the highest number of permit holders to fish since 2001—the last time there were 2 buyers in the fishery. Since 2004, when a buyer returned to Kotzebue to purchase salmon, the number of permit holders that fished had been in the 40s, and was less than half the number of permit holders that fished in the 1990s, and well below the nearly 200 permit holders that fished in the 1980s.

A total of 1.51 million pounds of chum salmon (average weight 8.0 pounds) were sold at an average price of $0.25 per pound. The total exvessel value was $377,000 to Kotzebue Sound fishermen, which is 64% of the $585,000 historical average. The average value for each participating permit holder was $6,073.

Table 6.–Preliminary 2009 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total [a,b]
	Chinook	Sockeye	Coho	Pink	Chum	
Kuskokwim River	7	26	105	0	77	215
Kuskokwim Bay	15	145	57	0	108	325
Kuskokwim Area Total	22	171	162	0	185	540
Lower Yukon River	0	0	8	0	182	190
Upper Yukon River	0	0	0	0	14	13
Yukon River Total	0	0	8	0	195	203
Norton Sound	0	0	87	17	34	138
Kotzebue Area	0	0	0	0	188	180
AYK Region Total	22	171	257	17	603	1,061

[a] Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

[b] Columns and rows may not total exactly due to rounding error.

WESTWARD REGION

KODIAK MANAGEMENT AREA

The 2009 Kodiak Management Area (KMA) commercial salmon fishery began on June 9 and the last commercial landing occurred on September 30. Harvests by fishing area and species is summarized in Table 7.

Table 7.– Preliminary 2009 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total[a,b]
Kodiak	7	1,727	289	27,649	956	30,600
Chignik	3	1,198	110	1,408	256	2,977
South Peninsula and Aleutian Islands	6	1,725	249	9,547	1,687	13,214
North Peninsula	3	2,427	68	275	106	2,879
Alaska Peninsula Total	9	4,152	317	9,822	1,793	16,093
Westward Region Total	19	7,077	716	38,879	3,005	49,670

[a] Missing data indicates no harvest and zeros indicate harvest activity but <1,000.
[b] Columns and rows may not total exactly due to rounding error.

Commercial fishing effort was once again low during the 2009 commercial salmon season although it increased slightly from 2008. Of the 608 eligible commercial salmon permits, only 291 (48 %) made commercial landings.

By gear type, a total of 132 set gillnet, 158 purse seine and 1 beach seine permit holder(s) fished in 2009. Both purse seine and gillnet permit holder participation was below the previous 10-year average. During 2009 set gillnet permit holder participation was lower than in 2008 while purse seine permit holder participation was higher than in 2008. The number of permits actually fished at any given time varied throughout the season.

The 2009 commercial harvest sold by KMA fishermen and Kodiak Regional Aquaculture Association as a cost recovery program included 7,219 Chinook, 1.727 million sockeye, 289,000 coho, 27.649 million pink and 956,000 chum salmon, for a total of approximately 30.6 million, which is above the previous 10-year (1999–2008) average of 23.3 million. An additional 4,500 were retained for the permit holder's own use (taken but not sold). Subsistence fishery salmon harvests will not be known until after permits and questionnaires are returned to the department in late spring of 2010.

The estimated total exvessel value of the 2009 fishery was approximately $35.6 million, which was above the 10-year average exvessel value of $23.6 million.

Purse seine fishermen accounted for 93% of the total number of salmon harvested and averaged $185,000 per fished permit. The exvessel value increased from the 2008 season, and was significantly higher than the previous 10-year average ($114,000) for purse seine permit holders.

Set gillnet fishermen accounted for 7% of the total number of salmon harvested. Earnings averaged approximately $48,000 per fished permit, which was an increase from 2008, and higher than the previous 10-year average permit holder earnings of $38,000.

2009 Commercial Harvest Summary

Chinook Salmon

There are no directed Chinook commercial fisheries in the KMA but incidental commercial harvest occurs during targeted sockeye salmon fisheries. The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the KMA. Although no commercial openings were allowed in the Inner Karluk, Outer Karluk or Inner Ayakulik sections in June or July, non-retention of Chinook salmon was implemented during the one fishing period allowed in the Outer Ayakulik Section in July due to low returns. The 2009 commercial harvest of Chinook salmon in the KMA totaled 7,219, which was lower than the previous 10-year average (19,000) and below the 2009 forecast (20,000).

Sockeye Salmon

The 2009 commercial sockeye harvest in the KMA totaled 1.7 million. The harvest was below the recent 10-year average (2.9 million) but above the forecast (1.5 million).

Early season management for much of the west side and north end of Kodiak Island is driven by the Karluk early-run sockeye salmon (through July 15). Due to poor returns minimal fishing time was allowed targeting Karluk early-run sockeye salmon. Early season westside fisheries harvest (through July 15) was approximately 195,000, which was above the early-run point forecast of 154,000. Late-season westside fishery harvest was approximately 231,000, which was above the late-run point forecast of 202,000.

The Ayakulik River was forecasted to have a surplus (44,000) available to commercial fishing in 2009. A directed sockeye fishery was allowed in the Inner and Outer Ayakulik sections late July and early August. Approximately 78,000 were harvested in the Inner and Outer Ayakulik sections during the 2009 season.

The department tentatively scheduled a commercial salmon fishing period for June 9 in the Alitak District if certain criteria were met prior to June 7. Generally, the early-run sockeye salmon appear in Upper Station earlier than they do in the Frazer system. The intent of the early opening was to allow an opportunity to harvest Upper Station early-run sockeye salmon prior to the Frazer Lake sockeye salmon peak run timing. The Upper Station sockeye salmon early-run came in as expected, and a commercial salmon fishery was prosecuted on June 9 as a 33-hour test fishery. The resulting sockeye harvest indicated a fair run. As the season progressed, it became evident that the early-run sockeye salmon to Upper Station was fair. The 2009 forecast for Frazer Lake was estimated at 401,000 with a harvestable surplus of approximately 263,000. The Frazer Lake sockeye run came in stronger than expected. By July 4, the lower sockeye goal was achieved through the Dog Salmon weir. The Alitak District early-run commercial harvest was 352,000, above the projected harvest of 332,000.

Cape Igvak Salmon Management Plan

This regulatory management plan (5 AAC 18.360) allocates 15% of the total Chignik-bound sockeye harvest prior to July 25 to KMA fishermen in the Cape Igvak Section. Based on

regulations, 90% of all sockeye salmon caught prior to July 25 in the Cape Igvak Section are considered to be Chignik-bound.

Allocative and biological criteria of the management plan were expected to be met in 2009. However, as the season progressed, it became evident the early-run portion of the Chignik sockeye run was either weaker than forecast or late. In late June, escapement and catch rates in Chignik increased dramatically and fishing was allowed in the Cape Igvak Section beginning July 9. By July 25, of the 141,000 sockeye salmon harvested in this section, 127,000 (12.2% of the total Chignik run) were considered to be Chignik-bound.

North Shelikof Sockeye Salmon Management Plan

From July 6 to July 25, this regulatory management plan (5 AAC 18.363) places harvest limits on 2 areas of the KMA bordering northern Shelikof Strait to limit interception of sockeye salmon that are considered Cook Inlet-bound. During the period that this management plan is in effect, KMA fisheries are targeting local pink runs and the fishing periods are based on the projected pink run strength. If it appears that the sockeye harvest will meet or exceed limits set by the Board of Fisheries, then fisheries are to be restricted to inshore "Shoreward Zones" only, and offshore "Seaward Zones" are closed. In 2009, a department biologist was present on the grounds to determine the sockeye catch and facilitate orderly, short notice closures if the harvest limits were met.

A Seaward Zone closure was implemented in the North Shelikof Unit at 9:00 PM July 15 when it was estimated that the cumulative sockeye salmon had approached the 15,000 limit. The total July 6–25 harvest in the North Shelikof Unit was 15,645, which includes both the Shoreward Zone and Seaward Zone harvests. A Seaward Zone closure was not required in the Southwest Afognak Section as the harvest cap of 50,000 was not met. The July 6–25 harvest in the Southwest Afognak Section was 41,516.

Terminal and Special Harvest Areas

Some fisheries occur in areas where salmon enhancement projects create surplus production. Sockeye salmon harvests occurred as follows.

There was little commercial salmon effort or harvest in the Waterfall and Foul Bay SHAs with a total of 8,742 sockeye salmon harvested in both SHAs.

In the Spiridon SHA (Telrod Cove), 81,725 sockeye salmon were harvested. The harvest in the Spiridon SHA represents only a portion of the total harvest of Spiridon enhancement fish; the remainder are harvested in traditional net fisheries along the westside of the KMA. The total Spiridon sockeye commercial harvest was an estimated 155,000 (forecast 183,000).

The Kitoi Bay Hatchery sockeye harvest was an estimated 82,000, and was above the point forecast of 66,000. This includes the commercial harvest of both enhanced and wild salmon from the Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections. Additional enhanced sockeye salmon may have been harvested in adjacent sections, but stock separation data are not available.

Coho Salmon

The commercial coho salmon harvest of 289,000 was below the forecast (422,000) and below the 1999–2008 average (397,000).

The largest portion of the coho commercial harvest occurred in those sections associated with Kitoi Bay Hatchery (Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections), with a total harvest of 153,780, which was slightly above the projected harvest of 148,000.

Pink Salmon

Overall, the 2009 pink salmon harvest of 27.6 million was above the harvest forecast (22 million), and well above the past 5 odd-year (1999–2007) average harvest of 20.0 million, and also the previous 10-year average harvest of 19.1 million.

Wild stock pink harvests were stronger than forecast (12.1 million) with 18.7 million harvested in the KMA. Westside fisheries (Southwest Afognak to Ayakulik), accounted for 3.6 million and the eastside and the north end of Kodiak Island had a harvest of 7.6 million.

The Kitoi Bay Hatchery pink return was weaker than expected. In those sections near the hatchery 8.9 million pink salmon were harvested compared to a projected harvest of 10 million. Additional Kitoi-bound pink salmon were likely harvested along the west side and east side of Kodiak and Afognak islands. However, the department does not have a stock separation program for pink salmon and is unable to differentiate stocks. There was a cost recovery fishery near the hatchery, with Kitoi pink, coho, chum and sockeye salmon harvested and sold by the Kodiak Regional Aquaculture Association.

Chum Salmon

The chum harvest of 964,000 was well above the forecast (623,000) and slightly above the 1999–2008 average (928,000). Harvests on the eastside and the north end of Kodiak Island accounted for 355,205. Kitoi Bay Hatchery chum production was weaker than expected, with 101,000 harvested, below the 2009 forecast of 118,000.

2009 Escapement Summary

During the 2009 KMA commercial salmon season, fish counting weirs were operated on 8 systems, including the Karluk, Ayakulik, Litnik, Upper Station, Frazer, Buskin, Saltery and Big Bay (Shuyak Island) systems. Continued erosion of funding has reduced the number of weirs from 12 in 2000. In addition, 4 observers flew over 30 aerial surveys, and several observers conducted foot and skiff survey escapement estimates. Foot surveys are still being conducted on road system streams, primarily by the Division of Sport Fish.

Chinook Salmon

The total Chinook salmon escapement (4,052) was well below the previous 10-year average (18,894). Escapement goals for Chinook salmon have been developed for the Karluk and Ayakulik rivers and the escapements are estimated using fish counting weirs.

Due to a relatively weak sockeye run, there was no commercial fishing allowed in the Outer Karluk and Inner Karluk sections this year and there was reduced fishing time in the other management units of the Westside Kodiak fishery. In addition, both subsistence and sport fish fisheries were closed to the harvest of Chinook salmon in the Karluk system. Despite the reduced incidental catch of Chinook salmon in these fisheries, the count through the Karluk weir (1,308) was below the range of the established goal (3,600–7,300) and escapement through the Ayakulik weir (2,615) was also below the established range of the escapement goal (4,800–9,600).

Sockeye Salmon

The 2009 sockeye returns to systems in the KMA were varied. The Karluk early-run, Buskin, Pasagshak, and Little River escapements did not meet established minimum escapement goals. Upper Station early and late runs, the Frazer, Afognak, Uganik, Saltery, Ayakulik, and Karluk late-run had sockeye salmon escapements that were within or above established escapement goals. The entire KMA estimated sockeye salmon escapement (1.1 million) was below the previous 10-year average (1.6 million).

Coho Salmon

The only established coho escapement goals occur in the Northeast Kodiak and Eastside Kodiak districts in the following rivers: American (400–900), Olds (1,000–2,200), Buskin (3,200–7,200) and the Pasagshak rivers (1,200–3,300). The escapement goals were met for the Buskin (10,624), American (639), and Pasagshak rivers (2,385); however, escapements in the Olds River (697) were below escapement objectives.

For the entire KMA, the estimated coho escapement (110,000) was slightly below the previous 10-year average (115,000). However, it is expected that more coho salmon entered KMA systems throughout the fall after the conclusion of aerial surveys and removal of weirs. At this time the KMA has very little coho monitoring, (the last aerial surveys were conducted on September 12) and the lack of stock status information will further hamper the management of coho salmon in the KMA.

Pink Salmon

Overall pink escapement (5.1 million) was above the previous 5 odd-year average (3.8 million) and slightly above the previous 10-year average (5.0 million). Pink salmon escapement goals have been established as an aggregate goal for the entire Kodiak Archipelago and the Mainland District. The escapement goal range (2.0–5.0 million) was met for the Kodiak Archipelago (4.7 million). The Mainland District pink escapement of 430,000 was within the established escapement goal range (250,000–750,000).

Chum Salmon

Overall chum salmon escapement (306,000) was below the recent 10-year average (534,000). Escapement goals have been established in Kodiak Archipelago and the Mainland. The escapement in the Kodiak Archipelago was above the escapement goal of 151,000 with an estimate of 202,000 while the Mainland District escapement of 104,000 was at the escapement goal of 104,000.

CHIGNIK MANAGEMENT AREA SEASON SUMMARY

The Chignik River watershed supports 2 distinct sockeye salmon runs which traditionally provide the majority of directed harvest opportunities within the CMA. In 2009, the combined early- and late-run sockeye salmon harvest was above recent averages. Additionally, there are several streams within the CMA that support large runs of pink, chum, and coho salmon. In 2009, the CMA was open to commercial salmon fishing for 86 days (June 20 to September 25) and a total of 56 permits were fished.

Escapement Summary

Escapement through the Chignik River weir was monitored using underwater digital video equipment. Two underwater gates in the weir were open to provide uninterrupted escapement. The numbers of fish passing the weir were counted by species for the first 10 minutes of each hour. The counts were expanded to obtain hourly escapement estimates, and then summed to provide an estimate of daily fish passage. A digital video archive was kept of each 10-minute counting period. The first count of the 2009 season occurred on May 29 when weir installation was complete, and the last weir count of the season took place on August 31, after which the weir was removed.

Aerial surveys were flown throughout the season to monitor escapement into CMA streams. Peak aerial survey counts, by index stream and species, were summed and compared to available escapement goals established by Witteveen et al. (2007). Pink and chum salmon escapements were measured against established areawide SEGs which were apportioned into district-wide management objectives.

Chinook Salmon

The Chignik River is the only Chinook salmon-producing stream within the CMA and one of the largest Chinook salmon streams on the South Alaska Peninsula. The BEG for Chinook salmon in the Chignik River watershed is 1,300–2,700 (Witteveen et al. 2005). The 2009 Chignik River Chinook escapement, through the weir (1,680) is assumed to have met the BEG but was well below the previous 5- and 10-year averages. Subsistence and sport fishery harvest of Chinook salmon above the weir will not be known until after permits and questionnaires are returned and tabulated by the fall of 2010.

Sockeye Salmon

Sockeye salmon escapement to the Chignik River is managed based on separate interim escapement objectives for both early- and late-run sockeye salmon. The early-run SEG (350,000–400,000) through July 4 was achieved with an estimated escapement of 391,476.

The late-run objectives include an additional 50,000 sockeye salmon which are incorporated into the late-run SEG to provide for additional freshwater subsistence fishing opportunity. The late-run (post-July 4) SEG (250,000–400,000) was met with an estimated escapement of 328,586. Post-weir escapement estimates were produced for the September 1–15 and the September 16–30 periods, which were included in the total late-run escapement estimate.

Early-run escapement was above the prior 5-year average but below the previous 10-year average. The late-run sockeye salmon escapement was above prior 5- and 10-year averages. Sockeye salmon escapements into other CMA streams were relatively minor.

Coho Salmon

Coho salmon begin to enter CMA drainages in mid-August and continue through November. The coho salmon run is generally building when the weir is removed; therefore, coho salmon escapement estimates are considered incomplete. The 2009 Chignik River coho salmon escapement estimate through August 31 was 7,670. This was below prior 5- and 10-year average escapements. Although no coho salmon escapement goals have been established for the CMA (Witteveen et al. 2005), coho salmon escapement throughout the CMA appears to be consistent with past years and sustainable at this level.

Pink Salmon

An estimated 12,900 pink salmon passed the Chignik River weir in 2009, which was below previous 5-year and above previous 10-year pink salmon average escapements. Pink salmon escapements into CMA streams were estimated via aerial survey and summarized by district. The odd-year upper end of the SEG for all districts combined (800,000; Witteveen et al. 2007) was exceeded with an estimated total peak escapement of 856,000.

Chum Salmon

The 2009 Chignik River chum escapement was 109, which was below average for the Chignik River. Chum escapements to other CMA streams were estimated via aerial survey and summarized by district. The SEG of all districts combined (57,400; Witteveen et al. 2007) was exceeded with an estimated total peak escapement of 215,000.

Commercial Fishery Summary

The CMA was open to commercial salmon fishing for 86 days during the 2009 commercial salmon season. The first fishing period occurred on June 20 and was largely over by September 7, after which there was very little effort before commercial salmon fishing closed on September 25. In 2009, 56 permit holders (including the department's test fishery permit) made a total of 2,172 landings.

Harvest Summary

Chinook Salmon

A total of 3,319 Chinook salmon were commercially harvested in 2009, which was above recent average harvests. The majority of the 2009 CMA Chinook salmon harvest occurred in the Western District, with much of the remainder harvested in the Chignik Bay and Central districts. Most of the Chinook salmon harvest occurred from late June until the end of July.

Sockeye Salmon

A total of 1.2 million sockeye salmon were commercially harvested in the CMA during 2009, which was similar to the prior 10-year average harvest and approximately 341,000 (40%) more than the prior 5-year average harvest. The majority of the 2009 CMA harvest came from the Chignik Bay District, although substantial harvests also occurred in Central and Western districts.

In 2009, Southeast District Mainland and Cape Igvak opened to commercial salmon fishing for the first time on July 9. A total of 60,000 (48,000 considered Chignik-bound) sockeye salmon were harvested in the Southeast District Mainland through the end of the allocation period, on July 25. Cape Igvak fisherman harvested 141,000 (127,000 considered Chignik-bound) during the allocation period.

Coho Salmon

A total of 110,000 coho salmon were commercially harvested in 2009, which was greater than the prior 5- and 10-year average harvests. The majority of the coho harvest in 2009 took place during July and August in the Western District.

Pink Salmon

A total of 1.4 million pink salmon were commercially harvested in 2009, which was above the prior 5- and 10-year average harvests. The largest portion of the CMA pink harvest came from the Western District, although the Central and Eastern districts also yielded a substantial portion of the catch. Most pink salmon were harvested between late June and mid-August.

Chum Salmon

A total of 256,000 chum salmon were commercially harvested in 2009, which was well above the prior 5- and 10-year average harvests. The majority of the harvest in 2009 took place in the Western District, although the Central and Eastern districts also yielded substantial catches. Most were harvested between late June and mid-August

Economic Value Summary

The exvessel value of the 2009 CMA commercial salmon fishery was about $7.6 million (approximately $157,000 per active permit holder). A majority of the value was from the sale of sockeye salmon (82%), while pink harvest contributed a smaller proportion (9%) of the fishery value than the past 2 years, contributing roughly $14,500 per active permit holder. Furthermore, coho (6%) and chum (2.5%) harvest accounted for a much smaller proportion of the value than in 2008. The harvest provided about $9,469 (chum salmon), $4,015 (coho salmon), and $558 (Chinook salmon) per active permit holder.

Department Test Fishery Summary

The department conducted test fisheries on 2 occasions in 2009. Data from these test fisheries were used to assess the early season buildup of sockeye salmon in Chignik Lagoon. An estimated 1,689 sockeye salmon were harvested, which provided approximately $11,000 that was used to offset the cost of vessel charters and operating the Chignik weir.

Subsistence Summary

At this writing subsistence harvest numbers for 2009 have not been finalized.

ALASKA PENINSULA, ALEUTIAN ISLANDS, AND ATKA-AMLIA ISLANDS MANAGEMENT AREAS SALMON SEASON SUMMARY

Total harvest presented from the 2009 commercial salmon fishing season should closely approximate final harvest numbers for all species. The 2009 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas totaled 9,000 Chinook, 4.2 million sockeye, 316,000 coho, 9.8 million pink, and 1.8 million chum salmon. Subsistence salmon harvest will be reported in the 2009 annual management report. Data in this report are considered preliminary and supersede any data previously published.

The commercial harvests of Chinook, coho, pink, and chum salmon were all above 2009 harvest projections and the most recent 10-year average harvest. Preliminary exvessel value of salmon harvested in Area M totaled $26.5 million. Value information was generated from fish tickets and does not include post season adjustments paid to fishermen.

South Unimak and Shumagin Islands June Fisheries

The South Unimak and Shumagin Islands fishing season began at 6:00 AM on June 7 with an 88-hour fishing period for all gear types (purse seine, drift gillnet, and set gillnet gear). During

the June fishery, there were four 88-hour periods and one 64-hour fishing period. The commercial salmon harvest for the June fishery consisted of 3,800 Chinook, 1.7 million sockeye, 203 coho, 2.2 million pink, and 698,000 chum salmon. Drift gillnet gear accounted for the majority of the harvest of both sockeye and chum salmon, followed by purse seine and set gillnet gear types in the South Unimak area. Purse seine accounted for majority of both sockeye and chum salmon in the Shumagin Islands area.

Southeastern District Mainland

The Chignik early-run sockeye returned later than expected and commercial fishing was not allowed in the CMA until June 20. Due to the late timing of the Chignik early run and average expected harvest, the total sockeye harvest in the Chignik Management Area did not reach 600,000 until July 11. Set gillnet fishermen were first allowed in the Southeastern District Mainland (SEDM) from July 9 to July 10, with the purse seine fishermen following on July 13. There was a total of 3 openers for the set gillnet fleet and 2 openers for the purse seine fleet. Between June 1 and July 25, a total of 120 Chinook, 152,000 sockeye, 2,000 coho, 60,000 pink, and 15,600 chum salmon were harvested in the SEDM.

In 2009, the Orzinski Lake weir was operated from June 12 through August 3 and passed 21,457 sockeye salmon. Additional aerial surveys were conducted after the weir was removed but no additional sockeye salmon were observed escaping into Orzinski Lake. Due to the strong Orzinski Lake sockeye escapement, the first commercial fishing opening was permitted in the Northwest Stepovak Section on July 1. As a result, 35 set gillnet and 3 purse seine permit holder made deliveries between July 3 and July 25. A total of 91,000 sockeye salmon were harvested during this time frame.

From July 26 to August 31, the SEDM is managed based on the abundance of local salmon stocks. From July 26 through August 28, the harvest was approximately 1.0 million, including 29 Chinook, 84,000 sockeye, 9,400 coho, 803,000 pink, and 132,000 chum salmon. The department suspended commercial salmon fishing from August 28 through August 31 to allow for additional pink and chum salmon escapement.

Between July 26 and August 31 the SEDM is managed on the abundance of local pink, chum, and coho salmon. The total SEDM harvest from July 26 through August 31 was 29 Chinook, 84,000 sockeye, 9,386 coho, 803,000 pink, and 132,000 chum salmon. From September 1 through September 30 the SEDM was opened based on the abundance of local coho salmon. The total harvest from September 1 through September 30 was 3 Chinook, 7,674 sockeye, 5,017 coho, 12,145 pink, and 3,208 chum salmon.

South Peninsula Post-June Fishery

Prior to the South Peninsula Post-June fishery, the department conducts a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishing occurred on July 3, 4 and 5 and resulted in 28 (July 3), 72 (July 4), and 64 (July 5) immature salmon per set, which was below the threshold of 100 immature salmon per set. The Shumagin Islands of the Southeastern District, South Central District, Southwestern District and Unimak District were opened to commercial salmon fishing for the July 6 period for both purse seine and set gillnet gear.

From July 6 to July 21, there were 6 fishing periods, each consisting of a 24-hour opening followed by a 48-hour closure. From July 22 to July 31, there were 3 fishing periods that

consisted of a 36-hour opening followed by a 48-hour closure. During August, the post-June fishery is managed based on the abundance of local stocks. In September, management focuses on coho returns though the status of local pink and chum salmon returns may also be taken into consideration.

The 2009 South Peninsula (minus the SEDM July 1–25 harvest) post-June total commercial harvest totaled 1,900 Chinook, 403,000 sockeye, 246,000 coho, 5.6 million pink, and 968,000 chum salmon. A total of 114 permit holders participated in the 2009 South Peninsula post-June salmon fishery.

Aleutian Islands Fishery

The department opened the Aleutian Islands Area to commercial salmon fishing by seine gear on July 23. Commercial harvest of salmon occurred in Unalaska and Makushin bays, with a total harvest of 0 Chinook, 703 sockeye, 16 coho, 1.6 million pink, and 2,000 chum salmon.

On July 30, an aerial survey of Unalaska and Makushin bays was performed by the department. An estimated 170,000 pink salmon were observed as escapement. Currently there is no escapement goal for pink salmon in the Aleutian Islands area. However, an aerial survey was conducted to provide escapement information for inseason management purposes and to monitor the abundance of pink salmon in this area. No additional salmon escapement surveys were conducted in the Aleutian Islands during 2009.

South Peninsula Escapement

The South Peninsula indexed sockeye escapement of 128,117 was above the upper end of the management objective range (48,200–86,400). Pink indexed total escapement of 3.1 million was near the upper end of the odd-year goal range (1.5–3.3 million). Chum indexed total escapement of 512,000 was within the escapement goal range (330,000–661,000). A total of 109,000 coho salmon were documented in South Peninsula streams. Some of the major coho systems are typically not surveyed or are surveyed during off-peak times. There are few escapement goals on the South Peninsula for coho salmon due to their late run timing. A lack of escapement information for coho salmon is due to management staff leaving the South Peninsula region prior to peak coho runs, and poor weather conditions during the peak coho runs prevents aerial surveys from being conducted.

North Alaska Peninsula

In 2009, 166 Area M permit holders participated in commercial salmon fisheries along the North Alaska Peninsula. Effort by Area M permit holders was similar to 2007 and 2008 when 157 (2007) and 158 (2008) Area M permit holders participated. Two Area T permit holders fished in the Area M and Area T overlap fishing sections in 2009. This was the first year since 2006 that an Area T permit holder participated in the overlap area. The numbers of Area M and Area T permit holders participating in 2009 were far below the historic numbers observed during the 1990s.

The North Alaska Peninsula fishery is predominantly a sockeye salmon fishery, although depending on market conditions, directed Chinook, coho, and chum salmon fisheries occur in some locations. During even-numbered years, depending on market conditions, pink salmon runs are frequently targeted in the Northwestern District.

In 2009, the North Alaska Peninsula harvest of sockeye, coho, pink, and chum salmon were above the previous 10-year (1999–2008) averages, while the harvest of Chinook salmon was below the previous 10-year average. The harvest of Chinook, sockeye, coho and chum salmon were all below projected levels, while the pink harvest was above projected levels.

Northwestern District

In the 2009 Northwestern District commercial salmon fishery a total of 37,000 sockeye, 50 coho, 275,000 pink, and 54,000 chum salmon were harvested. A total of 9 permit holders participated in the fishery (6 purse seiners and 3 drift gillnetters). The commercial fishery in Urilia Bay harvested a total of 24,000 sockeye salmon in 2009.

In the Northwestern District, chum salmon escapement was 84,000. The Northwestern District chum salmon escapement goal (100,000–215,000) was not met, with similar escapement for both the Bechevin Bay and Izembek-Moffet Bay sections. The Urilia Bay Section had an escapement of 49,000 sockeye salmon and 72,000 pink salmon, which escaped into Bechevin Bay. Bechevin Bay is the only North Peninsula location with a pink salmon escapement objective (1,600 during odd-numbered years), which was met in 2009.

Nelson Lagoon Section

The total run of 374,000 sockeye salmon (includes harvest and escapement) from the Nelson Lagoon Section was below the estimated forecast of 420,000. From the total run, 214,000 sockeye salmon were harvested in Nelson Lagoon and 160,000 escaped, of which 157,000 returned to the Nelson (Sapsuk) River, and 2,500 were observed in other tributaries of Nelson River such as David's and Caribou rivers. The sockeye salmon escapement into Nelson River met the BEG (97,000–219,000).

Bear River and Three Hills Sections

By regulation, the Bear River Section opens to commercial salmon fishing on May 1 and the Three Hills Section opens June 25. Both areas are managed based on the sockeye salmon run strengths into Bear and Sandy rivers. In 2009, a portion of the Bear River Section and all of the Three Hills Section were closed to commercial salmon fishing to protect Sandy River sockeye salmon, which struggled to meet the interim escapement objectives throughout the season. The Bear River early-run (through July 31) sockeye salmon escapement of 216,000 was within the escapement goal (176,000–293,000).

The Bear River sockeye salmon late-run (after July 31) escapement of 133,000 met the escapement goal (117,000–195,000). Although the late run met its season ending escapement goal, the run was below the 10-year average. To ensure the late-run met the season ending escapement objective, a portion of the Bear River Section was closed to commercial salmon fishing during most of the late-run.

In 2009, the Port Moller Bight, Bear River, Three Hills, and Ilnik sections were closed from July 28 through August 5. During this time period the Bear River early run is ending and the late run is beginning. A test fishery was conducted from August 3 to August 4 to assess the run strength. The August 3 test fishery showed a moderate buildup of sockeye salmon in the vicinity of Bear River. Due to uncertainty of the sockeye salmon buildup, a second test fishery was conducted the following day. The August 4 test fishery showed a far greater buildup of sockeye salmon near Bear River. On August 6, the commercial salmon fishery was reopened in the Port Moller

Bight, Bear River, Three Hills and Ilnik sections. To protect milling fish destined for Bear River, commercial fishing was restricted in the vicinity of Bear River. Typically the late run peaks between August 15 and August 20. Due to the steady daily escapement into Bear River, commercial fishing in the immediate vicinity of Bear River remained restricted until August 21, when it was assured the late run would meet the season ending escapement objective.

The final 2009 Sandy River sockeye salmon escapement of 36,000 was below the 10-year average of 52,000; however, it did meet the season ending escapement goal range (34,000–74,000). For most of the season, the sockeye salmon escapement into Sandy River did not meet the interim escapement objectives. To protect Sandy River fish and ensure the escapement objectives would be met, the Three Hills section did not open to commercial salmon fishing until July 14. A large portion of the Bear River Section was also closed to commercial salmon fishing until July 25, when Sandy River had reached its season ending escapement objective. At that time the sockeye salmon run into Sandy River had tapered off and was essentially over.

Ilnik Section

Since 2005, the Ocean River, normally a tributary of the Ilnik River, has emptied directly into the Bering Sea and bypassed the Ilnik River weir. Prior to 2005, the Ocean River had not emptied directly into the Bering Sea since 1987. To account for Ocean River-bound sockeye salmon that bypassed the weir, the Ilnik River weir escapement goal was decreased by 20%. Early season aerial surveys of Ilnik River revealed that a new channel had connected Willie Creek (a major spawning tributary to Ilnik River) with Ocean River. This development allowed fish destined for Ilnik River and Willie Creek to bypass the weir. Foot and aerial surveys confirmed that sockeye salmon were bypassing the weir using the new channel and accessing Willie Creek and possibly the upper Ilnik River. The Ocean River escapement estimate of 16,000 sockeye salmon, based on aerial surveys, exceeded the season ending escapement goal (8,000–12,000). The total Ilnik River system escapement based on aerials surveys was 66,000, which includes 11,000 from Willie Creek. The number of sockeye salmon through the weir met the season-ending escapement goal for the Ilnik River, but post-weir aerial surveys documented more fish than were counted through the weir; therefore, the low weir counts did not accurately represent the actual escapement into the Ilnik River watershed. To better manage Ocean River and Ilnik River sockeye salmon, aerial surveys were used in conjunction with the Ilnik River weir counts.

By regulation, the Ilnik Section can open to commercial salmon fishing on June 20, but because of low escapement rates into Ilnik River, the area did not open until June 27. Based on the 10-year average, by June 23 the Ilnik River weir has typically passed roughly half its total escapement for the year. In 2009 only 7,224 sockeye salmon had passed the weir. The June 27–29 harvest in the Ilnik Section averaged about 71,300 per day. During the July 4–7 opener the daily average harvest was about 41,350. By mid-July the Ilnik River sockeye salmon run is typically over.

In 2009, a total of 127 permit holders harvested 652,000 sockeye salmon in the Ilnik Section from June 27 to August 25. About 43% of this commercial harvest occurred southwest of Unangashak Bluffs (279,000), and 57% was harvested between Unangashak Bluffs and Strogonof Point (373,000). The peak daily catch in the southern portion of the Ilnik Section was on July 5 when 31,000 were harvested. The largest daily harvest occurred June 29, in the northern portion of the Ilnik Section when 89,000 were harvested.

Beginning August 15, Ilnik Section is managed for coho salmon runs into Ilnik Lagoon. No directed coho salmon fisheries occurred in the Ilnik Section during 2009. Commercial fisheries in the Ilnik Section continued targeting sockeye salmon while coho salmon were harvested incidentally in the sockeye fisheries.

Inner and Outer Port Heiden Sections

Aerial escapement surveys began on the Meshik River on June 18 and were conducted about once per week throughout the fishery. On July 3, 25,000 sockeye salmon were observed inriver. A peak survey conducted on July 11 documented 42,000 sockeye salmon in the Meshik River, meeting the season-ending escapement goal (20,000–60,000). The final escapement in the Inner Port Heiden Section (including Meshik River, Red Bluff and Yellow Bluff creeks and tributaries) was 88,200.

Fishing time in the Outer Port Heiden Section is based on Meshik River sockeye abundance unless management actions are taken for the conservation of Ugashik River sockeye salmon in the Egegik District. By regulation, the Outer Port Heiden Section can open to commercial salmon fishing from June 20 to July 31. The weekly fishing periods in the Outer Port Heiden Section are scheduled from 6:00 AM Monday to 6:00 PM Wednesday. The Outer Port Heiden Section opened on June 29 and had consistent openings of 2.5 days per week throughout July until the section closed for the season on July 28. In 2009, a total of 107 permit holders harvested 763,000 sockeye salmon from the Outer Port Heiden Section. The peak daily catch was on July 2 when 106,000 sockeye salmon were harvested. A small harvest occurred in the Inner Port Heiden Section in 2009 when less than 3 permit holders participated in the fishery.

Cinder River Section

There was limited harvest reported in the Cinder River Section in September when coho salmon were targeted for a short period by less than 3 permit holders.

PRELIMINARY FORECASTS OF 2010 SALMON RUNS TO SELECTED ALASKA FISHERIES

ADF&G prepares forecasts for salmon runs that affect major fisheries around the state. Salmon runs to be forecasted are selected using several criteria, including economic importance, feasibility, compatibility with existing programs, and management needs. For the 2010 fishing year, forecast fisheries are as follows:

Southeast	pink salmon
Prince William Sound	chum, sockeye, and pink salmon
Copper River/ Copper River Delta	Chinook and sockeye salmon
Upper Cook Inlet	sockeye, pink, chum, coho and Chinook salmon
Lower Cook Inlet	pink salmon
Kodiak	pink salmon
Spiridon Lake	sockeye salmon
Ayakulik River	sockeye salmon
Karluk Lake (Early Run)	sockeye salmon
Karluk Lake (Late Run)	sockeye salmon
Frazer lake (Dog Salmon Creek)	sockeye salmon
Upper Station (Olga Lakes, Early Run)	sockeye salmon
Upper Station (Olga Lakes, Late Run)	sockeye salmon
Chignik	sockeye salmon
Bristol Bay	Sockeye, pink, chum, coho and Chinook salmon
Nushagak District	Chinook salmon
Alaska Peninsula, Bear Lake (late run)	sockeye salmon
Nelson River	sockeye salmon
Arctic-Yukon-Kuskokwim	Chinook, sockeye, coho, pink, and chum salmon
Yukon Area	chum salmon

A variety of information is used to forecast salmon runs. In most cases the principal indicator of future abundance is the escapement magnitudes of parental stocks. Other information that might have been considered includes spawning stock distribution, outmigrating smolt numbers, returns to date from sibling age classes of the projected return, and environmental conditions. A range of run possibilities are predicted for each forecasted fishery. In general, based on past experience, the actual run can be expected to fall within the range (between the lower and upper limits) less than half the time. Please see the appendices for further details.

Catch projections based on quantitative forecasts of salmon runs generally reflect potential harvests, and are made for most of major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon runs to the Southeast Alaska, Kodiak, and PWS areas. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, PWS, Kodiak, and the South Alaska Peninsula areas, the catch projections are made based on recent catch levels and are reflective of recent levels of fishing effort. Recent harvest levels have been constrained in many areas by historically low fishing effort, thus recent catch levels are reflective of both market conditions and recent levels of salmon runs. Harvest projections for these fisheries may not be indicative of potential harvest levels.

SALMON SPECIES CATCH AND PROJECTIONS

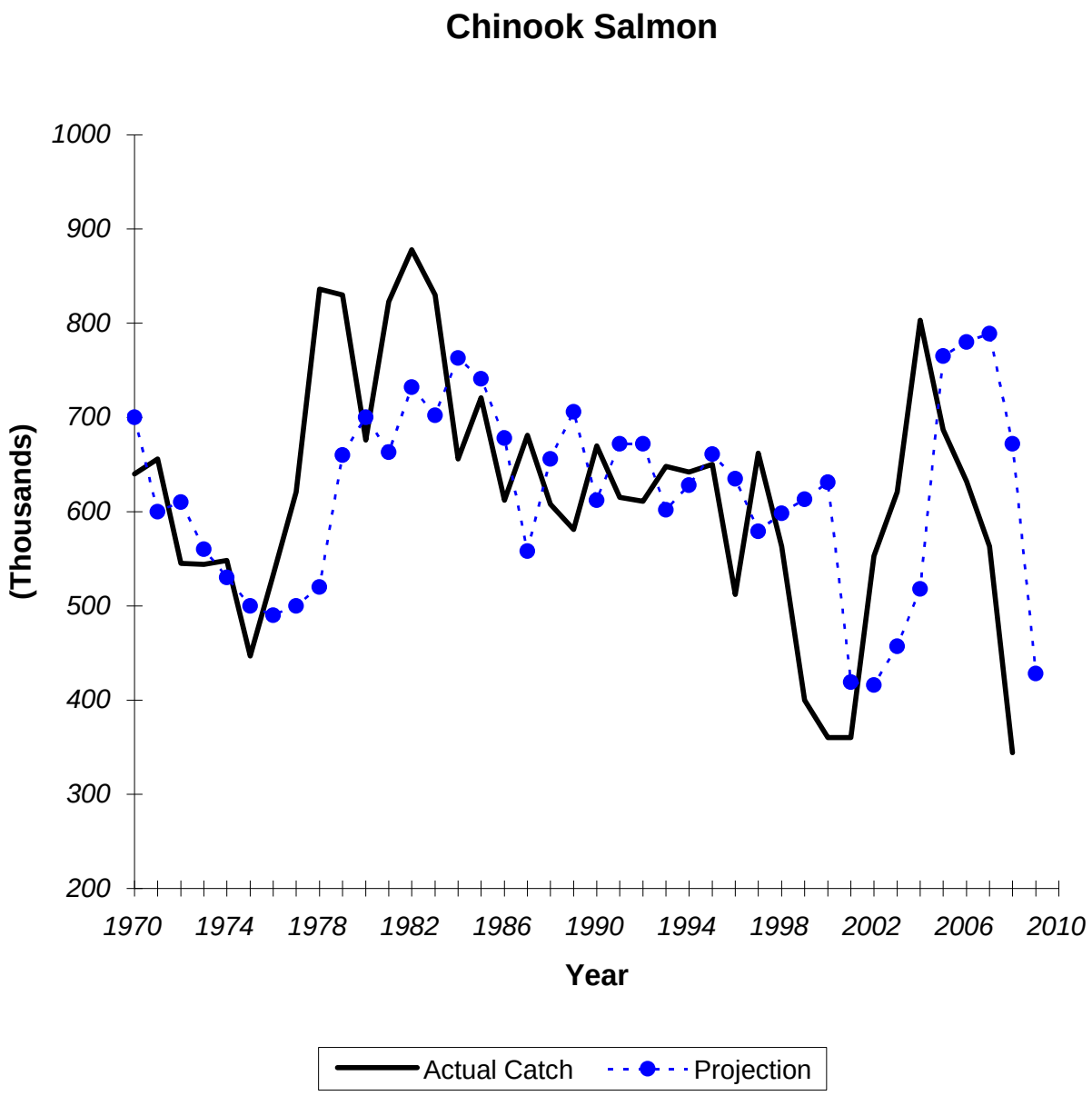

Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2009. No 2010 projection is provided because Southeast Alaska Chinook harvest projections are not available until April.

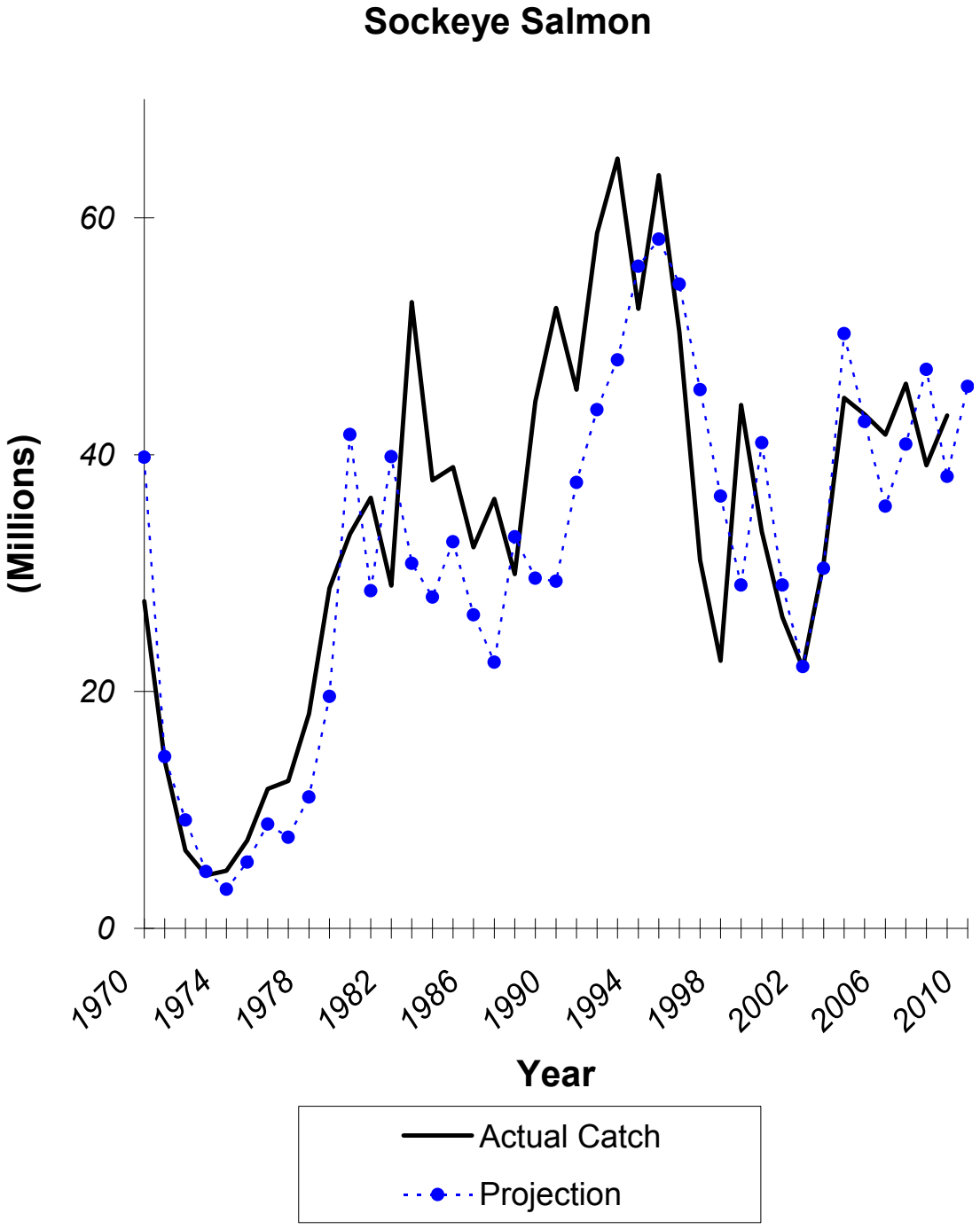

Figure 3.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2009, with the 2010 projection.

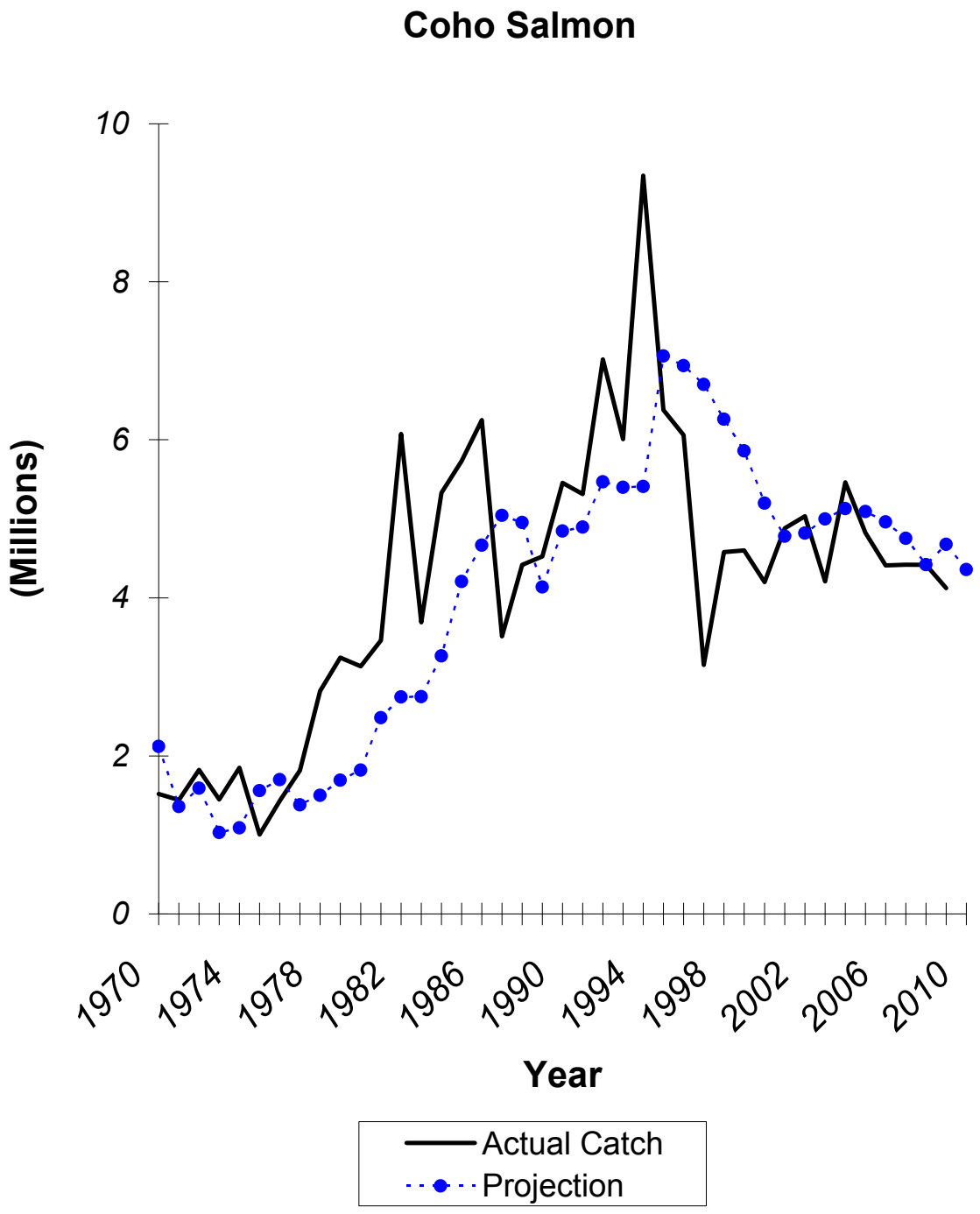

Figure 4.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2009, with the 2010 projection.

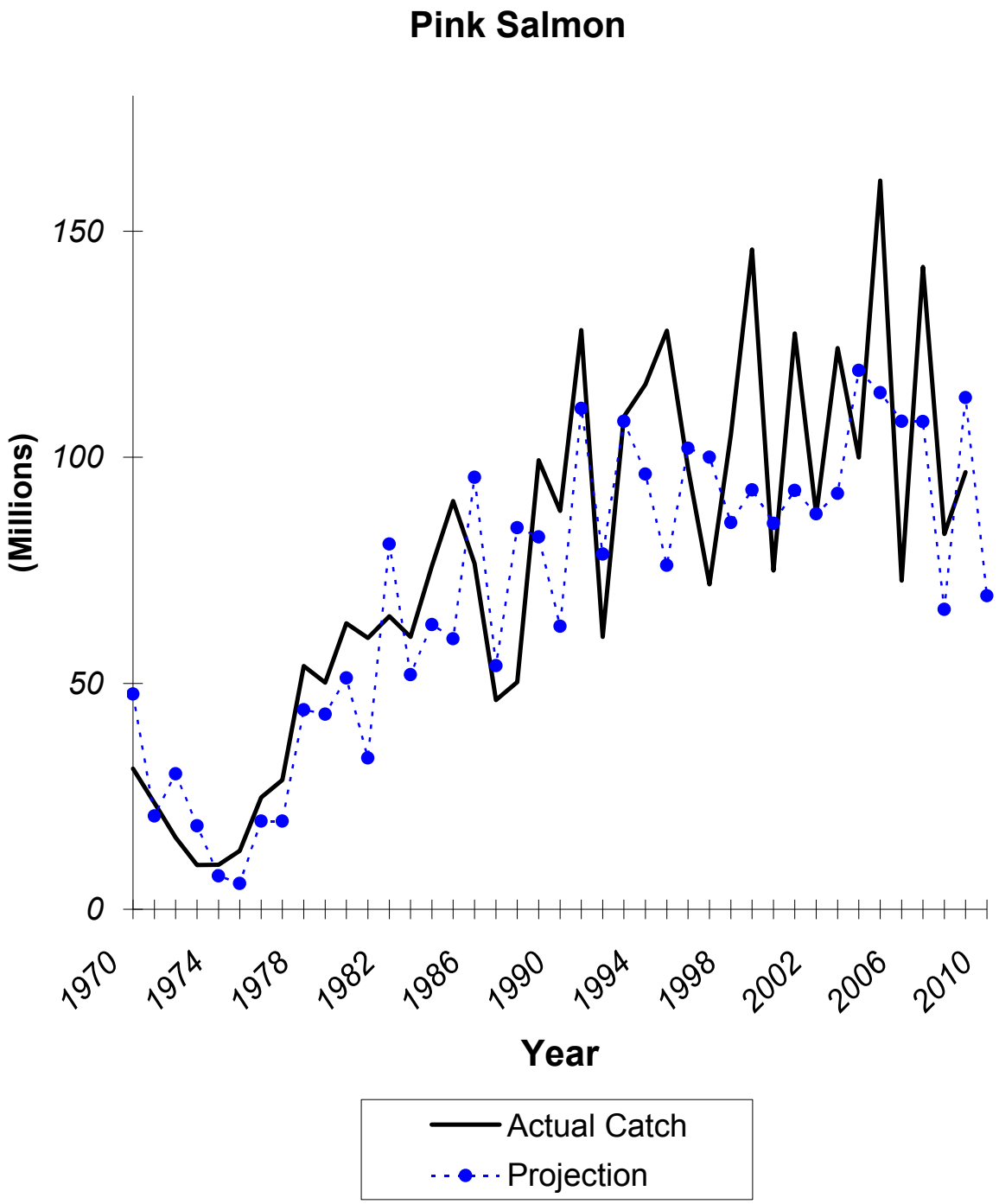

Figure 5.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2009, with the 2010 projection.

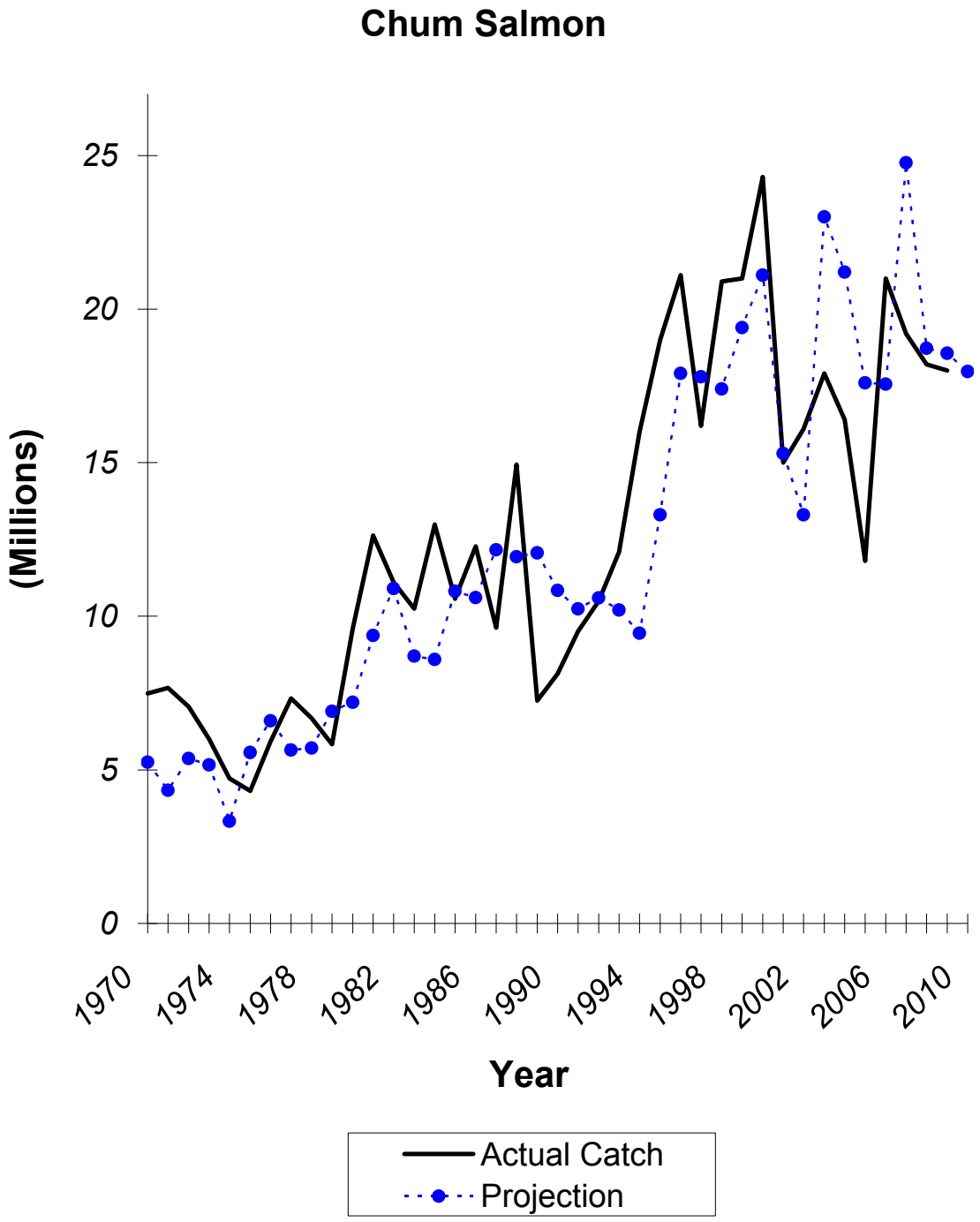

Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2009, with the 2010 projection.

APPENDICES

Forecast Area: Southeast Alaska
Species: Pink Salmon

The Southeast Alaska pink salmon harvest in 2010 is predicted to be in the Weak to Average range, with a point estimate of 19 million (80% confidence interval: 11–32 million). The categorical ranges of pink harvest in Southeast Alaska were formulated from the 20th, 40th, 60th, and 80th percentiles of historical harvest from 1960 to 2009.

Category	Range (millions)	Percentile
Poor	Less than 11	Less than 20^{th}
Weak	11 to 16	20^{th} to 40^{th}
Average	16 to 28	40^{th} to 60^{th}
Strong	28 to 50	60^{th} to 80^{th}
Excellent	Greater than 50	Greater than 80^{th}

Forecast Methods

The 2010 forecast is an average of 2 forecasts: 1) a forecast of the trend in the harvest, and 2) the forecast trend adjusted using 2009 juvenile pink abundance data. The forecast of the trend in pink harvests was based on a time-series technique called *exponential smoothing*. This technique is similar to a running average, except that all harvests since 1960 were used in the forecast estimate. Recent harvest observations were given more weight in the analysis, while past harvest observations were increasingly down-weighted with time; i.e., the older the datum, the less influence it has on the forecast. If x_t, x_{t-1}, ... denotes the observed harvests in year t, t-1, and so on, then the forecast in year t+1 is given by,

$$\hat{x}_{t+1} = cx_t + (1-c)\hat{x}_t \ .$$

The forecast for year t, that is $\hat{x}_t$, is also a weighted average of the observed catch in year t-1, and the forecast in year t-2. This is a kind of recursive equation that contains all of the data in the series. Because the recent harvest series has developed an odd-year and even-year cycle, we let t be 2008, the parent year for the 2010 return. Since the formula used to calculate the forecast is a weighted average of the 2008 harvest and its associated forecast, which was also based on the associated parent-year harvest and forecast, this forecast is based entirely on even-year data. That is, we used all of the even-year harvest data up to 2008, assuming that the 2008 parent-year and other even years in the series will better predict the 2010 return. We estimated a value of c to be approximately 0.46, based on minimizing the sum of past squared errors in the entire data set (odd and even years combined). This analysis produced a forecast of 22 million pink salmon (Figure A1).

We adjusted the forecast using peak June–July juvenile pink catch-per-unit-effort (CPUE) statistics provided by the NOAA Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (Joe Orsi, Auke Bay Laboratories, personal communication). These data were obtained from systematic surveys conducted annually in upper Chatham and Icy straits in conjunction with NOAA's Southeast Coastal Monitoring Project and are highly correlated with the harvest of adult pink salmon in the following year (see Orsi et al. 2006[1]).

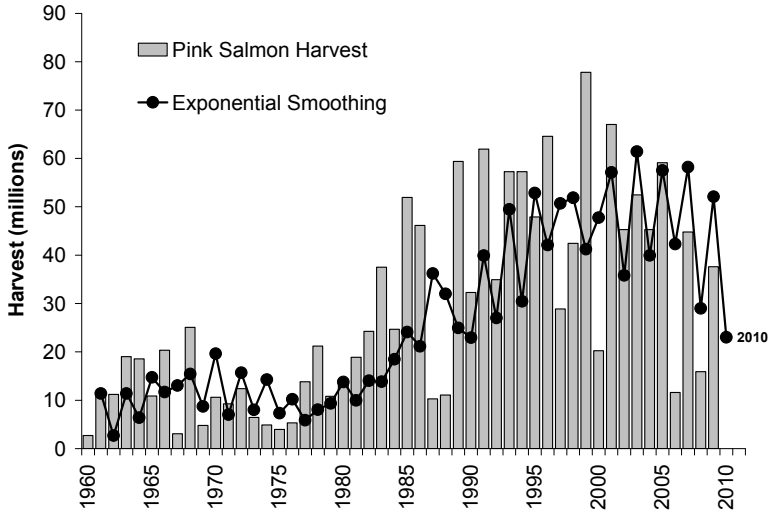

Figure A1.– Comparison of the annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2010 forecast model. This method produced a 2010 harvest forecast of 22 million pink salmon.

We developed a simple equation to predict the forecast error in the in the exponential smooth by regressing the forecast error proportions from 1998 to 2009 on the corresponding NOAA CPUE data from 1997 to 2008 (Figure A2). The forecast error proportion was simply the forecast error (the exponential smooth forecast subtracted from the actual harvest) divided by the forecast point estimate. We predicted the 2010 forecast error and adjusted the exponential-smooth forecast downward, from 22 million to 15 million pink salmon (Figure A3).

Finally, we gave equal weight to both the exponential-smooth forecast (22 million) and the adjusted forecast (15 million), and present the point estimate of 19 million pink salmon as the 2010 pink salmon harvest forecast. We used this "equal-weight" approach to produce hindcast predictions for 1998–2009, and calculated the sum of the squared errors of the log of the observed values minus the log of the predicted values. The 80% confidence interval (11–32 million) was calculated as the harvest forecast plus or minus the root-mean-squared error times the appropriate *t*-value (1.363).

[1] We gratefully acknowledge the assistance and advice of Joe Orsi and Alex Wertheimer and their colleagues at the NOAA Auke Bay Lab. However, we accept responsibility for this forecast, and we accept sole responsibility for this use of their data. For a detailed description of these NOAA research activities see Orsi, J. A., E. A. Fergusson, M. V. Sturdevant, B. L. Wing, A. C. Wertheimer, and W. R. Heard. 2006. Annual Survey of Juvenile Salmon and Ecologically Related Species and Environmental Factors in the Marine Waters of Southeastern Alaska, May–August 2005. NPAFC Doc. 955. Auke Bay Lab., Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, 11305 Glacier Highway, Juneau, AK 99801-8626, USA. http://www.npafc.org/new/pub_documents.html.

Forecast Discussion

The 2010 forecast of 19 million pink salmon is 48% of the recent 10-year average harvest of 40 million pink salmon. There are 2 primary reasons to expect that the harvest in 2010 will be smaller than the recent average. The first is that the parent-year escapement index in 2008 was the smallest since 1990 (only 56% of the prior 10-year average). Escapements were extremely poor on the inside waters north of Sumner Strait, where pink salmon escapement indices were below the recommended management targets for 19 of 21 pink salmon stock groups. In addition, the NOAA Auke Bay Lab's 2009 peak June–July juvenile pink salmon CPUE statistic from upper Chatham and Icy straits in northern Southeast Alaska ranked in the bottom third out of the 12 previous years that NOAA has collected that information. Pink salmon harvests associated with the 3 previous smallest indices in their data set ranged between 12 and 20 million.

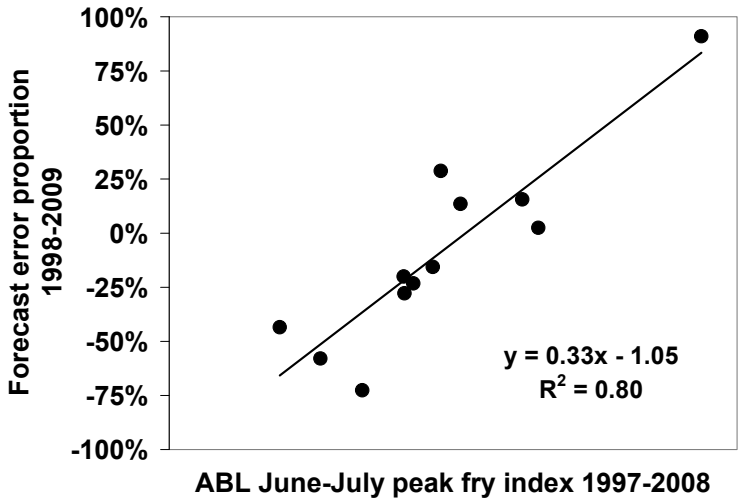

Figure A2.–Regression of ADF&G forecast error proportion on the peak June–July juvenile pink salmon index from Icy Strait one year prior. The forecast error is a proportion calculated by dividing the forecast error (the annual ADF&G forecast subtracted from the actual harvest) by the forecast point estimate.

(Pink salmon fry index data provided by Joe Orsi, NOAA Auke Bay Laboratory, personal communication).

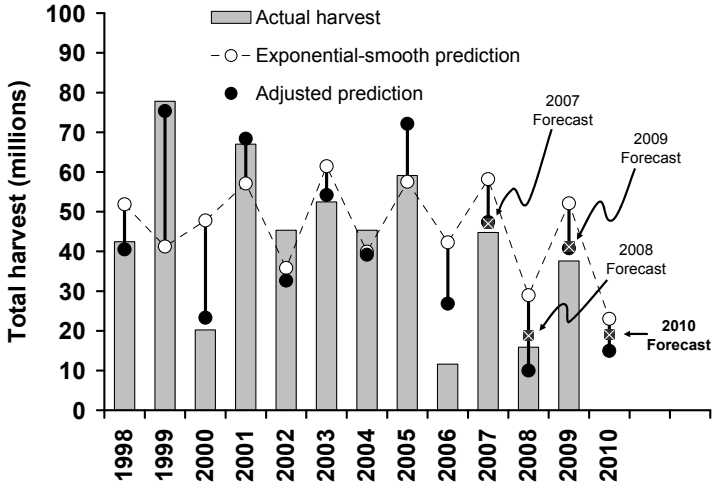

Figure A3.–Annual harvest of pink salmon in Southeast Alaska, 1998–2009, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory juvenile pink salmon data. The 2007–2009 ADF&G harvest forecasts were very close to the actual harvests in those years. The 2010 forecast of 19 million pink salmon is the average of the exponential-smooth prediction (22 million; white circle) and the adjusted prediction (15 million; black circle).

We point out that this year's forecast is similar to our 2008 forecast in that we gave equal weight to both the exponential-smooth forecast and the adjusted forecast, rather than simply using the adjusted forecast as we did for the 2007 and 2009 seasons (Figure A3). We feel this slightly more cautious approach is warranted, given that the exponential-smooth forecast for 2010 already accounts for the recent downward trend in even-year harvests and, while parent-year escapements were extremely poor in Northern Southeast Alaska (where the NOAA's juvenile pink salmon data are collected), 2008 pink salmon escapement indices in Southern Southeast Alaska (Sumner Strait and south) were improved over 2006.

The NOAA Auke Bay Lab continues to conduct research that has greatly improved our ability to forecast pink salmon harvests in Southeast Alaska. ADF&G forecasts that were adjusted using NOAA's juvenile pink salmon data were much improved over previous forecasts (Figure A4). Hindcasts of past harvests (1998–2009) using this forecast method also exhibited fair to good performance in predicting the direction of forecast error (Figure A3). Even if these hindcast values were not always precise (e.g., in 2006), the ability to predict if the harvest will be greater than average or less than average is a big improvement over past ADF&G forecasts. For these reasons, we are using this method to forecast the pink salmon harvest for a fourth straight year.

The department will manage the commercial purse seine fisheries inseason based on the strength of salmon runs. Aerial escapement surveys and fishery performance data will continue, as always, to be essential in making inseason management decisions.

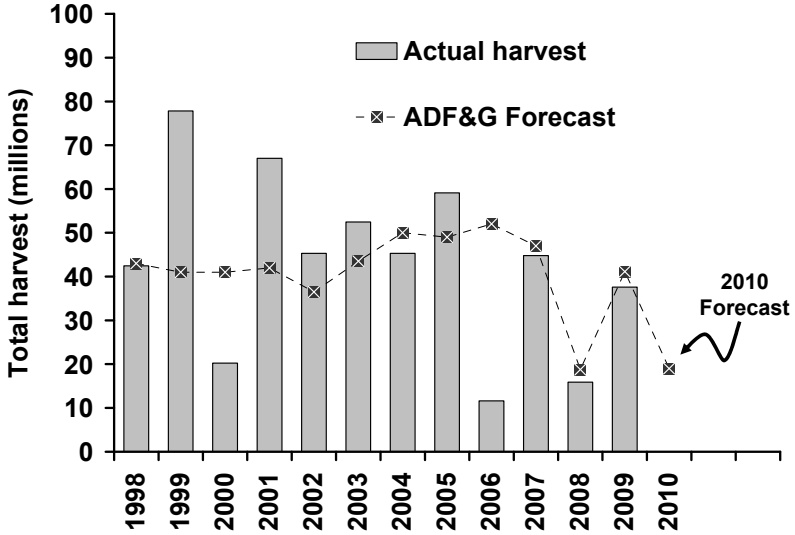

Figure A4.–Annual harvest of pink salmon in Southeast Alaska compared to the ADF&G pre-season harvest forecast, 1998–2009. The 2007–2009 ADF&G harvest forecasts were adjusted using NOAA's juvenile pink salmon data.

Steve Heinl, Salmon Research Supervisor, Ketchikan
Andy Piston, Fishery Biologist, Ketchikan
Haixue Shen, Biometrician, Douglas

Forecast Area: Prince William Sound
Species: Pink Salmon (Wild Only)

Preliminary Forecast of the 2010 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	2,801	0–5,664
Escapement Goal [a]	2,000	
Harvest Estimate	801	0–3,664

[a] The escapement goal of 2.0 million pink salmon is the midpoint of the SEG range (1.25–2.75 million).

Forecast Methods

The predicted natural run of pink salmon is the average total run for the even years 2006 and 2008. The total run by year was estimated as the total natural (nonhatchery) contribution to commercial harvests combined with the escapement index. The escapement index is calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. The natural pink salmon contributions to the CPF were estimated by subtracting hatchery contributions from the CPF total. Hatchery contributions were determined by thermal marked otolith recoveries (1997–2009), coded wire tag recoveries (1985–1996), or average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates. The current (2000–2010) prediction procedure differs from the 1997–1999 method that used linear regressions of adult production versus brood year escapement index. Prior to 1997, forecast methods employed surveys of pre-emergent fry; however, surveys have not been conducted since 1995. The forecast range is the 80% prediction interval around the mean total brood year return. The prediction interval was calculated as:

$$\tilde{y} \pm t_{\alpha/2,n-1} \times s\sqrt{1+\frac{1}{n}}$$

Where ỹ is the average of the 2 previous even brood years (2006 and 2008), t is the critical value, s is the standard deviation, and n is the sample size.

Forecast Discussion

Beginning in 2004, the department stopped producing hatchery pink salmon forecasts because the hatchery operators were already producing forecasts for their releases. Forecast methods examined for the 2010 natural run included: 1) the previous even-brood-year total run (most naïve forecast method), 2) total run averages with 2 to 20 years of data, and 3) linear regression of log-transformed total PWS escapement versus log-transformed total PWS return by brood line. The 2010 forecast was generated from the average of the 2006 and 2008 (even-brood year) runs because this forecasting method had the lowest mean absolute percentage forecast error.

The brood year 2008 escapement index (862,419) was below the SEG range (1.25–2.75 million) and ranked 14th of the observed even-year escapements since 1960. If the 2010 total run forecast is realized, it will be the seventh smallest among the 25 even brood year returns since 1960. There are environmental indicators pointing towards a smaller-than-average pink salmon return to PWS in 2010. Ocean temperatures along the GAK1 line off Seward remained well below average for much of the last few years, including 2009 (http://www.ims.uaf.edu/gak1/). The last few years have also been one of the longest periods of negative (cold) Pacific Decadal Oscillation index values since the 1970s http://jisao.washington.edu/pdo/. A warm Pacific Decadal Oscillation regime, coinciding with generally high productivity of salmon, began in approximately 1977. It will not be known for several more years if the recent period of negative Pacific Decadal Oscillation values has signaled the beginning of a new cold regime. It is also not known how the developing El Nino Southern Oscillation (http://www.elnino.noaa.gov/index.html) event will impact pink salmon productivity or survival.

Steve Moffitt, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Prince William Sound
Species: Chum Salmon (Wild Only)

Preliminary Forecast of the 2010 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	355	253–457
Escapement Goal [a]	200	
Harvest Estimate	155	53–257

[a] The escapement goal of 91,000 chum salmon is the minimum threshold of the SEG range. It is the intention of ADF&G to manage for the long-term escapement mean of 200,000 among all districts with an existing SEG.

Forecast Methods

The forecast of the total natural chum salmon run was calculated as the 2005–2009 average. The total natural run by year was estimated as the total commercial harvest contribution combined with the escapement index. The escapement index is calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. The CPF harvest contributions of natural stock chum salmon were estimated using pre-hatchery average wild runs (2002 and 2003) or thermally marked otolith estimates (2004–2009) for the Coghill, Eshamy, and Montague districts. The forecast range is the 80% prediction interval about the 5-year mean run size. The prediction interval was calculated as:

$$\tilde{y} \pm t_{\alpha/2,n-1} \times s\sqrt{1+\frac{1}{n}}$$

Where $\tilde{y}$ is the average total run of the 5 previous years (2005–2009), t is the critical value, s is the standard deviation and n is the sample size.

Forecast Discussion

Beginning in 2004, the department stopped producing hatchery chum salmon forecasts because the hatchery operators were already producing forecasts for their releases. Our ability to accurately forecast natural chum salmon stocks is limited by the small amount of data available. Estimates of natural stock contributions to CPF were unavailable prior to 2003. From 2003 through 2009 natural chum contribution estimates based on thermally marked otoliths were available for the Coghill and Montague districts. Contribution estimates from thermal marked otoliths in other districts have been available since 2004. Historical chum salmon age data from escapements and CPF harvests are unavailable for most districts of PWS. If the 2010 wild chum salmon forecast is realized, it would be the 31st largest of the 41 years since 1970.

The cold ocean temperatures and negative Pacific Decadal Oscillation index values discussed previously for pink salmon may also negatively affect the run of chum salmon in 2010.

Steve Moffitt, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Prince William Sound
Species: Sockeye Salmon (Wild Only)

Preliminary Forecast of the 2010 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound, Coghill Lake		
Total Run	71	20–303
Escapement Goal[a]	30	
Harvest Estimate	41	0–273
Prince William Sound, Eshamy Lake		
Total Run	47	14–80
Escapement Goal[b]	21	
Harvest Estimate	26	0–60
Total Production		
Run Estimate	118	57–353
Escapement Goal	51	
Common Property Harvest[c]	67	6–301

[a] The escapement goal of 30,000 for Coghill Lake is the midpoint of the escapement goal range (20,000–40,000).

[b] The escapement goal of 20,500 for Eshamy Lake is the midpoint of the escapement goal range (13,000–28,000).

[c] The total PWS harvest estimate does not include the average annual Unakwik District commercial harvest of approximately 6,688.

Forecast Methods

The natural sockeye salmon run forecast to Coghill Lake is the total of estimates for 5 age classes. Linear regression models with log-transformed data were used to predict returns of age-1.2 and age-1.3 sockeye salmon. The return of these 2 age classes was predicted from the relationship between returns of that age class and returns of the age class one year previous from the same brood year. For example, the model to predict the return of age-1.2 fish in 2009 used the return of age-1.1 fish in 2008 as the input parameter. Predicted returns of age-1.1, age-2.2, and age-2.3 sockeye salmon were calculated as the 1974–2009 mean return of that age class. Although harvest, escapement numbers, and age composition data have been available for Coghill Lake sockeye salmon runs since 1962, escapement numbers prior to installation of a full weir in 1974 are considered unreliable. Therefore, only data collected since 1974 were used to estimate model parameters, calculate individual age class forecasts, and generate 80% prediction intervals. An approximate 80% prediction interval for the total run forecast was calculated using the squared deviations between past forecast and actual run as the forecast variance (mean squared error):

$$\tilde{y} \pm t_{\alpha/2,n-1} \times MSE$$

Where $\tilde{y}$ is the forecast prediction from the linear regression model described above, t is the critical value, n is the sample size and MSE is the mean squared error.

The forecast of the natural run to Eshamy Lake is the mean of the runs from the second year in the 4-year cycle. Eshamy Lake escapement has been enumerated at a weir since 1950, except in 1987 and 1998. Commercial harvest data are available for the same period, but age composition data are available for only some years after 1962. Data collected since 1970, excluding 1987 and 1998, were used to calculate the forecast and the 80% prediction interval using the equation described for wild pink and chum salmon returns.

The PWS total run and common property harvest forecasts were calculated from the sum of Coghill and Eshamy lakes midpoint forecasts. The 80% prediction intervals were calculated as the sum of the point estimates plus/minus the square root of the sum of the squared differences between the individual point estimates and 80% prediction intervals for Coghill and Eshamy lakes.

Forecast Discussion

Beginning in 2004, the department stopped forecasting hatchery sockeye runs to Main Bay Hatchery because hatchery operators were already producing forecasts. Coghill Lake has very dynamic limnological characteristics that significantly impact the sockeye salmon population. Studies conducted in the mid 1980s and early 1990s indicated the lake may be zooplankton limited. As a result, the BEG midpoint was lowered in 1992 (from 40,000 to 25,000) to allow zooplankton populations to recover. Fertilizers were added to the lake (1993–1996) in a cooperative project with the U.S. Forest Service to improve the forage base for rearing sockeye salmon juveniles. In 2005, current data were reviewed and the midpoint escapement goal remained unchanged while the goal type was changed from a BEG to a SEG. Also, in 2002 the department began collecting limnological data to monitor basic lake characteristics. The Coghill Lake natural run escapement has been within or above the escapement goal range every year since 1995. If achieved, the 2010 total run forecast midpoint would rank as the 14th largest run since 1988.

The Eshamy Lake natural stock appears to exhibit a 4-year cycle. The 2010 run is the third year in the cycle. The Eshamy Lake natural stock is the largest natural stock contributor to CPF harvests of sockeye salmon in PWS outside of the Coghill District. The Eshamy Lake natural run has historically contributed to a substantial incidental harvest by the purse seine fishery in the Southwestern District. Although escapements into Eshamy River have been counted at a weir for 50 years, only periodic collection of age, sex, and size data has occurred for the Eshamy and Southwestern District CPF sockeye salmon harvests. Contributions to CPF harvests in western PWS of sockeye salmon produced by the Main Bay Hatchery have been estimated by recovery of coded wire tags and thermally marked otoliths. However, not all harvests can be adequately sampled, increasing the uncertainty of total run estimates for all natural and enhanced sockeye salmon stocks in western PWS. Age composition data and weir counts were not collected in 1987 and 1998 because of budget reductions. The on-going Eshamy River weir operation and thermal otolith marking of Main Bay Hatchery sockeye salmon should allow more accurate estimates of total Eshamy Lake natural runs.

The escapement goal for Eshamy Lake was reviewed in 2008 and the range was changed. The new BEG range is 13,000–28,000 (midpoint 20,500). The old range was 20,000–40,000.

Steve Moffitt, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Copper River
Species: Chinook Salmon

Preliminary Forecast of the 2010 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	49	22–75
Escapement Goal[a]	24 or greater	
Harvest Estimate[b]	25	0–51

[a] The spawning escapement goal of 24,000 is the minimum threshold of the SEG range. ADF&G intends to manage for the estimated long-term average escapement of 26,000.

[b] The maximum harvest by all fisheries (subsistence, personal use, sport, and commercial). Given the recent 5-year average exploitation rate, the commercial harvest would be about 17,000.

Forecast Methods

The 2010 Chinook salmon forecast is the previous 2-year (2008–2009) mean total run. The 80% prediction interval was calculated using the equation described for wild pink and chum salmon runs. The harvest forecast is the total run estimate minus the escapement threshold. Therefore, the harvest estimate is the maximum harvest estimate.

Forecast Discussion

The department did not generate a formal Chinook salmon total run forecast between 1998 and 2007 because of inadequate estimates of inriver abundance or spawning escapement. Forecasts made prior to 1998 used aerial survey indices adjusted to approximate the total escapement. These forecasts performed poorly, especially after the number of aerial surveys was significantly reduced in 1994. In 1999, ADF&G's Division of Sport Fish began a mark–recapture program to estimate the inriver abundance of Chinook salmon. The Native Village of Eyak became a collaborator on the project and eventually took the lead in its operation. There are currently 11 years (1999–2009) of inriver abundance estimates; however the 2009 estimate has not been finalized.

Forecast methods examined for the Chinook salmon forecast included: 1) a pseudo-sibling model using commercial harvest age data and inriver abundance estimated as the Miles Lake sonar count multiplied by the proportion of Chinook salmon in the Chitina Subdistrict personal use fishery (brood years 1977–2002), 2) a pseudo-sibling model using commercial harvest age data and inriver abundance data from the mark–recapture program (brood years 1993–2002), 3) the previous year's run size (most naïve method), and 4) mean total run size estimates (2-, 3-, 4-, and 5-year averages). The first pseudo-sibling model using log-transformed data produced good model fits for age 1.2 to predict age 1.3 ($P < 0.01$) and marginal fits for the model using age 1.3 to predict age 1.4 ($P = 0.07$). The pseudo-sibling model using only the last 9 years with mark–recapture estimates produced poor model fits for both age 1.2 to predict age 1.3 ($P = 0.69$) and age 1.3 to predict age 1.4 ($P = 0.08$). Additionally, retrospective forecasts using the pseudo-sibling models had MAPE greater than those from any of the mean run size models. Retrospective forecasts using a 2-year total run average had the lowest MAPE, and a lower standard deviation than all the other mean total run forecasts except the most naïve forecast (the previous year's run size). Therefore, the forecast for 2010 is the previous 2-year total run average.

The 2010 total run forecast point estimate is 31,000 below the 10-year average (2000–2009 average is 80,000). If realized, the 2010 forecast total run would be the second smallest since 1999 and only slightly larger than the preliminary estimate of the total run for 2009 (44,000).

Steve Moffitt, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	1,703	1,023–2,383
Escapement Goal[a]	530	
Common Property Harvest[b]	1,173	558–1,788
Hatchery And Supplemental Production		
PWSAC - Gulkana Hatchery		
Hatchery Run	471	283–659
Broodstock Needs	20	
Supplemental Escapement[c]	136	
Common Property Harvest[b]	315	150–480
Total Production		
Run Estimate	2,174	1,306–3,042
Natural Escapement Goal	530	
Broodstock Needs	20	
Supplemental Escapement[c]	136	
Common Property Harvest[d]	1,488	822–2,154

[a] The escapement goal of 530,000 is the historical average spawning escapement (361,000) of the upper Copper River (spawning escapement goal range 300,000–500,00) combined with the historical average Copper River delta aerial survey peak count times 2 (spawning escapement goal range 55,000–130,000). The average Copper River delta peak count of 84,500 is multiplied by 2 to adjust for surveyor efficiency, i.e., we assume surveyors count 50% of the total fish. No adjustment is made for freshwater residence time. Therefore, the escapement goal is 361,000 (upriver) + 84,500 × 2 (delta) = 530,000.

[b] Includes the harvests from commercial, subsistence, personal use, and sport fisheries.

[c] Hatchery production that will not be harvested to ensure that natural escapement to the upper Copper River is achieved, because natural stocks cannot sustain the higher exploitation levels of hatchery stocks.

[d] Includes the harvests from commercial, subsistence, personal use, and sport fisheries. The commercial common property harvest midpoint estimate is approximately 704,000.

Forecast Methods

Forecast methods for 2010 are similar to methods used since 1998. The forecast of natural sockeye salmon to the Copper River is the total of estimates for 6 age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2, age-1.3, and age-2.2 sockeye salmon. These 3 age classes were predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year (sibling model). For example, the model to predict the return of age-1.3 fish in 2010 used the return of age-1.2 fish in 2009 as the input parameter. The predicted return of age-1.1, age-0.3, and age-2.3 sockeye salmon were calculated as the 5-year mean return of those age classes. The total common property harvest forecast was calculated by subtracting the Gulkana Hatchery broodstock, hatchery surplus, and wild stock escapement goal needs from the total run forecast. The 80% prediction bounds for the total run and harvest forecast were calculated using the method described previously for Coghill Lake sockeye salmon except only the years 1983–2009 were used in the calculation of mean squared error.

Supplemental production from Gulkana Hatchery remote releases to Crosswind and Summit lakes was predicted using age specific smolt-to-adult survival estimates from brood years 1995–1998. The survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements. Supplemental production from Gulkana I and Gulkana II hatcheries was estimated from fry releases and a fry-to-adult survival of 1%. The run was apportioned to brood year using a maturity schedule of 13% age 4 and 87% age 5.

The average estimated exploitation rate (67%) for 2000–2009 was used to project the total harvest of Gulkana Hatchery stocks in 2010. The 80% prediction interval for the forecast of supplemental production was calculated using the mean square error estimate of the total run described above.

Forecast Discussion

Forecasts prior to 1998 relied on the relationship between number of spawners and subsequent returns, using return-per-spawner values for parent-year abundance similar to the dominant age class (age 5) of the forecast. Because average return-per-spawner values do not reflect recent production trends, and because returns are still incomplete from the most recent brood years, linear regressions of brood-year sibling returns were used to produce forecasts beginning in 1998. Additionally, more precise estimates of survival and contributions from supplemental production for individual brood years and release locations were available through coded wire tag recoveries in harvests and escapements for brood years 1995 to 1998.

Historical estimates of Gulkana Hatchery production prior to 1995 are considered imprecise. Improved contribution estimates for brood years from 1995 to 1998 indicate large contributions from supplemental production and smolt-to-adult survival estimates for Crosswind Lake releases that averaged about 20%. Fish marked with strontium chloride (Sr) began returning in 2003 (age 4) and the majority of the adult run (age 4 and age 5) was marked beginning in 2004. Fish from all release locations (Gulkana I and Gulkana II hatchery sites and Crosswind and Summit lakes) are now marked, but all fish have the same mark. We can estimate the total contribution of enhanced fish from all Gulkana Hatchery releases, but unless different marks for individual releases can be developed, future forecasts will be limited to using fry-to-adult survival estimates and estimated maturity schedules to forecast total enhanced production.

The 2010 run will be composed primarily of returns from brood years 2005 and 2006. Five-year-old fish (brood year 2005) are expected to predominate the Copper River delta and upper Copper River runs. The Miles Lake cumulative sonar counts for 2005 were above the minimum objective all season and totaled 854,268. The cumulative sonar count in 2006 (959,706) exceeded the maximum inriver objective by the end of the season; however, the cumulative count did not reach the minimum cumulative objective until June 2. The Copper River delta escapement index for 2005 (58,406) was well below the 1999–2008 average (80,128); however, the 2006 (98,896) index was well above the 1999–2008 average.

The Gulkana Hatchery run will include 5-year-old fish from the largest Crosswind Lake smolt outmigration (approximately 2.5 million) and 4-year-old fish from the fifth largest smolt outmigration between 1989 and 2008. The run will also include 4-year-old fish from the 10th largest Summit Lake smolt outmigration and 4-year-old fish from the third largest smolt outmigration.

The 2010 total run forecast is about 50,000 above the recent 5-year average (2.13 million). If realized, the 2009 forecast total run would be the 10th largest since 1980 and only slightly smaller than the 2005 total run. The 1.7 million natural run would be about 270,000 below the recent 20-year average (1990–2009) of 1.97 million, and a 470,000 Gulkana Hatchery run would be almost 3 times the 5-year (2005–2009) average of 170,000. The large natural forecast is driven by the large number of 4-year-old (age-1.2) fish in 2009 and the subsequent prediction for a large number of 5-year-old (age-1.3) fish in 2010. The large enhanced run forecast is driven by the large smolt outmigration from Crosswind Lake in 2007(approximately 2.5 million).

Steve Moffitt, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Upper Cook Inlet
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	3.6	2.3–5.8
Escapement	1.3	
Harvest Estimate	2.3	

Forecast Methods

The major sockeye salmon systems in UCI are the Kenai, Kasilof, Susitna, and Crescent Rivers, and Fish Creek. Spawner, return, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the run of sockeye salmon to UCI in 2010: 1) the relationship between adult returns and spawners, 2) the relationship between adult returns and fry, 3) the relationship between adult returns and smolts, and 4) the relationship between sibling adult returns. Several forecast models were evaluated for each stock and age class. Models providing the smallest mean MAPE between the forecasts and actual runs over the past 10 years were generally used. In most cases, these were sibling models.

The returns of age-1.3, age-2.2, and age-2.3 sockeye salmon to the Kenai River in 2010 were forecasted using sibling models. The sibling-model prediction for the return of age-1.3 sockeye salmon was based on the abundance of age-1.2 sockeye salmon in 2009. The reconstructed ocean abundances of Bristol Bay sockeye salmon was a significant covariate in this model. The nature of the relationship was consistent with the notion that competition for food between UCI and Bristol Bay sockeye salmon during the first 2 years of ocean rearing caused more UCI sockeye salmon to return at age 1.3 when Bristol Bay abundance was high. A spawner-recruit model was used to forecast the return of age-1.2 sockeye salmon to the Kenai River. Smolt models were used to forecast the returns of age-1.2, age-1.3 and age-2.2 sockeye salmon to the Kasilof River, but the return of age-2.3 sockeye salmon was forecasted using a sibling model.

The return of sockeye salmon to the Susitna River was forecasted using the recent 4-year average aggregate escapement into Judd, Shell, Chelatna, and Larson lakes expanded to the entire Susitna River watershed using 2006–2008 mark–recapture abundance estimates. The total run of Susitna River sockeye salmon to UCI was forecasted using the mean harvest rate estimated from genetic stock composition of the 2007–2008 commercial harvest.

The sockeye forecast for unmonitored systems in UCI was estimated as 5% of the aggregate forecast for the 5 major stocks. The fraction of the total run destined for unmonitored systems was estimated using genetic stock composition estimates from the commercial harvest. The total harvest by all user groups was estimated by subtracting the aggregate escapement from the total run forecast for all stocks. The aggregate escapement was estimated from the sum of the midpoints of the escapement goal ranges for each of the major sockeye salmon producing systems in UCI and the escapement into unmonitored systems (estimated as 5% of the aggregate escapement into monitored systems). The estimated sport harvest upstream of the sonar at river mile 19 on the Kenai River was subtracted from the aggregate escapement into monitored systems.

The forecast range was calculated by multiplying the forecast times the upper and lower values of the percent error of the actual runs from published forecast runs from 2000 through 2009.

Forecast Discussion

In 2009, the harvest of sockeye salmon by all user groups in UCI was 2.6 million, while the preseason forecast was 3.0 million. The lower-than-expected harvest in 2009 was largely due to a weak run to the Susitna River. In 2009, the total run was 2.4 million to the Kenai River, 817,000 to the Kasilof River, 196,000 to the Susitna River, 183,000 to the Crescent River, and 112,000 to Fish Creek. The forecasted run in 2009 was 2.4 million to the Kenai River, 822,000 to the Kasilof River, 669,000 to the Susitna River, 92,000 to the Crescent River, and 80,000 to Fish Creek.

A run of 3.6 million sockeye salmon is forecasted to return to UCI in 2010 with a harvest by all user groups of 2.3 million. The forecasted harvest in 2010 is about 1.7 million below the 20-year average harvest by all user groups of 4.0 million. The run forecast for the Kenai River is 1.7 million, which is 45% less than the 20-year average run of 3.1 million. Age-1.3 sockeye salmon typically comprise about 61% of the run to the Kenai River. The age-1.3 sockeye salmon returning in 2010 are the progeny from an overescapement (1.1 million) in 2005. A sibling model based upon the return of age-1.2 sockeye salmon in 2009 (86,000; 20-year average: 238,000) predicted a return of 1.0 million age-1.3 sockeye salmon. A fry model based upon the abundance of fry rearing in Skilak and Kenai lakes in the fall of 2006 (29.6 million; 20-year average: 18.5 million) predicted a return of 2.5 million age-1.3 sockeye salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (27%) than the fry model (55%). Age-2.3 sockeye salmon typically comprise about 16% of the run to the Kenai River. A sibling model based upon the return of age-2.2 sockeye salmon in 2009 (179,000; 20-year average: 190,000) predicted a return of 317,000 age-2.3 sockeye salmon in 2010. The forecasted return is 42% less than the 20-year average return for this age class. The predominant age classes in the 2010 run should be age-1.3 (57%) and age 2.3 (17%). he 10-year MAPE for the set of models used for the 2010 Kenai sockeye salmon run forecast was 29%.

The sockeye salmon run forecast for the Kasilof River is 901,000, which is 6% less than the 20-year average run of 958,000. Age-1.3 sockeye salmon typically comprise about 36% of the run to the Kasilof River. The forecast for age-1.3 sockeye salmon is 324,000, which is 7% less than the 20-year average return (348,000) for this age class. A smolt model based upon the abundance of age-1 sockeye salmon smolts in 2007 was used to forecast the return of age-1.3 sockeye salmon in 2010. The abundance of age-1 smolts in 2007 was 3.1 million, which is 28% less than the 20-year average abundance (4.3 million) for this age class. A sibling model predicted a return of 282,000 age-1.3 sockeye salmon. The smolt model was used for this forecast because the 10-year MAPE was lower for the smolt model (19%) than the sibling model (22%). Age-1.2 sockeye salmon typically comprise about 29% of the run. The forecast for age-1.2 sockeye salmon is 281,000, which is equal to the 20-year average return for this age class. A smolt model based upon the abundance of age-1 smolts (3.3 million) in 2008 was used to forecast the return of age-1.2 sockeye salmon in 2010. However, there is uncertainty in the age-1.2 forecast because the sibling model forecasted a return of 558,000. The smolt model was used for this forecast because the 10-year MAPE was lower for the smolt model (43%) than the sibling model (50%). Age-2.2 sockeye salmon typically comprise about 22% of the run. The forecast for age-2.2 sockeye salmon (169,000), is 21% less than the 20-year average return (213,000) for this

age class. A smolt model based upon the abundance of age-2 smolts in 2008 was used to forecast the return of age-2.2 sockeye salmon in 2010. The abundance of age-2 smolts in 2008 was 1.1 million, which is 35% less than the 20-year average abundance (1.7 million) for this age class. The predominant age classes in the 2010 run should be age-1.2 (31%), age-1.3 (36%), and age-2.2 (19%). The 10-year MAPE for the set of models used for the 2010 Kasilof sockeye salmon run forecast was 22%.

The sockeye salmon run forecast for the Susitna River is 542,000, which is 41% less than the 20-year average run of 913,000. This forecast was derived from historical aggregate weir counts rather than sonar and age composition allocation models, because recent mark–recapture studies have shown that the Yentna sonar project underestimated sockeye salmon escapement causing estimates of adult returns to also be underestimated. Since this is the first year a weir-based method has been used, no MAPE can be estimated. The 20-year average run was calculated by expanding sonar abundance estimates using mark–recapture and genetic stock composition estimates.

The sockeye salmon run forecast for Fish Creek is 142,000, which is 2% greater than the 20-year average run of 139,000. Age-1.2 and age-1.3 sockeye salmon typically comprise 77% of the run to Fish Creek. Sibling models based upon the abundances of age-1.1 and age-1.2 sockeye salmon in 2009 were used to forecast the runs of age-1.2 (90,000) and age-1.3 (26,000) sockeye salmon in 2010. The age-1.2 forecast is 31% greater than the 20-year average return (68,000) for this age class, while the age-1.3 forecast is 33% less than the 20-year average return (38,000). The predominant age classes in the 2010 run should be age-1.2 (63%), age-1.3 (18%), and age-2.2 (13%).

The sockeye salmon run forecast for Crescent River is 148,000, which is 47% greater than the 20-year average run of 101,000. Age-1.3 and age-2.3 sockeye salmon typically comprise 76% of the run to Crescent River. Sibling models based upon returns of age-1.2 and age-2.2 sockeye salmon in 2009 were used to forecast returns of age-1.3 (82,000) and age-2.3 (48,000) sockeye salmon in 2010. The predominant age classes in the 2010 run should be age-1.3 (55%) and age-2.3 (32%).

Forecast runs to individual freshwater systems are as follows.

System	Run	Inriver Goals
Crescent River	148,000	30,000–70,000
Fish Creek	142,000	20,000–70,000
Kasilof River	901,000	150,000–250,000
Kenai River	1,672,000	650,000–850,000
Susitna River	542,000	
• Larson Lake	NA	15,000–50,000
• Chelatna Lake	NA	20,000–65,000
• Judd Lake	NA	20,000–55,000
Minor Systems	170,000	NA
Total	3,575,000	

Mark Willette, Research Project Leader, Upper Cook Inlet

Forecast Area: Upper Cook Inlet
Species: Other Salmon Species

Preliminary Forecast of the 2010 Commercial Harvest

Natural Production	Forecast Estimate (thousands)
Pink Salmon	305
Chum Salmon	70
Coho Salmon	179
Chinook Salmon	17

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2010. The forecast for pink salmon was based upon the average harvest during the past 5 even-numbered years.

Forecast Discussion

The recent 5-year average commercial harvest was used in the forecast, because regulatory changes have substantially restricted harvests of these species in recent years.

Mark Willette, Research Project Leader, Upper Cook Inlet

Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary forecast of the 2010 run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	1,344	550–1,580
Escapement	346	124–565
Commercial Harvest	567	423–1,015

Note: Columns may not total exactly due to rounding to the nearest thousand fish.
Note: Commercial Harvest is Total Run–Escapement.
Note: Additional harvests may be expected from systems not included in the forecast.

Forecast Methods

The forecast of wild pink salmon runs to 10 harvest areas in the LCI Management area was based on a logarithmic regression of total run and escapement from 38 to 44 years of observations. The total run forecast for LCI natural production was the sum of the 10 individual harvest area forecasts. Upper and lower bounds around the total run forecast, however, were derived by multiplying the forecast times the upper and lower values of the percent error ([actual return-forecast return]/actual return) observed during the previous 10 years (excluding 2004). Forecasted commercial harvest ranges were obtained by subtracting corresponding escapement goals from the upper and lower bounds of the forecast range. The forecasted aggregate escapement was the sum of mid-points from the individual escapement goals. The total forecasted commercial harvest was the total run minus the aggregated escapement.

Forecast Discussion

Because pink salmon exhibit a 2-year life cycle, comparisons of run size are typically stratified by odd and even years to account for dominance of one line over the other. In LCI, dominance of one line is typically short-lived, lasting from 2 to 6 generations, before the opposing line becomes dominant. Despite the relative parity between odd- and even-year pink salmon returns in LCI over broad time scales, we continue to stratify run size comparisons by odd and even years to account for the short-term dominance cycles.

In 2008, the last even-numbered year, all 10 forecasted systems had runs within the forecast range. The 2010 forecast for natural production of 913,000 pink salmon has a forecast range of 550,000 to 1.58 million. Strong parent-year escapements in 2008 and reasonably good spawner-return ratios in recent years suggest there is a good likelihood of reaching the point estimate of this forecast range. If realized, a natural pink run of 913,000 would be 7.5% higher than the mean run size of 849,000 for even-year returns between 1962 and 2008. The pink cumulative escapement goal is 346,000 (range 127,000–565,000) for systems with a forecast. If the total run comes in as forecasted for all index streams, the mid-point of the cumulative escapement goal range should be met.

Four districts make up the LCI management area. The harvestable surplus of naturally produced pink salmon in the Southern District is projected to be 106,000, with 57,000 coming from Humpy Creek, 35,000 from Seldovia Bay, and the balance from Port Graham River. Pink salmon

are no longer being produced by hatcheries in LCI, so there will not be a supplemental harvest of enhanced pink salmon in 2010.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 395,000, with over 55% (218,000) of the harvest expected to occur in the Port Dick subdistrict. If realized, the Port Dick harvest would be slightly less than the mean even-year catch since 1962. The next largest harvest is projected to occur in Windy Bay (90,000), while smaller harvests (10,000–65,000) are anticipated from Port Chatham, Nuka Island, and Rocky Bay.

No pink salmon harvest is expected from the Eastern District in 2010. Commercial fishing specifically directed at pink salmon has not been allowed in the Eastern District in recent years due to a combination of erratic production and potential conflicts with the Resurrection Bay Salmon Management Plan, which limits commercial interference with the sport coho salmon fishery.

In the Kamishak Bay District, the number of naturally produced pink salmon available for harvest is projected to be 65,000, over 68% of which is expected to occur in the Bruin Bay subdistrict. If realized, the Bruin Bay harvest of 45,000 would be similar to the mean even-year catch since 1962 for this index area. A small harvestable surplus of 21,000 is also projected from Ursus and Rocky coves. However, low market value and lack of tender service and available buyers have limited the incentive to harvest pink salmon in the Kamishak District in recent years.

Edward O. Otis, Area Finfish Research Biologist, Homer
Lee F. Hammarstrom, Area Finfish Management Biologist, Homer

Forecast Area: Kodiak
Species: Pink Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
KMA Wild Stock Total Run	9.2	7.9 – 10.8
KMA Escapement Goal	3.5	2.0 – 5.0
KMA Wild Stock Harvest	5.7	4.4 – 7.3
Kitoi Bay Hatchery Harvest[a]	5.7	4.1 – 7.2
Total KMA Pink Salmon Harvest	11.4	8.5 – 14.4

Note: Column numbers may not total or correspond exactly with numbers in text due to rounding.

[a] This figure is the total expected return (6.0 million) minus the broodstock collection goal of 350,000; the Kitoi Bay Hatchery cost recovery harvest is expected to be roughly 1.0–1.5 million

The 2010 KMA predicted pink salmon harvest is expected to be in the Weak to Average category with a point estimate of 11.4 million (8.5–14.4 million) combining the wild stock and Kitoi Bay Hatchery harvest estimates. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest in the KMA from 1980 to 2009 and will be used to determine the length of initial fishing periods.

Total KMA Harvest Category	Range (millions)	Percentile
Poor	Less than 7.0	Less than 20th
Weak	7.0 to 10.6	21st to 40th
Average	10.6 to 15.2	41st to 60th
Strong	15.2 to 22.6	61st to 80th
Excellent	Greater than 22.6	81st to 100th

Forecast Methods

The KMA wild stock pink harvest forecast is derived from a total run forecast minus the mid-point (3.5 million) of the KMA escapement goal range. The total run estimates were derived from a combination of Karluk and Ayakulik weir counts, aerial survey indices, and harvest estimates.

For the 2010 KMA wild stock pink salmon forecast, a generalized Ricker model (Quinn and Deriso 1999[b]) was fit to the even-year KMA returns from 1980 to 2008 utilizing Karluk and Ayakulik rivers pink salmon escapement counts for the spawner index. Four additional terms were included in this generalized Ricker model: 1) KMA pink salmon indexed escapement (total escapement minus Karluk and Ayakulik escapement) of brood year, 2) November–February average air temperature anomalies, 3) November–February total precipitation divided by the variance (analogous to the Sharpe ratio) anomalies, and 4) June–July average air temperature anomalies (Figure G1).

[b] Quinn II, T. J. and R. B. Deriso. 1999. Quantitative fish dynamics. Oxford University Press. New York, NY.

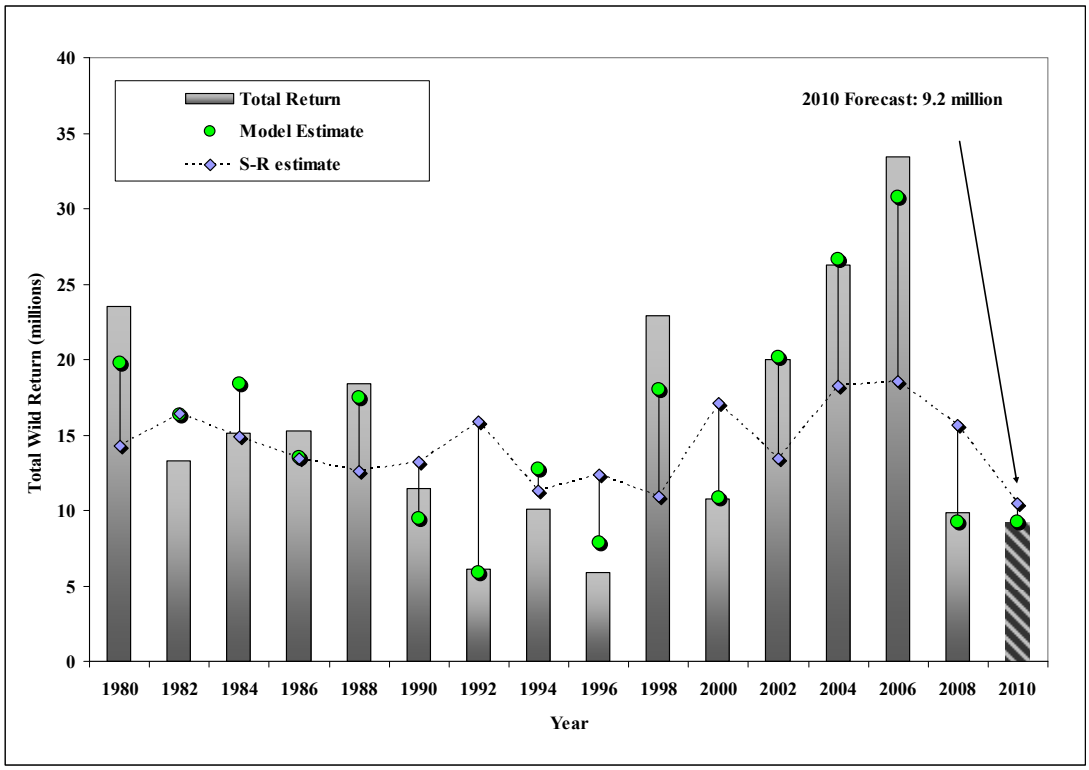

Figure E1.–Kodiak even-year pink salmon wild stock total return compared to spawner-recruit and generalized Ricker model (hindcast) estimates, from 1980 to 2008, and 2010 forecast.

This generalized model assumes that these environmental conditions affect the survival at early life history stages of pink salmon and thus were lagged to time of gravel residence (November–February) and near shore migration (June–July) of returning salmon. All environmental variables displayed a positive effect on total pink salmon return and the overall strength of the model was excellent ($R^2 = 0.93$; $P = 5.2 \times 10^{-5}$). Environmental conditions were estimated from Kodiak Airport (PADQ) climate observations. In constructing and evaluating the regression model, standard regression diagnostic procedures were used. Based on the generalized Ricker model, 80% prediction intervals were estimated.

The 2010 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survivals from even brood years 1994 through 2006, when releases from the facility were in excess of 100 million fry. Brood years 1996 through 2006 are particularly important to the forecasting model because all pink fry were released on the same day in order to saturate the release area with fry (predator satiation).This release strategy has proven to significantly improve fry to adult survival.

The pink return to Kitoi Bay Hatchery is an odd-year dominant return, but does experience an average strength even-year return every fourth year, which will occur in 2010. The total return estimate of 6.0 million reflects a marine survival of 3.88% and is an average of the previous 4 cyclical returns (2006, 2002, 1998 and 1994).

Forecast Discussion

The 2010 KMA wild stock pink salmon total run (9.2 million) will be below average but similar to 2008. Environmental conditions used in the model affecting the early life survival of the 2010 pink salmon run were below average but not as poor as those conditions affecting the 2008 return; however, the 2008 indexed pink salmon escapement estimate of 3.2 million is the lowest in the even-year time series back to 1980. The prediction of a Weak-Average wild stock total run is corroborated by ancillary information provided by the department's 2009 Arnie Shaul Memorial pink salmon fry abundance index estimated in Kodiak area harbors. Arnie Shaul worked as an Alaska Department of Fish and Game Area Management Biologist on the Alaska Peninsula from 1973 until 2005 and often predicted pink salmon abundance based on prior-year pink fry indices estimated in the nearshore waters. Confidence in the 2010 forecast estimate is good due to the strength of the wild stock model.

The 2010 Kitoi Bay Hatchery pink salmon production is expected to be 6.0 million. The broodstock collection goal is 350,000 million, resulting in a total hatchery harvest projection of about 5.7 million. The Kodiak Regional Aquaculture Association Board of Directors has yet to set a cost recovery goal for 2010, but it is estimated that 1.0–1.5 million will be harvested in the cost recovery fishery. In 2009, 153.7 million fry were released at an average size of 0.67 grams, which in terms of number of fry, was one of the largest in recent years. Saltwater temperatures trended cool early in the season and then increased rapidly later in the rearing period, which resulted in excellent fry growth despite a late emergence.

This forecast level should allow an initial weekly fishing period length of 57 hours (2½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2010). By the third week of July, fishing time likely will be restricted, by section or district, to ensure escapement goals will be met.

M. Birch Foster, Finfish Research Biologist, Kodiak
Drew Aro, Kitoi Bay Hatchery Manager, Afognak

Forecast Area: Kodiak, Spiridon Lake
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	176	133–220
Escapement Goal	0	
Harvest Estimate	176	133–220

Forecast Methods

The 2010 Spiridon Lake sockeye forecast was prepared primarily by investigating simple linear regression models utilizing 1992–2007 outmigration-to-return relationships for 2 age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-2.2 ($R^2 = 0.89$; $P = 4.4 \times 10^{-8}$) fish were predicted from age-2 smolt outmigration abundance (1992–2007) and age-1.3 fish ($R^2 = 0.85$; $P = 0.009$) were predicted from age-1 smolt outmigration abundance (recent 6 years). Age-1.2 fish were predicted by the median percent return based on age-1 outmigration abundance during the last 6 years. All other age classes were estimated by summing the age classes (0.2, 1.1, 0.3, 2.1, 3.1, 1.4, 2.3 and 3.2) by return year (1996–2009) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and median age class estimates. When the median return by age class was used, prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

Sockeye salmon are prevented from returning to Spiridon Lake because barrier falls block upstream migrations in the outlet creek (Telrod Creek). Therefore, all returning adult sockeye salmon are available for harvest, primarily in the Central Section of the Northwest Kodiak District and in the Spiridon Bay SHA in Telrod Cove. The 2010 forecast (176,000) is 7,000 less than the 2009 forecast (183,000) and 21,000 more than the actual 2009 run estimate (155,000). The 2010 run should be composed of approximately 61% age-2.2 and 25% age-1.3 fish. Confidence in this forecast is good due to the strength of the regression models. If realized, this run will be about 70,000 less than the recent 10-year average (2000–2009) run of 247,000. The peak of the Spiridon Lake sockeye salmon run timing through the Westside fishery will be during the month of July.

M. Birch Foster, Finfish Research Biologists, Kodiak

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	670	478–862
Escapement Goal	250	200–500
Harvest Estimate	420	

Forecast Methods

The 2010 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing outmigration year saltwater age class relationships. The Ayakulik sockeye salmon run tends to peak every 3 years (e.g., 2001, 2004, and 2007), thus only peak-year predictors were used in this year's forecast analysis. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-.2 sockeye salmon were predicted from prior year age-.1 returns ($R^2 = 0.85$; $P = 0.0009$) using only recent outmigration years (1990–2007). The age-.3 sockeye salmon were predicted from prior year age-.2 returns ($R^2 = 0.36$; $P = 0.09$) using outmigration years from 1980 to 2006. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return (last 13 years) and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2010. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% confidence intervals for each age class forecasted.

Forecast Discussion

The 2010 Ayakulik forecast (670,000) is 386,000 more than the 2009 forecast (284,000) and about 284,000 more than the actual 2009 run estimate of 386,000. The 2010 run should be composed of approximately 59% age-.2 and 39% age-.3 fish. If realized, this run will be 335,000 more than the recent 10-year average (2000–2009) and the largest since 1999. The Ayakulik sockeye salmon 3-year cycle of dominance historically has demonstrated roughly 70% stronger returns during peak years than other years; the 2010 run will represent the next peak in the cycle corroborating the strong forecast. The confidence in the 2010 Ayakulik forecast is good, due to the strong regression relationships. The projected harvest of 420,000 is based on the escapement of 250,000.

M. Birch Foster, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Karluk Lake (Early Run)
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	205	170–241
Escapement Goal	150	110–250
Harvest Estimate	55	

Forecast Methods

The 2010 Karluk Lake early-run sockeye salmon forecast was prepared by investigating one simple linear regression model and 3 Ricker curve relationships utilizing recent brood year (1979–2005) sibling relationships for 4 age groups. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. The prediction estimate from the regression model was only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-1.3 fish were predicted from age-1.2 siblings ($R^2 = 0.73$; $P > 1.1 \times 10^{-7}$). Age-2.3 fish were predicted using Ricker curves from age-2.2 siblings, and age-3.3 fish were predicted using Ricker curves from age-3.2 siblings. Age-.2 fish (ages 0.2, 1.2, 2.2, 3.2, and 4.2) were predicted using a Ricker curve from age-.1 fish (ages 1.1, 2.1, 3.1, and 4.1). All remaining age classes were estimated by summing 12 minor age class run estimates (ages 1.1, 0.3, 2.1, 0.4, 3.1, 1.4, 4.1, 2.4, 2.5, 3.4, 4.3 and 4.4) by year (1985–2009) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Using the variances of the models, 80% prediction intervals for the regression and Ricker curve estimates were calculated. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2010 forecast of 205,000 is about 99,000 more than the 2009 forecast (304,000) and about 136,000 more than the actual 2009 run estimate of 69,000. The 2010 run should be composed of approximately 75% age-.2 fish and 19% age-.3 fish. If realized, this run will be 311,000 less than the recent 10-year average (2000–2009) run of 516,000. The projected harvest of 55,000 is based on achievement of the mid-point of the escapement goal range (150,000). Age-2.2 fish were the dominant age class for 9 straight years prior to 2007 season and are historically the dominant age class. In 2009, all age classes returned a lower-than-expected levels. Most notably, the age-.2 fish returned at only one quarter of what was expected.

Due to the unanticipated extremely weak 2009 run, our confidence in this forecast is fair.

Mark Witteveen, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Karluk Lake (Late Run)
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	710	296–1,120
Escapement Goal	270	170–380
Harvest Estimate	440	

Forecast Methods

The 2010 Karluk Lake late-run sockeye salmon forecast was prepared by investigating simple linear and multiple regression models utilizing recent brood year (1980–2004) alternative sibling relationships, temperature indices, parent-year escapement, and calculating median returns. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). A significant alternative sibling regression relationship was employed to estimate the age-3.2 component of the run from age-2.2 sockeye salmon 2009 returns. A significant multiple regression relationship was employed to estimate the age-2.2 age class using a Kodiak summer air temperature index from 1986 to 2006 during the first summer of lake residence and the average of the parent-year escapement and escapement immediately prior to the parent year as predictors. Both the summer air temperature and parent-year escapement had a negative correlation with the age-2.2 returns ($R^2 = 0.62$; $P = 2.6 \times 10^{-4}$). A significant regression relationship was employed to estimate the age-.3 classes using a Kodiak summer air temperature index from 1980 to 2004 during the first summer of lake residence as a predictor. The age-.3 returns were also negatively correlated with summer temperature ($R^2 = 0.23$; $P = .01$). The age-3.2 fish were predicted from their age-2.2 siblings ($R^2 = 0.15$; $P = 0.06$). All remaining age classes were estimated by summing 13 minor age class run estimates (ages 0.1, 0.2, 1.1, 1.2, 2.1, 0.4, 3.1, 1.4, 2.4, 2.5, 4.2, and 3.4) by year (1989–2009) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2010 forecast of 710,000 is about 238,000 more than the 2009 forecast (472,000) and about 380,000 more than the actual 2009 run estimate of 330,000. The 2010 run should be composed of approximately 50% age-2.2, 24% age-3.2, and 22% age-.3 fish. If realized, this run will be 38,000 less than the recent 10-year average (2000–2009) of 749,000. The projected harvest of 440,000 is based on achievement of the mid point of the escapement goal range (270,000). Age-2.2 fish have been the dominant age class historically, but were in unexpectedly low abundance in 2006 through 2008 and extremely low in abundance in 2009.

This low abundance appears to be at least in part due to poor freshwater rearing conditions. The predictors for the 2010 age-2.2 component indicate a significant improvement, but poor freshwater growth will remain a significant factor and the 2010 age-2.2 forecast may be high. The higher-than-expected 2009 run of age-3.2 fish is further evidence of poor freshwater rearing conditions as what may normally have been age-2.2 fish reared in the lake an additional year and returned instead as age 3.2. Since there is rarely a negative relationship at Karluk Lake between the age-2.2 component in a given year and the subsequent age-3.2 fish the next year (as occurred in 2008/2009), our confidence in the 2010 predicted run of age-3.2 fish is fair. The Karluk late run continues to be difficult to forecast due to very few significant sibling relationships.

Mark Witteveen, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Frazer Lake (Dog Salmon Creek)
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	258	64–452
Escapement Goal	125	95–190
Harvest Estimate	133	

Forecast Methods

The 2010 Frazer Lake (Dog Salmon Creek) sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent years (post Frazer Lake fertilization) saltwater age class relationships; however, mostly median estimates were used. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-.2 sockeye salmon were predicted from prior year age-.1 (jacks) returns ($R^2 = 0.78$; $P = 2.9 \times 10^{-5}$) using the 1994–2008 outmigration years. Using the variances of the regression models, 80% prediction intervals for the regression estimate were calculated. The age-.1, age-.3, and age-.4 sockeye salmon were predicted by calculating the median return (post-fertilization) and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Frazer sockeye salmon run for 2010. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% confidence intervals for each age class forecasted.

Forecast Discussion

The 2010 Frazer Lake forecast of 258,000 is 143,000 less than the 2009 forecast (401,000) and about 217,000 less than the actual 2009 run estimate of 475,000. The 2010 run should be composed of approximately 55% age-.3 and 32% age-.2 fish. If realized, this run will be 126,000 less than the recent 10-year average (2000–2009) run of 384,000. Overall, the confidence in the 2010 Frazer Lake forecast is fair due to the number of median estimates used and large confidence interval. The projected harvest of 133,000 is based on the achievement of 125,000 through the Dog Salmon Creek weir. The targeted escapement is the Frazer Lake S_{MSY} estimate of 105,000 plus an additional 20,000 to account for the typical natural mortality (e.g., bear predation) occurring between the 2 weirs.

M. Birch Foster, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Upper Station (Olga Lakes, Early Run)
Species: Sockeye Salmon

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	91	34–147
Escapement Goal	48	30–65
Harvest Estimate	43	

Forecast Methods

The 2010 Upper Station early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year saltwater age class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-.2 sockeye salmon were predicted from prior year age-.1 returns ($R^2 = 0.56$; $P = 2.2 \times 10^{-4}$) using the 1989 to 2008 outmigration years. The age-.3 sockeye were predicted from prior year age-.2 returns ($R^2 = 0.42$; $P = 2.6 \times 10^{-3}$) using the 1988 to 2007 outmigration years. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return (1990–2009) and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon early run for 2010. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% confidence intervals for each age class forecasted.

Forecast Discussion

The 2010 Upper Station early-run forecast of 91,000 sockeye salmon is 13,000 less than the 2009 forecast (104,000) and about 10,000 more than the actual 2009 run estimate of 81,000. The 2010 run should be composed of approximately 65% age-.2 and 31% age-.3 fish. If realized, this run will be 21,000 less than the recent 10-year average (2000–2009) run of 111,000. Overall, the confidence in the 2010 Upper Station early-run forecast is good; however, residual trends in the age-.2 predictor regression suggest the run will fall in the lower part of the range. The projected harvest of 43,000 is based on achievement of the mid-point (48,000) of the escapement goal range.

M. Birch Foster, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Upper Station (Olga Lakes, Late Run)
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	399	204–595
Escapement Goal	186	120–265
Harvest Estimate	213	

Forecast Methods

The 2010 Upper Station late-run sockeye salmon forecast was prepared primarily by investigating regression models utilizing recent outmigration year saltwater age class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-.2 sockeye salmon were predicted from prior year age-.1 returns ($R^2 = 0.62$; $P = 0.001$) using the 1995–2007 outmigration years assuming a Ricker relationship. The age-.3 sockeye were predicted from prior year age-.2 returns ($R^2 = 0.66$; $P = 7.6 \times 10^{-4}$) using the 1994–2006 outmigration years assuming a linear relationship. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return (1996–2009) and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon late run for 2010. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% confidence intervals for each age class forecasted.

Forecast Discussion

The 2010 Upper Station late-run forecast of 399,000 is 72,000 more than the 2009 forecast (328,000) and about 50,000 more than the actual 2009 run estimate of 349,000. The 2010 run should be composed mostly of age-.2 fish (86%). If realized, this run will be 100,000 more than the recent 10-year average (2000–2009) run of 300,000. Overall, the confidence in the 2010 Upper Station late-run forecast is good due to the strength of the age-.2 sockeye relationship which comprises the majority of the run. The projected harvest of 213,000 fish is based on the achievement of the S_{MSY} estimate (186,000).

M. Birch Foster, Finfish Research Biologist, Kodiak

Forecast Area: Chignik
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run (Black Lake)	Total Run Estimate	1,080	373–1,790
	Escapement Goal	350	350–400
	Harvest Estimate[a]	730	
Late Run (Chignik Lake)	Total Run Estimate	1,110	646–1,570
	Escapement Objective[b]	250	250–400
	Harvest Estimate[a]	857	
Total Chignik System	Total Run Estimate	2,190	1,019–3,360
	Escapement Objective[b]	600	600–800
	Harvest Estimate[a]	1,590	

Note: Column numbers may not total or correspond exactly with numbers in text due to rounding.

[a] These figures include harvests of Chignik-bound sockeye salmon from the Southeastern District Mainland and the Cape Igvak fisheries; approximately 1.3 million sockeye salmon are projected to be harvested in the Chignik Management Area.

[b] The Chignik Lake late-run escapement goal is 200,000–400,000, resulting in an escapement goal for the entire run of 550,000–800,000. However, managers try to achieve an additional inriver run goal of 50,000 in August and September.

Forecast Methods

The forecasts for the 2010 early and late Chignik sockeye salmon runs were based on available data from 1977 to the present. Simple linear regressions were modeled using recent outmigration year saltwater age class relationships. Each regression model was assessed with standard regression diagnostic procedures. Regression estimates were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The variance of each estimate was calculated from the error structure of the regression. Regression analyses were examined for serial autocorrelation.

The predicted 2010 early-run age-.3 (ages 0.3, 1.3, 2.3, 3.3, and 4.3) sockeye returns were estimated based on the abundance of prior age-.2 (ages 0.2, 1.2, 2.2, and 3.2; $R^2 = 0.55$; $P = 1.6 \times 10^{-5}$). Following non-significant regression results, the early-run age-.1 (ages 0.1, 1.1, 2.1 and 3.1), age-.2 (ages 0.2, 1.2, 2.2, and 3.2), age-.4 (ages 0.4, 1.4, 2.4, and 3.4), and age-.5 (age-1.5 and age-2.5 fish) components were predicted by calculating the median returns since 1981 outmigration year. Saltwater age class and cumulative precipitation relationships were analyzed for the late-run forecast. The age-.2 sockeye salmon were predicted from prior year's age-.1 returns using simple linear regression, ($R^2 = 0.42$; $P = 2.6 \times 10^{-4}$). Returns of age-.3 sockeye salmon were predicted from an index of total cumulative winter precipitation. The age-.3 sockeye returns were negatively correlated with winter precipitation ($R^2 = 0.27$; $P = 0.02$). The summation of precipitation data from October through April of the winter prior to the outmigration year were obtained from the Cold Bay Airport climate database. The age-.4 sockeye salmon were predicted from age-.3 returns using simple linear regression ($R^2 = 0.13$; $P = 0.08$). The age-.1 and age-.5 sockeye age classes were predicted by calculating the median returns.

The variances associated with individual regression estimates by age class were used to calculate 80% prediction intervals for those estimates. Prediction intervals were re-estimated utilizing the standard error from a regression of the residuals when serial autocorrelation was detected. Prediction intervals for median estimates were calculated using the 10th and 90th percentiles of the returns. For each run (early and late), the overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each forecasted age class. The early- and late-run regression and median estimates were summed to estimate the total Chignik watershed sockeye salmon run for 2010. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the 2 runs.

Forecast Discussion

The 2010 sockeye salmon run to the Chignik River is expected to be approximately 2.19 million. The early run is expected to be approximately 1.08 million. The late run is expected to be approximately 1.11 million. The 2010 Chignik sockeye salmon run is expected to be approximately 158,000 more than the recent 10-year average run (2.03 million) and 90,000 more than the 2009 run (2.10 million).

The projected harvest estimate for the early run of 730,000 is based on achievement of the lower end of the early-run escapement goal range of 350,000. The projected harvest estimate for the late run of 857,000 is based on achievement of the lower end of the late-run inriver run goal range through September 15 (250,000). Harvest estimates for the both runs include Chignik-bound sockeye salmon harvested in the Cape Igvak Section of the Kodiak Management Area and the Southeastern District Mainland of the Alaska Peninsula Management Area.

Available smolt data were analyzed and a significant simple linear regression relationship (R^2 = 0.62; P = 0.002) was found using the number of outmigrating age-2. smolt to predict the subsequent age-.3 adult returns (about 82% of the run). This estimate was then expanded proportionally to account for other ages (age-.1, -.2, -.4, and age-.5). The smolt-based forecast of the 2010 Chignik total sockeye salmon run is 1.54 million, which is less (700,000) than that predicted from ocean-age relationships and median estimates (2.19 million).

The smolt forecast approximates the median and ocean-age class forecasts. Given this ancillary information, our confidence in this forecast is fair.

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Forecast Area: Bristol Bay
Species: Sockeye Salmon

Forecast of the 2010 Run

Total Production	Forecast (millions)	Forecast Range (millions)
Total Run	39.77	36.26–49.83
Escapement	8.01	
Commercial Common Property Harvest	31.76	
Bristol Bay Harvest	30.53	
South Peninsula Harvest	1.23	

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2010 is the sum of individual predictions for 9 river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak rivers) and 4 age classes (ages 1.2, 1.3, 2.2, and 2.3, plus ages 0.3 and 1.4 for Nushagak River). Adult escapement and return data from brood years 1976 to 2006 were used in the analyses.

Predictions for each age class returning to a river system were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models also included simple linear regression and recent year averages. All models were evaluated for time series trends. Models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2007 through 2009.

The forecast range was the upper and lower values of the mean percent error (MPE) of actual runs from published run predications. The confidence bounds were calculated by multiplying the forecast times the upper and lower MPE for the 2001 through 2009 runs, using deviations of actual runs from published run predictions for the 2001 through 2008 runs.

Forecast Results

A total of 39.77 million sockeye salmon are expected to return to Bristol Bay in 2010. This prediction is 13% higher than the previous 10-year mean of total runs (35.30 million; range of 17.83–46.04 million). The forecast range is from 36.26 to 49.83 million. All systems are expected to exceed their minimum spawning escapement goals.

A run of 39.77 million sockeye salmon can potentially produce a total harvest of 31.76 million if escapement goals are met for managed stocks and industry is capable of taking the surplus. The projected harvest includes 30.53 million in Bristol Bay and 1.23 million in the South Peninsula fisheries. A Bristol Bay harvest of 30.53 million would be 34% higher than the previous 10-year mean harvest (22.74 million; range of 10.66–30.90 million).

The run forecast to each district and river system is 13.00 million to Naknek-Kvichak District (3.84 million to Kvichak River; 1.79 million to Alagnak River; 7.37 million to Naknek River); 10.63 million to Egegik District; 4.50 million to Ugashik District; 10.61 million to Nushagak

District (6.18 million to Wood River; 2.32 million to Nushagak River; 2.11 million to Igushik River) and 1.03 million to Togiak District (Table G1) .

The 2010 inshore run forecast to the Kvichak River is 3.84 million with a projected harvest of 1.84 million (1.72 million in Bristol Bay and 0.12 million in South Peninsula). The harvest projection is based upon an escapement goal minimum of 2 million sockeye. The recommended escapement goal range is 2–10 million with a 50% harvest rate.

The total run forecast of 39.77 million sockeye salmon is expected to be comprised of 15.49 million age-1.3 fish (39%) followed by 11.73 million age-1.2 fish (29%), 6.37 million age-2.2 fish (16%), 6.05 million age-2.3 fish (15%), 0.011 million age-0.3 fish (<1%) and 133,000 age-1.4 fish (<1%) (Table G1).

Forecast Discussion

Similar methods have been used to produce the Bristol Bay sockeye salmon forecast since 2001. These forecast methods have performed fairly well when looking at the overall Baywide forecast. There has been a tendency for the forecasts and projected harvests to be biased low in recent years. The forecast in 2009 was 19% below the total run, and the forecasts since 2001 have averaged 11% below the actual total run. The run forecast differences have ranged from 26% below actual run in 2007 to 9% above actual run in 2001, and the expected harvests have averaged 2% below actual harvest since 2001. The expected harvest differences have ranged from 22% below actual harvest in 2009 to 28% above actual harvest in 2004.

There is a much greater amount of uncertainty in our forecasts of returns to individual rivers. Since 2001, we have underforecast the returns to the Alagnak (–35%), Togiak (–23%), Nushagak (–21%), Naknek (–12%), and Wood (–8%) rivers and overforecast returns to Igushik (25%), Egegik (18%), and Kvichak (28%) rivers. An example of the large variability can be observed in the forecasts to the Kvichak. We overforecast the returns to Kvichak by an average of 97% from 2001 through 2004 during an unusually unproductive period and underforecast the returns to the Kvichak by an average of –27% from 2005 through 2009 during a higher period of productivity. In large part, an individual river's forecast error is reflective of its current production as it relates to average historical production.

Even though there is large amount of variability around the forecasts to the individual rivers, the overall Baywide forecasts have been fairly accurate since 2001. This appears to have been the result of overforecasting returns to some rivers and underforecasting returns to other rivers. The forecasts to individual rivers have been offsetting each other such that the overall Baywide forecast has been more accurate than the individual forecasts. The main reason for this forecast discrepancy is probably incorrect allocation of catch among the rivers, which results in overestimating total run (catch + escapement) to some of the rivers and underestimating total run to other rivers. The department has been conducting a genetic stock identification program in Bristol Bay since 2006. Results from the genetics program will help provide estimates of stock composition of the catch in each of the districts and will ultimately provide reliable estimates of total run for sockeye salmon stocks in Bristol Bay in the future.

We anticipate the 2010 run will be dominated by age-1.3 (39%), followed by age-1.2 (29%), age-2.2 (16%) and age-2.3 (15%) sockeye. There is always some uncertainty in our forecast of returns by age class. However, we expect the overall uncertainty in 2010 to be similar to what occurred in 2009. We overforecast age-1.2 (28% forecast compared to 19% observed) and age-1.3 (49% forecast compared to 43% observed) sockeye in 2009. Conversely, we underforecast age-2.2 (14% forecast compared to 27% observed) and age-2.3 (9% forecast compared to 8% observed).

The 2010 forecast of 39.77 million is not unexpected. Recent total runs to Bristol Bay have been fairly productive and stable. Since 2004, total runs have averaged 42.8 million and ranged from 39.3 million (2005) to 46.0 million (2007). We are not sure if this recent trend of productivity and stability will continue. Historically, total runs to Bristol Bay have been highly variable. If the 2010 forecast is accurate, it would be the 7th consecutive year where total run is close to or exceeds 40 million sockeye salmon.

Tim Baker, Fred West, and Greg Buck, Bristol Bay Fishery Research Staff, Anchorage

Table G1.–Forecast of total run, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay river systems in 2010.

District	Millions of Sockeye Salmon							
	Total Run Forecast by Age Class					Forecast		South
• River	1.2	2.2	1.3	2.3	Total	Escapement	Harvest	Peninsula [a]
Naknek-Kvichak								
• Kvichak	1.74	0.65	0.98	0.47	3.84	2.00	1.72	0.12
• Alagnak	0.48	0.10	1.10	0.11	1.79	0.93 [b]	0.80	0.06
• Naknek	1.72	0.82	3.87	0.96	7.37	1.10	6.04	0.23
Total	3.94	1.57	5.95	1.54	13.00	4.03	8.56	0.40
Egegik	1.35	4.02	1.34	3.92	10.63	1.10	9.20	0.33
Ugashik	2.29	0.45	1.33	0.43	4.50	0.85	3.51	0.14
Nushagak [c]								
• Wood	3.06	0.23	2.83	0.07	6.18	1.10	4.89	0.19
• Igushik	0.65	0.02	1.41	0.02	2.11	0.23	1.82	0.07
• Nushagak	0.29	0.01	1.84	0.03	2.32 [d]	0.55	1.70	0.07
Total	4.00	0.27	6.09	0.11	10.61	1.88	8.41	0.33
Togiak [e]	0.15	0.06	0.78	0.04	1.03	0.15	0.85	0.03
Bristol Bay	11.73	6.37	15.49	6.05	39.77	8.01	30.53	1.23
	29%	16%	39%	15%	100%			

Note: This table summarizes the forecast of sockeye salmon in millions of fish. Any differences in addition are due to rounding.

[a] The projected harvest accounts for the harvest of Bristol Bay sockeye salmon in the South Peninsula commercial salmon fisheries. The South Peninsula harvest has averaged 3.1% of the total Bristol Bay sockeye salmon production during the last 5 years.

[b] The projected escapement to the Alagnak River was estimated based on exploiting the Alagnak River at the same exploitation rate as the Kvichak River.

[c] Forecast for Snake River system was not included (1971–1991 average escapement was 18,000).

[d] Nushagak River forecast includes age-0.3 (11,000) and age-1.4 (133,000).

[e] Forecasts for Kulukak, Kanik, Osviak, and Matogak river systems were not included. These systems contribute approximately 50,000 to Togiak District harvest each year.

Forecast Area: Bristol Bay, Nushagak District
Species: Chinook Salmon

Forecast of the 2010 Run

Total Production	Forecast (thousands)	Forecast Range (thousands)
Total Run	117	96–142
Inriver Run Goal[a]	75	
Commercial Common Property Harvest	42	

[a] The Nushagak inriver goal is 75,000 Chinook salmon based on 5 AAC 06.361 Nushagak-Mulchatna King Salmon Management Plan.

Forecast Methods

A total of 117,000 Chinook salmon are forecast to return to the Nushagak River in 2010. This forecast is 24% less than the recent 10-year mean of 152,000 (ranging from 77,000 in 2000 to 244,000 in 2005). The forecast range (96,000–142,000), is based on observed MPE. A run of 117,000 can potentially produce a harvest of 42,000 (36% harvest rate). We anticipate an actual harvest closer to 33,000 based on an average harvest rate of 28% during the previous 5 years (2005–2009). A harvest of 33,000 would be 26% lower than the recent 10-year mean of 45,000 (ranging from 12,000 in 2001 to 101,000 in 2004).

The 2010 Nushagak District Chinook salmon forecast is the sum of individual predictions of 5 age classes (age-1.1 through age-1.5). Data sets in the analyses included adult escapement from 1978 to present and corresponding at age return data through brood year 2006. Predictions for each age class were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models included simple linear regressions and averages. Models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) as assessed using mean absolute deviation, mean absolute percent error, and mean percent error between forecast and actual returns during the last 3 years (2007–2009).

A simple 5-year average of recent returns was used to forecast age-1.1 Chinook salmon. Log spawners versus log age-1.3 returns were used to forecast age-1.2 and age-1.3 Chinook salmon. The best age-1.4 models were based on log normal sibling relationship age-1.4 versus age-1.3 returns and Ricker stock-recruitment model. The best age-1.5 model was a simple 5-year average. Age composition of the forecast total run is <1% (1,000) age-1.1, 20% (23,000) age-1.2, 35% (41,000) age-1.3, 43% (50,000) age-1.4, and <1% (1,000) age-1.5.

There is always uncertainty when forecasting returns of Nushagak River Chinook salmon and the 2010 forecast is no different. Two age classes that have caused much uncertainty in recent years have been the returns of age-1.3 and age-1.4 Chinook salmon. We underforecast age-1.3 Chinook salmon by 30% and overforecast age-1.4 Chinook salmon by 58% in 2009. Forecast differences for age-1.3 have ranged from 29% below in 2008 to 170% above in 2007, while age-1.4 forecast differences ranged from 27% above in 2006 to 132% above in 2007.

Similar methods have been used to produce the Nushagak Chinook salmon forecast since 2002. Since then, forecast differences have ranged from 59% below in 2004 to 43% above in 2007. Overall, there has been a tendency for the forecasts and expected harvests to be biased high. The 5 previous forecasts (2005–2009) have averaged 17% above the total run; ranging from 0.5% below in 2005 to 43% over in 2007 across the same time period. We will continue to look for ways to improve our forecasts of Nushagak Chinook salmon in the future.

Greg Buck, Fred West and Tim Baker, Bristol Bay Research Staff, Anchorage

Forecast Area: Alaska Peninsula, Bear Lake (Late Run)
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	423	232–613
Escapement Goal	117	117–195
Harvest Estimate	306	

Forecast Methods

The 2010 Bear River late-run sockeye salmon forecast was prepared using regression and median estimates and investigating simple linear regression models of saltwater age class relationships with data from the past 19 years. In constructing and evaluating the regression models, standard regression diagnostics were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The age-.3 sockeye salmon returns were predicted from the previous year age-.2 returns using simple linear regression ($R^2 = 0.36$; $P = 9.1 \times 10^{-3}$). Returns of age-.2 sockeye salmon were predicted using multiple regression from an index of a 4-year average of winter (January through April and October through December) air temperatures that encompassed temperatures from the year of outmigration and the 3 years prior to the outmigration and the total inches of October precipitation from the year of outmigration ($R^2 = 0.47$; $P = 6.0 \times 10^{-3}$). The age-.2 sockeye salmon returns were positively correlated with air temperature; however, they were negatively correlated with October precipitation. Air temperature and precipitation data were obtained from the Cold Bay Airport climate database. Estimates of variance were calculated from the regressions. The remaining sockeye salmon age-.1 and age-.4 returns were predicted from median estimates for each of the age class run estimates using data from the last 15 years. The total run forecast was calculated by summing individual regression and median age class estimates. When the median return by ocean age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Using the variances estimated from the model, 80% prediction intervals were calculated for the regression model. The overall 80% prediction interval was calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2010 Bear Lake late-run forecast of 423,000 sockeye salmon is about 369,000 less than the 2009 forecast (792,000) but about 118,000 more than the actual 2009 run of 304,000. The 2010 run should be composed of approximately 71% age-.2 and 24% age-.3 fish. If realized, this run will be 109,000 less than the recent (2000–2009) 10-year average (532,000). On average, age-.2 sockeye salmon comprise about 63% of the Bear Lake late run. The projected harvest of 306,000 is based on the achievement of the lower bound of the escapement goal range (117,000). Because the uncertainty associated with the variable predictive capabilities of the sibling data, our confidence in this forecast is fair.

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Forecast Area: Alaska Peninsula, Nelson River
Species: Sockeye Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	492	295–689
Escapement Goal	150	97–219
Harvest Estimate	342	

Forecast Methods

The 2010 Nelson River sockeye forecast was prepared primarily by investigating simple linear regression models of saltwater age class relationships and temperature and precipitation data from the past 22 years. The precipitation indices were constructed from the total May precipitation measured at the King Salmon Airport in the year prior to outmigration starting in 1985 and annual average summer (May–September) air temperatures from the Cold Bay Airport for corresponding outmigration years, starting in 1986. In constructing and evaluating each of the regression models, standard regression diagnostics were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The age-.2 sockeye salmon returns were predicted from the King Salmon May total precipitation index in the year prior to outmigration using simple linear regression. The age-.2 sockeye salmon returns were negatively correlated with May precipitation ($R^2 = 0.28$; $P = 1.1 \times 10^{-2}$). The age-.3 sockeye returns were predicted by linear regression of the ratio between age-.3 and age-.2 fish (same outmigration year) on the annual average summer air temperature index. The age-.3 sockeye returns were negatively correlated with the average summer air temperature ($R^2 = 0.34$; $P = 5.9 \times 10^{-3}$). Estimates of variance were calculated from each regression. The remaining age-.1 and age-.4 returns were calculated from the median estimates for each of the age class run estimates using data from 1989 to the present. The total run forecast was calculated by summing individual regression and pooled age class estimates. When the median return by age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Using the variances of the regression models, 80% prediction intervals for the regression estimates were calculated. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2010 Nelson River forecast of 492,000 is about 72,000 more than the 2009 forecast (420,000) and about 121,000 more than the actual 2009 run of 371,000. The 2010 Nelson River sockeye salmon run is expected to be 50,000 less than the recent 10-year average run (543,000). The 2010 run should be composed of approximately 65% age-.2 and 33% age-.3 fish. Since the regression relationships predicting age-.2 and age-.3 sockeye are significant and represent a vast majority of the run, the confidence in this forecast is fair. The projected harvest of 342,000 is based on the achievement of the approximate midpoint of the escapement goal range (150,000).

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Forecast Area: Arctic-Yukon-Kuskokwim
Species: All Salmon

ADF&G does not produce formal run forecasts for most salmon runs in the Arctic-Yukon-Kuskokwim Region. The salmon run outlooks presented in this report are qualitative in nature because of a lack of information with which to develop more rigorous forecasts. Consequently, these commercial harvest outlooks are typically based upon available parent-year spawning escapement indicators, age composition information, recent year trends and the likely level of commercial harvest that can be expected to be available from such indicators, given the fishery management plans in place. While commercial harvest outlooks provide for a general level of expectation, the fisheries are managed based upon inseason run assessment. A formal forecast of Yukon River fall chum salmon is provided. A Canadian-origin Yukon River Chinook salmon forecast is made prior to the meeting of U.S./Canada Yukon River Panel in the spring of 2010.

In the AYK Region, as in some other areas of the state, salmon production notably decreased for many stocks from 1998 to 2002, rebuilt rapidly beginning in 2003 with record and near record runs in 2005 and 2006, and has shown a general decline again since 2007. Currently, Yukon River and Eastern Norton Sound Chinook salmon stocks and Northern Norton Sound chum salmon stocks are classified as *stocks of yield concern* under the Sustainable Salmon Fisheries Policy.

The Bering Sea trawl bycatch has indicated the presence of large numbers of chum and Chinook salmon in the Bering Sea from 2003 through 2007, although chum salmon bycatch dropped off during the 2007 season. The trawl bycatch was low in 2008 and 2009 for both Chinook and chum salmon. The high seas Bering Arctic Subarctic Integrated Surveys study indicated a decline in the presence of juvenile Chinook salmon in 2005 and 2006, but an increase in 2007. The study also observed a decline chum salmon in 2004 and 2005, but 2006 and 2007 results showed an increase. No surveys were conducted in 2008, but in 2009, there was a slight decrease from the high numbers observed in 2007 for both species. A collaborative effort between ADF&G and NOAA is in progress to test the applicability of Bering Arctic Subarctic Integrated Surveys juvenile salmon indices for run size forecasting.

In general, market conditions have not been accounted for in the 2010 commercial harvest outlooks, except for Norton Sound where up to 2 million pink salmon will likely be surplus in 2010. Poor pink and chum salmon markets in Norton Sound and Kuskokwim areas may result in harvests that are lower than the harvest outlook projections.

The 2010 commercial harvest outlook by management area, in thousands of fish.

	Salmon Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	5–7	20–30	100–150	0	70–150	
Kuskokwim Bay	13–17	140–160	50–60	0	50–80	
Kuskokwim Area Total	18–24	160–190	150–210	0	120–230	
Yukon	0–5		30–70		250–500	0–100
Norton Sound	0	0	80–100	150–300	60–80	
Kotzebue Sound					175–225	

Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2010 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	686	548–825
Escapement Goal		300–600
Harvest Estimate		0–100

Forecast Methods

The forecast for the fall chum salmon run to Yukon Area in 2010 is based on run reconstruction of 5 river systems (Tanana, Chandalar, Sheenjek, Fishing Branch and the mainstem Yukon River in Canada) and 4 age classes—age-3 through age-6, with age-4 fish dominating followed by age-5 fish. Adult escapement and return data was used from the complete brood years from 1 to 2003, production from incomplete brood years 2004 and 2005 was estimated based on return per spawner from brood year returns, and an auto-regressive Ricker model was used to predict returns from the 2006 and 2007 parent years.

Predicted returns were multiplied by corresponding average maturity schedule for even and odd-numbered parent years to estimate 2010 run size, and rounded to the nearest thousand. The odd/even maturity schedule from 1984 to 2003 was used to estimate the 2010 return, since current production is reduced from the pre-1984 level. The forecast range is the upper and lower values of the 80% confidence bounds for the total run forecast. Confidence bounds are calculated using deviation of the point estimates and the observed returns from run projections from 1987 to 2009.

The 2010 projected run size of fall chum salmon for the Yukon Area is approximately 686,000. This projection is average for even-numbered runs; however, recent runs have fluctuated more widely and have produced runs as low as 400,000 in 2001 to as high as 2.3 million in 2005. The 80% confidence bounds for the 2010 forecast range from 548,000 to 825,000. If the run materializes as projected, abundance would be sufficient to meet BEGs including meeting requirements for Canadian border passage and escapement obligations, provide an average subsistence harvest, and may provide opportunity for limited amounts of commercial fishing.

Drainage-wide escapements between 300,000 and 600,000 provide a mean yield of 520,000. The mean subsistence harvest from 1974 to 2008 for Alaskan subsistence and Canadian aboriginal harvests is 147,000. Commercial harvests are prosecuted on the amount above 600,000 based on inseason assessments of run size. Due to drastic fluctuations of pulses of fish entering the Yukon River mouth and the lateness of the stocks as a whole considering length of migration, fishery management is challenging. ADF&G anticipates a subsistence harvest of about 100,000 and commercial harvest to be between zero and 100,000 depending on inseason assessment of run size and application to the 5 AAC 01.249 *Yukon River Drainage Fall Chum Salmon Management Plan.*

The forecasted total run of 686,000 fall chum salmon is expected to be comprised of 76% age-4 and 21% age-5 fish. The age-4 component of fall chum salmon runs has varied widely ranging between 37% (1992) to 94% (2005). Fall chum salmon also exhibited a strong odd-even abundance cycle that was fairly regular between 1974 and 1992 (averaging 1.0 million in odd-numbered years and 684,000 in even-numbered years). Since 1993 the odd-even abundance relationship has severely deteriorated with wide swings in production that are thought to be due to conditions primarily in the marine environment, some density dependence may have occurred in 2005. The effect of the odd-even cycle was restricted between 1993 and 2002 during which most years (1993 and 1997–2002) stocks were severely depressed. Age-4 fish contributed greater than 90% (record levels) during the recent runs in 2003 and 2005. However the extremely large escapement observed in 2005, based on preliminary analysis, is only producing an estimated 0.26 returns per spawner.

Forecast Discussion

Point projections for expected returns have been developed since 1987 for fall chum salmon in the Yukon River drainage. Forecast methods changed from point estimates to ranges beginning in 1999. Additionally, in attempts to reflect poor runs and improvements in some runs, adjustments to the point estimates were made by reducing the projection of run size by the average ratio of observed to predicted returns through 2005. In 2006 through 2010 the ranges were developed around the point estimate based on the 80% confidence bounds using the standard deviation between the annual point estimates and observed returns. Production has changed approximately 27-fold (based on 30 brood year returns) with the most drastic fluctuations occurring between brood years 1995 and 2001; therefore, projections of run size remain extremely difficult to predict.

Since ranges of projections were established in 1999, 45% were within the projected range of run size, 36% were below and 18% were above the range. Returns of age-4 fish in even-numbered years are typically 20% lower than odd-numbered years. The age-4 component in 2010 is returning from a relatively large escapement in 2006 and is anticipated to carry the run. The point estimate for 2010 of 686,000 fall chum salmon is completely reliant on the return of age-4 component at a much higher production level (0.95 returns per spawner) than observed from the 2005 (0.26) parent year. This run size is expected to provide for a limited commercial harvest of approximately 100,000. The fall fishery typically occurs from July 15 through the end of August in the Lower Yukon Area and through September in the Upper Yukon Area.

Bonnie Borba, Yukon Area Fall Season Research Project Leader, Fairbanks

ACKNOWLEDGMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Steve Heinl, Lowell Fair, Dani Evenson, and Mark Witteveen assembled the forecasts for their respective regions. Individual credit for forecast material is contained in area forecast discussions in the Appendix. Area biologists throughout the state supplied reviews of the 2009 fishing season.