Special Publication 09-07

Run Forecasts and Harvest Projections for 2009 Alaska Salmon Fisheries and Review of the 2008 Season

Edited by

Eric C. Volk

Michael D. Plotnick

and

Amy M. Carroll

March 2009

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
mid eye to fork	MEF
mid eye-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

SPECIAL PUBLICATION 09-07

RUN FORECASTS AND HARVEST PROJECTIONS FOR 2009 ALASKA SALMON FISHERIES AND REVIEW OF THE 2008 SEASON

By

Eric C. Volk
Michael D. Plotnick
and
Amy M. Carroll
Alaska Department of Fish and Game, Division of Commercial Fisheries

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

March 2009

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, documents that do not fit in another publication series; 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.

Eric C. Volk
Alaska Department of Fish and Game, Division of Commercial Fisheries
333 Raspberry Road, Anchorage, AK 99518-1565

Michael D. Plotnick
Alaska Department of Fish and Game, Division of Commercial Fisheries
Capital Office Park, 1255 W. 8th Street, P.O. Box 115526, Juneau AK 99811-5526

Amy M. Carroll
Alaska Department of Fish and Game, Division of Commercial Fisheries
Capital Office Park, 1255 W. 8th Street, P.O. Box 115526, Juneau AK 99811-5526

This document should be cited as:
Volk, E. C., M. D. Plotnick, and A. M. Carroll. 2009. Run forecasts and harvest projections for 2009 Alaska salmon fisheries and review of the 2008 season. Alaska Department of Fish and Game, Special Publication No. 09-07, Anchorage.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

ADF&G	Alaska Department of Fish and Game
BEG	biological escapement goal
CPF	Commercial Common Property Fishery
CPUE	catch per unit effort
KMA	Kodiak Management Area
MAPE	mean absolute percentage error
NOAA	National Oceanic and Atmospheric Administration
PWSAC	Prince William Sound Aquaculture Corportion
SEG	sustainable escapement goals
VFDA	Valdez Fisheries Development Association

DEFINITION OF TERMS

Biological escapement goal (BEG)	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 (CPF) 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	The total number of mature salmon returning in a given year from ocean-rearing areas to coastal waters.

ABSTRACT

This report contains a detailed review of Alaska's 2008 commercial salmon season as well as salmon run forecasts and harvest projections for 2009. The Alaska salmon harvest of all species combined for 2008 totaled 146.1 million fish, which was about 13.6 million fish greater than the preseason forecast of 132.5 million and the 16th largest salmon harvest since 1960. This combined harvest was composed of 344,000 Chinook salmon *Oncorhynchus tshawytscha*, 39.1 million sockeye salmon *O. nerka*, 4.4 million coho salmon *O. kisutch*, 84 million pink salmon *O. gorbuscha*, and 18.2 million chum salmon *O. keta*. The Alaska Department of Fish and Game is expecting an increase in commercial salmon catches in 2009 primarily due to the projected increase in pink salmon harvests. The 2009 total commercial salmon catch (all species) projection of 174.8 million is expected to comprise 249,000 Chinook salmon, 38.1 million sockeye salmon, 4.6 million coho salmon, 113.1 million pink salmon, and 18.5 million chum salmon. The projected pink salmon harvest is about 34% higher than the harvest experienced in 2008 (84 million). The projected sockeye salmon harvest is lower than the harvest in 2008. This projected decrease is primarily the result of the expected decrease in the sockeye salmon harvest in Bristol Bay. Chum salmon harvests are expected to be slightly higher than those experienced in 2008.

When the appropriate quantity and quality of 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 2009 as well as a detailed review of Alaska's 2008 commercial salmon season.

The Alaska Department of Fish and Game (ADF&G) is expecting an increase in commercial salmon catches in 2009 primarily due to the projected increase in pink salmon *Oncorhynchus gorbuscha* harvests. The 2009 total commercial salmon catch (all-species) projection of 174.8 million is expected to comprise 249,000 Chinook salmon *O. tshawytscha*, 38.1 million sockeye salmon *O. nerka*, 4.6 million coho salmon *O. kisutch*, 113 million pink salmon, and 18.5 million chum salmon *O. keta*. The projected pink salmon harvest is about 34% higher than the harvest experienced in 2008 (84 million) and similar to the recent 5 even-year average. The sockeye salmon harvest projection is slightly lower than the harvest that occurred in 2008. This projected decrease is primarily the result of the expected decrease in the sockeye salmon harvest in Bristol Bay. Chum salmon harvests are expected to be slightly higher than those experienced in 2008. Table 1 shows specific harvest projection numbers by species and fishing area. These projections generally 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, Alaskan 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 2009 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Alaska						
Natural Production				41,000	2,100 [a]	43,100
Hatchery Production[b]		228		1,230	7,900	9,358
Southeast Region Total	n/a [c]	1,465 [a]	2,523 [a]	42,230	10,000	56,218
Prince William Sound						
Natural Production	53 [d]	827 [e]	343 [f]	12,280	176 [a]	13,679
Hatchery Production[g]	0	1,033	367	25,597	3,250	30,246
Upper Cook Inlet	20 [a]	3,000	210 [a]	70 [h]	80 [a]	3,380
Lower Cook Inlet	1 [i]	300 [j]	14 [i]	998 [j]	45 [k]	1,358
Bristol Bay	83 [r]	23,990	79 [a]	1 [s]	1,535 [a]	25,688
Central Region Total	157	29,150	1,013	38,946	5,086	74,351
Kodiak						
Natural Production	20 [l]	1,369 [m]	270 [n]	12,200 [o]	505 [p]	14,364
Hatchery Production[n]	0	299 [q]	148 [r]	10,000 [r]	118 [r]	10,565
Chignik	2 [s]	632 [t]	91 [s]	1,598 [s]	117 [s]	2,440
South Alaska Peninsula	6 [u]	2,212 [u]	185 [u]	8,073 [u]	840 [u]	11,316
North Alaska Peninsula	7 [v]	2,800 [v]	70 [v]	50 [v]	150 [v]	3,077
Westward Region Total	34	7,312	764	31,921	1,730	41,761
Arctic-Yukon-Kuskokwim Region Total	58	240	378	101	1,743 [w]	2,520
Statewide Total	249	38,167	4,678	113,198	18,559	174,850

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

[a] Average harvest for the 5-year 2004 to 2008 period.

[b] Hatchery projections made by Southeast Regional Aquaculture Association, Northern Southeast Regional Aquaculture Association, Douglas Island Pink and Chum.

[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] Forecast based on 5-year average total run size and commercial exploitation rate (2003 to 2007).

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

[f] Ten-year average harvest (1999 to 2008) 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). The Solf Lake sockeye salmon remote release and the Whittier, Cordova, and Chenega coho salmon remote releases were excluded.

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

[i] Commercial harvest forecasts of Chinook and coho salmon represent average harvests since 1980 and are comprised of a combination of naturally-produced fish as well as fish produced from enhancement programs in Lower Cook Inlet; no attempt is made to separate the 2 components.

[j] Includes common property plus cost recovery harvests.

[k] Forecasts for chum salmon are simply average annual commercial harvests since 1989.

[l] Kodiak Chinook: annual projection of harvest (non-targeted).

[m] Kodiak natural sockeye: includes the formal forecasts of harvest (968,000 fish) for major Kodiak Management Area stocks (Appendix E); remaining harvest projection was calculated by applying the 10-year (1999 to 2008) average proportion of total harvest allocated to systems with a formal forecast to the 2009 total formal forecast.

[n] Kodiak natural coho: sum of 5-year (2004 to 2008) harvest median by geographical area.

[o] Kodiak natural pink: formal forecast (see Appendix E).

[p] Kodiak natural chum: estimated using a modified Ricker spawner-recruit model fit to the Kodiak Management Area returns from 1993 to 2008. Adjustment of model estimate was calculated from the negative correlation between model residuals and estimated abundance of pink salmon fry (interspecies competition) during early marine life history.

[q] Kodiak hatchery sockeye: includes the formal harvest forecast (183,000 fish) for the Spiridon Lake (Appendix E) and harvest projections (116,000 fish) provided by the Kodiak Regional Aquaculture Association for stocking projects at Hidden, Waterfall, Crescent, and Little Kitoi lakes.

[r] Kodiak hatchery coho, pink, and chum: harvest projections provided by Kitoi Bay Hatchery personnel.

[s] Chignik Chinook, coho, pink, and chum: based on 3-year, 2006 to 2008 average harvests (post cooperative fishery).

[t] Chignik sockeye: formal forecast (see Appendix F).

[u] South Alaska Peninsula: 5-year (2004 to 2008) average harvest.

[v] North Alaska Peninsula: based on 10-year average harvests, recent run trends, and market conditions. Sockeye projection includes formal forecasts of harvest for the late-run Bear Lake (675,000 fish) and Nelson River (270,000 fish) stocks (Appendix H).

[w] Includes 250,000 fall chum.

The Alaska salmon harvest of all species combined for 2008 totaled 146 million fish, which was about 13.6 million fish greater than the preseason forecast of 132.5 million and the 16th largest salmon harvest since 1960. This combined harvest was composed of 344,000 Chinook salmon, 39.1 million sockeye salmon, 4.4 million coho salmon, 84 million pink salmon and 18.2 million chum salmon. Table 2 shows 2008 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 2008 harvest by species and area.

Table 2.–Preliminary 2008 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	241[a]	422	2,373	15,987	9,027	28,049
Prince William Sound	12	1,301	551	42,354	5,076	49,294
Upper Cook Inlet	13	2,372	172	169	50	2,776
Lower Cook Inlet	<1	408	3	506	176	1,092
Bristol Bay	25	27,756	90	278	1,202	29,351
Central Region Total	50	31,837	816	43,307	6,504	82,513
Kodiak Area	17	1,819	301	8,788	908	11,833
Chignik[b]	1	687	162	2,390	209	3,449
South Peninsula & Aleutians	4	2,239	226	13,508	803	15,750
North Peninsula	2	2,004	125	21	177	2,329
Westward Region Total	24	6,749	814	24,707	2,097	33,361
AYK Region Total	29	113	416	90	584	1,232
Total Alaska	344	39,121	4,419	84,091	18,212	146,187

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2007 to September 30, 2008 catch accounting period.

[b] 2008 Chignik Harvest includes test fish and personal use.

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 2008 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.

Table 3.–Preliminary 2008 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	3,638	2,666	18,734	59,308	77,601	161,945
Prince William Sound	265	8,004	5,032	118,486	34,199	165,985
Upper Cook Inlet	307	14,074	1,205	643	379	16,607
Lower Cook Inlet	4	1,921	22	1,801	1,439	5,186
Bristol Bay	443	163,758	579	1,000	7,573	173,353
Central Region Total	1,019	187,757	6,838	121,930	43,590	361,131
Kodiak Area	138	10,062	2,430	32,531	7,639	52,800
Chignik	15	4,734	1,290	8,192	1,726	15,958
South Peninsula & Aleutians	75	12,216	1,525	46,155	5,710	65,681
North Peninsula	28	11,273	941	75	1,363	13,680
Westward Region Total	256	38,285	6,186	86,953	16,438	148,119
AYK Region Total	374	755	2,941	237	4,278	8,585
Total Alaska	5,287	229,463	34,699	268,428	141,907	679,780

Note: Columns may not total exactly due to rounding.

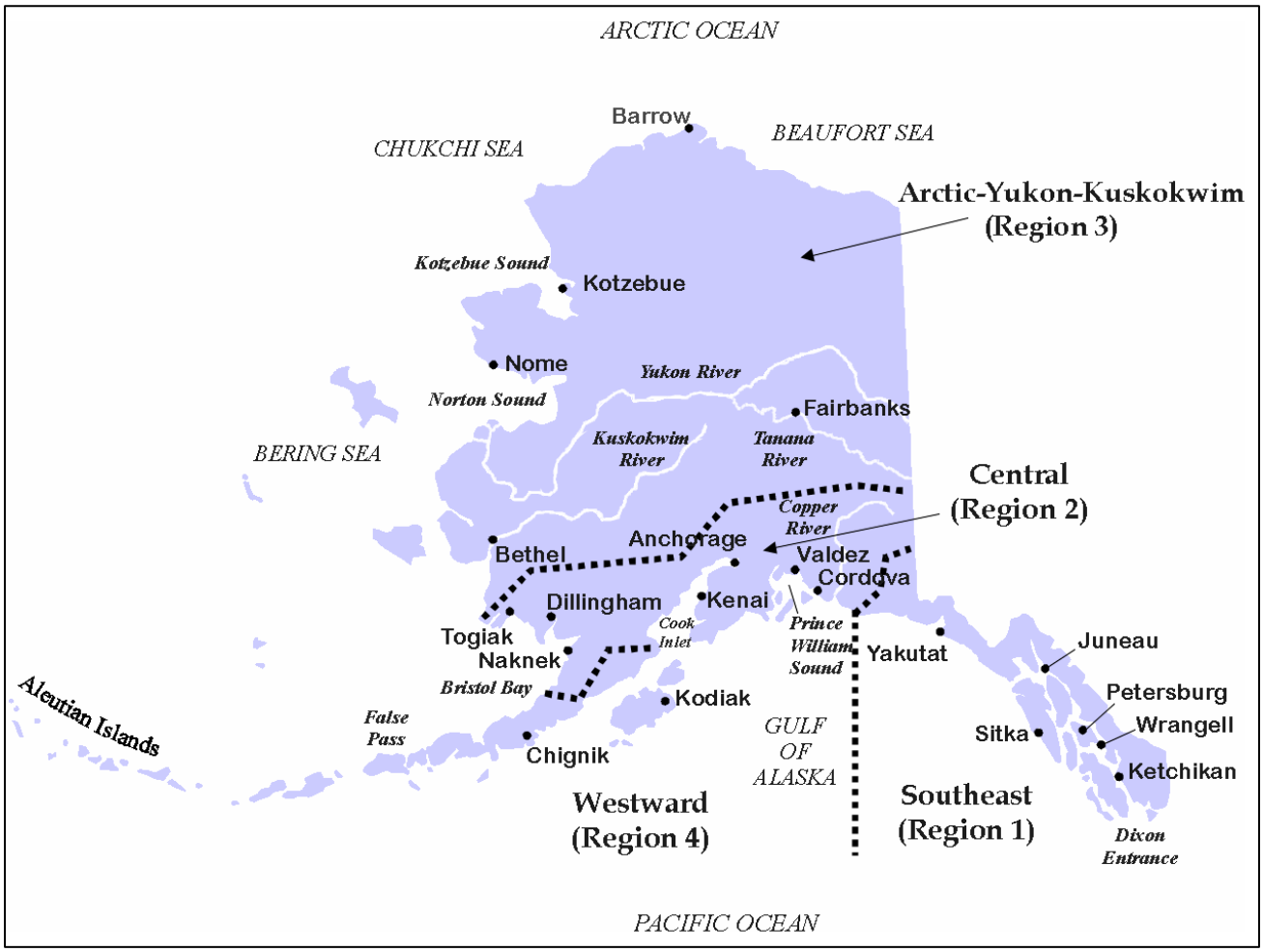

Figure 1.–The 4 fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Alaska Department of Fish and Game, Division of Commercial Fisheries.

The common and scientific names for Alaska's Pacific salmon species are as follows:

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

PRELIMINARY REVIEW OF THE 2008 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

Region I salmon harvests totaled 28.0 million salmon and 162 million pounds in 2008 (Tables 2, 3, and 4). The exvessel value as initially reported on fish tickets was $117 million; however this value will be increased based on final reports from buyers and processors. Harvest was down substantially from 58.6 million fish in 2007, but value was up slightly from $99 million in 2007 and $95 million in 2006 due to strong prices. Cumulative all-gear commercial harvest included 241,000 Chinook, 422,000 sockeye, 2.4 million coho, 9.0 million chum, and 16.0 million pink salmon. The proportional harvest by species included 1% Chinook, 2% sockeye, 8% coho, 32% chum, and 57% pink salmon. Landings were made by 1,853 limited entry permit holders in 2008, which represents a slight decrease in effort from the prior year.

The 2008 pink salmon harvest of 16.0 million was somewhat better than the 11.7 million harvest of 2006, but below the long-term average since statehood of 29.6 million and well below the most recent 10-year average harvest of 46.7 million. The pre-season ADF&G harvest forecast for 2008 was 19 million fish. The Southeast purse seine fishery provided 89% of this harvest—14.3 million pinks. Following a strong harvest of 44.9 million pink salmon in 2007, the 2008 season harvest was weak, and similar to 2006. July harvests in 2008 were low, with fewer than 1.0 million harvested by the end of the month. Northern Inside area runs were a failure. Harvests for the northern inside were limited to 400,000, the lowest since 1974, and the escapement for this area was the lowest since 1976. August harvests to Southern Southeast areas and to Northern Outside areas were well below the recent 10-year averages but escapement targets for these areas were within the escapement goal ranges. Pink salmon averaged 3.7 pounds and prices in the purse seine fishery averaged $0.28 per pound. Pink salmon harvests are initially estimated at $16.5 million in exvessel value.

Total commercial chum salmon harvests were 9.0 million in 2008. The harvest was 78% of the recent 10-year average harvest. The major portions of this harvest included 3.2 million (36%) in purse seine fisheries, 3.0 million (33%) in hatchery cost recovery harvests, and 2.6 million (29%) in drift gillnet fisheries. A total of 67% of chum salmon harvests took place in terminal areas in either cost recovery or common property terminal area fisheries. A large portion of chum salmon 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 9.0 million was 88% of the projected return of around 10.25 million, based largely on forecasts by hatchery operators. Wild summer chum salmon escapements, based on newly-established sustainable escapement goal thresholds, were below goals for Southern Southeast Alaska and Northern Southeast Inside waters, but above goal in Northern Southeast Outside waters. Fall chum salmon escapements were generally good, with large returns to the Chilkat River. The total weight of landings and the combined exvessel value of chum salmon harvests in the region dominated other species. Based on fish tickets, harvests were worth an initial $50.1 million based on a total of 77.6 million pounds landed and prices around $0.67 per pound.

The sockeye harvest was only 422,000 fish, and harvests were very poor throughout the region. In a historical context this was the lowest harvest since 1975, when 245,000 fish were harvested. Prior to that, the only lower harvests were from the period from 1878 to 1888. Harvests included 265,000 fish (63%) from the drift gillnet fisheries, 74,000 fish (18%) from the purse seine fisheries, and 35,000 fish (8%) from the Yakutat set net fisheries. It is thought that poor sockeye harvests are related to poor pink salmon harvests in 2006, and poor chum salmon harvests in 2007 were due to the similar ocean entry timing of the dominant year classes. Sockeye escapement goals were not met for 11 out of 13 stocks, and the 2 stocks that were within the escapement goal range also had poor returns. Sockeye salmon contributed $3.6 million to regional exvessel value, with price in the drift gillnet fisheries averaging $1.37 per pound.

Regional harvest of coho salmon was 2.4 million fish in 2008. This harvest was between the long-term average harvest since statehood of 2.1 million fish and the recent 10-year average harvest of 2.8 million fish. Troll fisheries harvested 1.3 million coho (63%), followed by drift gillnet (14%), purse seine (9%), and Yakutat set net (7%). Coho escapement goals were met or exceeded for most monitored systems around the region in 2008. The initial fish ticket value of coho harvests was $28.6 million, around 25% of the regional total value. Troll fisheries received an average of $1.95 per pound for coho in 2008.

Regional Chinook harvest included 236,000 large fish for the October 1, 2007 to September 30, 2008 catch accounting year. The exvessel value of this harvest is estimated at $17.9 million, similar to both the 2006 and 2007 seasons. As harvests have declined each year from a peak of 484,000 fish in 2004, prices have increased. Troll prices for Chinook averaged $6.23 per pound for the year. Proportionate harvests by gear included 61% by troll, 17% by hatchery operators, and 13% by drift gillnet fisheries. In 2008 the all-gear treaty Chinook quota for Southeast Alaska was 170,000 fish based on the coastwide Chinook model under the Pacific Salmon Treaty. Quota allocations included 125,400 fish to troll fisheries, 7,300 fish to purse seine fisheries, 5,900 fish to drift and set gillnet fisheries, and 31,350 fish to sport fisheries. Also under the Pacific Salmon Treaty, directed fisheries targeting Stikine River Chinook took place in District 8 to harvest a U.S. Allowable Catch of 9,150 fish based on a harvest sharing agreement with Canada. There was no directed fishery on the Taku River in 2008 due to low forecast returns. Chinook harvests included 36,600 fish in Spring troll fisheries, 30,300 fish in hatchery terminal area fisheries, and 41,700 fish in hatchery cost recovery fisheries based on Chinook returns to Alaskan hatchery programs.

Table 4.–Preliminary 2008 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

Fishery	Chinook[a]	Sockeye	Coho	Pink	Chum	Total [b c]
Total Purse Seine	16	74	218	14,304	3,208	17,821
Southern Purse Seine[d] Total	8	69	190	12,323	883	13,472
Southern Purse Seine Traditional	1	67	187	12,293	672	13,221
Southern Purse Seine Hatchery Terminal	7	2	3	30	210	252
Northern Purse Seine[e] Total	8	6	28	1,981	2,326	4,349
Northern Purse Seine Traditional	0	4	19	1,796	258	2,076
Northern Purse Seine Hatchery Terminal	8	2	9	186	2,068	2,273
Total Drift Gillnet	29	265	337	561	2,589	3,784
Tree Point	2	34	96	271	240	643
Prince of Wales	1	31	116	90	102	341
Stikine	13	36	34	18	82	185
Taku-Snettisham	2	117	37	90	774	1,020
Lynn Canal	0	35	46	11	606	698
Drift Gillnet Hatchery Terminal	11	13	7	80	785	897
Set Gillnet	1	35	154	65	1	256
Total Troll	147	1	1,292	28	61	1,529
Hand Troll Total	14	0	82	2	1	99
Hand Troll Traditional	7	0	81	1	0	90
Hand Troll Hatchery Terminal	3		1	0	0	4
Hand Troll Experimental	5	0	0	0	0	5
Power Troll[f] Total	132	1	1,210	27	60	1,429
Power Troll Traditional	99	1	1,190	25	55	1,370
Power Troll Hatchery Terminal	1	0	19	0	0	20
Power Troll Experimental	32	0	1	1	5	40
Total Annette Island Reservation	1	6	37	926	153	1,123
Annette Island Purse Seine	0	2	7	626	22	658
Annette Island Drift Gillnet	1	4	29	300	131	464
Total Annette Island Troll	0		1	0		1
Annette Island Hand Troll	0		1	0		1
Annette Island Power Troll	0					0
Hatchery Cost Recovery	42	40	321	96	2,981	3,479
Miscellaneous[g]	1	1	1	6	9	18
Southern SE Area Totals	75	176	926	13,638	2,221	17,039
Northern SE Area Totals	155	211	1,243	2,283	6,780	10,673
Yakutat Area Totals	6	35	192	65	1	299
Southeast Region Total	236	422	2,361	15,987	9,001	28,010

[a] Chinook adults, not jacks are reported.

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

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

[d] Districts 101–108. Traditional fishery.

[e] Districts 109–114. Traditional fishery.

[f] Catch accounting period for the 2008 Chinook salmon season goes from October 1, 2007 through September 30, 2008.

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

CENTRAL REGION

PRELIMINARY 2008 PRINCE WILLIAM SOUND SALMON SEASON SUMMARY

The 2008 Prince William Sound Area commercial salmon harvest was 49.3 million fish, comprised of 42.4 million pink, 1.3 million sockeye, 5.1 million chum, 551,000 coho, and 12,000 Chinook salmon. The 2008 harvest was composed of 41.0 million (83%) commercial common property fishery (CPF), and 8.3 million (17%) hatchery cost recovery fish.

Gillnet Fisheries

Copper River District

The commercial salmon fishing season in the Copper River District began on Thursday, May 15. In accordance with modifications made to the Copper River King Salmon Management Plan, (5 AAC 24.361) at the December 2005 Board of Fisheries meeting, there was only one period per week during statistical weeks 20 and 21 when commercial fishing was permitted inside of the barrier islands as defined in 5 AAC 24.350(1)(B). The 2008 sockeye salmon harvest of 321,000 ranked as the fourth smallest since 1970, and was about half the forecasted harvest of 742,166. The preliminary harvest composition was 299,000 (93%) wild sockeye, 21,700 (7%) Gulkana Hatchery sockeye, and 74 (<1%) Main Bay Hatchery sockeye salmon. The harvest of 11,500 Chinook salmon was well below the previous 10-year average harvest of 43,059 fish and the pre-season forecast of 46,908. The coho salmon commercial harvest of 202,000 was below the previous 10-year average harvest of 285,221 fish and the pre-season forecast of 288,013. The 2008 in river goal for salmon passing the Miles Lake sonar site was set at 597,600 to 791,000 fish. The 2008 sonar escapement estimate was 718,344 fish.

Bering River District

Opening in early June, the Bering River District is managed concurrently with the Copper River District. The 2008 harvest of 1,200 sockeye salmon was far below the recent 10-year average of 19,000. The coho salmon harvest of 40,400 fell below the 10-year harvest average of 45,400 coho salmon.

Coghill District (Drift Gillnet)

The commercial common property harvest of chum salmon in the Coghill District was 2.3 million fish: 2,308,000 by drift gillnet gear and 9,000 by purse seine gear. Prince William Sound Aquaculture Corporation (PWSAC) harvested 641,000 chum salmon for corporate cost recovery. The Coghill Lake sockeye salmon escapement of 29,296 fish was within the sustainable escapement goal (SEG) range of 20,000 to 40,000 fish. The total commercial common property harvest of sockeye salmon in the Coghill District was 179,000 fish, of which 127,000 fish were of enhanced stock Main Bay Hatchery origin and 51,000 fish were of wild stock origin. The majority of the sockeye salmon, 178,000 fish, were harvested by the drift gillnet fleet. The coho salmon harvest of 117,000 fish fell below the PWSAC preseason harvest forecast of 125,300 enhanced fish. The majority (81,000 fish) were harvested by the drift gillnet fleet. Additionally, the purse seine fleet harvested 37,000 coho salmon. A small portion of the Coghill District coho salmon harvest was likely of wild stock origin.

Eshamy District

The Eshamy District sockeye salmon harvest was composed of 6,500 (~1%) harvested for hatchery broodstock, 162,000 (22%) set gillnet fish and 561,000 (77%) drift gillnet fish. The department's preseason forecast for Eshamy Lake was 84,000 wild sockeye salmon. The harvest of 654,000 Main Bay Hatchery sockeye salmon in the Eshamy District was below the preseason forecast of 929,000 fish. The PWSAC did not harvest any Main Bay Hatchery sockeye salmon for cost recovery. The sockeye salmon escapement to Eshamy Lake was 18,495 fish when the weir was removed on August 28. This was within the anticipated range of escapement of 16,932 to 33,865 fish for that date based on the biological escapement goal (BEG).

Unakwik District

The Unakwik District CPF harvest of 389 fish was taken exclusively by the drift gillnet fleet. This harvest was far below the 10-year average of 8,810 fish and the preseason harvest forecast of 8,594 sockeye salmon.

Purse Seine Fisheries

Chum Salmon

The 2008 enhanced chum salmon CPF harvest in Prince William Sound was 4.2 million fish, which was 1.5 million fish above the CPF preseason forecast. The 2008 chum salmon purse seine CPF harvest of 1.8 million fish was composed of approximately 4% wild fish and 96% hatchery fish. The predominant areas for purse seine harvest of enhanced chum salmon were the Port Chalmers Subdistrict and the Armin F. Koernig Hatchery terminal harvest area (1.2 million fish) and special harvest area (511,000 fish) . The Coghill District had a purse seine harvest of 9,000 chum salmon and a drift gillnet harvest of 2.3 million chum salmon. Inseason wild chum salmon aerial survey escapement estimates were below cumulative anticipated levels in all but the Coghill and Northwestern districts. The 2008 total Prince William Sound wild stock chum salmon escapement of 203,000 fish in districts with SEGs (211,000 fish in all districts) was more than double the SEG lower bound of 91,000 fish.

The 2008 chum salmon total run forecast for Prince William Sound was 3.8 million fish. The majority of the forecast, 3.4 million fish (88%), were of PWSAC hatchery origin. PWSAC forecasted a run of 2.3 million chum salmon to Wally Noerenberg Hatchery, 787,000 fish to Port Chalmers, and 309,000 fish to Armin F. Koernig Hatchery. Approximately 640,000 chum salmon (28%) out of the forecast 2.3 million Wally Noerenberg Hatchery run were required for corporate cost recovery. All Port Chalmers and Armin F. Koernig Hatchery chum salmon were available for harvest in the purse seine CPF. Based on the department's wild chum salmon forecast of 446,000 fish, there was a potential CPF harvest of 246,000 wild chum salmon.

Pink Salmon

The 2008 harvest of 42.4 million pink salmon, composed of approximately 3% wild fish and 97% hatchery fish, was the second largest even-year Prince William Sound pink salmon harvest on record. The overall harvest by gear type was 33.7 million by purse seine, 20,000 by set gillnet, 960,000 by drift gillnet, and 7.7 million (4.2 million VFDA and 3.5 million PWSAC) for hatchery cost recovery and broodstock. The aquaculture association contributions to the enhanced pink salmon harvest were 33% VFDA and 67% PWSAC. VFDA cost recovery and broodstock harvest was approximately 28% of the total pink salmon run to the Solomon Gulch

Hatchery. PWSAC cost recovery and broodstock harvest was approximately 13% of the total pink salmon run to PWSAC hatcheries.

The 2008 preseason forecast for the pink salmon harvest in Prince William Sound was 29.5 million fish. This estimate included 3.5 million wild stock fish, 9.8 million Valdez Fisheries Development Association (VFDA) hatchery fish, and 16.2 million PWSAC hatchery fish. Approximately 3.5 million pink salmon (30%) of the projected 16.2 million pink salmon returning to the PWSAC hatcheries were anticipated to be needed for cost recovery and broodstock. The remaining 12.7 million PWSAC fish would be available for CPF harvest. Approximately 5.0 million pink salmon (51%) of the projected 9.8 million pink salmon returning to the VFDA Hatchery were anticipated to be needed for cost recovery and broodstock. The remaining 4.8 million VFDA fish would be available for CPF harvest. A total harvest of 1.5 million wild stock pink salmon was forecasted for CPF leaving 2.0 million pink salmon for escapement.

Despite limited fishing opportunity outside of hatchery subdistricts, inseason wild pink salmon aerial survey escapement estimates were below cumulative anticipated levels in all but Coghill and Northwestern districts. The 2008 total Prince William Sound wild stock pink salmon escapement of 862,000 was below the even-year SEG lower bound of 1.3 million fish, and was the lowest escapement since 1992. The preliminary Prince William Sound wild stock pink salmon harvest of 1.4 million fish, 140,000 below the 2008 commercial harvest forecast midpoint estimate, was the third lowest wild stock harvest contribution by number (second lowest by percent of total harvest) in the last 30 years. The ratio of enhanced pink salmon to wild pink salmon in the 2008 commercial common property harvest was 32:1.

Coho Salmon

The purse seine fleet harvested 158,000 coho salmon in the Eastern District. The majority of these coho salmon were assumed to be VFDA stock. The purse seine fleet also harvested 37,000 coho salmon in the Coghill District (the majority assumed to be PWSAC enhanced stock). VFDA harvested a total of 24,230 coho salmon, of which 1,460 fish were utilized for brood, 420 fish were given away, and 22,360 fish were sold.

The 2008 VFDA coho salmon run was anticipated to be 211,000 fish. A total of 2,000 salmon were anticipated to be needed to meet VFDA broodstock objectives.

COOK INLET

Lower Cook Inlet

The 2008 Lower Cook Inlet all-species commercial salmon harvest of just over 1.092 million fish was the third lowest during the past decade, representing slightly more than 60% of the recent 10-year average of 1.786 million fish. The overall harvest failed to achieve the cumulative preseason forecast of 1.252 million fish, in large part due to much smaller than anticipated harvests of natural runs of pink salmon. Nonetheless, the sockeye harvest of 407,600 was the third highest in the last decade and exceeded the recent 10-year average of 310,600 by over 30%. The chum harvest of 175,700 was the second highest since 1988 and was almost triple the recent 10-year average of 63,300. Increased prices paid for salmon this season yielded an estimated exvessel value of approximately $3.96 million, making the value of the 2008 Lower Cook Inlet harvest the highest since 1988 and the fourth highest since statehood.

For the third consecutive season, Lower Cook Inlet commercial salmon harvests in 2008 were not dominated by hatchery and enhanced fish production. This is primarily because no pink salmon returned to the Tutka Hatchery facility, where operations were suspended after 2004, and also because the minimal pink return to Port Graham Hatchery did not contribute to commercial catches. Hatchery production did contribute to sockeye catches, with approximately 40% of the Lower Cook Inlet sockeye salmon harvest attributed to lake stocking and fertilization projects. Most of these projects were originally begun by ADF&G, but are currently maintained by Cook Inlet Aquaculture Association. These projects were conducted at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District. Two newer sockeye salmon enhancement projects in the Southern District, one conducted by the Port Graham Hatchery Corporation in Port Graham and the other undertaken by Cook Inlet Aquaculture Association in Tutka Bay, contributed an additional 10% to Lower Cook Inlet catches. Virtually all fish from these projects were utilized for hatchery cost recovery. The proportion of the Lower Cook Inlet salmon harvest utilized for hatchery cost recovery in 2008 (8.5%) was significantly less than the historical average normally taken by Cook Inlet Aquaculture Association and Port Graham Hatchery Corporation to support the stocking and hatchery programs. Hatchery harvest in 2008 generated approximately 14% of the exvessel value of the 2008 Lower Cook Inlet salmon fishery.

Sockeye Salmon

The 2008 sockeye catch of 407,600 fish accounted for about 37% of the Lower Cook Inlet commercial salmon harvest in total numbers of fish, yet provided approximately 70% of the exvessel value of the entire salmon fishery this season. The 2008 Lower Cook Inlet commercial sockeye harvest was characterized by much weaker than expected returns to key enhanced systems at Leisure and Hazel Lakes (Southern District), Bear Lake (Eastern District), and Kirschner Lake (Kamishak Bay District). In contrast, natural sockeye returns within the management area ranged from good to outstanding, with 4 of 5 major systems achieving or exceeding their respective SEGs. The fifth system fell slightly short of its SEG based on aerial surveillance, but video escapement counts showed more escapement than estimated aerially. Two additional systems with both natural and enhanced production also attained their respective desired inriver returns. Of particular note was the formerly enhanced system of Chenik Lake, located in the Kamishak Bay District on the west side of Lower Cook Inlet, where the sockeye return this season was one of the best on record. The resulting 2008 commercial catch in nearby waters totaled over 171,000 fish, which was over 2.5 times the average catch for that area during the previous 4 seasons. Stocking of Chenik Lake was discontinued after the 1996 season, thus all present production is considered natural, and this season's return was estimated at approximately 182,500 sockeyes, continuing a 6-year trend of excellent returns to the system.

Pink Salmon

Natural returns of pink salmon, usually the dominant species in numbers of commercially harvested salmon in Lower Cook Inlet, were considered variable this year. For the first time in many seasons, Lower Cook Inlet catches of pink salmon were entirely the result of natural production. The numerous and fairly liberal openings to target these natural stocks produced overall catches totaling nearly 506,000 fish. The 2008 harvest figure is only about 36% of the most recent 10-year average and represents the second lowest catch of this species during that timeframe, primarily due to the lack of hatchery production. Pink salmon SEGs were achieved at virtually all monitored systems in the management area.

Chum Salmon

For the eighth year out of the past 9 seasons, Lower Cook Inlet chum salmon returns were relatively strong, producing a harvest of nearly 176,000 fish, the second highest catch for the species in that area since 1988. Interestingly, the majority of this season's chum harvest occurred in Port Dick of Lower Cook Inlet's Outer District, not normally a prominent area for catches of this species, rather than Kamishak Bay which has historically dominated catches. The catch of 87,500 chums in Port Dick was the highest catch for that area since 1981, even greater than that of the strong 1988 season. Kamishak Bay catches this season totaled slightly more than 73,000 chums, considered very good. Escapements into most Lower Cook Inlet chum systems were sufficient to achieve goals, with the exception of McNeil River, where the escapement fell short of its established goal range for the 14th time in the last 19 years.

Coho Salmon

The coho salmon resource is not extensive in the Lower Cook Inlet management area, and as a result this species rarely attains commercial prominence. The commercial harvest of approximately 3,000 coho salmon in 2008 was the lowest since 1977 and was only about one-quarter of the recent 10-year average for this species. The Eastern District accounted for around 55% of the area-wide coho harvest. This district frequently produces the bulk of the Lower Cook Inlet coho catches because of the Seward Silver Salmon Derby and Cook Inlet Aquaculture Association hatchery cost recovery at Bear Lake. The remainder of the Lower Cook Inlet commercial coho catch was split between seiners (24%) and set gillnetters (20%) in the Southern District. One aerial survey was flown specifically for coho salmon this season, indicating good escapement into Clearwater Slough, the major coho salmon index stream at the head of Kachemak Bay in the Southern District.

Chinook Salmon

The 2008 harvest of Chinook salmon, not normally a commercially important species in Lower Cook Inlet, totaled fewer than 200 fish, or less than 20% of the average during the last decade and the lowest catch since 1975. Virtually all of the catch came from the Southern District, with the majority taken in Tutka Bay Subdistrict. Set gillnetters accounted for 79% of the Southern District Chinook catch, with purse seiners taking the remaining 21%.

Upper Cook Inlet

The 2008 Upper Cook Inlet commercial harvest of 2.8 million salmon is approximately 1.5 million fish below the average long-term harvest (Table 1). While all 5 species of Pacific salmon are present in Upper Cook Inlet, the primary focus of the commercial fishery is sockeye salmon. Sockeye salmon escapement goals are monitored in 6 systems in Upper Cook Inlet. In 2008, 2 were within, 2 were below, and 2 were over the goal ranges.

Sockeye Salmon

The preseason forecast for the 2008 season projected a run of 5.6 million sockeye salmon, with a harvest estimate (sport, personal use and commercial) of 3.9 million fish. The total run to the Kenai River, generally the largest producer in Upper Cook Inlet, was forecasted to be 3.1 million fish. This resulted in managing for an inriver sonar goal range in the Kenai River of 750,000 to 950,000 fish. Two regularly scheduled fishing periods plus up to 51 hours of additional fishing time in the Upper Subdistrict set gillnet fishery were allowed with this run size under the

abundance-based escapement goal for the Kenai River. In addition, this run strength mandated 2 closed periods (windows) per week, a 24- and a 36-hour period in the Upper Subdistrict set gillnet fishery.

While the fishing season opens in most of Upper Cook Inlet in mid to late June, participation and harvests remain fairly low until about July 4. In 2008, harvests in the Central District were relatively low through July 12 for a return forecast at the level of 5.6 million; however winds and tides will sometimes have this effect. After July 12, the harvest from each fishing period was approximately one-half of that expected. Beginning July 20, indications from the Offshore Test Fish Program, coupled with harvests and escapements to date, began to indicate the return was not going to be as strong as forecast. On July 24, the run estimate from the Offshore Test Fish Program indicated that the run was going to be not only well below forecast but below 2.0 million, triggering a different escapement goal of 650,000 to 850,000 fish and different management parameters. The commercial fishery targeting Kenai Stocks in the Upper Subdistrict and Central District drift gillnet fishery was closed at the end of the July 24 fishing period and remained closed for the remainder of the year due to lagging sockeye passage to the Kenai River. Even with these actions to conserve Kenai Sockeye, the inriver goal was not achieved. On August 1, the department assessed the total Kenai River sockeye salmon run to be between 1.85 and 1.91 million fish. With this inseason assessment, the inriver escapement goal for the Kenai River became 650,000 to 850,000 fish. The final inriver sonar count in the Kenai River was 614,946 sockeye salmon, slightly below the lower end of the inriver goal range for a run of fewer than 2.0 million. The total Upper cook Inlet run in 2008 was approximately 4 days early and much weaker than forecast.

Postseason assessments of run strength by river system indicate a run to the Kenai River of 2.1 million fish. While there is significant error associated with this estimate it dictates and escapement goal range of 750,000 to 950,000 fish meaning the escapement in 2008 was approximately 135,000 below the lower end of the escapement goal.

The Upper Cook Inlet commercial harvest of 2.3 million fish was significantly below the preseason forecast harvest estimate of 3.9 million and the ninth lowest harvest since 1980. The total run of 4.0 million sockeye salmon to Upper Cook Inlet was 29% less than the preseason forecast. Returns to all systems were significantly less than forecasted, with the largest disparity on the Kenai River, where the run was approximately 1.0 million fish less than forecast.

Sockeye salmon prices at the beginning of the season were approximately $1.20 per pound. The total exvessel value in Upper Cook Inlet for sockeye salmon was approximately $18.0 million, which was 92.5% of the total Upper Cook Inlet exvessel value.

Coho Salmon

The 2008 coho salmon harvest of 166,475 fish was slightly below the recent 10-year average harvest of 188,000 and approximately half of the 1966 to 2007 long-term average coho salmon harvest of 316,000 fish. Commercial coho salmon harvests in 2008 were likely reduced because of attempts to achieve the Yentna Sockeye escapement goal using area restrictions of the drift fleet, closure of several periods in the Northern District set gillnet fishery, and an early closure in the drift fishery and Upper Subdistrict set gillnet on July 24 for much of the remaining season. The coho salmon run in 2008 was judged to be above average. Commercial coho salmon harvests in Upper Cook Inlet during the 1980s and early 1990s were much higher than the long-term average due to good coho salmon production and strong sockeye salmon returns to Upper

Cook Inlet, which resulted in more fishing time in the Central District. Since 1996, Board of Fisheries regulations have reduced fishing time for the drift fleet in the Central District and eliminated additional fishing time directed at coho salmon surpluses in the Northern District, Kalgin Island and Upper Subdistricts of the Central District, which has resulted in marked reductions in the commercial harvest. The only significant coho salmon return to Upper Cook Inlet with an escapement goal is the Little Susitna River. In 2008, the final escapement count of 18,485 fish was slightly below the upper end of the escapement goal range of 19,200 fish. The exvessel value of coho salmon to the commercial fishery was approximately $700,000 or 3.6% of the total exvessel value in Upper Cook Inlet.

Pink Salmon

Approximately 168,000 pink salmon were harvested in 2008. This figure is 75% of the recent 10-year average pink salmon harvest of 187,000 fish and about one-third of the average harvest of 490,000 fish since 1966. Pink salmon harvests were impacted by the restrictions implemented for Yentna River sockeye salmon and the early termination of the Upper Subdistrict set gillnet fishery. Pink salmon escapements are not monitored in Upper Cook Inlet to an appreciable degree; however, it appears that escapements to most river systems were very good. Prices paid for pink salmon ranged from $0.10 to $0.35 per pound, resulting in an exvessel value for this species of $150,000, less than 1% of the total exvessel value.

Chum Salmon

The 2008 harvest of 51,301 chum salmon was well below the long-term average harvest of approximately 500,000 fish. The 2008 chum salmon harvest was approximately 50% less than the recent 10-year average harvest of 120,000 fish. Much of this reduction in harvest was the result of reduced fishing time in traditional fishing areas, primarily by the drift fleet, due to sockeye salmon concerns in Northern Cook Inlet. Following the flood of 1986 through the mid 1990s, chum salmon production in much of Southcentral Alaska was poor. Since the mid-1990s, chum salmon production has increased. Chum salmon runs to most of Cook Inlet in 2008 were good by recent standards. The exvessel value of chum salmon to the commercial fishery was approximately $150,000, or less than 1% of the total value.

Chinook Salmon

The 2008 harvest of 12,917 Chinook salmon is 25% below both the long- and short-term average harvests of 16,200 fish. The two fisheries where Chinook salmon are harvested in appreciable numbers in Upper Cook Inlet are set gillnet fisheries in the Northern District King Salmon Fishery and in the Upper Subdistrict of the Central District. After experiencing a significant downturn in the early to mid-1990s, Northern District Chinook salmon stocks rebounded and were relatively strong for the next 10 years. However, in 2008, the Deshka River Chinook salmon run, generally the largest run in the region was below average, failing to meet its escapement goal. To conserve Chinook salmon, one of the five allowable king salmon periods was closed. The first regular sockeye period on June 26 was also closed in the Northern District. Harvests in the Northern District fishery remain well below the harvest cap of 12,500 fish due to reduced participation and regulatory closures of the highest producing fishing sites located north of the Theodore River. The 2008 harvest in the Northern District of 4,000 fish is about 1,600 higher than the recent 10-year average harvest of 2,400 fish. This is most likely due to changes made by the Board of Fisheries in 2005 that lengthened the fishing periods from 6 hours to 12 hours on each Monday. In 2008, the commercial harvest of 7,000 Chinook salmon in the Upper Subdistrict set gillnet fishery was

about 75% of the average harvest since 1966 when harvest records were available. Late-run Kenai River Chinook salmon 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 36 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 pass into the Kenai and Kasilof Rivers during closed windows, allowable fishing time is maximized when fewer sockeye salmon are moving into Upper Cook Inlet in an attempt to keep sockeye salmon goals within their ranges. This may result in increased Chinook salmon harvest in the set gillnet fishery. In 2008, the exvessel value for Chinook salmon was $461,000 which is approximately 2.4% of the total exvessel value.

BRISTOL BAY

The 2008 inshore Bristol Bay sockeye salmon run of approximately 40.4 million fish ranks 21st since statehood and the preliminary catch of 27.7 million fish ranks 17th since statehood. This year's total inshore run was 9% above the 20-year average (1988 to 2007) of 37.0 million and was slightly higher than the preseason forecast of 40.3 million fish. The Nushagak District came in slightly under forecast, while Ugashik District came in significantly (55%) under forecast. The following districts were above forecast: Togiak (14%), Naknek/Kvichak (8%), and Egegik (18%). The commercial harvest of sockeye salmon was 15% below the 31.4 million preseason forecast. Bay wide total escapement was nearly 12.7 million fish.

Approximately 24,000 Chinook salmon were harvested in Bristol Bay in 2008. This is 36% of the average harvest for the last 20 years and significantly below the preseason expected harvest of 85,000 fish. The chum salmon harvest of approximately 1.2 million is nearly half the 2006 or 2007 harvest; however, it is above the 20-year average of 1.0 million fish. The coho salmon harvest of approximately 90,000 is also close to the 20-year average of 98,000 fish. The pink salmon harvest of approximately 280,000 is above the 20-year average of 240,000 fish. The recent trend of lower pink and coho harvests have more to do with market demand than with stock status.

The 2008 harvest of all salmon species in Bristol Bay was approximately 29.3 million fish. To derive a preliminary estimate of the exvessel value of the fishery, the figures listed in Table 5 were used. These figures represent a rough 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 2008 Bristol Bay salmon fisheries is approximately $113.3 million, which is 91% of the 20-year average, and ranks 11th over that same period.

Sockeye Salmon

The 2008 inshore sockeye salmon run of 40.4 million was only slightly higher than the preseason forecast of 40.3 million fish.

The main concerns for the 2008 season were processor capacity and the potential delayed run due in part to the late spring break-up. Early indications from the Togiak herring fishery and the cold spring temperatures suggested the run could be 1 or 2 days behind schedule. With a projected harvest of 31.4 million sockeye, the department planned to allow more fishing time

early in the run. Most districts were fishing daily by June 26 with catches increasing at manageable levels through June 29. By June 30, daily harvest had increased to over 1.2 million fish and the first action to suspend or limit catch was imposed. With the July 1 harvest of 1.5 million fish, additional suspensions or limits were imposed by a few companies. On July 2, 2.6 million fish were harvested followed by another 2.0 million fish on July 3. By the evening of July 3, 12 companies issued some level of limits or suspensions, and company restrictions continued over the next several days. By July 8, most limits were higher than what permit holders could catch. By July 16, daily catch rates dropped to levels under 500,000 fish and permit holders began to put their boats up for the season. The total harvest was less than forecast, but the inshore run was very close to forecast. For the first time since 1995 the Naknek River and Egegik River Special Harvest Areas were not opened.

Chinook Salmon

Chinook salmon harvests in Bristol Bay districts were below average in every district. As in most areas of the state, the Chinook run to the bay in 2008 was extremely late. There were 2 directed Chinook fishing periods in the Nushagak District with 10 fish harvested in the first period and less than 500 in the second period. The fishery remained closed until management switched to sockeye salmon due to the increasing abundance of that species. Chinook salmon catch and escapement increased in late June. Approximately 18,000 Chinook were harvested during the directed sockeye fishery, with the majority harvested between June 28 and July 2. The final Chinook escapement of 96,700 fish is above the inriver goal of 75,000 fish established in the Nushagak Mulchatna King Salmon Management Plan and exceeded the SEG range. Runs of Chinook salmon to all districts were below average and exhibited late run timing.

Chum Salmon

The total Bristol Bay chum salmon harvest in 2008 was approximately 1.2 million fish. All districts produced harvests above their 20-year average. As in 2007, the Nushagak District had the largest chum harvest of nearly 550,000 fish.

Pink Salmon

Pink salmon have strong runs during even years in Bristol Bay. In 2008, approximately 258,000 pinks were harvested on the Westside of Bristol Bay, and less than 20,000 were harvested from the combined 3 districts on the Eastside.

Coho Salmon

The Bay wide harvest of approximately 90,000 coho salmon was 9% below the recent 20-year average of 98,000 fish. Based on available information it appears the 2008 coho run was slightly early, weak, and compressed in most districts. In the Nushagak District, the main producer for coho in the Bay, the run was strong and lasted past the middle of August. In other districts coho arrived in late July in moderate numbers, but declined in mid-August. In some districts, harvest was limited by market availability.

Table 5.– Preliminary 2008 Central Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Purse Seine						
Eastern	0	1	158	10,830	21	11,009
Northern	0	1	1	8,547	39	8,588
Coghill	0	1	37	6,585	9	6,632
Northwestern						
Southwestern	0	62	7	7,549	517	8,135
Montague	0	10	0	216	1,234	1,460
Southeastern						
Unakwik						
Drift Gillnet						
Bering River	0	1	40	0	0	42
Copper River	11	321	202	1	1	537
Unakwik	0	0	0	1	0	1
Coghill	0	178	81	854	2,308	3,421
Eshamy	0	561	2	103	251	918
Set Gillnet						
Eshamy	0	162	0	20	54	237
Hatchery [c]	0	0	23	7,639	641	8,303
Misc. Prince William Sound [d]	1	3	1	7	0	10
Prince William Sound Total	12	1,301	551	42,354	5,076	49,294
Southern District	0	132	1	10	2	145
Kamishak District	0	184	0	28	73	285
Outer District	0	2	0	468	101	571
Eastern District	0	90	2	0	0	92
Lower Cook Inlet Total	0	408	3	506	176	1,090
Central District	9	2,345	130	165	49	2,698
Northern District	4	26	42	4	2	78
Upper Cook Inlet Total	13	2,372	172	169	50	2,776
Naknek-Kvichak District	1	10,440	6	18	183	10,650
Nushagak District	19	6,886	68	138	541	7,651
Egegik District	0	7,430	13	1	65	7,510
Ugashik District	1	2,349	1	0	111	2,461
Togiak District	3	651	2	121	302	1,078
Bristol Bay Total	25	27,756	90	278	1,202	29,351
Central Region Total	50	31,837	816	43,307	6,504	82,514

Note: Missing data indicates no harvest and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.
Note: Modified 1/30/2009.

[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 1,231,000 fish and 8.58 million pounds in 2008 (Tables 2, 3, and 6). The exvessel value was estimated to be $4.0 million. Cumulative all-gear commercial harvest included 29,000 Chinook, 113,000 sockeye, 415,000 coho, 584,000 chum, and 90,000 pink salmon. The Chinook salmon 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 1,098 limited entry permit holders in 2008.

KUSKOKWIM AREA

A total of 494,108 salmon were commercially harvested from the Kuskokwim Area, approximately 50,000 more fish than in 2007. A total of 462 permit holders participated in the Kuskokwim Area commercial fisheries, which is up slightly from the 456 permit holders that operated in 2007. Exvessel value for the Kuskokwim Area commercial harvest is estimated at $1.487 million. Prices paid for Chinook, sockeye, and coho salmon were higher in 2008 than in 2007. Chinook salmon average price increased from $0.57 to $0.71 per pound, sockeye average price increased moderately from $0.53 to $0.56 per pound, and coho average price increased from $0.38 to $0.42 per pound. The price paid for chum salmon remained at the 2007 level of $0.05 per pound.

The 2008 Kuskokwim Area (Kuskokwim River and Kuskokwim Bay districts) sockeye and chum salmon runs were similar to what was anticipated; however, there has been a general reduction in abundance from the levels for these species seen in 2005 and 2006. The Chinook salmon runs were classified as late and below average in 2008. The 2008 forecast was for the Chinook salmon abundance to be near average and similar to 2007. Preliminary inseason assessment from Kuskokwim River test fishing and subsistence reports seemed to confirm the expectation of average runs; however, based on harvest and escapement estimates, the runs appeared to be lower in 2008 than in 2007. Subsistence harvest information in 2008 is still being compiled, so no postseason total abundance estimate is possible at this time. The commercial coho salmon harvest was below the most recent 10-year average for the Kuskokwim Area fishery; however, coho escapement and harvest information indicate coho runs were stronger in 2008 than in the last few years and had approximately normal timing.

Kuskokwim River

In the Kuskokwim River, processing capacity and continued weak chum salmon market conditions were reoccurring issues in 2008. However, the first commercial fishing period was scheduled on June 20, which focused mainly on sockeye and chum salmon. There was a single buyer operating during the June portion of the season that informed the department that they would cease buying operations from late June through July and would not resume buying operations in District 1 until the coho directed fishery began in August. Participation in the District 1 June fishery fluctuated from 126 to 171 permits. In addition to the single buyer, 8 fishers registered with the department as Catcher/Sellers, with 6 making deliveries. An additional processor operated a buying station on a tender during one full District 1 commercial period during the August coho fishery. The Kuskokwim River District 1 commercial harvest in 2008 was 8,865 Chinook, 15,601 sockeye, 30,516 chum, and 142,862 coho salmon from 20 fishing periods. The 2008 Chinook, sockeye, and chum salmon harvests were above the most recent 10-

year average while the coho salmon harvest was approximately 27% below the recent 10-year average. A total of 374 individual permit holders recorded landings in District 1 during the 2008 season. This level of fishing effort was approximately 23% below the recent 10-year average of 428 fishers. The total exvessel value of the fishery was $538,310—approximately 10% above the recent 10-year average.

Based on preseason outlook and projections, the Kuskokwim River subsistence fishing schedule was not implemented in 2008. We expect that the amounts of salmon necessary for subsistence were achieved throughout the area in 2008. However, high operating cost, weather conditions that were not optimum for processing salmon for subsistence use, and the outlook for high winter heating fuel prices may have increased the subsistence harvest to compensate for possible losses due to the damp conditions in June and July and higher living expenses.

Chinook salmon escapements were evaluated through aerial surveys on 13 index streams and by enumeration at weirs on 7 tributary streams. Chinook escapements in 2008 ranged from above average to below average at all monitored locations. Results of Chinook salmon aerial surveys ranged from below escapement goal ranges or below the median to above escapement goal ranges and above the median. Kogrukluk River Chinook escapement was within the escapement goal range, while Chinook escapement to the Kwethluk, Tuluksak, and George rivers did not achieve the lower end of their respective escapement goal ranges. Chinook salmon escapement timing was among the latest on record with some populations arriving almost 2 weeks later than average. This was inconsistent with inriver run timing near Bethel, which was only slightly later than average this year by 2 to 3 days.

Sockeye salmon escapements were monitored at each of the 7 tributary weir projects; however, sockeye are not a prominent species in many of these systems. Among these locations, Kogrukluk and Kwethluk Rivers receive the largest sockeye escapements. The sockeye salmon passage in these rivers in 2008 was above average, but below the record escapements observed in 2005 and 2006. Sockeye salmon escapement timing was approximately a week later than average at the Kwethluk and Kogrukluk rivers and among the latest on record. This was also inconsistent with inriver run timing near Bethel, which was only slightly later than average this year by approximately 3 days.

Chum salmon escapements were evaluated through enumeration at weirs on 7 tributary streams and a tributary sonar project on the Aniak River. Chum escapements in 2008 ranged from above average to below average at all monitored locations, and were overall well below the record escapements seen in recent years. Chum escapements to the Kogrukluk and Aniak Rivers were within and near the upper end of their respective escapement goal ranges. Chum salmon escapement timing ranged from near average to among the latest on record with some populations arriving a week to 10 days late. Inriver run timing near Bethel was near average.

Coho salmon escapements were counted at weirs on 7 tributary streams. Coho salmon escapements in 2008 were above average at nearly all monitored locations, with the exception of Tuluksak River, which was below average. Escapement at Kogrukluk River was within and near the upper end of the escapement goal range. Overall, coho salmon escapements were higher in 2008 than in previous years. Coho salmon escapement timing was approximately average this year. This was fairly consistent with inriver run timing near Bethel, which was approximately a day earlier than average in 2008.

Kuskokwim Bay

Kuskokwim Bay commercial salmon fisheries were managed according to their associated management plans and regulations. In Kuskokwim Bay, the 2008 District 4 (Quinhagak) commercial harvests were 13,812 Chinook, 69,743 sockeye, 57,033 chum, and 94,257 coho salmon from 31 fishing periods. District 4 Chinook salmon harvest was 27% below the recent 10-year average. Sockeye salmon harvest was 20% above the recent 10-year average, although well below the record harvests taken in recent years. Chum salmon harvest was above average over all years and was 43% above the recent 10-year average. Coho salmon harvest was above average compared to historical harvests and was 57% above the recent 10-year average. The total exvessel value of the District 4 fishery was $750,731—approximately 45% above the recent 10-year average value.

The Kanektok River weir, the primary escapement assessment project for District 4, maintained consistent operation from July 17 through August 21. The decision was made in 2008 to discontinue Kanektok River weir operations each year once the majority of the Chinook, sockeye, and chum salmon runs have come to a close. This action was taken in an effort to reduce the potential of the weir remaining inriver over the winter because of high water levels experienced consistently each fall. Escapement counts at the weir for the operational period in 2008 were 4,730 Chinook, 68,993 sockeye, 24,490 coho, and 53,771 chum salmon. These escapement counts are incomplete because of the late startup of weir operations and earlier project stop date. Chinook and sockeye salmon aerial surveys were flown over the Kanektok River drainage on August 6 for a total count of 3,659 Chinook and 38,900 sockeye salmon. Chinook salmon aerial survey counts were within the escapement goal, although counts were at the lower end of the range. Sockeye salmon aerial survey counts exceeded the upper end of the escapement goal range.

District 5 (Goodnews Bay) commercial harvests in 2008 were 1,281 Chinook, 27,236 sockeye, 10,340 chum, and 22,547 coho salmon from 30 periods. The District 5 Chinook salmon harvest was approximately 49% below the recent 10-year average. Sockeye salmon harvest was approximately 2% above the recent 10-year average, although well below historical high harvests dating back to the early 1990s. Chum salmon harvest was approximately 29% above the recent 10-year average, although well below historical high harvests dating back to the late 1980s and early 1990s. Coho salmon harvest was approximately 29% above the recent 10-year average, although well below historical high harvests dating back to the early 1980s and mid-1990s. A total of 25 individual permit holders recorded landings in District 5 during the 2008 season. This level of fishing effort was slightly lower compared to 2007, and was 33% below the recent 10-year average of 38 fishers. The total exvessel value of the District 5 fishery was $198,070—approximately 30% above the recent 10-year average value.

The Middle Fork Goodnews River weir maintained consistent operation from July 2 through September 15 when heavy rains and rising water resulted in project closure for the remainder of the season. Preliminary weir escapement counts were 1,983 Chinook, 35,635 sockeye, 33,308 coho, and 35,454 chum salmon. Chinook and sockeye salmon escapements were within their respective escapement goal ranges, and the chum and coho salmon escapement goal thresholds were achieved. Coho salmon escapement is believed to be a minimum count because weir operations were suspended on September 15. Chinook and sockeye salmon aerial surveys were flown on the Goodnews River drainage on August 5. Total aerial survey counts were 2,190 Chinook and 13,935 sockeye salmon on the Middle Fork, and 2,155 Chinook and 32,500

sockeye salmon on the North Fork. North Fork Chinook salmon aerial survey counts were within the escapement goal and sockeye salmon aerial survey counts exceeded the upper end of the escapement goal range.

YUKON AREA

The 2008 Yukon River total commercial harvest was 4,641 Chinook, 151,201 summer chum, 119,265 fall chum, 14,100 pink, and 35,691 coho salmon for the Alaskan portion of the drainage. A total of 4,641 Chinook, 125,598 summer chum, 108,974 fall chum, 14,100 pink, and 33,192 coho salmon were harvested in the Lower Yukon River (Districts 1–3) and 0 Chinook, 25,603 summer chum, 10,291 fall chum, and 2,499 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 496 permit holders sold fish in 2008 and the exvessel value was $1.4 million.

The 2008 Chinook salmon run was anticipated to be similar to the 2007 run, and below average in abundance. Despite recent declines in run size, it was anticipated the Chinook salmon run would provide for escapements, support a normal subsistence harvest, and support a small commercial harvest of 5,000 to 30,000 fish. The 2008 summer chum run was anticipated to be near average and support escapements and a normal subsistence and commercial harvest. Summer chum salmon runs have exhibited steady improvements since 2001, with a harvestable surplus in each of the last 5 years (2003 to 2007). The commercial harvestable surplus in Alaska was expected to range from 500,000 to 900,000 fish, recognizing that the actual commercial harvest of summer chum salmon could likely be 1) affected by a potentially poor Chinook salmon run, as Chinook salmon are incidentally harvested in this fishery, and 2) dependent on market conditions and fishing effort, though there has been a renewed market interest for summer chum salmon since 2007.

ADF&G and United States Fish and Wildlife Service staff cooperatively developed the preseason and inseason management approaches which were distributed in May, as the 2008 Yukon River Salmon Fisheries informational flyer. The subsistence salmon fishing schedule was initiated on May 26 in District 1 and implemented upriver chronologically, consistent with migratory timing as the run progressed upstream.

All available run assessment information was reviewed on a daily basis, including the Lower Yukon Test Fishery, Pilot Station sonar, Marshall Test Fishery, subsistence harvest reports, age composition data, and abundance and run timing information from other western Alaska rivers. This information was used to evaluate abundance, run timing, and quality of the Chinook salmon run. By June 20, the historical midpoint of the run, most indicators pointed to a weak Chinook salmon run.

The Lower Yukon Test Fishery detected the first pulse of Chinook salmon entering the Yukon River from the evening of June 14 through June 17, followed by 5 days of low catch rates. On June 20, the cumulative catch per unit effort (CPUE) was approximately half the historic average for that date. The first pulse of Chinook salmon yielded a lower than expected estimate of approximately 10,000 fish at Pilot Station Sonar. The estimated Pilot Station sonar run projection at that time appeared to be as low as 80,000 fish. These data raised concerns about the magnitude of the run. The projected Chinook salmon run abundance would not support average subsistence harvests in Alaska (approximately 50,000 Chinook salmon), meet escapement goals in Alaska, and

meet the interim management escapement goal of more than 45,000 fish in Canada agreed to by the Yukon River Panel.

During Yukon River Drainage Fisheries Association weekly teleconferences, ADF&G and United States Fish and Wildlife Service staff provided run assessment and potential management strategies. Subsistence fishers provided reports on fishing efforts and were encouraged to provide input on management strategies. In an effort to conserve Chinook salmon, management actions were implemented that reduced the subsistence salmon fishing period duration chronologically from downriver to upriver after the first pulse of Chinook salmon had passed—consistent with the migratory timing as the run progressed. These reductions beginning June 23 in District 1, while unfortunate, were needed to provide adequate numbers of Chinook salmon on the spawning grounds.

The inseason management strategy was to protect the second and third pulses throughout the Yukon River mainstem by attempting to implement subsistence fishing period reductions equally among each of the districts and subdistricts to conserve Chinook salmon as these pulses migrated upriver. This entailed reducing the regulatory fishing periods by half for 3 consecutive periods in Districts 1 through 4 and Subdistricts 5-A, B, and C. Because Subdistrict 5-D has a regulatory schedule of 7 days per week, the schedule was reduced by half for 2 weeks. Additionally, gillnet mesh size was restricted to 6 inch or smaller in Districts 1–3 to target chum salmon. This management action was taken to account for the opportunity lower river fishers had to harvest Chinook during the first pulse and was implemented when good quality chum salmon were available for harvest. This strategy may have impacted District 3 fishers more, because historically fewer chum salmon are harvested for subsistence than in Districts 1 and 2.

During the Yukon River Drainage Fisheries Association weekly teleconferences, there were discussions about applying lower river mesh size restrictions to upriver districts and establishing fish wheel restrictions requiring release of Chinook salmon. However, it was determined that fewer fishers upriver had access to smaller mesh size gillnets and the presence of poor quality of chum salmon would not be utilized for subsistence. Therefore, subsistence periods were reduced in Districts 4 and 5, but no gear restrictions were established. Subsistence fishing restrictions were not implemented in the Tanana and Koyukuk River drainages because of low fishing effort, and in the case of the Tanana River, assessment projects are available to manage this river separately.

No directed Chinook salmon commercial fishery occurred in 2008. Based on the projected average run estimate for summer chum, the department initiated short commercial periods restricted to 6-inch maximum mesh size in the lower river districts directed at chum salmon beginning in District 1 on July 2. Because of the uncertainty about the Chinook salmon run strength, only restricted mesh openings were allowed in 2008. Additionally, the department attempted to schedule these chum-directed commercial periods when Chinook salmon abundance was low, and 7 commercial periods were established in Subdistrict 4-A. Six commercial periods were established in District 6 directed at summer chum salmon, but due to high water events, fishing effort was limited. The commercial Chinook salmon harvest was 88% below the 1998 to 2007 average harvest of 39,367 fish. The summer chum salmon harvest was 206% above the 1998 to 2007 average harvest of 49,675 fish. A total of 457 permit holders participated in the summer chum salmon fishery, which was approximately 24% below the 1998 to 2007 average of 599 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 444 permit holders fished in the Lower Yukon Area in 2008, which was approximately 23% below the 1998 to 2007

average of 577. In the Upper Yukon Area, 13 permit holders fished, which was approximately 48% below the 1998 to 2007 average of 25.

Yukon River fishermen in Alaska received an estimated $718,000 for their Chinook and summer chum salmon harvest in 2008, approximately 71% below the 1998 to 2007 average of $2.5 million. Two buyer-processors and 5 catcher-sellers operated in the Lower Yukon Area (Districts 1–3). Lower Yukon River fishers received an estimated average price per pound of $4.64 for incidentally harvested Chinook and $0.40 for summer chum salmon. The average price paid for Chinook salmon in the Lower Yukon Area was approximately 35% above the 1998 to 2007 average of $3.44 per pound. The average income for Lower Yukon Area fishers in 2008 was $1,479. Three buyer-processors and one catcher-seller operated in the Upper Yukon Area (Districts 4–6). Upper Yukon Area fishers received an estimated average price per pound of $0.25 for summer chum sold in the round and $3.00 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 1998 to 2007 average of $0.23 per pound. No Chinook salmon were sold in the Upper Yukon Area. The average income for Upper Yukon Area fishers that participated in the 2008 fishery was $2,633. The majority of the income earned in the upper river was from the Subdistrict 4-A commercial fishery.

Preliminary postseason analysis indicates that the 2008 Chinook salmon total run was approximately 65,000 to 75,000 less than anticipated. Parent year escapements in 2002 and 2003 were generally above average across the drainage. High water hampered efforts to accurately quantify individual tributary escapements; thus, most escapement goals could not be assessed. Based on available data, it appears that the lower end of the BEGs in the Chena and Salcha rivers, the largest producing tributaries of Chinook salmon in the Alaska portion of the drainage, were met. Typically, about 50% of the Chinook salmon production occurs in Canada; hence, the US/Canada Yukon River Panel agreed to a 1-year Canadian Interim Management Escapement Goal of more than 45,000 Chinook salmon, based on the Eagle sonar program.. The preliminary estimated escapement into Canada is approximately 32,000 fish, or 28% below the goal.

In 2008, there was an exceptionally large run of pink salmon and, for the period of approximately June 30 through July 3, we believe a significant number of pinks were initially incorrectly apportioned by Pilot Station sonar as summer chum salmon. These estimates were corrected postseason, reducing the final estimate for summer chums from 1,858,000 to 1,665,667 fish, which was still well above the drainage-wide optimum escapement goal of 600,000 fish for the Yukon River.

Summer chum escapements were generally good in lower river tributaries and the Koyukuk River drainage. Escapement goals have been established for the Andreafsky and Anvik Rivers. The estimated escapement of 57,259 summer chum salmon for the East Fork Andreafsky River was below the BEG range of 65,000 to 135,000 fish. The Anvik River sonar-based escapement count of 374,929 summer chum salmon was within the BEG range of 350,000 to 700,000 fish. The large number of pink salmon in the Anvik River precluded accurate inseason estimates, and a postseason adjustment was necessary.

The 2008 Yukon River fall chum salmon run was late and drawn out which contributed to a commercial harvest of both fall chum and coho salmon below the preseason outlook for both species. The fall commercial fishery anticipated a harvest of 50,000 to 400,000 fish based on the brood year returns and recent production levels. The 2008 commercial harvest of 119,265 fall

chum salmon was approximately 148% above the 1998 to 2007 average of 48,086 fish and the 35,691 coho harvest was 66% above the 10-year average of 21,490 fish.

The commercial fall chum and coho salmon season value for the Yukon Area was estimated to be $671,552 ($645,746 for the Lower Yukon Area, $25,806 for the upper Yukon Area). The value was well above the previous 10-year average for the Yukon Area of $114,002 ($99,287 for the Lower Yukon Area, $14,715 for the Upper Yukon Area). Yukon River fishers received an average price of $0.55 per pound for fall chum salmon in the Lower Yukon Area and $0.27 per pound in the Upper Yukon Area in 2008; the recent 10-year average price was $0.24 per pound in the Lower Yukon Area and $0.14 per pound in the Upper Yukon Area. For coho salmon, fishers received an average price of $0.97 per pound in the Lower Yukon Area and $0.20 per pound in the Upper Yukon Area; the recent 10-year average price was $0.29 per pound in the Lower Yukon Area and $0.10 per pound in the Upper Yukon Area. An average of 117 permit holders fished the fall chum and coho salmon fishery (112 for the Lower Yukon Area, 5 for the Upper Yukon Area) during the previous 10 fall seasons as compared to 439 fishers who participated in 2008 (428 for the Lower Yukon Area, 11 for the Upper Yukon Area).

The long drawn-out run timing of fall chum salmon resulted in a slow harvest rate. Commercial fishing activity was delayed midseason until additional surplus became available in accordance with the Yukon River Drainage Fall Chum Salmon Management Plan. The fall season was extended and fishing time was increased as fish continued to enter the river late in the season. Overall fish quality was reported as exceptional with the highest prices paid per pound in the last 20 years. The slow salmon passage discouraged fall salmon markets in District 4 while Districts 5 and 6 fishermen were challenged with lost fishing gear due to flood waters and freezing conditions terminating commercial operations.

The total 2008 fall chum salmon run size was estimated to be approximately 730,000 fish, which was below the preseason projection of 900,000 to 1.2 million fish. Parent-year escapements in 2003 were 695,000 fish and in 2004 were 538,000 fish. The drainage-wide escapement was estimated to be near 500,000 fall chum salmon in 2008 and within the BEG goal of 300,000 to 600,000. Tributary stock escapement goals and management objectives were met or exceeded for the Chandalar River, the Canadian Mainstem, and the Tanana River while escapements fell slightly below goals for the Sheenjek and Fishing Branch Rivers.

There is only one established escapement goal for coho salmon in the Yukon River drainage, which is a SEG for the Delta Clearwater River. The 2008 boat count survey of 7,500 coho salmon was within the SEG range of 5,200 to 17,000 fish. The 2008 Pilot Station Sonar passage index of 136,000 fish was below the 1995, and 1997 to 2008 average of 149,000 fish, which is in agreement with most index projects for coho salmon of a slightly below average run strength and average timing.

NORTON SOUND AREA

Highlights of the 2008 Norton Sound District commercial salmon fishery included the third highest coho salmon harvest on record, a resurgence of directed pink salmon fishing, and the return of commercial salmon fishing in the Golovin (Subdistrict 2) and Norton Bay (Subdistrict 4) Subdistricts for the first time in years. There was increased commercial interest in chum salmon, but the onset of the chum salmon fishery was delayed until mid-July in southern Norton Sound in order to conserve Chinook salmon. In northern Norton Sound, below average chum salmon escapements limited directed chum salmon fishing to a few brief periods. Once again

Chinook salmon runs were poor in Norton Sound and subsistence closures were necessary in Subdistricts 5 and 6 (Shaktoolik and Unalakleet). Commercial salmon fishing began with a 12-hour opening in Subdistricts 2 and 4 on July 1 directed at pink and chum salmon. A subsequent 12-hour period occurred on July 3 in Subdistricts 2 and 4 although mesh size was restricted to $4^1/_2$ inches or less in Norton Bay in order to minimize the incidental harvest of Chinook salmon because of weakness shown in the Chinook salmon run in southern Norton Sound.

Commercial fishing for chum salmon began in Moses Point (Subdistrict 3) on July 5 with a 12-hour period followed by another 12-hour period on July 9. However, a weak commercial CPUE and comparably poor tower counts in both Subdistricts 2 and 3 indicated a surplus was not available for commercial harvest and directed chum salmon fishing was no longer permitted in these subdistricts. Fishing resumed in Subdistrict 3 in late July to target pink salmon after the majority of chum run was over. There was a lack of fishing effort in Subdistricts 2 and 4 during coho salmon season, but the Subdistrict 3 harvest was in the top ten historically.

Commercial salmon fishing began in Subdistricts 5 and 6 on July 8, with a 6-hour pink salmon opening. Commercial pink salmon fishing continued for a week with 3 more 6-hour periods and 4 more 8-hour periods. Catches in the Unalakleet River test net for chum salmon were record-setting in early July, but the department held off on commercial chum salmon fishing until July 17 in order to protect Chinook salmon. Chinook salmon runs were poor in 2008 and the run ended up being the worst on record. Subsistence fishing for Chinook salmon was closed for 2 weeks beginning on July 5 in both the marine waters of Subdistricts 5 and 6 and in the Unalakleet River drainage. The North River, a tributary of the Unalakleet River, had the lowest tower count of Chinook salmon in the project's history.

Cumulative Unalakleet River test net and Subdistrict 5 commercial coho salmon harvests were record-setting in 2008 and the Subdistrict 6 commercial coho harvest was the fourth highest on record. The first coho salmon fishing period began on July 20 in Subdistricts 5 and 6 and two 48-hour fishing periods a week were allowed until mid-September.

The Port Clarence District had several 12-hour openings the first half of July to target sockeye salmon. However, by mid-July the in-river goal of 30,000 sockeye salmon for the Pilgrim River was projected to fall short and commercial fishing was suspended. The commercial catch was 89 sockeye salmon, 256 chum salmon, and 623 pink salmon.

The Norton Sound District combined commercial harvest of all salmon species ranked first in the last ten seasons. The number of commercial permits fished (92) was the highest since 1997, but twelfth lowest on record. The 2008 fishery value to permit holders of $760,362 was well above the recent 5-year average of $289,047 and the highest since 1994. The average value per permit holder of $8,346 was a record without adjusting for inflation.

The Norton Sound District coho salmon harvest of 120,293 fish was nearly 150% above the recent 5-year average and nearly 240% above the recent 10-year average. A total of 75,384 pink and 25,124 chum salmon was purchased in the Norton Sound District, the majority of which were harvested in the Shaktoolik and Unalakleet Subdistricts.

The average price paid was $0.73 per pound for Chinook salmon, $0.56 per pound for sockeye salmon, $0.77 per pound for coho salmon, $0.23 per pound for pink salmon, and $0.34 per pound for chum salmon. The average price paid for pink salmon was the highest on record, while the average prices for coho and chum salmon were the highest since 1988.

KOTZEBUE SOUND AREA

The chum salmon run to Kotzebue Sound in 2008 was estimated to be well above average based on the commercial harvest rates, above average subsistence catches, the Kobuk test fish index, and aerial surveys. The commercial harvest consisted of 190,321 chum salmon and ranked second highest in the last decade. Also harvested during the commercial fishery and kept for personal use were 4 Chinook salmon, 9 sockeye salmon, 693 pink salmon, 36 coho salmon, 1,629 Dolly Varden, and 37 sheefish. There were likely some additional fish kept for personal use that did not get reported on fish tickets. The Kobuk test fish index ranked second highest in the 16-year project history. Both Kobuk River and Noatak River aerial surveys ranked in the top 3 historically.

As in recent years, the department opened the commercial fishery continuously and allowed the buyer to set the fishing time for their fleet. There were 48 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 from his boat to Kotzebue area residents. The number of active permit holders has been in the 40s since a buyer returned in 2004, but is less than half the permit holders that fished in the 1990s, and well below the nearly 200 permit holders that fished in the early 1980s.

A total of 1,540,238 pounds of chum salmon (average weight 8.1 lbs) were sold at an average of $0.25 per pound. The total exvessel value was $385,270 to Kotzebue Sound fishers. The average value for each participating permit holder was $8,026. The total exvessel value represents 65% of the $589,587 historical average from 1962 to 2007.

Table 6.–Preliminary 2008 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [a]
Kuskokwim River	9	16	143	0	31	199
Kuskokwim Bay	15	97	117		67	296
Kuskokwim Area Total	24	113	260	0	98	495
Lower Yukon River	5	0	33	14	235	287
Upper Yukon River			2		35	37
Yukon River Total	5	0	36	14	270	324
Norton Sound	0	0	120	76	25	222
Kotzebue Sound					190	190
AYK Region Total	29	113	416	90	584	1,232

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

[a] Columns and rows may not total exactly due to rounding errors.

WESTWARD REGION

KODIAK MANAGEMENT AREA

The following is an overview of the 2008 Kodiak Management Area (KMA) commercial salmon season and stock status summary. The 2008 KMA commercial salmon fishery began on June 5 and the last commercial landing occurred on September 14.

Salmon escapement and harvest estimates reported in this document were summarized from the ADF&G escapement and fish ticket databases on October 1, 2008. Data provided in this report are preliminary and supersede any data previously published.

Commercial fishing effort was once again low during the 2008 commercial salmon season and slightly lower than 2007. Of the 608 eligible commercial salmon permits, only 277 (45.6 %) made commercial landings.

By gear type, a total of 148 set gillnet and 129 purse seine permit holders fished in 2008. Beach seine permit holders did not participate in 2008. Both seine and gillnet permit holder's participation was below the previous 10-year average, and below the 2007 commercial salmon season as well. The number of permits actually fished at any given time varied throughout the season.

The 2008 estimated total for the KMA commercial harvest was 17,268 Chinook salmon, 1,818,702 sockeye salmon, 300,779 coho salmon, 8,788,000 pink salmon and 908,030 chum salmon (Table 7). Approximately 11.8 million fish were commercially harvested in the KMA, which is below the previous 10-year (1998 to 2007) average of 24.7 million fish. Of the total salmon commercially harvested in 2008, 3,270 salmon were retained for the permit holders' own use (homepack, taken but not sold). Subsistence and sport fishery salmon harvests will not be known until after permits and questionnaires are returned to the department in late spring of 2009.

The estimated total exvessel value of the 2008 fishery was approximately $27.87 million, which was above the 10-year average exvessel value of $24.32 million.

Purse seine fishermen accounted for 83.1% of the total number of salmon harvested and averaged $163,644 per fished permit. The exvessel value increased from the 2007 season, and was significantly higher than the previous 10-year average of $109,266 for purse seine permit holders.

Set gillnet fishermen accounted for 16.9% of the total number of salmon harvested. Earnings averaged approximately $43,187 per fished permit, which was an increase over 2007, and higher than the previous 10-year average permit holder earnings of $38,427.

2008 Commercial Harvest Summary

Chinook Salmon

The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the KMA. There are no directed Chinook salmon commercial fisheries in the KMA but incidental commercial harvest occurs during targeted sockeye salmon fisheries. Non-retention of Chinook salmon was implemented in the Outer Karluk Section in 2008 due to low returns. The 2008 commercial harvest of Chinook salmon in the KMA totaled 17,268 fish which was lower than the previous 10-year average of 19,037 and below the 2008 forecast of 20,000 fish.

Sockeye Salmon

The 2008 commercial harvest of sockeye salmon in the KMA totaled 1,818,702 fish. The harvest was below the recent 10-year average of 3,051,291 but above the point forecast of 1,706,150 fish.

Early season (through July 15) management for much of the west side and north end of Kodiak Island is driven by the Karluk early-run sockeye salmon. The Karluk early-run sockeye salmon minimum escapement goal of 110,000 fish was not achieved in 2008 (82,071 fish). Approximately 220,591 sockeye salmon were harvested in early-season (through July 15) westside fisheries, which was below the early-run sockeye salmon point forecast of 251,000 fish. Approximately 352,747 sockeye salmon were harvested in the late-season westside fishery which was above the late-run sockeye salmon point forecast of 191,000 fish.

The Ayakulik River was forecasted to have a small surplus of sockeye salmon (171,000 fish) available to commercial fishing in 2008. However, the total return proved to be weaker than forecast with escapements of 162,888, which was below the minimum escapement goal of 200,000 fish. No directed sockeye salmon fishery was allowed in the Inner and Outer Ayakulik sections. Approximately 50,000 sockeye salmon were harvested in the Inner and Outer Ayakulik sections during a pink salmon opening.

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 salmon harvest indicated a fair run. As the season progressed, it became evident that the early-run sockeye salmon to Upper Station was fair. The Upper Station lower escapement goal was met for early-run sockeye salmon by June 20. The 2008 forecast for Frazer Lake was estimated at 420,000 with a harvestable surplus of approximately 295,000 fish. The Frazer Lake sockeye salmon run came in a little later than average with the first significant escapement count occurring on June 14. After the first push, it became evident that the run was stronger than expected. By July 9, the desired sockeye salmon goal was achieved through the Dog Salmon weir. In order to prevent overescapement, the Alitak District was opened until further notice. The Alitak District early-run sockeye salmon commercial harvest was approximately 407,726 fish, which was above the point forecast of 357,000 fish.

The late-run sockeye salmon forecast for Upper Station predicted a total return of 241,000 fish with 55,000 fish available for harvest. The late-run sockeye salmon to Upper Station proved to be much stronger than forecast. Escapements were sufficient to allow several commercial fishing openings in the Alitak District. The total late-run sockeye salmon harvest of 334,912 fish was well above forecast of 55,000 fish.

Cape Igvak Salmon Management Plan

This regulatory management plan (5 AAC 18.360) allocates 15% of the total Chignik-bound sockeye salmon 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 2008. However, as the season progressed, it became evident the early-run portion of the Chignik sockeye salmon run was below forecast. The Cape Igvak Section did not open to commercial salmon fishing prior to July 25 in the 2008 season.

North Shelikof Sockeye Salmon Management Plan

From July 6 to 25, this regulatory management plan (5 AAC 18.363) places harvest limits on 2 areas of the KMA bordering northern Shelikof Strait (mid- to north Mainland and northwest Afognak/Shuyak Islands) 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 salmon runs and the fishing periods are based on the projected pink salmon run strength. If it appears that the sockeye salmon 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 2008, a department biologist was present on the grounds to determine the sockeye salmon catch and facilitate orderly, short notice closures if the harvest limits were met.

A Seaward Zone closure was not required in the North Shelikof Unit. The total July 6 to 25 harvests in the North Shelikof Unit was 5,157 sockeye salmon, 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 fish was not met. The July 6 to 25 harvests in the Southwest Afognak Section was about 17,216 fish.

Terminal and Special Harvest Areas

Some fisheries occur in areas where salmon enhancement projects create surplus production. Sockeye salmon harvests are outlined below.

There was very little commercial salmon effort or harvest in the Waterfall and Foul Bay special harvest areas with a total of 5,879 sockeye salmon harvested in both areas.

In the Spiridon special harvest area (Telrod Cove), 154,575 sockeye salmon were harvested. The harvest in the Spiridon special harvest area represents an estimated 41% of the total harvest of Spiridon enhancement fish; the other 59% are harvested in traditional net fisheries along the westside of the KMA. The total Spiridon sockeye salmon commercial harvest is an estimated 377,012 fish (forecast 226,000 fish).

The Kitoi Bay Hatchery sockeye salmon harvest was an estimated 66,318 fish, and was above the point forecast of 46,000 fish. 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 300,779 was below the forecast of 409,737 fish, and below the 1998 to 2007 average of 409,412 fish.

The majority of the coho salmon 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 120,366 fish.

Pink Salmon

Overall, the 2008 pink salmon harvest of 8,788,884 was near the harvest forecast of 9,850,000 fish, and well below the past 5 even-year (1998 to 2006) average harvest of 20,690,329 fish, and below the previous 10-year average harvest of 20,393,127 fish.

Wild stock pink salmon harvests were poor as forecasted with 6,670,084 fish harvested in the KMA. Westside fisheries (Southwest Afognak to Ayakulik), accounted for 3,067,936 fish and the eastside and the north end of Kodiak Island had a harvest of 1,298,089 fish.

The Kitoi Bay Hatchery pink salmon return was weaker than expected. In those sections near the hatchery about 2,053,800 million fish were harvested. 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 salmon harvested and sold by the Kodiak Regional Aquaculture Association.

Chum Salmon

The chum salmon harvest of 908,030 fish was slightly below the forecast of 919,372 fish, but above the 1998 to 2007 average of 869,010 fish. The eastside and the north end of Kodiak Island accounted for 317,947 chum salmon. Kitoi Bay Hatchery chum salmon production was weaker than expected, with 120,366 fish which was below the 2008 forecast of 161,000 fish.

2008 Escapement Summary

During the 2008 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 of 3,845 was well below the previous 10-year average of 20,967 fish. Escapement goals for Chinook salmon have been developed for the Karluk and Ayakulik rivers and the escapements are estimated using fish counting weirs. The Chinook salmon count of 752 through the Karluk weir was below the range of the established goal of 3,600 to 7,300 fish. Early in the 2008 commercial salmon season, it appeared that the Chinook salmon escapement into the Karluk River would be weak. In order to increase escapement numbers, the department implemented the non-retention of Chinook salmon over 28 inches in the Outer Karluk Section. In addition, both subsistence and sport fish fisheries were closed in the Karluk system. Chinook salmon escapement of 3,071 fish through the Ayakulik weir was also below the established range of the escapement goal of 4,800 to 9,600 fish.

Sockeye Salmon

The 2008 sockeye salmon returns were varied. The Karluk early-run, Karluk late-run, Ayakulik, Buskin, and Little River systems did not meet the minimum escapement goals for sockeye salmon. The Upper Station early and late runs, the Frazer, Afognak, Uganik, Saltery and Pasagshak systems had escapements that were within or above established escapement goals.

Coho Salmon

The only established coho salmon escapement goals occur in the Northeast Kodiak and Eastside Kodiak districts and include the following rivers; American (400 to 900 fish), Olds (1,000 to 2,200 fish), Buskin (3,200 to 7,200 fish) and the Pasagshak (1,200 to 3,300 fish) rivers. The escapement goals were met for the Buskin River (9,001 fish), and the American River (700 fish); however escapements in the Olds and Pasagshak rivers were below escapement objectives.

For the entire KMA, the estimated coho salmon escapement of 62,869 fish was well below the previous 10-year average of 132,114 fish. However, it is expected that the coho salmon escapement estimates will continue to increase as more coho salmon enter KMA systems throughout the fall. At this time the KMA has very little coho salmon monitoring, (the last aerial surveys were conducted on September 23) and the lack of stock status information will further hamper the management of coho salmon in the KMA.

Pink Salmon

Overall, pink salmon escapement (3,161,208 fish) was below the previous 5 even-year average of 6,927,653 fish and below the 10-year average of 5,364,912 fish. Pink salmon escapement goals have been established as an aggregate goal for the entire Kodiak Archipelago and the Mainland District. The escapement goal range of 2.0 million to 5.0 million fish was met for the combined Kodiak Archipelago (2,924,708 fish). The Mainland District pink salmon escapement of 236,500 was below the established escapement goal range of 250,000 to 750,000 fish.

Chum Salmon

The overall chum salmon escapement of 223,907 fish was below the recent 10-year average (549,389 fish). Escapement goals have been established in Kodiak Archipelago and the Mainland. The escapement in the Kodiak Archipelago was below the escapement goal of 151,000 fish with an estimate of 101,482 fish while the Mainland District escapement of 122,425 fish exceeded the escapement goal of 104,000 fish.

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 Chignik Management Area. There are several streams within the Chignik Management Area that additionally support large runs of pink, chum, and coho salmon. In 2008, the sockeye salmon early and late-run were below recent averages. In contrast, strong returns of pink and chum salmon resulted in near record runs for those species. In 2008, the area was open to commercial salmon fishing for 73 days (June 24 to September 27) and a total of 54 permits were fished.

Escapement Summary

Escapement through the Chignik River weir was monitored using underwater digital video equipment. There were 2 gates in the weir, which were normally 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 2008 season occurred on May 26 when weir installation was complete, and the last weir count of the season took place on September 2, after which the weir was removed.

Aerial surveys were flown throughout the season to monitor escapement into Chignik Management Area streams. Peak aerial survey counts, by index stream and species, were summed and compared to established escapement goals. Pink and chum salmon escapements were measured against established area-wide SEGs which were apportioned into district-wide management objectives.

Chinook Salmon

The Chignik River is the only Chinook salmon-producing stream within the Chignik Management Area and one of the largest Chinook streams on the South Alaska Peninsula. The BEG for Chinook salmon in the Chignik River watershed is 1,300 to 2,700 fish. The 2008 Chignik River Chinook salmon escapement of 1,730 fish through the weir is assumed to have met the BEG but was well below the previous 5-, 10-, and 20-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 2009.

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 late-run objectives include an additional 50,000 fish which are incorporated into the late-run SEG to provide for additional freshwater subsistence fishing opportunity. The early-run SEG of 350,000 to 400,000 sockeye salmon through July 4 was achieved with an estimated escapement of 377,579 fish.

Post-weir sockeye salmon escapement estimates were produced for the September 3–15 and the September 16–30 periods, which were included in the total late-run escapement estimate. The late-run (post-July 4) SEG of 250,000 to 400,000 fish was met with an estimated escapement of 328,479 fish. Early run escapement was slightly above the prior 5-year average but below the previous 10-, and 20-year average escapements. The late run was above prior 5-, 10-, and 20-year average escapements. Sockeye salmon escapements into other Chignik Management Area streams were relatively minor.

Coho Salmon

Coho salmon begin to enter Chignik Management Area 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 2008 Chignik River coho salmon escapement estimate through September 2 was 13,958 fish. This was below prior 5-year, and above the 10-year average. Although no coho salmon escapement goals have been established for the Chignik Management Area, coho salmon escapement throughout the area appears to be consistent with past years and sustainable at this level.

Pink Salmon

An estimated 22,341 pink salmon passed the Chignik River weir in 2008, which was the largest recorded pink salmon escapement on record. Pink salmon escapement to other Chignik Management Area streams were estimated via aerial survey and summarized by district. The even-year upper end of the SEG for all districts combined (600,000) was exceeded with an estimated total peak escapement of 796,190 fish.

Chum Salmon

The 2008 Chignik River chum salmon escapement was 124 fish, which was slightly below average for the Chignik River. Chum salmon escapements to other Chignik Management Area streams were estimated via aerial survey and summarized by district. The SEG of all districts combined (57,400 fish) was exceeded with an estimated total peak escapement of 193,135 fish.

Commercial Fishery Summary

The 2008 Chignik Management Area commercial salmon fishery was the third season since the cooperative management plan was deemed invalid in 2005. The first fishing period in the area occurred on June 24 and the last fishing period ended on September 27; however, there was no salmon harvest after September 16.

Harvest Summary

Chinook Salmon

A total of 970 Chinook salmon were commercially harvested in 2008, which was below historic average harvests. The majority of the 2008 Chignik Management Area Chinook salmon harvest occurred in the Western District, with much of the remainder harvested in the Chignik Bay and Central districts. Most Chinook salmon were harvested in July and early August.

Sockeye Salmon

A total of 687,270 sockeye salmon were commercially harvested in the Chignik Management Area during 2008, which was approximately 633,000 (48%) less than the prior 10-year average harvest and approximately 251,000 (27%) less than the prior 5-year average harvest. The majority of the 2008 Chignik Management Area sockeye salmon harvest came from the Chignik Bay District, although substantial harvests also occurred in the Central and Western districts.

The Southeast District Mainland and Cape Igvak fisheries were not opened during the allocation period as the Chignik Area sockeye harvest did not exceed the required 600,000 fish during this time (through July 25).

Coho Salmon

A total of 161,536 coho salmon were commercially harvested in 2008, which was greater than the prior 10- and 20-year average harvests, and over 116,000 more coho salmon than the prior 5-year average harvest. The majority of the coho salmon harvest in 2008 took place in the Western District, and most were harvested during July and August.

Pink Salmon

A total of 2,389,958 pink salmon were commercially harvested in 2008, which was well above the prior 5-, 10-, and 20-year average harvests and was the second largest harvest on record. The largest portion of the Chignik Management Area pink salmon harvest came from the Western District, although the Central, Eastern, and Perryville districts also yielded a substantial portion of the catch. Most were harvested between late July and mid-August.

Chum Salmon

A total of 209,325 chum salmon were commercially harvested in 2008, which was well above the prior 5-, 10-, and 20-year average harvests. The majority of the chum salmon harvest in 2008

took place in the Western District, although the Central and Eastern districts also yielded substantial catches. Most chum salmon were harvested between late July and mid-August.

Economic Value Summary

The exvessel value of the 2008 Chignik Management Area commercial salmon fishery was about $7.3 million, which is approximately $134,000 per active permit holder. A majority of the value was from the sale of sockeye salmon (56%), while pink harvest contributed a greater proportion (25%) of the fishery value than past years, contributing roughly $33,500 per active permit holder. Furthermore, coho (11%) and chum (7%) harvest accounted for a greater proportion of the value than past years. Per active permit holder, the harvest provided $14,412 for coho, $9,877 for chum $282 for Chinook salmon.

Department Test Fishery Summary

The department conducted test fisheries on 5 occasions in 2008. Data from these test fisheries were used to assess the early season buildup of sockeye salmon in Chignik Lagoon and to provide biological samples. An estimated 5,090 sockeye salmon were harvested, which provided approximately $26,204 that was used to offset the cost of vessel charters and operating the Chignik weir.

Subsistence Summary

At this writing subsistence harvest numbers for 2008 have not been finalized.

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

The 2008 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas totaled 6,000 Chinook, 4,243,000 sockeye, 351,000 coho, 13,529,000 pink, and 980,000 chum salmon (Table 7). Subsistence salmon harvest will be reported in the 2008 annual management report. Data reported in this report are considered preliminary and supersede any data previously published.

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 and one 64-hour fishing period. The commercial salmon harvest in June consisted of 3,744 Chinook, 1,713,167 sockeye, 178 coho, 1,971,268 pink, and 410,932 chum salmon. The first 2 periods of the June fishery were marked by a price dispute between the processors and most of the fleet. By the end of the second period, participation had returned to levels consistent with recent June fisheries.

Southeastern District Mainland

Due to a weak early-run and a small commercial harvest in the Chignik Management Area, the Southeastern District Mainland remained closed and no commercial salmon harvest occurred during the allocation period (June 1 through July 25).

Beginning July 1, the Northwest Stepovak Section of the Southeastern District Mainland is managed on the strength of the Orzinski Lake sockeye salmon run. The return of sockeye salmon to Orzinski Lake was stronger than anticipated this year which allowed for commercial

harvest opportunity in the Northwest Stepovak Section. From July 3 through July 25 there were 29 Chinook, 31,669 sockeye, 505 coho, 34,137 pink, and 6,139 chum salmon harvest in the Northwest Stepovak Section. The Orzinski Lake sockeye salmon escapement of 36,839 fish was above the season ending escapement objective (15,000 to 20,000 fish) through August 12, when the weir was removed.

From July 26 to September 30, the Southeastern District Mainland is managed based on the abundance of local salmon stocks. Approximately 2.9 million fish were harvested in the area from July 26 through August 20, consisting of 357 Chinook, 118,149 sockeye, 36,910 coho, 2,634,166 pink, and 63,071 chum salmon. The department suspended commercial salmon fishing from August 20 through August 31 to allow for additional pink and chum salmon escapement

From September 1 through September 30 the Southeastern District Mainland is opened concurrently with the remainder of the Southeastern District based on the abundance of coho salmon stocks. In September, 4 Chinook, 19,361 sockeye, 10,516 coho, 2,365 pink, and 3,053 chum salmon were harvested in the Southeastern District Mainland.

South Peninsula Post-June Fishery

Prior to the South Peninsula Post-June fishery, ADF&G conducts a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishery results on July 5 indicated there were 112.3 immature salmon per set, which was above the threshold of 100 immature salmon per set. Consequently, the Shumagin Islands were opened to commercial salmon fishing to only set gillnet gear for the July 6 period. Test fishing results on July 8 indicated 48.0 immature salmon per set. With this information, commercial fishing during the July 8 period was opened to both set gillnet and seine gear. Continued monitoring of the seine fishery indicated that the harvest of immature salmon remained below the threshold throughout the season.

From July 6 to 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. Additional fishing time in terminal areas was first allowed on July 15. During August, the post-June fishery is managed based on the abundance of local stocks. In September, management focuses on coho salmon returns though the status of local pink and chum salmon returns may also be taken into consideration.

The total commercial harvest for the South Peninsula Post-June fishery (excluding the Southeastern District Mainland) was 1,031 Chinook, 366,390 sockeye, 179,441 coho, 8,082,047 pink, and 330,928 chum salmon. A total of 126 permit holders participated in the 2008 South Peninsula Post-June salmon fishery. Participation consisted of 52 purse seine, 22 drift gillnet, and 52 set gillnet permits.

The South Peninsula indexed sockeye salmon escapement of 94,339 was above the upper end of the escapement goal range of 48,200 to 86,400 fish. The South Peninsula indexed total pink salmon escapement of 3,166,070 was near the upper end of the even-year goal range of 1,864,600 to 3,729,300 fish. The South Peninsula indexed total chum salmon escapement of 532,350 was within our escapement goal range of 330,400 to 660,800 fish. A total of 19,600 coho salmon were documented in South Peninsula streams. Some of the major coho salmon systems are typically not surveyed or surveyed during off-peak times. There are few escapement goals on the South Peninsula for coho salmon due to their late run timing.

Aleutian Islands Fishery

The department opened the Aleutian Islands Area to commercial salmon fishing by seine gear on August 2. Commercial harvest of salmon occurred in Unalaska and Makushin bays, with a total harvest of 1 Chinook, 29 sockeye, 48 coho, 784,828 pink, and 261 chum salmon.

On July 30, an aerial survey of Unalaska and Makushin bays was performed by the department. An estimated 124,300 pink salmon were observed as escapement. No additional salmon escapement surveys were conducted in the Aleutian Islands during 2008.

North Alaska Peninsula

In 2008, 158 Area M permit holders participated in commercial salmon fisheries along the North Alaska Peninsula. There were less than 3 deliveries made by Area T permit holders from Area M and Area T overlap fishing sections in 2008. Effort by Area M permit holders was similar to 2006 (156) and 2007 (157). In 2006, 11 Area T permit holders participated, and in 2007, 6 Area T permit holders fished. The numbers of Area M and Area T permit holders participating in 2008 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 2008, the North Alaska Peninsula harvests of Chinook, sockeye, and pink salmon were below previous 10-year (1998 to 2007) averages, while the harvests of coho and chum were above the previous 10-year averages. Similarly, the harvest of Chinook, sockeye and pink salmon were all below projected levels, while coho and chum were above projected levels. The 2008 Chinook salmon harvest was 1,799 fish (7,000 projected), the sockeye salmon harvest was 2,003,906 fish (2,800,000 projected), the coho salmon harvest was 125,291 fish (70,000 projected), the pink salmon harvest was 21,137 fish (50,000 projected), and the chum salmon harvest was 177,469 fish (150,000 projected). Sockeye salmon harvests were below projections due in part to a lengthy closure in the Bear River, Three Hills, and Ilnik sections from 16 July to 10 August due to a poor return of early run sockeye salmon to Bear Lake.

Northwestern District

In the 2008 Northwestern District commercial salmon fishery, a total of 51,446 sockeye, 42 coho, 16,541 pink, and 104,140 chum salmon were harvested. A total of 7 permit holders participated in the fishery, consisting of 3 purse seine, and 4 drift gillnet fishers.

The commercial fishery in Urilia Bay harvested a total of 41,319 sockeye salmon in 2008, lower than the most recent 10-year average of 59,499 fish.

In the Northwestern District, chum salmon escapement totaled 357,850 fish, with the bulk of the escapement in the Izembek-Moffet Bay Section. The Northwestern District chum salmon escapement goal is 100,000 to 215,000 fish and was exceeded. The Urilia Bay Section had an escapement of 87,300 sockeye salmon and 13,400 pink salmon escaped into Bechevin Bay. Bechevin Bay is the only North Peninsula location with a pink salmon escapement objective (31,000 fish during even-numbered years); the objective was not met in 2008.

Nelson Lagoon Section

The total run of 361,930 sockeye salmon from the Nelson Lagoon Section harvest and escapements of all Nelson River tributaries was below the point estimate forecasted run of 523,000 fish. From the total run, 183,330 sockeye salmon were harvested in Nelson Lagoon and 178,600 escaped, of which 141,600 spawned in the Nelson (Sapsuk) River, and 37,000 sockeye salmon were observed in other tributaries such as the David's and Caribou rivers. The sockeye salmon escapement into Nelson River met the BEG of 97,000 to 219,000 fish.

Bear River and Three Hills Sections

By regulation, the Bear River Section opens to commercial salmon fishing on May 1 while the Three Hills Section opens June 25. Both areas are managed based on the sockeye salmon run strengths into the Bear and Sandy rivers. In 2008 the lower-than-expected sockeye salmon returns to the Bear and Sandy rivers resulted in the Bear River and Three Hills sections being closed to commercial salmon fishing during June and July; no harvest occurred until August 11. The Bear River early-run (through July 31) sockeye salmon escapement of 125,526 fish was below the escapement goal of 176,000 to 293,000 fish. However, during an aerial survey on July 30, 30,000 dark sockeye salmon were observed in the Bear River in 2 large schools above the Mad Sow confluence (midriver). Subsequent surveys over the next 2 weeks continued to document these fish in the same location.

The Bear River sockeye salmon late-run (after July 31) escapement of 195,474 fish, which includes the 30,000 seen in-river on July 30, exceeded the escapement goal of 117,000 to 195,000 fish. The largest daily escapement occurred on August 15 when 25,047 sockeye salmon were counted through the weir. There were 9 days when weir counts exceeded 9,000 fish, and 2 days when counts exceeded 20,000 fish.

In 2008, the Port Moller Bight, Bear River, Three Hills, and Ilnik sections were closed August 1 through August 9 and a test fishery was conducted to assess the run strength on August 6 and August 9. The August 9 test fishery showed a substantial buildup of sockeye salmon in the vicinity of Bear River. Subsequent weir counts in the following days also showed large numbers of fish moving up river. Good escapement counts at the Bear River weir allowed the Three Hills Section and the southern portion of the Bear River Section to reopen on August 10. A large closed area buffer was implemented to protect the milling fish observed in the test fishery. Within a few days, the entire Bear River Section was opened with 1,000 yard regulatory markers in effect and remained open for the duration of the commercial salmon fishing season. The sockeye salmon harvest in the Bear River Section during August and September was 417,261 fish while the Three Hills Section harvest was 123,344 fish.

The final 2008 Sandy River sockeye salmon escapement was 32,200—slightly below the escapement goal range of 34,000 to 74,000 fish.

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%. The final Ilnik River and Ocean River sockeye salmon escapement was 44,300 fish and met the 40,000 to 60,000 escapement goal range. The Ocean River escapement estimate of 16,000

sockeye salmon, based on aerial surveys, exceeded the escapement objective range of 8,000 to 12,000 fish. By regulation, the Ilnik Section could open to commercial salmon fishing on June 20, but because of low escapement rates into the Ilnik River, the area did not open until June 30. The closure of the entire Bear River and Three Hills sections due to the weak runs into Bear and Sandy rivers left only the Ilnik and Outer Port Heiden sections open to commercial salmon fishing.

No commercial salmon fishing effort occurred inside Ilnik Lagoon in 2008. The cumulative Ilnik River sockeye salmon escapement on June 30 met escapement objectives and continued to do so until about July 10 when it started to fall below objectives. The commercial salmon fishery was closed shortly thereafter and remained closed until August 10 when the late Bear River sockeye run strength was sufficient to warrant an opening.

Aerial escapement surveys began on the Meshik River on June 17 and were usually conducted weekly throughout the fishery. On July 3, 25,000 sockeye salmon were observed inriver. A peak survey conducted on July 30 documented 76,150 fish in the Meshik River, exceeding the season-ending escapement goal of 20,000 to 60,000 fish. The final escapement in the Inner Port Heiden Section (including Meshik River, Red Bluff and Yellow Bluff creeks and tributaries) was 99,150 fish.

Management of the portion of the Ilnik Section southwest of Unangashak Bluffs is based on the run strength of Ilnik River sockeye salmon. Because the Ilnik River was meeting the escapement objective prior to about July 11, fishing time of $4^1/_2$ days per week was allowed in the southern portion of the Ilnik Section (southwest of Unangashak Bluffs) from June 30 to July 11. That portion of the Ilnik Section northeast of Unangashak Bluffs to Strogonof Point is managed on the basis of Meshik and Ilnik Rivers sockeye salmon stocks prior to July 20. This area opened to commercial salmon fishing on June 30 and the fishing time was also $4^1/_2$ days per week for 2 weeks. The entire Ilnik Section was closed to commercial salmon fishing July 11 to allow passage of sockeye salmon bound for the Ilnik, Bear and Sandy rivers as these rivers were not meeting escapement objectives.

In 2008, a total of about 120 permit holders harvested 885,634 sockeye salmon in the Ilnik Section from June 30 until mid-September. About 40% (348,585 fish) of this commercial harvest occurred southwest of Unangashak Bluffs and 60% (537,049 fish) was harvested between Unangashak Bluffs and Strogonof Point. The peak daily catch in the southern portion of the Ilnik Section was on July 3 when 32,811 fish were harvested. The largest daily harvest occurred July 4, in the northern portion of the Ilnik Section when 138,675 fish were harvested.

Between July 20 and August 15, the Ilnik Section is managed based on the abundance of Bear River sockeye salmon stocks. For effective management of late-run sockeye, the Ilnik Section was closed to commercial salmon fishing on July 11 along with the Bear River and Three Hills sections. These areas reopened on August 10 due to a strong return of late-run sockeye salmon to the Bear River.

Beginning August 15, the Ilnik Section is managed for coho salmon runs into Ilnik Lagoon. No directed coho salmon fisheries occurred in the Ilnik Section during 2008 even though there was a strong run into Ilnik Lagoon. Commercial fisheries in the Ilnik Section continued targeting sockeye salmon while coho salmon were harvested incidentally in the sockeye salmon fisheries.

Inner and Outer Port Heiden Sections

Fishing time in the Outer Port Heiden Section is based on Meshik River sockeye salmon abundance, unless management actions are taken for the conservation of Ugashik River sockeye salmon in the Egegik District. The weekly fishing periods in the Outer Port Heiden Section are scheduled from 6:00 AM Monday to 6:00 PM Wednesday. A total of 9 days of fishing were permitted in the Outer Port Heiden Section during 2008, and the fishery was closed on July 15. The harvest from Inner Port Heiden is confidential because fewer than 3 permits fished in this section. In 2008, a total of 92 permit holders harvested 320,857 fish from the Outer Port Heiden Section. The peak daily catch was on July 8 when 63,094 fish were harvested.

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.

Table 7.– Preliminary 2008 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak	17	1,819	301	8,788	908	11,833
Chignik	1	687	162	2,390	209	3,449
South Peninsula	4	2,239	226	12,723	803	15,750
North Peninsula	2	2,004	125	21	177	2,329
Alaska Peninsula Total	6	4,243	351	12,744	980	18,079
Aleutian Islands	0	0	0	785	0	785
Westward Region Total	24	6,749	814	24,707	2,097	33,361

Note: Missing data indicates no harvest and zeros indicate harvest activity but <1,000.
Note: Columns may not total exactly due to rounding.
Note: Modified Western Region January 23, 2009 by DAS.
[a] 2008 Chignik Harvest includes test fish and personal use.

PRELIMINARY FORECASTS OF 2009 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 2009 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 was used to make salmon run forecasts. 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 hatchery runs to the Southeast Alaska, Kodiak, and Prince William Sound areas. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, Prince William Sound, 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.

ACKNOWLEDGMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Bill Davidson, Lowell Fair, Dani Evenson, and Steven Honnold 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 2008 fishing season.

SALMON SPECIES CATCH AND PROJECTIONS

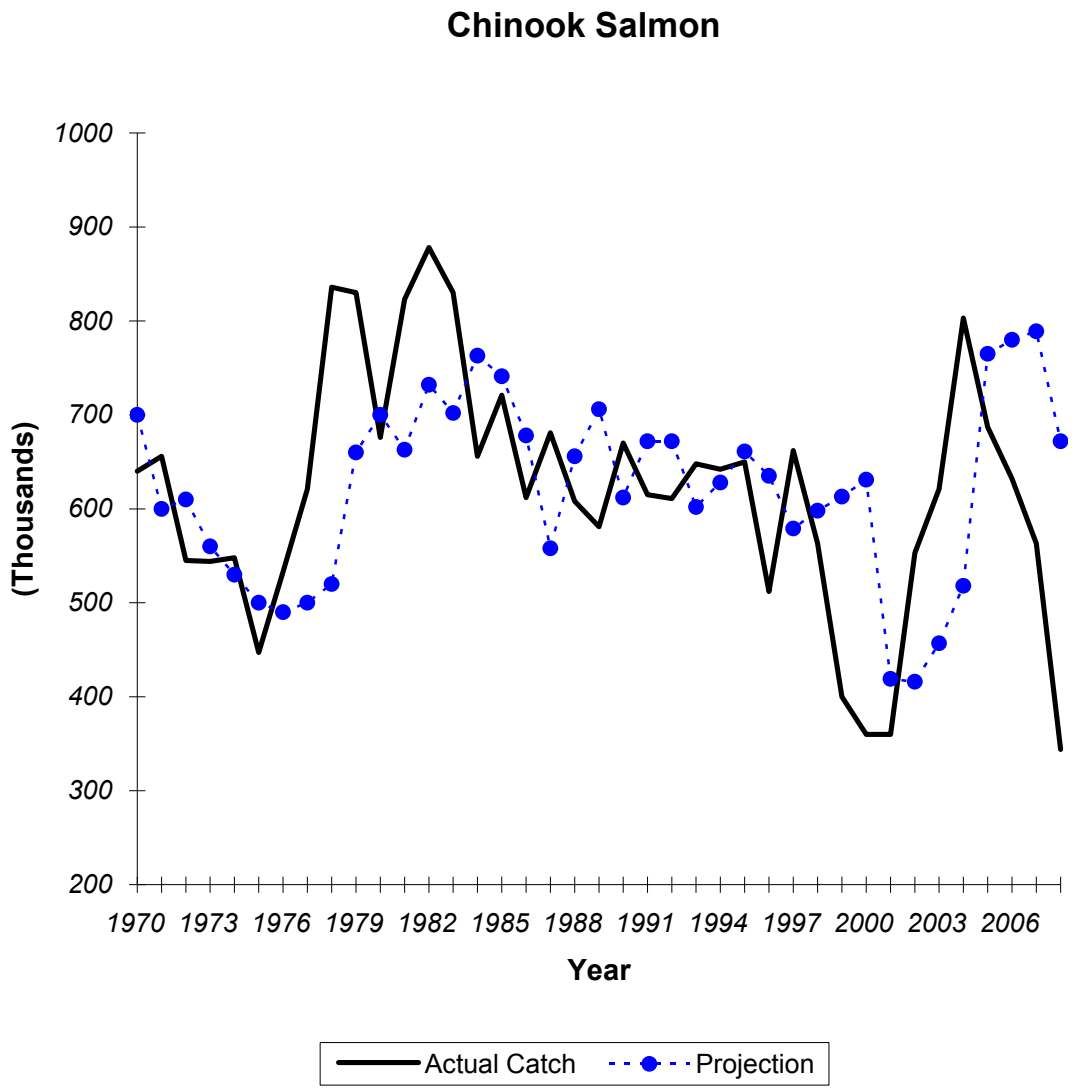

Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2008. No 2009 projection is provided because Southeast Alaska Chinook harvest projections are not available until April.

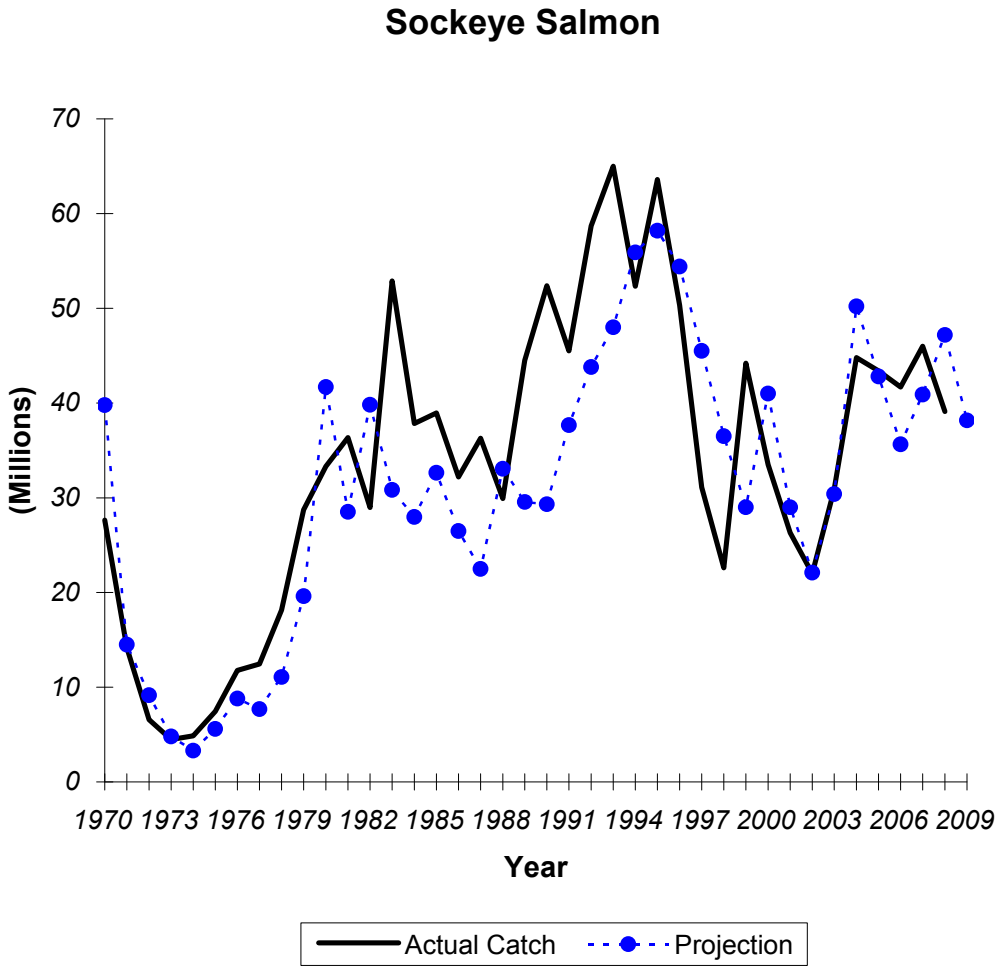

Figure 3.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2008, with the 2009 projection.

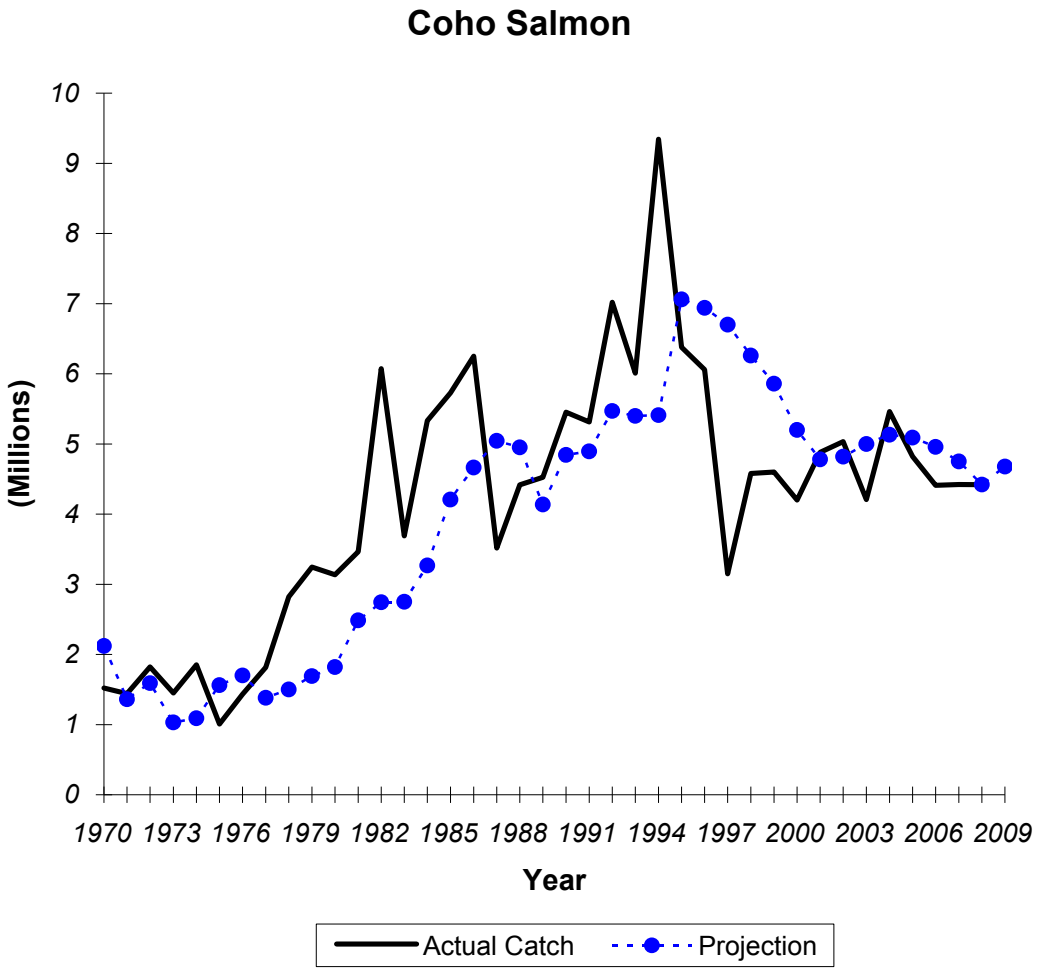

Figure 4.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2008, with the 2009 projection.

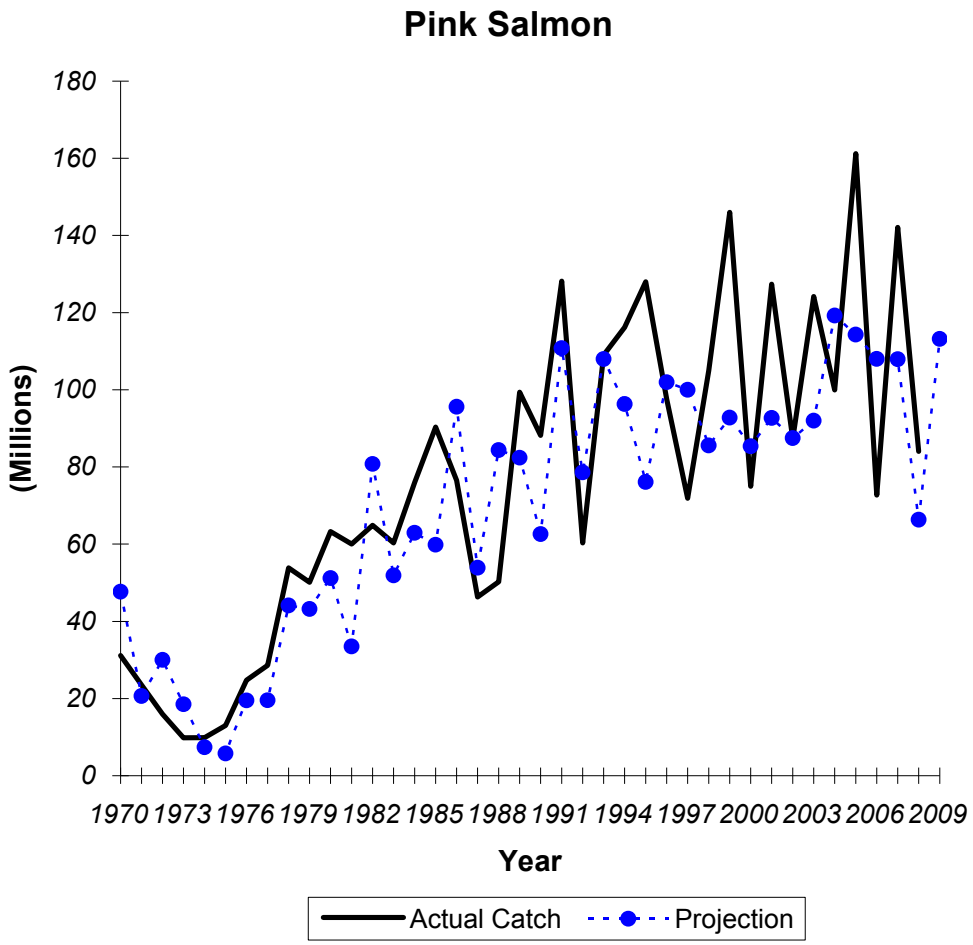

Figure 5.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2008, with the 2009 projection.

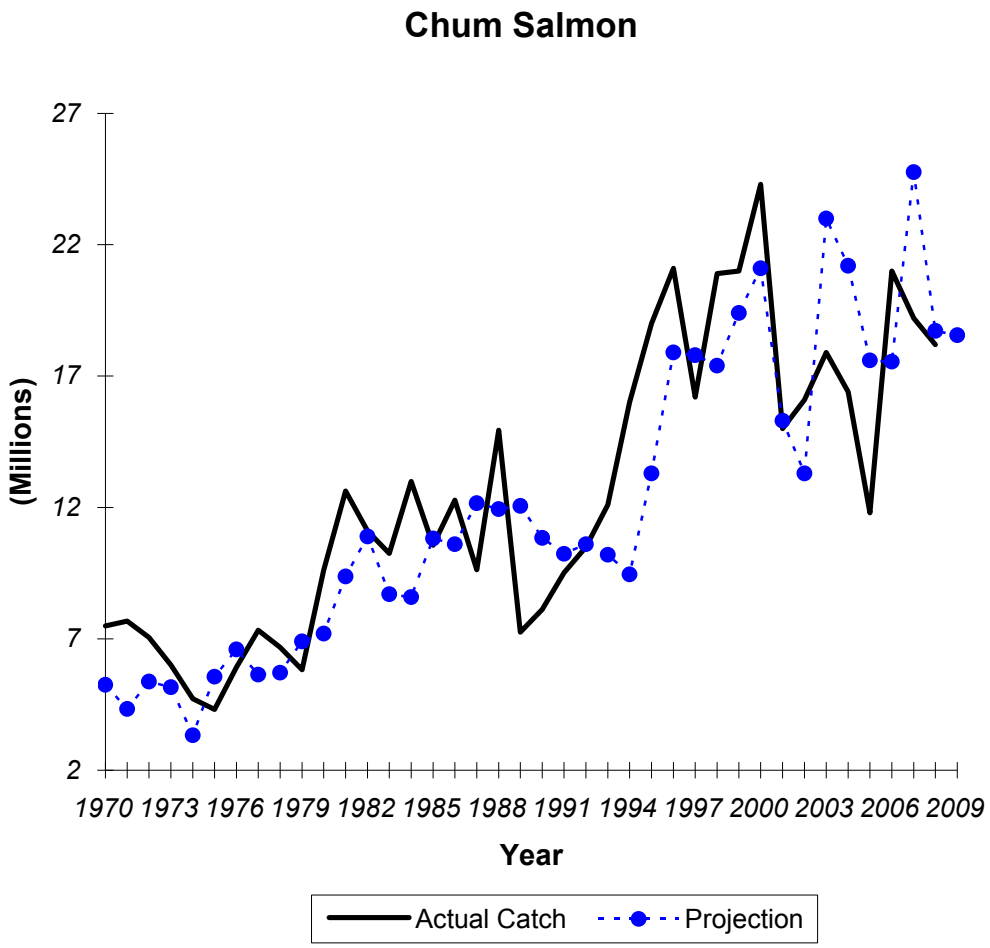

Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2008, with the 2009 projection.

APPENDICES

Forecast Area: Southeast Alaska
Species: Pink Salmon

The Southeast Alaska pink salmon harvest in 2009 is predicted to be in the *Strong* category, with a point estimate of 41 million fish (80% confidence interval: 30 million to 53 million fish). The categorical ranges of pink salmon harvest in Southeast Alaska were formulated from the 20th, 40th, 60th, and 80th percentiles of historical harvest from 1960 to 2008.

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

Forecast Methods

The 2009 forecast was produced in 2 steps: 1) a forecast of the trend in the harvest, and 2) the forecast trend adjusted using 2008 pink salmon fry abundance data. The forecast of the trend in pink salmon 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 2007, the parent year for the 2009 return. That is, we used all of the harvest data up to 2007, and excluded the 2008 catch from the exponential-smooth algorithm, assuming that the return in the 2007 parent year will better predict the 2009 return than the return in the 2008 parent year. We chose a value of c to be approximately 0.46, based on minimizing the sum of past squared errors. This analysis produced a harvest forecast of 52 million pink salmon (Figure A1).

We then adjusted the forecast using peak June–July pink salmon fry CPUE statistics provided by the NOAA Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (Joe Orsi and Alex Wertheimer, 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[b]). We developed a simple equation

[b] 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.

to predict the forecast error in the exponential smooth by regressing the forecast error proportions from 1998 to 2008 on the corresponding NOAA CPUE data from 1997 to 2007 (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 2009 forecast error and adjusted the exponential-smooth forecast downward, from 52 million to 41 million pink salmon (Figure A3). The forecast range is based on an 80% confidence interval, calculated from cross-validation estimates of the forecast error.

Forecast Discussion

The 2009 forecast of 41 million pink salmon is slightly below the recent 10-year average harvest of 44 million pink salmon. The parent-year escapement in 2007 appears to have been ample to provide a strong total return in 2009 if marine conditions were favorable for pink salmon. The brood year escapement indices for the Southern Southeast subregion and the Northern Southeast Outside subregion exceeded the biological escapement goal ranges. In contrast, however, while the escapement index for the Northern Southeast Inside subregion fell within the escapement goal range, it was the smallest odd-year index since the mid-1990s. In addition, the NOAA Auke Bay Lab's 2008 peak June–July juvenile pink salmon CPUE statistic from upper Chatham and Icy straits in northern Southeast Alaska was just below the average of the 11 previous years that NOAA has collected that information (and the smallest yet for an odd year).

The NOAA Auke Bay Lab continues to conduct research that has greatly improved our ability to forecast pink salmon harvests in Southeast Alaska. In the last 2 years, the ADF&G forecasts were calculated using an exponential smoothing technique, then adjusted using NOAA's juvenile pink salmon CPUE data to predict the forecast error. The 2007 adjusted ADF&G forecast of 47 million pink salmon was very close to the actual 2007 harvest of 45 million pink salmon (Figure A3). The 2008 forecast of 19 million was an average of 2 forecasts—a forecast of the trend in the harvest, and the forecast trend adjusted using 2008 pink salmon fry abundance data—and was also very close to the actual 2008 harvest of 16 million (Figure A3). Hindcasts of past harvests (1998 to 2006) 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 an immense improvement over past ADF&G forecasts. For these reasons, we are using this method to forecast the pink salmon harvest for a third 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.

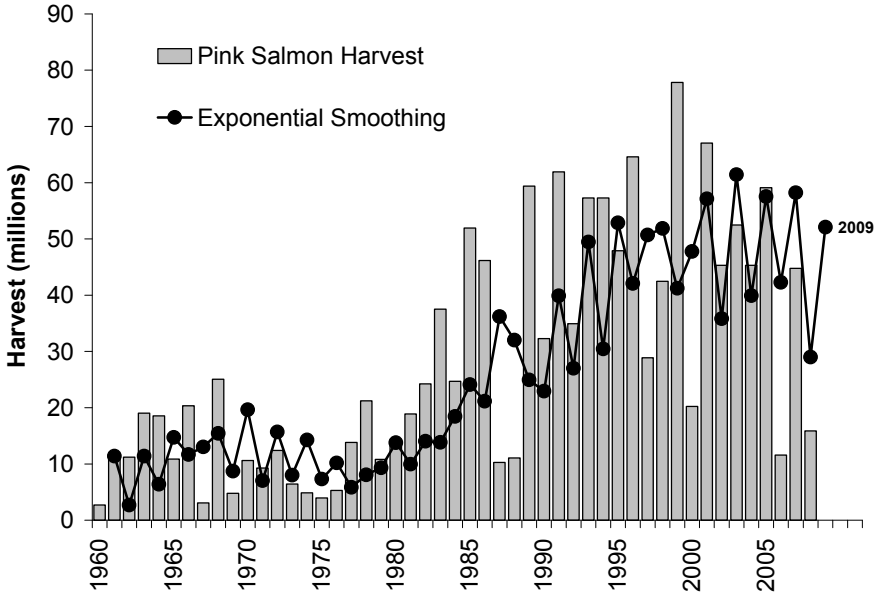

Figure A1.–Comparison of the annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2009 forecast model. This method produced a 2009 harvest forecast of 52 million pink salmon.

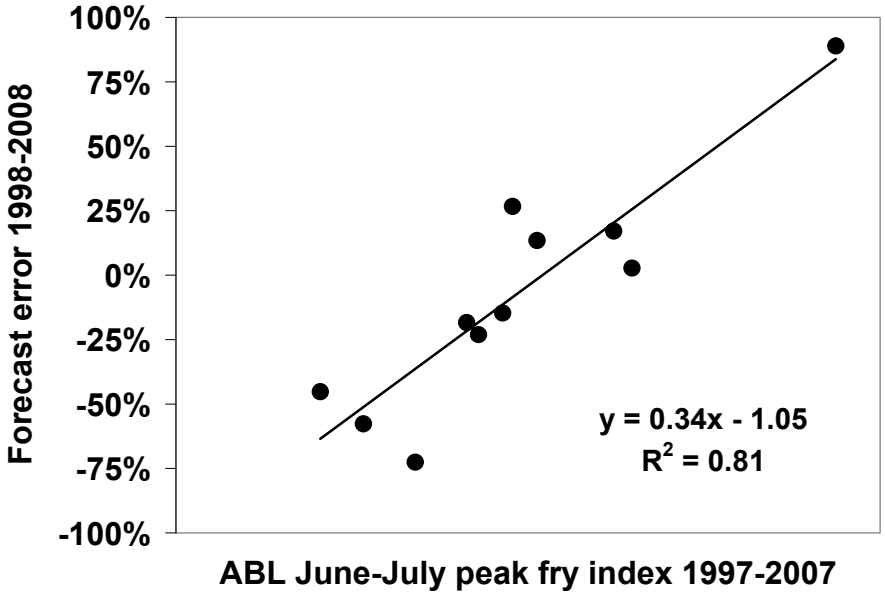

Figure A2.–Regression of ADF&G forecast error on the peak June-July pink salmon fry index from Icy Strait one year prior (Pink salmon fry index data provided by Joe Orsi, NOAA Auke Bay Laboratory, personal communication). The forecast error is a proportion calculated by dividing the forecast error (the annual ADF&G forecast subtracted from the actual harvest) by the forecast point estimate.

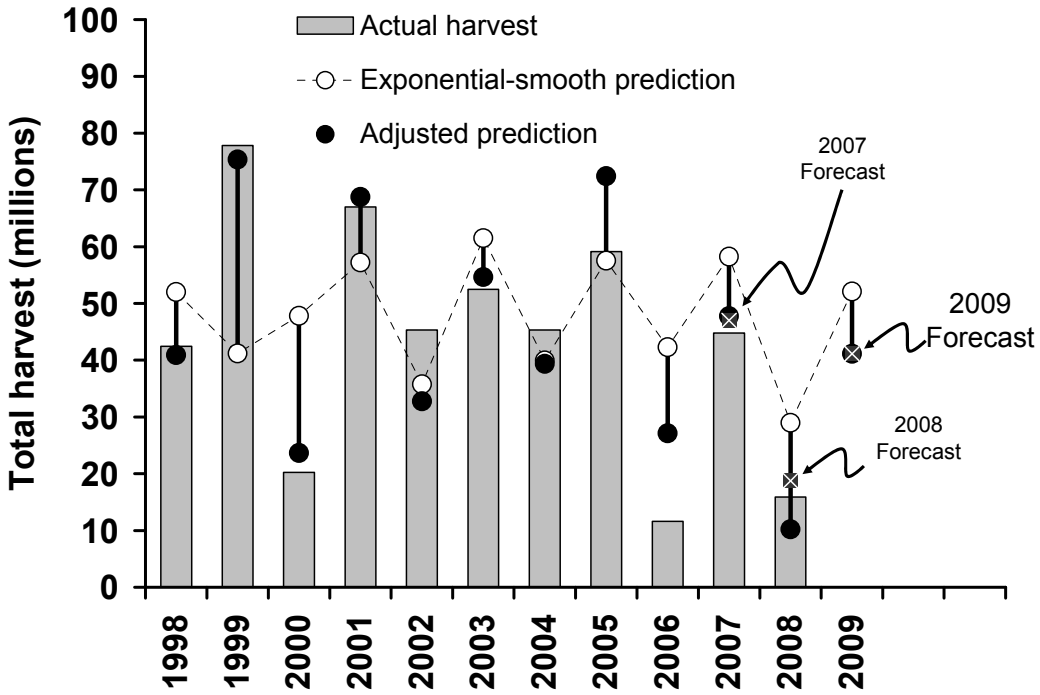

Figure A3.–Annual harvest of pink salmon in Southeast Alaska, 1998–2008, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory pink salmon fry data. The 2007 ADF&G harvest forecast of 47 million pink salmon was very close to the actual harvest of 45 million. The 2008 forecast of 19 million pink salmon was also very close to the actual harvest of 16 million. The 2009 forecast is for a harvest of 41 million pink salmon.

Steve Heinl, Pink and Chum Salmon Project Leader, Ketchikan

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

Preliminary Forecast of the 2009 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	14,280	0–28,950
Escapement Goal [a]	2,000	
Harvest Estimate	12,280	0–26,950

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

Forecast Methods

The predicted natural run of pink salmon is the average total run for the odd years 2005 and 2007. The total run by year was estimated as the total natural (non-hatchery) 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 to 2008), coded wire tag recoveries (1985 to 1996), or average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates. The current (2000 to 2009) prediction procedure differs from the 1997 to 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, these 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 odd brood years (2005 and 2007), 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 2009 natural run included: 1) the previous odd-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 Prince William Sound escapement versus log-transformed total Prince William Sound return by brood line. The 2009 forecast was generated from the average of the 2005 and 2007 (odd-brood year) runs because this forecasting method had the lowest mean absolute percentage forecast error.

The brood year 2007 escapement index (~1,509,000 fish) was within the sustainable escapement goals range, but below the sustainable escapement goal midpoint, and ranked 12th of the observed odd year escapements since 1960. If the 2009 total run forecast is realized, it will be the 5th largest among the 24 odd brood year returns from 1960 to 2007. There are several environmental factors that could have a substantial impact on pink salmon returns to Prince William Sound in 2009. The degree to which these factors will affect natural pink salmon returns is unknown; however, these factors could have serious effects on pink salmon survival in both the fresh and marine waters. Ocean temperatures along the GAK1 line off Seward going into the winter of 2007/2008 were the lowest recorded since the early 1970s (http://www.ims.uaf.edu/gak1/). Salmon production in the Gulf of Alaska is generally negatively correlated with cold ocean temperatures (http://www.iphc.washington.edu/Staff/hare/html/papers/hare-francis/harefran.pdf).

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 2009 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	376	267–486
Escapement Goal [a]	200	
Harvest Estimate	176	67–286

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

Forecast Methods

The forecast of the total natural chum salmon run was calculated as the 2004 to 2008 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 Commissioner's Permit Fishery harvest contributions of natural stock chum salmon were estimated using prehatchery average wild runs (2002 and 2003) or thermally marked otolith estimates (2004 to 2008) 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 ỹ is the average total run of the 5 previous years (2004 to 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 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 2008 natural chum salmon 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 Prince William Sound. If this total run is realized it will be the 30th largest since 1970.

The cold ocean temperatures measured along the GAK1 line off Seward may negatively affect the run of chum salmon in 2009; however, chum salmon may be buffered from these impacts because fish from multiple brood years return during a given year.

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 2009 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound - Coghill Lake		
Total Run	224	65–382
Escapement Goal [a]	30	
Harvest Estimate	194	35–352
Prince William Sound - Eshamy Lake		
Total Run	76	12–140
Escapement Goal [b]	20.5	
Harvest Estimate	55.5	0–120
Total Production		
Run Estimate	300	129–470
Escapement Goal	50.5	
Common Property Harvest	249.5	78–420

[a] The escapement goal of 30,000 sockeye salmon for Coghill Lake is the midpoint of the escapement goal range of 20,000 to 40,000 sockeye salmon.

[b] The escapement goal of 20,500 sockeye salmon for Eshamy Lake is the midpoint of the escapement goal range of 13,000 to 28,000 sockeye salmon.

Forecast Methods

The forecast of the natural sockeye salmon run 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 2008 used the return of age-1.1 fish in 2007 as the input parameter. The predicted returns of age-1.1, -2.2, and -2.3 sockeye salmon were calculated as the 1974 to 2008 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 counted 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 above for wild pink and chum salmon returns to Prince William Sound.

The Prince William Sound total run and common property harvest forecasts were calculated from the sum of the Coghill and Eshamy lakes midpoint forecasts. The 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for Coghill and Eshamy lakes.

Forecast Discussion

Beginning in 2004, the department stopped forecasting hatchery runs of sockeye salmon to the Main Bay Hatchery because the hatchery operators were already producing forecasts for these releases. Coghill Lake has very dynamic limnological characteristics that can significantly impact the sockeye salmon population. Studies conducted in the mid-1980s and early 1990s found the lake may be zooplankton limited. As a result, the BEG midpoint was lowered in 1992 (from 40,000 to 25,000 fish) to allow zooplankton populations to recover. Fertilizers were added to the lake from 1993 to 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. 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 2009 total run forecast midpoint would rank as the largest run since 1988.

The Eshamy Lake natural stock appears to exhibit a 4-year cycle. The 2009 run is the second year in the cycle. The Eshamy Lake natural stock is the largest natural stock contributor to CPF harvests of sockeye salmon in Prince William Sound 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 Prince William Sound 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 Prince William Sound. Age composition data and weir counts were not collected in 1987 and 1998 because of budget reductions. The ongoing 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 to 28,000 fish (midpoint 20,500). The old range was 20,000 to 40,000 fish.

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

Forecast Area: Copper River
Species: Chinook Salmon

Preliminary Forecast of the 2009 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	77	47–108
Escapement Goal[a]	24 or greater	
Harvest Estimate[b]	53	23–84

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

[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 30,000 Chinook salmon.

Forecast Methods

The 2009 Chinook salmon forecast is the previous 5 year (2004 to 2008) mean total run. The 80% prediction interval was calculated as this 5-year average total run and the equation described above for wild pink and chum salmon returns to Prince William Sound. 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 has not generated a formal Chinook salmon total run forecast since 1997 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 the ADF&G 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 there are currently 10 years (1999 to 2008) of inriver abundance estimates.

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 times the proportion of Chinook salmon in the Chitina Subdistrict Personal Use Fishery (brood years 1977 to 2002), 2) a pseudo-sibling model using commercial harvest age data and inriver abundance data from the mark-recapture program (brood years 1993 to 2002), 3) the previous years 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 ($p = 4.1$ E-07) and marginal fits for the model using age-1.3 to predict age-1.4 ($p = 0.046$). 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 ($p = 0.56$) and age-1.3 to predict age-1.4 ($p = 0.081$). 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, but a higher standard deviation than all the other mean total run forecasts. The 5-year mean total run size forecast had the best compromise of low MAPE and low variability to the absolute percentage error.

The 2009 total run forecast point estimate is approximately 3,000 fish below the 10-year average (1999 to 2008) of 80,000 fish. If realized, the 2008 forecast total run would be the seventh largest since 1999 and approximately 24,000 above the 2008 run.

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

Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2009 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	1,107	391–1,823
Escapement Goal[a]	530	
Common Property Harvest[b]	577	0–1,348
Hatchery And Supplemental Production		
Prince William Sound Aquaculture Corp. - Gulkana Hatchery		
Hatchery Run	225	79–370
Broodstock Needs	20	
Supplemental Escapement[c]	55	
Common Property Harvest[b]	150	0–351
Total Production		
Run Estimate	1,332	470–2,193
Natural Escapement Goal	530	
Broodstock Needs	20	
Supplemental Escapement[c]	55	
Common Property Harvest[d]	728	69–1,386

[a] The escapement goal of 530,000 sockeye salmon is the historical average spawning escapement (361,000 fish) of the upper Copper River (spawning escapement goal range: 300,000 to 500,00 fish) combined with the historical average Copper River delta aerial survey peak count times 2 (spawning escapement goal range 55,000 to 130,000 fish). 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 fish.

[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 sockeye salmon.

Forecast methods

Forecast methods for 2009 are similar to forecast methods used since 1998. The forecast of natural run 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, -1.3, and -2.2 sockeye salmon. The return for these 3 age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the return of age-1.3 fish in 2009 used the return of age-1.2 fish in 2008 as the input parameter. Finally, predicted return of age-1.1, -0.3, and -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 was calculated using the method described previously for Coghill Lake sockeye except only the years 1983 to 2008 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 to 1998. The survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements. The forecast of supplemental production from Gulkana I and Gulkana II hatcheries was estimated from the total fry release and a fry to adult survival of 1%. The return was apportioned to return year using a maturity schedule of 13% age-4 fish and 87% age-5 fish.

The average estimated exploitation rate (67%) for 2000 to 2008 was used to project the total harvest of Gulkana Hatchery stocks in 2009. 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 year. 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 harvest 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 1995 to 1998 indicate large contributions from supplemental production and smolt-to-adult survival estimates for Crosswind Lake releases that averaged ~20%. Fish marked with strontium chloride (Sr) began returning in 2003 (age-4 fish) and the majority of the adult run (age-4 and age-5 fish) 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, forecasts will be limited to using fry-to-adult survival estimates and estimated maturity schedules to forecast total enhanced production.

The 2009 run will be composed primarily of returns from brood years 2004 and 2005. Five-year-old fish (brood year 2004) are expected to predominate Copper River delta and upper Copper River runs. The Miles Lake cumulative sonar counts for 2004 (669,646 fish) and 2005 (854,268 fish) were above the minimum objective from the beginning of the season and remained above the minimum cumulative objective all season. The Copper River delta escapement indices for 2004 (69,385 fish) and 2005 (58,406 fish) were below the recent 10-year average of 80,189 fish.

The 2009 total run forecast is 840,000 fish below the 5-year average (2004 to 2008) of 2.17 million fish. If realized, the 2009 forecast total run would be the fifth lowest since 1980 and just below the 1983 total run. The approximately 1.11 million natural run would be well below the recent 20-year average (1989 to 2008) of 1.97 million fish, and a 230,000 Gulkana Hatchery run would be well below the 10-year (1999 to 2008) average of 340,000 fish. The decreased natural forecast is driven by the low number of age-4 (age-1.2) fish in 2008 and the subsequent prediction for a low number of age-5 fish in 2009.

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 2009 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	4.3	1.0–7.6
Escapement	1.3	
Harvest Estimate	3.0	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet are the Kenai, Kasilof, Susitna and Crescent Rivers, and Fish Creek. Spawner, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the run of sockeye salmon to Upper Cook Inlet in 2009: 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 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 ages-1.3, -2.2 and -2.3 sockeye salmon to the Kenai River in 2009 were forecast 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 2008. The reconstructed ocean abundances of Bristol Bay sockeye salmon was a significant covariate in this model. The nature of the relationships was consistent with the notion that competition for food between Upper Cook Inlet and Bristol Bay sockeye salmon during the first 2 years of ocean rearing caused more Upper Cook Inlet sockeye salmon to return at age-1.3 when the abundance of Bristol Bay sockeye salmon was high. A spawner-recruit model was used to forecast the return of age-1.2 sockeye salmon to the Kenai River. Sibling models were used to forecast the return of age-1.2 and age-2.3 sockeye salmon to the Kasilof River, but the return of age-1.3 and age-2.2 sockeye salmon were forecasted using smolt models.

The return of ages-1.2, -1.3, and -2.3 sockeye salmon to the Susitna River were forecast using sibling models, but a spawner-recruit model was used to forecast the return of age-2.2 sockeye salmon. The brood tables used to forecast the Susitna sockeye salmon run have been derived using an age composition allocation model, which is based upon sonar estimates of sockeye salmon escapement into the Yentna River. However, recent Susitna sockeye salmon mark-recapture studies have shown that the Yentna sonar project underestimated sockeye salmon escapement causing estimates of adult returns to also be underestimated. Therefore, the 2009 Susitna sockeye salmon run forecast was expanded to better estimate the actual number of returning fish. An expansion factor (2.137) was estimated from the ratio of Susitna sockeye salmon run estimates based on mark-recapture and genetic stock identification versus estimates derived from sonar and the age composition allocation model.

The sockeye salmon forecast for unmonitored systems in Upper Cook Inlet was estimated as 5% of the aggregate forecast for the 5 major stocks. The fraction of the total sockeye salmon run destined for unmonitored systems was estimated using genetic stock composition estimates for 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 Upper Cook Inlet, 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. An approximate 80% confidence interval for the total run forecast was calculated using the squared deviations between past forecasts and actual runs as the forecast variance (mean square error).

Forecast Discussion

In 2008, the harvest of sockeye salmon by all user groups in Upper Cook Inlet was 2.8 million fish, while the preseason forecast was 3.9 million fish. The lower-than-expected harvest in 2008 was largely due to weaker-than-expected returns of age-1.3 sockeye salmon to the Kenai River. However, sockeye salmon runs to all 5 monitored systems were below the forecasted run size. In 2008, the total run of sockeye salmon was 2.1 million fish to the Kenai River, 1.1 million fish to the Kasilof River, 307,000 fish to the Susitna River, 82,000 fish to the Crescent River, and 27,000 fish to Fish Creek. The forecasted run of sockeye salmon in 2008 was 3.1 million fish to the Kenai River, 1.3 million fish to the Kasilof River, 344,000 fish to the Susitna River, 100,000 fish to the Crescent River, and 53,000 fish to Fish Creek.

A run of 4.3 million sockeye salmon is forecasted to return to Upper Cook Inlet in 2009 with a harvest by all user groups of 3.0 million sockeye salmon. The forecasted harvest by all user groups in 2009 is about 900,000 fish below the 20-year average harvest of 3.9 million fish. The sockeye salmon run forecast for the Kenai River is 2.4 million fish, which is 27% less than the 20-year average run of 3.4 million fish. However, there is considerable uncertainty in the 2009 Kenai River sockeye salmon run forecast. Age-1.3 sockeye salmon typically comprise about 61% of the run to the Kenai River. The age-1.3 sockeye salmon returning in 2009 are the progeny from an overescapement of 1.12 million fish into the Kenai River in 2004. A sibling model based upon the return of 19,000 age-1.2 sockeye salmon in 2008 (20-year average of 247,000 fish) predicted a return of 1.8 million age-1.3 sockeye salmon to the Kenai River, while a fry model based upon the abundance of sockeye salmon fry rearing in Skilak and Kenai lakes in the fall of 2005 (41.9 million fish, 20-year average of 18.5 million fish) predicted a return of 3.5 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 (28%) than the fry model (48%). Age-2.3 sockeye salmon typically comprise about 21% of the run to the Kenai River. A sibling model based upon the return of 107,000 age-2.2 sockeye salmon in 2008 (20-year average of 212,000 fish) predicted a return of 230,000 age-2.3 sockeye salmon to the Kenai River in 2009. The forecasted return is 67% less than the 20-year average return for this age class. The predominant age classes in the 2009 run should be age-1.3 (73%) and age-2.3 (9%). The 10-year MAPE for the set of models used for the 2009 Kenai sockeye salmon run forecast was 31%.

The sockeye salmon run forecast for the Kasilof River is 822,000 fish, which is 13% less than the 20-year average run of 945,000 fish. Age-1.3 sockeye salmon typically comprise about 36% of the run to the Kasilof River. The age-1.3 sockeye salmon returning in 2009 are the progeny from an overescapement of 575,000 fish into the Kasilof River in 2004. The forecast for age-1.3 sockeye salmon is 275,000 fish, which is 18% less than the 20-year average return of 336,000 fish for this age class. A smolt model based upon the abundance of age-1 sockeye salmon smolts emigrating from the Kasilof River in 2006 was used to forecast the return of age-1.3 sockeye salmon in 2009. The abundance of age-1 smolts in 2006 was 2.6 million, which is 40% less than the 20-year average abundance of 4.3 million fish for this age class. However, the forecast for the age-1.3 sockeye salmon return is uncertain, because the sibling model predicted a return of 443,000 fish—1.6 times greater than the smolt model. The smolt model was used for this forecast, because the 10-year MAPE was lower for the smolt model (10%) than the sibling model (24%). Age-1.2 sockeye salmon typically comprise about 30% of the run to the Kasilof River. The forecast for age-1.2 sockeye salmon is 342,000 fish, which is 22% greater than the 20-year average return of 280,000 fish for this age class. A sibling model based upon the return of age-1.1 sockeye salmon in 2008 was used to forecast the return of age-1.2 sockeye salmon in 2009. About 1,500 age-1.1 sockeye salmon returned to the Kasilof River in 2008, which is 31% greater than the 20-year average return of 1,200 fish for this age class. Age-2.2 sockeye salmon typically comprise about 23% of the run to the Kasilof River. The forecast for age-2.2 sockeye salmon is 129,000 fish, which is 41% less than the 20-year average return of 216,000 fish for this age class. A smolt model based upon the abundance of age-2 sockeye salmon smolts emigrating from the Kasilof River in 2007 was used to forecast the return of age-2.2 sockeye salmon in 2009. The abundance of age-2 smolts in 2007 was 875,000 fish, which is 50% less than the 20-year average abundance of 1.8 million fish for this age class. The predominant age classes in the 2009 run should be age-1.2 (42%), age-1.3 (33%), and age-2.2 (16%). The 10-year MAPE for the set of models used for the 2009 Kasilof sockeye salmon run forecast was 20%.

The sockeye salmon run forecast for the Susitna River is 669,000 fish, which is 27% less than the 20-year average run of 913,000 fish. As previously described, the 2009 Susitna sockeye salmon run forecast has been expanded to better represent actual numbers of fish, so the run estimates are substantially higher than those reported in previous forecasts due only to the different method used. Age-1.3 sockeye salmon typically comprise about 55% of the run to the Susitna River. The forecast for age-1.3 sockeye salmon is 260,000 fish, which is 48% less than the 20-year average return of 501,000 fish for this age class. A sibling model based upon the return of age-1.2 sockeye salmon in 2008 was used to forecast the return of age-1.3 sockeye salmon in 2009. About 60,000 age-1.2 sockeye salmon returned to the Susitna River in 2008, which is 63% less than the 20-year average return of 163,000 fish for this age class. Age-1.2 sockeye salmon typically comprise about 18% of the run to the Susitna River. The forecast for age-1.2 sockeye salmon is 201,000 fish, which is 24% greater than the 20-year average return of 163,000 fish for this age class. A sibling model based upon the return of age-1.1 sockeye salmon in 2008 was used to forecast the return of age-1.2 sockeye salmon in 2009. About 5,000 age-1.1 sockeye salmon returned to the Susitna River in 2008, which is 61% greater than the 20-year average return of 2,100 fish for this age class. Age-2.3 sockeye salmon typically comprise about 14% of the run to the Susitna River. The forecast for age-2.3 sockeye salmon is 97,000 fish, which is 25% less than the 20-year average return of 130,000 fish for this age class. A sibling

model based upon the return of age-2.2 sockeye salmon in 2008 was used to forecast the return of age-2.3 sockeye salmon in 2009. About 42,000 age-2.2 sockeye salmon returned to the Susitna River in 2008, which is 30% less than the 20-year average return of 59,000 fish for this age class. The 10-year MAPE for the set of models used for the 2009 Susitna sockeye salmon run forecast was 33%.

The sockeye salmon run forecast for Fish Creek is 80,000 fish, which is 42% less than the 20-year average run of 139,000 fish. 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 2008 were used to forecast the runs of age-1.2 (65,000 fish) and age-1.3 (4,000 fish) sockeye salmon in 2009. The age-1.2 forecast is 5% less than the 20-year average return of 68,000 fish for this age class, while the age-1.3 forecast is 90% less than the 20-year average return of 38,000 fish. The predominant age classes in the 2009 run should be age-1.2 (81%), age-1.3 (5%), and age-2.2 (11%).

The sockeye salmon run forecast for Crescent River is 92,000 fish, which is 8% less than the 20-year average run of 101,000 fish. Age-1.3 and age-2.3 sockeye salmon typically comprise 82% of the run to Crescent River. Sibling models based upon returns of age-1.2 and age-2.2 sockeye salmon in 2008 were used to forecast returns of age-1.3 (48,000 fish) and age-2.3 (28,000 fish) sockeye salmon to the Crescent River in 2009. The predominant age classes in the 2009 run should be age-1.3 (52%) and age-2.3 (30%).

Forecast runs to individual freshwater systems are as follows.

System	Run	Inriver Goal
Crescent River	92,000	30,000– 70,000
Fish Creek	80,000	20,000–70,000
Kasilof River	822,000	150,000–250,000
Kenai River	2.441,000	750,000–950,000
Susitna River	669,000	90,000–160,000[a]
Minor Systems	193,000	N/A
Total	4,297,000	

[a] The in-river goal listed for Susitna River sockeye salmon is the escapement goal range for Yentna River sockeye salmon. The sonar estimate of sockeye salmon escapement into the Yentna River is typically multiplied by 1.95 to expand the estimate to the entire Susitna River watershed.

Mark Willette, Research Project Leader, Upper Cook Inlet

Forecast Area: Upper Cook Inlet
Species: Other Salmon Species

Preliminary Forecast of the 2009 Commercial Harvest

Natural Production	Forecast Estimate (thousands)
Pink Salmon	70
Chum Salmon	80
Coho Salmon	210
Chinook Salmon	20

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and chinook salmon in 2009. The forecast for pink salmon was based upon the average harvest during the past 5 odd-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 2009 run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	1,344	379–837
Escapement	346	124–565
Commercial Harvest	998	255–5,272

Note: Columns may not total exactly due to rounding to the nearest thousand fish.
Note: Escapement values include a potential escapement goal shortfall of 3,000 fish for systems with a forecast in 2009.
Note: Commercial Harvest = Total Run–Escapement.
Note: Additional harvests may be expected from systems not included in the forecast.

Forecast Methods

The forecast of wild pink salmon returns to 10 harvest areas in the Lower Cook Inlet Management area was based on a logarithmic regression of total return and escapement from 37 to 43 years of observations. Cross-validation was used to reconstruct historical forecast errors for each harvest area. These errors were used to estimate standard deviation and an 80% confidence interval around individual harvest area forecasts. Projected harvest ranges were obtained by subtracting corresponding escapement goals from the upper and lower total run forecast confidence bounds. The total run forecast for Lower Cook Inlet natural production was the sum of the 10 individual harvest area forecasts. Upper and lower bounds around the total run forecast, however, were derived from a cross validation using total runs rather than the sum of the 10 individual harvest areas' confidence intervals. The aggregate escapement goal was the sum of individual escapement goals. The total projected harvest was the total run minus the aggregated escapement goal and the total escapement shortfall.

Forecast Discussion

The natural production forecast model was tested using cross-validation methods. The model has correctly predicted 39 out of 47 changes in direction of annual run size. 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 Lower Cook Inlet, dominance of one line is typically short lived, lasting 2 to 6 generations, before the opposing line becomes dominant. Despite the relative parity between odd and even year pink salmon returns in Lower Cook Inlet over broad time scales, we continue to stratify run size comparisons by odd and even years to account for the short term dominance cycles we observe.

In 2007, the last odd-numbered year, 9 of 10 systems forecasted had runs within the forecast range. The 2009 forecast for natural production of 1.34 million pink salmon has an 80% confidence interval of 379,000 to 5.84 million fish. Strong parent-year escapement and fair marine survival from 2007 to 2008, as indicated by 2008 returns, suggests there is a good likelihood of reaching the midpoint estimate of this forecast. If realized, a natural run of 1.34 million pink salmon would be 1.6 times higher than the mean run size of 820,000 fish for odd-year returns between 1963 and 2007. The pink salmon cumulative escapement goal is 346,000

(127,000 to 565,000 fish) for systems with a forecast. If the run comes in as forecast, the mid-point of the escapement goal range should be met for all of our 10 index streams. However, if the lower end of the forecast range is realized, the total return to Port Chatham and Nuka Island creeks will be insufficient to meet their escapement goals, resulting in escapement goal shortfalls of 2,500 for Port Chatham and 400 for Nuka Island. The resulting cumulative escapement forecast would then be 124,000 pink salmon.

The Lower Cook Inlet management area is made up of 4 districts. The harvestable surplus of naturally produced pink salmon in the Southern District is projected to be 80,000 fish, with 45,000 coming from Seldovia Bay and the balance relatively evenly split between Humpy Creek and Port Graham River. Supplemental production of pink salmon in the Southern District historically contributed from 24% to 90% of the total Lower Cook Inlet commercial harvest. However, pink salmon are no longer being produced by hatcheries in Lower Cook Inlet. The Tutka Hatchery, which previously generated the majority of the supplemental production of pink salmon in Lower Cook Inlet, ceased egg-take operations in 2004 and realized its final adult return in 2005. The Port Graham Hatchery did not collect broodstock in 2007. Consequently, no enhanced adult pink salmon returns will occur to Port Graham in 2009.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 496,000 fish, with over 56% (281,000 fish) of the harvest expected to occur in the Port Dick subdistrict. If realized, the Port Dick harvest would be nearly 1.4 times the mean odd-year catch since 1963. The next largest harvest is projected to occur in Rocky Bay (147,000 fish), while smaller harvests ranging from 4,000 to 56,000 fish are anticipated from Port Chatham, Nuka Island, and Windy Bay.

No pink salmon harvest is expected from the Eastern District in 2009. 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 422,000 fish, over 72% of which is expected to occur in the Ursus/Rocky Cove subdistrict. If realized, the Ursus/Rocky Cove harvest of 305,000 fish would be 21 times the mean odd-year catch since 1963 for this index area. A large harvestable surplus of 117,000 fish is also projected from Bruin Bay. 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

Appendix E.–Kodiak

Forecast Area: Kodiak
Species: Pink Salmon

Preliminary Forecast of the 2009 Run

	Forecast Estimate (millions)	Forecast Range (millions)
Total Production		
KMA Wild Stock Total Run	15.7	12.5–19.6
KMA Escapement Goal	3.5	2.0–5.0
KMA Wild Stock Harvest	12.2	9.0–16.1
Kitoi Bay Hatchery Harvest[a]	10.0 [a]	7.9–12.9
Total KMA Pink Salmon Harvest	22.1	16.8–29.0
Wild Stock Harvest by area:		
Afognak	0.6	0.4–0.7
Westside	4.2	3.1–5.6
Alitak	1.2	0.9–1.6
Eastside	4.7	3.5–6.3
Mainland	1.5	1.1–2.0

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

[a] This figure includes the Kitoi Bay Hatchery cost recovery harvest that is expected to be roughly 1.4 million to 2.0 million fish; figure does not include the 350,000 fish broodstock collection goal.

The 2009 KMA predicted pink salmon harvest for wild stock and Kitoi Bay Hatchery combined is expected to be in the *Strong to Excellent* range with a point estimate of 22.1 million fish. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest in the KMA from 1978 to 2008.

Total KMA Harvest Category	Range (millions)	Percentile
Poor	Less than 7.3	Less than 20th
Weak	7.3 to 10.8	21st to 40th
Average	10.8 to 14.3	41st to 60th
Strong	14.3 to 21.4	61st to 80th
Excellent	Greater than 21.4	Greater than 80th

Forecast Methods

The KMA wild stock pink salmon 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 several weir estimates, from aerial surveys and from harvest data.

For the 2009 KMA wild stock pink salmon forecast, a Ricker spawner-recruit model was fit to the odd-year KMA returns from 1979 to 2005. A multiple regression of the spawner-recruit model residuals (*ln*) on 4 independent environmental variables was performed with the resulting regression estimate used to adjust (positively or negatively) the spawner-recruit estimate based on favorable or unfavorable environmental conditions affecting the life history after egg deposition but prior to outmigration (Figure E1).

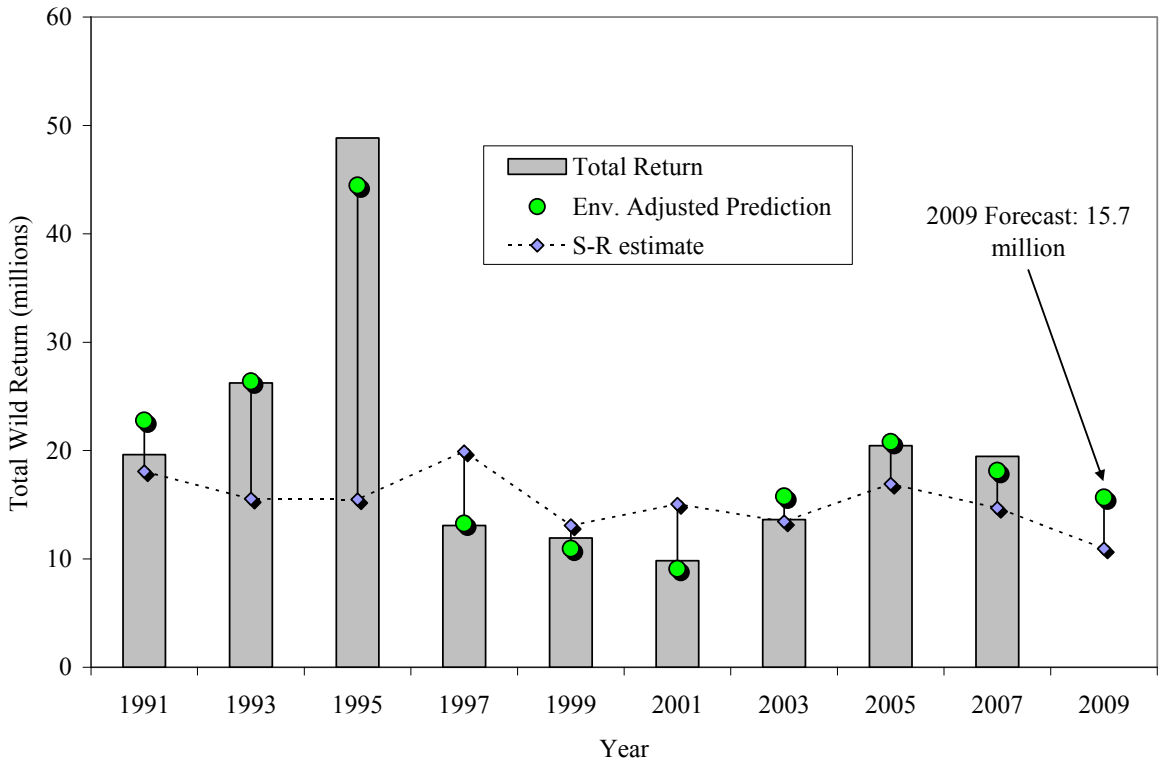

Figure E1.–Kodiak odd-year pink salmon wild stock total return compared to S-R estimates and environmentally adjusted prediction, 1991 to 2007, and 2009 forecast. The 2009 forecast is based on the spawner-recruit model estimate plus the environmental conditions adjustment (+/–).

The environmental variables used in the regression model were September precipitation, early winter (November to January) precipitation, average early winter air temperature, and average March air temperature prior to the outmigration of progeny from the 2007 pink salmon escapement.All environmental conditions were estimated from Kodiak Airport climate observations. In constructing and evaluating the regression model, standard regression diagnostic procedures were used. Prediction intervals of 80% from the multiple regression estimate were calculated and used to estimate the forecast range.

The 2009 Kitoi Bay Hatchery pink salmon forecast is the product of the number of 2008 pink fry releases and an average Kitoi Bay Hatchery marine survival estimate. Pink salmon survivals were evaluated from brood years 1991 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 and chum 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 salmon return to Kitoi Bay Hatchery is an odd-year dominant return which experiences exceptional marine survival every fourth year dating back to the first releases in 1977 (with the exception of 1997). The primary forecasting consideration for the 2009 predicted marine survival relates to this 4-year cyclical return which is the strongest year in this cyclical analysis. The midpoint estimate of 10.3 million reflects a marine survival of 7.12% and is an average of the previous 4 cyclical returns (2005, 2001, 1997 and 1993).

Forecast Discussion

The 2009 KMA wild stock pink salmon total run (15.7 million) will be above average but less than the last 2 odd-year wild stock returns. The environmental condition adjustment regression prediction for the 2007 brood year is (+4.7 million) above the spawner-recruit total run estimate indicating favorable environmental conditions were affecting the early life-history of the progeny (Figure E1). However the Kodiak area indexed pink salmon escapement estimate of 2.5 million fish in 2007 (the spawner-recruit model predictor) was well below average and the lowest estimate since 1987. The prediction of an above average wild stock return is corroborated by ancillary information provided by the 2008 ADF&G pink salmon fry abundance index estimated in Kodiak area harbors. Confidence in the 2009 wild stock forecast is excellent due to the strength of the spawner-recruit model ($P = 0.013$) and the environmental conditions adjustment regression ($R^2 = 0.962$; $F = 25.7$; $P = 0.004$).

The 2009 Kitoi Bay Hatchery pink salmon production is expected to be excellent with 10.3 million fish forecasted. The broodstock collection goal is 350,000 fish, resulting in a midpoint harvest projection of about 10.0 million fish. The Kodiak Regional Aquaculture Association Board of Directors have yet to set a cost recovery goal for 2009, but it is estimated that 1.4 to 2.0 million fish will be harvested in the cost recovery fishery. In 2008, 144.9 million fry were released at an average size of 0.64 grams. In terms of fry numbers this was one of the larger releases in recent years, but due to below average water temperatures during the rearing period, fry size was slightly smaller than average.

The KMA wild stock harvest prediction of 12.2 million fish will allow an initial weekly fishing period length of 105 hours (4½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2009). By the fourth week of July, fishing time may be extended or restricted, by section or district, as true run strengths become known.

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 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	183	47–319
Escapement Goal	0	
Harvest Estimate	183	47–319

Forecast Methods

The 2009 Spiridon Lake sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing the 1989 to 2004 outmigration-to-return relationships for 3 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-1.2 ($P = 0.03$) and age-1.3 ($P = 3.5\times10^{-3}$) fish were predicted from age-1 smolt outmigration abundance and age-2.2 ($P = 1.4\times10^{-7}$) were predicted from age-2 smolt outmigration abundance. 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 to 2008) 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 10^{th} and 90^{th} percentiles of the data. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. 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 Special Harvest Area in Telrod Cove. The 2009 forecast of 183,000 fish is 43,000 less than the 2008 forecast of 226,000 fish and 61,000 less than the actual 2008 run estimate of 244,000 fish. The 2009 run should be composed of approximately 51% age-1.2, 23% age-1.3 and 19% age-2.2 fish. Based on the age-1 smolt outmigration, the age-1.2 component is expected to be strongest of the age classes returning in 2009. However, our confidence in this forecast is fair because there has been a recent trend of the age-1 smolt to remain at sea an additional year. If realized, this run will be about 95,000 less than the recent 10-year average (1999 to 2008) run of 278,000 fish. Spiridon Lake sockeye salmon are expected to return in late June with the run ending by mid-August.

Mark Witteveen, M. Birch Foster, Finfish Research Biologists, Kodiak

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	284	73–496
Escapement Goal	240	200–500
Harvest Estimate	44	

Forecast Methods

The 2009 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing 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 ($P = 3.4\times10^{-7}$) using only recent outmigration years (1991 to 2007). The age-.3 sockeye salmon were predicted from prior year age-.2 returns ($P=1.3\times10^{-8}$) using outmigration years from 1967 to 2006. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return from last 16 years; prediction intervals were calculated using the 10^{th} and 90^{th} percentiles of the returns. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2009. 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 2009 Ayakulik forecast of 284,000 sockeye salmon is 87,000 less than the 2008 forecast of 371,000 fish and about 40,000 more than the actual 2008 run estimate of 244,000 fish. The 2009 run should be composed of approximately 59% age-.2 fish and 37% age-.3 fish. If realized, this run will be 111,000 less than the recent 10-year average (1999 to 2008) run of 395,000 fish. Overall, the confidence in the 2009 Ayakulik forecast is good, due to the strong regression relationships. The projected harvest of 44,000 fish is based on the escapement of 240,000 fish which is 40,000 above the lower bound of the escapement goal range.

M. Birch Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	304	126–482
Escapement Goal	150	110–250
Harvest Estimate	154	

Forecast Methods

The 2009 Karluk Lake early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent brood year (1979 to 2004) sibling relationships for 3 age classes. Linear regression models were also used to investigate the relationship between age-.1 and age-.2 sockeye salmon. 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-1.3, -2.3, and -3.3 were predicted from age-1.2, -2.2, and -3.2 siblings, respectively ($P = 2.6 \times 10^{-7}$, $P = .02$, $P = .01$). Age-.2 fish (age-0.2, -1.2, -2.2, -3.2, and -4.2) were predicted from age-.1 fish (ages-1.1, -2.1, 3.1, and -4.1; $P = 1.3 \times 10^{-3}$. All remaining age classes were estimated by summing 11 minor age class run estimates (ages-1.1, -0.3, -2.1, -0.4, -3.1, -1.4, -4.1, -2.4, -3.4, -4.3 and -4.4) by year (1985 to 2008) 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 10^{th} and 90^{th} percentiles of the data. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. 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 2009 forecast of 304,000 fish is about 97,000 less than the 2008 forecast of 401,000 fish, and about 151,000 more than the actual 2008 run estimate of 153,000 fish. The 2009 run should be composed of approximately 52% age-.2 fish and 43% age-.3 fish. If realized, this run will be 262,000 fish less than the recent 10-year average (1999 to 2008) run of 566,000 fish. The projected harvest of 154,000 fish is based on achievement of the approximate midpoint of the escapement goal range of 150,000 fish. Age-2.2 fish were the dominant age class for 9 straight years prior to the 2007 and 2008 seasons and are historically the dominant age class. In 2008, age-.2 fish were at very low levels while other age classes were near average levels. The smolt outmigration project was eliminated in 2007, so we do not have further ancillary information to suggest future trends. 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 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	472	107–838
Escapement Goal	270	170–380
Harvest Estimate	202	

Forecast Methods

The 2009 Karluk Lake late-run sockeye salmon forecast was prepared by investigating simple linear regression models utilizing recent brood year (1980 to 2003) alternative sibling relationships, temperature indices, and estimating 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 2008 returns of age-2.2 sockeye salmon. Significant regression relationships were employed to estimate the age-2.2 component and age-.3 age classes using a Kodiak summer air temperature index from 1980 to 2005 during the first summer of lake residence as a predictor. Following non-significant regression results, the median return by age class was used to estimate the age-1.2 component of the run. All remaining age classes were estimated by summing 10 minor age class run estimates (ages-0.1, -0.2, -1.1, -2.1, -0.4, -3.1, -1.4, -2.4, -4.2, and -3.4) by year (1989 to 2008) 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 10^{th} and 90^{th} percentiles of the data. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. 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 2009 forecast of 472,000 fish is about 11,000 more than the 2008 forecast of 461,000 fish and about 177,000 more than the actual 2008 run estimate of 295,000 fish. Estimates using temperature indices were used for most age classes due to relatively poor sibling relationships. The 2009 run should be composed of approximately 51% age-2.2 fish, 6% age-3.2 fish, and 36% age-.3 fish. If realized, this run will be 344,000 less than the recent 10-year average (1999 to 2008) of 816,000 fish. The projected harvest of 202,000 fish is based on achievement of the approximate mid point of the escapement goal range of 270,000 fish. Age-2.2 fish have been the dominant age class historically, but were in unexpectedly low abundance in 2006 through 2008. It is likely that this trend will continue and the run will be in the lower half of the forecast range. The Karluk late run continues to be difficult to forecast due to very few significant sibling relationships. Our confidence in this forecast is fair.

Mark Witteveen, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	401	223–579
Escapement Goal	138	95–190
Harvest Estimate	263	

Forecast Methods

The 2009 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. 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 ($P = 1.3\times10^{-5}$) using the 1994 to 2007 outmigration years. The age-.3 sockeye were predicted from prior year age-.2 returns ($P = 2.2\times10^{-3}$) using the 1994 to 2006 outmigration years. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return (postfertilization) and prediction intervals were calculated using the 10^{th} and 90^{th} percentiles of the returns. Regression and median estimates were summed to estimate the total Frazer sockeye salmon run for 2009. 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 2009 Frazer Lake forecast of 401,000 sockeye salmon is 19,000 less than the 2008 forecast of 420,000 fish and about 120,000 less than the actual 2008 run estimate of 521,000 fish. The 2009 run should be composed of approximately 64% age-.3 fish and 27% age-.2 fish. If realized, this run will be 29,000 more than the recent 10-year average (1999 to 2008) run of 372,000 fish. Overall, the confidence in the 2009 Frazer Lake forecast is good, due to the good abundance of the age-.2 predictor age class. The 2008 run demonstrated a rebound from the 20-year low represented in the 2006 and 2007 seasons for Frazer Lake sockeye salmon annual run production and the 2009 run should be similar in magnitude. The projected harvest of 263,000 fish is based on the achievement of 138,000 fish through the Dog Salmon Creek weir. The targeted escapement is the Frazer Lake S_{msy} estimate of 118,000 fish plus and additional 20,000 fish to account for the average 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	104	46–162
Escapement Goal	48	30–65
Harvest Estimate	56	

Forecast Methods

The 2009 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 ($P = 3.5\times10^{-4}$) using the 1989 to 2007 outmigration years. The age-.3 sockeye were predicted from prior year age-.2 returns ($P = 3.5\times10^{-3}$) using the 1988 to 2006 outmigration years. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return (1990 to 2008) and prediction intervals were calculated using the 10^{th} and 90^{th} percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon early run for 2009. 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 2009 Upper Station early-run forecast of 104,000 sockeye salmon is 12,000 more than the 2008 forecast of 92,000 fish and about 5,000 more than the actual 2008 run estimate of 99,000 fish. The 2009 run should be composed of approximately 56% age-.2 fish and 40% age-.3 fish. If realized, this run will be 8,000 less than the recent 10-year average (1999 to 2008) run of 112,000 fish. Overall, the confidence in the 2009 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 56,000 fish is based on achievement of the mid-point (48,000 fish) 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 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	328	165–491
Escapement Goal	186	120–265
Harvest Estimate	142	

Forecast Methods

The 2009 Upper Station late-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year 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 ($P = 0.07$) using the 1995 to 2007 outmigration years. The age-.3 sockeye were predicted from prior year age-.2 returns ($P = 0.001$) using the 1994 to 2006 outmigration years. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both age-.1 and age-.4 sockeye salmon were predicted by calculating the median return from 1996 to 2008 and prediction intervals were calculated using the 10^{th} and 90^{th} percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon late run for 2009. 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 2009 Upper Station late-run forecast of 328,000 sockeye salmon is 87,000 more than the 2008 forecast of 241,000 fish and about 95,000 less than the actual 2008 run estimate of 423,000 fish. The 2009 run should be composed mostly (78%) of age-.2 fish. If realized, this run will be 6,000 more than the recent 10-year average (1999 to 2008) run of 322,000 fish. The late-run sockeye production from Upper Station has been weak since the late 1990s and it appears will remain below average in 2009. Overall, the confidence in the 2009 Upper Station late-run forecast is good. The projected harvest of 142,000 fish is based on the achievement of the S_{msy} estimate of 186,000 fish.

M. Birch Foster, Finfish Research Biologist, Kodiak

Appendix F.–Chignik

Forecast Area: Chignik
Species: Sockeye Salmon

Preliminary Forecast of the 2009 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run (Black Lake)	Total Run Estimate	846	240–1,450
	Escapement Goal	350	350–400
	Harvest Estimate[a]	496	
Late Run (Chignik Lake)	Total Run Estimate	535	22–1,050
	Escapement Objective[b]	250	250–400
	Harvest Estimate[a]	285	
Total Chignik System	Total Run Estimate	1,380	263–2,500
	Escapement Objective[b]	600	600–800
	Harvest Estimate[a]	781	

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 632,000 sockeye salmon are projected to be harvested in the Chignik Management Area.

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

Forecast Methods

The forecasts for the 2009 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 ocean 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 AR(1). When detected, an estimate of the bias from the serial autocorrelation was calculated from the regression residuals and applied to the original point estimate.

The predicted 2009 early-run age-.3 (ages-0.3, -1.3, -2.3, -3.3, and -4.3) sockeye salmon returns were estimated based on the abundance of prior age-.2 sockeye salmon (ages-0.2, -1.2, -2.2, and -3.2; $P = 2.9\times10^{-5}$). Following non-significant regression results, the early-run age-.1 (age-0.1, -1.1, -2.1 and -3.1 fish), age-.2 (age-0.2, -1.2, -2.2, and -3.2 fish), and age-.4 (age-0.4, -1.4, -2.4, and -3.4 fish) age class components were predicted by calculating the median returns since 1981.

Ocean age class and temperature 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, ($P = 1.1\times10^{-4}$). Returns of age-.3 sockeye salmon were predicted from an index of average summer temperatures ($P = 0.02$). Temperature data were obtained from the Cold Bay Airport climate database. The temperature index was constructed using a 5-year average of temperatures from June through August beginning in the year prior to the year of outmigration.

The age-.4 sockeye salmon were predicted from age-.3 returns using simple linear regression (P = 0.09). The age-.1 and age-.5 (age-2.5 fish) sockeye salmon age classes were predicted by calculating the median return.

The variances associated with individual regression estimates by age class were used to calculate 80% prediction intervals for those estimates. Prediction intervals for median estimates were calculated using the 10^{th} and 90^{th} 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. Prediction intervals were re-estimated utilizing the standard error from a regression of the residuals when serial autocorrelation was detected. The early- and late-run regression and median estimates were summed to estimate the total Chignik watershed sockeye salmon run for 2009. 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.

Available smolt data were analyzed and a significant simple linear regression relationship (P = 0.003) was found using the number of outmigrating age-2. smolt to predict the subsequent age-.3 adult returns (about 85% of the run). This estimate was then expanded proportionally to account for other ocean ages (ages-.1, -.2 and -.4 fish).

Forecast Discussion

The 2009 sockeye salmon run to the Chignik River is expected to be approximately 1.38 million fish. The early run is expected to be approximately 846,000 fish. The late run is expected to be approximately 535,000 fish. The 2009 Chignik sockeye salmon run is expected to be approximately 885,000 less than the recent 10-year average run of 2.27 million fish, and 12,000 less than the 2008 run of 1.39 million fish.

The projected harvest estimate for the early run of 496,000 sockeye salmon is based on achievement of the lower end of the early-run escapement goal range of 350,000 to 400,000 fish. The projected harvest estimate for the late run of 285,000 fish is based on achievement of the lower end of the late-run goal range of 250,000 fish, which includes the late-run inriver run goal through September 15. 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.

The smolt-based forecast of the 2009 Chignik total sockeye salmon run is 1.62 million sockeye salmon, which is 236,000 greater than that predicted from ocean-age relationships and median estimates of 1.38 million fish.

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 2009 Run

Total Production	Forecast (millions)	Forecast Range (millions)
Total Run	33.78	24.66–42.90
Escapement	8.74	
Commercial Common Property Harvest	25.04	
Bristol Bay Harvest	23.99	
South Peninsula Harvest	1.05	

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2009 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 2005 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 included simple linear regression and recent year averages. Tested models were also evaluated for time series trends. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, MAPE, and mean percent error between forecasts and actual returns for the years 2006 through 2008.

The forecast range was the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 2001 through 2008 runs.

Forecast Results

A total of 33.78 million sockeye salmon are expected to return to Bristol Bay in 2009. This prediction is 4% lower than the previous 10-year mean of total runs (35.23 million fish; range of 17.83 million to 46.04 million fish). The 80% confidence bounds for the 2009 forecasted run ranged from 24.66 million to 42.90 million. All systems are expected to exceed their minimum spawning escapement goals.

A run of 33.78 million sockeye salmon can potentially produce a total harvest of 25.04 million fish if escapement goals are met for managed stocks and industry is capable of taking the surplus fish. The projected harvest includes a harvest of 23.99 million fish in Bristol Bay and 1.05 million fish in the South Peninsula fisheries. A Bristol Bay harvest of 23.99 million sockeye salmon would be 8% higher than the previous 10-year mean harvest of 22.20 million fish (range of 10.36 million to 29.46 million fish).

The forecasted run to each district and river system is as follows: 12.11 million fish to Naknek-Kvichak District (5.30 million to Kvichak River; 2.03 million to Alagnak River; 4.79 million to Naknek River); 9.59 million fish to Egegik District; 2.38 million fish to Ugashik District; 8.93 million fish to Nushagak District (5.01 million to Wood River; 1.66 million to Nushagak River; 2.26 million to Igushik River) and 770,000 fish to Togiak District (Table 1).

The 2009 inshore run forecasted to the Kvichak River is 5.30 million sockeye salmon with a projected harvest of 2.65 million fish (2.48 million in Bristol Bay and 0.16 million in South Peninsula). The harvest projection is based upon an escapement goal minimum of 2 million with a recommended 50% harvest rate. The current escapement goal ranges are 2 million to 10 million for off-cycle years: and 6 million to 10 million for pre-peak/peak years. There is a recommended 50% harvest rate on both off-cycle and pre-peak/peak years. The 2009 Kvichak sockeye salmon run would have been classified as a pre-peak year. However, the 2009 Kvichak River sockeye salmon run will be treated like the traditional off-cycle run with a 50% harvest rate and minimum escapement goal of 2 million spawners rather than a traditional pre-peak/peak run with a 50% harvest rate and minimum escapement goal of 6 million spawners. This change is analogous to what occurred in 2005. A pre-peak/peak escapement goal, largely composed of 5-year-old age-.2 fish, was originally established because it was believed that production differed from that of off-cycle years; therefore, it was advantageous to separate the 2 goals. However, currently the production of pre-peak/peak versus off-cycle years shows similarity such that we cannot conclude they are different. Additionally, average total runs for pre-peak and peak years have decreased from roughly 20 million to 30 million from 1979 through 1995 to less than 9 million since 1999. Based on the relatively weak forecast of 5-year-old age-.2 fish in 2009, this shift in abundance will continue.

The forecasted total run of 33.78 million sockeye salmon is expected to be comprised of 16.62 million age-1.3 fish (49%) followed by 9.41 million age-1.2 fish (28%), 4.58 million age-2.2 fish (14%), 3.02 million age-2.3 fish (9%), 0.075 million age-0.3 (<1%) and 0.078 million age-1.4 fish (<1%).

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 2008 was 4% below the total run. The forecasts since 2001 have averaged 9% below the actual total run. The forecasted run differences have ranged from 25% below actual run in 2007 to 9% above actual run in 2001. The expected harvests have averaged 5% below actual harvest since 2001. The expected harvest differences have ranged from 17% below actual harvest in 2006 to 33% 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 (-39%), Togiak (-21%), Nushagak (-21%), Naknek (-15%), and Wood (-6%) rivers and over-forecast returns to Igushik (5%), Egegik (22%), Kvichak (30%). An example of the large variability can be observed in the forecasts to the Kvichak. We overforecasted the returns to Kvichak by 93% from 2001 through 2004 and underforecasted the returns to the Kvichak from 2005 through 2008.

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 due to incorrectly allocating the catch among the rivers, which results in overestimating the total run (catch + escapement) to some of the rivers and underestimating the 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 2009 run will be dominated by age-1.3 fish (49%), followed by age-1.2 fish (28%), age-2.2 fish (14%) and age-2.3 fish (9%). There is always some uncertainty in our forecast of returns by age class. However, we expect the overall uncertainty in 2009 to be similar to what occurred in 2008. During 2008, our forecast of age-1.2 fish (33%) was similar to the return (35%). We slightly under-forecast age-1.3 fish (49% forecast compared to 56% return) and over-forecast the returns of age-2.2 fish (9% forecast compared to 6% return) and age-2.3 fish (9% forecast compared to 2% return).

The 2009 forecast of 33.78 million is approximately 21% lower than recent total runs to Bristol Bay. The total run has averaged approximately 43 million sockeye salmon during the last 5-years (2004 to 2008). The lower forecast in 2009 is not unexpected. Ocean temperatures have been colder in the North Pacific during the past 2 years (2007 and 2008). Colder ocean temperatures usually result in reduced marine survival of sockeye salmon. We are not sure how recent colder water temperatures will ultimately affect the overall return of sockeye salmon to Bristol Bay in 2009.

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

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

Forecast of the 2009 Run

Total Production	Forecast (thousands)	Forecast Range (thousands)
Total Run	145	77–213
Inriver Run Goal[a]	75	
Commercial Common Property Harvest	70	

[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 145,000 Chinook salmon are forecasted to return to the Nushagak River in 2009. This forecast is 4% less than the recent 10-year mean of 151,000 fish (range of 77,000 fish in 2000 to 246,000 fish in 2005). The 80% confidence bounds for the forecast ranged from 77,000 to 213,000 fish. A run of 145,000 Chinook salmon can potentially produce a harvest of 70,000 fish. We anticipate an actual harvest closer to 46,000 Chinook salmon based on the average exploitation rate of 36% during the previous 5 years (2003 to 2007). A harvest of 46,000 Chinook salmon is 6% higher than the recent 10-year mean of 43,000 fish (range of 11,000 fish in 1999 to 101,000 fish in 2004).

The forecast range was the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 2001 through 2008 runs.

The 2009 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 and return data from brood years 1978 to 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. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, MAPE, and mean percent error between forecasts and actual returns for the years 2006 through 2008.

A simple average of recent returns was used to forecast age-1.1 Chinook salmon. A simple average and Ricker stock-recruitment model was used to forecast age-1.2 Chinook salmon. A Ricker stock-recruitment model using spawning escapements and total returns was used to forecast age 1.3 Chinook salmon. The best age-1.4 model was based on the log normal relationship between sibling returns in succeeding years (i.e., age-1.3 returns for 2008). The best age-1.5 model was a simple average.

Age composition of the forecasted total run is 1% (1,000 fish) age-1.1, 19% (28,000 fish) age-1.2, 34% (50,000 fish) age-1.3, 45% (65,000 fish) age-1.4, and 1% (1,000 fish) age-1.5.

There is always uncertainty when forecasting returns of Chinook salmon to the Nushagak River. The 2009 forecast is no different than previous years. The greatest uncertainty in the 2009 forecast is predicting the return 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 77% in 2008. We have also had fairly large forecast differences for age-1.3 and age-1.4 Chinook salmon in the last 5 years. Forecast differences in the past 5 years (2004 to 2008) for Chinook salmon age-1.3 have ranged from 49% below the actual run in 2004 to 161% above the actual run in 2007 and age-1.4 have ranged from 7% below the actual run in 2004 to 124% above the actual run in 2007.

Similar methods have been used to produce the Nushagak Chinook salmon forecast since 2001. The forecasts have varied widely since 2001. The forecast run differences have ranged from 59% below the actual run in 2004 to 42% above the actual run in 2008. Overall, there has been a tendency for the forecasts to be biased low and expected harvests to be biased high. The 5 previous total run forecasts (2004 to 2008) have averaged 3% above the total run. The forecasted harvests have averaged 48% above the actual harvest for the last 5 years. 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

Appendix H.–Alaska Peninsula

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

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	792	535–1,049
Escapement Goal	117	117–195
Harvest Estimate	675	

Forecast Methods

The 2009 Bear River late-run sockeye salmon forecast was prepared primarily using median estimates and investigating simple linear regression models of ocean 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-.4 sockeye salmon returns were predicted from the previous year age-.2 returns using simple linear regression ($P = 0.01$). Returns of age-.2 sockeye salmon were predicted from an index of average March precipitation from the year of outmigration ($P = 0.003$). 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 16-year median estimates for each of the age class run estimates. 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 10^{th} and 90^{th} percentiles of the data. Prediction intervals of 80% were calculated for the regression model using the variances estimated from the 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 2009 Bear Lake late-run forecast of 792,000 sockeye salmon is about 34,000 less than the 2008 forecast of 826,000 fish but about 81,000 less than the actual 2008 run of 873,000 fish. The 2009 run should be composed of approximately 66% age-.2 fish and 31% age-.3 fish. If realized, this run will be 214,000 greater than the recent (1999 to 2008) 10-year average of 578,000 fish. On average, age-.2 sockeye salmon have comprised about 66% of the Bear Lake late run over the last 10 years. The projected harvest of 675,000 fish is based on the achievement of the lower bound of the escapement goal range (117,000 fish). 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 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	420	224–615
Escapement Goal	150	97–219
Harvest Estimate	270	

Forecast Methods

The 2009 Nelson River sockeye salmon forecast was prepared primarily by investigating simple linear regression models of ocean age class relationships and temperature data from the past 21 years. The temperature indices were constructed from annual average winter month (January through April and October through December) air temperatures from the King Salmon Airport and annual average summer (May through September) temperatures from the Cold Bay Airport for corresponding outmigration years. 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 annual average winter temperature index using simple linear regression ($P = 0.02$). 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 temperature index ($P = 0.01$). 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. 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 10^{th} and 90^{th} percentiles of the data. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. 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 2009 Nelson River forecast of 420,000 sockeye salmon is about 103,000 less than the 2008 forecast of 523,000 fish and about 95,000 more than the actual 2008 run of 325,000 fish. The 2009 Nelson River sockeye salmon run is expected to be 129,000 less than the recent 10-year average run of 549,000 fish. The 2009 run should be composed of approximately 69% age-.2 fish and 29% age-.3 fish. Because the regression relationships predicting age-.2 and age-.3 sockeye salmon are significant and represent a vast majority of the run, the confidence in this forecast is fair. The projected harvest of 270,000 fish is based on the achievement of the approximate midpoint of the escapement goal range of 150,000 fish.

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 the 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 the 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 US/Canada Yukon River Panel in the spring of 2009.

In the Arctic-Yukon-Kuskokwim Region, as in some other areas of the state, salmon production notably decreased for many stocks from 1998 to 2002. Causes for the loss of productivity have been the subject of much interest and concern, but to date are unknown. Consequently, Chinook salmon stocks in the Yukon and Kuskokwim Rivers and Eastern Norton Sound were classified as *stocks of concern* under the guidelines established in the Sustainable Salmon Fisheries Policy. Similarly, chum salmon from the Kuskokwim, Yukon (summer and fall), and Northern Norton Sound were also classified as *stocks of concern*. However, beginning in 2003, there has been an increasing trend of returning salmon in the region. Although stock of yield concern designations still persist for Yukon River and Eastern Norton Sound Chinook and Northern Norton Sound chum salmon stocks, *stock of concern* designations for Yukon and Kuskokwim River chum salmon were discontinued in 2007 based on annual runs that were at or above the historical average each year since 2002. 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 for both Chinook and chum salmon. The high seas Bering Aleutian Salmon International Survey study indicated a decline in the presence of immature chum and Chinook salmon in 2005 and 2006, but 2007 results showed an increase for both species.

Market conditions have not been accounted for in the 2008 commercial harvest outlooks. Poor chum salmon markets in Norton Sound and Kuskokwim areas may result in harvests that are lower than the harvest outlook projections.

The 2009 commercial harvest outlook by management area, in thousands of fish.

	Salmon Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	20–50	20 – 50	100–250	0–1	300–600	
Kuskokwim Bay	17–29	110–280	45–80	0–1	80–130	
Kuskokwim Area Total	35–80	130–330	145–330	0–2	380–730	
Yukon	0–1		30–70		500–900	100–400
Norton Sound	0	10	80–100	100	50–75	
Kotzebue Sound					150–200	

Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2009 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	1,000	880–1,200
Escapement Goal		300–600
Harvest Estimate		100–400

Forecast Methods

The forecast for the fall chum salmon run to Yukon Area in 2009 is based on the run reconstruction of 5 river systems (Tanana, Chandalar, Sheenjek, Fishing Branch and the mainstem Yukon River into 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 1974 to 2002, production from incomplete brood years 2003 and 2004 was estimated based on return per spawner from brood year returns, while an auto-regressive Ricker model was used to predict returns from the 2005 and 2006 parent years.

The predicted returns were multiplied by corresponding average maturity schedule for odd and even-numbered parent years to estimate the 2009 run size, and rounded to the nearest thousand fish. The odd/even maturity schedule from 1984 to 2002 was used to estimate the 2009 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. The confidence bounds are calculated using deviation of the point estimates and the observed returns from run projections from 1987 to 2008.

The 2009 projected run size of fall chum salmon for the Yukon Area is approximately 1.0 million fish. This projection is average for odd-numbered runs; however, recent runs have fluctuated more widely and have produced runs as low as 400,000 fish in 2001 to as high as 2.3 million fish in 2005. The 80% confidence bounds for the 2009 forecast range from 880,000 to 1.2 million fish. If the run materializes as projected, the abundance would be sufficient to meet biological escapement goals, provide an average subsistence harvest with commercial fishing opportunity and meet the requirements for Canadian border passage and escapement obligations.

Drainage-wide escapements between 300,000 and 600,000 fish provide a mean yield of 520,000 fall chum salmon. The mean subsistence harvest from 1974 to 2008 for Alaskan subsistence and Canadian aboriginal harvests is 150,000 fall chum salmon. Commercial harvests are prosecuted on the amount above 600,000 fish based on inseason assessments of run size. Due to the drastic fluctuations of pulses of fish entering the Yukon River mouth and the lateness of the stocks as a whole considering the length of their migration, fishery management is challenging. ADF&G anticipates a subsistence harvest of about 100,000 fish (similar to 2008) and the commercial harvest to be between 100,000 and 400,000 fish, depending on inseason assessment of run size

and the application to the 5 AAC 01.249 Yukon River Drainage Fall Chum Salmon Management Plan.

The forecasted total run of 1.0 million fall chum salmon is expected to be comprised of 83% age-4 and 16% age-5 fish. However, the age-4 fish have varied greatly ranging between 37% and 94%. Although this wide range is typically accounted for by the odd-even fall chum salmon abundance cycle, the affect was restricted between 1993 and 2002 during which most years (1993, and 1997 to 2002) the stocks were severely depressed. The odd-even cycle of fall chum salmon abundance may be related to competition with the conversely cyclic pink salmon abundance in the ocean. The mean odd-numbered year fall chum salmon run size is 1.0 million fish whereas the mean even-numbered year run size is 685,000 fish.

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 run failures 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. From 2006 to 2009 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 26-fold (based on 29 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, 50% were within the projected range of run size, 20% were below and 30% were above the range. Returns of age-4 fish in odd-numbered years are typically 20% higher than even-numbered years. However, extremely high representations of age-4 fish were observed in 2003 (91%) and 2005 (95%) while 2007 was more near the 1977 to 2008 average of 77%. The age-4 component in 2009 is returning from the large escapement realized in 2005 and, even with expected low return per spawner, the age-4 fish are anticipated to carry the run. The point estimate for 2009 of 1.0 million fall chum salmon is reasonable based on the described factors and is expected to provide for a commercial harvest of approximately 100,000 to 400,000 fish. Harvests of fall chum salmon are also predicated on the abundance of coho salmon that have overlapping migration timing primarily during the latter half of the run.

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