Special Publication 13-03

Run Forecasts and Harvest Projections for 2013 Alaska Salmon Fisheries and Review of the 2012 Season

Edited by

Douglas M. Eggers

Cathy Tide

and

Amy M. Carroll

February 2013

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
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

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

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	ã
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	â
trademark	ä
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, c^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	³
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)	a
probability of a type II error (acceptance of the null hypothesis when false)	b
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

SPECIAL PUBLICATION 13-03

RUN FORECASTS AND HARVEST PROJECTIONS FOR 2013 ALASKA SALMON FISHERIES AND REVIEW OF THE 2012 SEASON

Edited by

Douglas M. Eggers,
Cathy Tide,
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

February 2013

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

Douglas M. Eggers,
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, USA

Cathy Tide, and 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, USA

This document should be cited as:

Eggers, D. M., C. Tide, and A. M. Carroll, editors. 2013. Run forecasts and harvest projections for 2013 Alaska salmon fisheries and review of the 2012 season. Alaska Department of Fish and Game, Special Publication No. 13-03, Anchorage.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

DEFINITION OF TERMS

Biological escapement goal	The number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum yield (human use). This determination is based on biological information about the fish stock in question. (Also see: optimum escapement goal.)
Commercial harvest	Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery (see below) and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.
Commercial common property harvest	Harvests taken by traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and sale of confiscated fish.
Common property harvest	Harvests taken by the commercial common property fisheries (see above), as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost recovery harvests.
Cost recovery harvest	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
Enhancement of runs	Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques.
Escapement, spawning population, or brood stock	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.
Harvest projections or harvest outlooks	Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts, when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.
Optimum escapement goal	The number of salmon in a particular stock that should be allowed to spawn to achieve sustainable runs based on biological needs of the stock, as well as consideration of social and allocative needs.
Run forecast	Forecasts of a run (harvest + escapement) are estimates of the fish that will return in a given year based on such information as parent-year escapements, subsequent fry abundance, and spring seawater temperatures. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.
Salmon run	Run refers to the total number of mature fish returning in a given year from ocean-rearing areas to spawn.
Sustainable escapement goal	Sustainable Escapement Goal (SEG) is defined as a level of escapement, indicated by an index or a range of escapement estimates that is known to have provided for sustained yield over a 5 to 10 year period. An SEG is used in situations where a BEG cannot be estimated due to the absence of a stock-specific catch estimate.
Return	Return refers to an aggregation of salmon over several or more years that represent the surviving adult offspring from a single brood year.

NAMES FOR ALASKA'S PACIFIC SALMON SPECIES

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

ABSTRACT

This report contains a detailed review of Alaska's 2012 commercial salmon season as well as run forecasts and harvest projections for 2013. The Alaska all-species salmon harvest for 2012 totaled 127.1 million, which was about 5.0 million less than the preseason forecast of 132.1 million. This combined harvest was composed of 349,000 Chinook salmon *Oncorhynchus tshawytscha*, 35.4 million sockeye salmon *O. nerka*, 3.1 million coho salmon *O. kisutch*, 68.0 million pink salmon *O. gorbuscha*, and 20.1 million chum salmon *O. keta*. The Alaska Department of Fish and Game is expecting a large increase in commercial salmon catches in 2013 due to the projected increase in pink salmon *Oncorhynchus gorbuscha* harvests. The 2013 total commercial salmon catch (all species) projection of 178.8 million is expected to include 110,000 Chinook salmon in areas outside Southeast Alaska, 34.3 million sockeye salmon, 3.9 million coho salmon, 117.8 million pink salmon, and 22.7 million chum salmon. The projected pink salmon harvest is about 73% higher than the harvest experienced in 2012 (68.0 million). The projected sockeye salmon harvest is about 1% lower than the harvest in 2012. The projected chum salmon harvest is expected to be 1% higher than the harvest in 2012.

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

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

INTRODUCTION

This report contains salmon run forecasts and harvest projections for 2013 as well as a detailed review of Alaska's 2012 commercial salmon season. Salmon escapement and harvest estimates reported in this document were summarized from the Alaska Department of Fish and Game (ADF&G) escapement and fish ticket databases. Data provided in this report are preliminary and supersede any data previously published.

ADF&G is expecting a large increase in commercial salmon catches in 2013 due to the projected increase in pink salmon harvests. The 2013 total commercial salmon catch (all species) projection of 178.8 million is expected to include 110,000 Chinook salmon in areas outside Southeast Alaska, 34.3 million sockeye, 3.9 million coho, 117.8 million pink, and 22.7 million chum salmon. The projected pink salmon harvest is about 73% higher than the harvest experienced in 2012 (68.0 million). The projected sockeye salmon harvest is about 1% lower than the harvest in 2012. The projected chum salmon harvest is expected to be 1% higher than the harvest in 2012.

Table 1 shows specific harvest projection numbers by species and fishing area. These projections reflect potential harvests for most of the major sockeye salmon fisheries as well as for large hatchery runs, including pink, sockeye, and chum salmon to the Southeast Alaska, Kodiak, and Prince William Sound areas. Fishing effort influences average catch levels, and effort is partly determined by market conditions and the size of salmon runs. Therefore these projections may not be indicative of potential harvest levels. With the exception of the Southeast Alaska Chinook salmon fisheries and the South Peninsula June fisheries, Alaska salmon management will be based on inseason 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 2013 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		854	2,390	54,000	2,701	59,945
Hatchery Production[a]					10,803	10,803
Southeast Region Total	[b]	854[c]	2,390[a]	54,000	13,504	70,747
Prince William Sound						
Natural Production	15	1,380[d]	222[e]	4,751	312	6,680
Hatchery Production[f]		1,379	198	33,603	2,925	38,106
Upper Cook Inlet	9[c]	4,900	147[c]	99[c]	152[a]	5,307
Lower Cook Inlet						
Natural Production	0	127[c]	1	104	86[c]	318
Hatchery Production		145[g]		196		341
Bristol Bay	45	16,590	82	1[h]	1,554[c]	18,272
Central Region Total	69	24,521	650	38,755	5,029	69,024
Kodiak						
Natural Production	19[c]	2,207[i]	238[c]	6,800[j]	687[c]	9,951
Hatchery Production[k]		496[k]	14	10,200	171	10,881
Chignik[l]	5	2,581	108	1,066	298	4,058
South Peninsula & Aleutians	6[c]	1,837[c]	176[c]	6,792[m]	978[c]	9,790
North Alaska Peninsula	2[c]	1,672[n]	62[c]	109[h]	224[c]	2,069
Westward Region Total	32	8,792	599	24,967	2,358	36,748
Arctic-Yukon-Kuskokwim Region Total	9	93	265	100	1,858	2,324
Statewide Total	110	34,260	3,904	117,822	22,748	178,844

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

[a] Hatchery projections made by Southern Southeast Regional Aquaculture Association, Northern Southeast Regional Aquaculture Association, Douglas Island Pink and Chum , Armstrong-Keta, Inc., Kake Nonprofit Fishereis Corporation, and Metlakatla Indian Community less broodstock (500,000). Wild chum salmon catch estimated as 20% of total catch.

[b] Southeast Chinook treaty forecast not available. The allowable catch of Chinook salmon in Southeast Alaska is determined by the Pacific Salmon Commission and the Commission has not published the quota for 2013. Release of the 2013 Chinook salmon quota for Southeast Alaska is expected in late March or early April.

[c] Average harvest for the five-year, 2008–2012 period.

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

[e] Five-year average harvest (2008–2012) in the Copper River and Bering River districts.

[f] Hatchery projections made by Prince William Sound Aquaculture Corporation and Valdez Fisheries Development Association. Gulkana Hatchery projection made by ADF&G.

[g] Includes common property plus cost recovery harvests.

[h] Average previous five odd-year harvests, 2003–2011 period.

[i] Total Kodiak harvest of 2.207 million natural run sockeye salmon includes projected harvests from formally forecasted systems, projected Chignik harvest at Cape Igvak, and projected harvest from additional minor systems totaling 869,000 fish.

[j] See formal pink salmon forecast.

[k] Hatchery projections made by Kodiak Regional Aquaculture Association. Sockeye salmon hatchery projections include KRAA projections (125,000); enhanced Spiridon sockeye salmon run harvest forecast (371,000) was developed by ADF&G staff.

[l] Chignik Chinook, coho, pink, and chum salmon harvests based on five-year (2008–2012) average harvests (postcooperative fishery); Chignik sockeye salmon based on a formal forecast with projected harvest at Igvak and Southeastern District Mainland excluded.

[m] Based on South Peninsula formal forecast and the Aleutian Islands average previous three odd-year harvests, 2007–2011 period.

[n] Five-year average (2008–2012); sockeye salmon includes formal forecasts for Bear late run (172,000), Nelson stocks (227,000).

The Alaska all-species salmon harvest for 2012 totaled 127.1 million, which was about 5.0 million less than the preseason forecast of 132.1 million. This combined harvest was composed of 349,000 Chinook, 35.4 million sockeye, 3.1 million coho, 68.0 million pink, and 20.2 million chum salmon. Table 2 shows 2012 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 2012 harvest by species and area.

Table 2.–Preliminary 2012 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	282[a]	947	2,084	21,288	12,372	36,974
Prince William Sound	12	3,690	209	27,234	3,818	34,963
Upper Cook Inlet	3	3,134	108	468	270	3,982
Lower Cook Inlet	0	187	0	256	55	499
Bristol Bay	17	20,557	110	910	666	22,261
Central Region Total	32	27,567	428	28,869	4,809	61,704
Kodiak Area	15	2,231	208	16,873	866	20,194
Chignik	4	1,800	33	138	171	2,146
South Peninsula and Aleutians	8	2,000	87	650	612	3,358
North Peninsula	1	764	37	1	284	1,088
Westward Region Total	27	6,796	366	17,662	1,934	26,785
Arctic-Yukon-Kuskokwim Region Total	8	91	255	205	1,051	1,611
Total Alaska	349	35,402	3,133	68,025	20,166	127,074

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

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2011–September 30, 2012, catch accounting period.

Table 3.–Preliminary 2012 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	3,653	5,906	13,339	75,393	112,421	210,711
Prince William Sound	255	24,785	1,683	107,187	27,188	161,098
Upper Cook Inlet	43	21,339	644	1,775	2,153	25,954
Lower Cook Inlet	1	928	1	815	472	2,217
Bristol Bay	237	117,833	577	2,849	4,465	125,961
Central Region Total	537	164,885	2,905	112,626	34,277	315,230
Kodiak Area	109	12,402	1,451	60,417	6,824	81,202
Chignik	50	12,266	226	452	1,535	14,529
South Peninsula and Aleutians	121	11,869	523	2,014	610	15,138
North Peninsula	17	4,405	255	3	2,132	6,814
Westward Region Total	298	40,942	2,455	62,887	11,101	117,683
Arctic-Yukon-Kuskokwim Region Total	125	617	1,578	429	6,987	9,737
Total Alaska	4,613	212,350	20,277	251,335	164,786	653,361

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

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2011–September 30, 2012, catch accounting period.

Look for inseason harvest information, postseason statistics, and other information about salmon in Alaska on the World Wide Web at http://www.Fishing.adfg.alaska.gov.

ADF&G's four 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 2012 commercial salmon season. We normally release it before final catch figures are available to provide preliminary information to the Alaska Board of Fisheries (BOF), the fishing industry, and the public.

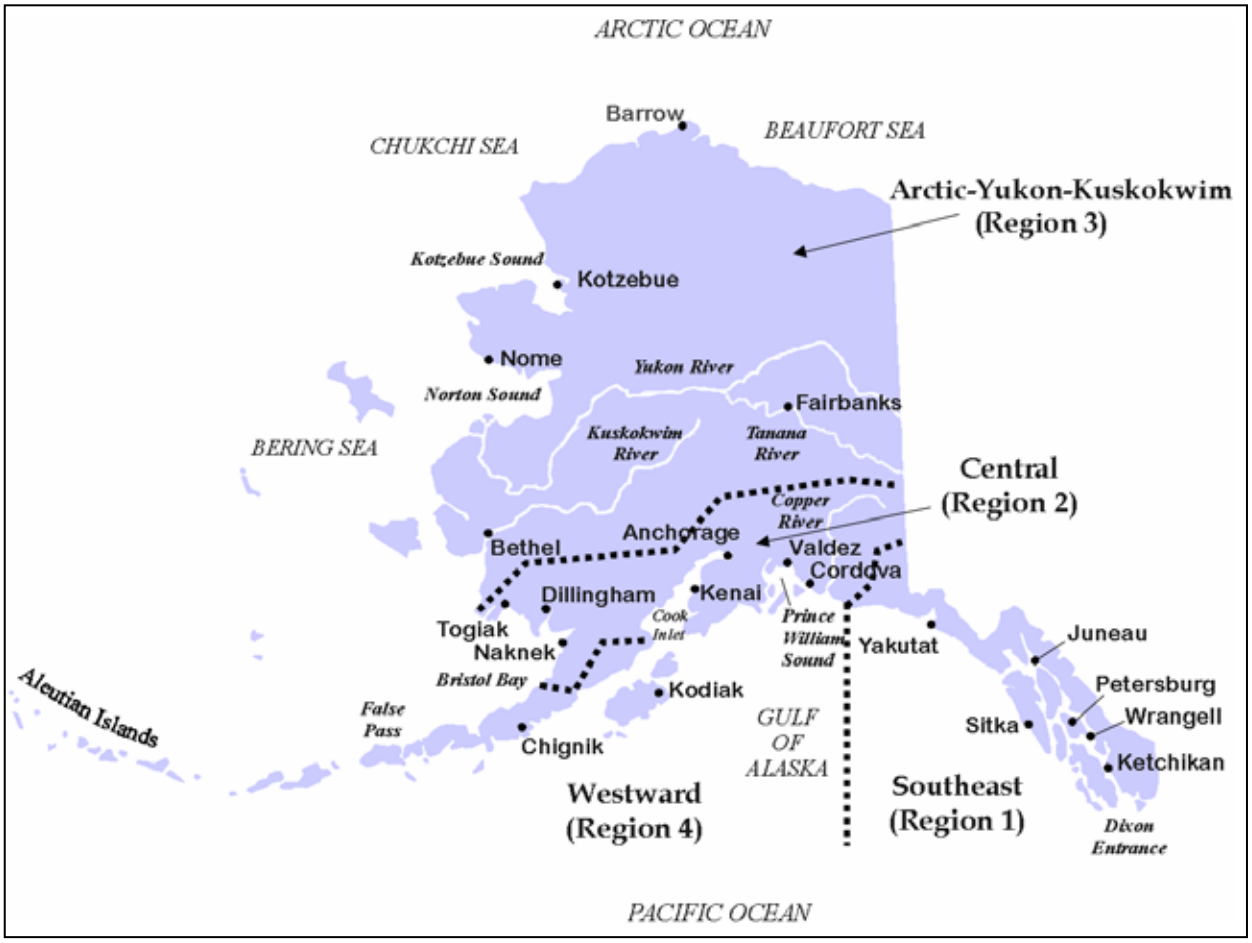

Figure 1.–The four ADF&G fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Division of Commercial Fisheries.

PRELIMINARY REVIEW OF THE 2012 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

Region I harvests totaled 37.0 million salmon and an estimated 211.0 million pounds in 2012 (Tables 2 and 3). The initial estimate of exvessel value based on prices reported on fish tickets is $156.0 million; however, this estimate is expected to increase following Commercial Fisheries Entry Commission analysis after Commercial Annual Operator Reports are submitted by fish buyers. The total harvest in 2012 was 69% of the recent 10-year average harvest of 53.7 million fish, and 94% of the long-term average harvest since 1962 of 39.3 million fish. The cycle of strong odd-year and weak even-year pink salmon returns that began in 2006 has persisted with 2012 pink salmon harvest similar to but slightly less than the 2010 pink salmon harvest. The overall 2012 harvest in numbers of fish ranked as 25th highest out of 51 years since 1962. Total poundage harvested in 2012 was similar to 2010, but well below the 327.0 million pounds harvested in 2011. Average fish weights in 2012 were similar to 2011 for sockeye and pink salmon, lower for Chinook salmon, and increased for coho and chum salmon. Chum salmon average weights increased by 20% compared with the previous season. Total harvests included 282,000 Chinook, 947,000 sockeye, 2,084,000 coho, 21,288,000 pink, and 12,372,000 chum salmon. The proportional harvest composition by species included <1% Chinook, 3% sockeye, 6% coho, 58% pink, and 33% chum salmon. With generally strong prices, strong chum salmon harvest numbers and weights, the preliminary exvessel value of $132.0 million for common property fisheries for 2012 ranks third among Commercial Fisheries Entry Commission reported values from 1985 to 2011. A total of 1,889 limited entry permit holders participated in the 2012 salmon fisheries, down 4% from the 2011 season and up 2% from the 2010 season.

CHINOOK SALMON

The regional Chinook salmon harvest was 282,000 fish for the October 1, 2011, to September 30, 2012, catch accounting year. The catch accounting year begins with the start of the winter troll fishery and ends after the summer fishery. This harvest was just below the long-term average harvest of 300,000, and well below the recent 10-year average harvest of 359,000. In 2012 the all-gear treaty Chinook salmon quota for Southeast Alaska was 266,800 fish based on the coastwide Chinook salmon abundance model updated by the Chinook Technical Committee under terms of the Pacific Salmon Treaty. Quota allocations of treaty fish included 197,272 for the troll fishery, 11,472 for the purse seine fishery, 7,737 for the drift and set gillnet fisheries, and 49,318 for the sport fishery. In addition to the coastwide treaty quota, preseason forecasts provided small allowable catches for directed fisheries of 5,890 for returns to the Stikine River and 6,700 for returns to the Taku River. However, in response to reduced returns measured inseason by stock assessment projects, directed fisheries on both rivers were curtailed and the river harvests on those transbounary rivers were minimal. Chinook salmon produced by Alaska hatcheries are targeted in spring troll fisheries (along with treaty fish), in terminal area fisheries by all seine, gillnet, and troll gears, and are harvested for hatchery cost recovery. The total regional Chinook salmon harvest of 282,000 fish apportioned by commercial fisheries included:

74% to troll gear, 9% to drift gillnet gear, 8% to purse seine gear, and 7% to hatchery cost recovery (Table 4). Based on prices reported on fish tickets, the initial estimated exvessel value of the Southeast Alaska region Chinook salmon harvest was $14.8 million based on harvests of 3.6 million pounds and an average price of $4.05/lb. The troll harvest of 209,000 fish included: 48,000 during the winter season, 25,000 during the spring season, and 136,000 during the summer season. Troll price for winter-caught Chinook salmon averaged $7.62/lb.

SOCKEYE SALMON

The sockeye salmon harvest of 950,000 fish was below the long-term average and recent 10-year average harvest of 1.25 million. Sockeye salmon have generally contributed only 2.3% in numbers of fish to regional harvests over the past 10-year period and this year contributed 2.6%. Regional harvests included 170,000 fish (18%) from the purse seine fisheries, 498,000 fish (53%) from the drift gillnet fisheries, 125,000 fish (13%) from the Yakutat set gillnet fisheries, and 126,000 (13%) from hatchery cost recovery fisheries (Table 4). Sockeye salmon escapement goals were met or exceeded for 11 out of 13 stocks that have escapement goals. The upper range of sockeye salmon escapement goals were exceeded for 4 out of 13 stocks. Sockeye salmon contributed an estimated $8.1 million to the regional exvessel value based on a harvest of 5.9 million pounds and an average price of $1.38/lb.

COHO SALMON

The regional harvest of coho salmon was 2.1 million fish in 2012. This harvest was at the long-term average but was below the recent 10-year average harvest of 2.6 million fish. Troll fisheries harvested 1.2 million coho salmon (58%), followed by purse seine (13%), drift gillnet (13%), hatchery cost recovery (10%), and Yakutat set gillnet (5%, Table 4). Eleven out of thirteen coho salmon escapement goals in the region were either met or exceeded in 2012. The initial fish ticket value for the coho salmon harvest was $17.8 million based on harvests of 13.3 million pounds and an average price of $1.33/lb. Summer troll fisheries received an average price of $1.64/lb. for coho salmon, and troll fisheries accounted for 64% of the total value of coho salmon harvest. In 2012, average troll weights increased 9%—from 5.3 lb in 2011 to 5.8 lb in 2012. Somewhat lower coho harvests may have occurred during the past two years due to increased targeting of enhanced chum salmon by the troll fleet.

PINK SALMON

The 2012 pink salmon harvest of 21.3 million fish was below both the recent 10-year average harvest of 39.6 million and the long-term average since statehood of 30.0 million. The preseason ADF&G harvest forecast for 2012 was 17.0 million fish with an 80% confidence interval range of 10.0–29.0 million. Pink salmon are predominantly harvested by the purse seine fishery. The Southeast purse seine fishery accounted for 90% of the regional pink salmon harvest, and the drift gillnet fishery and Annette Island Reservation fisheries each harvested 4%. Pink salmon weights averaged 3.8 lb. Based on an average price of $0.41/lb and 75.0 million lb harvested, the initial exvessel value for pink salmon was $30.6 million. Seine harvest distribution included 1.8 million in northern districts and 17.3 million in southern districts (Table 4). Common property seine harvests by district from high to low included: 6.0 million in District 2, 5.8 million in District 4, 3.4 million in District 1, 1.4 million in District 13, 1.1 million in District 3, 0.7 million in District 7, 0.3 million in District 6, 0.2 million in District 12, 0.1 million in District 10, and less than 0.1 million in Districts 9, 5, and 11. Of the three subregional geological escapement

goals for pink salmon, the Southern Southeast and the Northern Southeast Outside goals were met or exceeded, but the Northern Southeast Inside area was below goal. Of the 46 pink salmon stock groups in the region, 31 met or exceeded management targets for escapement, and 15 stock groups were below their target ranges.

CHUM SALMON

The total commercial chum salmon harvest was 12.4 million fish in 2012. The harvest was above the recent 10-year average harvest of 9.8 million and the long-term average harvest of 5.4 million. The 2012 chum salmon harvest was sixth highest since statehood. The major harvests included 4.8 million (39%) in common property purse seine fisheries, 3.5 million (28%) in drift gillnet fisheries, and 3.1 million (25%) in hatchery cost recovery harvests (Table 4). The 3.5 million chum salmon harvested in drift gillnet fisheries was a record. A total of 71% of chum salmon harvests took place in common property fisheries in either traditional areas or terminal harvest areas. 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.

Of note in 2012:

1. Northern Southeast Regional Aqulculture Association contributed to an increase in the common property harvest of chum salmon in the region by implementing for the first time a special tax on landings within the Hidden Falls Special Harvest Area (SHA);
2. Douglas Island Pink and Chum, Inc. reduced the proportion of fish in cost recovery fisheries by implementating two common property seine openings in the Amalga Harbor SHA; and
3. In common property fisheries, 78% of chum salmon runs were harvested to Southern Southeast Regional Aquaculture Association, including 50% of runs to Neets Bay; their primary cost recovery location.

The regional chum salmon harvest of 12.4 million was above the projected harvest of around 10.6 million, which was based on forecasts by the major hatchery operators of 8.5 million plus an allowance of around 2.1 million (20%) expected for wild production. Total enhanced chum salmon harvests reported by hatchery operators were 10.7 million, which included 4.7 million to four Southern Southeast Regional Aquaculture Association release locations, 1.8 million to two Northern Southeast Regional Aqulculture Association release locations, 4.0 million to four Douglas Island Pink and Chum, Inc. release locations, and 0.15 million to the Armstrong-Keta, Inc. SHA. Wild summer chum salmon escapement indices, were above the lower-bound sustainable escapement goals (SEG) in all three subregions: Northern Southeast Outside, Northern Southeast Inside, and Southern Southeast. Of five fall chum salmon index systems, three exceeded escapement goal ranges, one was within range, and one was below range. The chum salmon harvest, based on 112.0 million lb landed and an average fish ticket price $0.75/lb, was worth $85.0 million in exvessel value. Chum salmon were the most valuable species in the Southeast Alaska region in 2012 and contributed 54% to the overall salmon value for the region.

Table 4.–Preliminary 2012 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

Fishery	Chinook[a]	Sockeye	Coho	Pink	Chum	Total[b, c]
Purse Seine						
Southern Purse Seine Traditional	5	144	229	17,194	1,921	19,493
Northern Purse Seine Traditional	0	16	7	1,688	214	1,926
Hatchery Terminal	17	11	39	291	2,699	3,057
Total Purse Seine	22	170	275	19,173	4,835	24,475
Drift Gillnet						
Tree Point	1	62	62	204	314	644
Prince of Wales	2	45	121	130	104	403
Stikine	8	22	20	16	241	307
Taku-Snettisham	1	126	24	192	566	909
Lynn Canal	3	207	23	293	1,352	1,878
Drift Gillnet Hatchery Terminal	11	36	15	104	940	1,106
Total Drift Gillnet	26	498	265	939	3,518	5,246
Set Gillnet (Yakutat)	1	125	99	27	2	254
Troll						
Hand Troll						
Traditional	9	0	81	11	6	108
Hatchery Terminal	0		0	0	1	1
Spring Areas	4	0	1	0	1	5
Total Hand Troll	13	0	82	11	8	114
Power Troll[d]						
Traditional	174	3	1,115	149	385	1,826
Hatchery Terminal	1	0	1	6	60	67
Spring Areas	21	0	3	3	23	50
Total Power Troll	196	3	1,119	158	468	1,944
Total Troll	209	3	1,201	169	476	2,058
Annette Island Reservation						
Seine	0	5	5	499	127	636
Drift Gillnet	1	17	38	309	341	706
Troll	0		0	0		0
Hand Troll	0		0	0		0
Power Troll						
Trap						
Total Annette Island Reservation	2	22	42	808	468	1,342
Hatchery Cost Recovery	20	126	200	137	3,055	3,537
Miscellaneous[e]	2	3	2	36	18	61
Southeast Region Total	282	947	2,084	21,288	12,372	36,974

[a] Chinook salmon adults and jacks are totaled.

[b] Missing data indicates no harvest, and zeros indicate harvest activity but <500.

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

[d] Catch accounting period for the 2012 Chinook salmon season goes from October 1, 2011, to September 30, 2012.

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

CENTRAL REGION

PRELIMINARY 2012 PRINCE WILLIAM SOUND SALMON SEASON SUMMARY

The following is an overview of the 2012 Prince William Sound (PWS) Area commercial salmon season. Fishing is complete in all districts and preliminary harvest totals should be representative for all species. Note that numbers in the narrative are rounded for simplicity and all data are considered preliminary.

The 2012 PWS Area commercial salmon harvest was 35.0 million fish. Harvest was composed of 27.2 million pink, 3.7 million sockeye, 3.8 million chum, 209,000 coho, and 12,180 Chinook salmon. The 2012 harvest was composed of 30.8 million (90%) commercial common property fishery (CPF) and 3.6 million (10%) hatchery cost recovery and broodstock fish.

Gillnet Fisheries

Copper River District

The 2012 preseason commercial harvest forecast for the Copper River District was 20,000 Chinook, 1.2 million sockeye, and 281,000 coho salmon. Gulkana Hatchery was expected to contribute 335,000 sockeye salmon to the CPF harvest. The commercial salmon fishing season in the Copper River District began on Thursday, May 17. The sockeye salmon harvest of 1.9 million fish was more than 1.5 times the previous 10-year (2002–2011) harvest average of 1.2 million sockeye salmon. The preliminary harvest composition was 1.5 million (82%) wild, 327,000 (18%) Gulkana Hatchery, and 14,000 (<1%) Main Bay Hatchery sockeye salmon. The CPF harvest of 12,000 Chinook salmon was below the previous 10-year (2002–2011) average harvest of 28,000. The coho salmon commercial harvest of 130,000 was below the previous 10-year (2002–2011) average harvest of 278,000. The inriver goal for salmon passing the Miles Lake sonar site was 684,000 to 1,074,000. The 2012 preliminary sonar escapement estimate was 1.3 million salmon. Spawning escapement to Copper River delta systems based on aerial survey indices was 67,000 sockeye salmon, and was within the SEG range (55,000–130,000). Coho salmon spawning escapement to the Copper River Delta based on aerial survey indices was 37,000 and was within the SEG range (32,000–67,000).

Bering River District

The Bering River District was initially closed to commercial sockeye salmon harvest due to aerial survey escapement estimates from 2007 to 2011 that were below the SEG range (23,000–35,000). Inseason aerial survey escapement estimates above the anticipated goal for the week ending June 23 led to the opening of the district to sockeye salmon fishing on June 25. The district remained open for the remainder of the season concurrent with the Copper River District fishery. The aerial escapement index of 18,000 sockeye salmon was within the new SEG range (15,000–33,000). No fishing effort was reported in the district until the beginning of the coho salmon fishery in mid-August. The coho salmon commercial harvest of 46,000 was below the previous 10-year (2002–2011) harvest average of 56,000. Aerial surveys of coho salmon produced an escapement index of 17,000 fish, which was within the SEG range (13,000–33,000).

Coghill District (Drift Gillnet)

Prince William Sound Aquaculture Corporation (PWSAC) forecasted a run of 1.0 million chum salmon to Wally Noerenberg Hatchery in 2012. Approximately 380,000 chum salmon (37%) of

the forecasted run were designated for corporate cost recovery and broodstock. The CPF harvest of chum salmon in the Coghill District was 2.4 million fish. PWSAC harvested 422,000 chum salmon for corporate cost recovery and broodstock.

The Coghill River weir passed 72,000 sockeye salmon, which exceeded the SEG range (20,000–60,000). The total CPF harvest of sockeye salmon in the Coghill District was 428,000 fish. Wild sockeye salmon contributed an estimated 81% of the CPF harvest in the Coghill District. The total CPF harvest of coho salmon in the Coghill District was 10,000 fish, the majority of which were likely enhanced from Wally Noerenberg Hatchery. Pink salmon CPF harvest in the Coghill District was 3.3 million fish. Wild pink salmon contributed 19% of the Coghill District CPF harvest.

Eshamy District

The department's preseason forecast for Eshamy Lake was 53,000 wild sockeye salmon and PWSAC forecasted a run of 1.2 million Main Bay Hatchery enhanced sockeye salmon. The CPF harvest of sockeye salmon in the Eshamy District was 1.3 million fish. The Eshamy District CPF harvest included 13% wild sockeye salmon. Sockeye salmon escapement to Eshamy Lake was monitored by video camera and foot survey this past season and counts are not yet available. The sockeye salmon biological escapement goal (BEG) range for Eshamy Lake is 13,000 to 28,000 fish.

Unakwik District

The department's preseason harvest forecast for the Unakwik District was 6,500 sockeye salmon. Unakwik District CPF harvest was 2,000 fish, which was below the 10-year average of 7,000 fish.

Montague District, Port Chalmers Subdistrict

PWSAC forecasted a run of 504,000 chum salmon to the Port Chalmers remote release site in 2012. CPF drift gillnet harvest of chum salmon in the Montague District was 292,000 fish. The drift gillnet gear group had access to the Port Chalmers Subdistrict in 2012 under the Prince William Sound Management and Salmon Enhancement Allocation Plan. The harvest was below the 5-year (2007–2011) CPF average of 597,000 chum salmon. Wild chum salmon contributed <1% of Port Chalmers Subdistrict CPF harvest.

Purse Seine Fisheries

Coho Salmon

The Valdez Fisheries Development Association (VFDA) coho salmon run was anticipated to be 129,000 fish. VFDA's broodstock objective was 1,000 coho salmon. Total CPF harvest of coho salmon in PWS (excluding Copper River and Bering River districts) was 28,000 fish. This was the lowest PWS CPF coho salmon harvest since 2010, when 15,000 fish were harvested. The majority of CPF coho salmon harvested in the Southwestern (9,000) and Coghill (10,200) districts are assumed to be of enhanced stock origin.

Pink Salmon

The 2012 pink salmon total run forecast for PWS was 37.5 million fish. This estimate included 4.4 million wild fish, 13.5 million VFDA hatchery fish, and 19.6 million PWSAC hatchery fish.

Approximately 3.4 million (17%) of the 19.6 million pink salmon return forecast to the PWSAC hatcheries was projected for cost recovery and broodstock with the remaining 16.2 million PWSAC fish expected to be available for CPF harvest. Approximately 2.7 million (20%) of the projected 13.5 million pink salmon return forecast to VFDA's Solomon Gulch Hatchery were projected for cost recovery and broodstock. The remaining 10.8 million VFDA fish were expected to be available for CPF harvest. A total harvest of 3.2 million wild stock pink salmon was forecasted for CPF harvest in PWS, leaving 1.2 million fish for escapement.

The CPF harvest of 24.0 million pink salmon was the 14th highest PWS pink salmon harvest since 1971. Total pink salmon harvest was 27.2 million fish, including 3.2 million (1.8 million for PWSAC and 1.4 million for VFDA) fish for hatchery cost recovery and broodstock. An estimated 13% of the PWS CPF harvest was wild pink salmon.

For the 2012 season, the PWS pink salmon SEGs for even- and odd-year brood lines changed to district-specific SEGs. Inseason pink salmon aerial survey escapement estimates remained above minimum anticipated escapement thresholds in most districts for much of the season. This allowed for targeted fishing effort on wild pink salmon and expanded area for targeted fishing effort on enhanced pink salmon. Inseason pink salmon aerial survey escapement estimates were below anticipated escapement thresholds in the Eshamy District for the entirety of the 2012 season, resulting in some time and area restrictions in the Southwestern District to reduce fishing effort on Eshamy District pink salmon stocks traveling through migratory corridors. The area-under-the-curve estimate of pink salmon escapement used for direct comparison with the SEG goals is not yet available, but considering that inseason pink salmon escapement indices were above anticipated aerial survey counts, overall escapement was likely within the even-year SEG range for all districts except Eshamy District. Aerial surveys ended early this year because of poor weather.

Chum Salmon

The 2012 chum salmon total run forecast for PWS was 2.0 million fish. The majority of the forecasted return, 1.8 million fish (90%), was projected to be of PWSAC hatchery origin. Of these PWSAC hatchery origin chum salmon, 210,000 fish were forecasted to be harvested primarily in the Armin F. Koernig Hatchery purse seine CPF. All other enhanced chum salmon were forecasted to be harvested primarily in gillnet fishery.

Based on the department's wild chum salmon forecast of 236,000 fish, there was a preseason expectation for the potential CPF harvest of 36,000 wild stock chum salmon in PWS, leaving 200,000 fish for escapement. The preseason forecast for total chum salmon CPF harvest in PWS was 1.4 million fish.

Chum salmon CPF harvest in PWS was 3.4 million fish, which was 2.0 million fish above the CPF preseason forecast. Purse seine chum salmon harvest in PWS was predominantly from the Eastern, Coghill, Southwestern, and Southeastern districts. CPFs targeting predominately enhanced chum salmon in the Southwestern District resulted in purse seine harvest totals of 173,600 fish. From July 21 until July 25, CPFs targeting predominantly enhanced chum salmon in the Coghill District resulted in purse seine harvest totals of approximately 122,000 fish. Estimated wild chum salmon contributions to CPF harvest were 5% in the Southwestern District and 3% in the Coghill district. CPFs targeting predominately wild chum salmon in the Eastern and Southeastern districts exceeded preseason expectations with harvest totals of 99,100 (Eastern District) and 35,100 (Southwestern District) fish, respectively.

COOK INLET

Lower Cook Inlet

The preliminary estimate of the 2012 Lower Cook Inlet Area commercial salmon harvest as based on current fish ticket data is 498,597 salmon. The harvest was composed of 256,267 pink, 186,581 sockeye, 55,434 chum, 182 coho, and 133 Chinook salmon. The harvest was comprised of 382,895 (77%) commercial CPF fish, and 115,702 (23%) hatchery cost recovery and broodstock fish.

Southern District

The 2012 preseason commercial harvest forecast for natural production in the Southern District was 1,900 sockeye and 6,200 pink salmon. Hatchery releases from previous years at Leisure Lake, Hazel Lake, Tutka Bay, Port Graham and English Bay were anticipated to contribute 8,500 sockeye salmon to the 2012 commercial harvest. The commercial salmon fishing season in the Southern District began on Friday, June 1. Purse seine harvest for the 2012 season was 6,396 sockeye and 157,770 pink salmon. This compares to a previous 10-year harvest average of 78,561 for sockeye and 10,702 for pink salmon. The set gillnet harvest was 10,260 sockeye and 10,305 pink salmon. The previous 10-year harvest average for this gear type is 30,597 sockeye and 3,730 pink salmon. Preliminary estimates show that pink salmon escapement in index streams was near the midpoint of the cumulative SEG range (59,700–178,500). The weir at the English Bay River passed 3,985 sockeye salmon. This was below the SEG (6,000–13,500) for this system**.**

Outer District

The 2012 preseason commercial harvest forecast for the Outer District was 16,700 sockeye and 256,000 pink salmon. The commercial salmon fishing season began in this district on Thursday, July 26. Overall harvest was 77 sockeye, 69,259 pink and 51,313 chum salmon. This harvest compares to previous 10-year averages of 14,558 sockeye, 422,428 pink and 24,149 chum salmon. Preliminary escapement survey indices for chum salmon were near the upper end of the SEG range (12,850–34,600). Pink salmon were in the lower end of their SEG range (54,500–237,200). Aerial surveys of Desire Lake documented 8,840 sockeye salmon. This is within the SEG range (8,800–15,200) for Desire Lake. The Delight Lake weir counted 10,887 sockeye salmon. This is also within the SEG range (7,500–17,650) for this system.

Eastern District

The 2012 preseason commercial forecast for the Eastern District was 25,700 wild stock sockeye salmon. Cook Inlet Aquaculture Association (CIAA) forecasted a total run of 216,000 sockeye salmon to Resurrection Bay facilities. Total harvest from this district was 83,953 sockeye salmon with all of these fish harvested by CIAA for cost recovery purposes. This compares to a previous 10-year average commercial harvest of 52,344 sockeye salmon for common property and cost recovery harvests combined. Escapement through the weir at Bear Creek (12,293) was sufficient to meet the desired inriver return of 5,620 to 13,220 sockeye salmon. This goal is the combination of the SEG (700–8,300) as well as the estimated 4,920 sockeye salmon required for broodstock for the CIAA sockeye salmon program at Trail Lakes Hatchery. In addition, 2,140 sockeye salmon were documented during aerial surveys of Aialik Lake escapement. This is below the SEG range (3,700–8,000) for this system.

Kamishak Bay District

The 2012 preseason commercial forecast for the Kamishak Bay District was 98,300 sockeye and zero pink salmon. CIAA forecasted a run of 10,200 sockeye salmon to the Kirschner Lake remote release site. Total harvest from this district was 55,255 sockeye, 61 pink and 2,425 chum salmon. In addition, 1,260 sockeye salmon were harvested by CIAA from the Kirschner Lake SHA for cost recovery purposes. This compares to a previous 10-year average of 64,961 sockeye, 70,776 pink and 56,663 chum salmon. Preliminary escapement survey indices for both chum and pink salmon show escapement levels in the lower end of their respective SEG ranges for chum (65,550–141,600), and for pink (25,950–203,400) salmon. Video enumeration of sockeye salmon returning to Chenik Lake documented escapement near the upper end of the SEG range (3,500-14,000). Video documentation of escapement to Mikfik Lake for this species was below the SEG range (6,300–12,150).

Upper Cook Inlet

The 2012 Upper Cook Inlet (UCI) commercial harvest of 4.0 million salmon ranks as the ninth largest overall harvest in the past 20 years. The estimated exvessel value of the 2012 harvest was approximately $34.2 million, ranking it as the 11th highest value in the UCI commercial fishery since 1960, and the 3rd highest exvessel value in the past 10 years. While all five species of Pacific salmon are present in UCI, sockeye salmon are the most valuable, accounting for approximately 77% of the exvessel value in the commercial fishery since 1960, and nearly 92% of the total value during the past 20 years. Currently, there are eight sockeye salmon escapement goals established in UCI. The Yentna River sonar goal was replaced in 2009 with SEGs monitored by weirs on three lake systems within the Susitna River, those being Judd and Chelatna Lakes in the Yentna River drainage and Larson Lake in the mainstem Susitna River drainage. Sockeye salmon escapement into Packers Lake was enumerated in 2012 using remote video technology. Unfortunately, a lack of solar radiation caused the video hardware to be under-powered, resulting in an incomplete escapement estimate. For the 2012 season, three of seven sockeye salmon goals fell within their established escapement goal range, while two exceeded and two fell below their goal objectives.

Chinook Salmon

In UCI, the two fisheries where Chinook salmon are commercially harvested in appreciable numbers occur via set gillnets in the Northern District and the Upper Subdistrict of the Central District. In 2012, Chinook salmon early runs were very weak throughout all of southcentral Alaska, resulting in restrictions and closures to many sport fisheries. These conservation actions presented some unique challenges to management of the commercial fisheries that harvest both early and late-run Chinook salmon stocks. At the 2011 BOF meeting, many Chinook salmon runs in the Northern District were found to be stocks of management concern. An action plan was developed which aimed to reduce Chinook salmon harvest in both sport and commercial fisheries. In the commercial fishery, that portion of the General Subdistrict of the Northern District, from approximately three miles south of Tyonek north to the Susitna River was closed to fishing for the entire 2011 directed Chinook salmon fishery. Prior to the 2012 fishing season, the department determined that additional restrictions were necessary to further reduce Chinook salmon commercial harvest. By emergency order, all fishing periods during the 2012 Northern District Chinook salmon fishery were reduced in duration from 12 hours to 6 hours per period. The estimated Chinook salmon harvest in the Northern District directed fishery was approximately 1,037 fish, or about 57% less than the previous 10-year average annual harvest of 2,389 fish.

The Deshka River is the only system in northern Cook Inlet where Chinook salmon escapement is monitored inseason with a weir. The 2012 Deshka River Chinook salmon escapement estimate of 14,088 fish was approximately 48% less than the previous 10-year average annual escapement of more than 27,000 fish. The escapement goal at the Deshka River is an SEG of 13,000 to 28,000 fish, and although this goal was met in 2012, closures and restrictions to both sport and commercial fisheries were needed to ensure the goal was achieved.

Both early and late-run Kenai River Chinook salmon runs for the past few years have been characterized as below average. At the 2011 BOF meeting, the Division of Sport Fish notified the BOF and all user groups that the standard target-strength sonar estimate of passage would no longer be used as the primary method of enumerating Chinook salmon escapement in the Kenai River. Instead, the department would rely on a number of *indices* of Chinook salmon abundance, as they transitioned to the new DIDSON-based system.

As stated in the sockeye salmon section of this summary, many of the 2012 early returning Chinook salmon runs in UCI were weak, resulting in restrictions and closures to most of the sport fisheries harvesting these stocks. In response to the poor performance of early-run Chinook salmon stocks, the late-run Chinook salmon sport fishery in the Kenai River, which begins on July 1, was prosecuted beginning with a no-bait restriction. In the commercial set gillnet fishery, unprecedented restrictions were implemented in the Upper Subdistrict in order to reduce harvest of Chinook salmon in late June and early July. The intent of these actions was to increase Chinook salmon escapement in the Kenai River in early July so that later in the month, when sockeye salmon are typically present in large numbers, the set gillnet fishery could be opened.

Restrictive actions included closing the set gillnet fishery for the first three periods of the year. Unfortunately, both the indices of abundance and the DIDSON-based Chinook salmon passage estimates in the Kenai River continued to lag during the early to mid part of July, eventually forcing a closure of the Kenai River sport fishery on July 19. This in turn triggered a closure of the Upper Subdistrict set gillnet fishery. Chinook salmon cumulative passage estimates did improve enough in August to allow the Upper Subdistrict set gillnet fishery to reopen for three regular fishing periods beginning on August 6. One additional fishing period was provided on August 12, as part of the new pink salmon management plan. The estimated Chinook salmon harvest in the Upper Subdistrict set gillnet fishery of 584 fish was the smallest harvest in this fishery since 1966, and was approximately 95% less than the previous 10-year average annual harvest of nearly 12,000 fish. In the Kenai River, the final DIDSON-based estimate of Chinook salmon passage was 21,817 fish. It is unknown how this number relates specifically to the minimum escapement goal of 17,800 Chinook salmon, previously measured with target strength sonar.

In all of UCI, approximately 2,526 Chinook salmon were harvested in 2012, which was about 85% less than the 1966–2011 average annual harvest of 15,700 fish. In 2012, the estimated exvessel value of $98,000 for Chinook salmon was approximately 0.3% of the total UCI commercial fishery.

Sockeye Salmon

The 2012 UCI preseason forecast projected a total run of 6.2 million sockeye salmon, with a harvest estimate (sport, personal use and commercial) of 4.4 million fish. Approximately 3.4 million sockeye salmon were predicted to be harvested commercially. The total run to the Kenai River, generally the largest producer in UCI, was forecast to be 4.0 million sockeye salmon.

For most of UCI, the general season for set gillnetting begins on the first Monday or Thursday on or after June 25, while drift gillnetting begins on or after June 19. In 2012, there was a significant departure from the traditional fishing schedule in the Upper Subdistrict set gillnet fishery due to very weak Chinook salmon runs throughout UCI (see Chinook salmon section below).

From the onset of the season, a strategy was implemented in the set gillnet fishery with intent to avoid possible closure of the fishery later in July due to inadequate Chinook salmon escapement. This strategy included closing the first three scheduled fishing periods (June 25 and 28, and July 2) in the Kasilof Section, which was done primarily to reduce harvest rates on Kenai and Kasilof river late-run Chinook salmon. Two fishing periods with set gillnets were provided in the Kasilof Section on July 3 and July 5, resulting in small catches of both Chinook and sockeye salmon. The Kenai and East Forelands Sections set gillnet fisheries were scheduled to open on Monday, July 9, but weak Chinook salmon passage estimates in the Kenai River resulted in closures of the regular fishing periods on July 9 and 12 in all of the Upper Subdistrict set gillnet fishery. The regularly scheduled fishing period on Monday, July 16, was allowed, with approximately 67,000 sockeye and 265 Chinook salmon harvested in the Upper Subdistrict set gillnet fishery. Three days later, on July 19, the Kenai River late-run Chinook salmon sport fishery was closed due to low escapement, and per the *Kenai River Late-Run King Salmon Management Plan*, the Upper Subdistrict set gillnet fishery was also closed.

By regulation, the Chinook salmon sport fishery in the Kenai River is complete on July 31. Thus, on August 1, the river reopened to sport fishing, albeit bait was not allowed in order to reduce incidental catch and release mortality of Chinook salmon. Estimates of Chinook salmon passage into the Kenai River eventually reached levels where reopening the Upper Subdistrict to regular commercial fishing periods was allowed. Three regularly scheduled fishing periods were opened on August 6, 9, and 13, as well as one fishing period on Sunday, August 12, which was provided as part of the new *Cook Inlet Pink Salmon Management Plan*. For the 2012 season, a total of 7 fishing periods were provided to the Upper Subdistrict set gillnet fishery, with a total harvest of approximately 95,000 sockeye salmon. This was the lowest harvest in this fishery since 1966.

With the Upper Subdistrict set gillnet fishery restricted or closed for most of the 2012 season, the Central District drift gillnet fleet became the primary harvester of Kenai and Kasilof river sockeye salmon. During the month of July, the drift fleet was fished a total of 21 days, as follows: one day in the Kasilof Section, 10 days in the expanded corridor, four days in Drift Area 1 and the regular or expanded corridor, two days in Drift Area 1 and 2, and four days in all of the Central District. Approximately 2.9 million sockeye salmon were harvested by the drift fleet in 2012. This accounted for more than 93% of the total UCI sockeye salmon harvest of 3.1 million fish.

The total sockeye salmon run to UCI in 2012 was estimated to be 6.4 million fish, which was 3% more than forecast. Based on Offshore Test Fish data, the run was one day early. Runs to the Crescent, Kasilof, and Kenai rivers were better than forecast, while sockeye salmon runs to Fish Creek, the Susitna River and minor systems all returned at less than forecast. The UCI commercial harvest of 3.1 million sockeye salmon was approximately 9% less than the preseason forecast harvest estimate of 3.4 million fish, but nearly identical to the average annual harvest during the previous 10 years.

Sockeye salmon prices varied during the season, but based on an estimated average price of $1.50 per pound, the total exvessel value from the 2012 UCI sockeye salmon harvest was approximately $31.8 million, which was 92.9% of the total UCI exvessel value.

Coho Salmon

The 2012 commercial harvest estimate of 108,000 coho salmon was the 43rd smallest harvest since 1966 (n=47 years) and was approximately 45% lower than the recent 10-year average annual harvest of approximately 187,000 fish. Reduced commercial harvest of coho salmon in 2012 can partly be attributed to restrictions in fishing areas put in regulation by the BOF to reduce the drift fleet coho salmon harvest, but were more likely the result of a below average coho salmon run to many parts of UCI.

Beginning on Friday, August 10, the Division of Sport Fish prohibited fishing for coho salmon in all waters of the Little Susitna River from its confluence with Cook Inlet upstream to the Parks Highway. Subsequently, on August 17, sport fishing for coho salmon was prohibited in all waters of the Knik Arm Management Area, excluding the Eklutna Tailrace. Restrictive actions were also taken in the commercial fishery in order to reduce harvest of northern bound coho salmon. The set gillnet fishery in the General Subdistrict of the Northern District was closed by emergency order on August 9 and 13. When coho salmon escapement did not improve in the Little Susitna River, all of the Northern District commercial set gillnet fishery was closed for the remainder of the 2012 season, beginning on August 16. In the drift gillnet fishery, four of the six district-wide drift gillnet fishing periods from July 16 through August 2 were restricted to either Drift Area 1 (two periods) or Drift Areas 1 and 2 (two periods) to reduce harvest of northern bound coho salmon.

Coho salmon escapement goals in UCI currently exist only at the Little Susitna River and at Fish Creek. In 2012, the estimated escapement in the Little Susitna River of 6,770 fish was more than 3,300 fish below the lower end of the SEG range (10,100–17,700). At the 2011 BOF meeting, the Fish Creek coho salmon SEG (1,200–4,400) was reinstated. The 2012 Fish Creek coho salmon escapement estimate was 1,237 fish, or just slightly above the minimum objective.

The estimated exvessel value of coho salmon in the 2012 commercial fishery was approximately $478,000, or 1.4 % of the total exvessel value in UCI.

Pink Salmon

The UCI commercial harvest of pink salmon in 2012 was estimated to be approximately 468,000 fish, which is 41% higher than the average annual harvest of 334,000 fish from the previous 10-years of even-year harvests. Pink salmon escapements are not specifically monitored in UCI; however, it appears that escapements in many river systems in 2012 were very good. The estimated average price per pound paid for pink salmon was approximately $0.35, resulting in an exvessel value for this species of $600,000, or 1.8 % of the total exvessel value.

Chum Salmon

The 2012 harvest of nearly 270,000 chum salmon was more than 130% above the previous 10-year average annual harvest of 121,000 fish. There is only one chum salmon escapement goal in UCI, which is an SEG of 3,800 to 8,400 fish in Clearwater Creek, the major tributary that drains into Chinitna Bay. Escapement is monitored via multiple aerial surveys. Approximately 5,300 chum salmon were observed during an August 25 survey flight. The exvessel value of chum salmon in the 2012 commercial fishery was approximately $1.24 million, or 3.6% of the total exvessel value, which represents the highest proportion by chum salmon to the UCI commercial exvessel value since 1995.

BRISTOL BAY

The 2012 inshore Bristol Bay sockeye salmon run of 29.1 million fish and (20.6 million harvest) ranks 14th over the last 20 years (1992–2011) and was 28% below the average run of 37.3 million for the same period. This year's run to the Bay was 7% below the preseason inshore forecast of 31.3 million fish. Both Egegik and Nushagak Districts fell short of their preseason harvest projections by 9% (Egegik) and 73% (Nushagak) respectively. The remaining districts exceeded preseason expectations as follows: Naknek–Kvichak District by 11%, Togiak District by 10%, Ugashik District by 11%. The commercial harvest of sockeye salmon was 6% below the 21.76 million preseason forecast. Total Bristol Bay escapement was 8.5 million sockeye salmon. It should be noted that this does not include an escapement count for the Alagnak River for the first time since 2000.

Approximately 17,000 Chinook salmon were harvested in Bristol Bay in 2012—293% below the average harvest for the last 20 years (67,188). The chum salmon harvest of 666,000 fish was 44% below the 20-year average of 957,000. Coho salmon harvest of 110,000 fish was 22% above the 20-year average of 84,000. Reported pink salmon harvest was 910,000 fish, more than three times the even-year average since 1992 of 253,000.

The 2012 harvest of all salmon species in Bristol Bay was 22.3 million salmon. The estimated preliminary exvessel value of the 2012 Bristol Bay salmon fishery is approximately $121.1 million, which is 5% above the 20-year average, and ranks ninth over that same period. The estimated exvessel valued does not consider the contribution of future price adjustments, loyalty bonuses, and differential prices for refrigerated versus nonrefrigerated fish.

Chinook Salmon

Chinook salmon harvests in Bristol Bay were below average in every district. No directed Chinook salmon fishing periods were permitted in the Nushagak District but incidental harvest of Chinook salmon during directed sockeye periods did occur with a preliminary total of 11,501 fish. Over the course of the season, the sport fishing seasonal bag limit was reduced to two fish greater than 20 inches in the Nushagak River and then returned to the unrestricted seasonal bag limit of four fish. Chinook salmon escapement into the Nushagak River was 107,786, surpassing the inriver escapement goal of 75,000.

Sockeye Salmon

The 2012 inshore sockeye salmon run of 29.1 million fish was 7% below the preseason inshore forecast of 31.3 million. All systems were within established SEG ranges.

The 2012 Bristol Bay sockeye salmon run was close to forecast and near to long-term averages, with one significant exception: the Nushagak District. Spring temperatures in the Bering Sea were notably colder than the last several years and stayed that way throughout much of the sockeye salmon season. Given the projected harvest of 21.8 million sockeye salmon, the department planned to allow more fishing time early in the run. At the December 2009 BOF meeting, the regulations were changed with the goal of encouraging early season fishing. The BOF adopted regulations allowing fishermen to fish eastside districts prior to June 25 without having to register their permit or vessel, which allows fishermen a chance to participate early in the run without the penalty of having to wait 48 hours to transfer between districts. Based on run performance in 2010 and 2011 in Egegik the department was more conservative early in the

season in 2012. This resulted in no drift openings in Egegik between June 15 and June 25 due to low escapement.

The total sockeye salmon harvest was 6% below forecast, and the total inshore run was 7% below forecast. Also of significance in 2012, the Wood River SHA was utilized. The Naknek River SHA was not utilized in 2012; only the fifth time since 1995 that the Naknek River SHA was not opened to commercial fishing.

Coho Salmon

The bay-wide harvest of 110,319 coho salmon was 26% above the recent 20-year average of 79,131. Again, with the Nushagak sonar operational and liberal fishing time due to surplus escapement, there was significant coho salmon harvested in Nushagak District. The harvest was 92,598 in Nushagak District and the escapement was 329,946. The coho salmon harvest in Togiak District was 13,144.

Pink Salmon

Pink salmon runs are strong during even years in Bristol Bay and 2012 saw some market interest in Nushagak District. The Nushagak sonar was operational until 19 August and was able to verify a large escapement of pink salmon. With escapement information indicating fish surplus to escapement needs, the department was able to provide significant amounts of fishing time. The total pink salmon harvest in Nushagak District was 877,466, contributing the majority of the 910,375 bay-wide harvest. Togiak District contributed 29,089 pink salmon to the total.

Chum Salmon

The 2012 preliminary Bristol Bay chum salmon harvest was 665,934. Togiak District produced a harvest above the 20-year average, while Egegik, Ugashik, Nushagak and Naknek-Kvichak districts produced less chum salmon than their 20-year averages. Nushagak District was the largest producer of chum salmon, where over 268,361 were harvested.

Table 5.– Preliminary 2012 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 District	0	12	8	10,594	102	10,716
Northern Dist.	0	1	1	3,677	2	3,680
Coghill Dist.	0	53	3	2,312	199	2,567
Northwestern Dist.		0	0	87	0	87
Southwestern Dist.	0	85	10	5,722	165	5,982
Montague Dist.		0	0	187	0	188
Southeastern Dist.	0	5	0	225	36	266
Unakwik Dist.		0		0	0	1
Drift Gillnet						
Bering River District	0		46	0		46
Copper River Dist.	12	1,867	130	6	27	2,042
Coghill Dist.	0	383	8	1,126	2,257	3,774
Eshamy Dist.	0	988	0	89	255	1,332
Montague Dist.	0	0	0	14	325	339
Unakwik Dist.		1		0	0	1
Set Gillnet						
Eshamy Dist.	0	295	0	17	24	336
Hatchery[a]	0	1	2	3,177	425	3,606
Prince William Sound Total	12	3,690	209	27,234	3,818	34,963
Southern District	0	48	0	187	1	236
Kamishak District		55		0	2	58
Outer District	0	0	0	69	51	121
Eastern District		84		0	0	84
Lower Cook Inlet Total	0	187	0	256	55	499
Central District	1	3,111	95	464	267	3,939
Northern District	1	23	13	4	2	43
Upper Cook Inlet Total	3	3,134	108	468	270	3,982
Naknek-Kvichak District	1	9,992	0	4	123	10,120
Nushagak District	12	2,702	93	877	268	3,952
Egegik District	0	4,890	1	0	38	4,929
Ugashik District	0	2,347			30	2,377
Togiak District	5	626	16	29	207	883
Bristol Bay Total	17	20,557	110	910	666	22,261
Central Region Total	32	27,567	428	28,869	4,809	61,704

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

Note: Columns may not total exactly due to rounding.

[a] Hatchery sales for operating expenses and broodstock harvests.

ARCTIC-YUKON-KUSKOKWIM REGION

Arctic-Yukon-Kuskokwim (AYK) Region harvests totaled 1,611,000 salmon and 9,737,000 lb in 2012 (Tables 2, 3, and 6). The exvessel value was estimated to be $6.5 million. Cumulative all-gear commercial harvest included 8,000 Chinook, 91,000 sockeye, 255,000 coho, 1,051,000 chum, and 205,000 pink salmon. Chinook salmon runs were low throughout the region and the harvest was the lowest since statehood. Chum and coho salmon harvests were above average. Average weight of coho salmon was near record low across the region, approximately one pound less than normal. While the pink salmon harvest increased, it was still substantially lower than available surplus. Landings were made by 1,178 limited entry permit holders in 2012.

KUSKOKWIM AREA

The Kuskokwim Area commercial salmon harvest in 2012 was 8,220 Chinook, 91,180 sockeye, 143,118 coho, and 150,798 chum salmon, for a total of 393,316 fish. A total of 478 permit holders participated and the exvessel value was estimated to be $2,040,797.

Overall sockeye and coho salmon harvests were similar to what was expected, while Chinook and chum salmon were below the expected harvest range in 2012. Escapement was adequate for all species at monitored locations except for Chinook salmon, which only met two of nine escapement goals. In general, run timing throughout Kuskokwim area for sockeye and chum salmon were characterized as average, while Chinook and coho salmon were considered late.

Kuskokwim River

In 2012 the following preseason and inseason management actions were taken in an attempt to achieve Chinook salmon escapement goals.

Subsistence Chinook salmon fishing with hook and line gear was closed and subsistence fishing was restricted to the use of gillnets with 4-inch or less mesh not to exceed 60 feet in length in the following waters of the Kuskokwim River drainage from June 1 until July 25: 1) the Kwethluk River drainage including its confluence with Kuskokuak Slough and downstream to ADF&G regulatory markers located at the downstream mouth of the Kuskokuak Slough, 2) the Kasigluk and Kisaralik river drainages including Old Kuskokuak Slough to ADF&G regulatory markers at the confluence of Old Kuskokuak Slough with Kuskokuak Slough, 3) the Tuluksak River drainage including its confluence with the Kuskokwim River and the Kuskokwim River mainstem downstream approximately one-mile to ADF&G regulatory markers, 4) the Aniak River drainage to ADF&G regulatory markers at its confluence with the Kuskokwim River, 5) the George River drainage including its confluence with the Kuskokwim River and downstream approximately a half mile to ADF&G regulatory markers.

Through much discussion, ADF&G, Federal Inseason Manager, and the Kuskokwim River Salmon Management Working Group (Working Group) agreed to a 2012 inseason Chinook salmon management objective (Management Objective) of 127,000 fish in order to meet existing escapement goals. Also, it was agreed that the Management Objective would be evaluated inseason using the Bethel Test Fishery CPUE.

Throughout the duration of the Chinook salmon run, the Bethel Test fishery CPUE did not indicate that the 2012 Management Objective would be met. As a result, the Kuskokwim River drainage subsistence salmon fishing was closed for 14 days with gillnets restricted to 4-inch or less mesh size not to exceed 60 feet in length, and subsistence salmon fishing was open (but

restricted to 6-inch or less gillnet mesh size) an additional 23 days in the Kuskokwim River from the mouth upstream to Chuathbaluk. The closures and gillnet mesh size restrictions were implemented in a stepwise progression up the Kuskokwim River in five river sections consistent with salmon run timing. From Chuathbaluk upstream to the headwaters, subsistence salmon fishing was closed for 12 days with gillnets restricted to 4-inch or less mesh size not to exceed 60 feet in length, and subsistence salmon fishing was open (but restricted to 6-inch or less gillnet mesh size) an additional 14 to 19 days. The first closure was initiated in the lowest section of the river on June 10, and on July 23 the entire river became open to subsistence salmon fishing with unrestricted gillnet mesh size.

Inseason reports during Working Group meetings suggested that many subsistence fishermen did not meet their Chinook salmon harvest needs. Postseason subsistence harvest surveys are not yet completed.

There were 23 commercial fishing periods in District 1 between July 13 and August 27. The start of the commercial fishing season was postponed due to concerns for Chinook salmon abundance. Processing capacity limited most commercial openings to one subdistrict per period. Therefore, the department alternated commercial fishing periods between Subdistricts 1-A and 1-B. Processing capacity did allow for two-hour extensions of fishing time in the Lower Section of Subdistrict 1-B. A total of 14 Chinook, 2,857 sockeye, 65,171 chum, and 86,389 coho salmon were harvested and sold. A total of 365 Chinook salmon were harvested during the commercial fishery, but 351 of those were retained for personal use because buyers agreed not to purchase Chinook salmon because of the poor run. A total of 379 individual permit holders (making at least one recorded landing) participated in the District 1 commercial fishery. Chum salmon harvest was above the most recent 10-year average, while Chinook, sockeye, and coho salmon harvests were below the most recent 10-year average. Average weight of coho salmon of 6.2 lb was the lowest on record since 1971. Typically the average weight of coho salmon is approximately 7.5 lb. Total exvessel value of the fishery in District 1 was $597,998; approximately 10% above the most recent 10-year average value.

Chinook salmon abundance in 2012 was low. Chinook salmon escapements were evaluated through aerial surveys on eight index streams throughout the drainage and by weirs on four tributary streams. Only two of seven escapement goals were achieved. High water affected several aerial surveys and weir projects.

Sockeye salmon escapements were monitored at five tributary weir projects, although they are not a prominent species in many of these systems. Sockeye salmon escapements were characterized as below average in 2012. The one established escapement goal on Kogrukluk River was not assessed because the weir was inoperable for a large portion of the run.

Chum salmon escapements were successfully monitored at three tributary weir projects and indicate overall abundance was above average. Neither of the two established SEGs were evaluated because the projects were not operational due to high water.

Coho salmon escapements were monitored at four tributary weirs. Escapement at the Kwethluk River weir was above the SEG lower bound. Escapements at the other monitored locations were characterized as below average.

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

Subsistence fishing in Kuskokwim Bay area was allowed seven days per week throughout the season with the exception of closed periods associated with commercial fishing. Subsistence harvests results are not yet available for 2012.

The District 4 commercial salmon fishing season opened June 27. Because of late Chinook salmon run timing and abundance concerns, the commercial fishing season was postponed by about 12 days in District 4. District 5 opened on June 27, which is about one week later than normal due to concerns for Chinook salmon abundance. Chinook salmon harvests and catch rates were below average to average throughout the season in both districts. Fishing time during the first week of July was reduced in both districts due to continued Chinook salmon abundance concerns. On July 4 the sockeye salmon harvest in both districts exceeded the Chinook salmon harvest and, by regulation, management was directed towards sockeye salmon. Sockeye salmon harvests and catch rates were below average in District 4 and above average in District 5.

District 4 chum salmon harvest was average and District 5 chum salmon harvest was well above average. Fishing time in District 4 was reduced during the last 11 days of July due to low chum salmon escapements. Chum salmon harvests and catch rates were average in District 4 and above average in District 5.

Coho salmon harvest exceeded sockeye salmon harvest in District 4 on August 1 and in District 5 on August 8. On those dates, each district shifted to coho salmon management. In District 4, commercial fishing time was reduced by one period during the week of August 13 due to concerns for coho salmon abundance. Coho salmon harvests and catch rates were below average in District 4 and above average in District 5.

In 2012, 179 individual permit holders recorded landings during 22 commercial periods in District 4. The total commercial harvest of 136,717 fish was composed of 6,675 Chinook, 37,688 sockeye, 61,140 chum, and 31,214 coho salmon. The Chinook salmon harvest was the lowest since 1975. The exvessel value of the District 4 commercial fishery was estimated to be $824,435.

A total of 58 individual permit holders recorded landings in District 5 during 28 commercial periods. The District 5 total commercial harvest of 102,168 fish was composed of 1,531 Chinook, 50,635 sockeye, 24,487 chum, and 25,515 coho salmon. The sockeye salmon harvest was the highest since 1994. The exvessel value of the District 5 commercial fishery was estimated to be $617,766.

Fish passage through the Kanektok River weir during its operation from July 7 through August 16 was 1,568 Chinook, 88,800 sockeye, and 24,173 chum salmon. Escapements of all three species were below average. Escapement estimates for coho and pink salmon are incomplete because the project does not operate through the entire coho and pink salmon runs. No formal escapement goals for any species have been established at the weir.

Fish passage through the Middle Fork Goodnews River weir was 516 Chinook, 31,066 sockeye, 13,679 coho, and 6,316 pink salmon. The weir was operational from June 29 through September 3. An aerial survey of the North Fork of the Goodnews River was flown on July 5 with 382 Chinook salmon and 16,700 sockeye salmon observed. Chinook salmon escapement goals were not met. The sockeye salmon escapement goals were met. The coho salmon lower bound SEG

was achieved at the weir. Chum salmon escapement at the weir was not estimated because a large portion of the run was missed due to high water.

YUKON AREA

The 2012 Yukon River total commercial harvest was 0 Chinook, 319,575 summer chum, 289,692 fall chum, and 74,789 coho salmon for the Alaskan portion of the drainage. A total of 207,849 summer chum, 269,126 fall chum, and 68,820 coho salmon were harvested in the Lower Yukon River (Districts 1–3) and 111,726 summer chum, 20,566 fall chum, and 5,969 coho salmon were harvested in the Upper Yukon River (Districts 4–6). A total of 494 permit holders sold fish in 2012 and the exvessel value was approximately $3,123,551.

Summer Season

The 2012 Yukon River Chinook salmon run was projected to be poor to below average. Due to the uncertainty concerning Chinook salmon run strength and the need to fulfill the Canadian border passage objective, meet Alaska escapement goals, and provide for subsistence uses, management of the Chinook salmon commercial fishery followed a conservative preseason management strategy. The regulatory windowed subsistence salmon fishing schedule began May 31 in District 1 and was implemented chronologically in upriver districts. Subsistence fishing was closed during the first pulse of Chinook salmon. Beginning in District 1, one fishing period was closed (approximately five-day closure) and this action was implemented in upriver fishing districts and subdistricts based on migratory timing. A second pulse closure was implemented immediately following the first pulse closure. This created a continuous closure of both the first and second pulse. The second pulse closure was followed by reduced subsistence fishing periods in Districts 1 through 4. These reduced subsistence periods were implemented to provide fishermen opportunity to harvest summer chum salmon while conserving Chinook salmon. Subsistence closures were most pronounced in Subdistrict 5-D, as management options such as gear restrictions were not implemented because of the lack of summer chum salmon in this area. Unfortunately, due to the low passage numbers at the Eagle sonar, it was necessary to further restrict Subdistrict 5-D in an attempt to meet the agreed to interim management escapement goal for the Canadian stock.

A surplus of summer chum salmon above escapement and subsistence needs occurred in 2012; however, the extent of the summer chum salmon commercial fishery was limited by the poor Chinook salmon run. No commercial periods targeting Chinook salmon were allowed. Sale of incidental Chinook salmon harvested was prohibited by emergency order during the summer season because subsistence fishing had been restricted in Districts 1–5. Fishermen could release any incidentally caught live Chinook salmon or use them for subsistence purposes. Additionally, the prohibition of Chinook salmon sales was in effect during the fall season and no sales occurred during any chum salmon directed fishing periods in 2012.

In an effort to further reduce incidental harvest of Chinook salmon during a poor run, the summer chum commercial salmon fishery was delayed until near the midpoint in the Chinook salmon run at the Lower Yukon test fishery. A substantial surplus of approximately 1.0 million summer chum salmon was projected based on Pilot Station sonar. The first summer chum directed commercial periods took place June 29 in District 1 and July 2 in District 2. Gillnet gear was restricted to 6-inch or smaller mesh. Concurrent subsistence and commercial fishing periods in Districts 1 and 2 were instituted intermittently throughout the season, primarily early in the summer chum salmon commercial season when the subsistence schedule was still in effect. The

intent of these concurrent openings was to decrease the amount of time that Chinook salmon were susceptible to harvest.

The department took further measures to provide commercial summer chum salmon harvest opportunities while still protecting Chinook salmon. Using inseason assessment and run timing information, portions of districts that indicated a low abundance of Chinook salmon were opened to summer chum salmon-directed commercial fishing. Moreover, commercial fishing was limited to areas and/or times in which incidental harvest rates were anticipated to be low. The area opened to commercial fishing in periods 1–8 in District 1 were restricted to the South Mouth only. This action was taken because Chinook salmon abundance was low in the South Mouth and Chinook salmon were entering the river primarily through the North and Middle mouths at this point in the season. Unfortunately, this strategy of limiting the area open to commercial fishing to minimize the incidental harvest of Chinook salmon is more difficult to implement in District 2. As the Yukon River begins to become more channelized in this area, salmon that enter from each of the mouths are present. Three of the commercial fishing periods in District 2 were limited to only the lower portion of the district.

There were a total of 10 commercial fishing periods in District 1 and 6 in District 2. The cumulative harvest for Districts 1 and 2 combined was 207,849 summer chum salmon, which was 84% above the 2002–2011 average harvest of 112,783. A total of 2,524 Chinook salmon were recorded on fish tickets as caught but not sold in Districts 1 and 2.

In Subdistrict 4-A, one buyer operated out of Kaltag and targeted summer chum salmon. New regulations adopted by the BOF in March 2012 allowed the department to open summer chum salmon directed commercial fishing periods in Subdistrict 4-A during times of Chinook salmon conservation with fish wheels only. Fish wheels had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. The cumulative summer chum salmon harvest for Subdistrict 4-A was 108,222 fish with the majority of the harvest being females. Thirteen periods were implemented with a total of 552 fishing hours. The summer chum salmon harvest was 438% above the most recent five-year average (2007–2011). At no time during this fishery were Chinook salmon allowed to be sold or kept for subsistence purposes. A total of 59 Chinook salmon were reported as caught and released alive back to the water.

The BOF adopted an emergency regulation only for the 2012 season specifying that during the summer chum season in District 6, in order to conserve Chinook salmon only fish wheels could be used. Fish wheels had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. Based upon an identified surplus and market interest, the department scheduled the first commercial fishing period to target summer chum salmon in District 6 on July 20. The department utilized this regulation for the initial three commercial fishing periods in District 6. Seven commercial periods were opened and the cumulative harvest was 3,504 summer chum salmon. No Chinook salmon were allowed to be sold. A total of 172 Chinook salmon were reported released alive and 24 Chinook salmon were recorded on fish tickets as caught but not sold.

A total of 427 permit holders participated in the summer chum salmon fishery, which was approximately 18% below the 2002–2010 average of 519. 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 413 permit holders fished in the Lower Yukon Area in 2012, which was

approximately 18% below the 2002–2011 average of 502. In the Upper Yukon Area, 14 permit holders fished, which was approximately 20% below the 2002–2011 average of 17. The exvessel value was an estimated $1.2 million for summer chum salmon, the third highest since 1995. However, this exvessel value represents the entire summer season fishery, as there was no Chinook salmon sold. The exvessel value of the summer season fishery was approximately 37% below the 2002–2011 average of $1.9 million.

Chinook salmon escapement goals for the East Fork Andreafsky, Nulato, and Salcha rivers were achieved. However, the Anvik and Chena rivers escapement goals were not met. Season cumulative counts on the Gisasa River were below average. Preliminary Chinook salmon passage at Eagle sonar is 34,747 fish, yielding a preliminary border passage estimate of approximately 32,747 fish which is below the 42,500–55,000 interim management escapement goal.

Most summer chum salmon producing tributaries experienced above average escapement. The East Fork Andreafsky River SEG and Anvik River BEG were achieved. Counts at the Gisasa and Henshaw rivers were above average. Salcha River escapement as assessed by tower counts was above the historical median.

Fall Season

The fall season began by regulation on July 16 in the lower river in District 1. Based on a preseason projection of greater than 800,000 fall chum salmon, all areas were returned to their regulatory subsistence fishing schedules commensurate with switching over to fall management based on timing of fish migrating up river.

The first pulse of fall season chum salmon entered the Yukon River on July 16. Fall chum salmon continued to enter the Yukon River over four additional pulses through September 7. The pulses that entered through August 8 occurred regularly at a rate of about once a week. In between pulses, daily passages of fall chum salmon past Pilot Station sonar project were steady with numbers mostly above 3,000 fish. Run assessment indicated there was a surplus available for commercial harvest and regular commercial fishing periods were scheduled in both Districts 1 and 2. A lull in daily fall chum salmon passage occurred from August 9 through August 18. No commercial fishing periods were scheduled in Districts 1 and 2 during this time. The fifth and largest pulse entered the Yukon River on August 16. From that point, run assessment continued to show a commercial surplus and regular commercial fishing periods in Districts 1 and 2 were scheduled throughout the remaining season. Commercial fishing periods were regularly scheduled in Subdistricts 4-A, 5-B, and 5-C from mid-August through early October, and in District 6 from September through early October. Finally, subsistence fishing was liberalized to seven days a week, 24 hours a day on August 24 in District 4, on September 26 in Subdistricts 5-A, 5-B, and 5-C, and on September 28 in District 6.

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

There were a total of 41 commercial periods during the fall season in 2012 with the majority of commercial harvest occurring in the lower river districts (a regular schedule of commercial fishing periods was established in Districts 4–6, but limited markets resulted in low fishing effort and relatively small harvests). The 2012 total commercial harvest for the Yukon River fall season in the Alaska portion of the drainage was 289,692 fall chum and 74,789 coho salmon. Both species were harvested above their respective most recent five-year (2007–2011) and 10-year (2002–2011) averages. The fall chum salmon harvest was the largest since 1983 and the coho salmon harvest was the second largest since 1991. Average weight of coho salmon of 6.2 lb was the second lowest on record. Typically the average weight of coho salmon is approximately 6.9 lb. All salmon were sold in the round and no salmon roe was sold separately. The exvessel value of the total harvest was $1,955,855; $1,413,904 for fall chum and $541,951 for coho salmon. All values were above the most recent 5-year (2007–2011) averages. A total of 469 individual permit holders participated in the 2012 fall chum and coho salmon fishery: 457 in Districts 1 and 2 combined and 12 in Districts 4, 5, and 6 combined.

The preliminary 2012 fall chum salmon run size is estimated to be 945,000 fish, which is below the low end of the preseason forecast range of 986,000 to 1.2 million. The preliminary drainagewide fall chum salmon escapement estimate is 569,000 fish which is within the BEG range (300,000–600,000). All fall chum salmon escapement goals were either achieved or exceeded throughout the drainage.

The estimated passage of 106,800 coho salmon past Pilot Station sonar was below the historical median of 135,600. The Delta Clearwater River has the only established escapement goal for coho salmon in the Yukon River drainage. A survey conducted in late October observed approximately 5,230 coho salmon which is within the SEG range (5,200–17,000).

NORTON SOUND AREA

Highlights of the 2012 Norton Sound District commercial salmon fishery included the highest pink salmon harvest since 1998 as a result of increased market interest. Commercial chum salmon harvest was the eighth best in 25 years. However, coho salmon harvests were below average in all subdistricts, except Subdistrict 4 (Norton Bay) which had its second highest harvest on record. The reduced coho salmon harvest was largely the result of persistent severe weather and high surf conditions that kept fishermen on the beach throughout much of August. Coho salmon average weight was tied for the lowest on record at 6.6 lb. Coho average weights have been available since 1967, and only 1993 and the record run of 2006 had an average weight of 6.6 lb. Disappointments in 2012 were the poor runs of Chinook and sockeye salmon as were forecasted.

Though many escapement objectives were met, escapement goals were not achieved for the second consecutive season on the Unalakleet River for Chinook salmon despite an early closure to Chinook salmon subsistence and sport fisheries. A closure to the Pilgrim River sockeye salmon subsistence fishery was also necessary for the fourth consecutive season. However, this measure was effective at ensuring the escapement goal was achieved for the second consecutive season.

Extensive June sea ice, record rainfall, and resultant flooding in August made it nearly impossible to accurately assess early run strength of chum and coho salmon runs in 2012. Large pans of first year thin ice and medium to thick shorefast ice melted in place in southern Norton Sound in 2012 keeping nearshore water temperatures low. As late as mid-May, shorefast ice thickness reports ranged from 3 to 5 feet from St. Michael Bay to Unalakleet and several miles of shorefast ice persisted from Stuart Island east to just south of Unalakleet into late June. Many Norton Sound

residents commented that the extent, thickness, and duration of sea ice in Norton Sound was exceptional; this most likely delayed the migration timing of most Chinook, pink and chum salmon stocks in Norton Sound, which showed late run timing at escapement projects in 2012. Early projections of salmon run strength used to set subsistence and commercial fishing schedules were difficult to make in 2012 as a result of exceptionally late run timing. Commercial fishing did not start until July 3, nearly two weeks later than the previous year. The first commercial periods targeted pink salmon with chum salmon periods only occurring in southern Norton Sound, except for one chum salmon period in northern Norton Sound in late July. Limited rainfall occurred in June and during most of July, which made for good drying conditions during the peak of the chum and pink salmon runs. Very low water levels were reported from most Norton Sound river drainages until late July when the rainy weather arrived. During the month of August, record-setting rainfall and large flood events rendered most Norton Sound salmon assessment projects inoperable for the majority of the coho salmon run. Once again, it was difficult for managers to make reliable projections of escapement at most projects as the bulk of the coho salmon run was not monitored at escapement projects. Few acceptable aerial spawning ground surveys were flown in 2012 due to murky water and high water levels. Likewise commercial fishermen were often unable to fish in August because of severe weather.

The Norton Sound District combined commercial harvest of all salmon species was the highest since 1998. The 2012 commercial harvest of pink salmon was two-thirds of the salmon harvest whereas in 1998 the commercial pink salmon harvest was nearly 92% the salmon harvest. The number of commercial permits fished (123) was the same as last year and the highest since 1993. The 2012 exvessel value was $758,908 and was the fourth highest in last 20 years.

The average price paid was $1.45/lb for sockeye salmon, $1.47/lb for coho salmon, $0.36/lb for pink salmon, and $0.52/lb for chum salmon.

KOTZEBUE SOUND AREA

The overall chum salmon run to Kotzebue Sound in 2012 was estimated to be above average based on the commercial harvest rates, subsistence fishermen reporting good catches, and the Kobuk test fishery index being the third highest in the 20-year project history. The commercial harvest of 227,965 chum salmon was the fourth highest in 20 years. Harvested during the commercial fishery and kept for personal use were 7 Chinook salmon, 6 sockeye salmon, 445 pink salmon, 18 coho salmon, 300 Dolly Varden, 1,867 sheefish, 27 whitefish, 2 pike and 1 tom cod. There were likely some additional fish kept for personal use not reported on fish tickets.

The commercial fishing season began on July 10. There were two buyers, but one buyer only bought from one fisherman for a value-added market. The major buyer bought during evening fishing hours and minor buyer bought during daytime fishing hours. Strong commercial and test fishery catches in July indicated a very large chum salmon run and the department continued to open fishing any time either buyer requested. Beginning in August, catch volume started to increase and the major buyer needed to shorten fishing hours. During the second half of August, severe weather limited the time the fleet was able to fish.

The biggest one-day catch was on August 2 when 32,704 chum salmon were sold during an 8-hour opening. This one-day catch was the largest catch in nearly 20 years. For the next week fishing time was reduced from the usual six to eight hours to three to four hours daily. Fishing effort peaked during the first and second weeks of August when often over 50 permit holders fished per opening. During the last two weeks of August a combination of heavy seas tended to

limit fishing effort and keep permit holders close to shore and there was only one fishing period where catches were over 1,000 chum salmon. The season closed on August 31.

A total of 1,751,473 lb of chum salmon (average weight 7.7 lb) were sold at an average of $0.32/lb. There were 83 permit holders that fished in 2012 and this number was slightly below the 89 permit holders who fished last year, but was the second highest number since 1995. The higher participation in the fishery the last two years may have been the result of the change to evening fishing hours in 2011 and 2012 for the first time since the mid-1990s. The price per pound for chum salmon dropped from $0.40 to $0.32 and may have been a factor in slightly fewer fishermen participating this year. The total exvessel value was $567,664. The average value for each participating permit holder was $7,138. The total exvessel value represents 96% of the $592,450 historical average.

Table 6.–Preliminary 2012 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					
	Chinook	Sockeye	Coho	Pink	Chum	Total[a]
Kuskokwim River	0	3	86		65	154
Kuskokwim Bay	8	88	57		86	239
Kuskokwim Area Total	8	91	143		151	393
Lower Yukon River			69		477	546
Upper Yukon River			6		132	138
Yukon River Total			75		609	684
Norton Sound		0	37	205	63	305
Kotzebue Sound					228	228
Arctic-Yukon-Kuskokwim Region Total	8	91	255	205	1,051	1,611

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 error.

WESTWARD REGION

KODIAK MANAGEMENT AREA

The 2012 Kodiak Management Area (KMA) commercial salmon fishery began on June 9 and the last commercial landing occurred on September 21. Harvests by fishing area and species are summarized in Table 7.

Table 7.–Preliminary 2012 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total[a]
Kodiak	15	2,231	208	16,873	866	20,194
Chignik	4	1,800	33	138	171	2,146
South Peninsula and Aleutians Islands	8	2,000	87	650	612	3,358[b]
North Peninsula	1	764	37	1	284	1,088[b]
Alaska Peninsula Total	9	2,765	124	651	896	4,446
Westward Region Total	27	6,796	366	17,662	1,934	26,785

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

[b] Catches includes test fishery catch.

Commercial fishing effort decreased slightly during 2012. Of the 595 eligible commercial salmon permits, 336 (56%) made commercial landings. By gear type, a total of 168 purse seine, 4 beach seine, and 164 set gillnet permit holders fished in 2012. Participation by each gear type was above the previous 10-year average.

The 2012 commercial harvest in the KMA was 14,785 Chinook, 2,231,044 sockeye, 208,379 coho, 16,873,171 pink, and 866,334 chum salmon. The total harvest of approximately 20.2 million salmon is below the previous 10-year average of approximately 23.9 million, but above the 2012 forecast

The estimated exvessel value of the 2012 fishery was approximately $45.0 million, which is the highest since 1995. This is also well above the previous 10-year exvessel value of $25.1 million.

Purse seine fishermen accounted for 86% of the total harvest and their earnings averaged $219,164 per fished permit. Set gillnet fishermen accounted for 13.9% of the total harvest and their earning averaged $52,007 per permit fished, the highest since 1999. Beach seine fishermen harvested 0.1% of the total catch and averaged $16,367 per permit fished

2012 Commercial Harvest Summary

Chinook Salmon

There are no directed Chinook salmon commercial fisheries in the KMA but incidental commercial harvest occurs during targeted sockeye salmon fisheries. The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the KMA. Nonretention of Chinook salmon was implemented from June 9 to July 13 along the Westside of Kodiak from the latitude of Cape Kuliuk to the latitude of Low Cape. Both Karluk and Ayakulik Chinook salmon achieved their escapement goals and nonretention of Chinook salmon was suspended on July 13.

The 2012 commercial harvest of Chinook salmon in the KMA totaled 14,785 fish which was below the previous 10-year average (17,601) and below the 2012 forecast (20,000).

Sockeye Salmon

The 2012 commercial harvest of sockeye salmon in the KMA totaled 2,231,044. The harvest was below the recent 10-year average (2,392,557) and below the forecast of 2,721,637.

Early season management for much of the Westside and north end of Kodiak Island is driven by Karluk early-run sockeye salmon (through July 15). For the first time since 2007, the Karluk early-run sockeye salmon escapement goal (110,000–250,000) was achieved. Extended fishing was allowed along the Westside of Kodiak in the Central, North Cape, Southwest Afognak, and Outer Karluk sections until the management focus turned to pink salmon (July 6). A total of 335,731 sockeye salmon were harvested in early-season (through July 15) Westside fisheries, which was above the Karluk early-run projected harvest of 85,682. A total of 440,730 sockeye salmon were harvested in the late-season Westside fishery, which was above the Karluk late-run sockeye salmon projected forecast of 366,535. These harvest numbers include a contribution from the enhanced Spiridon Lake sockeye salmon run (yet to be estimated).

The Ayakulik River was forecasted to have a surplus of sockeye salmon (521,209) available for harvest. The first commercial opening occurred in the Outer Ayakulik Section on June 22 and there were short openers throughout the season. Inner Ayakulik was only opened from July 14 to July 15. A total of 162,674 sockeye salmon were harvested from the Inner Ayakulik and Outer Ayakulik sections.

In Alitak, a 33-hour commercial salmon fishery occurred on June 9. The intent of the early opening is to allow an opportunity to harvest Upper Station early-run sockeye salmon prior to the Frazer Lake sockeye salmon peak run timing. As the season progressed it became evident that the early-run sockeye salmon to Upper Station was weak. The forecast for Frazer Lake was estimated at 410,000 sockeye salmon with a harvestable surplus of approximately 253,000. The Frazer Lake sockeye salmon run came in as expected and openings and closures were executed to allow harvest opportunity on Frazer Lake sockeye salmon while allowing passage of Upper Station sockeye salmon through the fishery. The Alitak District early-run sockeye salmon harvest was 208,100, below the projected harvest of 236,503.

The late-run sockeye salmon forecast for Upper Station predicted a total run of 257,000 with 71,000 available for harvest. The run came in about as expected and 151,790 fish were harvested after July 15.

Cape Igvak Salmon Management Plan

This regulatory management plan (5 AAC 18.360) allocates up to 15% of the total Chignik-bound sockeye salmon harvest 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.

The early Chignik sockeye salmon run was strong and the allocative and biological criteria were met to allow fishing in the Cape Igvak Section beginning June 9. Eight days of fishing were allowed in June during the early run and eight days were allowed in July targeting the late run.

Through July 25, the Cape Igvak harvest of sockeye salmon considered to be Chignik-bound (90%) was 324,895 fish. This represented 15.5% of the total Chignik sockeye salmon harvest

(15% allocation). Overall, the total sockeye salmon harvest in the Cape Igvak Section through July 25 was 360,994, which was above the preseason forecast of approximately 217,000.

North Shelikof Sockeye Salmon Management Plan

From July 6 to July 25, this regulatory management plan (5 AAC 18.363) places harvest limits on areas along the northern Shelikof Strait to limit interception of sockeye salmon that are considered Cook Inlet-bound. During the period that this management plan is in effect, KMA fisheries are targeting local pink salmon runs and fishing periods are based on projected pink salmon run strength. If it appears that the sockeye salmon harvest will meet or exceed limits set by the BOF, then fisheries are to be restricted to inshore *Shoreward Zones* only, and offshore *Seaward Zones* are closed.

A department biologist was present on the grounds to determine the sockeye salmon catch and to facilitate orderly and short notice closures if the harvest limits are met. A Seaward Zone closure was implemented in the North Shelikof Unit at 1:00 p.m., July 22, when it was estimated that the cumulative sockeye salmon harvest had approached the 15,000 fish limit. The total July 6 to July 25 sockeye salmon harvest in the North Shelikof Unit was 42,184 fish, which included both the Shoreward and Seaward Zone harvests. A Seaward Zone closure was not required in the Southwest Afognak Section as the sockeye salmon harvest cap of 50,000 was not met. The July 6 to July 25 sockeye salmon harvest in the Southwest Afognak Section was 33,921.

Terminal and Special Harvest Areas

Some fisheries occur in areas where salmon enhancement projects create surplus production.

There was above average effort and harvest in the Waterfall and Foul Bay SHAs with a total of 40,320 sockeye salmon harvested from both areas.

In the Spiridon Bay SHA (Telrod Cove), 77,934 sockeye salmon were harvested. This includes a cost recovery of 21,038 by Kodiak Regional Aquaculture Association. The harvest in the Spiridon Bay SHA represents only a portion of the total harvest of Spiridon enhancement fish, the remainder is harvested in traditional fisheries along the Westside of Kodiak and that total has not been estimated at this time.

The Kitoi Bay Hatchery harvest was an estimated 111,933 sockeye salmon, which was above the forecast of 80,767. 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 section, but stock separation data are not available.

Coho Salmon

The commercial coho salmon harvest of 208,379 was below the forecast (323,995) and below the previous 10-year average (367,546).

The majority of the coho salmon were caught in the Northwest Kodiak and Afognak districts. Those two districts accounted for 172,947 of the total harvest. In areas associated with Kitoi Bay Hatchery (Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections) a total of 48,353 coho salmon were harvested, which was below the forecast of 160,000.

Pink Salmon

The 2012 pink salmon harvest of 16,873,171 was above forecast (13.2 million) and below the previous 10-year average harvest of 20,242,086.

Wild stock pink salmon harvests were above the forecast of 9.5 million, with 13,905,101 harvested in the KMA. Westside fisheries (Southwest Afognak to Ayakulik) accounted for 9,622,640, the Alitak District had a harvest of 1,563,484, and the Eastside and Northeast Kodiak districts had a combined harvest of 808,868.

The Kitoi Bay Hatchery pink salmon run was weaker than expected. In sections near the hatchery, 2,968,070 were harvested compared to a projected harvest of 3.7 million. Additional Kitoi-bound pink salmon were likely harvested along the west and east sides of Kodiak and Afognak islands. Likewise, additional wild stock salmon were likely harvested in areas associated with Kitoi Bay Hatchery. 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 sockeye, pink, and chum salmon harvested and sold by the Kodiak Regional Aquaculture Association.

Chum Salmon

The chum salmon harvest of 866,334 was near the forecast (889,384) and near the previous 10-year average (863,392). The Eastside and Northeast Kodiak districts accounted for 193,020, the Mainland District had a harvest of 71,492 and Westside fisheries (southwest Afognak to Ayakulik) had a harvest of 337,812. Kitoi Bay Hatchery chum salmon production was weaker than expected with 218,740 chum salmon harvested, which is below the preseason forecast of 241,000.

Escapement Summary

Fish counting weirs were operated on eight systems in 2012, including the Karluk, Ayakulik, Litnik, Upper Station, Frazer, Buskin, Saltery, and Pasagshak systems. Three observers also flew 31 aerial surveys and several observers conducted foot and skiff survey escapement estimates.

Chinook Salmon

The total Chinook salmon escapement (8,109) was below the previous 10-year average. Escapement goals for Chinook salmon have been developed for the Karluk and Ayakulik rivers and escapements are estimated using fish counting weirs.

The Chinook salmon escapement through the Karluk weir (3,197) was within the escapement goal range (3,000–6,000). Chinook salmon escapement through the Ayakulik weir (4,760) was within the escapement goal range (4,000–8,000).

Sockeye Salmon

Sockeye salmon runs to most systems in the KMA were adequate. With the exception of Uganik, all systems either met or exceeded their established escapement goals. The entire KMA estimated sockeye salmon escapement (1,302,793) was slightly below the previous 10-year average of 1,341,541.

Coho Salmon

The only established coho salmon escapement goals occur in the Northeast Kodiak and Eastside Kodiak districts for the following systems: American (400), Olds (1,000), Buskin (3,200–7,200) and the Pasagshak rivers (1,200). Escapement goals were met for all these systems except Olds.

It is expected that coho salmon enter systems in the fall after weirs have been removed and aerial and foot surveys have concluded. The estimated coho salmon escapement of 118,814 was above the previous 10-year average of 95,420.

Pink Salmon

The KMA pink salmon escapement of 5,524,374 fish was above the previous 10-year average of (4,945,351). Pink salmon escapement goals have been established as aggregate goals for the entire Kodiak Archipelago and the Mainland District. The escapement goal range (2.0–5.0 million) was exceeded for the Kodiak Archipelago (5,111,049). The Mainland District pink salmon escapement of 413,325 was within the established escapement goal range (250,000–750,000).

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. Pink and chum salmon escapements were measured against established areawide SEGs.

Chum Salmon

Overall chum salmon escapement (341,330 fish) was below the previous 10-year average (400,982 fish. Escapement goals have been established for the Kodiak Archipelago and the Mainland District. The escapement in the Kodiak Archipelago was above the escapement goal of 151,000 fish with an estimated 197,230 fish and the Mainland District escapement of 144,100 fish was also above the escapement goal of 104,000 fish.

CHIGNIK MANAGEMENT AREA SEASON SUMMARY

The Chignik River watershed supports two distinct sockeye salmon runs which traditionally provide the majority of directed harvest opportunities within the Chignik Management Area (CMA). In 2012, the combined early- and late-run Chignik-bound sockeye salmon run was above recent averages. The CMA was open to commercial salmon fishing for 84 days (June 8–September 9) and a total of 70 permits were fished.

Escapement Summary

In mid-May the installation of the Chignik River weir was delayed due to sporadic ice flows. Due to this delay and reports of increasing subsistence harvests, a DIDSON sonar unit was deployed near the weir site to enumerate salmon escapements from May 30 through June 1. After completion of the weir structure on the evening of June 1, Chignik River escapement was monitored using underwater digital video equipment until weir removal began on August 29. 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 in the 2012 season. In mid-May the installation of the Chignik River weir was delayed due to sporadic ice flows. Due to this delay and reports of increasing subsistence harvests, a

DIDSON sonar unit was deployed near the weir site to enumerate salmon escapements from May 30 through June 1. After completion of the weir structure on the evening of June 1, Chignik River escapement was monitored using underwater digital video equipment until weir removal began on August 29. 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 in the 2012 season.

Aerial surveys were flown throughout the season to monitor escapement into CMA streams. Peak aerial survey counts, by index stream and species, were summed and compared. Pink and chum salmon escapements were measured against established areawide SEGs.

Chinook Salmon

The Chignik River is the only Chinook salmon-producing stream within the CMA and one of the largest Chinook salmon streams on the South Alaska Peninsula. The BEG for Chinook salmon in the Chignik River watershed is 1,300 to 2,700. The 2012 Chignik River Chinook salmon escapement, above the weir, of 1,449, was below the 5-year and 10-year averages. Subsistence and sport fishery harvest of Chinook salmon above the weir will not be known until permits and questionnaires are returned and tabulated by the spring of 2013.

Sockeye Salmon

Sockeye salmon escapement to the Chignik River is managed based on separate escapement objectives for both early- and late-run sockeye salmon. The early-run SEG (350,000–400,000) through July 4 was met with an estimated escapement of 353,441 fish.

The late-run objectives include an additional 50,000 sockeye salmon which are incorporated into the late-run SEG to provide for additional freshwater subsistence fishing opportunity. The late-run (post-July 4) SEG (250,000–400,000) was met with an estimated escapement of 358,948. Post-weir sockeye salmon escapement estimates were produced for the August 30 to September 15 (37,275) and the September 16–30 (15,543) periods and were included in the total late-run escapement estimate.

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

Coho Salmon

Coho salmon begin to enter CMA drainages in mid-August and continue through November. The coho salmon run is generally building when the weir is removed. The 2012 Chignik River coho salmon weir escapement estimate through August 29 was 2,663, which was below the average escapement estimates. A post-weir escapement of 66,812 was estimated using DIDSON sonar counts from August 30 through September 28. Although no coho salmon escapement goals have been established for the CMA, escapement throughout the CMA appears to be consistent with past years and sustainable at this level.

Pink Salmon

An estimated 2,849 pink salmon passed the Chignik River weir in 2012, which was well below the previous 5- and 10-year average escapements. Pink salmon escapements into other CMA

streams were estimated via aerial survey and summarized by district. The even-year lower bound of the SEG for all districts combined (200,000) was met with an estimated total peak escapement of 302,699.

Chum Salmon

The 2012 Chignik River chum salmon escapement was 73, which was slightly below average for the Chignik River. Chum salmon escapements to other CMA streams were estimated via aerial survey and summarized by district. The SEG threshold for all districts combined (57,400) was exceeded with an estimated total peak escapement of 210,973.

Commercial Fishery Summary

The CMA was open to commercial salmon fishing for 84 days during the 2012 commercial salmon season. The first fishing period occurred on June 8 and the CMA closed to commercial salmon fishing (September 9) shortly after area salmon processors ceased operations. In 2012, 70 permit holders (including the department's test fishery permit) made a total of 2,915 landings.

Harvest Summary

Chinook Salmon

A total of 3,687 Chinook salmon were commercially harvested in 2012, which was similar to recent average harvests. The majority of the 2012 CMA Chinook salmon harvest occurred in the Central and Western districts. Most of the Chinook salmon harvest occurred from late June until the end of July.

Sockeye Salmon

A total of 1,800,121 sockeye salmon were commercially harvested in the CMA during 2012, which was above the prior 5- and 10-year average harvests. The majority of the 2012 CMA sockeye salmon harvest came from the Chignik Bay and Central districts.

In 2012, Cape Igvak opened to commercial salmon fishing for the first time on June 9 and Southeastern District Mainland opened to commercial salmon fishing on June 16. A total of 157,604 (126,083 considered Chignik-bound) sockeye salmon were harvested in SEDM through the end of the allocation period, on July 25. Cape Igvak fisherman harvested 360,994 (324,895 considered Chignik-bound) during the allocation period.

Coho Salmon

A total of 33,316 coho salmon were commercially harvested in 2012, which was lower than the 5- and 10-year average harvest. The majority of the coho salmon harvest in 2012 took place during July and August in the Western District.

Pink Salmon

A total of 137,706 pink salmon were commercially in the CMA in 2012, which was well below the 5- and 10-year average harvest. The largest portion of the CMA pink salmon harvest came from the Central and Western districts. Most pink salmon were harvested between mid-July and mid-August.

Chum Salmon

A total of 171,112 chum salmon were commercially harvested in 2012, which was below the 5-year average and similar to the 10-year average chum salmon harvests. The majority of the chum salmon harvest in 2012 took place in the Central District, although the Western and Eastern districts also yielded substantial catches. Most chum salmon were harvested between mid-June and mid-August.

Economic Value Summary

The exvessel value of the 2012 CMA commercial salmon fishery was about $13.7 million, or approximately $198,975 per active permit holder. A majority of the value was from the sale of sockeye salmon (93%), with a total of approximately $185,558 per active permit holder. The remaining harvest provided approximately $690 (Chinook salmon), $1,412 (coho salmon), $2,116 (pink salmon), and $9,199 (chum salmon) per active permit holder.

Department Test Fishery Summary

The department conducted test fisheries on two occasions in 2012. Data from these test fisheries were used to assess the buildup of sockeye salmon in Chignik Lagoon. An estimated 2,089 sockeye salmon were harvested, which provided approximately $15,102 that was used to offset the cost of vessel charters and operations at the Chignik River weir.

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

The following is an overview of the 2012 Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Areas commercial salmon fishing season. Total harvest presented from the 2012 commercial salmon fishing season should closely approximate final harvest numbers for all species. The 2012 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas totaled 8,689 Chinook, 2,764,881 sockeye, 124,139 coho, 651,480 pink, and 896,418 chum salmon. Subsistence salmon harvest will be reported in the 2012 annual management report. Data detailed in this report are considered preliminary. Preliminary exvessel value of salmon harvested in Area M totaled $17,524,380. Exvessel value information was generated from fish tickets and does not include postseason adjustments paid to fishermen.

South Unimak and Shumagin Islands June Fisheries

The South Unimak and Shumagin Islands fishing season began at 6:00 a.m. on June 7 with an 88-hour fishing period for all gear types (purse seine, drift gillnet, and set gillnet gear). During the June fishery, there were four 88-hour periods and one 64-hour fishing period. The commercial salmon harvest for the June fishery consisted of 6,371 Chinook, 1,528,018 sockeye, 12 coho, 259,612 pink, and 392,305 chum salmon.

Southeastern District Mainland

Due to a strong commercial salmon harvest in the CMA, the Southeastern District Mainland (SEDM) opened to commercial salmon fishing on June 16. During the SEDM allocation openings, 93 Chinook, 157,604 sockeye, 1,142 coho, 40,603 pink, and 29,635 chum salmon were harvested.

Beginning July 1, the Northwest Stepovak Section of the SEDM is managed on the strength of the Orzinski Lake sockeye salmon run. The return of sockeye salmon to Orzinski Lake was adequate to allow limited commercial harvest opportunity in the Northwest Stepovak Section. From July 1 through July 25, there were 6 Chinook, 60,997 sockeye, 135 coho, 1,880 pink, and 2,188 chum salmon harvested in the Northwest Stepovak Section. The cumulative sockeye salmon escapement of 17,243 fish, through the Orzinski Lake weir, was within the SEG (15,000–20,000).

From July 26 to August 31, the SEDM is managed based on the abundance of local salmon stocks. Due to a very weak return of pink salmon the fishery was closed for the entirety of this time.

From September 1 through September 30 the SEDM is open concurrently with the remainder of the Southeastern District based on the abundance of coho salmon stocks. During this time frame the fishery remained closed for the season, due to the presence of late pink and chum salmon stocks.

South Peninsula post-June fishery

Prior to the South Peninsula post-June fishery, the department conducts a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishing occurred on July 2, 3, and 5 which resulted in 7, 8, and 4 immature salmon per set respectively, which was well below the threshold of 100 immature salmon per set.

From July 6 through July 21, there were six fishing periods, each consisting of a 24-hour opening followed by a 48-hour closure. From July 23 through July 31, there were three fishing periods, ech consisting of a 36-hour opening followed by a 48-hour closure. During August, the post-June fishery is managed based on the abundance of local stocks. In September and October, 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, including the SEDM (July 26–October 31), was 1,162 Chinook, 247,246 sockeye, 85,435 coho, 173,969 pink, and 186,783 chum salmon.

Commercial salmon fishing during the post-June SEDM (July 26–October 31) fishery remained closed for most of August due to low pink and chum salmon escapement. One commercial salmon fishing period was permitted from noon Friday, August 10 until noon Saturday, August 11.

Aleutian Islands Fishery

The department opened the Aleutian Islands Area to commercial salmon fishing by seine gear on August 7. Commercial harvest of salmon occurred in Unalaska Bay, with a total harvest of 173,252 pink, and 245 chum salmon (Table 7). Currently there is no escapement goal for pink salmon in the Aleutian Islands area. However, an aerial survey was conducted on August 3 of Unalaska and Makushin bays to provide escapement information for inseason management purposes and to monitor the abundance of pink salmon in this area. An estimated 194,500 pink salmon were observed as escapement. No additional salmon escapement surveys were conducted in the Aleutian Islands during 2012.

South Peninsula Escapement

The South Peninsula indexed sockeye salmon escapement of 55,900 was within the management objective range (48,200–86,400). Pink salmon total escapement of 478,910 was well below the SEG (1,864,600–3,729,30). Chum salmon indexed total escapement of 205,242 was below the cumulative district escapement goal range (330,400–660,800). A total of 7,910 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. A lack of escapement information for coho salmon is due to the departure of management staff from the South Peninsula region prior to peak coho salmon runs, and poor weather conditions during the peak coho salmon runs preventing aerial surveys from being conducted.

North Alaska Peninsula

The total 2012 commercial harvest for the North Alaska Peninsula fishery was 1,000 Chinook, 764,000 sockeye, 37,000 coho, 138,000 pink and 284,000 chum salmon. In 2012, 154 Area M permit holders participated in commercial salmon fisheries along the North Alaska Peninsula. There was no effort by Area T permit holders. The number of Area M permit holders participating in 2012 was 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 2012, the North Alaska Peninsula harvest of Chinook, sockeye, coho and pink salmon were below the previous 10-year (2002–2011) averages, while the harvest of chum salmon was above the previous 10-year average. Similarly, the harvest of Chinook, sockeye, coho and pink salmon were all below projected levels, while chum salmon was well above projected levels. In addition, the total 2012 North Alaska Peninsula sockeye salmon harvest was the lowest harvest since 1977.

Northwestern District

In the 2012 Northwestern District commercial salmon fishery a total of 9 Chinook, 57,373 sockeye, 1,981 coho, 894 pink, and 188,508 chum salmon were harvested. A total of 42 permit holders participated in the fishery, consisting of 6 purse seiners and 36 drift gillnetters.

In the Northwestern District, chum salmon escapement totaled 140,000 fish. The Northwestern District chum salmon escapement goal (100,000–215,000) was met, with a majority of the escapement occurring in the Izembek-Moffet Bay Section. The Bechevin Bay Section had an escapement of 34,100.

Black Hills Section

Typically in August, the majority of the drift gillnet fleet concentrate their harvest on the Bear River late-run sockeye salmon. However, as a result of a weak escapement in Bear River and other local streams, an area from the Bear River Section to the Ilnik Section was closed to commercial salmon fishing from mid-July to the end of the commercial season and many of the drift gillnet fleet concentrated their fishing effort in the Black Hills Section. In 2012, 51 permits fished the Black Hills section with the majority of the harvest effort occurring in late July

through August. This was the highest amount of effort in over 30 years, as well as the highest harvest, with 57,398 sockeye and 73,941 chum salmon harvested. North Creek is the only river in the Black Hills Section with a sockeye salmon escapement goal. The 2012 North Creek escapement (18,000; determined by aerial surveys) exceeded the escapement goal (4,400–8,800).

Nelson Lagoon Section

The Nelson River total run of 219,985 sockeye salmon (includes harvest and escapement) was below the estimated forecast of 252,000. From the total run, 116,685 sockeye salmon were harvested in Nelson Lagoon and 103,300 escaped in the Nelson (Sapsuk) River. The 2012 sockeye salmon escapement into Nelson River met the BEG (97,000–219,000).

Beginning August 15, the Nelson Lagoon Section may be managed on local coho salmon runs. In 2012, 19,160 coho salmon were observed in Nelson River exceeding the Nelson River SEG threshold (18,000).

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 Bear and Sandy rivers. In 2012, Bear and Sandy rivers both experienced weak sockeye salmon runs. As a result, commercial salmon fishing was restricted to a portion of the Bear River Section from July 2 until July 6 when the section was closed completely until escapement into Bear River improved. The run struggled to meet escapement goals; however, and the Bear River Section did not open for the rest of the 2012 commercial salmon fishing season. Fishing in the Three Hills Section was closed the entire 2012 commercial salmon season to help increase Bear and Sandy rivers escapements.

The Bear River early-run (through July 31) sockeye salmon escapement of 173,158 fish was slightly below the escapement goal (176,000–293,000). The Bear River late-run (after July 31) sockeye salmon escapement of 116,442 fish (includes post-weir estimate of 56,375 fish) was also just below the late-run escapement goal (117,000–195,000). After the weir was removed on August 25, the post-weir estimate (56,375) brought the Bear River season sockeye salmon escapement to 289,600 fish, which was below the season escapement goal (293,000–488,000). In 2012, there was no harvest on the Bear River late run as the entire area (Outer Port Heiden, Ilnik, Three Hills, Bear River and Port Moller Bight sections) was closed since early July. The late-run Bear River sockeye salmon escapement of 116,442 fish was well below the forecast estimate of 243,000.

The Sandy River did not meet any interim escapement goals in 2012. The 2012 Sandy River sockeye salmon escapement of 27,100 fish was well below the season ending escapement goal range (34,000–74,000) and was the lowest escapement on record since a weir has been installed in 1994.

Ilnik Section

The Ocean River, a major spawning tributary that accounts for approximately 20% of the spawning run in the Ilnik system, periodically empties directly into the Bering Sea instead of the Ilnik River. When this occurs, as it did in 2012, Ocean River bound salmon can bypass the Ilnik River weir. To account for the Ocean River-bound sockeye salmon that bypass the weir, the Ilnik River escapement goal (40,000–60,000; SEG) is decreased by 20% to 32,000–48,000 sockeye

salmon. The remaining 8,000–12,000 fish (or 20%) is the historical proportion of the Ocean River component of the Ilnik system. In addition to Ocean River having a direct outlet to the Bering Sea, two tidally affected sloughs also connected Ocean River to the Ilnik system in 2012. One slough connected Ocean River to Ilnik River and the other to Willie Creek, a spawning tributary. As a result, fish could reach spawning grounds in Ilnik River and Willie Creek without passing through the weir if they entered through Ocean River. Due to the various ways fish could bypass the weir in 2012, management attempted to do more aerial surveys when weather allowed and also installed a DIDSON sonar in one of the sloughs to help determine inseason escapement. Initially, weir counts were low and erratic and it was difficult to assess the amount of fish passage in the slough due to milling fish and tidal fluctuations. The sonar did however give an indication that fish were using the slough. The Ilnik River weir passed 46,300 sockeye salmon. The final season ending escapement for Ilnik River weir (including post-weir estimates and aerial surveys), Willie Creek, and Ocean River was 61,000 sockeye salmon. The Ocean River sockeye salmon escapement of 21,000 sockeye salmon (determined by aerial surveys) exceeded the 8,000–12,000 fish goal.

By regulation, the Ilnik Section can open to commercial salmon fishing on June 20. However, due to the variability in escapement counts and difficulty in assessing the run strength into the Ilnik River, the area did not open until July 2. Commercial salmon fishing in the Ilnik Section closed on July 11and did not open for the rest of the season due to rapidly decreasing harvests by the commercial fleet and concerns over escapements into local rivers.

In 2012, a total of 118 permit holders harvested 252,939 sockeye salmon in the Ilnik Section from July 2 until July 11. Within the Ilnik Section, about 38% of this commercial harvest occurred southwest of Unangashak Bluffs (95,060), and 62% was harvested between Unangashak Bluffs and Strogonof Point (157,479). The peak daily catch in the southern portion of the Ilnik Section was on July 2 when 24,165 sockeye salmon were harvested. The largest daily harvest in the northern portion of the Ilnik Section occurred on July 4, when 47,849 sockeye salmon were harvested.

Beginning August 15, the Ilnik Section may be managed for coho salmon runs into Ilnik Lagoon. Commercial salmon fishing was closed in the Ilnik Section during this time in 2012 due to concerns over the weak sockeye salmon escapement into Bear River and therefore, no directed coho salmon fisheries occurred. There was no harvest in the Ilnik Lagoon section in 2012.

Inner and Outer Port Heiden Sections

Aerial escapement surveys began on the Meshik River on June 25 and were conducted about once weekly throughout the fishery. A survey conducted on July 2 documented 33,000 sockeye salmon in the Meshik River, meeting the season-ending escapement goal (25,000–100,000). The final escapement in Meshik River, including tributaries, was 43,800 sockeye salmon and in the Inner Port Heiden Section (including Meshik River, Red Bluff and Yellow Bluff creeks and tributaries) the final escapement was 50,900 sockeye salmon.

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. By regulation, the Outer Port Heiden Section can open to commercial salmon fishing from June 20 to July 31. The weekly fishing periods in the Outer Port Heiden Section are scheduled from 6:00 a.m. Monday to 6:00 p.m. Wednesday. The Outer Port Heiden Section opened on June 28 and had three openings of 2½ days per week until the section

closed on July 15. In 2012, a total of 111 permit holders harvested 268,226 sockeye salmon from the Outer Port Heiden Section. The peak daily catch was on June 30 when 60,337 sockeye salmon were harvested. No commercial fishing occurred in the Inner Port Heiden Section in 2012.

Cinder River Section

There was no harvest reported in the Cinder River Section in 2012 despite weekly fishing periods of 2½ days per week for the entire season. The total sockeye salmon escapement estimate of 76,620 fish exceeded the escapement goal (12,000-48,000).

North Peninsula Escapement

Chinook Salmon

Nelson River is the only river in Area M with a Chinook salmon escapement goal. The 2012 Nelson River escapement was 992 fish and did not meet the escapement goal (2,400–4,400). The total Northern District Chinook salmon escapement of 3,537 was also well below the most recent 10-year average of 20,248.

Chum Salmon

The Northern District has a district wide chum salmon escapement goal of 119,600–239,200. This goal was met with an escapement of 140,418, yet below the most recent 10-year average of 189,837. The vast majority of the chum salmon escapement occurs in the Herendeen and Moller bays and in 2012 the total chum escapement in the bays was 110,700.

Coho Salmon

Coho salmon surveys were done on all Northern District streams; however, the surveys were done in early September and the runs were not complete at that time so the escapement numbers are considered minimum estimates. Nelson and Ilnik rivers each have coho salmon threshold escapement goals in the Northern District. The Nelson River escapement (19,160) met the threshold goal (18,000). The coho salmon run continues through September and the last aerials survey was on September 8. The Ilnik River escapement (14,000) met the threshold (9,000). Like Nelson River, it is expected that more coho salmon entered the system after early September when the last aerial survey occurred. The Ilnik River coho salmon run also goes through September. There was no directed coho salmon fishery in the Ilnik Section in 2012.

PRELIMINARY FORECASTS OF 2013 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 2013 fishing year, forecast fisheries are as follows:

Southeast	pink salmon
Prince William Sound	Wild chum, sockeye, and pink salmon
Copper River/ Copper River Delta	Chinook and sockeye salmon
Upper Cook Inlet	sockeye salmon
Lower Cook Inlet	pink salmon
Kodiak	
KMA	pink salmon
Spiridon Lake	sockeye salmon
Ayakulik River	sockeye salmon
Karluk Lake (Early and Late Runs)	sockeye salmon
Alitak District, Frazer and Upper Station	sockeye salmon
Chignik (Early and Late Runs)	sockeye salmon
Bristol Bay	sockeye salmon
Nushagak District	Chinook salmon
Alaska Peninsula	
South Alaska Peninsula	pink salmon
Bear River (late run)	sockeye salmon
Nelson River	sockeye salmon
Arctic-Yukon-Kuskokwim	
Yukon Area	fall chum salmon

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

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

SALMON SPECIES CATCH AND PROJECTIONS

Figures 2–6 show actual catch and projected catch for Chinook, sockeye, coho, pink, and chum salmon.

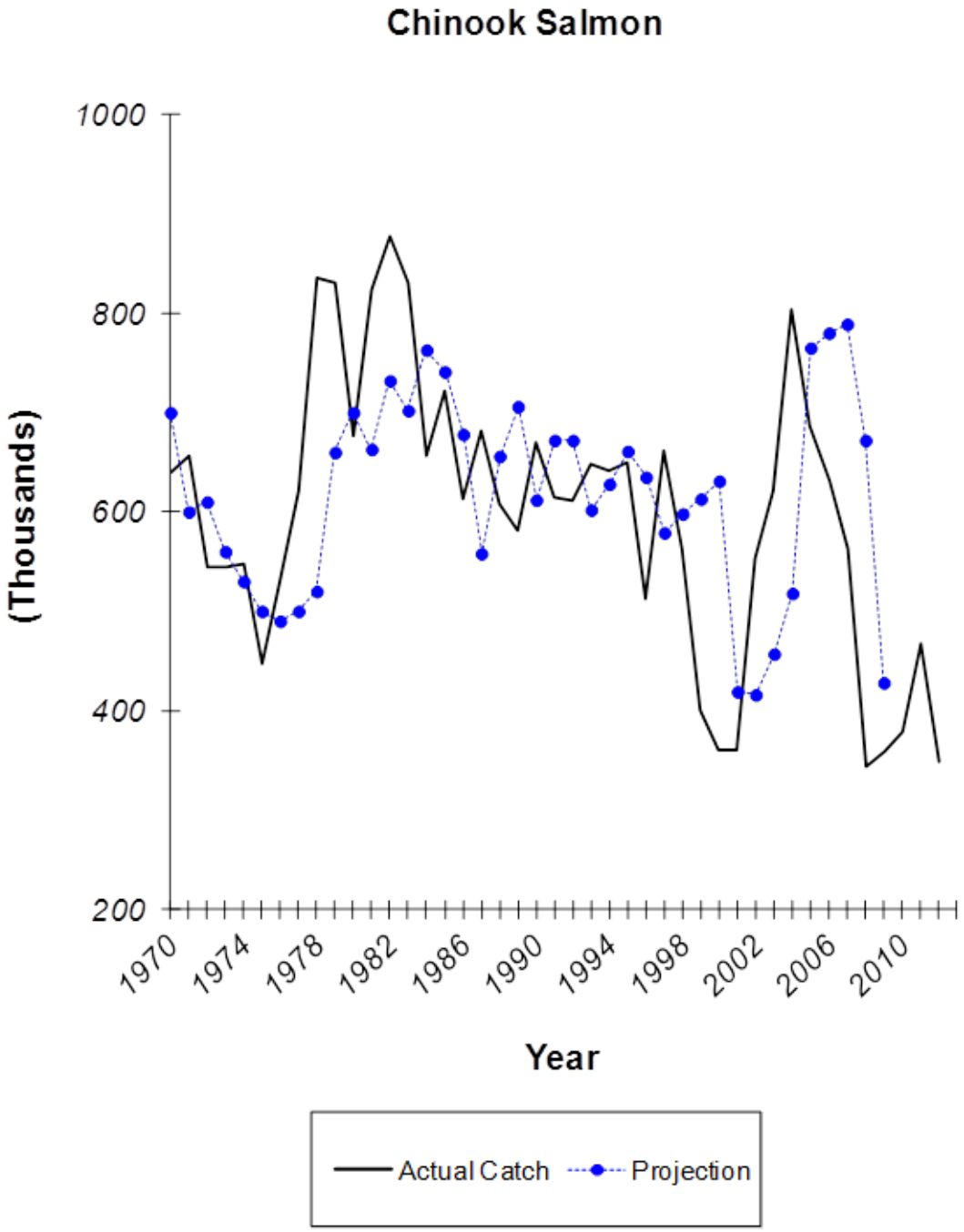

Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2012, 2011–2013 projection not available.

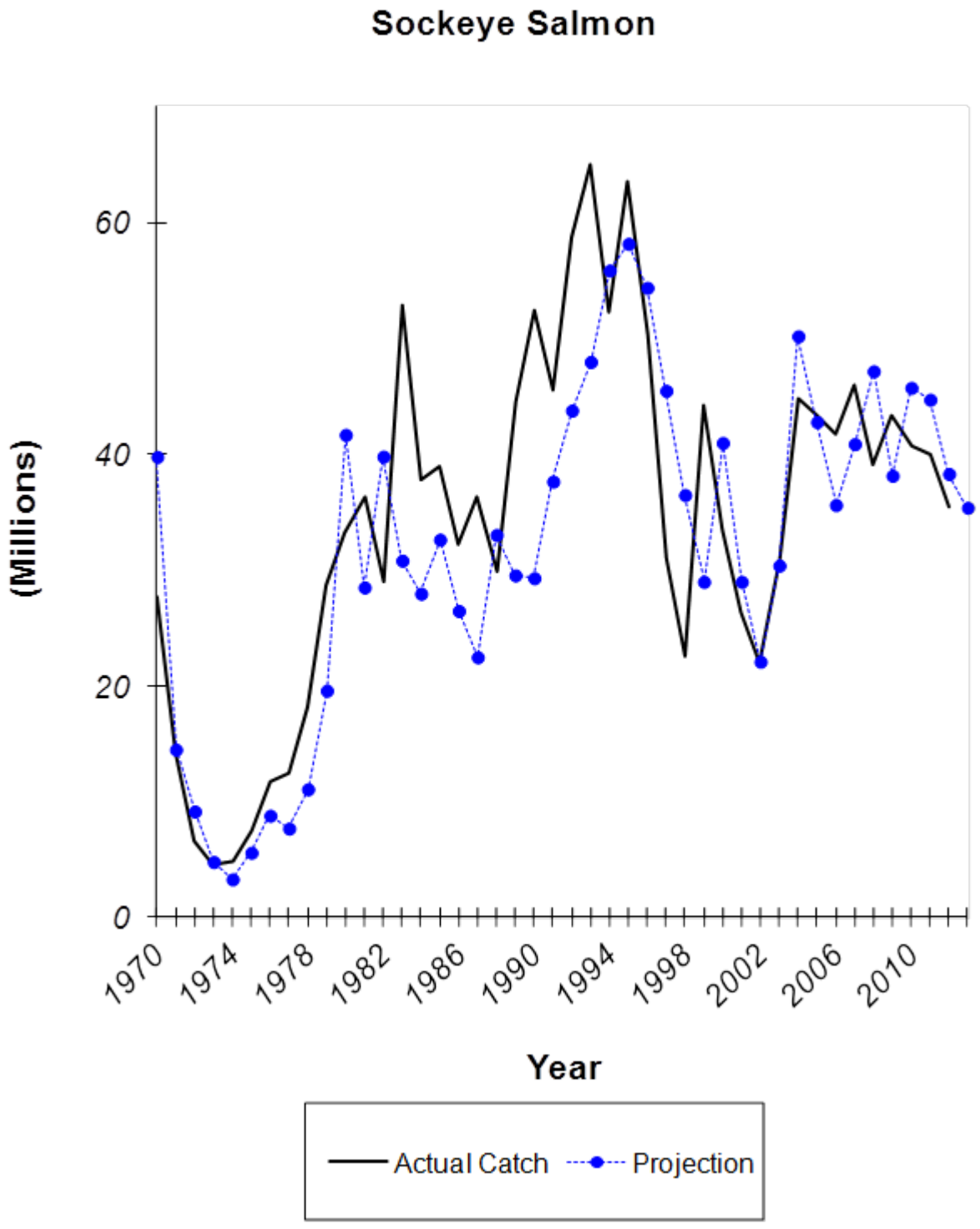

Figure 3.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2012, with the 2013 projection.

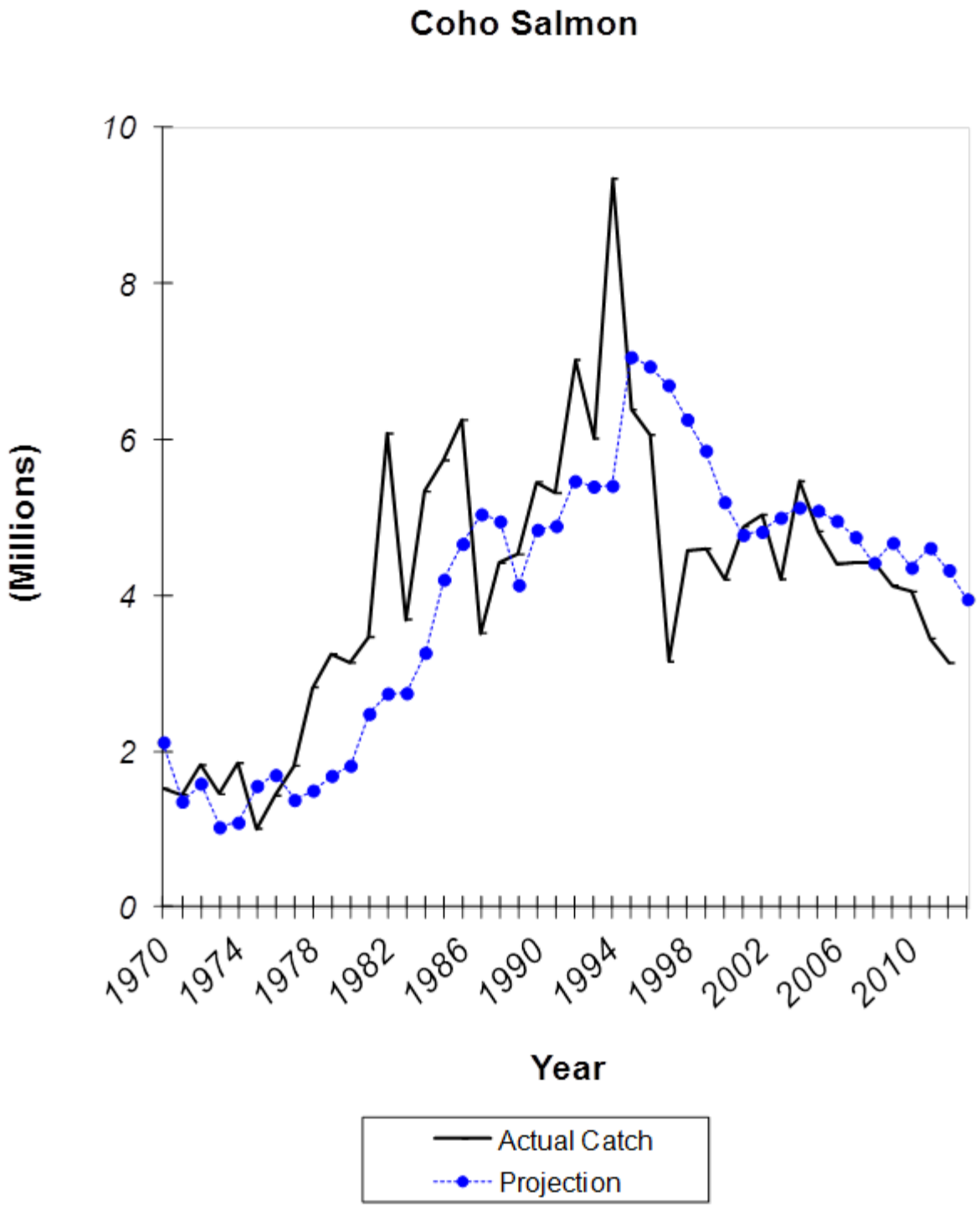

Figure 4.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2012, with the 2013 projection.

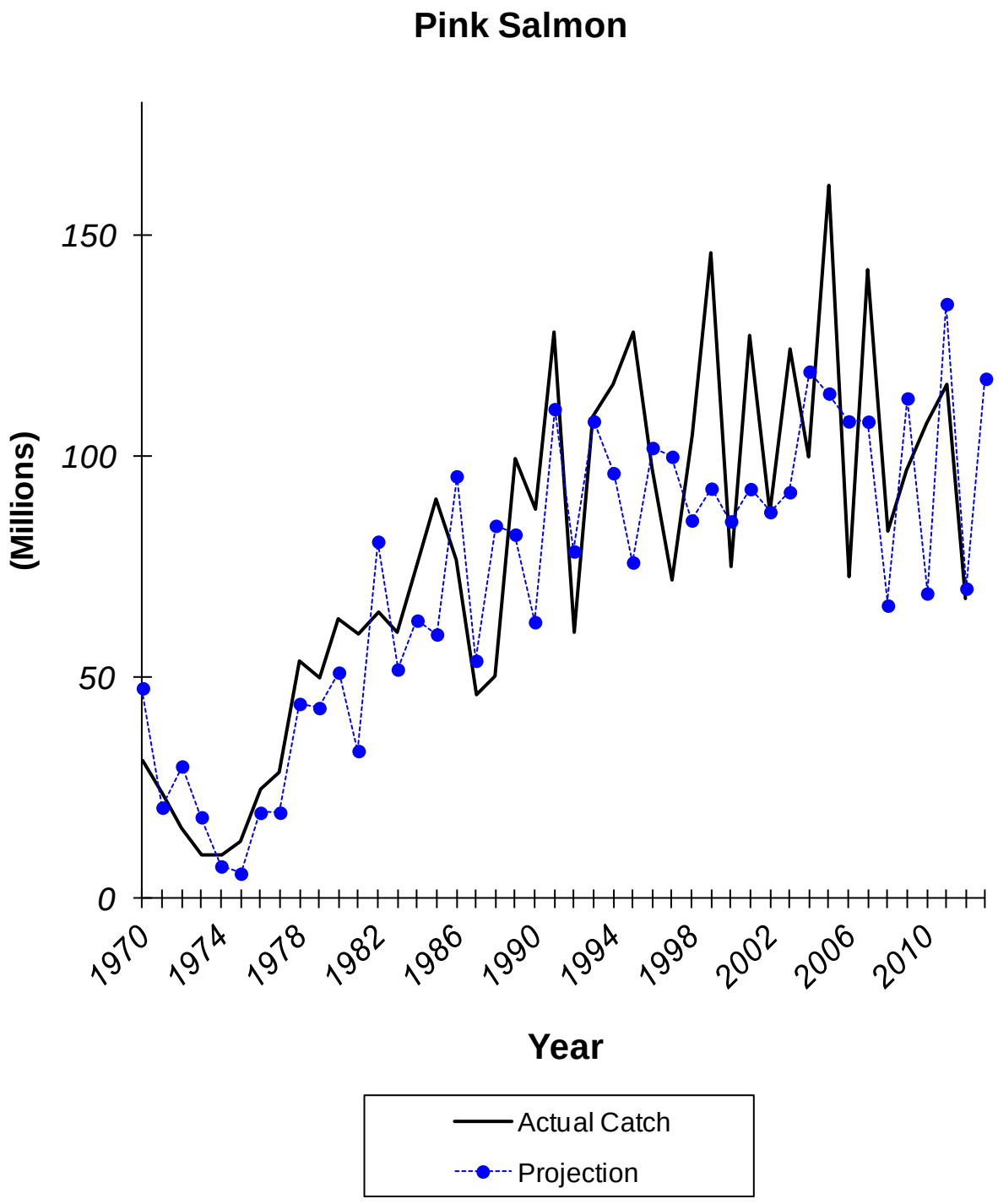

Figure 5.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2012, with the 2013 projection.

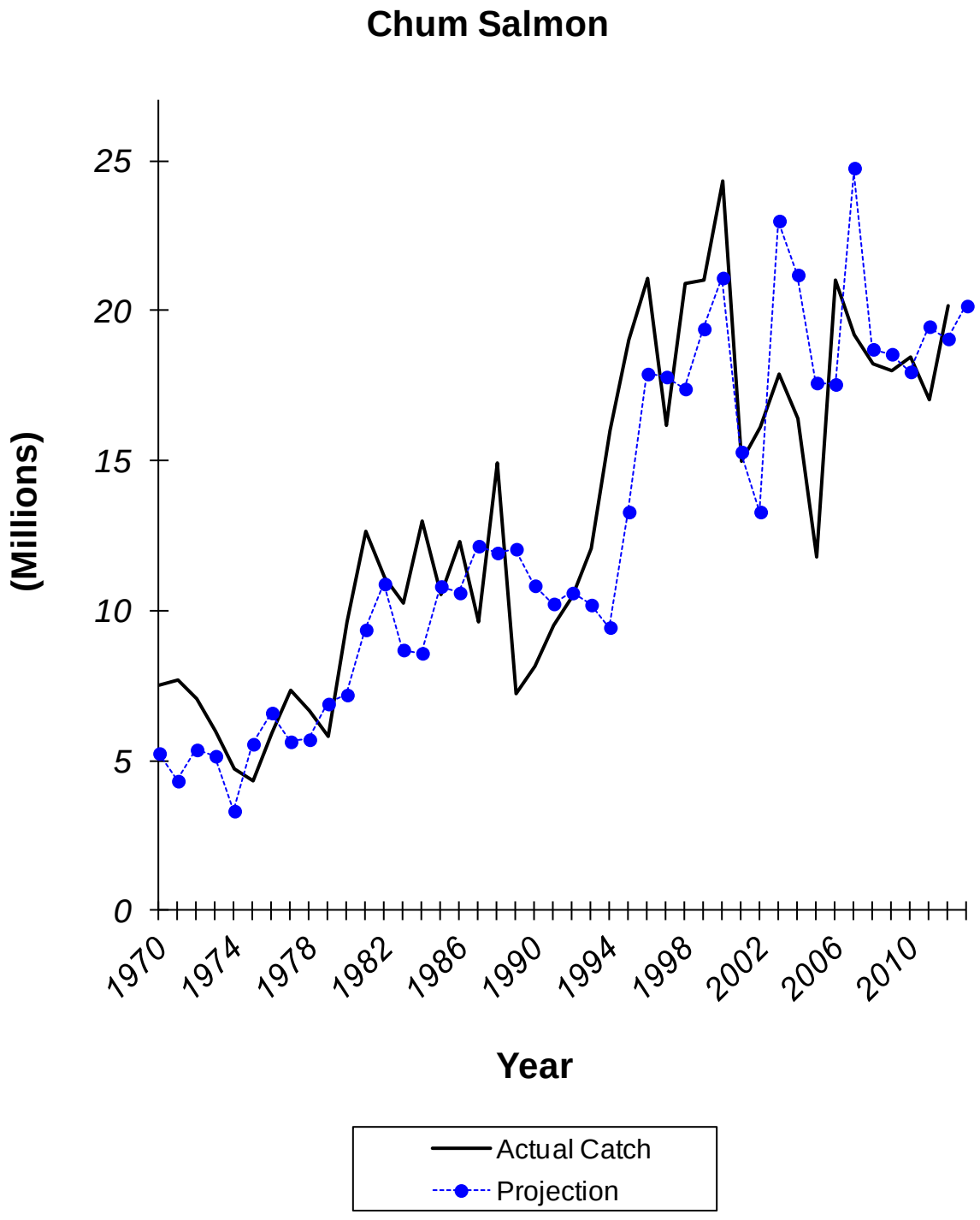

Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2012, with the 2013 projection.

ACKNOWLEDGMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Regional research biologists Steve Heinl, Lowell Fair and Nicholas Sagalkin; and Regional management coordinators Bill Davidson, Dan Bergstrom, and Tim Baker assembled the forecasts and salmon season summaries 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 2013 fishing season.

APPENDIX A: SOUTHEAST ALASKA

Forecast Area: Southeast Alaska
Species: Pink Salmon

The Southeast Alaska pink salmon harvest in 2013 is predicted to be in the excellent range, with a point estimate of 54.0 million fish (80% confidence interval: 42.0–67.0 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 over the 50-year period 1960 to 2012:

Category	Range (millions)	Percentile
Poor	Less than 11	Less than 20th
Weak	11–19	20th to 40th
Average	19–29	40th to 60th
Strong	29–48	60th to 80th
Excellent	Greater than 48	Greater than 80th

Forecast Methods

The 2013 forecast was produced in two steps: 1) a forecast of the trend in the harvest, and 2) the forecast trend adjusted using 2012 juvenile pink salmon 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 $\hat{x}_t, \hat{x}_{t-1}$, ... denotes the observed harvests in year t, t–1, and so on, then the forecast in year t+1 is given by,

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

We estimated a value of c to be approximately 0.45, based on minimizing the sum of past squared errors in the entire data set (odd and even years combined). The forecast for year t, that is $\hat{x}_t$, is also a weighted average of the forecast made for year t–1 and the actual harvest in year t–1. 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 2011, the parent year for the 2013 return. Since the formula used to calculate the forecast is a weighted average of the 2011 harvest and its associated forecast, which was also based on the associated parent year harvest and forecast, this forecast is based entirely on odd-year data. That is, we used all of the odd-year harvest data up to 2011, assuming that the 2011 parent year and other odd years in the series will better predict the 2013 return. This analysis produced a forecast of 52.0 million pink salmon (Figure A1).

We adjusted the forecast using peak June–July juvenile pink salmon CPUE statistics provided by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (Joe Orsi, Auke Bay Laboratories, personal communication). These data were obtained from systematic surveys conducted annually in upper Chatham and Icy straits in conjunction with NOAA's Southeast Coastal Monitoring Project and

-continued-

are highly correlated with the harvest of adult pink salmon in the following year (see Wertheimer et al. 2011[a]). We developed a simple equation to predict the forecast error in the exponential smooth model by regressing the forecast error proportions from 1998 to 2012 on the corresponding NOAA CPUE data from 1997 to 2011 (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 2013 forecast error and adjusted the exponential-smooth forecast upward, from 52.0 million to 54.0 million pink salmon (Figure A3). The forecast range (42.0–67.0 million) is based on an 80% confidence interval, calculated by cross-validation estimates of the forecast error.

Forecast Discussion

The 2013 harvest forecast of 54.0 million pink salmon is well above the recent 10-year average harvest of 37.0 million pink salmon, but is close to the average harvest over the past five odd years. There are two primary reasons to expect that the harvest in 2013 will be higher than the recent average. First, biological escapement goals were met or exceeded in the parent year, 2011, and escapements were well distributed throughout the region. Management targets for pink salmon were met or exceeded for 14 of 15 Districts, and, at a finer scale, for 44 of the 46 pink salmon stock groups. In addition, the NOAA Auke Bay Lab's 2012 peak June–July juvenile pink salmon CPUE statistic from upper Chatham and Icy straits in northern Southeast Alaska ranked in the top third of the 15 previous years that NOAA has collected that information, which may indicate good freshwater and early marine survival for pink salmon set to return in 2013. Pink salmon harvests associated with the top third of indices in the NOAA data set ranged between 45 and 78.0 million fish.

The NOAA Auke Bay Laboratories continues to conduct research that has greatly improved our ability to forecast pink salmon harvests in Southeast Alaska. NOAA has been using juvenile pink salmon catch and associated biophysical data to forecast adult pink salmon harvest in SEAK since 2004. The 2013 NOAA forecast can be found at the following link:

http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm (Acessed February 6, 2013).

ADF&G forecasts that were adjusted using NOAA's juvenile pink salmon data were much improved over previous forecasts (Figure A4). Hindcasts of past harvests (1998–2006) 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 seventh consecutive year.

-continued-

[a] We gratefully acknowledge the assistance and advice of Joe Orsi and Alex Wertheimer (retired) and their colleagues at the NOAA Auke Bay Laboratories. 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: Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2011. Forecasting pink salmon harvest in Southeast Alaska from juvenile salmon abundance and associated environmental parameters: 2010 returns and 2011 forecast (NPAFC Doc. 1343) Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, 17109 Point Lena Loop Road, Juneau, AK 99801-8626. http://www.npafc.org/new/pub_documents.html (Accessed February 6, 2013).

The department will manage the 2013 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.

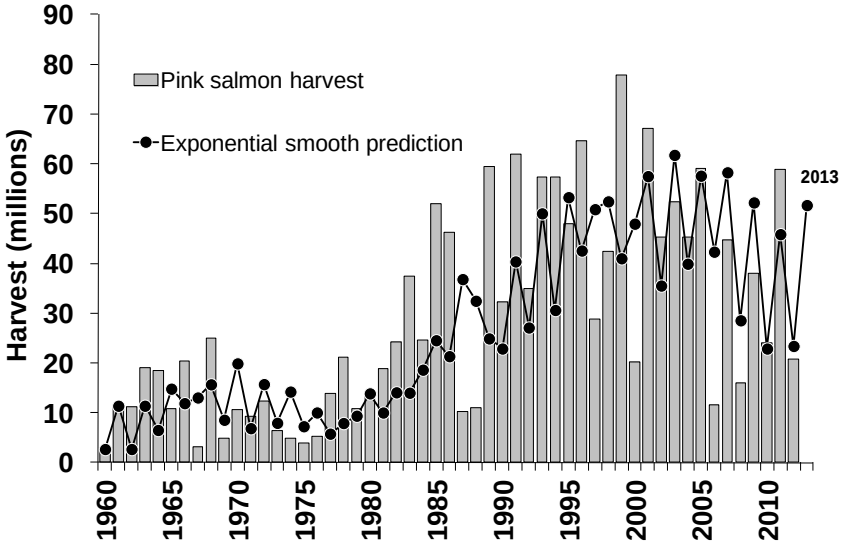

Figure A1. Comparison of the annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2013 forecast model. This method produced a 2013 harvest forecast of 52.0 million pink salmon.

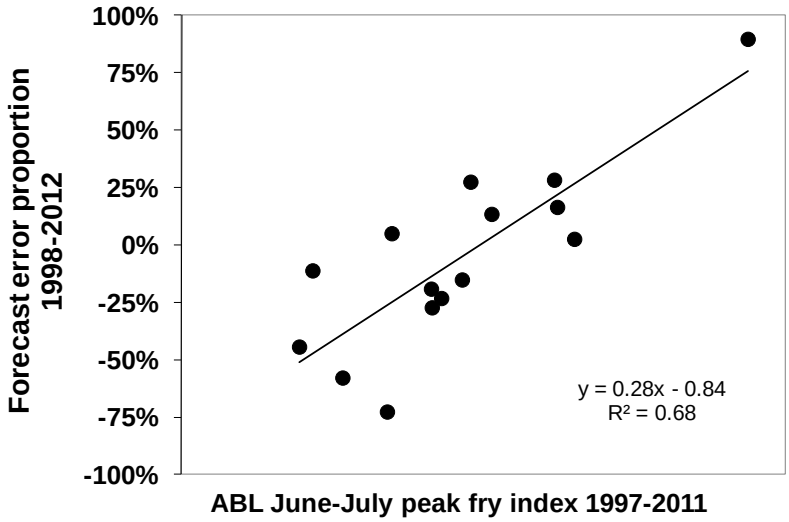

Figure A2. Regression of ADF&G forecast error proportion on the peak June–July juvenile pink salmon index from Icy Strait one year prior.

Source: Pink salmon fry index data provided by Joe Orsi, NOAA Auke Bay Laboratory, personal communication.
Note: 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.

-continued-

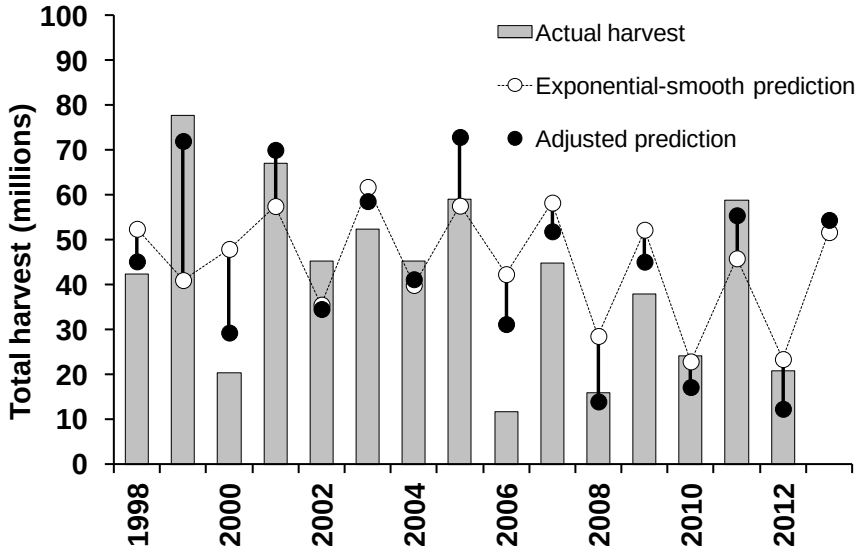

Figure A3. Annual harvest of pink salmon in Southeast Alaska, 1998–2012, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory juvenile pink salmon data.

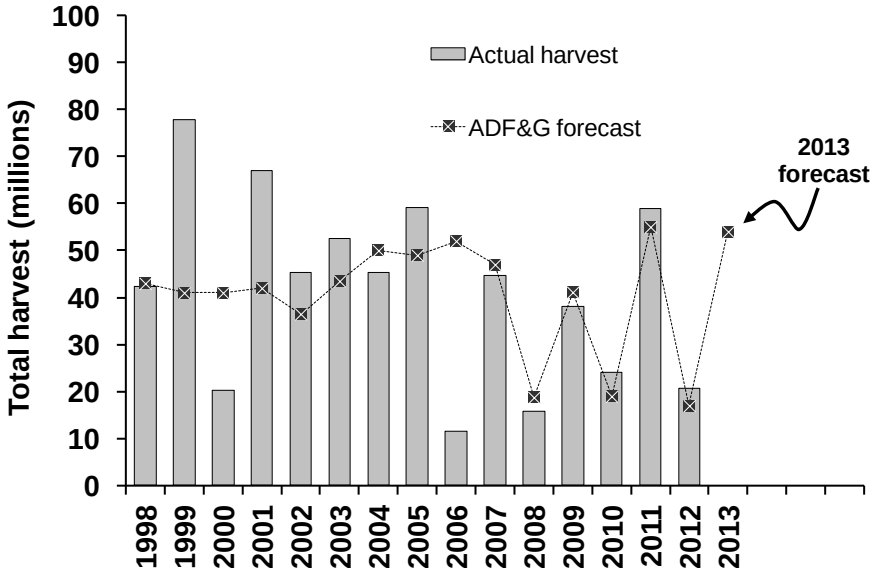

Figure A4. Annual harvest of pink salmon in Southeast Alaska compared to the ADF&G pre-season harvest forecast, 1998–2012. The 2007–2013 ADF&G harvest forecasts were adjusted using NOAA's juvenile pink salmon data.

Andy Piston, Pink and Chum Salmon Project Leader, Ketchikan
Steve Heinl, Regional Research Biologist, Ketchikan

APPENDIX B: PRINCE WILLIAM SOUND

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

Preliminary Forecast of the 2013 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	6,200	1,200–23,600
Escapement Goal[a]	1,440	
Harvest Estimate[b]	4,751	0–22,151

[a] PWS pink salmon escapement goals are the sum of the median values of the SEG for all districts in Prince William Sound for even or odd years. The escapement goals were changed in 2011 from a single sound-wide SEG to district and brood line specific SEGs (first implementation in 2012). The sum of the district specific SEG ranges is now 990,000–2.28 million pink salmon (median of 1.45 million) for the odd-year brood line and 790,000–1.70 million pink salmon (median of 1.16 million) for the even-year brood line.

[b] This total includes the harvests from commercial, subsistence, and sport fisheries.

Forecast Methods

Total natural run by year was estimated as the total natural (nonhatchery) contribution to commercial harvests combined with the stream escapement index. The stream escapement index is calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. No adjustments to the escapement index were made for aerial observer efficiency, the proportion of the total escapement represented by the index streams, or the number of hatchery strays in streams. The natural pink salmon contributions to the commercial CPF were estimated by subtracting hatchery contributions from the CPF total. Hatchery contributions were determined by thermal marked otolith recoveries (1997–2012), coded wire tag recoveries (1985–1996), or average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates (1977–1984).

The 2013 forecast is the average of the two previous brood year returns (2009 and 2011). This forecast method differs from the 2012 forecast that used the previous even-year total run, the 2011 forecast that used exponential smoothing, and the 1997–1999 method that used linear regressions of adult production versus brood year escapement index. Prior to 1997, forecast methods employed surveys of pre-emergent fry; however, these surveys ended in 1995. The forecast model for 2013 was selected by comparing the mean absolute percentage error (MAPE) and the standard deviation of the MAPE among the models examined (return years 1963–2011). The range for the total run forecast was calculated by:

$$(\hat{y}_{t+1} / (s_{\min/\max} + 1))$$

with

$$s_i = (\hat{y}_i - y_i)/y_i ,$$

where $\hat{y}_{t+1}$ is the forecast for the following year based on the average of the previous two odd brood year's total run size, $\sigma_{min/max}$ is the minimum and maximum proportional forecast error from all previous forecasts using this same method (1965–2011), σ_i is the proportional forecast error for individual past years and y_i and $\hat{y}_i$ are the actual and forecast total run sizes for individual previous years using this same method, respectively.

-continued-

Forecast Discussion

The predicted natural total run of pink salmon in 2013 is a naïve forecast that uses the average of the 2009 and 2011 total run estimates. 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 2013 natural run included: 1) previous odd brood year total run (most naïve forecast method), 2) total run averages with 2–10 years of data (odd years), 3) linear regression of log-transformed total PWS escapement versus log-transformed total PWS return by brood line, and 4) the inclusion of Pacific Decadal Oscillation (PDO; http://jisao.washington.edu/pdo/) and GAK1 water temperature data (http://www.ims.uaf.edu/gak1/) in regression models. The 2013 forecast was estimated from the average of the two previous odd-year total runs because this forecast had the lowest MAPE and the second lowest standard deviation of the MAPE. None of the models examined for natural pink salmon returning in odd-years produced forecasts with MAPE values below 100%.

The brood year 2011 escapement index (3.9 million) was above the current SEG range (1.21–2.08 million) and ranked second of the observed odd-year escapements since 1960. If the 2013 total run forecast (6.2 million) is realized, it will be the 16th largest among odd brood year returns since 1961. Environmental factors, which likely play a significant role in determining pink salmon returns in PWS, have been quite dynamic during the past 5–6 years. A warm regime, coinciding with generally high productivity of salmon, began in approximately 1977. Beginning in 2007, ocean temperatures at GAK1 along the Seward line were well below average (http://www.ims.uaf.edu/gak1/). The last few years have also been one of the longest periods of cold conditions, as measured by PDO index values, since the 1970s (http://jisao.washington.edu/pdo/). An El Niño event that spanned 2009–2010 corresponded to a period of positive PDO index values (http://www.elnino.noaa.gov/index.html) and the large number of pink salmon returning to PWS in 2010 spent much of their ocean lives in warmer El Niño conditions. With the passing of the 2009–2010 El Niño, PDO values again became negative in June of 2010 and remain negative through November 2012. The 2012 average PDO index rank as the eighth most negative (coldest) in the last 100 years. Because cold ocean conditions are generally associated with lower salmon productivity, the pink salmon run in 2013 may be smaller than projected. It will not be known for several more years if the recent period of relatively cold ocean conditions signals the beginning of a new cold regime.

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 2013 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	512	218–831
Escapement Goal[a]	200	
Harvest Estimate[b]	312	18–631

[a] ADF&G intends to manage for the long-term average escapement to those districts with escapement goals; a total of 200,000 chum salmon for the Eastern, Northern, Coghill, Northwestern, and Southeastern districts combined. The sum of the lower-bound SEGs for these districts is 91,000.

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

Forecast Methods

We evaluated several naïve methods for the 2013 PWS wild chum salmon forecast, including average run size for the previous 2, 3, 4, 5, and 10 years and total run size from the previous year. From these models, total run size from the previous year had the lowest MAPE and was chosen as the forecasting method for 2013. 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. No adjustments to the escapement index were made for aerial observer efficiency, the proportion of the total escapement represented by the index streams, or the number of hatchery strays in streams. The CPF harvest contributions of natural stock chum salmon were estimated using prehatchery average wild runs (2002 and 2003) or thermally marked otolith estimates (2004–2012) for each district in PWS. The range for the total run forecast was calculated by:

$$(\hat{y}_{t+1} / (s_{\min/\max} + 1))$$

with

$$s_i = (\hat{y}_i - y_i)/y_i ,$$

where $\hat{y}_{t+1}$ is the forecast for the following year based on the previous year total run size, $\sigma_{min/max}$ is the minimum and maximum proportional forecast error from all previous forecasts using this same method (1990–2012), σ_i is the proportional forecast error for individual past years and y_i and $\hat{y}_i$ are the actual and forecast total run sizes for individual previous years using this same method, respectively.

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 to 2012 natural chum salmon contribution estimates based on thermally marked otoliths were avail-

-continued-

able for the Coghill and Montague districts. Contribution estimates from thermally marked otoliths in other districts have been available since 2004. Historical chum salmon age data from escapements and CPF harvests are unavailable for most districts of PWS. If the 2013 wild chum salmon forecast of 512,200 is realized, it would be the 20th largest since 1970. For comparison, the estimated total run size was greater than 1.3 million from 1981 to 1988, but has not surpassed 1.0 million since 1988.

The cold ocean temperatures and negative PDO index values discussed previously for pink salmon may also negatively affect the run of chum salmon in 2013.

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

-continued-

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

Preliminary Forecast of the 2013 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound, Coghill Lake		
Total Run	156	88–330
Escapement Goal[a]	30	
Harvest Estimate[b]	126	58–300
Prince William Sound, Eshamy Lake		
Total Run	53	29–77
Escapement Goal[c]	21	
Harvest Estimate[b]	32	9–57
Total Production		
Run Estimate	209	140–380
Escapement Goal	51	
Common Property Harvest[b,d]	158	900–330

[a] The escapement goal of 30,000 for Coghill Lake is the median of historical escapement estimates and the SEG range is 20,000–60,000. The upper end was increased in 2011 from 40,000 to 60,000.

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

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

[d] The total PWS harvest estimate does not include the average annual commercial harvest of approximately 6,600 sockeye salmon in Unakwik District.

Forecast Methods

The natural sockeye salmon run forecast to Coghill Lake is the total of estimates for five age classes. A linear regression model with natural log-transformed data was used to predict returns of age-1.3 sockeye salmon. This linear regression model was parameterized using the historical relationship between returns of age-1.3 sockeye salmon and returns of the age-1.2 fish one year previous (sibling model), which are from the same brood year. For example, the model to predict the return of age-1.3 sockeye salmon in 2013 used the return of age-1.2 fish in 2012 as the input parameter. Predicted returns of age-1.1, -1.2, -2.2, and -2.3 sockeye salmon were calculated as the 1974–2012 mean return of that age class. Harvest, escapement, and age composition data are available for Coghill Lake sockeye salmon runs since 1962; however, inclusion of escapements prior to the installation of a full weir in 1974 reduced forecast reliability. 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 the 2007–2012 forecasts and actual runs as the forecast variance:

$$\hat{y} \pm t_{a/2,n-1} \acute{} \ MSE,$$

where $\hat{y}$ 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. Historically, sibling model

-continued-

estimates of age – 1.3 returns to Coghill Lake have a much lower MAPLE (~34%) than the sibling model used to predict returns of age-1.2 fish (~92%).

The forecast of the natural sockeye salmon run to Eshamy Lake has historically been based on an apparent four-year cycle with leap years being the strongest run year. However, this cycle has diminished in recent years, and the 2013 forecast is simply the average annual runs since 1989. Eshamy Lake escapement has been enumerated at a weir since 1950, except 1987, 1998 and 2012. 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, 1998, and 2012, were used to calculate the forecast. In 2012, a video monitoring system was used to enumerate the sockeye salmon run to Eshamy Lake. The 80% prediction interval was calculated using the equation described for Coghill Lake wild sockeye salmon.

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

Forecast Discussion

Beginning in 2004, the department stopped forecasting hatchery runs of sockeye salmon to Main Bay Hatchery because hatchery operators were already producing forecasts. Coghill Lake has dynamic limnological characteristics that significantly impact the sockeye salmon population. Studies conducted in the mid-1980s and early 1990s indicated the lake may be zooplankton limited. As a result, the BEG midpoint was lowered in 1992 (from 40,000 to 25,000) to allow zooplankton populations to recover. Fertilizers were added to the lake (1993–1996) in a cooperative project with the U.S. Forest Service to improve the forage base for rearing sockeye salmon juveniles. In 2005, current data were reviewed and the midpoint escapement goal remained unchanged, but the goal type was changed from a BEG to an SEG. In 2002 the department began collecting limnological data to monitor basic lake characteristics. In 2011, the upper end of the Coghill Lake SEG was increased from 40,000 to 60,000 (new range = 20,000–60,000). In 2012 the department began managing for the long-term median escapement of 30,000. The Coghill Lake natural run escapement has been within or above the escapement goal range every year since 1995. If achieved, the 2013 total run forecast midpoint (156,300) would be the seventh largest run since 1988. The majority (109,400) of the overall Coghill Lake wild sockeye salmon forecast is predicted to come from age-1.3 fish from the 2008 brood year. The substantial number of jacks returning in 2012 (1,950) could indicate a large run of age-1.2 sockeye salmon in 2013. However, there is considerable uncertainty in models used to estimate these returns, and we opted to use the average total return of age-1.2 sockeye salmon (35,900) rather than sibling model estimates (55,500) for the 2013 forecast. Other factors that may influence the Coghill Lake wild sockeye salmon run in 2013 are the 2009–2010 El Niño event (http://www.elnino.noaa.gov/index.html) and the trend towards cooler ocean temperatures discussed for the pink salmon forecast.

Historically, Eshamy Lake was the largest natural stock contributor to CPF harvests of sockeye salmon in PWS outside of the Coghill District, and contributed to a substantial incidental harvest

-continued-

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 districts CPF harvests because of inconsistent harvest and delivery locations outside of Cordova. Contributions to CPF harvests in western PWS of sockeye salmon produced by the Main Bay Hatchery have been estimated by recovery of coded wire tags and thermally marked otoliths. However, not all harvests can be adequately sampled, which increases the uncertainty of total run estimates for all natural and enhanced sockeye salmon stocks in western PWS. Age composition data and weir counts were not collected in 1987, 1998, and 2012 because of budget reductions.

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

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

APPENDIX C: COPPER RIVER

Forecast Area: Copper River
Species: Chinook Salmon

Preliminary Forecast of the 2013 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	46	28–75
Escapement Goal[a]	27	
Harvest Estimate[b]	20	1–48

[a] The Chinook salmon spawning escapement goal of 24,000 is a lower-bound SEG. ADF&G intends to manage for the estimated long-term average escapement of 27,000.

[b] The harvest by all fisheries (subsistence, personal use, sport, and commercial) while still achieving the average spawning escapement. The projected commercial common property harvest is 19,800.

Forecast Methods

Forecast methods examined for the Chinook salmon forecast included 1) the previous year's run size (most naïve method), and 2) mean total run size estimates (2-, 3-, 4-, and 5-year averages). The pseudo-sibling models were not updated for 2013. Retrospective forecasts using the previous year's run size had a smaller mean absolute percentage error (MAPE; 26%) and a smaller standard deviation of the MAPE (14%) than other mean run forecasts and was used as the forecast for 2013.

The range for the total run forecast was calculated as:

$$(\hat{y}_{t+1} / (s_{\min/\max} + 1))$$

with

$$s_i = (\hat{y}_i - y_i)/y_i ,$$

where $\hat{y}_{t+1}$ is the forecast for the following year based on the previous year total run size, $\sigma_{min/max}$ is the minimum and maximum proportional forecast error from all previous forecasts using this same method (2000–2012), σ_i is the proportional forecast error for individual past years and y_i and $\hat{y}_i$ are the actual and forecast total run sizes for individual previous years using this same method, respectively.

The harvest forecast is the total run estimate minus the average escapement of 27,000 since 1980 as determined from catch-age analysis and mark–recapture point estimates.

Forecast Discussion

The department did not generate a formal Chinook salmon total run forecast between 1998 and 2007 because of inadequate estimates of inriver abundance or spawning escapement. Forecasts made prior to 1998 used aerial survey indices adjusted to approximate the total escapement. These forecasts performed poorly, especially after the number of aerial surveys was significantly reduced in 1994. In 1999 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 eventually took the lead role. There are currently 14 years (1999–

-continued-

2012) of inriver abundance estimates. The 2013 total run forecast point estimate of 46,300 is ~23,000 fish below the 14-year average (1999–2012 average = 70,000). If realized, the 2013 forecast total run would be the fifth smallest since 1980.

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

-continued-

Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

Natural Production	Forecast Estimate(thousands)	Forecast Range (thousands)
Total Run	1,840	1,040–2,640
Escapement Goal[a]		
Upper Copper River	450	
Copper River Delta	169	
Common Property Harvest[b]	1,220	550–1,890
Hatchery And Supplemental Production		
PWSAC - Gulkana Hatchery		
Hatchery Run	400	230–440
Broodstock Needs	20	
Supplemental Escapement[c]	100	
Common Property Harvest[b]	280	130–440
Total Production		
Run Estimate	2,240	1,270–3,210
Natural Escapement Goal	619	
Broodstock Needs	20	
Supplemental Escapement[c]	100	
Upper Copper River Inriver Goal[d]	699	
All Harvest[e]	1,500	790–2,220

[a] The upper Copper River escapement goal of 450,000 sockeye salmon is the historical average spawning escapement. The new SEG adopted in 2011 is 360,000–750,000. The Copper River delta escapement goal is the average aerial survey peak count (84,500) multiplied by 2 to adjust for proportion of the total number of fish observed by aerial observers (SEG = 55,000–130,000).

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

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

[d] The upper Copper River inriver goal categories include spawning escapement (sockeye and other salmon); sport, subsistence, and personal use fishery harvests; and hatchery broodstock and supplemental escapement (5 AAC 24.360 (b)). The inriver goal estimate is preliminary until upriver harvest estimates for 2012 are available.

[e] The commercial common property harvest midpoint estimate is 1,300,000 sockeye salmon and the 80% prediction interval is 580,000–2,020,000. The point estimate for the total common property harvest is calculated as the forecast total run estimate minus the sockeye salmon portion of the inriver goal and the Copper River Delta escapement goal.

Forecast Methods

Forecast methods examined for natural Copper River sockeye salmon for 2013 included 1) the previous year's run size (most naïve method), 2) mean total run size estimates (2-, 3-, 4-, 5-, 10-, and all-year averages), 3) mean return of individual age classes, and 4) regression models of sibling relationships. The forecast of natural sockeye salmon to the Copper River is the total of estimates for six 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. These three age classes were predicted

-continued-

from the relationship between returns of that age class and returns of the age class one year younger from the same brood year (sibling model). The predicted return of age-1.1, -0.3, and -2.3 sockeye salmon were calculated as the five-year (2008–2012) 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 (upriver and Copper River Delta) from the total run forecast. The commercial common property estimate was calculated by subtracting from the total run a preliminary estimate of the inriver goal categories (5 AAC 24.360(b)) and the Copper River Delta spawning escapement goal. The 80% prediction bounds for the total run and harvest forecast were calculated using the method described previously for Coghill Lake sockeye salmon, except only the years from 1983 to 2012 were used in the calculation of mean squared error.

Forecast models examined to predict the 2013 run to Gulkana Hatchery included 1) age specific fry-to-adult survival estimate averages (3, 5, 10, and 25 years) applied to all releases combined, and 2) age specific smolt-to-adult survival estimates for Crosswind and Summit lakes releases combined with fry-to-adult survival estimates for onsite releases at Gulkana I and Gulkana II hatcheries. The selected forecast used age specific smolt-to-adult survival estimates of Crosswind and Summit lakes combined with fry-to-adult survival estimates of Gulkana I and Gulkana II hatcheries. Smolt-to-adult survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements from brood years 1995–1998. Supplemental production from Gulkana I and Gulkana II hatcheries was estimated from fry releases and a fry-to-adult survival of 1.5%. The run was apportioned to brood year using a maturity schedule of 13% age 4 and 87% age 5. An estimated exploitation rate of 70% was used to project the total harvest of Gulkana Hatchery stocks in 2013. The 80% prediction interval for the forecast of supplemental production was calculated using the mean square error estimate of the total run described above for Coghill Lake sockeye salmon.

Forecast Discussion

Forecasts prior to 1998 relied on the relationship between numbers 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 recent brood years, linear regressions of brood-year sibling returns were used for forecasts beginning in 1998. Additionally, more precise estimates of survival and contributions from hatchery production for brood years and release locations were available from coded wire tag recoveries in harvests and escapements for brood years 1995–1998.

Historical estimates of Gulkana Hatchery production prior to 1995 are considered imprecise. Improved contribution estimates for brood years 1995–1998 indicated large contributions from supplemental production and smolt-to-adult survival estimates for Crosswind Lake releases that averaged about 20%. Fish marked with strontium chloride (Sr) began returning in 2003 (age-4 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

-continued-

of enhanced fish from all Gulkana Hatchery releases, but unless different marks for individual releases can be developed, forecasts will soon be limited to using fry-to-adult survival estimates and estimated maturity schedules to forecast total enhanced production.

The spawning escapement goals for the upper Copper River and Copper River Delta were reviewed in 2011. The upper Copper River spawning escapement goal was changed from an SEG of 300,000–500,000 to 360,000–750,000. This change was because of the conversion of Bendix sonar counts to DIDSON sonar equivalent counts and an update in the years used in the goal calculation. There was no change to the Copper River Delta SEG (55,000–130,000).

The 2013 run will be composed primarily of returns from brood years 2008 and 2009. Five-year-old fish (brood year 2008) are expected to predominate Copper River Delta and upper Copper River runs. The 2008 Miles Lake cumulative count did not exceed the minimum anticipated until July 4, although the commercial fishery had six-day and 18-day closures in June. The 2009 cumulative sonar counts were above the minimum objective in May, but below the minimum cumulative objective for the first two weeks of June. The total counts for both 2008 and 2009 exceeded the minimum cumulative objectives by the end of the season: 718,344 actual vs. cumulative objective of 601,125 (2008) and 709,748 actual vs. cumulative objective of 576,818 (2009). The Copper River Delta escapement indices for 2008 (67,950) and 2009 (68,622) were within the SEG range (55,000–130,000).

The Gulkana Hatchery run will include fish from Crosswind Lake smolt migrations of more than 1.0 million fish in 2010 (1.7 million or third largest) and 2011 (1.4 million). The brood year 1993–2009 average migration from Crosswind Lake is 1.2 million smolt. The run will also include four-year-old fish from a small Summit Lake smolt outmigration (94,123) and five-year-old fish from the eighth largest smolt outmigration (416,000).

The 2013 total run forecast (2.24 million) is close to the recent 10-year average total run (2.28 million). If realized, the 2013 forecast total run would be the 11th largest since 1980. The 1.84 million natural run would be below the recent 10-year average (1.94 million), and a 400,000 Gulkana Hatchery run would be ~150,000 above the 10-year average (250,000). The natural run forecast is driven by the large four-year-old (age-1.2) fish estimate in 2012 (fourth largest since 1965) and the subsequent prediction for five-year-old (age-1.3) fish in 2013. There have been six additional years with run estimates of age-1.2 fish greater than ~400,000. The return of age-1.3 fish the following year has been significantly larger than expected in five of the six years. The enhanced run forecast is driven by smolt outmigration numbers from both Crosswind and Summit lakes. The influence of environmental factors including the cooler ocean temperatures that have predominated since September 2007, and the warmer ocean temperature from the El Niño event (August 2009 to May 2010) are factors that increase the uncertainty in the 2013 run projection.

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

APPENDIX D: UPPER AND LOWER COOK INLET

Forecast Area: Upper Cook Inlet
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	6.7	4.3–10.8
Escapement	1.8	
Harvest Estimate	4.9	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, Susitna, and Crescent rivers, and Fish Creek. Escapement (spawner abundance), return, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the run of sockeye salmon to UCI in 2013: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fry, (3) the relationship between adult returns and smolts, and (4) the relationship between sibling adult returns. Several forecast models were evaluated for each stock and age class. Models providing the smallest mean absolute percent error (MAPE) between the forecast and actual runs over the past 10 years were generally used. In most cases, these were sibling models. Forecast model predictions based on spawners, fry, smolt, or siblings were compared to evaluate uncertainty.

The returns of age-1.3 and age-2.2 sockeye salmon to the Kenai River in 2013 were forecasted using sibling models. For example, the sibling-model prediction of the return of age-1.3 salmon was based on the abundance of age-1.2 salmon in 2012. A spawner-recruit model prediction of the age-1.2 salmon return was based upon escapement in 2009. The return of age-2.3 salmon to the Kenai River was forecasted using a fry-smolt model based upon age-1 fall fry abundance in Skilak and Kenai lakes and smolt data when available (after brood year 2002). The returns of age-1.3 and -2.2 sockeye salmon to the Kasilof River were forecasted using sibling models based upon the abundance of age-1.2 and age-2.1 salmon in 2012. A spawner-recruit model was used to forecast the return of age-1.2 salmon, and a smolt model was used to forecast the return of age-2.3 salmon to the Kasilof River.

The total run of Susitna River sockeye salmon was forecasted using mean return per spawner by age class for brood years 2006–2007. Mark–recapture estimates of inriver run and genetic estimates of commercial harvest were available for these brood years.

The sockeye salmon forecast for unmonitored systems in UCI was estimated as 15% of the aggregate forecast for the five major stocks. The fraction of the total run destined for unmonitored systems was estimated using genetic estimates of the stock composition of offshore test fishery harvests.

The 2013 total harvest by all user groups was estimated by subtracting the aggregate escapement from the total run forecast for all stocks. Aggregate escapements were estimated from the sum of the midpoints of the escapement goal ranges for each of the major sockeye salmon-producing systems in UCI and the escapement into unmonitored systems (estimated as 15% of the aggregate escapement into monitored systems). The estimated sport harvest upstream of the

-continued-

sonar at river mile 19 on the Kenai River was subtracted from the aggregate escapement into monitored systems. The total run forecast range was calculated by multiplying the forecast with the upper and lower values of the percent error of the actual runs from published forecast runs from 2003 through 2012.

Forecast Discussion

In 2012, the harvest of sockeye salmon by all user groups in UCI was equal to the preseason forecast of 4.4 million. In 2012, the total run was 4.7 million to the Kenai River: 788,000 to the Kasilof River, 305,000 to the Susitna River; 89,000 to the Crescent River, and 32,000 to Fish Creek. The 2012 run forecast was 4.0 million to the Kenai River: 754,000 to the Kasilof River, 443,000 to the Susitna River, 81,000 to the Crescent River, and 84,000 to Fish Creek.

A run of 6.7 million sockeye salmon is forecasted to return to UCI in 2013, with a harvest by all user groups of 4.9 million. The forecasted harvest in 2013 is 1.1 million fish above the 20-year average harvest of 3.8 million by all user groups.

The run forecast for the Kenai River is approximately 4.4 million, which is 13% greater than the 20-year average run of 3.8 million. Age-1.3 salmon typically comprise about 56% of the run to the Kenai River. A sibling model based upon the return of age-1.2 salmon in 2012 (423,000; 20-year average is 371,000) predicted a return of 2.0 million age-1.3 salmon. A fry model based upon the abundance of age-0 fry rearing in Skilak and Kenai lakes in the fall of 2009 (10.7 million; 20-year average is 18.2 million) predicted a return of 1.6 million age-1.3 salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (26%) than the fry model (53%). Age-2.3 salmon typically comprise about 20% of the run to the Kenai River. A sibling model based upon the return of age-2.2 salmon in 2012 (513,000; 20-year average is 256,000) predicted a return of 1,227,000 age-2.3 salmon in 2013. A fry-smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2010 (5.9 million: 95% confidence interval 5.0–6.7 million) predicted a return of 1.5 million age-2.3 salmon. The fry-smolt model was used for this forecast due to the high age-2 smolt abundance in 2010 and the failure of the sibling model to accurately predict large returns of age-2.3 salmon like that seen in 2011–2012. The forecasted age-2.3 return is 194% greater than the 20-year average return for this age class (760,800). The predominant age classes in the 2013 run should be age 1.3 (45%), age 1.2 (9%), and age 2.3 (34%). The 10-year MAPE for the set of models used for the 2013 Kenai sockeye salmon run forecast was 23%.

The sockeye salmon run forecast for the Kasilof River is 903,000, which is 5% less than the 20-year average run of 947,300. Age-1.3 salmon typically comprise about 34% of the run to the Kasilof River. The forecast for age-1.3 salmon is 274,000, which is 15% less than the 20-year average return (322,000) for this age class. A sibling model based upon the abundance of age-1.2 salmon in 2012 was used to forecast the return of age-1.3 salmon in 2013. The abundance of age-1.2 salmon in 2012 was 256,000, which is 10% less than the 20-year average abundance (285,000) for this age class. A smolt model predicted a return of 236,000 age-1.3 salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (27%) than the smolt model (31%). Age-1.2 salmon typically comprise about 30% of the run. The forecast for age-1.2 salmon is 248,000, which is 13% less than the 20-year average return

-continued-

(285,000) for this age class. A spawner-recruit model based upon the abundance of spawners (325,000) in 2009 was used to forecast the return of age-1.2 salmon in 2013. A sibling model based upon the abundance of age-1.1 salmon (36,000) in 2012 forecasted a return of 241,000 age-1.2 salmon. The spawner-recruit model was used for this forecast because the 10-year MAPE was lower for the spawner-recruit model (64%) than the sibling model (104%). Age-2.2 salmon typically comprise about 24% of the run. The forecast for age-2.2 salmon is 307,000, which is 34% greater than the 20-year average return (228,000) for this age class. A sibling model based upon the abundance of age-2.1 salmon in 2012 was used to forecast the return of age-2.2 salmon in 2013. The spawner-recruit model forecast for age-2.2 salmon was 254,000. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (33%) than the spawner-recruit model (34%). The predominant age classes in the 2013 run should be age 1.2 (27%), age 1.3 (30%), and age 2.2 (34%). The 10-year MAPE for the set of models used for the 2013 Kasilof sockeye salmon run forecast was 21%.

The sockeye salmon run forecast for the Susitna River is 363,000, which is 20% less than the six-year average run of 452,000. This forecast was derived using mean return per spawner by age class for brood years 2006–2007 and mark–recapture estimates of spawner abundance from 2007 to 2009. Sonar and age composition catch allocation models were not used, because mark–recapture studies have shown that the Yentna sonar project underestimated sockeye salmon escapement, causing estimates of adult returns to also be underestimated. This is the first year this forecast method has been used, so MAPE is not available. The six-year average run (2006–2011) was calculated using mark–recapture estimates of inriver run and genetic estimates of commercial harvests.

The sockeye salmon run forecast for Fish Creek is 61,000, which is 52% less than the 20-year average (127,000). Age-1.2 and -1.3 salmon typically comprise 72% of the run to Fish Creek. A smolt model based upon the estimated abundance of age-1 smolt emigrating from Fish Creek in 2011 (269,000; 12-year average: 438,000) predicted a return of 47,000 age-1.2 salmon. A sibling model based upon the abundance of age-1.2 salmon returning in 2012 predicted a return of 6,200 age-1.3 salmon in 2013. The age-1.2 forecast is 12% less than the 20-year average return (60,000) for this age class, while the age-1.3 forecast is 80% less than the 20-year average return (31,000) for this age class. The predominant age classes in the 2013 run should be age 1.2 (76%) and age 1.3 (10%).

The sockeye salmon run forecast for Crescent River is 110,000, which is equal to the 20-year average run. Age-1.3 and -2.3 salmon typically comprise 63% of the run to Crescent River. Sibling models based upon returns of age-1.2 and -2.2 salmon in 2012 were used to forecast returns of age-1.3 (60,000) and -2.3 (28,000) salmon in 2013. The predominant age classes in the 2013 run should be age 1.3 (54%) and age 2.3 (26%).

-continued-

Run forecasts to individual freshwater systems are as follows:

System	Run	Escapement Goals
Crescent River	110,000	30,000–70,000
Fish Creek	61,000	20,000–70,000
Kasilof River	903,000	160,000–340,000
Kenai River	4,374,000	1,000,000–1,200,000[a]
Susitna River	363,000	NA[b]
Larson Lake	NA	15,000–50,000
Chelatna Lake	NA	20,000–65,000
Judd Lake	NA	25,000–55,000
Unmonitored Systems	872,000	NA
Total	6,683,000	

[a] This is the inriver sockeye salmon escapement goal measured using sonar at river mile 19 on the Kenai River.

[b] Susitna sockeye salmon are managed to achieve escapement goals at Larson, Chelatna and Judd lakes.

Mark Willette, Research Project Leader, Upper Cook Inlet

-continued-

Forecast Area: Upper Cook Inlet
Species: Other Salmon Species

Preliminary Forecast of the 2013 Commercial Harvest

Natural Production	Forecast Estimate (thousands)
Pink Salmon	99
Chum Salmon	152
Coho Salmon	147
Chinook Salmon	9

Forecast Methods

The recent five-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2013. The forecast for pink salmon was based upon the average harvest during the past five odd-numbered years.

Forecast Discussion

The recent five-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

-continued-

Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary forecast of the 2013 run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	279	139–482
Escapement	175	75–415
Commercial Harvest	104	64–67
Supplemental Production		
Total Run	339	113–565
Broodstock	143	137–148
Commercial Harvest	196	0–434
Total Area Production		
Total Run	618	252–1,047
Broodstock and Escapement	318	212–563
Commercial Harvest	300	64–501

Note: Columns may not total exactly due to rounding to the nearest thousand fish.

Note: Commercial Harvest = Total Run–Escapementand refers to fish available for harvest; no prediction of fishing effort is made.

Note: Additional harvests may be expected from systems not included in the forecast.

Forecast Methods

The forecast of wild pink salmon runs to nine harvest areas in the Lower Cook Inlet (LCI) Management area was based on a logarithmic regression of total run and escapement from 39 to 47 years of observations. The total run forecast for LCI natural production was the sum of the nine individual harvest area forecasts. Upper and lower bounds around the total run forecast, however, were derived by multiplying the forecast times the upper and lower values of the percent error ([actual return–forecast return]/actual return) observed during the previous 10 years (excluding 2004). Forecasted commercial harvest ranges from natural production were obtained by subtracting corresponding escapement goals from the upper and lower bounds of the forecast range. The forecasted aggregate escapement was the sum of midpoints from the individual escapement goals minus any expected escapement shortfall. The forecast for supplemental production by the Tutka Bay Lagoon Hatchery was based on a marine survival rate of 3.0% (range: 1.0–5.0%). Projected harvest from supplemental production was obtained by subtracting broodstock goals from the supplemental production forecast.

Forecast Discussion

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

-continued-

In 2011, the last odd-numbered year, four of nine forecasted systems had runs within the forecast range. The 2013 forecast for natural production of 279,000 pink salmon has a forecast range of 139,000 to 482,000 fish. Generally poor parent-year escapements in 2011 and modest return-per-spawner ratios in recent years suggest there is only a fair likelihood of reaching the point estimate of this forecast range. If realized, a natural run of 279,000 pink salmon would be less than one-third of the mean run size of 879,000 fish for odd-year returns between 1963 and 2011. The pink salmon cumulative escapement goal is 337,000 (range 124,000–551,000) for systems with a forecast. If the total run comes in as forecasted, six of nine index streams will not meet the mid-point of the cumulative escapement goal range. The following streams will fall short of their goals by the following number of fish: Humpy Creek (50,700), Port Chatham (8,300), Windy Bay (3,500), Rocky Bay (4,700), Bruin Bay (78,200), and Ursus/Rocky Cove (16,600). The resulting cumulative escapement forecast would then be 175,000 pink salmon.

Four districts make up the LCI management area. The harvestable surplus of naturally produced pink salmon in Southern District is projected to be 40,000 fish, with 28,000 coming from Seldovia and the balance from Port Graham Bay. Humpy Creek is expected to fall short of its escapement goal. Hatchery production of pink salmon in LCI recently resumed after several years of inactivity and the first adult returns are expected to Southern District in 2013. Tutka Bay Lagoon Hatchery is not yet up to full production and is expecting 245,000 pink salmon to return to Tutka Lagoon in 2013. An additional 94,000 fish are forecasted to return to a remote release site in Halibut Cove. The 2013 brood stock goal for the Tutka Hatchery is 131,000 fish. Because cost-recovery requirements are dependent upon inseason fish prices, the allocation of hatchery-produced salmon returns between common property and cost-recovery fisheries cannot yet be determined.

In Outer District, the number of naturally produced pink salmon available for harvest is projected to be 63,000, with all of the harvest expected to occur in Port Dick Subdistrict. If realized, the Port Dick harvest would be less than one-third of the mean odd-year catch since 1963. Port Chatham and Windy and Rocky bays are expected to fall short of their escapement goals.

No pink salmon harvest is expected from Eastern District in 2012. Commercial fishing specifically directed at pink salmon has not been allowed in Eastern District in recent years due to a combination of low production and potential conflicts with the Resurrection Bay Salmon Management Plan, which limits commercial interference with the sport coho salmon fishery.

Poor returns are forecasted for both of the major pink salmon producers in Kamishak Bay District. Escapement shortfalls are expected for Bruin Bay and Ursus and Rocky Cove Subdistricts. Therefore, no commercial harvest of pink salmon is anticipated for Kamishak Bay District in 2013.

Edward O. Otis, Area Finfish Research Biologist, Homer
Glenn Hollowell, Area Finfish Management Biologist, Homer

APPENDIX E: KODIAK

Forecast Area: Kodiak
Species: Pink Salmon

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
KMA Wild Stock Total Run	9.8	6.1–13.5
KMA Escapement Goal[a]	3.0	
KMA Wild Stock Harvest	6.8	3.1- 10.5
Kitoi Bay Hatchery Harvest[b]	10.2	6.9- 13.9
Total KMA Pink Salmon Harvest	17.0	10.0- 24.4

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

[a] The 2013 estimated escapement is within the range of the odd-year aggregate escapement goals for the Kodiak Archipelago (2.0- 5.0 million) and the Mainland District (250,000- 1.0 million).

[b] This figure is the total expected run (10.6 million) minus the broodstock collection goal of 430,000 fish; the Kitoi Bay Hatchery cost recovery harvest is expected to be roughly 1.0 to 2.0 million fish.

The 2013 Kodiak Management Area (KMA) predicted pink salmon harvest is expected to be in the *Strong* category with a point estimate of 17.0 million combining the wild stock and Kitoi Bay Hatchery (KBH) harvest estimates. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest in the KMA from 1978 to 2012.

KMA Harvest Category	Range (millions)	Percentile
Poor	Less than 7.4	Less than 20th
Weak	7.4 to 10.6	21st to 40th
Average	10.6 to 15.3	41st to 60th
Strong	15.3 to 21.5	61st to 80th
Excellent	Greater than 21.5	81st to 100th

Forecast Methods

The KMA wild stock pink salmon harvest forecast is derived from a total run forecast minus the estimated escapement (3.0 million). The total run estimates were derived from a combination of Karluk and Ayakulik weir count, aerial survey index, and harvest estimates.

The 2013 KMA wild stock pink salmon forecast was estimated by calculating the median total run of the pink salmon *cold-cycle* years. The *cold-cycle* years are defined as those years where the overwintering in-gravel development encountered the lower 25% average winter (Nov-Feb) temperatures from 1971 to 2012. Those run years included in the calculation were: 1973, 1975, 1976, 1977, 1990, 1992, 2000, 2001, 2007, 2008, and 2010. The 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data.

The 2013 KBH pink salmon forecast was prepared by evaluating pink salmon survivals from odd brood years 1991 through 2011, when releases from the facility were in excess of 100.0 million fry. Brood years 1996 through 2010 are particularly important to the hatchery forecasting model because all pink salmon fry were released on the same day in order to saturate the release area with

-continued-

fry (predator satiation). This release strategy has proven to significantly improve fry-to-adult survival.

The pink salmon return to KBH is odd-year dominant and exhibits higher than average strength runs every fourth year and average runs in between. The total run estimate of 10.6 million reflects a marine survival of 6.76% and is an average of the previous five cyclical returns (1993, 1997, 2001, 2005, and 2009).

Forecast Discussion

The 2013 KMA wild stock pink salmon total run (9.8 million) will be a below average odd-year run but the predicted strong Kitoi Bay hatchery run should result in the catch reaching the *Strong* KMA harvest category. The cold winter air temperatures in Kodiak (Nov 2011 to Feb 2012) affecting the 2013 wild stock run were the lowest since the 1977 run year temperatures (~27.5°F). Typically the *cold cycle* pink salmon run production is equal to only 60% of the production of all other years. The prediction of a below average wild stock total run is supported by ancillary information provided by the 2012 ADF&G Arnie Shaul Memorial pink salmon fry abundance index estimated in Kodiak area harbors. Arnie Shaul worked as an ADF&G Area Management Biologist on the Alaska Peninsula from 1973 until 2005 and often predicted pink salmon abundance based on prior-year pink salmon fry indices estimated in the nearshore waters. Confidence in the 2013 forecast estimate is good due to the predictability of *cold cycle* pink salmon runs.

The 2013 KBH pink salmon production is expected to be 10.6 million. The brood stock collection goal is 430,000, resulting in a total hatchery harvest projection of about 10.2 million fish. The KBH is operated by Kodiak Regional Aquaculture Association and the board of directors has yet to set a cost recovery goal for 2013, but it is estimated that 1.0 to 2.0 million fish will be harvested for cost recovery. In 2012, 157.0 million fry were released, the highest number since 1993; however, below average water temperatures at Kitoi Lake resulted in late emergence and below average size fry (0.62 g).

The wild stock forecast level should allow an initial weekly fishing period length of 57 hours (2½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2013). By the third week of July, fishing time likely will be restricted, by section or district, to ensure escapement goals will be met.

The majority of the wild stock pink salmon harvest will occur in the NW Kodiak, Alitak, and NE Kodiak districts in 2013. Based on poor brood-year escapement in 2011, poor pink salmon harvests are expected in the Mainland and Afognak districts, with the exception of those sections surrounding the Kitoi Bay Hatchery. Although Eastside escapement levels were strong in 2011, the cold winter is projected to have a much greater impact on those smaller Eastside streams resulting in low anticipated pink salmon harvest in the Eastside District in 2013.

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

-continued-

Forecast Area: Kodiak, Spiridon Lake
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	371	230–512
Escapement Goal	0	
Harvest Estimate	371	230–512

Forecast Methods

The 2013 Spiridon Lake sockeye salmon forecast was prepared by investigating simple linear regression models, utilizing 1999–2010 outmigration-to-return relationships for two age classes and using the median survival applied to the outmigration estimate for a third age class. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with regression models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

Age-2.2 fish were predicted from total freshwater-age-2 smolt outmigration two years prior and age-1.3 fish were predicted from total freshwater-age-1 smolt outmigration three years prior. Age-1.2 fish were predicted by applying the median survival of freshwater age-1 outmigration to the actual outmigration. All other age classes were predicted by calculating the pooled median contribution (2003–2012). The total run forecast was calculated by summing individual and median age class estimates. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

Sockeye salmon are prevented from returning to Spiridon Lake because barrier falls block upstream migrations in the outlet creek (Telrod Creek). Therefore, all returning adult sockeye salmon are available for harvest, primarily in the Central Section of the Northwest Kodiak District and in the Spiridon Bay SHA in Telrod Cove. The point estimate forecast of 371,000 in 2013 is 200,000 more than the actual 2012 run estimate of 171,000. The 2013 run will likely be composed of approximately 59% age-1.2 fish and 22% age-1.3 fish. Confidence in this forecast is good due to the strength of the regression models and performance of last years' model. If realized, this run will be about 157,000 more than the recent 10-year average (2003–2012) run of 214,000 fish. The peak of the Spiridon Lake sockeye salmon run timing through the Westside fishery is typically in July.

Mark Witteveen, Finfish Research Biologists, Kodiak

-continued-

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	602	350–854
Escapement Goal	300	200–400
Harvest Estimate	302	

[a] The escapement estimate is the the midpoint of the combined escapement goals for the early (140,000–280,000) and late runs (60,000–120,000) in 2013.

Forecast Methods

The 2013 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year ocean-age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

The age-.2 sockeye salmon were predicted from prior year age-.1 returns using recent outmigration years (1989–2010). The age-.3 sockeye salmon were predicted from prior year age-.2 returns using recent outmigration years (1988–2009). Age-.1 and -.4 sockeye salmon were predicted by the median return (1990–2012). Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2013 Ayakulik forecast of 602,000 sockeye salmon is about 44,000 more than the actual 2012 run estimate of 558,000. The 2013 run will likely be composed of approximately 52% age-.2 fish and 45% age-.3 fish. If realized, this run will be 243,000 fish more than the recent 10-year average (2003–2012) and the largest since 1999. The confidence in the 2013 Ayakulik forecast is good, due to the strong regression relationships. The projected harvest of 302,000 fish is based on the achievement of the midpoint of the escapement goal range (300,000). Reverting to a historic management strategy, Ayakulik is now managed based on both an early and late run (post July 15). Based on brood-year escapement proportions from what will be the major contributing brood years (2007–2009), approximately 60% of the total run will occur during the early portion (through 15 July).

M. Birch Foster, Finfish Research Biologist, Kodiak

-continued-

Forecast Area: Kodiak, Karluk River
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run	Total Run Estimate	333	132–535
	Escapement Goal[a]	175	110–250
	Harvest Estimate	158	
Late Run	Total Run Estimate	577	236–918
	Escapement Objective[a]	270	170–380
	Harvest Estimate	307	
Total Karluk River System	Total Run Estimate	910	363–1,433
	Escapement Objective[a]	445	280–918
	Harvest Estimate	465	

[a] The escapement estimates are the approximate midpoints of escapement goals for the early (110,000–250,000), late (170,000–380,000), and total combined runs in 2013.

Forecast Methods

The 2013 Karluk River sockeye salmon forecasts were based on recent ocean-age-class outmigration year relationships (1998–2010). Simple regressions were used to model outmigration year ocean age-class relationship and ocean age-class proportions by brood year. Each model was assessed with standard diagnostic procedures. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

The early-run, age-.2 sockeye salmon returns were predicted based on the prior-year return of age-.1 sockeye salmon (adjusted for parent year proportion of age-.2 spawners) using recent outmigration years (2001–2010). The age-.3 sockeye salmon returns were predicted based on the abundance of the prior-year return of age-.2 sockeye salmon (adjusted for parent year proportion of age-.3 spawners) using recent outmigration years (2000–2009). The age-.1 and -.4 return predictions were calculated using their pooled 11-year median contribution.

The late-run age-.2 sockeye salmon returns were predicted based on the prior-year return of age-.1 sockeye salmon (adjusted for parent year proportion of age-.2 spawners) using recent outmigration years (1999–2010) but excluding outlier from 2003. The age-.3 sockeye salmon returns were predicted based on the abundance of the prior-year return of age-.2 sockeye salmon (adjusted for parent year proportion of age-.3 spawners) using recent outmigration years (1998–2009) but excluding outlier from 2001. The age-.1 and -.4 return predictions were calculated using their pooled 11-year median contribution.

-continued-

Regression and median estimates were summed to estimate the total Karluk sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the two runs.

Forecast Discussion

The total 2013 sockeye salmon run to the Karluk River is expected to be approximately 910,000. The early run is expected to be approximately 333,000, which is about 41,000 below the recent 10-year average (375,000) and 97,000 above the 2012 run (236,000). The late run is expected to be approximately 577,000 which is 49,000 below the recent 10-year average (626,000) and 13,000 less than the 2012 run (590,000).

The projected harvest estimate for the early run (158,000) is based on achievement of the early-run S_{MSY} (175,000). The projected harvest estimate for the late run (307,000) is based on achievement of the late-run S_{MSY} (270,000). The majority of both runs is expected to be age-.3 fish which is notable because age-.2 fish normally dominate the Karluk River runs. The 2012 season showed a substantive increase from Karluk River sockeye salmon run's phase of low productivity observed between 2008 and 2011. The 2013 season should demonstrate a similar run magnitude. While the 2012 forecast was excellent, confidence in the 2013 forecast is fair due to the strength of the regression relationships.

Birch Foster, Finfish Research Biologist, Kodiak

-continued-

Forecast Area: Kodiak, Alitak District, Frazer Lake and Upper Station Rivers
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

TOTAL PRODUCTION		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Upper Station River	Total Run Estimate	50	13–87
	Escapementl[a]	25	26–93
	Harvest[b]	25	
Late Upper Station River	Total Run	231	110–351
	Escapement Goal[c]	186	120–265
	Harvest[b]	45	
	Total Run	186	
	Escapement[c]	137	10–362
Frazer Lake	Harvest Estimate[b]	49	95–190
Total Alitak District	Total Run	466	132–799
	Escapement	348	240–448
	Harvest	118	

[a] Alaska Board of Fisheries instituted an optimal escapement goal of 25,000 in 1999. Upper Station Early Run has a BEG of 43,000 to 93,000.

[b] The harvest of Upper Station bound sockeye salmon is concurrent with the harvest of Frazer Lake bound sockeye salmon and predominantly occurs within the Alitak Bay District.

[c] The escapement estimate for the Upper Station late run is the S_{MSY} estimate of the escapement goal (120,000–265,000).

Forecast Methods

The 2013 sockeye salmon run to the Alitak District was forecasted with simple linear regression models using ocean age-class relationships by system from recent outmigration years. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

Upper Station (early and late) age-.2 sockeye salmon were predicted based on the prior year age-.1 returns using recent outmigration years (1998–2010). Upper Station age-.3 sockeye salmon were predicted from prior year age-.2 returns using recent outmigration years (1998–2009). The Upper Station age-.1 and -.4 return predictions were calculated using the pooled 10-year median contributions. Frazer Lake age-.2 returns were predicted based on the prior age-.1 returns using recent outmigration years (1996–2010). The Frazer age-.1, -.3, and -.4 return predictions were calculated using their pooled 15-year median contribution.

Regression and median estimates were summed to estimate the total Alitak District sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and

-continued-

calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted. The combined Alitak District 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the two runs.

Forecast Discussion

The 2013 sockeye salmon run to the Alitak District is expected to be approximately 466,000, which is approximately 310,000 less fish than the recent 10-year average run (776,000) and 180,000 less fish than the 2012 run (646,000). The Upper Station early run is expected to be approximately 50,000, which falls below the recent 10-year average run (94,000). The Upper Station late run is expected to be approximately 231,000, which is also below the recent 10-year average run (298,000). The Frazer Lake run is expected to be approximately 186,000, which is below the recent 10-year average (384,000). The 2013 Alitak District sockeye salmon run should be composed of approximately 58% age-.2 fish, and 34% age-.3 fish. Overall, our confidence in the forecast is fair, based on the strength of the regression models and the large confidence interval.

The projected harvest estimate of 118,000 is based on achievement of optimal escapement goal for Upper Station early run, the S_{MSY} estimate for Upper Station late run, and the S_{MSY} estimate plus an additional 20,000 (20-year median of the number of fish that pass through Dog Salmon but do not ascend the Frazer Lake fish pass) for the Frazer run. S_{MSY} is an estimate of the escapement that has the largest expectation of subsequent surplus production.

Michelle L. Moore, Finfish Research Biologist, Kodiak

APPENDIX F: CHIGNIK

Forecast Area: Chignik
Species: Sockeye Salmon

Preliminary Forecast of the 2013 Run

TOTAL PRODUCTION		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run (Black Lake)	Total Run Estimate	2,767	1,981–3,554
	Escapement Goal[a]	350	350–400
	Harvest Estimate[b]	2,417	
Late Run (Chignik Lake)	Total Run Estimate	1,047	707–1,387
	Escapement Goal[a]	250	250–400
	Harvest Estimate[b]	951	
Total Chignik System	Total Run Estimate	3,814	2,688- 4,941
	Escapement Objective[b]	600	600–800
	Harvest Estimate	3214	
	Chignik Area	2,581	
	Southeastern District Mainland Area	181	
	Cape Igvak Section	452	

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

[a] Targeted escapement and range are the lower bound and range of the 2013 escapement goals for early (350,000–400,000), late (200,000–400,000), and combined (600,000–800,000) runs. An inriver run goal of 50,000 sockeye salmon is added to the lower bound of the late-run escapement goal.

[b] Includes anticipated harvests of Chignik-bound fish in Southeastern District Mainland and Cape Igvak fisheries.

Forecast Methods

Simple linear regressions and generalized Ricker models using age-class relationships, escapement, and environmental data from 1977 to the present were used to forecast the 2013 early- and late- Chignik sockeye salmon runs. Each regression model was assessed with standard regression diagnostic procedures. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

For the early run, simple linear regression of sibling relationships was used to predict age-1.3 and -2.3 sockeye salmon which make up a vast majority of the run. Age-1.3 fish were predicted based on the abundance of age-1.2 fish from the prior year. Age-2.3 sockeye salmon were predicted from age-2.2 fish from the prior year. Remaining age-class components of the run were predicted by calculating median returns since the 1981 outmigration year (7.4% of the run).

The 2013 late run was predicted using ocean-age-class relationship, parental escapement, sea surface temperature anomalies from the Kaplan sea surface temperature model, and precipitation recorded at the Cold Bay Airport. Age-.2 sockeye salmon were predicted from the prior year age-.1 fish using simple linear regression; age-.4 fish were predicted from the prior year age-.3 fish by the same method. A generalized Ricker model was used to predict age-.3 fish from averaged parental escapement corresponding with age-1.3 and -2.3 returns (5- and 6-year-old fish), southern Alaska Peninsula June sea surface temperature anomalies at the time of parental

-continued-

escapement, and Cold Bay precipitation anomalies corresponding with freshwater rearing of age-1.3and -2.3 fish. Remaining age-class components of the run were predicted by calculating median returns since the 1981 outmigration year (0.4% of the run).

The early- and late-run regression and median estimates were summed to estimate the total Chignik River sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the two runs.

Forecast Discussion

The 2013 Chignik sockeye salmon early run is expected to be 2.77 million, which is 1.56 million more than the 10-year average of 1.21 million, and 1.20 million more than the 2012 early run of 1.57 million. The late run is expected to be 1.05 million, which is 102,000 more than the 10-year average of 945,000, but 345,000 less than the 2012 late run of 1.39 million. The total Chignik sockeye salmon run is expected to be 3.81 million, which is approximately 1.66 million more than the 10-year average of 2.16 million and 850,000 more than the 2012 total run.

The projected early-run harvest estimate of 2.42 million is based on achievement of the lower end of the early-run escapement goal range of 350,000. The projected late-run harvest estimate of 797,000 is based on achieving the lower end of the late-run goal of 250,000 plus the in-river run goal of 50,000. Sockeye salmon harvest estimates for both runs include fish harvested in the Chignik Management Area, Chignik-bound fish harvested in the Cape Igvak Section of the Kodiak Management Area, and in the Southeastern District Mainland of the Alaska Peninsula Management Area.

Exploratory analysis using smolt outmigration data and other sibling relationships yielded results similar to this formal forecast. Due to the range of variation in the relationships used in these forecasts, our confidence in them is fair to good.

Adam St.Saviour and Heather Finkle, Finfish Research Biologist, Chignik

APPENDIX G: BRISTOL BAY

Forecast Area: Bristol Bay
Species: Sockeye Salmon

Forecast of the 2013 Run

Total Production	Forecast (millions)	Forecast Range (millions)
Total Run	20.03	17.30–34.76
Escapement	8.5	
Commercial Common Property Harvest	17.53	
Bristol Bay Harvest	16.59	
South Peninsula Harvest	0.94	

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2013 is the sum of individual predictions for nine river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak rivers) and four 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 1972–2009 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. All models were evaluated for time series trends. Models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2010 through 2012.

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 predictions from 2001 through 2012.

Forecast Results

A total of 26.03 million sockeye salmon are expected to return to Bristol Bay in 2013. This prediction is 33% lower than the previous 10-year mean of total runs (39.06 million; range of 24.1–46.60 million), and 20% lower than the long-term mean of 32.38 million. The forecast range is from 17.30 million to 34.76 million. All systems are expected to meet their spawning escapement goals.

A run of 26.03 million sockeye salmon can potentially produce a total harvest of 17.53 million fish if escapement goals are met for managed stocks and industry is capable of taking the surplus fish. The projected harvest includes 16.59 million fish in Bristol Bay and 940,000 million fish in the South Peninsula fisheries. A Bristol Bay harvest of 16.59 million would be 40% lower than the previous 10-year mean harvest (27.63 million; range of 17.22–32.01 million), and 20% lower than the long-term mean of 20.67 million.

The run forecast to each district and river system is as follows: 10.61 million to Naknek-Kvichak District (5.08 million to Kvichak River, 2.08 million to Alagnak River, 3.46 million to Naknek

-continued-

River); 6.06 million to Egegik District; 3.53 million to Ugashik District; 5.25 million to Nushagak District (3.42 million to Wood River, 1.31 million to Nushagak River, 520,000 to Igushik River); and 590,000 to Togiak District (Table G1).

The total run forecast of 26.03 million sockeye salmon is expected to be comprised of 10.12 million age-1.3 fish (39%), 6.38 million age-2.2 fish (25%), 6.10 million age-1.2 fish (23%), 3.37 million age-2.3 fish (13%), 44,000 age-1.4 fish (<1%), and 15,000 age-0.3 fish (<1%) (Table G1).

Forecast Discussion

Prediction or forecasting is very difficult, especially if it is about future salmon returns. We have used similar methods since 2001 to produce the Bristol Bay sockeye salmon forecast. These forecast methods have performed fairly well when looking at the overall Baywide forecast. The forecast in 2012 was 3% above the total run and forecasts since 2001 have averaged 7% below the actual total run. Run forecast differences have ranged from 26% below actual run in 2007 to 21% above actual run in 2011. Forecasted harvests have averaged 2% below actual harvest since 2001 and harvest differences have ranged from 24% below actual harvest in 2009 to 30% above actual harvest in 2011.

There is a much greater amount of uncertainty in our forecasts of returns to individual rivers. Since 2001, on average, we have underforecast the returns to the Alagnak (–37%), Togiak (–19%), Wood (–9%), Kvichak (–5%), and Naknek (–2%) rivers and overforecast returns to Igushik (73%), Egegik (35%), Ugashik (11%), and Nushagak (3%) rivers.

Even though there is large amount of variability around the forecasts to the individual rivers, the overall Bristol Bay 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 Bristol Bay forecast has been more accurate than the individual forecasts.

We anticipate the 2013 run will be dominated by age-1.3 sockeye salmon (39%), followed by age-2.2 (25%), age-1.2 (23%), and age-2.3 (13%) fish. There is always some uncertainty in our forecast of returns by age class. However, we expect the overall uncertainty in 2013 to be similar to what occurred in 2012. Our forecasts were close for age-1.2 (19% forecast compared to 23% observed) and age-2.3 (13% forecast compared to 9% observed) sockeye salmon. We overforecast age-1.3 (41% compared to 28% observed) and underforecast age-2.2 (26% forecast compared to 39% observed) sockeye salmon in 2012.

Historically, total runs of sockeye salmon to Bristol Bay have been highly variable. The 2013 forecast of 26.03 million is below the long-term historical average of 32.38 million (1963–2012), and below the more recent historical average of 39.06 million (2003 to 2012). We had seven consecutive years (2004–2010) where total run was close to or exceeded 40.0 million. In 2011, total run dropped to 31.91 million. We expect the 2013 run to be less than the total run in 2012.

Chuck Brazil, Fred West, and Greg Buck, Bristol Bay Fishery Research Staff, Anchorage

-continued-

Table G1.–Forecast of total run, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay river systems in 2013.

District	Millions of Sockeye Salmon							South Peninsula[a]
	Forecasted Production by Age Class					Forecasted		
River	1.2	2.2	1.3	2.3	Total	Escapement	Harvest	
Naknek-Kvichak								
Kvichak	1.31	1.65	1.39	0.74	5.08	2.54	2.36	0.18
Alagnak	0.50	0.19	1.29	0.10	2.08	1.04[b]	0.96	0.07
Naknek	0.77	0.52	1.61	0.55	3.46	1.10	2.23	0.12
Total	2.57	2.35	4.30	1.39	10.61	4.68	5.55	0.38
Egegik	0.16	3.22	1.18	1.49	6.06	1.10	4.74	0.22
Ugashik	1.59	0.59	1.00	0.35	3.53	0.80	2.60	0.13
Nushagak[c]								
Wood	1.49	0.15	1.70	0.08	3.42	1.00	2.30	0.12
Igushik	0.15	0.02	0.34	0.02	0.52	0.25	0.25	0.02
Nushagak	0.03	0.00	1.20	0.02	1.31[d]	0.50	0.76	0.05
Total	1.67	0.17	3.24	0.11	5.25	1.75	3.31	0.19
Togiak[e]	0.11	0.04	0.41	0.03	0.59	0.18	0.39	0.02
Bristol Bay	6.10	6.38	10.12	3.37	26.03	8.50	16.59	0.94
	23%	25%	39%	13%	100%			

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

[a] The projected harvest accounts for the harvest of Bristol Bay sockeye salmon in the South Peninsula commercial salmon fisheries. The South Peninsula harvest has averaged 3.6% of the total Bristol Bay sockeye salmon production during the last five years.

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

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

[d] Nushagak River forecast includes age-0.3 (15,000) and age-1.4 (44,300) fish.

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

-continued-

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

Forecast of the 2013 Harvest

Total Production	Forecast (thousands)	Forecast Range (thousands)
Commercial Common Property Harvest	45	25–65

Forecast Methods

While it has been our practice to forecast Chinook salmon total return to the Nushagak River and from that, project the anticipated commercial harvest, the total run forecast model has not performed well in recent years. As we did in 2012, we will forgo a total run forecast for 2013 and simply project the commercial harvest for 2013 based on historical performance.

The anticipated commercial harvest of Nushagak River Chinook salmon in 2013 is 45,000 and is projected to range between 25,000 and 65,000. This projection is based on the 10-year historical average harvest and forecasted mean absolute percent error (MAPE; 44%). During this timeframe, actual commercial harvests have ranged between 11,000 and 97,000 Chinook salmon from the Nushagak River.

Various factors account for our inability to accurately forecast future Chinook salmon runs to the Nushagak River. One of the more likely factors is our assessment of escapement using sonar near the village of Portage Creek. The sonar estimates salmon passage in the nearshore area of the river but does not have the ability to detect salmon across the entire river. We believe that our sonar estimate represents true abundance of sockeye salmon which almost exclusively migrate within the counting range of our sonar. Because an unknown portion of migrating Chinook salmon migrate farther offshore, we operate under the premise that our Chinook salmon estimate is an index of abundance. Our assumption has been that we count a consistent proportion of returning Chinook salmon and that this index therefore provides a solid basis from which to forecast. However, the low return of Chinook salmon in recent years and the recent poor performance of the forecast have cast doubt on that assumption. Additional concerns include recent changes made to the sonar equipment and the methods used to apportion counts to salmon species with gillnets. Research begun in 2011 attempts to address some of the uncertainties associated with estimating Chinook salmon abundance. We believe these efforts will eventually improve our ability to assess the total run of Chinook salmon in the Nushagak River and produce reliable forecasts in the future.

Even with the difficulties in assessing and forecasting the total run of Chinook salmon in the Nushagak River, we believe the 2013 run will be large enough to meet the inriver goal and provide for commercial, sport, and subsistence harvest opportunities. The Nushagak River Chinook salmon run was very weak between 2007 and 2010 but has increased in each of the two years since. We expect it to remain at current levels or slightly higher in 2013 based on long-term historical trends. We expect the Nushagak River Chinook salmon run to be comprised of age-1.3 (~42%), age-1.4 (~33%), and age-1.2 (~24%) fish.

Chuck Brazil, Fred West, and Greg Buck, Bristol Bay Fishery Research Staff, Anchorage

APPENDIX H: ALASKA PENINSULA

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

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	328	66–591
Escapement[a]	156	117–195
Harvest Estimate	172	

[a] The escapement estimate is the midpoint of the goal range (117,000- 195,000) in 2013.

Forecast Methods

The 2013 forecast of the Bear Lake sockeye salmon late-run was prepared using simple and multiple linear regressions of ocean-age-classes and environmental data from the past 22 years and median estimates. Models were evaluated with standard regression diagnostics. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10^{th} and 90^{th} percentiles of the data were used to calculate the 80% prediction interval of the median estimates.

Age-.3 sockeye salmon returns were predicted from previous-year age-.2 returns using simple linear regression. Returns of age-.2 sockeye salmon were predicted using a multiple regression of average winter (October through April) air temperatures and October precipitation recorded at the Cold Bay airport. This index encompasses the temperatures from the year of outmigration and the three years prior to outmigration as well as total inches of October precipitation in the year of outmigration. Returns of age-.1 and -.4 sockeye salmon were predicted from median values for each of the age class run estimates using data from the last 22 years.

Regression and median estimates were summed to estimate the total Bear late sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2013 Bear Lake late-run forecast of 328,000 is 122,000 fewer than the 10 year average of about 451,000, but 212,000 more more than the 2012 run of 116,000. Age-2.3 fish predicted to return in 2013 will be the last major year class component of the run that was directly affected by a severe storm in December 2007 which impacted lake rearing conditions on the Alaska Peninsula. Bear Lake remained turbid through the winter and much of the following growing season (H. Finkle, Division of commercial Fisheries Fishery Biologist, ADF&G, Kodiak; personal communication), and juvenile salmon foraging was likely negatively impacted. The projected harvest of 172,000 is based on achieving the midpoint of the escapement goal range (156,000) and adequate run strength as determined by the Area Management Biologist. Based on uncertainty associated with the variable predictive capabilities of ocean age class and environmental relationships, our confidence in this forecast is fair.

Adam St. Saviour, Finfish Research Biologist, Alaska Peninsula

-continued-

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

Preliminary Forecast of the 2012 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	327	179–474
Escapement[a]	100	97–219
Harvest Estimate	227	

[a] The escapement estimate is near the low end of the goal range (97,000- 219,000) in 2013.

Forecast Methods

The 2013 Nelson River sockeye salmon run was forecasted using simple linear regression and generalized Ricker models of ocean-age-class, air temperature, and precipitation data from the past 25 years. Precipitation and air temperature indices were constructed from Cold Bay Airport data. Standard regression diagnostics were used to evaluate each model. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. Age classes that could not be estimated with one of these models were estimated using pooled medians and the 10th and 90th percentiles of the data were used to calculate the prediction interval of the median estimates.

Age-.2 sockeye salmon returns were forecasted with a generalized Ricker model that used parental escapement of dominant age-2.2 fish from 1992 to 2007, December precipitation anomalies corresponding to outmigration year, and temperature anomalies of averaged November air temperatures from the year prior to and the year during outmigration. Both environmental variables were negatively related to age-.2 returns.

Age-.3 sockeye salmon returns were predicted by linear regression of the ratio between age-.3 and -.2 fish (same outmigration year) predicted by an index of the annual average summer (May–September) air temperatures using outmigration years 1986 to 2009. Age-.3 returns were negatively correlated with the average summer air temperature. The remaining age-.1 and -.4 returns were calculated from median estimates for each ocean age class using run data from 1989 to the present.

Regression and median estimates were summed to estimate the total Nelson River sockeye salmon run for 2013. The range was estimated as the overall 80% prediction intervals and calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2013 Nelson River forecast of 327,000 is about 135,000 less than the 10-year average of about 462,000 but 115,000 more than the 2012 run of about 220,000. The 2013 run should be composed mainly of age-.2 and -.3 fish. Age-2.3 fish predicted to return in 2013 will be the last major year class component of the run that was directly affected by a severe storm in December

-continued-

2007, which impacted lake rearing conditions on the Alaska Peninsula. Regression relationships predicting age-.2 and -.3 sockeye salmon are significant and represent the majority of the run. However, the Nelson River sockeye salmon run is notoriously unpredictable, therefore, confidence in this forecast is fair. The projected harvest of 227,000 is based on achieving the lower end (~100,000) of the escapement goal range.

Adam St. Saviour, Finfish Research Biologist, Alaska Peninsula

-continued-

Forecast Area: Alaska Peninsula, South Alaska Peninsula Aggregate
Species: Pink Salmon

Preliminary Forecast of the 2013 Run

TOTAL PRODUCTION	Forecast Estimate(millions)	Forecast Range (millions)
South Peninsula Total Run	7.3	0.5- 14.2
South Peninsula Escapement[a]	1.6	1.6- 3.3
South Peninsula Harvest	5.7	0- 12.6

[a] The escapement estimate is the low end of the aggregate escapement goal (1.6 to 3.3 million) in 2013.

The 2013 South Alaska Peninsula predicted pink salmon harvest is expected to be in the *Average* category with a point estimate of 5.7 (0–12.6) million fish. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest on the South Alaska Peninsula from 1978 to 2012.

S. Alaska Peninsula Pink Salmon Harvest Category	Range (millions)	Percentile
Poor	Less than 3.3	Less than 20th
Weak	3.3 to 5	21st to 40th
Average	5 to 7.2	41st to 60th
Strong	7.2 to 9.3	61st to 80th
Excellent	Greater than 9.3	81st to 100th

Forecast Methods

The South Alaska Peninsula pink salmon harvest forecast is derived from a total run forecast minus the lower end (1.6 million) of the odd-year South Alaska Peninsula escapement goal range. The total run estimates were derived from two variables. The first was the average temperature (measured in Cold Bay) during parent year migration and spawning, and early in-gravel life history (April–November). The second variable was the average Pacific Decadal Oscillation (PDO; a measure of North Pacific climate) during 16 months during parent year spawning through the first year of the pink salmon's life (May–August). For the 2013 South Alaska Peninsula pink salmon forecast, a multiple regression of the average Cold Bay temperature and average PDO versus the South Peninsula pink salmon run from 1985 to 2012 was used to predict the 2013 run. The range was estimated as the 80% prediction intervals based on the error structure of the regression.

Forecast Discussion

The 2013 South Alaska Peninsula pink salmon total run (7.3 million) will be average and the highest since 2007. Environmental conditions used in the model suggest that the early life survival of the 2012 pink salmon run will be slightly above average. The parent year escapement was slightly below average at 2.5 million. Due to a relative lack of strength in the regression model, confidence in the forecast is only fair.

Mark Witteveen, Finfish Research Biologist, Kodiak

APPENDIX I: ARCTIC-YUKON-KUSKOKWIM

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

ADF&G does not produce formal run forecasts for most salmon runs in the AYK Region. The salmon run outlooks presented in this report are qualitative in nature because of a lack of information with which to develop more rigorous forecasts. Consequently, these commercial harvest outlooks are typically based upon available parent year spawning escapement indicators, age composition information, recent year trends and the likely level of commercial harvest that can be expected to be available from such indicators, given the fishery management plans in place. While commercial harvest outlooks provide for a general level of expectation, fisheries management is based on inseason run assessment. A formal forecast of Yukon River fall chum salmon is provided. A Canadian-origin Yukon River Chinook salmon forecast will be made prior to the meeting of US/Canada Yukon River Panel in the spring of 2013.

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

The high seas Bering Arctic Subarctic Integrated Surveys (BASIS) study indicated low abundance of juvenile Chinook salmon in 2009 and 2010, the juvenile years that would contribute to the predominant age classes returning to the river in 2013 (age 6 and 5, respectively). However, the distribution of these fish was more southerly, which is predicted to be advantageous to survival during the salmon's first winter at sea. Chum salmon observed in the BASIS study were of average abundance in 2010, which would correspond to the age-5 returns in 2013. The other primary returning age class, age 4, would have been present in 2011 BASIS surveys; these were estimated as the second highest juvenile chum salmon abundance reported by this survey since 2002. A collaborative effort between ADF&G and NOAA is in progress to test the applicability of BASIS juvenile salmon indices for run size forecasting.

In general, management for anticipated low Chinook salmon abundance, and small processing capacity in some areas, will result in chum salmon harvests that are lower than the outlook projections in the AYK region. Norton Sound has a pink salmon market, but in odd-numbered years run size is greatly reduced resulting in lower harvest as projected.

Appendix Table I1.–The 2013 commercial harvest outlook by management area, in thousands of fish.

Management Area	Salmon Species					
	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	0–3	5–30	30–110	0	100–500	
Kuskokwim Bay	5–10	50–100	40–80	0	60–150	
Kuskokwim Area Total	5–13	55–130	120–240	0	160–650	
Yukon	0	0	40–80	0	500–800	370–600
Norton Sound	0	0	30–60	50–100	40–70	
Kotzebue Sound					225–250	

-continued-

Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2013 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	1,043	920–1,166
Escapement Goal		300–600
Harvest Estimate		470–600

Forecast Methods

The forecast for the 2013 Yukon Area fall chum salmon run is based on run reconstruction of five river systems (Tanana, Chandalar, Sheenjek, Fishing Branch and the mainstem Yukon River in Canada) and four 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 (1974–2006), production from incomplete brood years 2007 and 2008 was estimated based on return per spawner from brood year returns, and an auto-regressive Ricker model was used to predict returns from the 2009 and 2010 parent years.

Predicted returns were multiplied by corresponding average maturity schedules for even and odd-numbered parent years to estimate 2013 run size, and rounded to the nearest thousand fish. The even/odd maturity schedule from 1974 to 2006 was used to estimate the 2013 return. The forecast range is the upper and lower values of the 80% confidence bounds for the total run forecast. Confidence bounds are calculated using deviation of the run projection point estimates and the observed returns from 1987 to 2012.

The 2013 projected run size of fall chum salmon for the Yukon Area is approximately 1,043,000 fish. This projection is average for odd-numbered runs; however, recent runs have fluctuated more widely and have produced runs as low as 380,000 in 2001 to as high as 2.3 million in 2005. The 80% confidence bounds for the 2013 forecast range from 920,000 to 1,166,000 fall chum salmon. If the run materializes as forecasted, abundance would be sufficient to meet escapement goals, including Canadian border passage and harvest sharing objectives, provide an average subsistence harvest, and opportunity for a commercial harvest.

Drainagewide escapements between 300,000 and 600,000 provide a mean yield of 520,000 fall chum salmon. The mean subsistence harvest from 1974 to 2011 for Alaskan subsistence and Canadian aboriginal harvests is 141,000 fall chum salmon. Commercial harvests are prosecuted on the amount above 500,000 based on inseason assessments of run size. ADF&G anticipates a subsistence harvest of about 100,000 fish and commercial harvest to be between 370,000 and 600,000 fish. The preseason forecast will be modified into a projection in mid-July to be used for inseason management based on the relationship to summer chum salmon returns to the Yukon River. The actual harvest will be dependent on inseason assessment of run size, fishing effort and buying capacity, and application to 5 AAC 01.249 Yukon River Drainage Fall Chum Salmon Management Plan.

-continued-

The forecasted total run of 1,043,000 fall chum salmon is expected to be composed of 62% age-4 and 35% age-5 fish. The age-4 component of fall chum salmon runs has varied widely, ranging from 37% (1992) to 94% (2005). Fall chum salmon also exhibit a strong even-odd abundance cycle (averaging 1,000,000 in odd-numbered years and 687,000 in even-numbered years) that was fairly regular between 1974 and 1992. Since 1993 the odd-even abundance relationship has severely deteriorated with wide swings in production that are primarily thought to be due to conditions in the marine environment, although density dependence may have occurred in some brood years. The effect of the odd-even cycle was restricted between 1993 and 2002 during which most years' (1993 and 1997–2002) stocks were severely depressed, with peaks of high production occurring in 1995 and 2005. Age-4 fish contributed greater than 90% (record levels) during the recent runs in 2003 and 2005. However, based on preliminary analysis, the extremely large escapement observed in 2005 only produced an estimated 0.25 return per spawner (R/S).

Forecast Discussion

Point projections for expected returns have been developed since 1987 for fall chum salmon in the Yukon River drainage. Forecast methods were changed to provide ranges around the point estimates beginning in 1999. Additionally, in attempt to reflect poor runs and improvements in some runs, adjustments to the point estimates were made by reducing them by the average ratio of observed to predicted returns through 2005. In 2006 through 2013 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. High and low cycles in production have changed approximately 36-fold (based on 33 brood year returns) with the most drastic fluctuations occurring between brood years 2001 and 2005; therefore, forecasts of run size remain extremely difficult to make.

Since forecasted ranges were established in 1999, 50% of the observed runs were within the range, 29% were below, and 21% were above. Returns of age-4 fish in odd-numbered years are typically 17% higher than even-numbered years. Sibling relationships for this stock are weak. However, the analysis is predicting an above average return of age-5 fish. The age-4 component is returning from an escapement above the midpoint of the drainagewide goal in 2009, while the age-5 escapement exceeded the upper end of the drainagewide goal in 2008. Production levels are estimated to be 1.71 R/S (age 5) and 1.85 R/S (age 4), a continued improvement from the low R/S observed in 2005. The 2013 point estimate of 1,043,000 will be dominated by age-4 component; however, age-5 is forecasted to make up more than a third of the run. The upper end of the forecasted run size of 1,166,000 would provide for a commercial harvest of up to approximately 600,000.

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