Special Publication 14-10

Run Forecasts and Harvest Projections for 2014 Alaska Salmon Fisheries and Review of the 2013 Season

Edited by

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and

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April 2014

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	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

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

SPECIAL PUBLICATION 14-10

RUN FORECASTS AND HARVEST PROJECTIONS FOR 2014 ALASKA SALMON FISHERIES AND REVIEW OF THE 2013 SEASON

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April 2014

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.

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This document should be cited as:

Munro, A. R., and C. Tide, editors. 2014. Run forecasts and harvest projections for 2014 Alaska salmon fisheries and review of the 2013 season. Alaska Department of Fish and Game, Special Publication No. 14-10, Anchorage.

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DEFINITION OF TERMS

Biological escapement goal	The number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum yield (human use). This determination is based on biological information about the fish stock in question. (Also see: optimum escapement goal.)
Commercial harvest	Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery (see below) and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.
Commercial common property harvest	Harvests taken by traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and sale of confiscated fish.
Common property harvest	Harvests taken by the commercial common property fisheries (see above), as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost recovery harvests.
Cost recovery harvest	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
Enhancement of runs	Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques.
Escapement, spawning population, or brood stock	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.
Harvest projections or harvest outlooks	Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts, when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.
Optimum escapement goal	The number of salmon in a particular stock that should be allowed to spawn to achieve sustainable runs based on biological needs of the stock, as well as consideration of social and allocative needs.
Run forecast	Forecasts of a run (harvest + escapement) are estimates of the fish that will return in a given year based on such information as parent-year escapements, subsequent fry abundance, and spring seawater temperatures. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.
Salmon run	Run refers to the total number of mature fish returning in a given year from ocean-rearing areas to spawn.
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 2013 commercial salmon season as well as run forecasts and harvest projections for 2014. The Alaska all-species salmon harvest for 2013 totaled 282.9 million, which was about 104.1 million more than the preseason forecast of 178.8 million. This combined harvest was composed of 323,394 Chinook salmon *Oncorhynchus tshawytscha*, 29.5 million sockeye salmon *O. nerka*, 5.8 million coho salmon *O. kisutch*, 226.3 million pink salmon *O. gorbuscha*, and 21.0 million chum salmon *O. keta*. The Alaska Department of Fish and Game is expecting a large decrease in commercial salmon catches in 2014 due to the projected decrease in pink salmon harvests. The 2014 total commercial salmon catch (all species) projection of 132.6 million is expected to include 79,000 Chinook salmon in areas outside Southeast Alaska and Bristol Bay, 33.6 million sockeye salmon, 4.4 million coho salmon, 74.7 million pink salmon, and 19.9 million chum salmon. The projected pink salmon harvest is about 67% lower than the harvest experienced in 2013 (226.3 million). The projected sockeye salmon harvest is about 14% higher than the harvest in 2013. The projected chum salmon harvest is expected to be 6% lower than the harvest in 2013.

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 2014 as well as a detailed review of Alaska's 2013 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 decrease in commercial salmon catches in 2014 due to the projected decrease in pink salmon harvests. The 2014 total commercial salmon catch (all species) projection of 132.6 million is expected to include 79,000 Chinook salmon in areas outside Southeast Alaska and Bristol Bay, 33.6 million sockeye, 4.4 million coho, 74.7 million pink, and 19.9 million chum salmon. The projected pink salmon harvest is about 67% lower than the harvest experienced in 2013 (226.3 million). The projected sockeye salmon harvest is about 14% higher than the harvest in 2013. The projected chum salmon harvest is expected to be 6% lower than the harvest in 2013.

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 2014 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		962	2,687	22,000	2,357	28,006
Hatchery Production[a]					9,430	9,430
Southeast Region Total	[b]	962[c]	2,687	22,000	11,787	37,435
Prince William Sound						
Natural Production	33	1,513[d]	232[e]	3,140	245	5,163
Hatchery Production[f]		2,031	335	30,174	2,664	35,205
Upper Cook Inlet	8[c]	4,300	165[c]	338[c]	170	4.981
Lower Cook Inlet						
Natural Production	0[c]	60[c]	2	182	62[c]	306
Hatchery Production		94[g]		402		496
Bristol Bay		17,920	85[c]	535[h]	921[c]	19,461
Central Region Total	41	25,918	820	34,771	4,062	65,611
Kodiak						
Natural Production	22[c]	1,817[i]	117[c]	12,000[j]	709[c]	14,666
Hatchery Production		495[k]	128	2,500[g]	126	3,250
Chignik[l]	5	1,097	82	762	287	2,234
South Peninsula & Aleutians	7[c]	1,834[c]	189[c]	2,294[m]	1,005[c]	5,329
North Alaska Peninsula	2[c]	1,415[n]	43[c]	22[h]	215[c]	1,696
Westward Region Total	37	6,658	560	17,578	2,342	27,175
Arctic-Yukon-Kuskokwim Region Total	2	83	295	375	1,673	2,427
Statewide Total	79	33,620	4,361	74,725	19,863	132,648

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 Fisheries 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 2014. Release of the 2014 Chinook salmon quota for Southeast Alaska is expected in early April.

[c] Average harvest for the 5-year, 2009–2013 period.

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

[e] Five-year average harvest (2009–2013) 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 even-year harvests, 2004–2012 period.

[i] Total Kodiak harvest of 1.818 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 750,000 fish.

[j] See formal pink salmon forecast.

[k] Hatchery projections made by Kodiak Regional Aquaculture Association. Sockeye salmon hatchery projections include Kodiak Regional Aquaculture Association projections (105,000); enhanced Spiridon sockeye salmon run harvest forecast (391,000) was developed by ADF&G staff.

[l] Chignik Chinook, coho, pink, and chum salmon harvests based on 5-year (2009–2013) average harvests; 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 four even-year harvests, 2006–2012 period.

[n] Five-year average (2009–2013); sockeye salmon includes formal forecasts for Bear late run (219,000), Nelson stocks (365,000).

The Alaska all-species salmon harvest for 2013 totaled 282.9 million, which was about 104.1 million more than the preseason forecast of 178.8 million. This combined harvest was composed of 323,394 Chinook, 29.5 million sockeye, 5.8 million coho, 226.3 million pink, and 21.0 million chum salmon. Table 2 shows 2013 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 2013 harvest by species and area.

Table 2.–Preliminary 2013 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	241[a]	975	3,864	94,787	12,578	112,444
Prince William Sound	11	2,339	609	92,463	4,070	99,492
Upper Cook Inlet	5	2,683	261	48	139	3,137
Lower Cook Inlet	0	170	6	2,099	54	2,329
Bristol Bay	19	15,376	135	1	872	16,402
Central Region Total	35	20,568	1,011	94,611	5,135	121,360
Kodiak Area	34	2,574	269	28,192	794	31,863
Chignik	3	2,398	32	872	155	3,460
South Peninsula and Aleutians	7	2,235	293	7,799	947	11,281
North Peninsula	1	721	27	5	131	886
Westward Region Total	44	7,928	622	36,868	2,026	47,489
Arctic-Yukon-Kuskokwim Region Total	3	52	277	8	1,285	1,624
Total Alaska	323	29,523	5,773	226,274	21,024	282,917

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2012–September 30, 2013, catch accounting period.

Table 3.–Preliminary 2013 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	3,225[a]	5,870	23,467	305,236	98,078	435,875
Prince William Sound	185	14,193	4,831	256,364	30,205	305,777
Upper Cook Inlet	75	16,794	1,603	154	1,035	19,661
Lower Cook Inlet	4	922	32	6,463	405	7,826
Bristol Bay	346	92,259	810	2	5,578	98,994
Central Region Total	610	124,168	7,276	262,982	37,222	432,259
Kodiak Area	255	14,814	1,779	89,159	6,221	112,227
Chignik	37	17,056	226	2,610	1,194	21,124
South Peninsula and Aleutians	79	13,256	1,868	24,304	6,814	46,321
North Peninsula	7	4,057	230	15	985	5,294
Westward Region Total	378	49,183	4,103	116,088	15,213	184,965
AYK Region Total	44	330	2,057	24	8,711	11,166
Total Alaska	4,256	179,551	36,902	684,330	159,225	1,064,265

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2012–September 30, 2013, 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 2013 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.

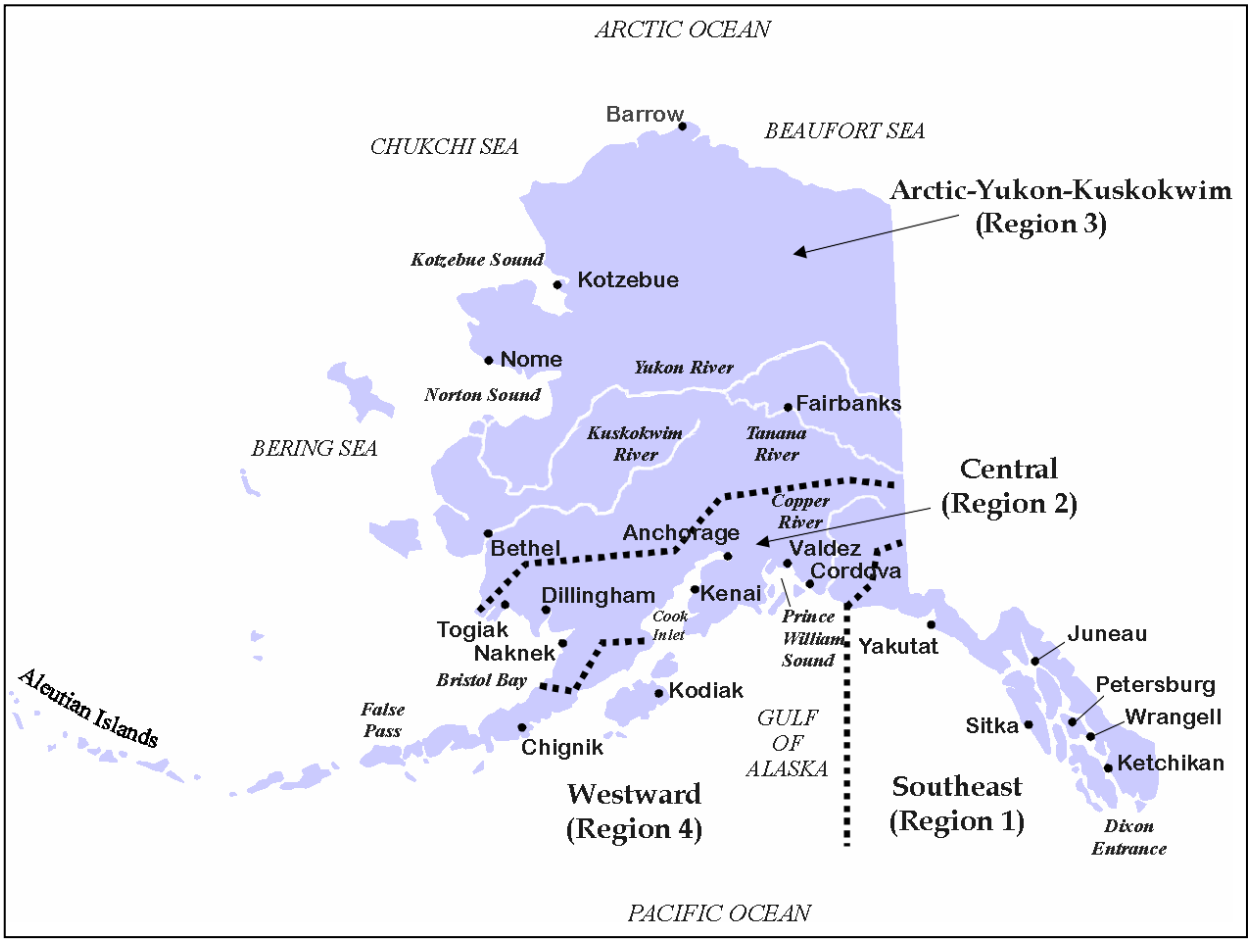

Figure 1.–The four ADF&G fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Division of Commercial Fisheries.

PRELIMINARY REVIEW OF THE 2013 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

Region I salmon harvests totaled 112.4 million salmon and an estimated 435.9 million pounds in 2013 (Tables 2 and 3). The initial estimate of exvessel value based on prices reported on fish tickets is $238.1 million; however, this estimate is expected to increase following Commercial Fisheries Entry Commission analysis when Commercial Operator's Annual Reports are submitted by fish buyers. The total harvest in 2013 was 218% of the recent 10-year average harvest of 51.6 million fish, and 287% of the long-term average harvest since 1962 of 39.2 million fish. The cycle of strong odd-year and weak even-year pink salmon returns that began in 2006 persisted in 2013. The overall 2013 harvest in numbers of fish ranked as the largest of the 52 years since 1962. Average fish weights in 2013 were similar to 2012 for sockeye, pink, Chinook, and coho salmon. Chum salmon average weights decreased by 14% compared with the previous season. Total harvests included 241,000 Chinook, 975,000 sockeye, 3,864,000 coho, 94,787,000 pink, and 12,578,000 chum salmon. The proportional harvest composition by species included <1% Chinook, 1% sockeye, 3% coho, 84% pink, and 11% chum salmon. With generally high prices and a record pink salmon harvest, the preliminary exvessel value of $238 million for common property fisheries for 2013 ranks first among Commercial Fisheries Entry Commission reported values from 1985 to 2013. A total of 1,917 limited entry permit holders participated in the 2013 salmon fisheries, an increase of 1% from the 2012 season.

CHINOOK SALMON

The regional Chinook salmon harvest was 241,000 for the catch accounting year beginning with the winter troll fishery on October 1, 2012 and ending with the summer troll fishery on September 30, 2013. Chinook salmon averaged 13.4 pounds. This harvest was below both the long-term average harvest (299,000) and the recent 10-year average harvest (347,000). In 2013 the all-gear treaty Chinook salmon quota for Southeast Alaska was 176,000, 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 130,000 for the troll fishery, 7,600 for the purse seine fishery, 6,100 for drift and set gillnet fisheries, and 32,000 for the sport fishery. Preseason forecasts were not sufficient to allow directed fisheries on Chinook salmon from the Stikine and Taku rivers. Chinook salmon produced by Alaska hatcheries are targeted in spring troll fisheries (along with treaty fish) in terminal area fisheries by seine, gillnet, and troll gears, and are harvested for hatchery cost recovery. The total regional Chinook salmon harvest of 241,000 apportioned by commercial fisheries included 62% to troll gear, 15% to drift gillnet gear, 12% to hatchery cost recovery, and 10% to purse seine gear (Table 4). The troll harvest of 150,000 included 27,000 during the winter season, 38,000 during the spring season, and 85,000 during the summer season. The initial estimated exvessel value of the Southeast Alaska region Chinook salmon harvest is $15 million based on harvests of 3.2 million pounds and an average price of $4.66/lb. Chinook salmon escapement goals were met or exceeded for 7 of the 11 stocks that have escapement goals.

SOCKEYE SALMON

The 2013 sockeye salmon harvest of 1.0 million was below the long-term and recent 10-year average harvests of 1.3 million. Sockeye salmon averaged 6.0 pounds. Regional harvests included 456,000 (47%) by drift gillnet fisheries, 282,000 (29%) by purse seine fisheries, 168,000 (17%) by Yakutat set gillnet fisheries, and 50,000 (5%) by hatchery cost recovery fisheries (Table 4). Sockeye salmon contributed an estimated $9.6 million to the initial regional exvessel value based on a harvest of 5.9 million pounds and an average price of $1.63/lb. Sockeye salmon escapement goals were met or exceeded for 8 of the 13 stocks that have escapement goals.

COHO SALMON

The 2013 coho salmon harvest was 3.9 million, making it the second largest since statehood. Coho salmon averaged 6.1 pounds. This harvest was above the long-term average harvest of 2.1 million and the recent 10-year average harvest of 2.5 million. Troll fisheries harvested 2.4 million coho salmon (62%), followed by purse seine (14%), drift gillnet (11%), hatchery cost recovery (7%), and Yakutat set gillnet (4%; Table 4). The initial exvessel value for the coho salmon harvest was $32.7 million, based on harvests of 23.5 million pounds and an average price of $1.39/lb. Coho salmon escapement goals were met or exceeded for 12 of the 13 stocks that have escapement goals.

PINK SALMON

The 2013 pink salmon harvest of 94.8 million established a record high for Southeast Alaska. Pink salmon averaged 3.2 pounds. The preseason ADF&G harvest forecast for 2013 was 54 million, with an 80% confidence interval range of 42–67 million. The Southeast Alaska purse seine fishery accounted for 94% of the regional pink salmon harvest, Annette Island Reservation fisheries harvested 3%, and the drift gillnet fishery harvested 2%. Seine harvest distribution included 39.3 million pink salmon in northern districts and 49.4 million in southern districts (Table 4). Based on an average price of $0.41/lb and 305.2 million pounds harvested, the initial exvessel value for pink salmon harvested by all gear groups was $125.0 million. Pink salmon were the most valuable species for the Southeast Alaska region in 2013, contributing 53% of the overall salmon value for the region. Of the three subregional biological escapement goals (BEG), all were met or exceeded. Of the 46 stock groups in the region, 31 groups exceeded, 14 groups met, and 1 group was below management target ranges.

CHUM SALMON

The total commercial chum salmon harvest was 12.6 million in 2013, making it the sixth largest since statehood. The harvest was above the recent 10-year average (10.3 million) and the long-term (1962–2011) average harvest (5.6 million). Chum salmon averaged 7.8 pounds. Major harvests included 5.8 million (46%) in common property purse seine fisheries, 3.4 million (27%) in drift gillnet fisheries, 2.1 million (17%) in hatchery cost recovery harvests, and 1.1 million (8%) in troll fisheries (Table 4). A total of 82% of the chum salmon harvest took place in common property fisheries in either traditional areas or terminal harvest areas. The regional chum salmon harvest of 12.6 million was below the projected harvest of around 13.5 million—based on forecasts by the major hatchery operators of 10.8 million plus an allowance of around 2.7 million (20%) expected for wild production. Based on an average fish ticket price of $0.57/lb

and 98.1 million pounds landed, the initial exvessel value of chum salmon harvested by all gear groups was $55.8 million. Of the three subregional summer chum salmon Sustainable Escapement Goals (SEG), only the Northern Southeast Outside subregion was below the lower bound. Of five fall chum salmon index systems, three were within and two were below SEG ranges.

Table 4.–Preliminary 2013 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

	Species					
Fishery	Chinook[a,b]	Sockeye	Coho	Pink	Chum	Total
Purse Seine						
Southern Purse Seine Traditional	5	167	326	49,297	1,144	50,938
Northern Purse Seine Traditional	2	101	206	38,676	1,645	40,629
Hatchery Terminal	18	14	14	791	3,014	3,851
Total Purse Seine	25	282	546	88,764	5,802	95,419
Drift Gillnet						
Tree Point	2	55	106	693	232	1,088
Prince of Wales	2	49	161	475	94	781
Stikine	11	21	44	116	103	294
Taku-Snettisham	1	138	51	123	726	1,040
Lynn Canal	1	114	68	67	1,248	1,497
Drift Gillnet Hatchery Terminal	17	80	13	190	1,020	1,319
Total Drift Gillnet	35	456	442	1,664	3,422	6,019
Set Gillnet (Yakutat)	1	168	158	67	1	397
Troll						
Hand Troll						
Traditional	7	0	169	18	14	208
Hatchery Terminal	0		2	1	3	6
Spring Areas	5	0	3	4	12	24
Total Hand Troll	12	0	174	23	29	238
Power Troll						
Traditional	104	4	2,178	576	633	3,495
Hatchery Terminal	1	0	16	12	75	104
Spring Areas	33	1	24	73	318	449
Total Power Troll	138	5	2,218	661	1,026	4,048
Total Troll	150	5	2,392	685	1,055	4,286
Annette Island Reservation						
Seine	0	4	8	2,138	38	2,187
Drift Gillnet	1	7	41	440	145	634
Troll	0	0	2	0	0	2
Hand Troll	0	0	0	0	0	0
Power Troll	0		2	0	0	2
Trap						
Total Annette Island Reservation	1	11	50	2,578	182	2,823
Hatchery Cost Recovery	30	50	272	968	2,100	3,420
Miscellaneous[c]	0	2	4	60	14	81
Southeast Region Total	241	975	3,864	94,787	12,578	112,444

Note: Missing data indicates no harvest, and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

[a] Chinook salmon adults and jacks are totaled.

[b] Catch accounting period for the 2013 Chinook salmon season goes from October 1, 2012, to September 30, 2013.

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

CENTRAL REGION

PRELIMINARY 2013 PRINCE WILLIAM SOUND SALMON SEASON SUMMARY

The following is an overview of the 2013 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. Pink salmon harvest totals in particular are reflective of inseason reporting of inaccurate average weights. Postseason analysis of pink salmon harvest data will result in the upward revision of 2013 pink salmon harvest totals, which will be reported in the 2013 Prince William Sound Area Finfish Management Report.

The 2013 PWS Area commercial salmon harvest was 99.5 million. Harvest was composed of 92.5 million pink, 2.3 million sockeye, 4.1 million chum, 609,000 coho, and 10,900 Chinook salmon. The 2013 harvest was composed of 94.8 million (95%) commercial common property fishery (CPF), and 4.7 million (5%) hatchery cost recovery and broodstock fish.

Gillnet Fisheries

Copper River District

The 2013 preseason commercial harvest forecast for the Copper River District was 14,000 Chinook, 1.3 million sockeye, and 240,000 coho salmon. Gulkana Hatchery was expected to contribute 230,000 sockeye salmon to the CPF harvest. The commercial salmon fishing season in the Copper River District began on Thursday, May 16. The sockeye salmon harvest of 1.6 million was more than 1.2 times the previous 10-year (2003–2012) harvest average (1.3 million). The proportion of wild and enhanced sockeye salmon in the Copper River District CPF harvest is not available at this time. The CPF harvest of 9,000 Chinook salmon was below the previous 10-year (2003–2012) average harvest of 25,000. The coho salmon commercial harvest of 245,000 was above the previous 10-year (2003–2012) average harvest of 241,000. The inriver goal for salmon passing the Miles Lake sonar site was 728,000–1,120,000 salmon. Preliminary estimates of inriver Chinook salmon abundance indicate that escapement should be above the SEG threshold. The 2013 preliminary sonar escapement estimate was 1.27 million salmon. Spawning escapement to Copper River delta systems based on aerial survey indices was 74,000 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 38,000, which 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 the recent trend in poor annual escapement. Inseason aerial survey escapement estimates above the anticipated goal for the week ending June 15 led to the opening of the district to sockeye salmon fishing on June 13. The district only opened once during the next statistical week due to higher than anticipated harvest and minimal surplus indicated by the first aerial survey. Starting with the second aerial survey, sockeye salmon escapement trended above anticipated and the district remained open for the remainder of the season concurrent with the Copper River District fishery. No fishing effort was reported in the district between the third fishing period (June 24) until the beginning of the coho salmon fishery in mid-August. The coho salmon commercial harvest of 47,000 was below the previous 10-year (2003–2012) harvest average (50,000). The aerial

escapement index of 22,000 sockeye salmon was within the new SEG range (15,000–33,000). Aerial surveys of coho salmon produced an escapement index of 19,000, which was within the SEG range (13,000–33,000).

Coghill District (Drift Gillnet)

Prince William Sound Aquaculture Corporation (PWSAC) forecasted a run of 2.5 million chum salmon to Wally Noerenberg Hatchery in 2013. Approximately 380,000 chum salmon (15%) of the forecasted run were designated for corporate cost recovery and broodstock. The drift gillnet CPF harvest of chum salmon in the Coghill District was 2.1 million fish. PWSAC harvested 761,000 chum salmon for corporate cost recovery and broodstock. The total drift gillnet CPF harvest of sockeye salmon in the Coghill District was 94,000. The proportion of wild sockeye salmon in the Coghill District CPF harvest was 37%. Pink salmon drift gillnet CPF harvest in the Coghill District was 2.5 million. The proportion of wild pink salmon in the Coghill District CPF harvest was 12%. The total drift gillnet CPF harvest of coho salmon in the Coghill District was 63,000, the majority of which were likely enhanced from Wally Noerenberg Hatchery.

The Coghill River weir passed 17,231 sockeye salmon, which was below the SEG range (20,000–60,000). High water conditions resulted in partial removal of the weir for a short period of time and high pink salmon passage rates decreased the accuracy of sockeye salmon identification at the weir. Both of these factors likely resulted in an overall sockeye salmon count that was less than what actually escaped into Coghill Lake.

Eshamy District

The department's preseason forecast for Eshamy Lake was 53,000 wild sockeye salmon and PWSAC forecasted a run of 1.1 million Main Bay Hatchery enhanced sockeye salmon. The CPF harvest of sockeye salmon in the Eshamy District was 540,000, which was below the 10-year average (721,000). The proportion of wild sockeye salmon in the Eshamy District CPF harvest was 80%. PWSAC harvested 86,000 sockeye salmon to meet broodstock requirements, 77,000 of which were jacks culled during the egg-take process. 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 BEG range for Eshamy Lake is 13,000–28,000.

Unakwik District

The department's preseason harvest forecast for the Unakwik District was 5,700 sockeye salmon. Unakwik District drift gillnet CPF harvest was 800, which was below the 10-year average (6,600).

Montague District, Port Chalmers Subdistrict

PWSAC forecasted a run of 634,000 chum salmon to the Port Chalmers remote release site in 2013. The drift gillnet gear group had access to the Port Chalmers Subdistrict in 2013 under the Prince William Sound Management and Salmon Enhancement Allocation Plan. CPF drift gillnet harvest of chum salmon in the Montague District was 484,000. The harvest was close to the 5-year (2008–2012) CPF average (516,000). The proportion of wild chum salmon in the Port Chalmers Subdistrict CPF harvest was 5%.

Purse Seine Fisheries

Coho Salmon

The Valdez Fisheries Development Association (VFDA) coho salmon run was anticipated to be 127,000. VFDA's broodstock objective was 1,000. Total commercial purse seine harvest of coho salmon in PWS was 222,000. The majority of CPF coho salmon harvested in the Eastern (159,000), Coghill (7,600), and Southwestern (48,000) districts are assumed to be of enhanced stock origin.

Pink Salmon

The 2013 pink salmon total run forecast for PWS was 40.7 million. This estimate included 6.2 million wild fish, 13.8 million VFDA hatchery fish, and 20.7 million PWSAC hatchery fish. Approximately 2.4 million (12%) of the 20.7 million pink salmon return forecast to the PWSAC hatcheries was projected for cost recovery and broodstock, with the remaining 18.3 million PWSAC fish expected to be available for CPF harvest. Approximately 2.9 million (21%) of the projected 13.8 million pink salmon return forecast to VFDA's Solomon Gulch Hatchery were projected for cost recovery and broodstock. The remaining 10.9 million VFDA fish were expected to be available for CPF harvest. A total harvest of 4.8 million wild stock pink salmon was forecasted for CPF harvest in PWS, leaving 1.45 million for escapement.

The commercial purse seine harvest of 85.9 million pink salmon was the largest PWS purse seine pink salmon harvest on record. Total harvest was 92.5 million, including 3.9 million (1.8 million for PWSAC and 2.1 million for VFDA) for hatchery cost recovery and broodstock. The proportion of wild stock pink salmon in PWS commercial CPF harvest totals was 18.4%.

For the 2013 season, inseason pink salmon aerial survey escapement estimates were above anticipated escapement thresholds in most districts for most of the season. This allowed for targeted fishing effort on wild pink salmon and expanded time and area for targeted fishing effort on enhanced pink salmon. The area-under-the-curve estimate of pink salmon escapement used for direct comparison with the SEG goals is 4.7 million, which is above the odd-year SEG range (994,000–2,281,000) for all districts.

Chum Salmon

The 2013 chum salmon total run forecast for PWS was 3.6 million. The majority of the forecasted return, 3.2 million (89%), was projected to be of PWSAC hatchery origin. Of these PWSAC hatchery origin chum salmon, 306,000 were forecasted to return to Armin F. Koerning Hatchery. All other enhanced chum salmon were expected to be harvested in gillnet fisheries.

Based on the department's wild chum salmon forecast of 512,000, there was a preseason expectation for the potential CPF harvest of 312,000 wild stock chum salmon in PWS, leaving 200,000 for escapement. The preseason forecast for total chum salmon CPF harvest in PWS was 3.1 million.

Chum salmon commercial purse seine harvest in PWS was 488,000. Total chum salmon harvest was 4.1 million, including 761,000 for hatchery cost recovery and broodstock. This total harvest was 939,000 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 from June 1 through July 21 resulted in purse seine harvest totals of 221,000. Total chum salmon harvest in

the Southwestern District in 2013 was 275,000. From July 11 to July 21, CPFs targeting predominantly enhanced chum salmon in the Coghill District resulted in purse seine harvest totals of approximately 70,271. The proportion of wild chum salmon in the Southwestern and Coghill districts CPF harvest totals was 2.1%. CPFs targeting predominately wild pink and chum salmon in the Eastern and Southeastern districts resulted in harvest totals of 94,300 in the Eastern district and 41,000 in the Southeastern district. CPFs targeting predominately enhanced pink salmon in the Northern District resulted in a chum salmon harvest total of 6,300.

COOK INLET

Lower Cook Inlet

The preliminary estimate of the 2013 Lower Cook Inlet Area commercial salmon harvest based on current fish ticket data is 2.3 million salmon. The harvest was composed of 2.1 million pink, 170,000 sockeye, 54,000 chum, 5,600 coho, and 391 Chinook salmon. The harvest was comprised of 2.2 million (89%) commercial CPF fish, and 118,000 (5%) hatchery cost recovery fish. An additional 152,000 (6%) fish were harvested for broodstock, bringing the overall harvest to 2.5 million.

Southern District

The 2013 preseason commercial common property harvest forecast for natural production in the Southern District was 1,100 sockeye and 40,000 pink salmon. As a result of cost recovery requirements, hatchery releases from previous years at Leisure Lake, Hazel Lake, Tutka Bay, Port Graham and English Bay were not anticipated to contribute to the 2013 commercial common property harvest. The commercial salmon fishing season in the Southern District began on Monday, June 3. The CPF purse seine harvest for the 2013 season was 140 Chinook, 28,032 sockeye, 1,902 coho, 33,288 pink and 265 chum salmon. This compares to a previous 10-year harvest average of 103 Chinook, 83,869 sockeye, 913 coho, 34,681 pink, and 263 chum salmon. The set gillnet harvest was 250 Chinook, 38,393 sockeye, 3,616 coho, 1,961 pink, and 2,698 chum salmon. The previous 10-year harvest average for this gear type is 427 Chinook, 26,941 sockeye, 1,128 coho, 4,086 pink and 1,906 chum salmon. In addition, 18,462 sockeye and 48,017 pink salmon were harvested by Cook Inlet Aquaculture Association (CIAA) from the Tutka Bay special harvest area (SHA) for cost recovery purposes. Preliminary estimates show that pink salmon escapement in index streams was within the cumulative SEG range of 59,700–178,500 fish. The weir at the English Bay River passed 12,910 sockeye salmon, 2,006 of which were removed for broodstock (1,753) and otolith samping (253), leaving 10,904 as the spawning escapement. This was within the SEG (6,000–13,500) for this system.

Outer District

The 2013 preseason commercial harvest forecast for the Outer District was 10,200 sockeye, 63,000 pink, and 47,100 chum salmon. The commercial salmon fishing season began in this district on Monday, July 22. Overall harvest from 11 permit holders was 119 sockeye, 2.0 million pink and 49,062 chum salmon. This harvest compares to previous 10-year averages of 12,451 sockeye, 372,368 pink and 28,899 chum salmon and is the largest on record for pink salmon from this district. The next largest occurred in 1979 where 62 permit holders harvested 1.9 million pink salmon. Preliminary escapement survey indices for chum salmon were above the midpoint of the SEG range (12,850–34,600). Pink salmon were above the upper end of their SEG range (54,500–237,200). Aerial surveys of Desire Lake documented 8,400 sockeye salmon.

This is below the SEG range (8,800–15,200) for Desire Lake. The Delight Lake weir counted 5,961 sockeye salmon. This is below the SEG range (7,500–17,650) for this system.

Eastern District

Due to minimal returns in the last 10 years, no wild stock sockeye or pink salmon were forecast to be available for commercial common property harvest from the Eastern District in 2013. CIAA forecasted a total return of 70,666 sockeye salmon to Resurrection Bay facilities. Total harvest from this district was 43,443 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 71,019 sockeye salmon for common property and cost recovery harvests combined from Resurrection Bay. Escapement through the weir at Bear Creek (12,605) was sufficient to meet the desired inriver return of 5,620–13,220 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. Aerial surveys of Aialik Lake documented an escapement of 3,530 sockeye salmon, falling 170 below the SEG range (3,700–8,000) for this system.

Kamishak Bay District

The 2013 preseason commercial forecast for the Kamishak Bay District was 77,000 sockeye and 37,400 chum salmon. CIAA forecasted a return of 21,675 sockeye salmon to the Kirschner Lake remote release site—all of which would be required for cost recovery. Total common property harvest from this district was 33,154 sockeye, 314 pink and 2,357 chum salmon. In addition, 8,288 sockeye salmon were harvested by CIAA from the Kirschner Lake SHA for cost recovery purposes. This compares to a previous 10-year average of 70,343 sockeye, 26,947 pink and 53,445 chum salmon harvested in the CPF. Preliminary escapement survey indices show escapement levels slightly below the lower end of the SEG ranges for chum (65,550–141,600), and pink (25,950–203,400) salmon. Video enumeration at Chenik Lake documented 11,333 sockeye salmon, which is within the SEG range (3,500–14,000) for this lake. Video documentation of returns to Mikfik Lake for sockeye salmon counted 4,042, which is below the SEG range (6,300–12,150) for this lake.

Upper Cook Inlet

The 2013 Upper Cook Inlet (UCI) commercial harvest of 3.1 million salmon was approximately 23% less than the recent 10-year average annual harvest of 4.0 million. However, due to the increased price paid per pound for sockeye salmon, the overall value of the 2013 fishery was substantially increased. The estimated exvessel value of the 2013 harvest was approximately $39.1 million, ranking it as the eighth highest value in the UCI commercial fishery since 1960, and the second 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 93% of the total value during the past 20 years. Currently, there are seven sockeye salmon systems with escapement goals that are monitored in UCI. The Yentna River sonar goal was replaced in 2009 with SEGs monitored by weirs on three lake systems within the Susitna River: Judd and Chelatna Lakes in the Yentna River drainage, and Larson Lake in the mainstem Susitna River drainage. The sockeye salmon sonar project is no longer operated at Crescent River and an incomplete escapement estimate was achieved at Packers Lake, where remote video technology was utilized. For the 2013 season, one of six sockeye salmon enumeration estimates fell within

the established escapement goal ranges, while three goals were exceeded and two fell below their goal objectives.

Chinook Salmon

In UCI, there are two commercial fisheries where the majority of Chinook salmon are harvested: the set gillnet fisheries in the Northern District, and the Upper Subdistrict of the Central District. Chinook salmon runs were expected to be below average in watersheds throughout southcentral Alaska during the 2013 season. Therefore, it was anticipated that restrictions to both sport and commercial fisheries would be needed to ensure escapement objectives were achieved. In the Northern District, many Chinook salmon stocks were classified as stocks of management concern by the BOF in 2011. An action plan was developed which aimed to reduce Chinook salmon harvest in both sport and commercial fisheries. In the commercial fishery, beginning in 2011, the portion of the General Subdistrict of the Northern District, from approximately 1½ miles south of Tyonek north to the Susitna River, was closed to fishing during the directed Chinook salmon fishery. Prior to the 2013 commercial fishing season, the department determined that additional restrictions were necessary to further reduce the Chinook salmon commercial harvest. By emergency order, the first fishing period of the season, which was scheduled for Monday, May 27, was closed, and the remaining four fishing periods were reduced from 12-hour periods to 6-hour periods. The estimated Chinook salmon harvest in the Northern District directed fishery was approximately 1,327, or about 43% less than the previous 10-year average annual harvest of 2,318.

The Deshka River is the primary system in northern Cook Inlet where Chinook salmon escapement has been monitored inseason with a weir. The 2013 Deshka River Chinook salmon escapement estimate of 18,531 was well within the escapement goal range (13,000–28,000).

For the past few years, both early- and late-run Kenai River Chinook salmon runs have been characterized as below average. As stated in the sockeye salmon section of this summary, no changes were made to management plans by the BOF as a result of multiple meetings by the Cook Inlet Task Force or by the full BOF at the statewide finfish meeting, other than accepting the new interim Kenai River late-run Chinook salmon SEG of 15,000–30,000, as recommended by the department. The 2013 forecast for Kenai River late-run Chinook salmon was for a total run of approximately 29,000 fish. While this run size was much smaller than average, if realized, it would have allowed both sport and commercial fisheries to be prosecuted under a fairly normal fishing pattern.

The 2013 early-run of Chinook salmon turned out to be very weak, necessitating a total closure of the river to sport fishing beginning on June 20. Conversely, the early part of the Kasilof River sockeye salmon run was very strong. In order to reduce the harvest of the latter part of the early run of Kenai River Chinook salmon, two restrictive actions were taken. The final five days of the 10-day Kasilof River personal use set gillnet fishery were closed, and the Kasilof Section set gillnet commercial fishery was not opened until June 27, even though sockeye salmon escapements could have allowed the fishery to open on June 23.

As stated in the sockeye salmon section of this summary, the strategy employed during the 2013 season for the Upper Subdistrict set gillnet fishery was to allow regularly scheduled fishing periods, but to limit additional time to days when sockeye salmon abundance was strong on the east side beaches. This fishing pattern would be followed until such time that an accurate inseason assessment of the strength of late-run Kenai River Chinook salmon could be made.

Unfortunately, the Chinook salmon run remained weak throughout the first three weeks of July. The Kenai River sport fishery started on July 1 with a no-bait restriction, which was subsequently further restricted to catch and release fishing on July 25, and then total closure on July 28. The Upper Subdistrict set gillnet fishery fished all regular Monday and Thursday regular periods and a limited amount of extra fishing in an attempt to maximizing sockeye salmon harvest while minimizing Chinook salmon catches. The Kasilof River Special Harvest Area (KRSHA) was opened for part or all of 14 days between July 17 and August 2, with approximately 322 Chinook salmon being harvested from this area. The total Upper Subdistrict set gillnet Chinook salmon harvest in 2013, including the number taken in the KRSHA, was 2,784 fish, which was the second smallest Chinook salmon harvest in this fishery since 1966. The average 1966–2011 Chinook salmon harvest was approximately 10,000.

In all of UCI, approximately 5,398 Chinook salmon were harvested in 2013, which was about 65% less than the 1966–2012 average annual harvest of 15,500. Using a price of $2.80/lb for Chinook salmon, the estimated exvessel value of the 2013 harvest was $191,000. This value was approximately 0.5% of the total UCI commercial fishery.

Sockeye Salmon

The total sockeye salmon run to UCI in 2013 was estimated to be 5.8 million fish, which was 14% less than forecast. The Anchor Point offshore test fishery missed numerous days of fishing due to weather; therefore, the timing of this year's sockeye salmon run was unable to be estimated. That said, more than 62% of the Kenai River sockeye salmon passage and 54% of the total UCI sockeye salmon harvest occurred during the July 15–20 time frame, making this one of the most compressed—if not the most compressed—runs in UCI history. Sockeye salmon runs to the Kasilof and Susitna rivers were better than forecast, while runs to the Crescent and Kenai rivers, Fish Creek, and minor systems all returned at less than forecast. The UCI commercial harvest of 2.7 million sockeye salmon was approximately 31% less than the 2013 preseason forecast harvest estimate of 3.9 million. This harvest was also approximately 21% less than the 2003–2012 average annual harvest of 3.4 million.

Sockeye salmon prices varied during the season, but based on an estimated average price of $2.25/lb, the total exvessel value from the 2013 UCI sockeye salmon harvest was approximately $38.5 million, which was 95% of the total UCI exvessel value.

Upper Subdistrict Set Gillnet and Central District Drift Gillnet

The 2013 UCI preseason forecast projected a total run of 6.7 million sockeye salmon, with a harvest estimate (sport, personal use and commercial) of 4.9 million. Approximately 3.9 million sockeye salmon were predicted to be harvested commercially. The total run to the Kenai River, generally the largest producer in UCI, was forecasted to be 4.4 million. For Kenai River runs of 2.3–4.6 million, the inriver sonar goal range is 1.0–1.2 million sockeye salmon. In the Upper Subdistrict set gillnet fishery, two regularly scheduled 12-hour fishing periods per week, plus up to 51 hours of additional fishing time, are allowed for this run size under the abundance-based escapement goals for the Kenai River.

During the previous season (2012), the Upper Subdistrict set gillnet fishery was prosecuted under a very restrictive fishing schedule due to concerns about Kenai River late-run Chinook salmon. After the 2012 season, the BOF formed a task force comprised of sport, commercial, and personal use fishermen to examine the existing management plans to see if they could be

modified in a way that might prevent the highly restrictive actions that occurred in 2012 from reoccurring in 2013. The specific objective of the task force was to identify and discuss alternative management strategies that would allow set gillnetting for sockeye salmon in the Upper Subdistrict, while providing inriver users an opportunity to harvest Kenai River Chinook salmon during times when the department projected the abundance of late-run Chinook salmon to be low. The task force was charged with delivering a set of recommendations to the BOF at the 2013 statewide finfish meeting. After numerous task force meetings and a full BOF deliberation of the issues at the statewide meeting, the only change made to the management plans was to adopt the department's new late-run interim Chinook salmon escapement goal (see *Chinook Salmon* section above).

From the onset of the 2013 season, a strategy was implemented in the Upper Subdistrict set gillnet where fishing time was structured to maximize sockeye salmon harvest, while limiting Chinook salmon catches until such time that an accurate inseason assessment could be made of the 2013 Chinook salmon run. This strategy included opening the set gillnet fishery during regular Monday and Thursday fishing periods, but limiting additional fishing to times when sockeye salmon were abundant on the east side beaches.

In the Kasilof River, the sockeye salmon run started out very strong, with a June 30 cumulative passage estimate of 150,000 fish, which was the largest passage ever measured through that date. Unfortunately, the Kenai River early-run of Chinook salmon was very weak, resulting in the inriver fishery being closed. Therefore, even though the Kasilof River 50,000 fish trigger that allowed for an early setnet opening was achieved on June 22, the Kasilof Section set gillnet fishery was not opened until Thursday, June 27. During the management week of June 30 to July 6, the Kasilof Section set gillnet fishery was opened on four different days; two regular 12-hour fishing periods and two additional 8-hour extra periods. Sockeye salmon escapement in the Kasilof River continued to be very strong, reaching 177,000 fish by July 6. Again, this was the largest escapement ever measured through that date. The entire Upper Subdistrict set gillnet fishery opened on Monday, July 8. For the management week of July 7–13, both regular 12-hour fishing periods were allowed, as well as one 8-hour opening in the Kasilof Section one-half mile fishery. Approximately 800 Chinook salmon were harvested during these three fishing periods, while more than 120,000 sockeye salmon were harvested. The July 10 one-half mile fishery in the Kasilof Section produced a harvest of more than 50,000 sockeye salmon and only 100 Chinook salmon.

The new Kalgin Island offshore test fishery produced very large sockeye salmon indices on July 14 (632) and July 15 (807). This turned out to be a very accurate indicator that a large number of sockeye salmon had moved into the northern half of the Central District. These fish pushed hard to the east side beaches beginning on Monday, July 15. Both the drift gillnet and Upper Subdistrict set gillnet fisheries had very strong catches on that day, with the drift fishery taking approximately 438,000 fish and the setnet fishery capturing more than 341,000 fish. For the setnet fishery, this was the seventh largest single day sockeye salmon harvest in the history of the fishery. For drifters, their total harvest for the season had now reached nearly one million sockeye salmon. Although commercial catches were robust, a significant number of sockeye salmon were able to escape all the various fisheries (drift gillnet, set gillnet, personal use, and sport) and be enumerated by sonar in the Kenai and Kasilof rivers. For example, from July 15 to July 20, nearly 845,000 sockeye salmon were estimated to have moved past the Kenai River sonar site, bringing the estimated cumulative passage through July 20 to approximately 995,000.

In the Kasilof River, the estimated sockeye salmon cumulative passage had now reached 419,000. Conversely, like the early run of Kenai River Chinook salmon, the late run appeared to be weak, with passage estimates of only 7,700 fish through July 20. Because of this imbalance in sockeye and Chinook salmon passage, the following commercial fishing strategy was used in order to slow the rate of sockeye salmon passage to both the Kenai and Kasilof rivers, while affording as much protection as possible to Kenai River late-run Chinook salmon. First, beginning on Wednesday, July 17, the KRSHA was used extensively. From July 17 to August 2, the KRSHA was opened for part or all of 14 days. Approximately 63,000 sockeye and 328 Chinook salmon were harvested in this area during this time period. Additionally, from July 15 to July 31, the drift gillnet fleet was opened all but two days, with most of that fishing time occurring in the Expanded Kenai and Expanded Kasilof Sections (expanded corridor). Use of the drift fleet during their regular Monday and Thursday fishing periods, however, was limited to Drift Area 1, in order to reduce the harvest of northern-bound coho salmon (see *Coho Section*, below).

Chinook salmon passage in the Kenai River continued to lag through July 24, and on July 25 the Kenai River sport fishery was restricted to catch-and-release fishing, and then closed entirely on July 28. The *Kenai River Late-Run King Salmon Management Plan* (5 AAC 21.359) directs the department to close the commercial set gillnet fishery if the inriver sport fishery is closed. The July 25 regularly scheduled fishing period for set gillnets in the Upper Subdistrict was closed in response to the sport fishing catch-and-release restriction and then closed until further notice after the Kenai River sport fishery was completely closed on July 28. The Upper Subdistrict set gillnet fishery did not reopen after the July 25 closure, which meant the last time this fishery was open in 2013 was July 23.

Because the 2013 Upper Subdistrict set gillnet fishery was prosecuted under a fairly restrictive fishing schedule, the Central District drift gillnet fleet was again relied upon as the primary harvester of Kenai and Kasilof River sockeye salmon. During the month of July, the drift fleet was fished a total of 20 days as follows: one day in the Kasilof Section, 12 days in the expanded corridor, five days in Drift Area 1, and three days in all of the Central District. However, due to concerns for northern-bound coho salmon, all six regularly scheduled fishing periods occurring between July 11 and July 29 were limited to Drift Area 1, or a combination of Drift Area 1 and the regular or expanded corridor. For the 2013 season, approximately 1.65 million sockeye salmon were harvested by the drift fleet, while Upper Subdistrict setnetters harvested approximately 900,000, and all remaining setnetters caught approximately 92,000.

Western Subdistrict

The Western Subdistrict set gillnet fishery opened for regular periods by regulation on Monday, June 17. This fishery primarily targets sockeye salmon returning to the Crescent River. Due to strong sockeye salmon escapements into Crescent Lake, that portion of the Western Subdistrict south of Redoubt Point has been used extensively in an attempt to keep escapements within the BEG range. Even with an expanded fishery, from 1999 to 2012, the Crescent River sockeye salmon escapement goal was exceeded 11 times. In 2013, the Crescent River sonar program was not operated. However, early in the season sockeye salmon harvest data indicated the run to Crescent River would likely meet or exceed escapement objectives. Because of this information, the set gillnet fishery south of Redoubt Point was expanded to allow fishing from 6:00 a.m. until 10:00 p.m. on Mondays, Thursdays, and Saturdays each week from July 1 through August 3. Approximately 26,000 sockeye salmon were harvested in the Western Subdistrict in 2013.

Kustatan Subdistrict

The Kustatan Subdistrict includes those waters from the Drift River terminal to the Northern District boundary near the West Forelands. From 1993 to 2012, approximately nine permit holders per year have reported harvest from this area. The majority of participation and harvest (more than 92% of the harvest) comes from the Big River sockeye salmon fishery, which occurs from June 1 to June 24. Approximately 3,100 sockeye salmon were harvested in the Kustatan Subdistrict in 2013, with all but nine sockeye salmon caught during the Big River fishery.

Kalgin Island Subdistrict

The Kalgin Island Subdistrict opened for regular periods beginning June 27; however, the west side of Kalgin Island was open for commercial fishing on Mondays, Wednesdays, and Fridays from June 3 to June 24 as part of the Big River sockeye salmon fishery. Approximately 42,000 sockeye salmon were harvested from the Kalgin Island Subdistrict in 2013, with 12,500 of those fish taken during the Big River sockeye salmon fishery. The average annual sockeye salmon harvest on Kalgin Island during the previous 10 years was approximately 64,000.

Northern District

Commercial fishing in the Northern District opened on June 3 for the directed Chinook salmon fishery (see *Chinook Salmon* section above) and for regular periods beginning on June 27. Approximately 20,800 sockeye salmon were harvested in the Northern District in 2013, with about 800 of these fish being harvested during the four open periods of the Chinook salmon fishery. This harvest was 30% less than the recent 10-year (2003–2012) average (29,734). The decrease in the annual sockeye salmon harvest is likely caused by decreased sockeye salmon abundance in the Northern District and mandatory gear restrictions described in the *Northern District Sockeye Salmon Management Plan* (5 AAC 21.358).

Coho Salmon

The 2013 commercial harvest estimate of 261,000 coho salmon was approximately 50% higher than the recent 10-year (2003–2012) average annual harvest of approximately 173,000. The coho salmon harvest would have been somewhat higher if the Upper Subdistrict set gillnet fishery had fished a regular fishing pattern. Moreover, the drift gillnet fleet was restricted from fishing north of Drift Area 1, other than corridor fishing, from July 9–31, in an effort to reduce the harvest of coho salmon bound for northern Cook Inlet drainages. Prior to the 2013 season, the department had identified a management strategy intended to reduce the harvest of Little Susitna River coho salmon, as the escapement goal had not been achieved during the previous four years. This strategy included the possibility of reduced drift gillnet fishing time in the northern part of the Central District. Much of the restricted fishing time was also required in the *Central District Drift Gillnet Fishery Management Plan* (5 AAC 21.353), which states that on Kenai River sockeye salmon runs of 2.3–4.6 million fish, from July 16 to July 31, one fishing period per week will be restricted to Drift Gillnet Area 1 or the expanded corridor. For the 2013 season, this meant that three of the four regularly scheduled fishing periods from July 16 to July 31 would have mandatory restrictions. The fourth period could have been fished district wide, but the drift fleet was limited to Drift Gillnet Area 1 and the expanded corridor for this fishing period to reduce the harvest of northern-bound stocks.

In UCI, there are two coho salmon systems with escapement goals that are monitored inseason with weirs: Fish Creek and the Little Susitna River. The goal at Fish Creek is a SEG of 1,200–

4,400. The Fish Creek SEG was exceeded on August 18, with a final escapement estimate of nearly 7,600. This count, however, is a minimum number, as high water had the weir inoperable beginning on September 5. In the Little Susitna River, the goal is an SEG of 10,100–17,700. The final escapement estimate in the Little Susitna River was more than 13,500, but the weir was mostly inoperable after August 21 due to high water and therefore the last quarter of the historical run was underrepresented. At the time the weir became inoperable, approximately 13,000 coho salmon had been counted and the final passage was projected to be near 18,000. While the final coho salmon escapement is unknown in the Little Susitna River, it is possible the upper end of the SEG could have been achieved or exceeded had the weir remained in operation. Finally, there is a coho salmon single foot survey SEG of 450–700 fish at McRobert's Creek, which drains into Jim Creek, both located in the Knik River drainage. A foot survey conducted late in September found nearly 660 coho salmon in the stream, which was near the upper end of the SEG.

Based on an average price of $0.85/lb, the estimated exvessel value of the 2013 commercial coho salmon fishery was approximately $1.33 million, or 3.3% of the total exvessel value in Upper Cook Inlet. This was the highest exvessel value for coho salmon in UCI since 1995. Due to a significant increase in the price paid for coho salmon in August, it is possible the exvessel value was even higher than what was estimated here.

Pink Salmon

Pink salmon runs in UCI are even-year dominant, with odd-year average annual harvests typically less than one-sixth of even-year harvests. The UCI commercial harvest of pink salmon in 2013 was estimated to be approximately 48,000, which is 46% less than the average annual harvest of 89,000 from the previous 10-years of even-year harvests. This is not surprising, however, due to the fact that the Upper Subdistrict set gillnet fishery did not fish after July 23. Pink salmon escapements are not specifically monitored in UCI, but based on commercial harvest data it would appear that the 2013 run was likely average for an odd-year return. The estimated average price paid for pink salmon was approximately $0.35/lb, resulting in an exvessel value for this species of approximately $53,000, or 0.2 % of the total exvessel value.

Chum Salmon

The 2013 chum salmon harvest of 139,000 was about 12% above the previous 10-year average annual harvest of 124,000. There is only one chum salmon escapement goal in UCI, which is an SEG of 3,800–8,400 in Clearwater Creek, the major tributary that drains into Chinitna Bay. Escapement is monitored via aerial survey. More than 9,000 chum salmon were observed during an August 15 survey flight, which allowed Chinitna Bay to open to drift gillnetting beginning on Monday, August 19. The exvessel value of chum salmon in the 2013 commercial fishery was approximately $433,000 or 1.1% of the total exvessel value.

BRISTOL BAY

The 2013 inshore Bristol Bay sockeye salmon run of 23.0 million fish ranks 15th over the last 20 years (1993–2012) and was 36% below the 36.0 million average run for the same period. This year's sockeye run was 12% below the preseason inshore forecast of 26.0 million fish. Districts slightly above forecast were Togiak (2%) and Nushagak (8%), while districts below preseason expectations included Egegik (4%), Ugashik (13%), and Naknek/Kvichak (32%). The run was composed of a 15.4 million fish harvest and 7.6 million fish escapement. The 15.4 million

sockeye salmon commercial harvest was 6% below the 16.6 million preseason forecast. The escapement estimate does not include the Alagnak River where data is no longer collected.

Approximately 19,000 Chinook salmon were harvested in Bristol Bay in 2013, 71% below the average harvest for the last 20 years (64,604). The chum salmon harvest of 872,000 fish was 10% below the 20-year average (959,000). Bay-wide coho salmon harvest was 135,000, 80% above the 20-year average (75,000). Reported pink salmon harvest was 511 fish.

Also of note was the sinking of the tender vessel Lone Star in the mouth of the Igushik River. The tender sank on June 30 and a section of the Nushagak District was eventually closed for the season as a result of fuel leaking from the vessel. This closure reduced harvest in that area of the district and allowed increased escapement into the Igushik River. The Igushik River sockeye salmon escapement exceeded the upper end of the escapement goal range by 29% (Table 5).

The Bristol Bay 2013 harvest of all salmon species was 16.4 million, with a preliminary exvessel value of $141 million, which is 26% above the 20-year average and ranks seventh over that same period. This estimate does not include future price adjustments, loyalty bonuses, and differential prices for refrigerated versus nonrefrigerated fish. Although the harvest was below the historical average, the increased price per pound caused the value to be above average.

Chinook Salmon

Chinook salmon harvests in Bristol Bay were below average in every district. One directed Chinook salmon fishing period occurred in the Nushagak District on June 14 with a harvest of 518. Chinook salmon are also caught during directed sockeye periods in all commercial districts and approximately 19,000 were harvested. Chinook salmon escapement into the Nushagak River was 113,709 and within the escapement goal range (55,000–120,000).

Sockeye Salmon

The 2013 inshore sockeye salmon run of 23.0 million was 12% below the preseason inshore forecast of 26.0 million. The Nushagak and Igushik rivers were above the established escapement goal ranges while all other systems were within ranges.

The 2013 Bristol Bay sockeye salmon run was slightly under forecast and generally early to very early depending on river system. Spring temperatures in the Bering Sea were closer to long-term averages during the salmon season than the last several years. Total sockeye harvest was 6% below forecast, and total inshore run was 12% below forecast. The Wood River and Naknek River special harvest areas were not used in 2013.

Coho Salmon

Because of limited buyers, harvest information for coho salmon in the Nushagak District in 2013 is proprietary. Baywide harvest of coho salmon was 135,000.

Pink Salmon

Pink salmon runs are strong during even years and 2013 was an off-cycle year for Bristol Bay. A total of 511 pink salmon were reported in the commercial catch.

Chum Salmon

The 2013 preliminary Bristol Bay chum salmon harvest was 872,000. Nushagak and Naknek/Kvichak districts produced a harvest above the 20-year average, while Egegik, Ugashik, and Togiak districts produced less chum salmon than their 20-year averages. Nushagak District was the largest producer of chum salmon, where over 523,000 fish were harvested.

Table 5.–Preliminary 2013 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	13	159	25,561	94	25,828
Northern Dist.	0	3	3	17,054	6	17,067
Coghill Dist.	0	2	8	6,691	70	6,771
Northwestern Dist.		0	0	110	0	111
Southwestern Dist.	0	47	48	33,510	275	33,881
Montague Dist.		0	2	414	0	416
Southeastern Dist.	0	8	1	2,571	41	2,622
Unakwik Dist.		3	0	0	0	3
Drift Gillnet						
Bering River District	0		47	0		50
Copper River Dist.	9	1,622	245	65	10	1,952
Coghill Dist.	0	94	63	2,450	2,100	4,708
Eshamy Dist.	0	336	2	62	184	585
Montague Dist.	0	2	0	28	484	514
Unakwik Dist.	0	1		0	0	1
Set Gillnet						
Eshamy Dist.	0	203	0	19	43	265
Hatchery[a]		0	29	3,962	761	4,717
Prince William Sound Total	11	2,339	609	92,463	4,070	99,492
Southern District	0	66	6	35	3	111
Kamishak District		33		0	2	36
Outer District	0	0	0	2,015	49	2,064
Eastern District Hatchery[b]		70		48	0	118
Lower Cook Inlet Total	0	170	6	2,099	54	2,329
Central District	4	2,660	219	46	137	3,066
Northern District	1	23	42	2	2	71
Upper Cook Inlet Total	5	2,683	261	48	139	3,137
Naknek-Kvichak District	0	4,790	[c]	0	267	5,058[d]
Nushagak District	15	3,173	[c]	0	523	3,712[d]
Egegik District	0	4,766	[c]		43	4,809[d]
Ugashik District	0	2,173			31	2,204
Togiak District	3	474	[c]	0	8	485[d]
Bristol Bay Total	19	15,376	135	1	872	16,402
Central Region Total	35	20,568	1,011	94,611	5,135	121,360

Note: Missing data indicates no harvest and zeros indicate harvest activity but <500.

Note: Columns may not total exactly due to rounding.

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

[b] LCI hatchery harvest includes cost recovery only, not broodstock or donated fish.

[c] Confidential information.

[d] Confidential information not included in District totals.

ARCTIC-YUKON-KUSKOKWIM REGION

Arctic-Yukon-Kuskokwim (AYK) Region salmon harvests totaled 1,624,000 salmon and 11,166,000 pounds in 2013 (Tables 2, 3, and 6). The exvessel value was estimated to be $7.8 million. Cumulative all-gear commercial harvest included 3,000 Chinook, 52,000 sockeye, 277,000 coho, 1,285,000 chum, and 8,000 pink salmon. Chinook salmon harvests were considerably below average while chum and coho harvests were above average. Improved chum and coho salmon markets and corresponding higher prices resulted in larger harvests and exvessel value in the region. Poor pink salmon markets resulted in a substantially lower harvest than available surplus. Landings were made by 1,126 limited entry permit holders in 2013.

KUSKOKWIM AREA

The Kuskokwim Area commercial salmon harvest in 2013 was 2,550 Chinook, 51,682 sockeye, 156,776 coho, and 122,965 chum salmon for a total of 333,973 fish. A total of 469 permit holders participated and the exvessel value was estimated to be $2,399,035.

Overall Chinook and coho salmon harvests were similar to what was expected, but sockeye and chum salmon were below the expected harvest range in 2013. Escapement was adequate for all species at monitored locations except for Chinook salmon, which only met 2 of 10 escapement goals. In general, run timing throughout Kuskokwim area for Chinook, sockeye, and coho salmon was characterized as average, while chum salmon were considered to be late.

Kuskokwim River

In 2013 the following preseason and inseason management actions were taken in an attempt to conserve Chinook salmon and achieve escapement goals.

Subsistence Chinook salmon fishing with hook and line gear was closed and restricted to the use of gillnets with 4-inch or less mesh not to exceed 60 feet 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 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 downstream approximately 1-mile to ADF&G regulatory markers, and 4) the Aniak River drainage to ADF&G regulatory markers at its confluence with the Kuskokwim River.

Subsistence salmon fishing was restricted to the use of gillnets with 6-inch or less mesh size and hook and line Chinook salmon fishing was closed from Tuluksak downstream to the mouth of the Kuskokwim River from June 28 through July 9. These restrictions were also applied from Chuathbaluk downstream to Tuluksak from July 3 to July 14.

Inseason reports during Kuskokwim River Salmon Management Working Group meetings suggested that many subsistence fishermen in the lower river met their harvest needs for Chinook salmon, but many subsistence fishermen in the middle and upper river did not. Postseason subsistence harvest surveys are presently being conducted.

There were 11 commercial fishing periods in District 1 between July 16 and August 23. Processing capacity limited all commercial openings to Subdistrict 1-B. Processing capacity did

allow for 2-hour extensions of fishing time in the Lower Section of Subdistrict 1-B. A total of 1 Chinook, 768 sockeye, 52,235 chum, and 114,069 coho salmon were harvested. An additional 173 Chinook salmon were reported as harvested during the commercial fishery, but they were retained for personal use as the buyers agreed not to purchase Chinook salmon because of the poor run. A total of 378 individual permit holders (making at least one recorded landing) participated in the District 1 commercial fishery. Chum salmon harvest was similar to the most recent 10-year average. Chinook salmon harvest was 99% below the most recent 10-year average, sockeye salmon harvest was 94% below the most recent 10-year average, and coho salmon harvest was 31% below the most recent 10-year average. Total exvessel value of the fishery was $1,184,847, approximately 101% above the most recent 10-year average value.

Chinook salmon abundance in 2013 was poor. Chinook salmon escapements at tributary weirs were the lowest on record at all projects. Escapements at George and Kogrukluk rivers were below the respective SEGs. Operational uncertainties at Kwethluk River weir resulted in incomplete passage counts. Seven tributaries have aerial survey SEGs; escapements at two of the tributaries were within the respective SEGs, and escapements at five of the tributaries were below the respective SEGs. The Kuskokwim River drainagewide SEG was likely not achieved, but it will not be fully assessed until after estimates are made this winter.

Sockeye salmon escapements were monitored at seven tributary weir projects, although sockeye are not a prominent species in many of these systems. Kogrukluk and Telaquana rivers have the largest sockeye salmon escapements and were characterized as below average in 2013. The one established escapement goal in the Kuskokwim River was met.

Chum salmon escapements were monitored at six tributary weirs and indicate overall abundance was average. The SEG at Kogrukluk River weir was exceeded and the SEG at Aniak River sonar was not assessed as the project did not operate.

Coho salmon escapements were monitored at six tributary weirs. Escapement at the Kogrukluk River weir was within the escapement goal range. The escapement goal at Kwethluk River weir was not assessed because of operational difficulties. Escapements at the other monitored locations were characterized as average to below average.

Kuskokwim Bay District 4 (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 2013, but amounts necessary for subsistence use is expected to have been met.

The District 4 commercial salmon fishing season opened July 2. The commercial fishing season was delayed from the normal start of June 15 due to concerns for Chinook salmon abundance and subsistence fishing reports of late run timing. Additionally, fishing periods were reduced from three periods per week to two periods per week during the first two weeks of July for Chinook salmon conservation. Beginning the third week of July the historical schedule of three fishing periods a week commenced. During the first two weeks of August the schedule was reduced to two days a week because of below average harvest and catch rates of coho salmon. The season ended on August 23.

District 5 opened on June 29, which is about one week later than normal due to concerns for Chinook salmon abundance. In addition to opening the fishery a week late, the department

reduced the open waters of Goodnews Bay for the conservation of Chinook salmon. Analysis of harvest patterns the previous two years indicated a higher harvest of Chinook salmon in the eastern portion of the district, closer to the mouth of Goodnews River, compared to the western portion of the district near the entrance to the bay. Therefore, the eastern half of the district was closed to fishing the first four commercial fishing periods. This closure was then relaxed for the next two periods. Due to low escapement at the Goodnews River weir and a higher number of Chinook harvest in those two periods, the department reduced the open waters again for the July 17 and 19 fishing periods. After July 19 the historical fishing schedule of three days per week was established until the end of the season on August 23.

In 2013, 197 individual permit holders recorded landings during 18 commercial periods in District 4. The total commercial harvest of 107,652 fish was composed of 2,054 Chinook, 26,393 sockeye, 58,079 chum, and 21,126 coho salmon. The exvessel value of the District 4 commercial fishery was estimated to be $761,537.

A total of 71 individual permit holders recorded landings in District 5 during 21 commercial periods. The District 5 total commercial harvest of 59,248 fish was composed of 495 Chinook, 24,521 sockeye, 12,651chum, and 21,581 coho salmon. The exvessel value of the District 5 commercial fishery was estimated to be $452,651.

Chinook and sockeye salmon harvests and catch rates were below average this season in both districts. Chinook harvest in both districts was the lowest on record. Harvest and catch rates for chum salmon were average for both districts. Coho salmon harvests and catch rates were slightly below average in District 4, while they were above average in District 5.

Fish passage through the Kanektok River weir during its operation from June 25 to August 15 was 3,569 Chinook, 128,761 sockeye, and 43,040 chum salmon. An escapement estimate for coho salmon was incomplete because the project does not operate through the entire coho salmon run. No formal escapement goals for any species have been established at the weir. An aerial survey was flown over the Kanektok River drainage on July 30, with 2,346 Chinook and 64,802 sockeye salmon observed. The Chinook salmon SEG range (3,500–8,000) was not achieved, while the sockeye salmon SEG range (14,000–34,000) was exceeded.

Fish passage through the Middle Fork Goodnews River weir was 1,168 Chinook, 23,029 sockeye, and 27,673 chum salmon. The escapement of Chinook salmon was below the BEG while escapement of sockeye salmon was within the BEG. The escapement of chum salmon exceeded the lower bound SEG. Escapement estimates for coho are incomplete because the weir was plagued by high water during the latter part of the season. The weir was operational from June 24 to September 14. Due to inclement weather, there was no aerial survey flown on the Goodnews River drainage in 2013.

YUKON AREA

The 2013 Yukon River total commercial harvest was 0 Chinook, 485,587 summer chum, 238,051 fall chum, and 66,199 coho salmon for the Alaskan portion of the drainage. A total of 379,143 summer chum, 212,862 fall chum, and 58,760 coho salmon were harvested in the Lower Yukon River (Districts 1–3) and 106,444 summer chum, 25,189 fall chum, and 7,439 coho salmon were harvested in the Upper Yukon River (Districts 4–6). A total of 467 permit holders sold fish in 2013 and the exvessel value was approximately $3,513,436.

Summer Season

Based on the expectation that the 2013 Chinook salmon run could be near the lower end of the preseason projection range, approximately 100,000 fish, a precautionary management plan was initiated early in the season. The regulatory subsistence salmon fishing schedule was implemented in District 1 on May 30 and was chronologically implemented in upstream Districts 2–5, consistent with migratory timing. Gillnets were restricted to 6-inch or smaller mesh size when the schedule was put in place in each mainstem district.

Based on inseason assessment information, the Chinook salmon run appeared to be tracking later than average. Consistent with the new regulation requiring the protection of the first pulse of Chinook salmon, a subsistence fishing period was cancelled in District 1 and the northern portion of the Coastal District beginning June 20, and closures were similarly implemented in upriver districts chronologically as the pulse migrated into those areas. As the Chinook salmon run progressed, inseason projections indicated that the run was very weak and would likely be insufficient to meet all escapement objectives. Each of the subsequent three pulses of Chinook salmon were protected by subsistence fishing closures as they migrated through Districts 1–5. Very limited fishing opportunity was provided in between pulses to allow harvest of chum salmon and other species. During these open subsistence fishing periods, gillnets continued to be restricted to 6-inch or smaller mesh size and, in the upper river districts, the use of fish wheels was allowed with the stipulation that all Chinook salmon were to be release unharmed. In District 5, where relatively few summer chum salmon were available, subsistence fishing time was reduced even further to avoid offering opportunity that would primarily target Chinook salmon. Unfortunately, the most severe reductions in subsistence fishing opportunity occurred in Subdistrict 5-D, where additional closures were necessary to increase Chinook salmon passage into Canada in an attempt to meet the interim management escapement goal for the Canadian stock.

Conservative management actions were also taken in Yukon River tributaries, in an effort to provide protection for Alaskan Chinook salmon stocks. Gillnets were restricted to 6 inches or smaller mesh size in the Innoko River from June 5 to July 14 and in the Koyukuk River from June 19 to July 26.

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

In 2013, for the sixth consecutive year, no commercial periods targeting Chinook salmon were allowed in the mainstem Yukon River or in the Tanana River. However, commercial fishing opportunity was provided to target the available surplus of summer chum salmon in Districts 1 and 2, Subdistrict 4-A, and District 6. A suite of strategies were used to conservatively manage these fisheries to minimize the impact to the weak Chinook salmon run which are encountered incidentally.

Utilizing new regulations adopted by the BOF in 2013, the department allowed for the commercial harvest of summer chum salmon using dip nets and beach seines beginning June 18 in District 1 and June 20 in District 2. The intent was to provide for the selective commercial

harvest of summer chum salmon with gear types that allow for the release of Chinook salmon unharmed. Fifteen 12-hour periods occurred in District 1 and 17 periods in District 2 using dip nets and beach seines only, for a combined harvest of approximately 189,000 summer chum salmon, with 928 Chinook salmon reported released. Dip nets were surprisingly successful and accounted for the majority of the summer chum harvest taken with these new gear types. Unfortunately, due to the difficulty of operating beach seine gear in the high water conditions present during the summer season, very few fishermen chose to operate beach seine gear.

As in recent years, the use of gillnet gear was delayed until after the midpoint of the Chinook salmon run to reduce incidental harvest of Chinook salmon. Utilizing another new gear option, the first commercial gillnet period in District 1 took place July 2 and gillnets were restricted to 5 ½-inch or smaller mesh size, not exceeding 30 meshes in depth. This gear option was used for the first six commercial gillnet periods in District 1. Additionally, similar to the last several years, commercial gillnet fishing in District 1 was initially limited to the South Mouth only, where the incidental Chinook salmon harvest rates were anticipated to be low. Later in the season, all of District 1 was open to commercial fishing and the gillnet gear restriction was relaxed to 6-inch or smaller mesh size. In District 2 the use of dip nets and beach seine gear was continued later into the season before transitioning to a 6-inch or smaller mesh size gillnet gear restriction on July 8.

The sale of incidentally caught Chinook salmon was prohibited by emergency order during the entire commercial fishing season to ensure fishermen would not target Chinook salmon. During the gillnet commercial fishing periods fishermen could release any incidentally caught live Chinook salmon or use them for subsistence purposes. A total of 439 Chinook salmon were reported incidentally harvested in Districts 1 and 2 during the summer season. An additional 44 Chinook salmon were caught but not sold in the fall season.

The preliminary cumulative summer chum salmon commercial harvest for Districts 1 and 2 combined was 379,143. The summer chum salmon harvest was 210% above the 2003–2012 average harvest of 112,289. The dip net harvest was a significant contributor in making the 2013 summer chum salmon harvest in the Lower Yukon the largest on record since 1989.

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. Commercial fishing began July 1 and fish wheels had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. Additionally, new regulations were adopted in 2013 detailing construction specifications for commercial fish wheels in Subdistrict 4-A that were intended to reduce the potential for injuring Chinook salmon while being released. After the vast majority of the Chinook salmon run had passed through the area, the requirement that commercial fish wheels must be manned at all times during operations and all Chinook salmon caught in the fish wheels must immediately be released to the water alive was discontinued. A total of 27 24-hour periods were implemented resulting in a total of 648 fishing hours. The summer chum salmon harvest for Subdistrict 4-A was 100,507, with the majority of the harvest being female. A single fish buyer operated in Kaltag during the 2013 season and the summer chum salmon harvest was 167% above the most recent 10-year average (2003–2012). A total of 100 Chinook salmon were reported as caught and released alive back to the water, and no Chinook salmon were reported to have been kept for personal use.

In District 6, the Tanana River, a harvestable surplus of summer chum salmon was expected based upon Pilot Station sonar abundance estimates and genetic stock composition information. Commercial fishing commenced on July 19 in District 6 and fishing gear was initially restricted to fish wheels that had to be attended at all times during operations, and all Chinook salmon caught in the fish wheels had to be immediately released to the water alive. These gear restrictions were relaxed on August 4 after the Chinook run in the Tanana River was nearly over. The department scheduled seven commercial fishing periods and the harvest was 5,937 summer chum salmon. A total of 97 Chinook salmon were reported as caught and released alive back to the water, and 1 Chinook salmon was recorded on a fish ticket as caught but not sold.

A total of 395 permit holders participated in the summer chum salmon fishery, which was approximately 22% below the 2003–2012 average of 506 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission permit areas. A total of 384 permit holders fished in the Lower Yukon Area in 2013, which was approximately 22% below the 2003–2012 average of 489. In the Upper Yukon Area, 11 permit holders fished, which was approximately 35% below the 2003–2012 average of 17. The exvessel value was an estimated $1.9 million for summer chum salmon, the highest since 2007. However, this exvessel value represents the entire summer season fishery, as there were no Chinook salmon sold. The exvessel value of the summer season fishery was approximately 4.4% above the 2003–2012 average ($1.8 million).

Chinook salmon escapement goals for the East and West Fork Andreafsky, Nulato, and Salcha rivers were achieved. However, the escapement goals for the Anvik and Chena rivers were not met. The cumulative count on the Gisasa River was below average. High water conditions on the Chena River precluded counting for much of the season. Preliminary Chinook salmon passage at Eagle sonar was approximately 30,700, yielding a preliminary border passage estimate of approximately 30,400, which is well below the interim management escapement goal (42,500–55,000).

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

Fall Season

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

From July 16 through the end of July, fall chum salmon entry into Yukon River was steady with daily and cumulative passages past Pilot Station sonar comparable to historical medians. However, by the end of July (the median first quarter point) fall chum salmon passage did not increase as expected and had a cumulative passage of 132,000, a number below the historical median passage of 139,000. Moving into August, daily fall chum salmon passages past Pilot Station sonar continued to be below historical medians. The cumulative fall chum salmon passage past Pilot Station sonar on August 11 was 220,000, below the historical median for that date of 311,000. During this time no commercial fishing periods were announced in

Districts 1 and 2 to ensure enough fall chum salmon were getting upriver for escapement and subsistence use.

Although several relatively small groups of fall chum salmon entered Yukon River through mid-August, the first substantial pulse of fall chum salmon did not pass Pilot Station sonar until August 14. This pulse was two days in duration and approximately 195,000 fall chum salmon in size. After this pulse passed the sonar, cumulative counts rose above historical median counts. Commercial fishing resumed in Districts 1 and 2 and continued through the end of August. Unseasonably hot, dry, and calm weather in conjunction with above average water temperature in the Lower Yukon River may have contributed to the delay of substantial pulses until mid-August. A second pulse of fall chum salmon passed the sonar beginning August 18 and was five days in duration and was estimated to be approximately 174,000. By August 23, the cumulative fall chum passage past Pilot Station sonar of 600,000 was above the historical median of 467,500. A third pulse passed the sonar beginning August 25 and was three days in duration and was estimated to be approximately 65,000.

Commercial openings were announced in Subdistricts 5-B and 5-C from mid-August through the first week in October, and commercial fishing occurred in District 6 from mid-August through the end of September. Coho salmon passage was below average the entire season with only three individual daily peaks surpassing the average mark. The largest peak occurred on August 15 and the second largest occurred on August 27 (both peaks approximately 10,000 coho salmon each) and overall timing of coho salmon passage was average. Based on the lower Yukon River test fishery which operated until September 20, no additional pulses were observed. Coho salmon were harvested incidentally in fall chum salmon directed commercial openings. Because of their high incidental commercial harvest, coupled with below average passage based on test fisheries and Pilot Station sonar estimates, a coho salmon directed commercial fishery in the lower river in September was not prosecuted in 2013.

There were a total of 43 commercial periods during the fall season in 2013. The majority of fall season commercial harvest occurred in the lower 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 total commercial harvest for the Yukon River fall season in the Alaska portion of the drainage in 2013 was 238,051 fall chum and 66,199 coho salmon. Both species harvested were above their respective most recent 5-year (2008–2012) and 10-year (2003–2012) averages. The fall chum salmon harvest was the fifth largest since 1990 and the coho salmon harvest was the fourth largest since 1990.

All salmon were sold in the round and no salmon roe was sold separately. The exvessel value of the total harvest was $1,641,060 to $1,179,947 for fall chum and $461,113 for coho salmon. All values were above the most recent 5-year (2008–2012) averages. A total of 443 individual permit holders participated in the fall chum and coho salmon fishery; 436 in Districts 1 and 2 and 7 in Districts 4, 5, and 6.

The preliminary 2013 fall chum salmon run size is estimated to be 1.2 million, which is within the preseason forecast range (900,000–1.2 million). The preliminary drainagewide escapement estimate of fall chum salmon is estimated to be approximately 866,000, which exceeds the upper end of the SEG range (300,000–600,000). All fall chum salmon escapement goals were either achieved or exceeded throughout the drainage.

The estimated passage of 84,400 coho salmon past Pilot Station sonar was well below the historical average (141,000). The Delta Clearwater River has the only established escapement goal for coho salmon, an SEG range of 5,200–17,000. A boat survey conducted in the Delta Clearwater River in late October observed 6,222 coho salmon.

NORTON SOUND AREA

Highlights of the 2013 Norton Sound District commercial salmon fishery included the highest chum salmon harvest in over 25 years, and the third year out of the last four years that the exvessel value exceeded one million dollars. Also, Subdistrict 4 (Norton Bay) had record harvests of both chum and coho salmon, Subdistrict 2 (Golovin) had the second hightest coho salmon harvest, and Subdistrict 3 (Elim) had the fourth highest coho salmon harvest. Disappointments in 2013 were persistent severe weather and high surf conditions that kept fishermen on the beach throughout much of August in Subdistrict 5 (Shaktoolik) and to a lesser extent in Subdistrict 6 (Unalakleet), and weak Chinook salmon runs that occurred throughout Norton Sound requiring inseason restrictions and an early closure to southern Norton Sound subsistence fisheries.

Large chum salmon harvests in conjunction with high prices paid for coho salmon accounted for nearly all the $1,183,236 paid to 124 permit holders. The exvessel value ranked third highest in since 1961. Permit holder participation, although the highest in 20 years, was similar to last year when 123 permit holders fished. Commercial salmon harvests were 193 sockeye, 53,864 coho, 8,276 pink and 119,056 chum salmon. Harvested during the commercial fishery and kept for personal use were 151 Chinook, 54 sockeye, 51 coho, 87 pink and 37 chum salmon. Chinook salmon sales were prohibited by the department in Subdistricts 5 and 6 and the 137 Chinook salmon caught in those subdistricts were kept for personal use. Also, the buyer chose not to purchase Chinook salmon in other subdistricts.

Though many escapement objectives were met, escapement goals were not achieved for the third consecutive season on the Unalakleet River for Chinook salmon despite starting the season with restrictions to Chinook salmon subsistence and sport fisheries and later a complete closure. For the first time since 2009 a closure to the Pilgrim River sockeye salmon subsistence fishery was not needed and the escapement goal was achieved for the third consecutive season.

The 2013 forecasted commercial chum salmon harvest range was 40,000–70,000. However, the chum salmon run was much stronger than expected in southern Norton Sound and below average in northern Norton Sound, except for Subdistrict 1 (Nome) and Port Clarence District, which had well above average runs. Commercial chum salmon fishing was delayed until July in Subdistricts 5 and 6 to protect Chinook salmon, but the Subdistrict 6 chum salmon harvest was still the third highest on record. Overall southern Norton Sound accounted for 96% of the chum salmon harvest. Weaker chum salmon runs in Subdistricts 2 and 3 and only one permit holder fishing in Subdistrict 1 resulted in little chum fishing time and harvests occurring in the northern subdistricts. The Norton Sound chum salmon harvest ranked 18th highest out of 53 years, but was the best harvest since 1986.

The coho salmon harvest of 53,864 in 2013 was within the forecast range (30,000–60,000). The 2013 harvest was 45% above the 2012 harvest and was 94% of the long-term average since the late 1970s. Subdistricts 2 and 3 comprised 22% of the Norton Sound coho salmon harvest.

Coho salmon prices were the highest on record in 2013 with an average price of $1.77/lb. The average price paid of $1.49/lb for sockeye salmon was also a record. Prices paid for pink salmon were $0.22/lb and for chum salmon $0.55/lb.

KOTZEBUE SOUND AREA

The overall chum salmon run to Kotzebue Sound in 2013 was estimated to be well above average based on the commercial harvest rates, subsistence fishermen reporting good catches, and the Kobuk test fish index being the highest in the 21-year project history. The commercial harvest of 318,995 chum salmon was the 10th highest recorded. Buyers only purchased chum salmon. Harvested during the commercial fishery and reported retained for personal use were 16 Chinook, 67 chum, 13 sockeye, 42 pink, and 43 coho salmon, 302 Dolly Varden, 705 sheefish and 50 whitefish.

The commercial fishing season began on July 10. Strong commercial and test fish catches in July indicated a very large chum salmon run and the department continued to open fishing any time either of the two buyers requested. Beginning in late July catch volume started to increase and the major buyer needed to shorten fishing hours from the usual six or eight hour daily fishing periods to four hours or less. The major buyer did not request an increase in daily fishing time until the last week of August.

Sixty-six permit holders sold chum salmon in 2013. There was 20% drop in the number of permit holders selling fish this year compared to last year. The price per pound for chum salmon dropped 15% from last year and may have been a factor in the number of permit holders fishing in 2013. The season closed after August 31.

A total of 2,555,304 pounds of chum salmon (average weight 8.0 lb) were sold at an average of $0.27/lb. The total exvessel value was $689,163. The average value for each participating permit holder was $10,442. The total exvessel value was 16% above the $591,964 historical average.

Table 6.–Preliminary 2013 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [a]
Kuskokwim River	0	1	114		52	167
Kuskokwim Bay	3	51	43		71	167
Kuskokwim Area Total	3	52	157		123	334
Lower Yukon River			59		592	651
Upper Yukon River			7		132	139
Yukon River Total			66		724	790
Norton Sound		0	54[a]	8[a]	119	181[a]
Kotzebue Sound					319	319
AYK Region Total	3	52	277	8	1,285	1,624

Note: Missing data indicates no harvest and zeros indicate harvest activity but <500.

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

[a] Confidential information not included.

WESTWARD REGION

KODIAK MANAGEMENT AREA

The 2013 Kodiak Management Area (KMA) commercial salmon fishery began on June 7 and the last commercial landing occurred on September 18. Harvests by fishing area and species are summarized in Table 7.

Table 7.–Preliminary 2013 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak	34	2,574	269	28,192	794	31,863
Chignik	3	2,398	32	872	155	3,460
South Peninsula and Aleutians Islands	7	2,235	293	7,799	947	11,281[a]
North Peninsula	1	721	27	5	131	886[a]
Alaska Peninsula Total	7	2,956	321	7,805	1,078	12,166
Westward Region Total	44	7,928	622	36,868	2,026	47,489

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

[a] Catches includes test fishery catch.

Commercial fishing effort decreased slightly during 2013. Of the 595 eligible commercial salmon permits, 335 (55%) made commercial landings. By gear type, a total of 170 purse seine, 3 beach seine, and 152 set gillnet permit holders fished in 2013. Participation by purse and beach seine gear was above the previous 10-year average, but participation by set gillnet gear was below the 10-year average.

The 2013 commercial harvest in the KMA was 34,028 Chinook, 2,569,757 sockeye, 268,757 coho, 28,192,164 pink, and 794,054 chum salmon. The total harvest of approximately 31.9 million is above the 2013 forecast and the previous 10-year average of approximately 23.8 million.

The estimated exvessel value of the 2013 fishery was approximately $59.3 million, which is the highest since 1995. This is also well above the previous 10-year exvessel value of $28.3 million.

Purse seine fishermen accounted for 94.1% of the total harvest and their earnings averaged $304,105 per fished permit. Set gillnet fishermen accounted for 5.8% of the total harvest and their earnings averaged $55,671 per permit fished, the second highest since 1999. Beach seine fishermen harvested 0.1% of the total catch and averaged $24,550 per permit fished.

2013 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 7 till the end of the season along the Westside of Kodiak from the latitude of Cape Kuliuk to the latitude of Low Cape. Neither Karluk nor Ayakulik Chinook salmon achieved their escapement goals and nonretention of Chinook salmon

was implemented till the end of the season. The 2013 commercial harvest of Chinook salmon in the KMA totaled 34,028, which was above the previous 10-year average (17,153) and above the 2013 forecast (20,000).

Sockeye Salmon

The 2013 commercial harvest of sockeye salmon in the KMA totaled 2,573,757. The harvest was above the recent 10-year average (2,433,176), but below the forecast (2,702,770).

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). 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, Inner Karluk, and Outer Karluk sections until the management focus turned to pink salmon (July 6–15). A total of 716,071 sockeye salmon were harvested in early-season (through July 15) Westside fisheries, which was above the Karluk early-run projected harvest of 158,361. A total of 365,965 sockeye salmon were harvested in the late-season Westside fishery, which was below the Karluk late-run sockeye salmon projected forecast (428,955). These harvest numbers include a contribution from the enhanced Spiridon Lake sockeye salmon run.

The Ayakulik River was forecasted to have a surplus of sockeye salmon (302,363) available for harvest. The first commercial opening occurred in the Outer Ayakulik Section on June 17. The first commercial fishing period in the Inner Ayakulik occurred from June 27 to June 28, and there were several short openings throughout the season. A total of 76,945 sockeye salmon were harvested from the Inner Ayakulik and Outer Ayakulik sections.

The early-run sockeye salmon to Upper Station was weak. 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 170,623, above the projected harvest of 58,684. The Upper Station late-run sockeye salmon came in weaker than expected and only two fishing periods were permitted after August 9 (management focus changes from Frazer System pinks to Upper Station late-run sockeye salmon). The total harvest of the Alitak District late-run sockeye salmon was 51,531, which was below the forecasted harvest of 59,278.

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 8. Five days of fishing were allowed in June during the early run and 11 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 354,179. This represented only 12.79% of the total Chignik sockeye salmon harvest (15% allocation). Overall, the total sockeye salmon harvest in the Cape Igvak Section through July 25 was 393,532, which was below the preseason forecast of approximately 452,000.

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 management plan, 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 9:00 p.m. July 15 when it was estimated that the cumulative sockeye salmon harvest had approached the 15,000 limit. The total July 6–25 harvest in the North Shelikof Unit was 15,565, which included both the Shoreward and Seaward Zone harvests. A Seaward Zone closure was not required in the Southwest Afognak Section as the harvest cap of 50,000 was not met. The July 6–25 harvest in the Southwest Afognak Section was 16,993.

Terminal and Special Harvest Areas

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

There was below average effort and harvest in the Waterfall and Foul Bay Special Harvest Areas (SHAs) with a total of 16,474 sockeye salmon harvested from both areas.

In the Spiridon Bay SHA (Telrod Cove), 129,024 sockeye salmon were harvested. This includes a cost recovery of 95,725 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 109,706 sockeye salmon, which was above the forecast of 79,200 fish. This includes the commercial harvest of both enhanced and wild salmon from the Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections. Additional enhanced sockeye salmon may have been harvested in adjacent sections, but stock separation data are not available.

Coho Salmon

The commercial coho salmon harvest of 268,757 was above the forecast (158,690) but below the previous 10-year average (338,777).

The majority of the coho salmon were caught in the Eastside, Northwest Kodiak, and Afognak districts. Those three districts accounted for 200,344 of the total harvest. In areas associated with Kitoi Bay Hatchery (Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections), 52,714 coho salmon were harvested, which was above the forecast of 8,736.

Pink Salmon

The 2013 pink salmon harvest of 28,192,164 was above forecast (17.4 million) and above the previous 10-year average harvest of 20,096,622.

Wild stock pink salmon harvest was above the forecast (6.8 million) with 16,409,031 harvested in the KMA. Westside fisheries (Southwest Afognak to Ayakulik) accounted for 5,122,378, the Alitak District had a harvest of 2,648,475, and the Eastside and Northeast Kodiak districts had a combined harvest of 7,459,447.

The Kitoi Bay Hatchery pink salmon run was strong with 11,758,629 harvested in sections near the hatchery (10,585,000 forecast). 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 794,054 was below the forecast (963,719) and the previous 10-year average (885,011). The Eastside and Northeast Kodiak districts accounted for 329,957, the Mainland District had a harvest of 83,366, and Westside fisheries (southwest Afognak to Ayakulik) had a harvest of 62,557. Kitoi Bay Hatchery chum salmon production was weaker than expected with 96,142 harvested, which is below the preseason forecast of 289,182.

Escapement Summary

Fish counting weirs were operated on eight systems in 2013, including the Karluk, Ayakulik, Litnik, Upper Station, Frazer, Buskin, Saltery, and Pasagshak systems. Three observers also flew 38 aerial surveys and several observers conducted foot and skiff survey escapement estimates.

Chinook Salmon

The total Chinook salmon escapement (4,291) 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 (1,805) was below the escapement goal range (3,000–6,000). Chinook salmon escapement through the Ayakulik weir (2,363) was below the escapement goal range (4,000–8,000).

Sockeye Salmon

Sockeye salmon runs to most systems in the KMA were strong. All systems either met or exceeded their established escapement goals. The entire KMA estimated sockeye salmon escapement (1,326,667) was slightly above the previous 10-year average (1,311,408).

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.

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 77,310 was below the previous 10-year average (90,154).

Pink Salmon

The KMA pink salmon escapement of 5,071,191 fish was above the previous 10-year average (4,657,828). Pink salmon escapement goals have been established as aggregate goals for the entire Kodiak Archipelago and the Mainland District. Escapement for the Kodiak Archipelago (4,450,711) was within the escapement goal range (2.0–5.0 million). The Mainland District pink salmon escapement of 620,480 was within the established escapement goal range (250,000–750,000).

Chum Salmon

Overall chum salmon escapement (397,499) was above the previous 10-year average (382,056). Escapement goals have been established for the Kodiak Archipelago and the Mainland District. The escapement in the Kodiak Archipelago was above the escapement goal (151,000) with an estimated 284,799, and the Mainland District escapement of 112,700 was also above the escapement goal (104,000).

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 2013, the combined early- and late-run Chignik-bound sockeye salmon run was above recent averages. The CMA was open to commercial salmon fishing for 69 days (June 6 to August 27) and a total of 76 permits were fished (excluding the department's test fishery permit).

Escapement Summary

Escapement through the Chignik River weir was monitored using underwater digital video equipment. Two underwater gates in the weir were open to provide uninterrupted escapement. The numbers of fish passing the weir were counted, by species, for the first 10 minutes of each hour. The counts were expanded to obtain hourly escapement estimates, and then summed to provide an estimate of daily fish passage. A digital video archive was kept of each 10-minute counting period in the 2013 season with the first count occurring on May 28 when weir installation was complete, and the last weir count of the season took place on September 2, after which the weir was removed.

Aerial surveys were flown throughout the season to monitor escapement into CMA streams. Peak aerial survey counts, by index stream and species, were summed and compared to escapement goal. 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 1,300–2,700. The 2013 Chignik River Chinook salmon escapemen above the weir (1,253), 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 2014.

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) of sockeye salmon through July 4 was met with an estimated escapement of 386,782.

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) of sockeye salmon was met with an estimated escapement of 369,319. Post-weir sockeye salmon escapement estimates were produced for the September 3–15 (36,457) and the September 16–30 (24,251) periods and were included in the total late-run escapement estimate.

Early run escapement was below the 5- and similar to the 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 2013 Chignik River coho salmon weir escapement estimate through September 2 was 16,763, which was above the average escapement estimates. Although no coho salmon escapement goals have been established for the CMA, coho salmon escapement throughout the CMA appears to be consistent with past years and sustainable at this level.

Pink Salmon

An estimated 7,231 pink salmon passed the Chignik River weir in 2013, which was 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 upper bound of the SEG for all districts combined (800,000) was exceeded with an estimated total peak escapement of 863,991.

Chum Salmon

The 2013 Chignik River chum salmon escapement was 72, which was below average for the Chignik River. Chum salmon escapements to other CMA streams were estimated via aerial survey and summarized by district. The SEG lower bound for all districts combined (57,400) was met with an estimated total peak escapement of 335,907.

Commercial Fishery Summary

The CMA was open to commercial salmon fishing for 69 days during the 2013 commercial salmon season. The first fishing period occurred on June 6 and the CMA closed to commercial salmon fishing (August 27) shortly after area salmon processors ceased operations. In 2013, 77 permit holders (including the department's test fishery permit) made a total of 3,144 landings.

Harvest Summary

Chinook Salmon

A total of 2,959 Chinook salmon were commercially harvested in 2013, which was below recent average harvests. The majority of the 2013 CMA Chinook salmon harvest occurred in the

Central District. Due to the low escapement of Chinook salmon into the Chignik River the commercial fishing fleet was limited to nonretention of Chinook salmon 28 inches and greater in length in the Chignik Bay (after July 21) and Central (after July 22) districts.

Sockeye Salmon

A total of 2,398,066 sockeye salmon were commercially harvested in the CMA during 2013, which was well above the prior 5- and 10-year average harvests. The majority of the 2013 CMA sockeye salmon harvest came from the Chignik Bay and Central districts.

In 2013, Cape Igvak opened to commercial salmon fishing on June 8 and Southeastern District Mainland (SEDM) opened to commercial salmon fishing on June 11. A total of 211,286 (169,029 considered Chignik-bound) sockeye salmon were harvested in SEDM through the end of the allocation period, on July 25. Cape Igvak fisherman harvested 393,532 (354,179 considered Chignik-bound) during the allocation period.

Coho Salmon

A total of 32,282 coho salmon were commercially harvested in 2013, which was lower than the 5- and 10-year average harvest. The majority of the coho salmon harvest in 2013 took place during July and August in the Western District.

Pink Salmon

A total of 871,597 pink salmon were commercially harvested (excluding the department's test fishery and home pack) in the CMA in 2013, which was below the 5-year and similar to the 10-year average harvests. The 2013 CMA pink salmon harvest was well distributed between the Central, Eastern, Western, and Perryville districts. The majority of the pink salmon harvest occurred in August.

Chum Salmon

A total of 154,679 chum salmon were commercially harvested in 2013, 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 2013 took place in the Central District, although the Eastern and Western districts also yielded substantial catches. Most chum salmon were harvested in June and early-August.

Economic Value Summary

The exvessel value of the 2013 CMA commercial salmon fishery was about $23.3 million, or approximately $307,076 per active permit holder. A majority of the value was from the sale of sockeye salmon (94%), with a total of approximately $288,948 per active permit holder. The harvest provided approximately $495 for Chinook, $1,144 for coho, $11,422 for pink, and $5,068 for chum salmon, per active permit holder.

Department Test Fishery Summary

The department conducted test fisheries on three occasions in 2013. Data from these test fisheries were used to assess the buildup of sockeye salmon in Chignik Lagoon. An estimated 4,970 sockeye salmon were harvested, which provided approximately $52,500 that was used to offset the cost of vessel charters, general operations at the Chignik River weir, and the 2014 inseason genetics sampling.

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

The following is an overview of the 2013 Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Areas commercial salmon fishing season. Total harvest presented from the 2013 commercial salmon fishing season should closely approximate final harvest numbers for all species. The 2013 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas totaled 7,228 Chinook, 2,956,150 sockeye, 320,649 coho, 7,804,617 pink and 1,077,728 chum salmon. Subsistence salmon harvest will be reported in the 2013 annual management report. Data detailed in this report are considered preliminary. Preliminary exvessel value of salmon harvested in Area M totaled $32,939,600. 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 on June 7 for set gillnet gear and on June 10 for seine and drift gillnet gear. There were four 88-hour and one 64-hour fishing periods for set gillnet gear and four 88-hour fishing periods for seine and drift gillnet gear. The commercial salmon harvest for the June fishery consisted of 2,214 Chinook, 1,556,518 sockeye, 299 coho, 302,289 pink, and 397,024 chum salmon.

Southeastern District Mainland

Due to a strong commercial salmon harvest in the Chignik Management Area (CMA), the Southeastern District Mainland (SEDM) opened to commercial salmon fishing on June 11. During the SEDM allocation openings (June 1 to July 25) 611 Chinook, 211,286 sockeye, 17,588 coho, 322,889 pink, and 38,935 chum salmon were harvested.

Beginning July 1, the Northwest Stepovak Section (NWSS) of 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 NWSS. From July 1 to July 25, there were 86 Chinook, 29,745 sockeye, 93 coho, 3,969 pink, and 2,424 chum salmon harvested in the NWSS. The cumulative sockeye salmon escapement of 17,386 through the Orzinski Lake weir was within the SEG (15,000–20,000).

From July 26 to August 31, SEDM is managed based on the abundance of local salmon stocks. Due to late run timing of pink and chum salmon into SEDM streams the fishery was closed for the entirety of this time.

From September 1 to September 30 SEDM is open concurrently with the remainder of the Southeastern District based on the abundance of coho salmon stocks. During this time frame a weekly fishing period was established (Monday to Wednesday) with additional fishing time based on coho salmon abundance.

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 resulted in approximately 44 (July 2), 43 (July 3), and 24 (July 5) immature salmon per set, which were below the threshold of 100 immature salmon per set.

From July 6 to July 31, there was a 33-hour fishing period, followed by a 63-hour closure, followed by six 36-hour fishing periods separated by 60-hour closures. 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 late 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 from July 26 to October 31) was 3,746 Chinook, 436,719 sockeye, 275,217 coho, 7,170,189 pink, and 508,406 chum salmon

The SEDM was closed to commercial salmon fishing from July 26 to September 1 due to low pink and chum salmon escapement. SEDM harvest is representative of the September fishery.

Aleutian Islands Fishery

There were no commercial salmon fishing periods in the Aleutian Islands in 2013.

South Peninsula Escapement

The South Peninsula indexed sockeye salmon escapement of 31,386 was below the management objective range (48,200–86,400). Pink salmon total escapement of 2,320,790 was within the SEG range (1,637,800–3,275,700). Chum salmon indexed total escapement of 502,600 was within the cumulative district escapement goal range (330,400–660,800). No 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. 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 which prevented aerial surveys from being conducted.

North Alaska Peninsula

In 2013, 150 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 2013 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 2013, the North Alaska Peninsula harvest of Chinook, sockeye, coho, chum and pink salmon were well below the previous 10-year (2003–2012) averages for each species. Similarly, the harvest of Chinook, sockeye, coho, chum and pink salmon were all below projected levels. The total 2013 North Alaska Peninsula sockeye salmon harvest was the lowest harvest since 1977.

Northwestern District

In the 2013 Northwestern District commercial salmon fishery a total of 8 Chinook, 57,373 sockeye, 25 coho, 3,123 pink, and 86,382 chum salmon were harvested. A total of 42 permit holders participated in the fishery, consisting of 6 purse seiners and 36 drift gillnetters.

The Northwestern District, chum salmon escapement of 92,800 was below the chum salmon SEG (100,000–215,000). This escapement estimate represents a minimum; the actual

escapement likely being greater due to very poor survey conditions in one of the major chum salmon producing streams in the Northwestern District streams. The Bechevin Bay Section had an escapement of 38,200 chum salmon.

Black Hills Section

Due to closures protecting weak salmon runs in the Bear, Three Hills and Ilnik sections in the Northern District, effort by the drift gillnet fleet in the Black Hills Section was the third highest in the past 25 years. In 2013, 49 permits fished the Black Hills section with the majority of the harvest effort occurring throughout the month of July. The peak daily harvest of sockeye salmon occurred on July 10 (3,518) while the peak daily harvest of chum salmon occurred on July 30 (2,520). A total of 57,398 sockeye and 73,941 chum salmon were harvested in the Black Hills Section in 2013. Weekly fishing periods occurred throughout the season in the Black Hills Section with some restrictions in the southern portion of the area in August to protect chum salmon passing through the area bound for the Joshua Green River in the Northwestern District. North Creek is the only river in the Black Hills Section with a sockeye salmon escapement goal. The 2013 North Creek salmon escapement of 8,500 sockeye salmon (determined by aerial surveys) met the escapement goal (4,400–8,800).

Nelson Lagoon Section

The Nelson River total run of 465,327 sockeye salmon (includes harvest and escapement) was above the estimated forecast of 327,000. From the total run, 217,327 were harvested in Nelson Lagoon and 248,000 escaped in the Nelson (Sapsuk) River. The 2013 sockeye salmon escapement into Nelson River exceeded the BEG (97,000–219,000).

The Nelson Lagoon Section was opened for all regularly scheduled fishing periods along with many extensions in fishing time in 2013. Thirty-four permits were fished in the Nelson Lagoon Section and the peak sockeye salmon harvest occurred on June 27 (17,250). Beginning August 15, the Nelson Lagoon Section may be managed on local coho salmon runs. In 2013, 22,000 coho salmon were observed in Nelson River exceeding the Nelson River lower bound SEG (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 2013, Bear River experienced a weak early run while the Sandy River was plagued with high water events that washed out the weir and made it difficult to assess the strength of the salmon run. While the runs were on track most of the season to meet the minimum escapement goals, there did not appear to be a harvestable surplus present and as a result, commercial salmon fishing was closed in the Bear River and Three Hills sections from June 27 until August 7. A total of 94,335 sockeye salmon were harvested in the Bear River Section during 2013 and 19,983 sockeye salmon were harvested in the Three Hills Section.

The Bear River early-run (through July 31) sockeye salmon escapement of 219,074 met the escapement goal (176,000–293,000). The Bear River late-run (after July 31) sockeye salmon escapement of 196,926 (includes post-weir estimate of 39,568) slightly exceeded the late-run escapement goal (117,000–195,000). After the weir was removed on August 23 the post-weir estimate of 39,568 brought the Bear River season sockeye salmon escapement to 416,000, which was within the season escapement goal (293,000–488,000).

The 2013 Sandy River sockeye salmon escapement of 42,000 met the season ending escapement goal range (34,000–74,000).

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 2013, 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. The remaining 8,000–12,000 (or 20%) is the historical proportion of the Ocean River component of the Ilnik system. In 2013, the Ilnik River sockeye salmon escapement through the weir was 27,000 and did not meet the Ilnik River escapement goal (32,000–48,000). However, the Ocean River sockeye salmon escapement of 20,000 (determined by aerial surveys) exceeded the 8,000–12,000 goal. The final season ending escapement for the Ilnik River system (including post-weir estimates and aerial surveys), Willie Creek (a tributary to Ilnik River), and Ocean River, was 47,000 sockeye salmon, which met the Ilnik River system escapement goal (40,000–60,000).

By regulation, the Ilnik Section can open to commercial salmon fishing on June 20. Due to low weir counts, the area did not open until June 28. Sockeye salmon escapement into Ilnik River tracked minimum interim escapement objectives throughout the season; however, there appeared to be no harvestable surplus. As a result, the Ilnik Section was closed to commercial salmon fishing from June 30 until August 7. No commercial fishing effort occurred in Ilnik Lagoon in 2013 despite weekly fishing periods.

In 2013, a total of 95 permit holders harvested 81,289 sockeye salmon in the Ilnik Section. Within the Ilnik Section, about 67% of this commercial harvest occurred southwest of Unangashak Bluffs (54,834), and 33% was harvested between Unangashak Bluffs and Strogonof Point (26,455). The peak daily catch in the southern portion of the Ilnik Section was on June 29 when 21,399 sockeye salmon were harvested. The largest daily harvest in the northern portion of the Ilnik Section also occurred on June 29, when 14,420 sockeye salmon were harvested.

Beginning August 15, the Ilnik Section may be managed for coho salmon runs into Ilnik Lagoon. Very little effort occurred in the Ilnik Section after August 15 despite weekly fishing periods open to commercial salmon fishing in the area.

Inner and Outer Port Heiden Sections

Aerial escapement surveys began on the Meshik River on June 14. A survey conducted on July 5 documented 40,000 sockeye salmon in the Meshik River, meeting the season-ending escapement goal (25,000–100,000). The total sockeye salmon escapement into the Inner Port Heiden Section was 85,800. This includes escapement into the Meshik River and tributaries, as well as Red Bluff and Yellow Bluff creeks.

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 25 and had four openings of 2½ days per week until the section closed on July 17. In 2013, a total of 86 permit holders harvested 254,917 sockeye salmon from

the Outer Port Heiden Section. The peak daily catch was on July 4 when 71,466 sockeye salmon were harvested. No commercial fishing occurred in the Inner Port Heiden Section in 2013.

Cinder River Section

Little effort occurred in the Cinder River Section in 2013 despite weekly fishing periods of 2½ days per week for the entire season. The total Cinder River sockeye salmon escapement estimate of 64,000 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 2013 Nelson River Chinook salmon escapement was 1,221 and did not meet the escapement goal (2,400–4,400). The total Northern District Chinook salmon escapement of 4,346 was also well below the most recent 10-year average (20,252).

Chum Salmon

The Northern District has a districtwide chum salmon escapement goal of 119,600–239,200. This goal was met with an escapement of 137,251, yet it was below the most recent 10-year average (184,895). The bulk of the chum salmon escapement occurred in the Herendeen-Moller Bay Section (43,600) and the Meshik River in the Inner Port Heiden Section (30,100).

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 of 22,000 coho salmon met the threshold goal of 18,000. The coho salmon run continues through September and the last aerials survey was on September 10. The Ilnik River escapement of 13,000 met the threshold of 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 2013.

PRELIMINARY FORECASTS OF 2014 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 2014 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
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.

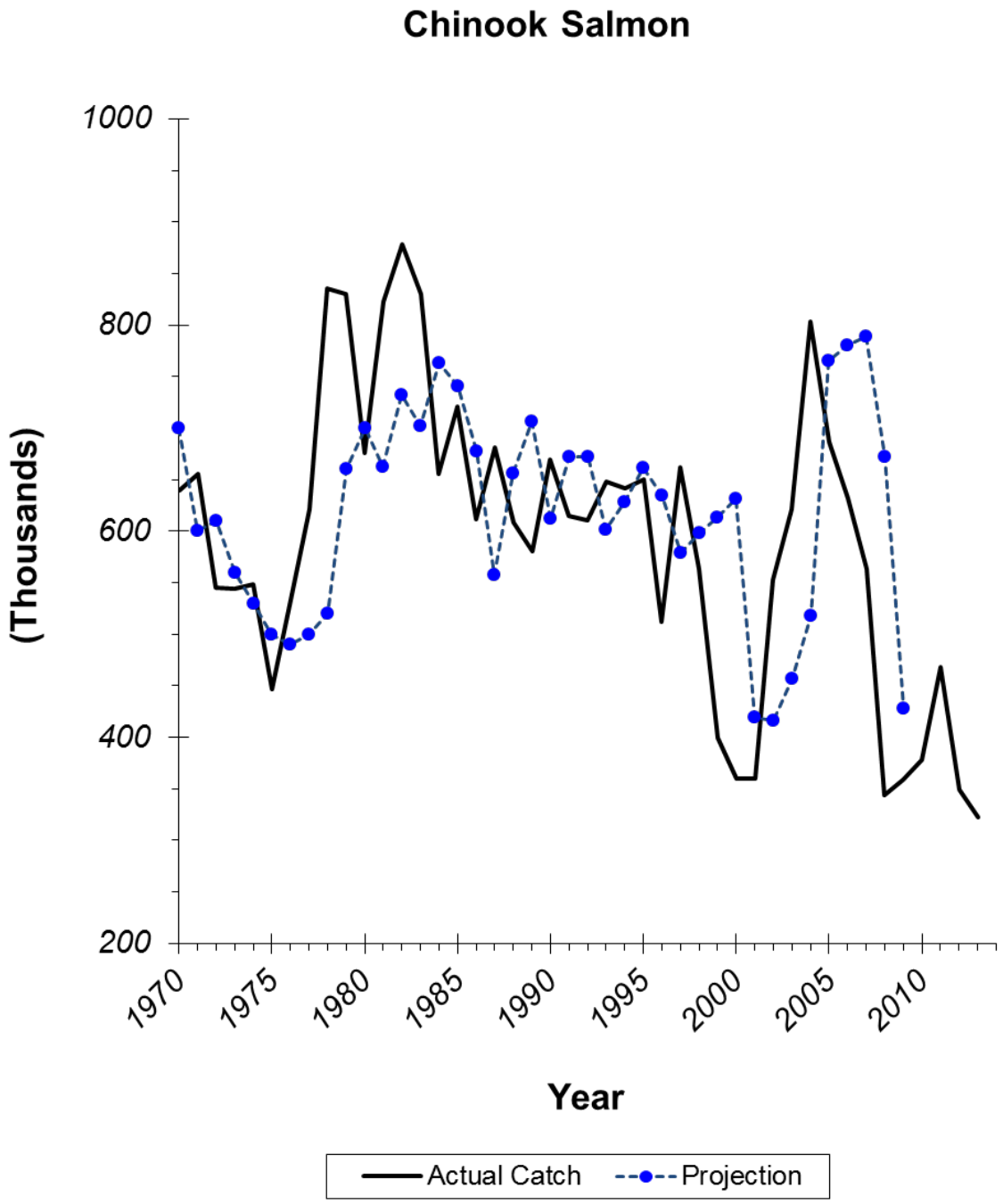

Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2013, 2011–2014 projection not available.

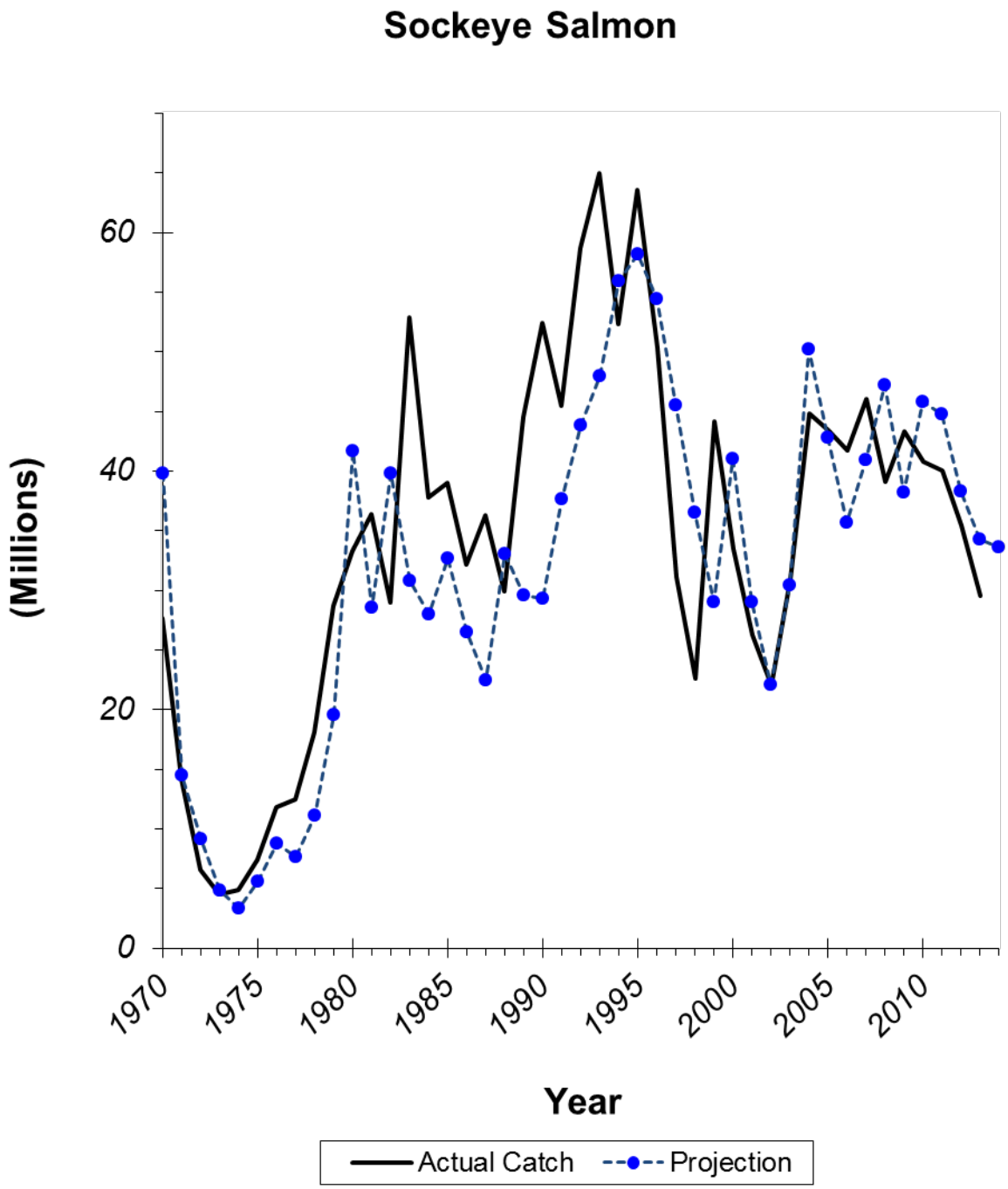

Figure 3.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2013, with the 2014 projection.

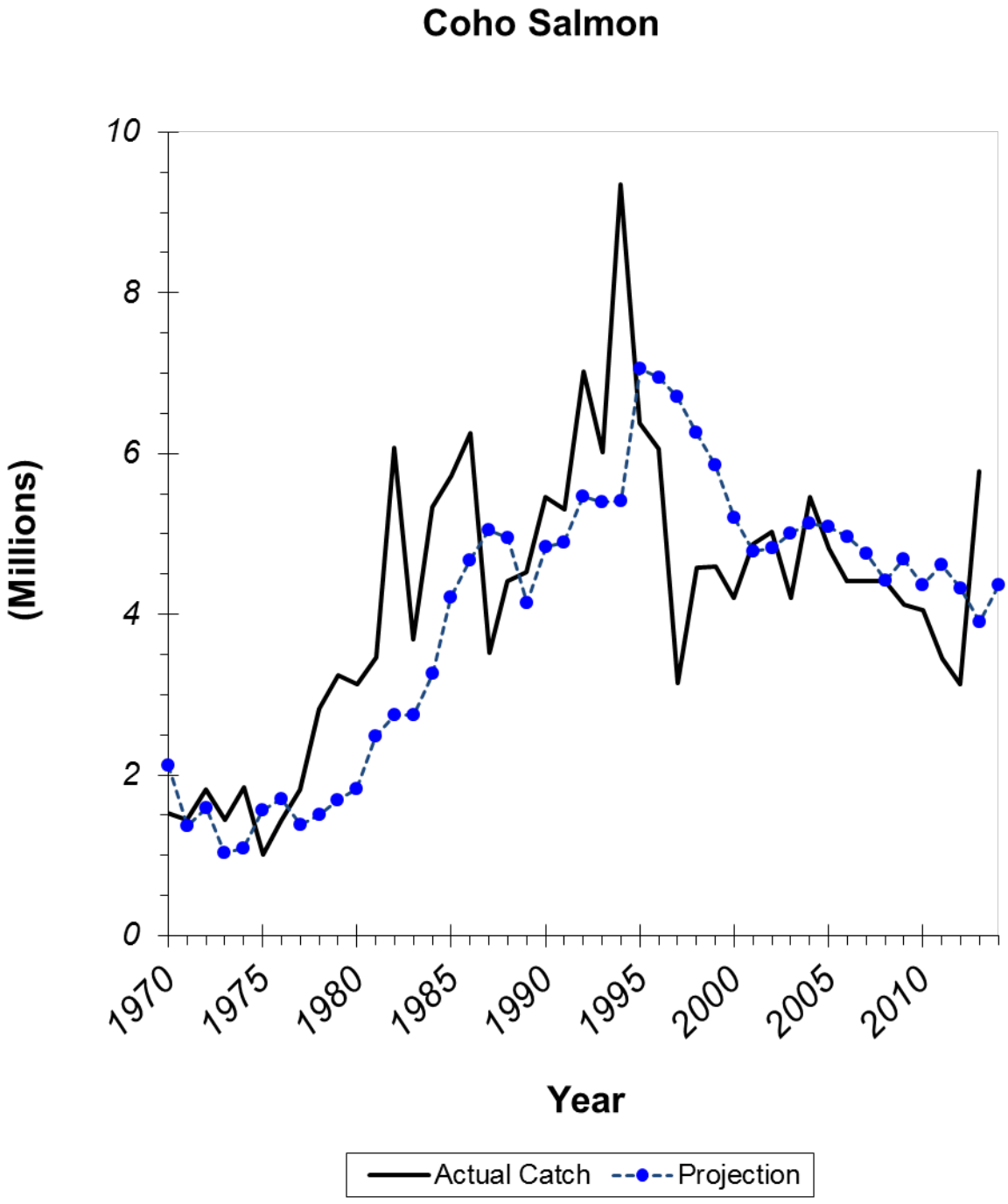

Figure 4.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2013, with the 2014 projection.

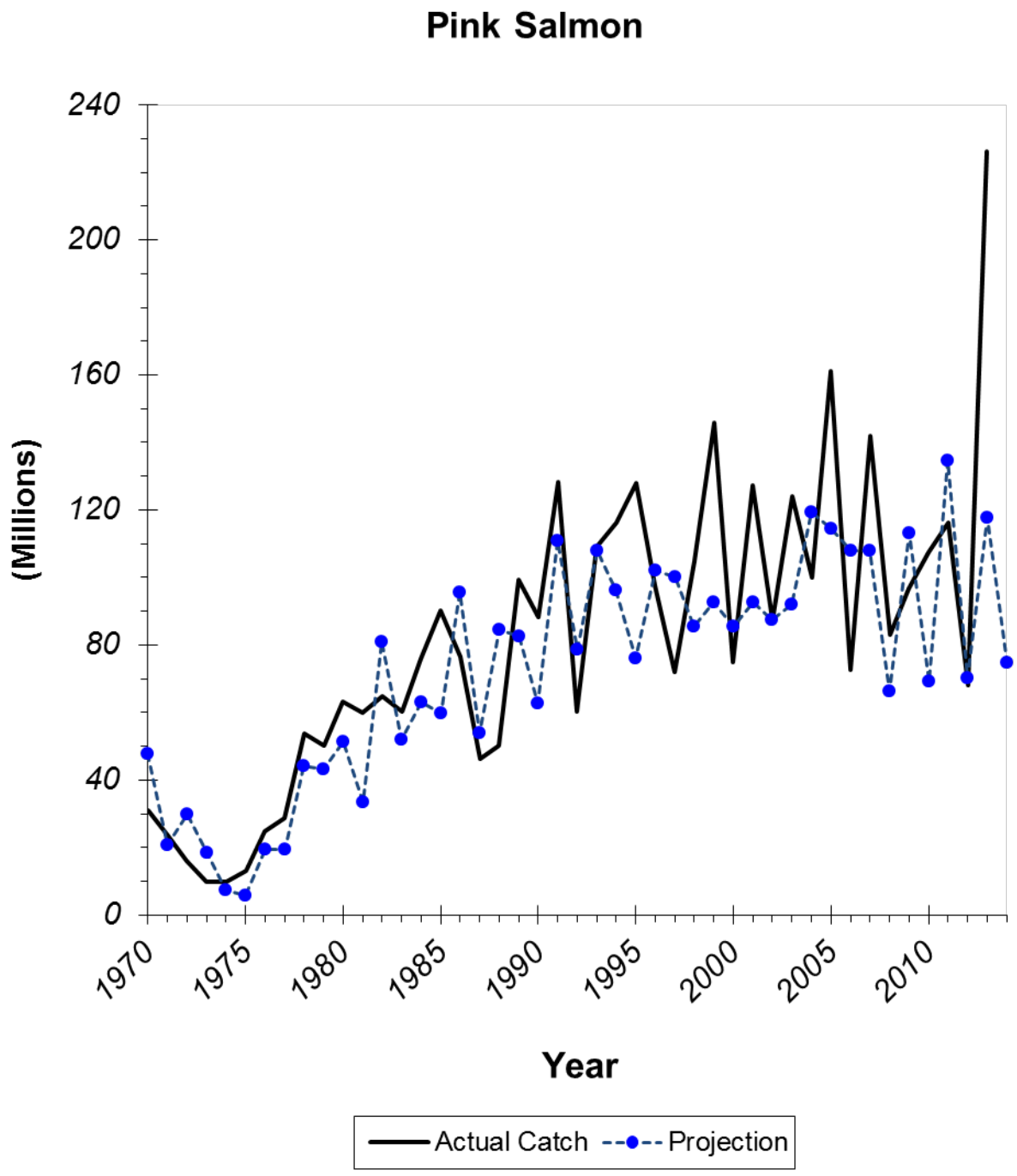

Figure 5.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2013, with the 2014 projection.

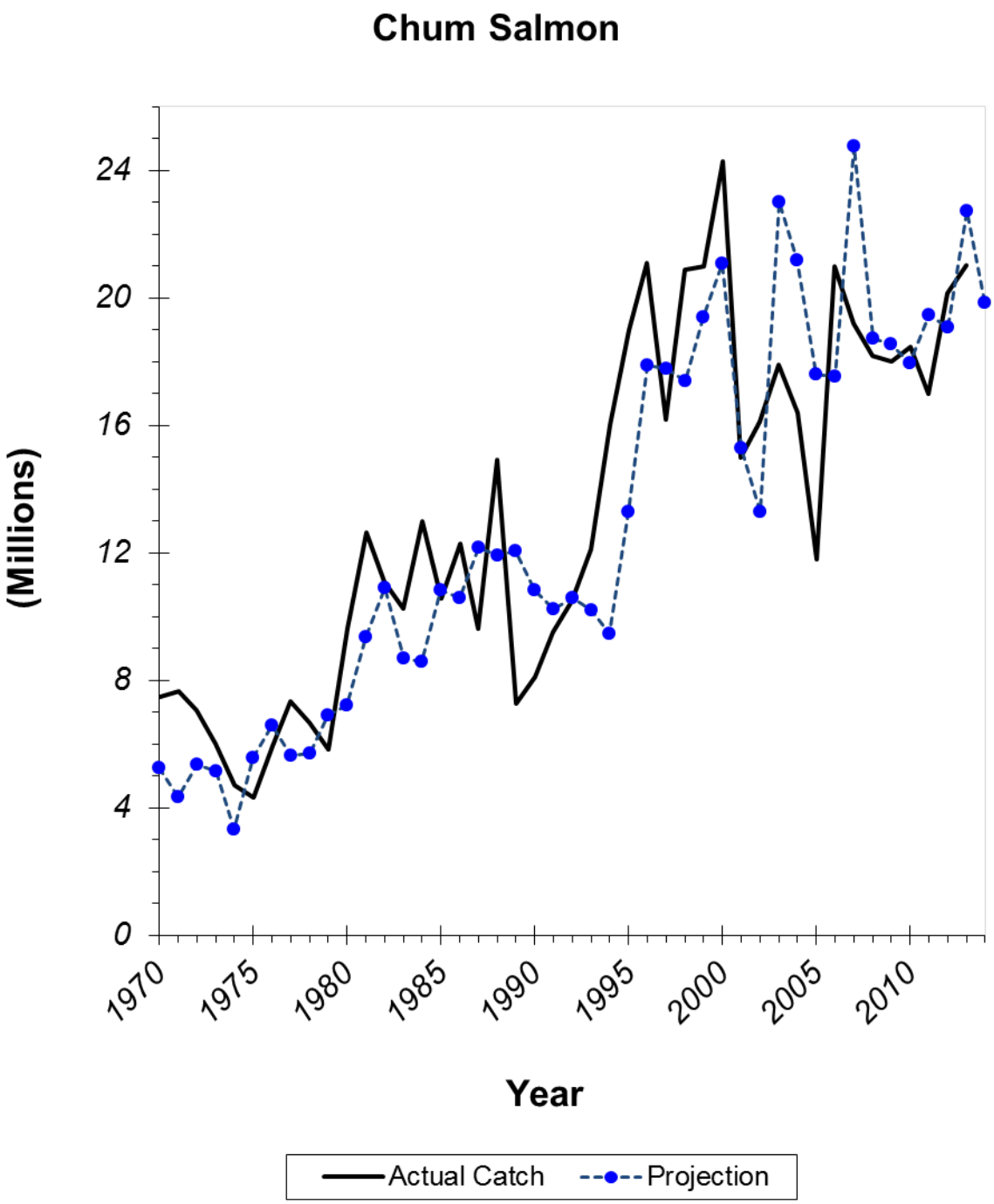

Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2013, with the 2014 projection.

ACKNOWLEDGMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Regional and Area research biologists Steve Heinl, Nicholas Sagalkin, Steve Moffitt, Mark Willette, Ted Otis, and Charles Brazil; and Regional management biologists Dan Gray, Bert Lewis, Paul Salamone, Dan Bergstrom, and Jeff Wadle 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 2014 fishing season.

APPENDIX A: SOUTHEAST ALASKA

Forecast Area: Southeast Alaska
Species: Pink Salmon

The Southeast Alaska pink salmon harvest in 2014 is predicted to be in the *average* range with a point estimate of 22 million fish (80% confidence interval: 8–36 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 51-year period 1960 to 2010.

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

Forecast Methods

The 2014 forecast was produced in two steps: 1) a forecast of the trend in harvest, and 2) the forecast trend adjusted using 2013 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 x_t, x_{t-1}, ... denotes the observed harvests in year t, t-1, and so on, then the forecast in year t+1 is given by,

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

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 2012, the parent year for the 2014 return. Since the formula used to calculate the 2014 forecast is a weighted average of the 2012 harvest and its associated forecast, which was also based on the associated parent year harvest and forecast, the 2014 forecast is based entirely on even-year data. That is, we used all of the even-year harvest data up to 2012, assuming that the 2012 parent year and other even years in the series will better predict the 2014 return. This analysis produced a forecast of 22 million pink salmon (Figure A1).

We adjusted the forecast using peak June–July juvenile pink salmon catch-per-distance-trawled (CPDT) 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

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annually in upper Chatham and Icy straits in conjunction with NOAA's Southeast Coastal Monitoring Project[a] and are highly correlated with the harvest of adult pink salmon in the following year. We developed a simple equation to predict the forecast error in the exponential smooth by regressing the forecast error proportions from 1998 to 2013 on the corresponding NOAA CPDT data from 1997 to 2012 (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. The predicted forecast error for 2014 was –3%, which resulted in only a slight adjustment to the exponential smooth forecast—the forecast rounded to the nearest million remained at 22 million pink salmon (Figure A3). The forecast range (8–36 million) is based on an 80% confidence interval calculated by cross-validation estimates of the forecast error.

Forecast Discussion

The 2014 harvest forecast of 22 million pink salmon is well below the recent 10-year average harvest of 41 million, but is close to the average harvest over the past five even years (24 million). The primary reason to expect that the harvest in 2014 will be below the recent 10-year average is that BEGs were met in only two of three subregions in the 2012 parent year. The Northern Southeast Inside Subregion escapement index was below goal and management targets were not met in 12 of this subregion's 21 stock groups. Overall, management targets for pink salmon were not met in 5 of 15 districts, and, at a finer scale, 15 of 46 pink salmon stock groups. However, the NOAA Auke Bay Lab's 2013 peak June–July juvenile pink salmon CPDT statistic from upper Chatham and Icy straits in northern Southeast Alaska ranked 10th out of the 17 years that they have collected juvenile salmon abundance information, which may indicate good freshwater and early marine survival for pink salmon set to return in 2014 and perhaps an increase in abundance over recent even-year returns. Pink salmon harvests associated with juvenile indices similar to the 2013 index (±10%) ranged from 24 to 52 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 2014 NOAA forecast can be found at the following link: http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm (Accessed April 4, 2014).

ADF&G forecasts that were adjusted using NOAA's juvenile pink salmon data were much improved over previous forecasts (Figure 4). 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 though these hindcast values were not always precise (e.g., in 2006), the

-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, USA. http://www.npafc.org/new/pub_documents.html (Accessed April 4, 2014).

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 an eighth consecutive year.

The department will manage the 2014 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.

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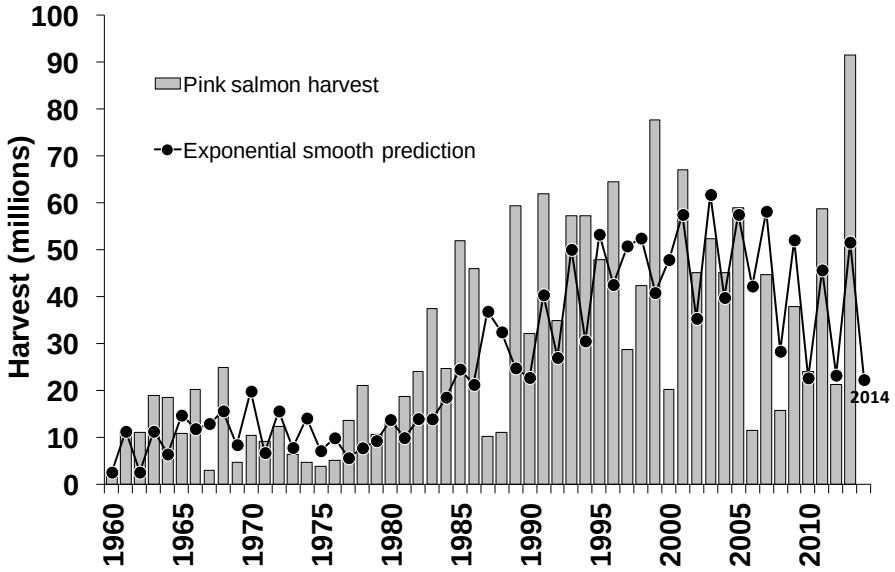

Figure A1. Comparison of the annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2014 forecast model. This method produced a 2014 harvest forecast of 22 million pink salmon.

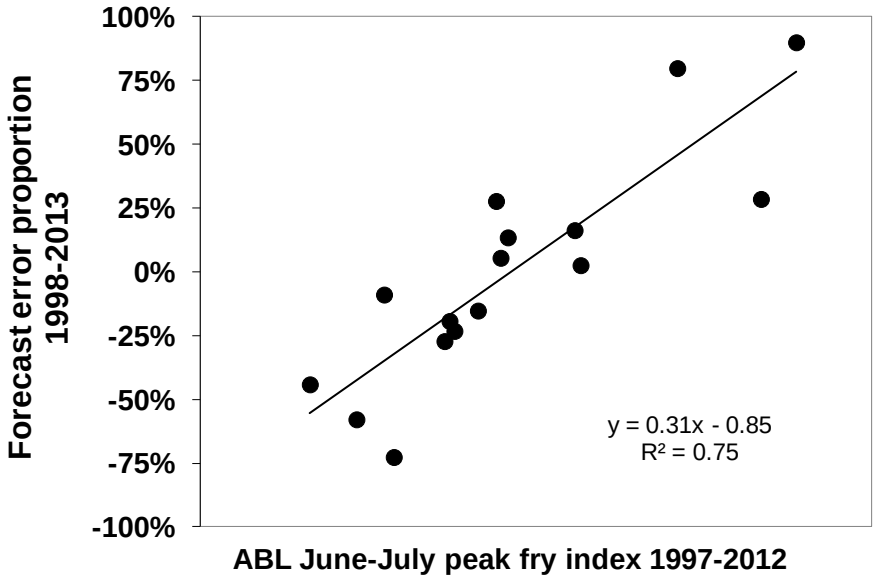

Figure A2. Regression of ADF&G forecast error proportion on the peak June–July juvenile pink salmon index from Icy Strait one year prior.

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.

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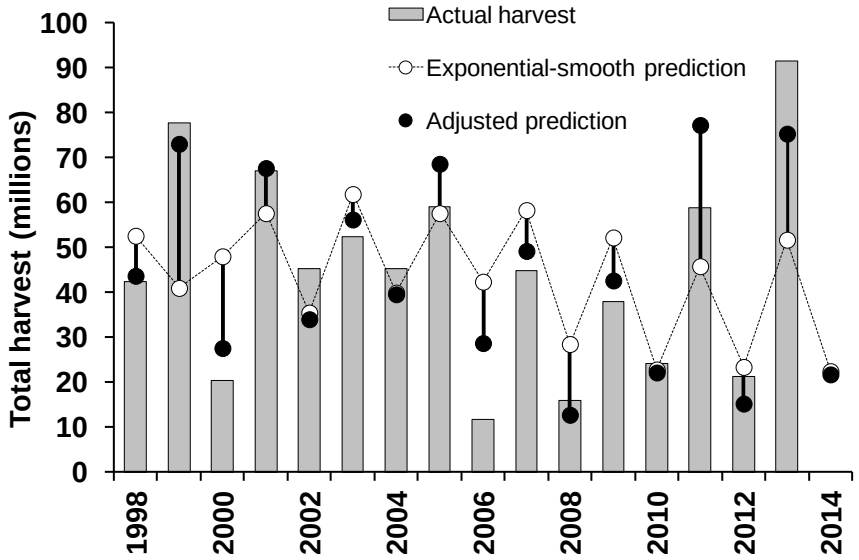

Figure A3. Annual harvest of pink salmon in Southeast Alaska, 1998–2013, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory juvenile pink salmon data.

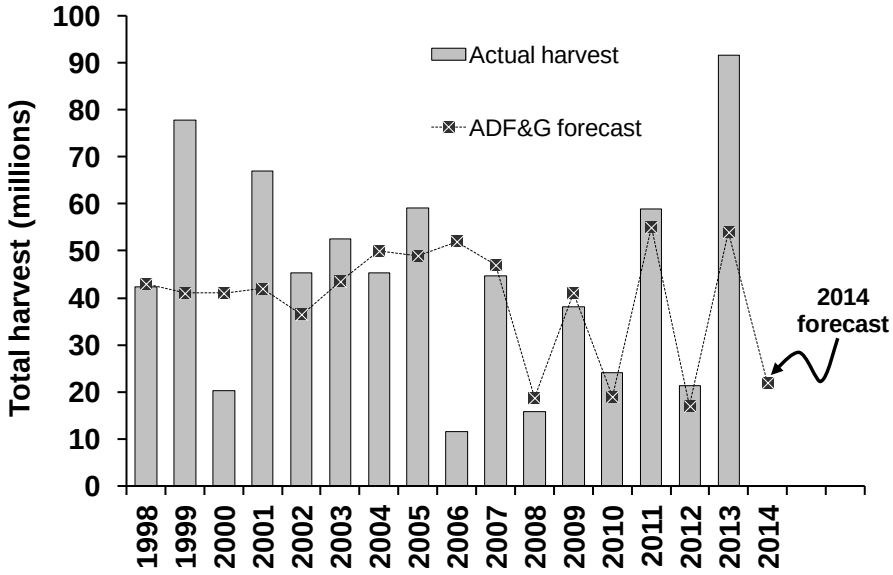

Figure A4. Annual harvest of pink salmon in Southeast Alaska compared to the ADF&G pre-season harvest forecast, 1998–2013.

Note: The 2007–2014 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 2014 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	4,300	580–19,000
Escapement Goal[a]	1,160	
Harvest Estimate[b]	3,140	0–17,840

[a] The PWS pink salmon escapement goal is the sum of the median historical even-years (1966–2010) escapement for each district in Prince William Sound with a sustainable escapement goal (SEG). 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 district specific SEG ranges is 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 common property fishery (CPF) were estimated by subtracting hatchery contributions from the CPF total. Hatchery contributions were determined by thermal marked otolith recoveries (1997–2013), 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 2014 forecast is based on an exponential smoothing and dampening technique that is heavily dependent upon the total run size of the previous brood year (2012). This forecast method differs from the 2013 forecast that used the average of the two previous brood year returns (2009 and 2011) 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 2014 was selected by comparing the mean absolute percentage error (MAPE) and the standard deviation of the MAPE among the models examined (even return years 1964–2012). The range for the total run forecast was calculated by:

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

with

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

where $\hat{y}_{t+1}$ is the forecast for the following year based on the average of the previous two even 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 (1964–2012), σ_i is the proportional forecast

-continued-

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

The predicted natural total run of pink salmon in 2014 is a naïve forecast that uses a lag 1 exponential smoothing with dampening to minimize MAPE. 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 2014 natural run included: 1) previous even brood year total run (most naïve forecast method), 2) total run averages with 2–10 years of data (even years), 3) linear regression of log-transformed total Prince William Sound (PWS) escapement versus log-transformed total PWS return by brood line, and 4) lag 1 exponential smoothing, and 5) lag 1 exponential smoothing with dampening. The 2014 forecast (lag 1 exponential smoothing with dampening) had the lowest MAPE for even brood year models examined, and lowest standard deviation of MAPE. None of the models examined for natural pink salmon returning in even-years produced forecasts with MAPE values below 100%, resulting in considerable uncertainty in the forecast point estimate.

The brood year 2012 escapement index (1.13 million) was within the current SEG range (0.79 million–1.70 million) and was similar to the median of the observed even-year escapements since 1960 (1.2 million). If the 2014 total run forecast (4.3 million) is realized, it will be similar to the median even brood year return since 1960. 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 2013. The 2013 average PDO index rank as the 26th most negative (coldest) in the last 100 years. Cold ocean conditions are generally associated with lower salmon productivity; however, there were very large runs in 2010 and 2013.

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

Preliminary Forecast of the 2014 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	445	190–722
Escapement Goal[a]	200	
Harvest Estimate[b]	245	0–522

[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 2014 PWS natural 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 2014. 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 natural 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

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

with

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

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 (1990–2013), 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 2013 natural chum

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salmon contribution estimates based on thermally marked otoliths were available for the Coghill and Montague districts. Contribution estimates from thermally marked otoliths in other districts have been available since 2004. Historical natural chum salmon age data from escapements and CPF harvests are unavailable for most districts of PWS. If the 2014 natural chum salmon forecast of 445,104 is realized, it would be the 25th 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 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 2014.

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

Preliminary Forecast of the 2014 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound, Coghill Lake		
Total Run	168	92–363
Escapement Goal[a]	30	
Harvest Estimate[b]	138	62–333
Prince William Sound, Eshamy Lake		
Total Run	53	29–77
Escapement Goal[c]	21	
Harvest Estimate[b]	32	9–57
Total Production		
Run Estimate	221	140–420
Escapement Goal	51	
Common Property Harvest[b,d]	170	90–370

[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 5,700 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 fish 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 fish in 2014 used the return of age-1.2 fish in 2013 as the input parameter. Predicted returns of age-1.1, -1.2, -2.2, and -2.3 sockeye salmon were calculated as the 1974–2013 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 2007–2013 forecasts and actual runs as the forecast variance:

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

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

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estimates of age-1.3 returns to Coghill Lake have a much lower MAPE (~34%) than the sibling model used to predict returns of age-1.2 fish (~89%).

The forecast of the natural sockeye salmon run to Eshamy Lake has historically been based on an apparent 4-year cycle with leap years being the strongest run year. However, this cycle has diminished in recent years, and the 2014 forecast is simply the average annual runs since 1989. Eshamy Lake escapement has been enumerated at a weir since 1950, except 1987, 1998, 2012, and 2013. 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, 2012, and 2013 were used to calculate the forecast. In 2012 and 2013, a video monitoring system was tested to enumerate the sockeye salmon run to Eshamy Lake. The 80% prediction interval was calculated using the equation described for Coghill Lake 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 2014 total run forecast midpoint (167,547) would be the seventh largest run since 1988. The majority (120,900) of the overall Coghill Lake sockeye salmon forecast is predicted to come from age-1.3 fish from the 2009 brood year. Few jacks were observed in 2013 relative to other years, which could indicate a small run of age-1.2 sockeye salmon in 2014. However, there is considerable uncertainty in models used to estimate this component of the run, and we opted to use the average total return of age-1.2 sockeye salmon (35,900) rather than sibling model estimates (13,100) for the 2014 forecast. Other factors that may influence the Coghill Lake sockeye salmon run in 2014 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

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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, 2012, and 2013 because of budget constraints and are not anticipated to resume.

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.

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APPENDIX C: COPPER RIVER

Forecast Area: Copper River
Species: Chinook Salmon

Preliminary Forecast of the 2014 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	62	42–90
Escapement Goal[a]	27	
Harvest Estimate[b]	33	15–63

[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 maximum harvest by all fisheries (subsistence, personal use, sport, and commercial) that allows achieving the average spawning escapement of 27,000. The commercial common property harvest midpoint estimate is 22,000 and the 80% prediction interval is 10,000–40,000.

Forecast Methods

The Chinook salmon run forecast to the Copper River is the total of estimates for eight age classes. A linear regression model with natural log-transformed data was used to predict returns of age-1.3 Chinook salmon. This linear regression model was parameterized using the historical relationship between returns of age-1.3 Chinook 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 Chinook salmon in 2014 used the return of age-1.2 fish in 2013 as the input parameter. Predicted returns of all other age classes of Chinook salmon were calculated as the average of the five previous returns. Estimates of commercial harvest of Chinook salmon to the Copper River date to 1890; however, reliable estimates of inriver abundance are only available since 1999. Therefore, only data collected since 1999 were used to estimate model parameters, calculate individual age class forecasts, and generate 80% prediction intervals. The 80% prediction intervals were calculated as the sum of the point estimates for each age class plus/minus the square root of the sum of the squared differences between the individual point estimates and 80% prediction intervals for each age class.

Historically, sibling model estimates of age-1.3 returns to the Copper River have a much lower MAPE (~38%) than the sibling model used to predict returns of age-1.4 fish (~68%); therefore, the only sibling model used was to predict age 1.3 fish.

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. The commercial harvest was calculated with the projected total harvest multiplied by the 5-year average proportion of harvest by the commercial fishery (~0.64).

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

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reduced in 1994. In 1999, the ADF&G Divison 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 15 years (1999–2013) of inriver abundance estimates.

The 2014 total run forecast point estimate of 62,000 is ~6,500 less than the 15-year average total run size (1999–2013 average = 68,500). However, this forecast is considerably larger than total runs since 2008, which have ranged from 33,000 to 54,000. Several lines of evidence suggest that the 2014 Chinook salmon run will be larger than in recent years. Most importantly, the 2013 estimated run of age-1.2 fish (6,700) was the largest since 2006 (9,600). Since 1975, a run of this many age-1.2 fish has never been followed by fewer than approximately 44,000 age-1.3 fish. There was a record percentage of age-1.1 fish (jacks) harvested upriver indicating the possibility of a strong run of age-1.2 fish in 2014. Finally, brood tables suggest that the weakness in recent runs was generally associated with fish from the 2004 and 2005 brood years, which have now all returned. If realized, the 2014 forecast total run would rank 24th in the recent 35 annual runs (since 1980).

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Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2014 Run

Natural Production	Forecast Estimate(thousands)	Forecast Range (thousands)
Total Run	2,100	1,270–2,930
Escapement Goal[a]		
Upper Copper River	450	
Copper River Delta	169	
Common Property Harvest[b]	1,340	730–1,940
Hatchery and Supplemental Production		
PWSAC - Gulkana Hatchery		
Hatchery Run	470	280–650
Broodstock Needs	20	
Supplemental Escapement[c]	100	
Common Property Harvest[b]	330	180–380
Total Production		
Run Estimate	2,560	1,550–3,580
Natural Escapement Goal	619	
Broodstock Needs	20	
Supplemental Escapement[c]	100	
Upper Copper River Inriver Goal[d]	699	
All Harvest[e]	1,800	1,080–2,530

[a] The upper Copper River escapement goal of 450,000 sockeye salmon is the historical average spawning escapement (1979–2010). The new SEG adopted in 2011 is 360,000–750,000. The adjusted Copper River Delta SEG is the average peak count from aerial surveys (84,500) multiplied by 2 to adjust for proportion of the total number of fish estimated by aerial observers. The SEG (55,000–130,000) is based on the sum of the unadjusted peak counts.

[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 2013 are available.

[e] The commercial common property harvest midpoint estimate is 1.6 million sockeye salmon and the 80% prediction interval is 880,000–2.32 million. 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 2014 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 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

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salmon were calculated as the 5-year (2009–2013) 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 1983–2013 were used in the calculation of mean squared error.

Forecast models examined to predict the 2014 run to Gulkana Hatchery included age specific smolt-to-adult survival estimate averages (3-, 5-, 10-, and 36-year averages) applied to all releases combined. The selected forecast used the recent 5-year average fry-to-adult survival estimate (2.13%) from all Gulkana I and Gulkana II hatcheries released combined (onsite and remote). 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 2014. 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 of enhanced fish from all Gulkana Hatchery releases, but unless different marks for individual releases can be developed, forecasts using smolt-to-adult survival estimates will no longer be possible.

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).

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The 2014 run will be composed primarily of returns from brood years 2009 and 2010. Five-year-old fish (brood year 2009) are expected to predominate Copper River Delta and upper Copper River runs. The Copper River Delta escapement indices for 2009 (68,622) and 2010 (83,285) were within the SEG range (55,000–130,000).

The Gulkana Hatchery run will include fish from Crosswind Lake smolt migrations of 1.4 million fish in 2011 (third largest in 24 years) and 970,000 in 2012 (13th largest). For brood years 1993–2010 the average migration from Crosswind Lake was 1.3 million smolt. The run will also include 4-year-old fish from a moderate Summit Lake smolt outmigration (314,911 or 12th largest in 29 years) and 5-year-old fish from the small smolt outmigration (94,123 or 19th largest).

The 2014 total run forecast (2.56 million) is similar to the recent 5-year average total run (2.57 million). If realized, the 2014 forecast total run would be the eighth largest in the last 35 years (since 1980). The 2.09 million natural run would be below the recent 5-year average (2.14 million), and a 470,000 Gulkana Hatchery run would be slightly above the recent 5-year average (420,000). The natural run forecast is driven by the large 4-year-old (age-1.2) fish estimate in 2013 (623,000; largest since 1965) and the subsequent prediction for 5-year-old (age-1.3) fish in 2014. There have been seven 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 six of the seven years. The enhanced run forecast is driven by moderate smolt outmigration numbers from both Crosswind and Summit lakes, but recent good survivals. The influence of environmental factors including the cooler ocean temperatures that have predominated since September 2007, and the El Niño event (August 2009 to May 2010) are factors that increase the uncertainty in the 2014 run projection. However, the main factor in the uncertainty of this forecast is inputs to the model to predict the age-1.3 return are outside the range of our historical data.

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APPENDIX D: UPPER AND LOWER COOK INLET

Forecast Area: Upper Cook Inlet
Species: Sockeye Salmon

Preliminary Forecast of the 2014 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	6.1	4.4–7.8
Escapement	1.8	
Harvest Estimate	4.3	

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 evaluated to forecast the run of sockeye salmon to UCI in 2014: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fall 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. Forecast model predictions based on spawners, fry, smolt, or siblings were compared to evaluate uncertainty.

The return of age-1.3 sockeye salmon to the Kenai River in 2014 was forecasted using a sibling model. 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 2013. A spawner-recruit model prediction of the age-1.2 salmon return was based upon escapement in 2010. The return of age-2.3 salmon to the Kenai River was forecasted using a smolt model based upon age-2 smolt data available after brood year 2002. The returns of age-1.3 and age-2.3 sockeye salmon to the Kasilof River were forecasted using sibling models based upon the abundance of age-1.2 and age-2.2 salmon in 2013. A spawner-recruit model was used to forecast the return of age-2.2 salmon, and a smolt model was used to forecast the return of age-1.2 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 2006–2009. 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 2014 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 sonar at river mile 19 on the Kenai River was subtracted from the aggregate escapement into

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monitored systems. The total run forecast range was calculated by multiplying the forecast by the MAPE of the actual runs from published forecast runs from 2004 through 2013.

Forecast Discussion

In 2013, the harvest of sockeye salmon by all user groups in UCI (3.5 million) was 1.4 million less than the preseason forecast of 4.9 million. In 2013, the total run was 3.5 million to the Kenai River; 1,080,000 to the Kasilof River; 461,000 to the Susitna River; 80,000 to the Crescent River; and 25,000 to Fish Creek. The sockeye salmon escapement into Crescent River was estimated using a harvest rate model, because the sonar was not operated in 2013. The 2013 run forecast was 4.4 million to the Kenai River; 903,000 to the Kasilof River; 363,000 to the Susitna River; 110,000 to the Crescent River; and 61,000 to Fish Creek.

A run of 6.1 million sockeye salmon is forecasted to return to UCI in 2014, with a harvest by all user groups of 4.3 million. The forecasted harvest in 2014 is 600,000 fish above the 20-year average harvest of 3.7 million by all user groups.

The run forecast for the Kenai River is approximately 3.8 million, which is equal to the 20-year average run. Age-1.3 salmon typically comprise about 57% of the run to the Kenai River. A sibling model based upon the return of age-1.2 salmon in 2013 (307,000; 20-year average is 369,000) predicted a return of 1.8 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 2010 (17.8 million; 20-year average is 17.7 million) predicted a return of 1.9 million age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling model (24%) than the fry model (49%). Age-2.3 salmon typically comprise about 18% of the run to the Kenai River. A sibling model based upon the return of age-2.2 salmon in 2013 (194,000; 20-year average is 252,000) predicted a return of 389,000 age-2.3 salmon in 2014. A smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2011 (4.8 million) predicted a return of 1.1 million age-2.3 salmon. The smolt model was used for this forecast due to the high age-2 smolt abundance in 2011 and the failure of the sibling model to accurately predict large returns of age-2.3 salmon like that seen in 2011–2013. The forecasted age-2.3 return is 150% greater than the 20-year average return for this age class (705,000). The predominant age classes in the 2014 run should be age 1.3 (47%), age 1.2 (11%), and age 2.3 (28%). The 5-year MAPE for the set of models used for the 2014 Kenai sockeye salmon run forecast was 11%. The 5-year MAPE was used for the Kenai sockeye salmon run forecast, because smolt data used for the age-2.3 forecast is only available for the past five brood years.

The sockeye salmon run forecast for the Kasilof River is 1,062,000, which is 11% greater than the 20-year average run of 953,000. Age-1.3 salmon typically comprise about 34% of the run to the Kasilof River. The forecast for age-1.3 salmon is 376,000, which is 17% greater than the 20-year average return (321,000) for this age class. A sibling model based upon the abundance of age-1.2 salmon in 2013 was used to forecast the return of age-1.3 salmon in 2014. The abundance of age-1.2 salmon in 2013 was 417,000, which is 39% greater than the 20-year average abundance (300,000) for this age class. A spawner-recruit model predicted a return of 370,000 age-1.3 salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (36%) than the spawner-recruit model (81%). Age-1.2

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salmon typically comprise about 31% of the run. The forecast for age-1.2 salmon is 279,000, which is 7% less than the 20-year average return (300,000) for this age class. A smolt model based upon age-1 smolt abundance (5.3 million) in 2012 was used to forecast the return of age-1.2 salmon in 2014. A sibling model based upon the abundance of age-1.1 salmon (6,600) in 2013 forecasted a return of 313,000 age-1.2 salmon. The smolt model was used for this forecast because the 10-year MAPE was lower for the smolt model (55%) than the sibling model (96%). Age-2.2 salmon typically comprise about 24% of the run. The forecast for age-2.2 salmon is 268,000, which is 17% greater than the 20-year average return (229,000) for this age class. A spawner-recruit model based upon spawner abundance in 2009 was used to forecast the return of age-2.2 salmon in 2014. The sibling model forecast for age-2.2 salmon was 219,000. The spawner-recruit model was used for this forecast, because the 10-year MAPE was lower for the spawner-recruit model (28%) than the sibling model (35%). The predominant age classes in the 2014 run should be age 1.2 (26%), age 1.3 (35%), and age 2.2 (25%). The 10-year MAPE for the set of models used for the 2014 Kasilof sockeye salmon run forecast was 24%.

The sockeye salmon run forecast for the Susitna River is 264,000, which is 39% less than the 7-year average run of 430,000. This forecast was derived using mean return per spawner by age class for brood years 2006–2009 and mark–recapture estimates of spawner abundance in 2006-2010. 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 second year this forecast method has been used, so MAPE is not available. The 7-year average run (2006–2012) was calculated using mark–recapture estimates of inriver run and genetic estimates of commercial harvests.

The sockeye salmon run forecast for Fish Creek is 79,000, which is 26% less than the 20-year average run of 107,000. Age-1.2 and -1.3 salmon typically comprise 72% of the run to Fish Creek. A smolt model based upon the abundance of age-1 smolt emigrating from Fish Creek in 2012 (178,000; 9-year average: 229,000) predicted a return of 40,000 age-1.2 salmon. A smolt model based upon the abundance of age-1 smolt in 2011 (269,000) predicted a return of 20,000 age-1.3 salmon in 2014. The age-1.2 forecast is 23% less than the 20-year average return (52,000) for this age class, while the age-1.3 forecast is 21% less than the 20-year average return (26,000) for this age class. The predominant age classes in the 2014 run should be age 1.2 (50%) and age 1.3 (25%).

The sockeye salmon run forecast for Crescent River is 92,000, which is 17% less than the 20-year average run. Age-1.3 and -2.3 salmon typically comprise 75% of the run to Crescent River. Sibling models based upon returns of age-1.2 and -2.2 salmon in 2013 were used to forecast returns of age-1.3 (38,000) and -2.3 (33,000) salmon in 2014. The predominant age classes in the 2014 run should be age 1.3 (42%) and age 2.3 (36%). The sockeye salmon run forecast for Crescent River was pooled with unmonitored systems, because the Crescent River sonar project is no longer funded, and the department has recommended that the escapement goal for this stock be removed.

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Run forecasts to individual freshwater systems are as follows:

System	Run	Goals[a]
Kenai River	3,792,000	1,000,000–1,200,000[b]
Kasilof River	1,062,000	160,000–340,000
Susitna River	264,000	NA[c]
Larson Lake	NA	15,000–50,000
Chelatna Lake	NA	20,000–65,000
Judd Lake	NA	25,000–55,000
Fish Creek	79,000	20,000–70,000
Unmonitored Systems	885,000	NA
Total	6,082,000	

[a] Goals listed here are as follows, Kenai River: Inriver; Kasilof River: BEG; Sustina River: SEG (weir goals); and Fish Creek: SEG.

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

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

Mark Willette, Research Project Leader, Upper Cook Inlet

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Forecast Area: Upper Cook Inlet
Species: Other Salmon Species

Preliminary Forecast of the 2014 Commercial Harvest

Natural Production	Forecast Estimate (thousands)
Pink Salmon	338
Chum Salmon	170
Coho Salmon	165
Chinook Salmon	7.6

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2014. The forecast for pink salmon was based upon the average harvest during the past five even-numbered years.

Forecast Discussion

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

Mark Willette, Research Project Leader, Upper Cook Inlet

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Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary forecast of the 2014 run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	458	229–861
Escapement	276	100–549
Commercial Harvest	182	129–312
Supplemental Production		
Total Run	558	372–744
Broodstock	156	137–147
Commercial Harvest	402	235–614
Total Area Production		
Total Run	1,016	601–1,605
Broodstock and Escapement	432	237–696
Commercial Harvest	584	364–926

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

Note: Commercial Harvest = Total Run–Escapement/Broodstock and 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 48 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% (range: 2–4%). Projected harvest from supplemental production was obtained by subtracting broodstock goals from the supplemental production forecast.

Forecast Discussion

Because pink salmon exhibit a 2-year life cycle, comparisons of run size are typically stratified by odd and even years to account for dominance of one line over the other. In LCI, dominance of one line is typically short lived, lasting two to 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.

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In 2012, the last even-numbered year, seven of nine forecasted systems had runs within the forecast range. The 2014 forecast for natural production of 458,000 pink salmon has a forecast range of 229,000 to 861,000. Generally good parent-year escapements in 2012 and exceptional marine survival in 2012 and 2013 suggest there is a strong likelihood of reaching the point estimate of this forecast range. If realized, a natural run of 458,000 pink salmon would be less than half of the mean run size of 829,000 fish for even-year returns between 1962 and 2012. 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, four of nine index streams will not meet the midpoint of the cumulative escapement goal range, falling short by the following numbers of fish: Port Chatham (5,100), Rocky Bay (11,400), Bruin Bay (28,600), and Ursus/Rocky Cove (15,900). The resulting cumulative escapement forecast would then be 276,000 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 79,000, with 33,000 coming from Humpy Creek and the balance from Seldovia and Port Graham bays. Hatchery production of pink salmon in LCI recently resumed after several years of inactivity and the first even-year adult returns are expected to Southern District in 2014. Tutka Bay Lagoon Hatchery is not yet up to full production and is expecting 131,000 pink salmon to return to Tutka Lagoon in 2014. An additional 428,000 enhanced fish are forecasted to return to Port Graham Bay. The 2014 brood stock goal for the Tutka Bay Lagoon Hatchery has not been announced, but is expected to comprise most of the expected return until the hatchery reaches full production.

In Outer District, the number of naturally produced pink salmon available for harvest is projected to be 102,000, with over 96% of the harvest expected to occur in Port Dick Subdistrict. If realized, the Port Dick harvest would be less than half of the mean even-year catch since 1962. Port Chatham and Rocky Bay are expected to fall short of their escapement goals.

No pink salmon harvest is expected from Eastern District in 2014. 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 2014.

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 2014 run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
KMA Wild Stock Total Run	17.0	12.2–23.7
KMA Escapement Goal [a]	5.0	
KMA Wild Stock Harvest	12.0	7.2–18.7
Kitoi Bay Hatchery Harvest [b]	2.5	2.0–3.4
Total KMA Pink Salmon Harvest	14.6	9.3–22.1

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

[a] The 2014 estimated escapement is within the range of the even-year aggregate escapement goals for the Kodiak Archipelago (3.0–7.0 million) and the Mainland District (250,000–1.0 million).

[b] This figure is the total expected return (3.0 million) minus the broodstock collection goal of 425,000 fish.

The 2014 Kodiak Management Area (KMA) predicted pink salmon harvest is expected to be in the *Average* category with a point estimate of 14.6 million fish combining the wild stock and Kitoi Bay Hatchery harvest estimates. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest in the KMA from 1978 to 2013.

KMA Harvest Category	Range (millions)	Percentile
Poor	Less than 7.5	Less than 20^{th}
Weak	7.5 to 11.0	21^{st} to 40^{th}
Average	11.0 to 16.6	41^{st} to 60^{th}
Strong	16.6 to 22.2	61^{st} to 80^{th}
Excellent	Greater than 22.1	81^{st} to 100^{th}

Forecast Methods

The KMA wild stock pink salmon harvest forecast is derived from a total run forecast minus the estimated KMA escapement (5.0 million). The total run estimates were derived from a combination of Karluk and Ayakulik weir count, aerial survey index, and harvest estimates.

For the 2014 KMA wild stock pink salmon forecast, a generalized Ricker model[a] was fit to the even-year KMA returns from 1982 to 2012 utilizing Karluk and Ayakulik rivers pink salmon escapement counts for the spawner index. Four additional terms were included in this generalized Ricker model: 1) KMA pink salmon indexed escapement (total escapement minus Karluk and Ayakulik escapement), 2) November to February average air temperature, 3) November to February total precipitation divided by the variance anomalies, 4) summed North Pacific upwelling indices (51°N, 131°W) May to October of early ocean residence.

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

This generalized model assumes that the first three environmental conditions affect the survival at early life history stages of pink salmon and thus were lagged correspondingly. It is assumed upwelling conditions in the North Pacific affect the early ocean survival of pink salmon. All environmental conditions were estimated from Kodiak Airport (PADQ) climate observations. In constructing and evaluating the regression model standard regression diagnostic procedures were used. Prediction intervals of 80% were estimated based on the generalized Ricker model.

The 2014 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survivals from even brood years 1994–2010, when releases from the facility were in excess of 100 million fry. Brood years 1996–2012 are particularly important to the forecasting model because all pink fry were released on the same day in order to saturate the release area with fry (predator satiation). This release strategy has proven to significantly improve fry-to-adult survival.

The pink return to Kitoi Bay Hatchery is an odd-year dominant return and experiences a below average strength even-year return every fourth year, which will occur in 2014. This low cyclical average and a smaller than average fry release of 107 million should result in a total return estimate of about 3.0 million, which reflects a marine survival of approximately 2.78%.

Forecast Discussion

The 2014 KMA wild stock pink salmon total run (17.0 million) will be a strong even-year return (Figure 1). Climate variables affecting the even-year model were fairly typical in a general sense (not anomalous) while the 2012 brood year escapement was robust. Confidence in the 2014 forecast estimate is good due to the strength of the model.

The 2014 Kitoi Bay Hatchery pink salmon production is expected to be 3.0 million. The brood stock collection goal is 425,000, resulting in a total hatchery harvest projection of about 2.5 million. It is estimated that approximately 625,000 will be harvested in the cost recovery fishery.

This forecast level should allow an initial weekly fishing period length of 105 hours (4½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2014). By the third week of July, fishing time may be restricted, by section or district, to ensure escapement goals will be met. The majority of the wild stock pink salmon harvest will occur on the Westside and the Alitak and Afognak districts. Indications of pink fry abundance during the spring and summer of 2013 were strong in Southwest Kodiak and Alitak areas but minimal in the Northeast Kodiak area.

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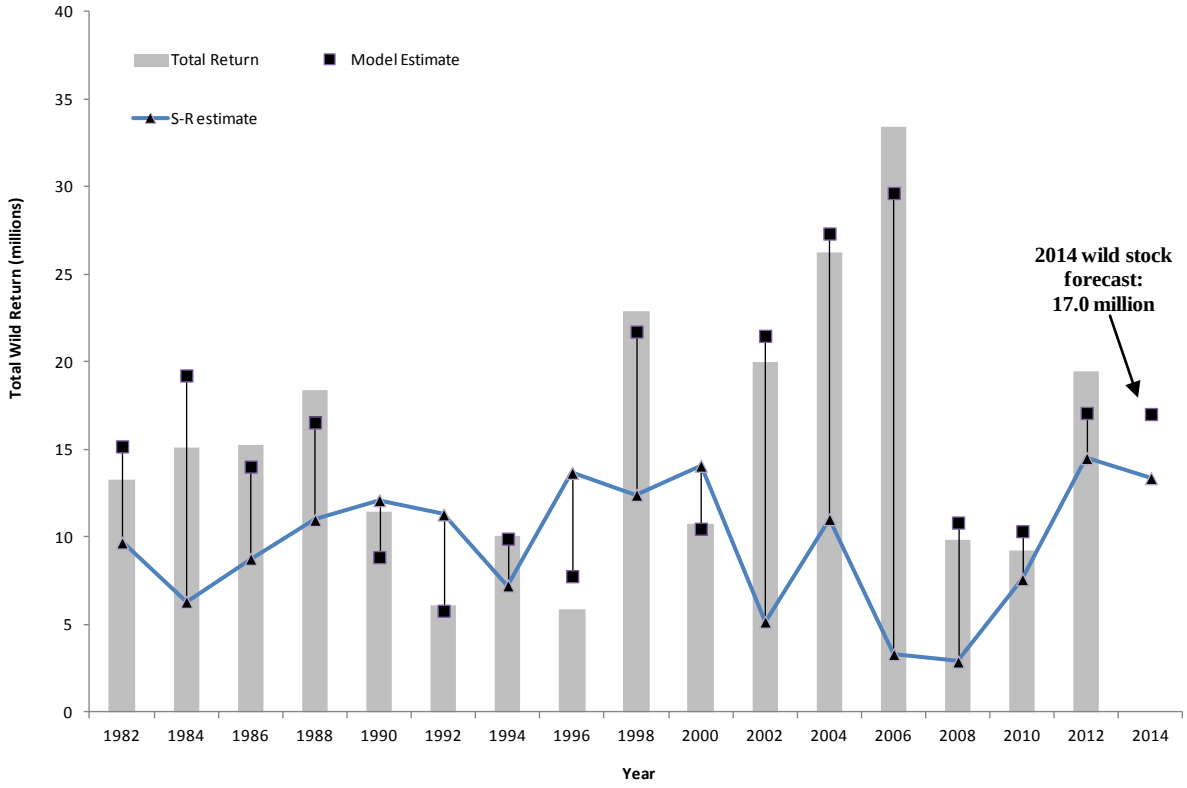

Figure 1.–Kodiak even-year pink salmon wild stock total return compared to S-R estimates and environmental model estimates, 1982 to 2012, and 2014 forecast.

M. Birch Foster, Finfish Research Biologist, Westward Region and
Drew Aro, Kitoi Bay Hatchery Manager, Afognak

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Forecast Area: Kodiak, Spiridon Lake
Species: Sockeye Salmon

Preliminary Forecast of the 2014 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Spiridon Lake	363	305–421
Telrod Cove Net Pen	28	23–31
Total Run	391	328–452
Escapement Goal	0	NA
Harvest Estimate	391	328–452

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

Forecast Methods

The 2014 Spiridon Lake sockeye salmon forecast was prepared by investigating simple linear regression models, utilizing 2002–2012 outmigration-to-return relationships for three age classes and using the median survival applied to the outmigration estimate for a fourth group of age classes. 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-1.2, -2.2, and -1.3 sockeye salmon returns were predicted from corresponding age-specific smolt outmigration estimates. All other age classes were predicted by calculating the pooled median contribution (2004–2013). Returns of age-1.2 sockeye salmon from 2012 net pen releases were estimated assuming 18% smolt-to-adult survival and that 55% return at age 1.2 based on historical averages. 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 Special Harvest Area in Telrod Cove. The point estimate forecast of 363,000 in 2014 is 8,000 less than the 2013 forecast (371,000) and 32,000 more than the actual 2013 run estimate of 331,000. It is estimated that approximately 70,000 will be harvested in the cost recovery fishery within Telrod Cove.

The 2014 run will likely be composed of approximately 22% age-1.2 fish, 25% age-2.2 fish and 49% age-1.3 fish. Confidence in this forecast is good due to the strength of the regression models and performance of last year's model. If realized, this run will be about 180,000 more than the recent 10-year average (2004–2013) run of 183,000. The 2014 season will mark the first year of adult returns to Telrod Cove originating from net pen releases. The peak of the Spiridon Lake sockeye salmon run timing through the Westside fishery is typically in early- to mid-July.

Heather Finkle, Finfish Research Biologists, Kodiak

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2014 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	588	367–809
Escapement Goal [a]	300	200–400
Harvest Estimate	288	

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

[a] The escapement estimate is the sum of the approximate midpoints of escapement goals for the early run (140,000–280,000) and late run (60,000–120,000).

Forecast Methods

The 2014 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression and time series models utilizing ocean-age class return-per-spawner relationships from 2000 to 2013 return 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.

Age-.2 sockeye salmon were predicted from prior year age-.1 return-per-spawner estimates. Age-.3 sockeye salmon were predicted from prior year age-.2 return-per-spawner estimates. Age-.1 sockeye salmon were predicted using exponential smoothing of the age-.1 return-per-spawner data. Age-.4 sockeye salmon were predicted by the median return. Regression, exponential smoothing, and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2014. 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 2014 Ayakulik forecast of 588,000 sockeye salmon is about 158,000 more than the actual 2013 run estimate of 430,000. The 2014 run will likely be composed of approximately 67% age-.2 fish and 22% age-.3 fish. If realized, this run will be 206,000 more than the recent 10-year average (2004–2013) and the largest since 1999. The confidence in the 2014 Ayakulik forecast is good, due to the strong regression relationships. The projected harvest of 288,000 is based on the achievement of the midpoint of the combined escapement goal ranges (300,000). Reverting to a historic management strategy, Ayakulik is managed based on both an early- and late-run (post July 15) components. Based on brood year escapement proportions from what will be the major contributing brood years (2008–2010), approximately 62% of the total run will occur in the early portion.

M. Birch Foster, Finfish Research Biologist, Westward Region

Forecast Area: Kodiak, Karluk River
Species: Sockeye Salmon

Preliminary Forecast of the 2014 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run	Total Run Estimate	283	93–473
	Escapement Goal [a]	175	110–250
	Harvest Estimate	108	
Late Run	Total Run Estimate	669	401–936
	Escapement Goal [a]	270	170–380
	Harvest Estimate	399	
Total Karluk River	Total Run Estimate	951	494–1,409
System	Escapement Goal [a]	445	280–630
	Harvest Estimate	506	

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

[a] The escapement estimates are based on the point estimate S_{MSY} for the early run (110,000–250,000) and late run (170,000–380,000) and summed for the total run.

Forecast Methods

The 2014 Karluk River sockeye salmon forecast was based on recent ocean-age class outmigration year relationships from 2001 to present. Simple regressions were used to model outmigration year ocean-age class relationships. 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.

For the early run, age-.3 sockeye salmon returns were predicted based on the abundance of the prior-year return of age-.2 sockeye salmon using outmigration year 2003 to 2012. The age-.1, -.2, and -.4 return predictions were calculated using their pooled 10-year median contribution.

For the late run, the summed age-.2 and -.3 sockeye salmon run abundance was predicted based on the summed two prior year returns of age-.1 sockeye salmon from both the early and late runs using outmigration years 2001 to 2012 but excluding an outlier from 2003. Summing the age-.2 and -.3 sockeye salmon for the late-run forecast was done due to the high rate of scale resorption that creates difficulties in assigning accurate ocean age with fish escaping in August and September. The age-.1 and -.4 return predictions were calculated using their pooled 12-year median contribution.

Regression and median estimates were summed to estimate the total Karluk sockeye salmon run for 2014. 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.

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Forecast Discussion

The total 2014 sockeye salmon run to the Karluk River is expected to be approximately 951,000. The early run is expected to be approximately 283,000, which is about 54,000 below the recent 10-year average (337,000) and 162,000 below the 2013 run (445,000). The late run is expected to be approximately 669,000 which is 126,000 above the recent 10-year average (542,000) and 85,000 less than the 2013 run (753,000).

The projected harvest estimate for the early run (108,000) is based on achievement of the early-run S_{MSY} (175,000). The projected harvest estimate for the late run (399,000) is based on achievement of the late-run S_{MSY} (270,000). The majority of both runs is expected to be age-.2 fish. While 2012 and 2013 showed a departure from the Karluk River sockeye salmon run's phase of low productivity from 2008 to 2011, expectations for a high run magnitude are tempered in 2014 by the low escapements in 2008 and 2009 that will drive the predominant 5- and 6-year-old fish at Karluk. Our confidence in the forecast is good.

M. Birch Foster, Finfish Research Biologist, Westward Region

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

Preliminary Forecast of the 2014 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Upper Station	Total Run Estimate	51	16–86
	Escapement Goal [a]	51	43–93
	Harvest Estimate [b]	0	
Late Upper Station	Total Run Estimate	214	97–332
	Escapement Goal [c]	186	120–265
	Harvest Estimate [b]	28	
Frazer Lake	Total Run Estimate	229	73–386
	Escapement Goal	137	95–190
	Harvest Estimate [b]	92	
Total Alitak District	Total Run Estimate	495	186–803
	Escapement Goal	374	258–548
	Harvest Estimate [b]	121	

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

[a] Alaska Board of Fisheries instituted an optimal escapement goal (OEG) of 30,000 in 2014, that is in effect only if the department determines that the upper end of the Frazer system sockeye salmon escapement goal will be exceeded. Upper Station early run has a biological escapement goal (BEG) of 43,000–93,000.

[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 2014 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 estimate.

Upper Station early-run age-.2 and age-.3 salmon were predicted based on prior year age-.1 and age-.2 returns respectively (outmigration years: 1999–2011 and 1999–2010). Upper Station early-run age-.1 and age-.4 sockeye salmon predictions were calculated using the pooled 10-year median contributions. Frazer age-.2 and age-.3 salmon were predicted based on prior year age-.1 and age-.2 returns respectively (most recent 15 years). Frazer age-.4 returns were calculated using the pooled median contributions from the last 15 years. Frazer age-.1 fish were estimated using the pooled median contributions from the cyclical high jack years over the last 15 years (outmigration years: 1998, 2001, 2002, 2005, 2006, 2009, and 2010). Upper station late-run age-.3 sockeye salmon were predicted based on prior year age-.2 returns using recent outmigration years (2001–2010). Upper Station late-run age-.1, -.2, and -.4 return predictions were calculated

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Using the pooled median contributions from the most recent 10 years.

Regression and median estimates were summed to estimate the total Alitak District sockeye salmon run for 2014. 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 Alitak District 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the two runs.

Forecast Discussion

The 2014 sockeye salmon run to the Alitak District is expected to be approximately 495,000, which is approximately 248,000 less than the recent 10-year average run (742,000) and 7,000 more than the 2013 run (487,000). The Upper Station early run is expected to be approximately 51,000, which falls below the recent 10-year average run (90,000). The Upper Station late run is expected to be approximately 214,000, which is also below the recent 10-year average run (272,000). The Frazer Lake run is expected to be approximately 229,000, which is below the recent 10-year average (380,000). The 2014 Alitak District sockeye salmon run should be composed of approximately 56% age-.2 fish, 26% age-.3 fish, and 18% age.-1 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 121,000 is based on achieving an escapement target within the Upper Station early run BEG range, 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 2014 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run (Black Lake)	Total Run Estimate	788	90–1,486
	Escapement Goal [a]	350	350–450
	Harvest Estimate [b]	438	
Late Run (Chignik Lake)	Total Run Estimate	909	468–1,349
	Escapement Goal [a]	250	250–400
	Harvest Estimate [b]	659	
Total Chignik System	Total Run Estimate	1,697	558–2,836
	Escapement Objective [a]	600	600–850
	Harvest Estimate [b]	1,097	
	Chignik Area	916	
	SEDM Area	53	
	Cape Igvak Section	127	

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 2014 escapement goals for early (350,000–450,000 fish), late (200,000–400,000 fish), and combined (600,000–850,000 fish) 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 and multiple linear regressions models using age class relationships and parent escapement data from 1959 to present were used to forecast the 2014 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 was used to predict age-.3 sockeye salmon from prior year age-.2 returns. Remaining age class components of the run were predicted by calculating median returns since the 1959 outmigration year (15% of the run).

The 2014 late run was predicted using parent escapement, ocean age class, and sibling relationships. Age-.2 sockeye salmon were predicted from the prior year age-.1 returns using simple linear regression. Age-.4 sockeye salmon were predicted from the prior year age-.3 returns by the same method with the exception that data from 1985 to the present were used. This was necessary because the 1959 to present relationship exhibited increasing and upward trending variance that could not be corrected with transformations. Age-1.3 sockeye salmon were predicted by simple linear regression from prior year age-1.2 returns using natural log-transformed values and back-transforming the prediction. Age-2.3 sockeye salmon were predicted

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from age-2.2 returns and parental escapement in a multiple linear regression. Remaining age class components of the run were predicted by calculating median returns since the 1959 outmigration year (<2% of the run).

The early- and late-run regression and median estimates were summed to estimate the total Chignik River sockeye salmon run for 2014. 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 2014 Chignik sockeye salmon early run is forecasted to be 788,000, which is 569,000 less than the 10-year average (1.36 million), and 1.58 million less than the 2013 early run of 2.37 million. The early run is predicted to comprise 85% age-.3 fish, 14% age-.2 fish, and <1% of remaining age class components. The late run is forecasted to be 909,000, which is 72,000 less than the 10-year average (981,000), and 401,000 less than the 2013 late run (1.31 million). The 2014 late run is predicted to comprise <1% age-.1, 20% age.-2, 79% age-.3 (22% age-1.3 and 55% age-2.3), and 1% age-.4 fish. The total Chignik sockeye salmon run is expected to be 1.70 million, which is approximately 640,000 less than the 10-year average (2.34 million) and 1.98 million less than the 2013 total run (3.68 million).

The projected early-run harvest estimate of 438,000 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 659,000 is based on achieving the lower end of the late-run goal of 200,000 plus the inriver 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.

The less than average predicted total run size was driven largely by very low numbers of age-.2 returns in both runs, but particularly in the early run. Although the total run forecast is below average and well below the past four years' runs, it is similar to the 2006–2008 run sizes. Exploratory analysis using other sibling relationships, smolt outmigration data, and environmental variables yielded results similar to this formal forecast. Due to the range of variation in the relationships used in these forecasts and their historic accuracy, our confidence in them is fair to good.

Adam St.Saviour Finfish Research Biologist, Alaska Peninsula

APPENDIX G: BRISTOL BAY

The revised 2014 Bristol Bay sockeye salmon forecast and harvest projection are provided below. This document supersedes the forecast released on 18 November, 2013. Following the release of the original forecast, we discovered a database error that prompted a re-evaluation. This most recent forecast is approximately 620,000 fish less than the initial release.

Forecast Area: Bristol Bay
Species: Sockeye Salmon

Forecast of the 2014 Run

TOTAL PRODUCTION	Forecast (millions)	Forecast Range (millions)
Total Run	26.58	18.35–34.80
Escapement	8.66	
Commercial Common Property Harvest	17.92	
Bristol Bay Harvest	16.86	
South Peninsula Harvest	1.06	

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2014 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 1972–2010 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 2011 through 2013.

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 2013.

Forecast Results

A total of 26.58 million sockeye salmon are expected to return to Bristol Bay in 2014. This prediction is 32% lower than the previous 10-year mean of total runs (38.98 million; range of 25.71–46.33 million), and 18% lower than the long-term mean of 32.26 million. The forecast range is 18.35–34.80 million. All systems are expected to meet their spawning escapement goals.

A run of 26.58 million sockeye salmon can potentially produce a total harvest of 17.92 million fish with escapements near the midpoint of their escapement goals and industry is capable of taking the surplus fish. The projected harvest includes 16.86 million fish in Bristol Bay and 1.06 million fish in the South Peninsula fisheries. A Bristol Bay harvest of 16.86 million would be 37%

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lower than the previous 10-year mean harvest (26.71 million; range of 15.43–31.10 million), and 14% lower than the long-term mean (19.71 million).

The run forecast to each district and river system is as follows: 10.51 million to Naknek-Kvichak District (5.30 million to Kvichak River; 1.72 million to Alagnak River; 3.49 million to Naknek River); 4.65 million to Egegik District; 1.81 million to Ugashik District; 8.88 million to Nushagak District (6.89 million to Wood River; 1.17 million to Nushagak River; 0.83 million to Igushik River); and 0.72 million to Togiak District (Table 1).

The total run forecast of 26.58 million sockeye salmon is expected to be comprised of 9.99 million age-1.2 fish followed by 8.97 million age-1.3 fish, 4.95 million age-2.2 fish, 2.56 million age-2.3 fish, 0.106 million age-1.4 fish, and 0.006 million age-0.3 fish (Table G.1).

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 well when looking at the overall Baywide forecast. The forecast in 2013 was 1.2% above the total run. Forecasts since 2001 have averaged 6.1% below the actual total run. Run forecast differences have ranged from 25.8% below actual run in 2007 to 20.6% above actual run in 2011. Forecasted harvests have averaged 1% above actual harvest since 2001 and harvest differences have ranged from 23% below actual harvest in 2009 to 35% 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 underforecasted the returns to the Alagnak (–35%), Togiak (–18%), Wood (–7%), and Kvichak (–5%) rivers and overforecasted returns to Igushik (62%), Egegik (33%), Ugashik (11%), Naknek (2%), and Nushagak (1%) 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 2014 run will be dominated by age-1.2 sockeye salmon (38%), followed by age-1.3 (34%), age-2.2 (19%), and age-2.3 (10%). There is always some uncertainty in our forecast of returns by age class. However, we expect the overall uncertainty in 2014 to be similar to what occurred in prior years. In 2013, we underforecasted age-1.3 (39% forecast compared to 48% observed) and age-2.3 (13% forecast compared to 22% observed) sockeye salmon. We overforecasted age-1.2 (23% compared to 16% observed) and age-2.2 (25% forecast compared to 13% observed) sockeye salmon in 2013. In general, there is more uncertainty in age-.2 returns because there is less reliable information (jack returns from the previous year or brood year spawning abundance) available for which to build a dependable forecast model.

Historically, total runs of sockeye salmon to Bristol Bay have been highly variable. The 2014 forecast of 26.58 million is below the long-term (1963–2013) historical average of 32.26 million, and below the more recent (2004–2013) historical average of 38.98 million. We had seven

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consecutive years (2004–2010) where total run exceeded 40 million. In 2011, total run dropped to 31.91 million and we are not sure if this recent trend of lower productivity will continue. We expect the 2014 run to be similar to the total run in 2013.

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

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Table G1.–Forecast of total run, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay river systems in 2014.

DISTRICT	Millions of Sockeye Salmon							
	Forecasted Production by Age Class					Forecasted		South
River	1.2	2.2	1.3	2.3	Total	Escapement	Harvest	Peninsula [a]
NAKNEK-KVICHAK								
Kvichak	2.37	1.21	1.31	0.41	5.30	2.65	2.44	0.21
Alagnak	0.26	0.04	1.30	0.13	1.72	0.86 [b]	0.79	0.07
Naknek	1.20	0.49	1.21	0.59	3.49	1.10	2.25	0.14
Total	3.83	1.73	3.82	1.12	10.51	4.61	5.48	0.42
EGEGIK	0.26	2.59	0.65	1.16	4.65	1.10	3.36	0.18
UGASHIK	0.64	0.41	0.61	0.15	1.81	0.85	0.89	0.07
NUSHAGAK [c]								
Wood	4.93	0.15	1.75	0.06	6.89	1.10	5.51	0.27
Igushik	0.15	0.02	0.64	0.02	0.83	0.23	0.57	0.03
Nushagak	0.06	0.01	0.98	0.01	1.17 [d]	0.60	0.52	0.05
Total	5.13	0.18	3.37	0.09	8.88	1.93	6.60	0.35
TOGIAK [e]	0.12	0.04	0.52	0.04	0.72	0.18	0.52	0.03
BRISTOL BAY	9.99	4.95	8.97	2.56	26.58	8.66	16.86	1.06
	38%	19%	34%	10%	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 3.9% 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 (6,650) and age-1.4 (105,980) 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.

APPENDIX H: ALASKA PENINSULA

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

Preliminary forecast of the 2014 run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	465	242–688
Escapement Goal [a]	100	97–219
Harvest Estimate	365	

Note: Column numbers may not total or correspond exactly with numbers in text due to rounding.
[a] The escapement estimate is near the low end of the escapement goal range (97,000–219,000) in 2014.

Forecast Methods

The 2014 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 27 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 1984 to 2009, 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 age-.2 fish (same outmigration year) predicted by an index of the annual average summer (May through September) air temperatures. Age-.3 returns were negatively correlated with the average summer air temperature. The remaining age-.1 and age-.4 returns were calculated from median estimates for each age class using run data from 1986 to the present.

Regression and median estimates were summed to estimate the total Nelson River sockeye salmon run for 2014. 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 2014 Nelson River forecast of 465,000 is about 29,000 less than the 10-year average of about 436,000, and identical in magnitude to the 2013 estimated run of 465,000. The 2014 run should be composed mainly of age-.2 (35.7%) and age-.3 (62.3%) fish. Regression relationships predicting age-.2 and age-.3 sockeye salmon are significant and represent the majority of the run. However, the Nelson River sockeye salmon run has been notoriously unpredictable and therefore, confidence in this forecast is fair. The projected harvest of 365,000 is based on achieving roughly the lower end (100,000) of the escapement goal range.

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

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

Species: Sockeye Salmon

Preliminary forecast of the 2014 run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	375	111–638
Escapement Goal [a]	156	117–195
Harvest Estimate	219	

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

[a] The escapement estimate is the midpoint of the escapement goal range (117,000–195,000) in 2014.

Forecast Methods

The 2014 forecast of the Bear Lake sockeye salmon late run was prepared using simple linear regressions of sibling-age classes and environmental data from 1989 to the present. 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 10th and 90th percentiles of the data were used to calculate the 80% prediction interval of the medians.

Simple linear regression was used to predict age-2.2 sockeye salmon returns from average winter (October through April) air temperatures recorded at the Cold Bay airport. Data were lagged such that temperatures corresponded with the winter a year class spent as eggs in the gravel. Age-1.3 sockeye salmon were predicted from prior year age-1.2 returns using simple linear regression. Age-2.3 sockeye salmon were predicted from prior year age-2.2 returns by the same method. Remaining age class components of the run were predicted by calculating median returns since the 1989 brood year (8.8% of the run). The 2014 late run is expected to be composed of 4.4% age-.1, 62.6% age-.2, (58.7% age-2.2), 32.8% age-.3 (9.0% age-1.3 and 23.8% age-2.3), and 0.2% age.-4.

Regression and median estimates were summed to estimate the total Bear late sockeye salmon run for 2014. 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 2014 Bear Lake late-run forecast of 375,000 is 72,000 fewer than the 10-year average of about 447,000, but 75,000 more more than the 2013 run of 299,000. All major age classes that were directly affected by a severe storm in December 2007 that impacted lake rearing conditions have returned. However, winter temperatures have remained consistently low on the North Peninsula and Bering Sea since 2006 which has likely limited production. The projected harvest of 219,000 is based on achieving the midpoint of the late-run 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 sibling age class and environmental relationships, our confidence in this forecast is fair.

Adam St. Saviour, Finfish Research Biologist, Alaska Peninsula

Forecast Area: Alaska Peninsula, South Alaska Peninsula Aggregate

Species: Pink Salmon

Preliminary forecast of the 2014 run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run Estimate	3.7	0.0–8.1
Escapement Goal[a]	1.9	1.9–3.7
Harvest Estimate	1.8	0–6.2

[a] The escapement estimate is the lower end of the aggregate goal range (1.9–3.7 million) in 2014.

The 2014 South Alaska Peninsula predicted pink salmon harvest is expected to be in the *Poor* category with a point estimate of 1.8 (0–6.2) million fish. Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest on the South Alaska Peninsula from 1976 to 2013.

S. Pen Harvest Category	Range (millions)	Percentile
Poor	Less than 2.6	Less than 20^{th}
Weak	2.6 to 4.4	21^{st} to 40^{th}
Average	4.4 to 7.1	41^{st} to 60^{th}
Strong	7.1 to 8.9	61^{st} to 80^{th}
Excellent	Greater than 8.9	81^{st} to 100^{th}

Forecast Methods

The South Alaska Peninsula pink salmon harvest forecast is derived from a total run forecast minus the lower end (1.9 million fish) of the even-year South Alaska Peninsula escapement goal range. The total run estimates were derived from two environmental variables. The first was the average temperature (measured in Cold Bay) during early in-gravel life history (November) and juvenile migration (April). 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 to August). For the 2014 South Alaska Peninsula pink salmon forecast, a multiple regression model was fit to the even-year South Peninsula pink salmon returns from 1974 to 2012 using the temperature and PDO predictor variables. The range was estimated as the 80% prediction intervals based on the error structure of the regression.

Forecast Discussion

The 2014 South Alaska Peninsula pink salmon total run (3.7 million) will likely be poor. Environmental conditions used in the model suggest that the early life survival of the 2014 pink salmon run will be below average. Additionally, the parent year escapement was the lowest since 1974 at 500,000, which corroborates the forecast for 2014. Due to a relative lack of strength in the regression model, confidence in the forecast is fair.

Nathaniel Nichols, Finfish management Biologist, Alaska Peninsula

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 Arctic-Yukon-Kuskokwim (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 U.S./Canada Yukon River Panel in the spring of 2014.

In the AYK Region, salmon production notably decreased for many stocks from 1998 to 2002, but increased rapidly beginning in 2003 to record and near record runs from 2004 to 2006. Since 2007, Chinook salmon production has shown a sharp decline. 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 Northern Bering Shelf (NBS) is the primary rearing habitat for juvenile Yukon and Norton Sound salmon during their first summer at sea. Trawl surveys collecting juvenile salmon in the NBS, led by NOAA Fisheries, were first initiated in 2002 and continued from 2003 to 2007 and from 2009 to 2013. Chum salmon collected in the NBS surveys in 2012 and 2011 would correspond to the age-4 and age-5 returns in 2014, respectively. Both years indicated high abundance of juvenile chum salmon. Juvenile Chinook salmon collected in the NBS surveys in 2010 and 2011 would correspond to age-6 and age-5 returns in 2014, respectively. Juvenile Chinook salmon abundance was poor in 2010 but improved slightly in 2011. A collaborative effort between ADF&G and NOAA is in progress to test the applicability of the Bering-Aleutian Salmon International Survey (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 likely 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 even-numbered years run size often greatly exceeds processing capacity resulting in a much lower harvest than the available surplus.

Appendix Table I1.–The 2014 commercial harvest outlook by management area, in thousands of fish.

	Salmon Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	0	5–20	80–140	0	100–200	
Kuskokwim Bay	0–3	40–100	30–70	0	60–130	
Kuskokwim Area Total	0–3	45–120	120–220	0	160–330	
Yukon	0	0	40–80	0	500–800	300–540
Norton Sound	0	0	60–90	250–500	80–110	
Kotzebue Sound					250–275	

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Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2014 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	921	802–1,040
Escapement Goal		300–600
Harvest Estimate		300–540

Forecast Methods

The forecast for the 2014 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 to 2007, production from incomplete brood years 2008 and 2009 was estimated based on return per spawner from brood year returns, and an auto-regressive Ricker model was used to predict returns from the 2010 and 2011 parent years.

Predicted returns were multiplied by corresponding average maturity schedules for even- and odd-numbered parent years to estimate 2014 run size, and rounded to the nearest thousand fish. The even/odd maturity schedule from 1974 to 2007 was used to estimate the 2014 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 2013.

The 2014 projected run size of fall chum salmon for the Yukon Area is approximately 921,000. This projection is above average for even-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 2014 forecast range from 802,000 to 1,040,000 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 2012 for Alaskan subsistence and Canadian aboriginal harvests is 140,000 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 at least 100,000 fish and a commercial harvest between 300,000 and 540,000 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.

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The forecasted total run of 921,000 fall chum salmon is expected to be composed of 68% age-4 and 27% 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 exhibit an even-odd abundance cycle (averaging 1,000,000 in odd-numbered years and 703,000 in even-numbered years) that was consistent between 1974 and 1992. Since 1993 the cycle has deteriorated and now wide swings in production are being observed. These swings are primarily thought to be due to conditions in the marine environment, although density dependence may also be a cause in some 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 this 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, adjustments to the point estimates were made by reducing them by the average ratio of observed to predicted returns through 2005. From 2006 to 2014 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 34 brood year returns) with the most drastic fluctuations occurring between brood years 2001 and 2005; therefore, forecasts of run size remain difficult to determine with accuracy.

Since forecasted ranges were established in 1999, 40% of the observed runs were within the range, 33% were below, and 27% were above. Returns of age-4 fish in even-numbered years are typically 17% lower than odd-numbered years. Sibling relationships for this stock are weak. Both the age-4 and age-5 components are returning from escapements above the midpoint of the drainagewide goal. Production levels are estimated to be 2.20 R/S for age 5, and 1.82 R/S for age-4, much improved from the low R/S observed in 2005. The 2014 point estimate of 921,000 fall chum salmon should be dominated by age-4 component and age-5 is forecasted to make up nearly a third of the run. The upper end of the forecasted run size of 1,040,000 fall chum salmon would provide for a commercial harvest of near 540,000 fish.

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

2014 Kuskokwim River Chinook Salmon Forecast

Forecast Area: Kuskokwim River
Species: Chinook Salmon

The forecasted run for 2014 Chinook salmon returning to the Kuskokwim River is as follows:

Total Production:	Forecast Estimate (Thousands)	Forecast Range (Thousands)
Total Run Estimate	94	71–116
Escapement		65–120
Harvest		0

Forecast Methods

The forecast for the 2014 Kuskokwim River Chinook salmon run is based on estimation of the total run in 2013. The estimate for the 2013 total run (~94,000) comes from a run reconstruction model that incorporates all escapement, harvest, and run timing information available, to estimate the most likely total run. Using the 2013 run as the forecast for the 2014 run is simplistic, but this method also performed better in estimating the realized run than other more complex analytical methods. The range around the forecast was developed using the recent 7-year average (24%) of the absolute percent error between forecasts using this method and the realized run. This error is essentially the average variation from year to year in the abundance of Chinook salmon in the Kuskokwim River.

The 2014 projected run size for Kuskokwim River Chinook salmon is approximately 94,000. This projection is well below average and is equivalent to the lowest total run on record. If the run materializes as projected, it will be sufficient to meet escapement goals, provide minimal subsistence harvest, and not allow harvest by other uses. Average subsistence harvest of Chinook salmon in the Kuskokwim River has been approximately 80,000 fish over the past 20 years (1994–2013), the run size projected for 2014 would be inadequate to provide for average subsistence harvest.

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