Special Publication 15-04

Run Forecasts and Harvest Projections for 2015 Alaska Salmon Fisheries and Review of the 2014 Season

Edited by

Andrew R. Munro

March 2015

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

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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 15-04

RUN FORECASTS AND HARVEST PROJECTIONS FOR 2015 ALASKA SALMON FISHERIES AND REVIEW OF THE 2014 SEASON

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DEFINITION OF TERMS

Biological escapement goal	The number of salmon in a particular stock that the Alaska Department of Fish and Game 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 2014 commercial salmon season as well as run forecasts and harvest projections for 2015. The Alaska all-species salmon harvest for 2014 totaled 157.9 million, which was about 25.3 million more than the preseason forecast of 132.6 million. This combined harvest was composed of 487,302 Chinook salmon *Oncorhynchus tshawytscha*, 44.1 million sockeye salmon *O. nerka*, 6.3 million coho salmon *O. kisutch*, 95.8 million pink salmon *O. gorbuscha*, and 11.3 million chum salmon *O. keta*. The Alaska Department of Fish and Game is expecting a large increase in commercial salmon catches in 2015 due to the projected increase in pink salmon harvests. The 2015 total commercial salmon catch (all species) projection of 220.9 million is expected to include 54,000 Chinook salmon in areas outside Southeast Alaska and Bristol Bay, 58.8 million sockeye salmon, 4.6 million coho salmon, 140.3 million pink salmon, and 17.2 million chum salmon. The projected pink salmon harvest is about 46% higher than the harvest experienced in 2014 (95.8 million). The projected sockeye salmon harvest is about 14% higher than the harvest in 2013. The projected sockeye salmon harvest is expected to be about 33% higher than the harvest in 2014, and the projected chum salmon harvest is expected to be about 52% higher than the harvest in 2014.

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 2015 as well as a detailed review of Alaska's 2014 commercial salmon season. Salmon escapement and harvest estimates reported in this document were summarized from the Alaska Department of Fish and Game (ADF&G) escapement and fish ticket databases. Data provided in this report are preliminary and supersede any data previously published.

ADF&G is expecting a large increase in commercial salmon catches in 2015 due to the projected increase in pink salmon harvests. The 2015 total commercial salmon catch (all species) projection of 220.9 million is expected to include 54,000 Chinook salmon in areas outside Southeast Alaska and Bristol Bay, 58.8 million sockeye salmon, 4.6 million coho salmon, 140.3 million pink salmon, and 17.2 million chum salmon. The projected pink salmon harvest is about 46% higher than the harvest experienced in 2014 (95.8 million). The projected sockeye salmon harvest is expected to be about 33% higher than the harvest in 2014, and the projected chum salmon harvest is expected to be about 52% higher than the harvest in 2014.

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 2015 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		1,111	2,918	58,000	1,853	63,881
Hatchery Production[a]					7,412	7,412
Southeast Region Total	[b]	1,111[c]	2,918[c]	58,000	9,265	71,294
Prince William Sound						
Natural Production	9	2,258[d]	264[e]	15,400	284	18,215
Hatchery Production[f]		2,290	170	36,015	2,618	41,093
Upper Cook Inlet	7[c]	3,700	161[c]	98[c]	176[c]	4,142
Lower Cook Inlet						
Natural Production	0[c]	58[c]	1	397	62[c]	518
Hatchery Production		431[g]		1,330		1,761
Bristol Bay		40,520	133[c]	1[h]	751[c]	41,405
Central Region Total	15	49,256	729	53,241	3,891	107,133
Kodiak						
Natural Production	22[c]	3,231[i]	113[c]	6,900[j]	500[c]	10,767
Hatchery Production		401[k]	168	7,400[g]	211	8,181
Chignik	7[c]	1,588[l]	87[c]	551[c]	246[c]	2,479
South Peninsula & Aleutians	7[c]	1,774[c]	199[c]	14,019[m]	767[c]	16,766
North Alaska Peninsula	1[c]	1,322[n]	51[c]	106[h]	219[c]	1,699
Westward Region Total	38	8,316	618	28,976	1,944	39,893
Arctic-Yukon-Kuskokwim Region Total	1	90	315	50	2,115	2,571
Statewide Total	54	58,773	4,580	140,268	17,216	220,891

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, which has not published the quota for 2015. Release of the 2015 Chinook salmon quota for Southeast Alaska is expected in late March or early April.

[c] Average harvest of the previous 5 years (2010–2014).

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

[e] 5-year average harvest (2010–2014) 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 of previous 5 odd-year harvests (2005–2013).

[i] Total Kodiak harvest of 3.23 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 1.53 million fish.

[j] See formal pink salmon forecast.

[k] Hatchery projections made by Kodiak Regional Aquaculture Association .Sockeye salmon hatchery projections include enhanced Spiridon Lake sockeye salmon run harvest forecast (391,000) and other Kodiak Regional Aquaculture Association projections (105,000).

[l] Chignik sockeye salmon harvest estimate based on a formal forecast with projected harvest at Igvak and Southeastern District Mainland excluded.

[m] Based on South Peninsula formal forecast and the average of previous 4 odd-year harvests (2007–2013) for the Aleutian Islands.

[n] 5-year average harvest (2010–2014); includes formal forecasts for Bear late run (349,000) and Nelson River (269,000) sockeye salmon stocks.

The Alaska all-species salmon harvest for 2014 totaled 157.9 million, which was about 25.3 million more than the preseason forecast of 132.6 million. This combined harvest was composed of 487,302 Chinook, 44.1 million sockeye, 6.3 million coho, 95.8 million pink, and 11.3 million chum salmon. Table 2 shows 2014 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 2014 harvest by species and area.

Table 2.–Preliminary 2014 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	428[a]	1,670	3,790	37,194	6,681	49,763
Prince William Sound	11	3,304	610	44,272	1,539	49,735
Upper Cook Inlet	5	2,343	137	643	116	3,244
Lower Cook Inlet[b]	0	271	1	271	73	617
Bristol Bay	15	29,118	287	1,298	483	31,201
Central Region Total	31	35,036	1,035	46,484	2,211	84,796
Kodiak Area	8	3,259	472	10,675	337	14,751
Chignik	9	620	132	352	55	1,169
South Peninsula and Aleutians	7	1,427	298	843	496	3,070
North Peninsula	1	1,964	108	11	129	2,213
Westward Region Total	25	7,270	1,010	11,881	1,016	21,203
Arctic-Yukon-Kuskokwim Region Total	3	83	438	237	1,424	2,184
Total Alaska	487	44,058	6,272	95,795	11,332	157,945

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

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2013–September 30, 2014, catch accounting period.

[b] Commercial harvest in Lower Cook Inlet includes commercial common property and hatchery cost recovery harvest, but not homepack, broodstock, or hatchery donated fish.

Table 3.–Preliminary 2014 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	5,170[a]	9,736	25,883	132,038	59,528	232,355
Prince William Sound	190	19,523	4,815	147,897	11,603	184,027
Upper Cook Inlet	74	14,580	864	2,353	859	18,729
Lower Cook Inlet[b]	3	1,254	4	957	539	2,757
Bristol Bay	233	161,796	1,846	4,764	2,932	171,571
Central Region Total	500	197,153	7,529	155,970	15,933	377,085
Kodiak Area	61	17,020	3,655	37,422	2,556	60,713
Chignik	76	4,141	1,091	1,138	458	6,905
South Peninsula and Aleutians	71	8,326	1,803	2,833	3,317	16,351
North Peninsula	13	10,823	866	37	932	12,671
Westward Region Total	221	40,310	7,416	41,430	7,263	96,640
AYK Region Total	27	467	3,061	758	10,368	14,681
Total Alaska	5,918	247,665	43,889	330,196	93,092	720,761

Note: Columns may not total exactly due to rounding.

[a] Total commercial harvest of Chinook salmon for the October 1, 2013–September 30, 2014, catch accounting period.

[b] Commercial harvest in Lower Cook Inlet includes commercial common property and hatchery cost recovery harvest, but not homepack, broodstock, or hatchery donated fish.

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

Though ADF&G 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 2014 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.

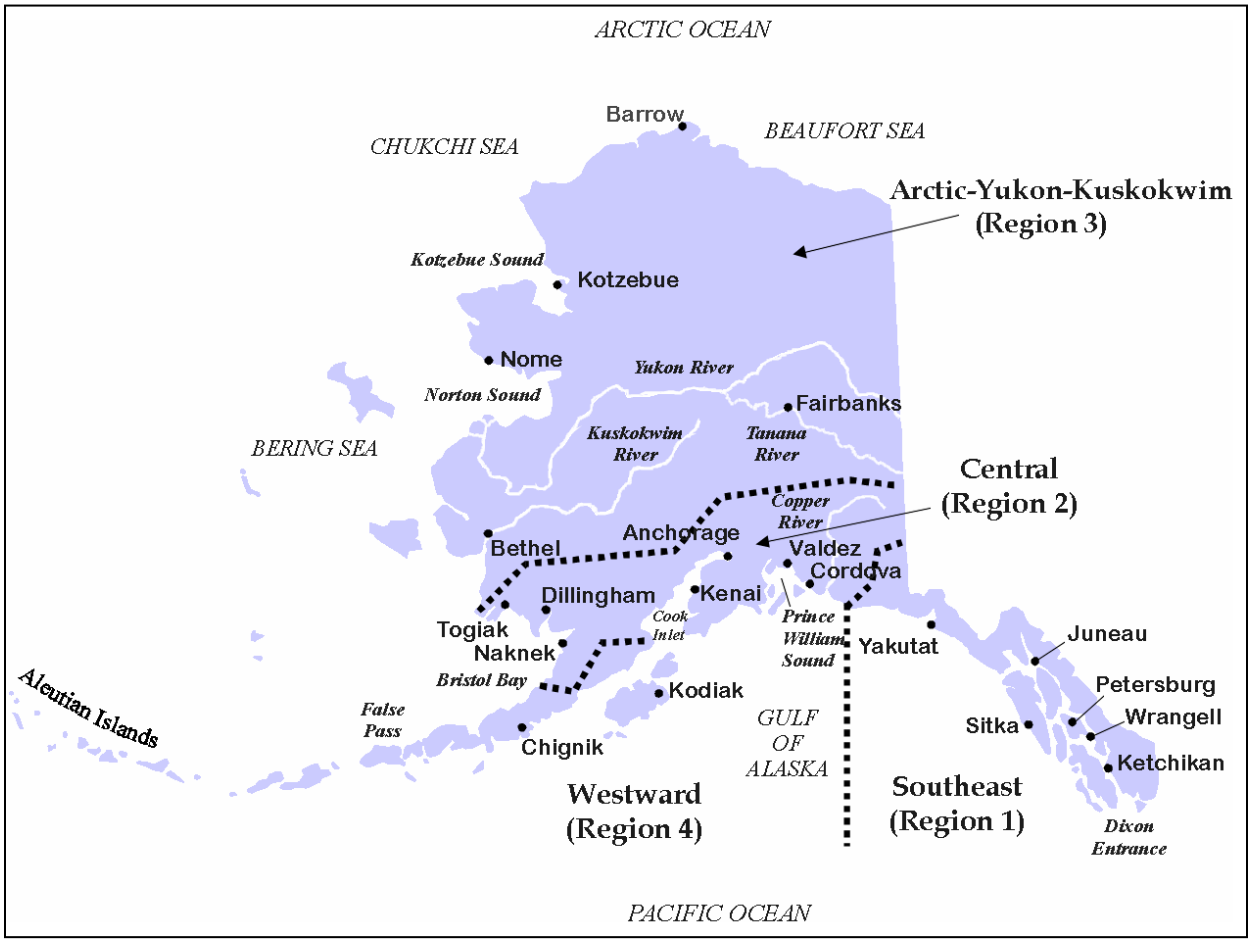

Figure 1.–The 4 ADF&G fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Division of Commercial Fisheries.

PRELIMINARY REVIEW OF THE 2014 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

The Region I cumulative commercial salmon harvest by all harvest categories, including hatchery cost recovery, was 49.8 million in 2014 (Table 4). Total common property commercial harvest was 45.2 million, 91% of total harvest after excluding private hatchery cost recovery, Annette Island Reservation harvests, and miscellaneous harvests. Overall harvest in numbers of salmon in 2014 was 44% that of 2013. The 2014 harvests by species compared with 2013 were as follows: Chinook 178%, sockeye 171%, coho 98%, pink 39%, and chum salmon 53%. The Region I total commercial salmon harvest proportions by species were: Chinook 1%, sockeye 3%, coho 8%, pink 75%, and chum salmon 13%. The 2014 combined-gear, large Chinook salmon harvest of 428,000 fish was 130% of the most recent 10-year average and 143% of the long-term average. The sockeye salmon harvest of 1.7 million was 138% of the recent 10-year average and 125% of the long-term average. The coho salmon harvest of 3.8 million fish was 145% of the 10-year average and 178% of the long-term average. The pink salmon harvest of 37.2 million was 90% of the 10-year average and 120% of the long-term average. The chum salmon harvest of 6.7 million was 64% of the 10-year average and 116% of the long-term average. The all species total harvest was 89% of the recent 10-year average harvest and 122% of the long-term average harvest.

CHINOOK SALMON

The Chinook salmon harvest of 428,000 in 2014 was above both the recent 10-year and long-term averages. The 2014 Chinook salmon harvest ranks third over the previous 53 years. Targeted Chinook salmon fisheries are composed of 3 components: (1) coastwide mixed stocks harvested within limits of the all-gear Pacific Salmon Treaty harvest ceiling, (2) production from Alaska Chinook salmon enhancement programs, and (3) directed fisheries on surplus returns to the Stikine and/or Taku rivers. The average total Chinook salmon harvest since 1962 has been around 300,000. In 2014, the all-gear Chinook salmon quota set through the Pacific Salmon Treaty was 439,400. Under state regulations this quota was allocated to provide 325,411 for troll fisheries, 18,894 for purse seine fisheries, 13,743 for gillnet fisheries, and 81,353 for sport fisheries. Chinook salmon less than 21 inches may be retained and sold in the purse seine fishery, and Chinook of all sizes may be sold in the drift gillnet fishery. The Pacific Salmon Treaty accounts for large Chinook salmon, greater than or equal to 28 inches overall length, as Treaty Chinook. Preliminary harvests of coastwide Chinook salmon accountable under the Pacific Salmon Treaty included 339,850 by troll gear, 15,997 by seine gear, 5,148 by gillnet gear, and 71,310 for sport fisheries. Total commercial harvests of Alaska hatchery origin Chinook salmon were 49,000, 11% of total Chinook salmon harvests, and 13,000 were harvested in private hatchery cost recovery fisheries. For transboundary river stocks regulated under the Pacific Salmon Treaty, preseason forecasts in 2014 provided no allowable catch for directed fisheries on returns of large Chinook (28 inches in length or greater) to the Stikine and Taku Rivers.

SOCKEYE SALMON

The harvest of sockeye salmon was 1.7 million in 2014. This harvest was above both the recent 10-year average of 1.2 million and the long-term average of 1.3 million. The 2014 sockeye salmon harvest ranks 14th over the previous 53 years since 1962. The majority of sockeye salmon were harvested in the Southeast Alaska Area purse seine fishery. Sockeye salmon harvests in northern boundary area and transboundary river fisheries are regulated under the Pacific Salmon Treaty to provide for conservation and harvest sharing with Canada. The drift gillnet fishery harvest of 498,000 was above the recent 10-year average of 492,000 and accounted for 30% of the regional total harvest. The set gillnet fishery harvest of 116,000 was below the recent 10-year average harvest of 127,000. The purse seine harvest of 901,000 sockeye salmon was well above average levels.

COHO SALMON

The 2014 coho salmon harvest was 3.8 million. This harvest exceeded both the long-term average harvest since 1962 and the recent 10-year average harvest. The 2014 coho salmon harvest ranks third of the 53 years since 1962. The coho salmon harvest in the troll fishery was 2.2 million, nearly double the long-term average harvest, and accounted for 59% of the harvest. Seine, drift gillnet, and set gillnet harvests of coho salmon were all above long-term and recent 10-year average harvests.

PINK SALMON

The 2014 pink salmon harvest was 37.2 million; 75% of the total region salmon harvest. The purse seine harvest was 33.5 million; 90% of the total pink salmon harvest. The 2014 pink salmon harvest was below the recent 10-year average and above the long-term average harvests, ranking as the 21st largest harvest since 1962. Following a sharp decline in harvest in the 2006 season, a strong odd-year, weak even-year return pattern has been established, and that pattern continued in 2014, especially in Northern Southeast Inside waters.

CHUM SALMON

The 2014 chum salmon harvest of 6.7 million fish ranks 21st since statehood and was below the recent 10-year average of 10.5 million. Most chum salmon production in the region is attributable to hatchery production. Before hatchery chum salmon production became significant in 1984, the 1962–1983 regional average chum salmon harvest was 1.6 million.

EXVESSEL VALUE

The initial reported value of the 2014 Region I commercial salmon harvest based on fish ticket data for all fisheries is $151 million. The total 2014 salmon harvest in numbers of fish was 44% of the 2013 harvest, primarily due to the trend toward strong odd-year and weaker even-year pink salmon returns since 2006. The 2014 commercial harvest of 232 million pounds (Table 3) was 53% of the 2013 commercial harvest of 435 million pounds. In 2014, chum salmon was 26% of the total weight of salmon harvested compared with 22% in 2013. In 2014, pink salmon was 57% of the total weight of salmon harvested compared with 70% in 2013. Average weights by species were similar (within 5%) in 2014 compared with 2013 for sockeye and Chinook salmon and increased for coho (15%), pink (10%), and chum (14%) salmon. The 2014 prices as initially reported on fish tickets compared to the 2013 prices from Commercial Fisheries Entry

Commission (CFEC) data decreased for Chinook from $5.19/lb to $4.07/lb, for sockeye salmon from $1.72/lb to $1.70/lb, for coho from $1.55/lb to $1.28/lb, and for pink salmon from $0.42/lb to $0.28/lb, and increased for chum from $0.61/lb to $0.74/lb. Following year-end annual commercial operator's reports and further analysis by the CFEC, the estimated wholesale value of the 2014 fishery is expected to increase.

The preliminary reported exvessel value of the 2014 Region I commercial salmon harvest for purse seine, gillnet, and troll fisheries combined based on fish ticket data is $130 million. The 2014 season exvessel value for these salmon fisheries is 114% of the recent 10-year average of $118 million and ranks fifth highest over the 40-year period since 1975. Common property fishery exvessel value estimates for 2014 exclude Annette Island Reservation, hatchery cost recovery, and miscellaneous harvests.

The 2014 exvessel value by gear was highest for the purse seine fishery ($58.2 million), followed by troll ($41.6 million), drift gillnet ($28.1 million), hatchery cost recovery ($17.6 million), Annette Island ($3.7 million), and set gillnet ($2.1 million) fisheries. Comparing the conservative, preliminary value for 2014 to reported CFEC fishery values by fishery since 1975, 2014 would rank as the sixth highest value for purse seine, fourth highest for drift gillnet, the highest for troll, and 25th highest for the Yakutat set gillnet fishery. The regional value breakdown by species included: $21.0 million for Chinook, $16.5 million for sockeye, $33.1 million for coho, $36.8 million for pink, and $44.0 million for chum salmon.

Table 4.–Preliminary 2014 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	16	881	320	29,891	916	32,024
Northern Purse Seine Traditional	0	15	28	3,336	215	3,594
Hatchery Terminal	11	5	41	245	1,253	1,556
Total Purse Seine	28	901	389	33,472	2,384	37,174
Drift Gillnet						
Tree Point	1	56	91	708	184	1,041
Prince of Wales	2	58	287	415	106	869
Stikine	8	20	30	34	85	177
Taku-Snettisham	1	110	54	29	291	486
Lynn Canal	1	214	58	84	1,226	1,583
Drift Gillnet Hatchery Terminal	14	40	34	146	489	724
Total Drift Gillnet	28	498	554	1,417	2,381	4,879
Set Gillnet (Yakutat)	1	116	162	21	1	301
Troll						
Hand Troll						
Traditional	13	0	119	4	1	137
Hatchery Terminal	0	0	1	1	1	3
Spring Areas	5	0	0	0	0	6
Total Hand Troll	18	0	120	5	3	146
Power Troll						
Traditional	298	6	2,108	51	89	2,553
Hatchery Terminal	1	0	13	18	88	119
Spring Areas	38	0	4	2	20	64
Total Power Troll	337	7	2,124	71	197	2,736
Total Troll	355	7	2,244	75	200	2,881
Annette Island Reservation						
Seine	0	13	5	1,477	31	1,527
Drift Gillnet	1	9	45	485	98	638
Troll	0	0	1	1	0	1
Hand Troll	0	0	1	1	0	1
Power Troll	0	0	0	0	0	0
Trap						
Total Annette Island Reservation	1	22	51	1,962	129	2,166
Hatchery Cost Recovery	13	123	388	236	1,577	2,338
Miscellaneous[c]	1	3	2	10	9	24
Southeast Region Total	428	1,670	3,790	37,194	6,681	49,763

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

Note: Columns may not total exactly due to rounding.

[a] Chinook salmon adults and jacks are totaled.

[b] Catch accounting period for the 2014 Chinook salmon season goes from October 1, 2013, to September 30, 2014.

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

CENTRAL REGION

PRELIMINARY 2014 PRINCE WILLIAM SOUND SALMON SEASON SUMMARY

The 2014 Prince William Sound (PWS) Area commercial salmon harvest was 49.74 million fish (Table 5). Harvest was composed of 44.27 million pink, 3.30 million sockeye, 1.54 million chum, 610,000 coho, and 10,800 Chinook salmon. The 2014 harvest was composed of 43.75 million (88%) commercial common property fishery (CPF) and 5.98 million (12%) hatchery cost recovery and broodstock fish.

Gillnet Fisheries

Copper River District

The 2014 preseason commercial harvest forecast for the Copper River District was 22,000 Chinook, 1.60 million sockeye, and 229,000 coho salmon. Gulkana Hatchery was expected to contribute 270,000 sockeye salmon to the CPF harvest. The commercial salmon fishing season in the Copper River District began on Thursday, May 15. The sockeye salmon harvest of 2.05 million fish was more than 1½ times the previous 10-year (2004–2013) harvest average of 1.32 million. The number of wild sockeye salmon in the Copper River District CPF harvest was 1.68 million, or 82%. Gulkana Hatchery contributed 298,000 sockeye salmon, or 15%, to the commercial harvest. Main Bay Hatchery contributed 72,500, or nearly 4%. The CPF harvest of 10,200 Chinook salmon was below the previous 10-year (2004–2013) average harvest of 21,200. The coho salmon commercial harvest of 316,000 was above the previous 10-year (2004–2013) average harvest of 229,000. The inriver goal for salmon passing the Miles Lake sonar site was 748,000 to 1,140,000. Preliminary estimates of inriver Chinook salmon abundance indicate that spawning escapement was below the lower bound sustainable escapement goal (SEG) of 24,000. The 2014 preliminary sonar escapement estimate was 1.22 million salmon and exceeded the upper end of the inriver goal. Spawning escapement to Copper River delta systems based on aerial survey indices was 64,000 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 43,000 and was within the SEG range (32,000–67,000).

Bering River District

The 2014 preseason commercial harvest forecast for the Bering River District was 15,300 sockeye and 45,700 coho salmon. The sockeye salmon commercial harvest of 50 fish was below the previous 10-year (2004–2013) harvest average of 15,300. The coho salmon commercial harvest of 98,000 was above the previous 10-year (2004–2013) harvest average of 48,100. The aerial escapement index of 14,000 sockeye salmon was below the SEG range (15,000–33,000). Aerial surveys of coho salmon produced an escapement index of 26,000 that was within the SEG range (13,000–33,000).

Coghill District (Drift Gillnet)

Prince William Sound Aquaculture Corporation (PWSAC) forecasted a run of 1.64 million chum salmon to Wally Noerenberg Hatchery in 2014. Approximately 512,000 chum salmon (31%) of the forecasted run were designated for corporate cost recovery and broodstock. The CPF harvest of chum salmon in the Coghill District was 643,000. PWSAC harvested 377,000 chum salmon for corporate cost recovery and broodstock. The total CPF harvest of sockeye salmon in the Coghill District was 159,000. The proportion of wild sockeye salmon in the Coghill District CPF

harvest was 27%. Pink salmon CPF harvest in the Coghill District was 1.96 million. The proportion of wild pink salmon in the Coghill District CPF harvest was 8%. The total CPF harvest of coho salmon in the Coghill District was 160,000, the majority of which were assumed to be enhanced from Wally Noerenberg Hatchery.

The sockeye salmon run forecast for Coghill River was 168,000. The Coghill River weir passed 22,000 sockeye salmon, which was within the SEG range (20,000–60,000).

Eshamy District

ADF&G's preseason forecast for Eshamy Lake was 53,000 wild sockeye salmon and PWSAC forecasted a run of 1.04 million Main Bay Hatchery enhanced sockeye salmon. The CPF harvest of sockeye salmon in the Eshamy District was 1.02 million, which was above the 10-year average of 699,000. The proportion of wild sockeye salmon in the Eshamy District CPF harvest was 6%. PWSAC harvested 12,700 sockeye salmon to meet broodstock requirements. Sockeye salmon escapement to Eshamy Lake is monitored by video camera and counts have not yet been finalized. The sockeye salmon biological escapement goal (BEG) range for Eshamy Lake is 13,000 to 28,000.

Unakwik District

ADF&G's preseason harvest forecast for the Unakwik District was 6,600 sockeye salmon. Unakwik District CPF harvest was 1,150, which was below the 10-year average of 5,720.

Purse Seine Fisheries

Chum Salmon

The 2014 chum salmon total run forecast for PWS was 3.08 million. The majority of the forecast return, 2.63 million (85%), was projected PWSAC enhanced fish. Of these PWSAC enhanced chum salmon, 492,000 were forecasted to return to Armin F. Koernig Hatchery, and 495,000 were forecasted to return to Port Chalmers. The purse seine fleet had exclusive access to both the Armin F. Koernig Hatchery and Port Chalmers enhanced chum salmon fisheries in 2014. Enhanced chum salmon returning to Wally Noerenberg Hatchery were expected to be harvested in gillnet fisheries.

Based on ADF&G's wild chum salmon forecast of 445,000, there was a preseason expectation for the potential CPF harvest of 245,000 wild chum salmon in PWS, leaving 200,000 for escapement. The preseason forecast for total chum salmon CPF harvest in PWS was 2.36 million.

Total commercial chum salmon harvest in PWS was 1.54 million, including 377,000 for Wally Noerenberg Hatchery broodstock and cost recovery. Chum salmon CPF harvest in PWS was 1.16 million, which was 50% below the CPF preseason forecast. Chum salmon commercial harvest in the Southwestern District was 66,300 versus a preseason forecast of 492,000. Chum salmon commercial harvest in the Port Chalmers Subdistrict was 187,000, which was below the preseason forecast of 495,000. Commercial fisheries in the Eastern and Southeastern districts resulted in chum salmon harvest totals of 101,000 (Eastern) and 12,700 (Southeastern).

Pink Salmon

The 2014 pink salmon total run forecast for PWS was 38.40 million. This estimate included 4.30 million wild fish, 12.90 million Valdez Fisheries Development Association (VFDA) enhanced

fish, and 21.20 million PWSAC enhanced fish. Approximately 3.07 million (14%) of the 21.20 million PWSAC pink salmon return forecast was projected for cost recovery and broodstock, with the remaining 18.1 million expected to be available for CPF harvest. Approximately 2.76 million (21%) of the projected 12.90 million pink salmon return forecast to VFDA's Solomon Gulch Hatchery were projected for cost recovery and broodstock. The remaining 10.20 million VFDA fish were expected to be available for CPF harvest. A total harvest of 3.14 million wild stock pink salmon was forecasted for CPF harvest in PWS, leaving 1.16 million fish for escapement.

Total commercial pink salmon harvest was 44.27 million, including 5.58 million (3.65 million for PWSAC and 1.93 million for VFDA) fish for hatchery cost recovery and broodstock. This is the third largest even-year commercial pink salmon harvest on record for PWS. VFDA's pink salmon total run set a new record for that facility with 25.45 million.

Coho Salmon

The VFDA coho salmon run was anticipated to be 106,000. VFDA's broodstock objective was 1,000 coho salmon. Due to a weak run, Port Valdez was not opened to commercial purse seine fishing to target surplus VFDA coho salmon in 2014. Total commercial harvest of coho salmon in PWS (excluding Copper River and Bering River districts) was 196,000, including 9,127 for hatchery cost recovery and broodstock. The majority of CPF coho salmon harvested in the Coghill (160,000) and Southwestern (19,700) districts are assumed to be of enhanced stock origin.

COOK INLET

Lower Cook Inlet

The preliminary estimate of the 2014 Lower Cook Inlet Area salmon commercial harvest was 616,554. The harvest was composed of 271,200 pink, 270,835 sockeye, 73,498 chum, 663 coho, and 358 Chinook salmon (Table 5). The harvest was composed of 443,064 (72%) CPF fish and 173,490 (28%) hatchery cost recovery and does not include broodstock (33,463) or hatchery donated (2,312) fish.

Southern District

The 2014 preseason commercial common property harvest forecast for natural production in the Southern District was 800 sockeye and 79,000 pink salmon. Hatchery returns were not anticipated to contribute to Southern District commercial common property harvest in 2014 due to hatchery cost recovery and broodstock needs. The commercial salmon fishing season in the Southern District began on Monday, June 2. The estimated purse seine harvest for the 2014 season was 18 Chinook, 23,188 sockeye, 269 coho, 58,890 pink and 3,360 chum salmon. In addition, 30,404 sockeye salmon were harvested from the Tutka Hatchery Special Harvest Area (SHA) for cost recovery purposes. This compares to a previous 10-year harvest average of 66 Chinook, 30,722 sockeye, 609 coho, 26,283 pink, and 164 chum salmon. The estimated set gillnet harvest was 320 Chinook, 32,910 sockeye, 393 coho, 3,231 pink, and 5,355 chum salmon (not including homepack). The previous 10-year harvest average for this gear type is 362 Chinook, 22,593 sockeye, 1,245 coho, 3,534 pink and 1,675 chum salmon. End-of-season estimates show that pink salmon escapement in index streams was within the cumulative SEG range (59,700–178,500). Escapement past the English Bay River weir was 6,955 sockeye salmon, which was within the SEG (6,000–13,500) for this system.

Kamishak Bay District

The 2014 preseason wild stock commercial harvest forecast for the Kamishak Bay District was 49,300 sockeye and 23,200 chum salmon. Cook Inlet Aquaculture Association (CIAA) forecasted a return of 8,200 sockeye salmon to the Kirschner Lake remote release site, of which all would be required for cost recovery. The total estimated common property harvest was 12,137 sockeye, 44,227 pink, and 4,449 chum salmon. In addition, 16,555 sockeye salmon were harvested by CIAA from the Kirschner Lake SHA for cost recovery purposes. This compares to a previous 10-year average of 72,408 sockeye, 26,422 pink, and 50,707 chum salmon harvested in the common property fishery. End-of-season escapement indices show escapement levels within the SEG ranges for both chum (65,550–141,600), and pink salmon (25,950–203,400). Video enumeration at Chenik Lake was used to document 17,797 sockeye salmon. This was above the SEG range (3,500–14,000). Video documentation of returns to Mikfik Lake for this species estimated 18,062. This was above the SEG range of sockeye salmon (3,400–13,000) for this lake.

Outer District

The 2014 preseason commercial harvest forecast for the Outer District was 9,900 sockeye, 102,000 pink, and 36,700 chum salmon. The commercial salmon fishing season began in this district on Monday, June 30. The total estimated harvest from 11 permit holders that participated was 24,264 sockeye, 163,938 pink, and 59,702 chum salmon. This harvest compares to previous 10-year averages of 9,801 sockeye, 545,712 pink, and 33,791 chum salmon. End-of-season escapement indices for chum salmon were within the SEG range (12,850–34,600). Pink salmon were also within their SEG range (54,500–237,200). Aerial surveys of Desire Lake were used to document 11,480 sockeye salmon. This was within the SEG range (8,800–15,200) for Desire Lake. The Delight Lake weir was used to count 22,289 sockeye salmon. This was above 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 2014. CIAA forecasted a total return of 66,000 sockeye salmon to Resurrection Bay facilities. Total cost recovery harvest from this district was 126,071 sockeye salmon with an additional 1,641 donated at the weir to members of the public. Escapement of 13,090 sockeye salmon through the weir at Bear Creek was sufficient to meet the desired inriver passage (5,620–13,220). 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 were confounded by high levels of suspended silt and algae and documented only 450 sockeye salmon. This is below the SEG range (3,700–8,000) for this system.

Upper Cook Inlet

The 2014 Upper Cook Inlet (UCI) commercial harvest of nearly 3.2 million salmon (Table 5) was approximately 20% less than the recent 10-year average annual harvest of 3.9 million. However, due to an increase in the price paid per pound for sockeye salmon, the overall exvessel value of the 2014 fishery was substantially raised. The estimated exvessel value of the 2014 harvest was approximately $35.0 million, the ninth highest value in the UCI commercial fishery since 1960, and the third highest exvessel value in the past 10 years. While all 5 species of Pacific salmon are present in UCI, sockeye salmon are the most valuable, accounting for

approximately 78% 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 7 sockeye salmon systems with escapement/inriver goals that are monitored in UCI. The Yentna River sonar goal was replaced in 2009 with SEGs monitored by weirs on 3 lake systems within the Susitna River (Judd and Chelatna lakes in the Yentna River drainage and Larson Lake in the mainstem Susitna River drainage). Remote video technology was used to evaluate the SEG at Packers Lake. The Crescent River sockeye salmon sonar project is no longer operational. For the 2014 season, 3 of 7 sockeye salmon enumeration estimates fell within the established goal ranges, while 2 goals were above and 2 were below their goal objectives.

Chinook Salmon

In UCI, there are 2 commercial fisheries where the majority of Chinook salmon are harvested: the set gillnet fisheries in the Northern District and in the Upper Subdistrict of the Central District. Chinook salmon runs were again expected to be below average in watersheds throughout Southcentral Alaska during the 2014 season. Therefore, it was anticipated that restrictions to both sport and commercial fisheries would be required to ensure that 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 that aimed to reduce Chinook salmon harvest in both sport and commercial fisheries. In the commercial fishery, beginning in 2011, that portion of the General Subdistrict of the Northern District, from approximately one and one-half miles south of Tyonek north to the Susitna River, was closed to fishing during the directed Chinook salmon fishery. In both the 2012 and 2013 commercial fishing seasons, ADF&G determined that additional restrictions were necessary to further reduce Chinook salmon commercial harvest. These additional restrictions included closing the first Monday fishing period of the season and reducing time in the remaining fishing periods from 12 hours to 6 hours. This same strategy was followed in 2014. The first fishing period of the year, which was scheduled for Monday, May 26, was closed, and the remaining 4 fishing periods were reduced to 6 hours by emergency order. However, ADF&G determined during the season that the Deshka River Chinook salmon escapement goal would be achieved, and as a result, the use of bait and multiple hooks was allowed back into the sport fishery beginning Saturday, June 14. In response to this, the last 2 setnet fishing periods, those on June 16 and June 23, were returned to 12 hours in duration. The estimated Chinook salmon harvest in the Northern District directed fishery was approximately 1,412, or about 39% less than the previous 10-year average annual harvest of 2,313.

The Deshka River is the primary system in northern Cook Inlet where Chinook salmon escapement has been monitored inseason with a weir. The 2014 Deshka River Chinook salmon escapement estimate of 16,335 was within the escapement goal range (13,000–28,000).

As a result of below average runs of Chinook salmon to the Kenai River the past few years, 5 AAC 21.358 the *Kenai River Late-Run King Salmon Management Plan* was substantially modified at the 2014 UCI finfish BOF meeting (please see the sockeye salmon section of this document for a description of restrictive actions taken in the Upper Subdistrict set gillnet fishery to conserve Kenai River Chinook salmon).

The 2014 Upper Subdistrict set gillnet fishery total Chinook salmon harvest was estimated to be 1,506. This does not include Chinook salmon harvested in the Kasilof River Special Harvest Area (KRSHA), which was open for part or all of 17 different days from July 16 to August 2.

Approximately 549 Chinook salmon were harvested by the set gillnet fishery in the KRSHA, with 11 additional Chinook salmon harvested by drifters in this area. Thus, the 2014 total Chinook salmon harvest by setnetters in the Upper Subdistrict was 2,055. The stock composition of the 2014 harvest will not be known until genetic samples collected during the fishery are processed by ADF&G's Gene Conservation Laboratory. The 2014 Kenai River late-run Chinook salmon escapement estimate was approximately 16,000; the SEG for this stock is 15,000 to 30,000.

In all of UCI, approximately 4,660 Chinook salmon were harvested in 2014, which was about 69% less than the previous 10-year (2004–2013) average annual harvest of 14,140. Using a price of $2.80/lb for Chinook salmon, the estimated exvessel value of the 2014 harvest was $139,000. This value is approximately 0.4% of the total UCI commercial fishery.

Sockeye Salmon

The total sockeye salmon run to UCI in 2014 was estimated to be 5.3 million fish, which was 13% less than forecast. Based upon the Anchor Point offshore test fishery, the 2014 sockeye salmon run was estimated to be one day early. The sockeye salmon run to the Kasilof River was slightly higher than forecast, while runs to all other systems were less than forecast. The UCI commercial harvest of 2.3 million sockeye salmon was approximately 33% less than the 2004–2013 average annual harvest of 3.3 million and ranks as the third lowest harvest in the past 10 years.

Sockeye salmon prices varied during the season, but based on an estimated average price of $2.25/lb, the total exvessel value from the 2014 UCI sockeye salmon harvest was approximately $33.2 million, which was 95% of the total UCI exvessel value.

Upper Subdistrict Set Gillnet and Central District Drift Gillnet

The 2014 UCI preseason forecast projected a total run of approximately 6.1 million sockeye salmon, with a harvest estimate (sport, personal use and commercial) of 4.3 million. Approximately 3.4 million sockeye salmon were predicted to be harvested commercially. The total run to the Kenai River, generally the largest producer in UCI, was forecasted to be 3.8 million. For Kenai River runs of 2.3 to 4.6 million, the inriver sonar goal range is 1.0 to 1.2 million. In the Upper Subdistrict set gillnet fishery, 2 regularly scheduled 12-hour fishing periods per week, plus up to 51 hours of additional fishing time, are allowed for this run size to the Kenai River. At the 2014 BOF meeting, there were numerous changes made to management plans that significantly impacted how the Upper Subdistrict set gillnet and the Central District drift gillnet fisheries were to be managed. In the set gillnet fishery, restrictive actions were to be paired and commensurate with restrictions in the Kenai River late-run Chinook salmon sport fishery. Restrictions in both fisheries were to be based upon inriver abundance levels of Chinook salmon.

The Kasilof Section set gillnet fishery opens on or after June 25; however, the section may open anytime from June 20 to June 24 if ADF&G estimates that 50,000 sockeye salmon have entered the Kasilof River by that date. The 2014 Kasilof River sockeye salmon run started out very strong, with nearly 50,000 fish estimated to have passed the sonar site by midnight of June 19. This represented the second highest passage ever measured through this date. However, because of concerns over Kenai River early-run Chinook salmon escapement levels, the Kasilof Section set gillnet fishery was not opened until Monday, June 23 to allow for additional Chinook salmon escapement into the Kenai River. The Kenai River early-run Chinook salmon sport fishery was

closed for the entire season. The final escapement of Kenai River early-run Chinook salmon (June 30 is the final day of enumeration for the early run) was estimated at 5,311, which meant the minimum optimum escapement goal (5,300–9,000) was achieved.

During the management week of June 22 to June 28, the Kasilof Section set gillnet fishery was opened on 3 different days: June 23, 26, and 28. Sockeye salmon escapement in the Kasilof River continued to be very strong, exceeding 136,000 by June 28, which was the largest passage measured through that date. The following week, June 29 to July 5, saw a similar fishing schedule, with the Kasilof Section set gillnet fishery opened on 3 different days. Sockeye salmon passage continued to be strong in the Kasilof River, reaching 173,000 through July 5, which was the second highest level of passage ever measured through that date.

At the 2014 BOF meeting, the *Kenai River Late-Run King Salmon Management Plan* was modified to include what is commonly referred to as *paired restrictions* in the Kenai River sport fishery, Kenai River personal use fishery, and Upper Subdistrict set gillnet fishery. The paired restrictions were intended to slow down the harvest of Chinook salmon in these fisheries during times of low abundance in the Kenai River. According to the modified management plan, if from July 1 to July 31, the projected inriver run of Kenai River late-run Chinook salmon is less than 22,500 fish, the Kenai River Chinook salmon sport fishery may be restricted to no bait, retention of Chinook salmon may be restricted in the Kenai River personal use fishery, and the set gillnet fishery may be restricted to no more than 36 hours of fishing time per week with regular Monday/Thursday 12-hour fishing periods no longer in effect. If retention of Chinook salmon is prohibited in the sport fishery, the set gillnet fishery is restricted to no more than 12 hours of fishing time per week.

The 2014 Kenai River late-run Chinook salmon forecast was for a total run of approximately 19,000, which, if realized, meant that according to the modified management plan both the inriver and set gillnet fisheries would require some level of harvest restrictions in order to meet the lower end of the SEG (15,000–30,000). Therefore, the late-run Chinook salmon sport fishery in the Kenai River began the season on July 1 under a no-bait restriction and the Upper Subdistrict set gillnet fishery was restricted to fishing no more than 36 hours per week without regular Monday/Thursday fishing periods.

During the management week of July 6 to July 12, the entire Upper Subdistrict set gillnet fishery (Kenai, Kasilof, and East Foreland sections) was open only 1 day for a 12-hour fishing period on July 9. Set gillnetting in the Kasilof Section was allowed on July 7 and July 12 for 9 hours each day, with the July 12 fishing period restricted to within one-half mile of shore in an attempt to harvest Kasilof River sockeye salmon, while reducing the harvest of Kenai River Chinook salmon. Chinook salmon passage in the Kenai River through July 12 was below average, having reached approximately 2,600, while the Kasilof River sockeye salmon passage estimate of 237,000 was the highest passage ever measured through that date.

Chinook salmon passage into the Kenai River did not increase substantially during the management week of July 13 to July 19; therefore, the set gillnet fishery was fished a limited number of hours. The Kasilof Section fished 9 hours on July 15—again restricted within one-half mile of shore. The entire Upper Subdistrict set gillnet fishery was again opened only 1 day, on July 17 for 12 hours. For this fishing period a gear restriction was enacted that required each permit holder to choose to fish either 3 set gillnets, each not more than 35 fathoms in length and 29 meshes in depth, or 2 set gillnets, each not more than 35 fathoms in length and 45 meshes in

depth. Late in the management week, final escapement projections of Kenai River late-run Chinook salmon revealed the minimum SEG may not be achieved without further harvest restrictions by all users. Thus, beginning on Saturday, July 19, the Kenai River Chinook salmon sport fishery was further restricted to catch and release. As a result of this announcement, the Upper Subdistrict set gillnet fishery was restricted to fishing no more than 12 hours per week, beginning July 19. Because of the imbalance of below average Chinook salmon passage into the Kenai River and strong sockeye salmon passage into the Kasilof River, the KRSHA was opened beginning July 16. This area is not subject to the hourly fishing restrictions in either the Chinook or sockeye salmon management plans if sockeye salmon escapement is projected to exceed 365,000, which was the case with the Kasilof River. By the end of the week, Kasilof River sockeye salmon passage had reached more than 320,000, while Kenai River sockeye salmon passage was approximately 400,000. The KRSHA was opened to both set and drift gillnetting for a total of 46 hours from July 16 to July 19, with approximately 66,000 sockeye salmon harvested during these 4 days.

The following week, July 20 to July 26, resulted in only one opening for the Upper Subdistrict set gillnet fishery on July 23. Continued low Chinook salmon passage into the Kenai River resulted in a closure of the Kenai River sport fishery and the Upper Subdistrict set gillnet fishery beginning on Saturday, July 26. To harvest the strong sockeye salmon run returning to the Kasilof River, the KRSHA was opened for 136 hours during the week, resulting in a total weekly harvest of 86,000 sockeye salmon and 211 Chinook salmon. Sockeye salmon passage had reached 676,000 in the Kenai River and 387,000 in the Kasilof River. Chinook salmon passage into the Kenai River began to improve moderately by the end of the week, but the cumulative estimate of approximately 10,400 through July 26 was not enough to keep open the sport and commercial fisheries that harvest this stock.

With the Upper Subdistrict set gillnet fishery closed, the KRSHA continued to be used extensively to reduce sockeye salmon passage in the Kasilof River. During the management week of July 27 to August 2, the KRSHA was opened for 122 hours, where approximately 37,000 sockeye and 190 Chinook salmon were harvested. The total harvest in the KRSHA for the season was estimated at 189,000 sockeye and 560 Chinook salmon. Chinook salmon passage into the Kenai River improved enough that by the end of the week a projection of the final escapement exceeded the minimum of 16,500 fish that was needed in order to reopen the Upper Subdistrict set gillnet fishery. On August 2, a 12-hour commercial fishing period was allowed in the Upper Subdistrict set gillnet fishery. Sockeye salmon passage in the Kenai River had reached 974,000, while the cumulative passage in the Kasilof River was approximately 428,000. Chinook salmon passage in the Kenai River for the week was about 4,500, bringing the season total to nearly 15,000.

The final week of the 2014 season for set gillnetting in the Upper Subdistrict started with a 12-hour fishing period on Monday, August 4. Based on changes the BOF made as to how the 1% rule in the Upper Subdistrict was to be calculated, the Kasilof Section closed for the season after the August 4 fishing period, as the sockeye salmon harvest from both the August 2 and August 4 fishing periods was less than 1% of the season total harvest in the section. The Kenai and East Foreland sections were open for one additional 12-hour fishing period on Wednesday, August 6, ending the season for the Upper Subdistrict set gillnet fishery. The season was closed due to the fact that all 36 hours available to the fishery in August, based on the newly modified *Kenai River Late-Run King Salmon Management Plan*, had been used.

The final Kenai River Chinook salmon passage estimate for the 2014 season was approximately 16,670, and after inriver mortality was subtracted, the final estimate of escapement was approximately 16,000. The cumulative sockeye salmon passage estimate in the Kasilof River, which was enumerated through August 7, was nearly 440,000[a]. In the Kenai River, a substantial pink salmon run provided numerous challenges to sockeye salmon sonar apportionment, but the final estimate of sockeye salmon passage, based on enumeration through August 12, was more than 1.52 million[b].

For the 2014 season, approximately 392,000 sockeye salmon were harvested in the Kasilof Section (14 days fished), while 133,000 sockeye salmon were harvested in the Kenai/East Foreland Sections (6 days fished). When the KRSHA harvest was added to these sums, the total Upper Subdistrict sockeye salmon harvest was approximately 705,000, which was the second lowest harvest since 2001.

With the Upper Subdistrict set gillnet fishery restricted during the 2014 season, the Central District drift gillnet fleet was used extensively to harvest Kenai and Kasilof river sockeye salmon. The BOF made substantive changes to the 5 AAC 21.353 *Central District Drift Gillnet Fishery Management Plan* that confined the drift fleet primarily to the eastside of the Central District during the latter half of July. In this region, the BOF created a new drift gillnet fishing area, the Anchor Point Section, that included those waters from the Ninilchik River south to the Anchor River. During the month of July, the drift fleet fished a total of 23 days as follows: 1 day in the regular Kasilof Section; 4 days in the Expanded Kenai/Kasilof sections; 11 days in the Expanded Kenai/Kasilof and Anchor Point sections; 5 days in Drift Area 1; and 2 days in all of the Central District (July 3 and 7). For the 2014 season, approximately 1.47 million sockeye salmon were harvested by the drift fleet, which represented 64% of the total UCI sockeye salmon harvest.

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. Since 1999, strong sockeye salmon escapements into Crescent Lake have resulted in that portion of the Western Subdistrict south of Redoubt Point being fished 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 2014 the Crescent River sonar program was discontinued. However, early in the season, sockeye salmon harvest data indicated the run to Crescent River was above average. 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 5 through August 5. Approximately 29,500 sockeye salmon were harvested in the Western Subdistrict in 2014.

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[a] Sonar estimate at river mile 8 on Kasilof River. To estimate escapement, sport harvest upstream of the sonar must be subtracted from the sonar estimate. Sport harvest estimates for 2014 will not be available until the Statewide Harvest Survey results are released in the spring of 2015 at the earliest.

[b] Sonar estimate at river mile 19 on Kenai River. To estimate escapement, sport harvest upstream of the sonar must be subtracted from the sonar estimate. Sport harvest estimates for 2014 will not be available until the Statewide Harvest Survey results are released in the spring of 2015 at the earliest.

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 2013, approximately 9 permit holders per year have reported harvest from this area. The majority of participation and harvest (more than 92% of the harvest) typically comes from the Big River sockeye salmon fishery, which is an early season fishery limited to one net per permit holder and occurs from June 1 through June 24. Approximately 2,200 sockeye salmon were harvested in the Kustatan Subdistrict in 2014, with nearly 1,800 of these caught during the Big River fishery.

Kalgin Island Subdistrict

The Kalgin Island Subdistrict opened for regular periods beginning June 26; however, the west side of Kalgin Island was open for commercial fishing on Mondays, Wednesdays, and Fridays from June 2 through June 23 as part of the Big River sockeye salmon fishery. Approximately 39,000 sockeye salmon were harvested from the Kalgin Island Subdistrict in 2014, with 8,600 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, with approximately 14,500 of those fish harvested during the early season Big River fishery. Based upon a video weir assessment of sockeye salmon escapement into Packers Lake, which projected a final escapement within the SEG range (15,000–30,000), an additional 12-hour fishing period was provided in the Kalgin Island Subdistrict on Wednesday, August 13. According to 5 AAC 21.370 *Packers Creek Sockeye Salmon Management Plan,* for the purpose of harvesting Packers Creek sockeye salmon, extra fishing time in the Kalgin Island Subdistrict shall be limited to no more than one additional fishing period per week.

Northern District

Commercial fishing in the Northern District opened on June 2 for the directed Chinook salmon fishery and for regular periods beginning on June 26. Approximately 37,700 sockeye salmon were harvested in the Northern District in 2014, with about 1,400 of these fish harvested during the 4 Chinook salmon fishery periods. The sockeye salmon harvest was 31% greater than the 10-year (2004–2013) average of 27,233, yet approximately 59% less than the 1966 to 2013 average of more than 86,000.

Coho Salmon

The 2014 commercial harvest estimate of nearly 137,000 coho salmon was approximately 29% less than the recent 10-year (2004–2013) average annual harvest of approximately 189,000. However, coho salmon harvests were undoubtedly reduced by significant restrictions in the Upper Subdistrict set gillnet fishery and modifications made to the *Central District Drift Gillnet Fishery Management Plan*. At the 2014 BOF meeting, changes to the drift management plan included restricting the drift fishery from July 16 to July 31 on Kenai River sockeye salmon runs of 2.3 to 4.6 million fish to 1 day per week in Drift Area 1. All other fishing time was to occur in one or all of the Expanded Kenai, Expanded Kasilof, and Anchor Point sections. The objective of the new drift gillnet restrictions was to pass coho salmon through the Central District to northern Cook Inlet drainages. In 2014, from July 16 to July 31, the drift gillnet fleet did not fish a districtwide period and was only allowed to fish in Drift Area 1 twice during this time frame. The 2014 drift gillnet harvest of 75,000 coho salmon was 34% less than the recent 10-year average of approximately 113,000.

In UCI, there are 2 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 to 4,400. Coho salmon escapement was enumerated at the weir from July 11 to September 1 and produced a final count of 10,283. In the Little Susitna River, the goal is an SEG of 10,100 to 17,700. The final escapement estimate in the Little Susitna River was approximately 24,200. Finally, there is a coho salmon foot survey SEG of 450 to 700 at McRobert's Creek, which drains into Jim Creek, both located in the Knik River drainage. A foot survey conducted late in September found 122 coho salmon in the stream, which was below the SEG.

Based on an average price per pound of $0.90, the estimated exvessel value of the 2014 commercial coho salmon fishery was approximately $695,000, or 2.0% of the total exvessel value in Upper Cook Inlet. This was approximately 6% higher than the recent 10-year (2004–2013) exvessel value of $656,000 for coho salmon in UCI.

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 2014 UCI commercial harvest of pink salmon was estimated to be approximately 643,000, which was 78% greater than the average annual harvest of nearly 361,000 from the previous 10 years of even-year harvests. The pink salmon harvest would have been larger had the Upper Subdistrict set gillnet fishery fished a more regular schedule. While pink salmon escapements are not specifically monitored in UCI, based on commercial harvest data, the 2014 run appears to have been very strong and very early in run timing. Using an average weight of 3.7 lb/fish and an average price of $0.25/lb, the estimated exvessel value for the 2014 pink salmon harvest was $581,000, or 1.7% of the total exvessel value.

Chum Salmon

The 2014 harvest of approximately 116,000 chum salmon was about 8% below the previous 10-year average annual harvest of nearly 126,000. There is only one chum salmon escapement goal in UCI, which is an SEG of 3,800 to 8,400 in Clearwater Creek, the major tributary that drains into Chinitna Bay. Escapement is monitored via aerial survey. Due to inclement weather, a survey was not flown in 2014 until August 25. An estimate of 3,510 chum salmon were observed during the survey, but the observer noted that conditions were poor for viewing fish and numerous carcasses (spawned out) were documented, indicating that the peak of the run had likely occurred prior to the survey. Because these data showed the chum salmon run to be nearly complete in the Clearwater Creek drainage, Chinitna Bay was opened to drift gillnetting beginning Friday, August 29. Two 12-hour fishing periods per week were allowed, 1 on Tuesdays and 1 on Fridays. The total exvessel value of the 2014 chum salmon commercial fishery was approximately $434,000 or 1.2% of the total exvessel value.

BRISTOL BAY

The 2014 inshore Bristol Bay sockeye salmon run of 41.1 million fish ranks sixth over the last 20 years (1994–2013) and was 19% above the 34.7 million average run for the same period. This year's sockeye run was 55% above the preseason inshore forecast of 26.6 million. Togiak was the only district to come in lower than preseason expectations with the Naknek/Kvichak, Egegik, Ugashik, and Nushagak districts all larger than predicted. The 29.1 million sockeye salmon commercial harvest (Table 5) was 63% above the 17.9 million preseason forecast. Total sockeye

salmon escapement was 12.0 million. It should be noted that escapement data is no longer collected on the Alagnak River due to lack of funding.

Approximately 15,000 Chinook salmon were harvested in Bristol Bay in 2014, 75% below the 20 year average of 61,000. The preliminary chum salmon harvest of 483,000 was 49% below the 20-year average of 957,000. Preliminary baywide coho salmon harvest was 287,000, about 364% above the 20-year average of 79,000. Reported pink salmon harvest was 1,298,000, or 441% above the average harvest of 294,000 for even-numbered years since 1994.

Chinook Salmon

Chinook salmon harvests in Bristol Bay were below average in every district. Four directed Chinook salmon fishing periods occurred in the Nushagak District between June 11 and June 19, with a harvest of 3,700. Chinook salmon are also caught during directed sockeye periods in all commercial districts, and approximately 15,000 were harvested. Chinook salmon escapement into the Nushagak River was 70,482 and within the escapement goal range (55,000–120,000).

Sockeye Salmon

The 2014 inshore sockeye salmon run of 41.1 million was 55% above the preseason inshore forecast of 26.6 million. The Naknek, Wood and Igushik rivers were above the established escapement goal ranges while all other systems were within ranges.

The 2014 Bristol Bay sockeye salmon run was above forecast in all systems except Togiak and generally early. Total sockeye harvest was 63% above forecast, and total inshore run was 55% above forecast. The Wood River Special Harvest Area (WRSHA) was opened at 12:00 noon on June 28 and was fished continuously until the end of the season. Both set and drift gillnets were permitted to fish the WRSHA, but harvest information is proprietary because of a limited number of buyers. The Naknek River SHA was not used in 2014. Preseason speculation among fishermen anticipated an early run based on warm temperatures in the Bering Sea.

Coho Salmon

Baywide harvest of coho salmon was 287,000, with 242,000 harvested in the Nushagak District. This is the largest coho salmon harvest in the last 20 years.

Pink Salmon

Pink salmon runs are strong during even years, and 2014 was a cycle year for Bristol Bay. A total of 1,298,000 pink salmon were reported in the commercial catch. This ranks second for the last 20 years. Nushagak District harvested 1,167,000 pink salmon in 2014.

Chum Salmon

The 2014 preliminary Bristol Bay chum salmon harvest was 483,000. All districts were below their 20-year average harvest. The Nushagak District was the largest producer of chum salmon, where just over 242,000 were harvested.

Table 5.–Preliminary 2014 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	14	2	19,854	101	19,971
Northern District	0	2	3	4,549	2	4,556
Coghill District	0	0	9	902	0	911
Northwestern District	0	0	0	71	6	77
Southwestern District	0	34	20	8,958	66	9,078
Montague District	0	10	1	3,044	187	3,243
Southeastern District	0	0	0	20	13	33
Unakwik District	0	1	0	0	0	1
Drift Gillnet						
Bering River District		0	98	0		98
Copper River District	10	2,050	316	12	44	2,431
Coghill District	0	159	152	1,055	643	2,009
Eshamy District	0	761	1	190	78	1,030
Montague District						
Unakwik District	0	0	0	0	0	0
Set Gillnet						
Eshamy District	0	260	0	36	21	316
Hatchery[a]	0	13	9	5,581	377	5,980
Prince William Sound Total	11	3,304	610	44,272	1,539	49,735
Southern District	0	56	1	62	9	128
Kamishak District	0	12	0	44	4	61
Outer District	0	24	0	164	60	248
Eastern District	0	5	0	1	0	6
Hatchery[b]	0	173	0	0	0	173
Lower Cook Inlet Total	0	271	1	271	73	617
Central District	3	2,305	102	635	114	3,159
Northern District	1	38	35	8	2	84
Upper Cook Inlet Total	5	2,343	137	643	116	3,244
Naknek-Kvichak District	2	13,791	1	7	87	13,888
Nushagak District	11	6,448	242	1,167	242	8,111
Egegik District	0	6,929	11	5	33	6,978
Ugashik District	0	1,507	0	0	20	1,528
Togiak District	2	443	32	119	100	696
Bristol Bay Total	15	29,118	287	1,298	483	31,201
Central Region Total	31	35,036	1,035	46,484	2,211	84,796

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] Lower Cook Inlet hatchery harvest includes cost recovery only, not broodstock or donated fish.

ARCTIC-YUKON-KUSKOKWIM REGION

Arctic-Yukon-Kuskokwim (AYK) Region harvests totaled 2,184,000 salmon and 14,681,000 pounds in 2014 (Tables 2, 3, and 6). The exvessel value was estimated to be $10.3 million. Cumulative all-gear commercial harvest included 3,000 Chinook, 82,000 sockeye, 438,000 coho, 1,424,000 chum, and 237,000 pink salmon. Chinook salmon harvests were considerably below average, while chum, coho, and pink salmon harvests were above average. Improved chum and coho salmon markets and higher prices resulted in larger harvests and exvessel value in the region. The pink salmon harvest was less than the available surplus in an even-numbered year. Landings were made by 1,162 limited entry permit holders in 2014.

KUSKOKWIM AREA

The Kuskokwim Area commercial salmon harvest in 2014 was 2,470 Chinook, 82,108 sockeye, 222,032 coho, 37,014 chum, and 3 pink salmon for a total of 343,627 fish. A total of 457 permit holders participated, and the exvessel value was estimated to be $2,234,287.

Overall Chinook and sockeye salmon harvests were similar to what was expected. Coho salmon harvest was above the expected harvest range in 2014, while chum salmon harvest was below the expected range. Escapement goals were achieved for sockeye and coho salmon. However, only 8 of 13 escapement goals were met for Chinook salmon. Chum salmon abundance was one of the lowest in the last 10 years. In general, run timing throughout Kuskokwim area for Chinook, sockeye, and chum salmon was characterized as average, while coho salmon were considered to be early.

Kuskokwim River

In 2014 the following preseason and inseason management actions were taken in an attempt to conserve Chinook salmon and achieve escapement goals.

On April 17, the Federal Subsistence Board adopted a Special Action to close the Kuskokwim Chinook salmon fishery to non-Federally qualified users within the boundary of the Yukon Delta National Wildlife Refuge. Subsistence fishing in the Kuskokwim River was restricted to the use of gillnets with a mesh size of 4 inches or less and not exceeding 60 feet in length within the Yukon Delta National Wildlife Refuge boundaries, beginning on May 20 downstream of Tuluksak, and on May 27 between Tuluksak and Aniak. This restriction was also implemented upstream of Aniak beginning June 1. Fishing for Chinook salmon with hook and line gear was closed drainagewide beginning May 1. An area at the mouth of the Kuskokwim River (east of the Ishkowik River to the northern boundary of District W-4) was also closed to subsistence fishing in order to provide additional protection to Chinook salmon entering the Kuskokwim River. In addition, there was a 6-inch mesh restriction in marine waters from Ishkowik River near the mouth of the Kuskokwim River west to Naskonat Peninsula from June 3 through June 30 to protect Chinook salmon stocks migrating through coastal waters of the Kuskokwim Area.

The 2014 fishing season was the first in which dip nets could be used as a legal salmon subsistence fishing gear in the Kuskokwim River drainage. The BOF adopted dip net gear as a method to allow subsistence opportunity during times of Chinook salmon conservation. Subsistence fishing with dip nets was allowed beginning June 15, with additional opportunity provided sequentially upstream as run timing dictated. All Chinook salmon caught in a dip net were required to be immediately released unharmed.

When chum and sockeye salmon abundance began exceeding Chinook salmon abundance, as indicated by the Bethel test fishery, limited subsistence fishing opportunity with 6-inch mesh gillnet gear was provided. The first 6-inch mesh fishing period was on June 20, with additional opportunity provided sequentially upstream as run timing dictated. Fish wheels were required to have a live box from June 19 through August 4 to facilitate the live release of Chinook salmon. The Kwethluk, Kasigluk, Kisaralik, Tuluksak, and Aniak river drainages remained restricted to the use of 4-inch mesh gillnets through August 4.

There were 8 commercial fishing periods in District 1 between July 14 and August 26. 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 0 Chinook, 2,714 sockeye, 117,557 coho, 19,048 chum, and 3 pink salmon were harvested. An additional 35 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 358 individual permit holders making at least one recorded landing participated in the District 1 commercial fishery. Salmon harvests were below the most recent 10-year average: 100% below for Chinook salmon, 80% below for sockeye salmon, 20% below for coho salmon, and 67% below for chum salmon. Total exvessel value of the fishery was $813,064, approximately 24% above the most recent 10-year average value. The price per pound for sockeye and coho salmon were above average.

Chinook salmon escapements at the Kogrukluk and Kwethluk rivers were below the respective SEGs, while the George River Chinook salmon SEG was achieved. All 7 tributaries with aerial survey goals were within their respective SEG ranges. The Kuskokwim River drainagewide SEG was likely achieved, but it will not be fully assessed until after estimates are made this winter.

The Kogrukluk River weir has the only established sockeye salmon escapement goal, and the escapement was within the SEG.

Chum salmon escapements were monitored at 6 tributary weirs and indicated overall abundance was below average. The escapement at Kogrukluk River weir was within the SEG.

Coho salmon escapements were monitored at 6 tributary weirs. Escapements at both the Kogrukluk and Kwethluk river weirs exceeded their escapement goals. Escapements at the other monitored locations were characterized as above average.

Kuskokwim Bay District 4 (Quinhagak) and District 5 (Goodnews Bay)

The District 4 commercial fishing season began on July 9 and ended on August 27. There were 18 commercial fishing periods. The commercial fishing season was delayed from the normal start of June 15, and subsistence salmon fishing was closed on Sundays for the month of June due to concerns for Chinook salmon abundance.

The District 5 commercial fishing season began on July 9 and ended on August 27. There were 17 commercial fishing periods. Over the last 2 years the Goodnews River has seen some of the lowest Chinook salmon escapements on record. The 2014 return was expected to be similar to 2013. The subsistence salmon fishery was restricted to the use of gillnets with a mesh size of 6 inches or less for the month of June, due to the concern for low Chinook salmon abundance. The commercial fishery was delayed until July 9 for the same reason.

In 2014, 194 individual permit holders recorded landings during 18 commercial periods in District 4. The total commercial harvest of 128,024 was composed of 2,265 Chinook, 58,879 sockeye, 52,317 coho, and 14,563 chum salmon. The exvessel value of the District 4 commercial fishery was estimated to be $844,734.

A total of 61 individual permit holders recorded landings in District 5 during 17 commercial periods. The District 5 total commercial harvest of 76,281 was composed of 205 Chinook, 20,515 sockeye, 52,158 coho, and 3,403 chum salmon. The exvessel value of the District 5 commercial fishery was estimated to be $576,489.

Chinook, sockeye, and chum salmon harvests were below average this season in both districts. Chinook harvest was the second lowest since 1967 in District 4 and the lowest since 1972 in District 5. Catch rates for Chinook and chum salmon were below average in both districts, as well. Sockeye salmon catch rates were above average in District 4 and average in District 5. Coho salmon harvest and catch rates were above average in both districts, with coho salmon harvest being the highest on record in District 5.

Fish passage through the Kanektok River weir during its operation from June 25 to August 15 was 3,594 Chinook, 256,969 sockeye, and 18,586 chum salmon. Sockeye salmon escapement was the third largest in the last 10 years, Chinook salmon escapement was the third lowest, and chum salmon excapement was the lowest. 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 29, with 1,871 Chinook and 148,800 sockeye salmon observed. The Chinook salmon aerial survey SEG range (3,500–8,000) was not achieved, while the sockeye salmon aerial survey SEG range (14,000–34,000) was exceeded.

Fish passage through the Middle Fork Goodnews River weir was 750 Chinook, 41,496 sockeye, and 11,506 chum salmon. The escapement of Chinook salmon was below the BEG range (1,500–2,900), while escapement of sockeye salmon exceeded the BEG range (18,000–40,000). The escapement of chum salmon was below the lower bound SEG of 12,000. Escapement estimates for coho salmon were incomplete because the weir was pulled on September 1 due to funding restraints. An aerial survey was flow over the North Fork Goodnews River on July 26, with 630 Chinook and 8,880 sockeye salmon observed. The Chinook salmon aerial survey SEG range (640–3,300) was not achieved, while the sockeye salmon SEG range (5,500–19,500) was achieved.

YUKON AREA

The 2014 Yukon River total commercial harvest was 0 Chinook, 530,644 summer chum, 115,593 fall chum, 104,638 coho, and 54,699 pink salmon for the Alaska portion of the drainage. A total of 427,347 summer chum, 110,961 fall chum, 103,352 coho, and 54,699 pink salmon were harvested in the lower Yukon River (Districts 1–3), and 103,297 summer chum, 4,632 fall chum, and 1,286 coho salmon were harvested in the upper Yukon River (Districts 4–6). A total of 482 permit holders sold fish in 2014, and the exvessel value was approximately $3,199,528.

Summer Season

The total Yukon River Chinook salmon run size in 2014 was projected to be poor, and given the low productivity trend since 2007, the expectation was that the 2014 Chinook run was anticipated to be the worst run on record. It was expected the Chinook salmon run size would not

provide any surplus for subsistence use and severe conservations measures would be necessary to help achieve escapement objectives.

Subsistence salmon fishing was closed in the northern portion of the Coastal District and in Districts 1, 2, and 3 beginning on May 26. These closures were progressively implemented in upriver districts as Chinook salmon migrated upstream and were in place for nearly the entire duration of the Chinook salmon run. The opportunity to harvest nonsalmon species using 4-inch or smaller mesh size gillnets was allowed 24 hours a day, 7 days a week, during subsistence salmon fishing closures.

Liberal subsistence fishing opportunity was provided with selective fishing gear to allow the harvest of abundant summer chum salmon with beach seines and dip nets in the lower river and dip nets and fish wheels in District 4, with the requirement that Chinook salmon be released alive. District 5 experienced the most restrictive management measures because very few summer chum salmon migrate through this district and any subsistence opportunity would likely target Chinook salmon.

Conservative management actions were also taken in Yukon River tributaries in an effort to provide protection for Alaska Chinook salmon stocks, with gillnets restricted to 6-inch or smaller mesh size in the Innoko and Koyukuk rivers for a significant portion of the Chinook salmon run. In the Tanana River, subsistence salmon fishing was closed to protect the first pulse of Chinook salmon in Subdistricts 6-A and 6-B and in the Old Minto Area. In Subdistrict 6-C, personal use salmon fishing was closed nearly the entire duration of the Chinook salmon run.

In 2014, for the seventh 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. The sale of incidentally caught Chinook salmon was prohibited by emergency order during the entire commercial fishing season to dissuade fishermen from targeting Chinook salmon during commercial fishing periods.

A suite of strategies was used to conservatively manage these fisheries to minimize the incidental impact to the weak Chinook salmon run. Utilizing new regulations adopted by the BOF in 2013, ADF&G allowed for the commercial harvest of summer chum salmon using dip nets and beach seines beginning June 9 in Districts 1 and 2. The impact to Chinook salmon was expected to be minimal as fishermen were required to immediately release incidentally caught Chinook salmon back to the water alive. ADF&G allowed twenty-one 12-hour periods in District 1 and twenty-three 10-hour periods in District 2 for dip net and beach seine use only. Although commercial and subsistence fishing occurred concurrently during the week, Saturdays were reserved for subsistence fishing.

In 2014, the use of 6-inch or smaller mesh size gillnet gear for subsistence and commercial fishing was delayed until approximately 90% of the Chinook salmon run had migrated out of Districts 1 and 2. The first commercial gillnet period in District 1 was on July 3 and the first commercial gillnet opening in District 2 occurred on July 6. There were 12 total commercial gillnet periods between Districts 1 and 2. Once the use of 6-inch gillnets was allowed, fishermen could release any incidentally caught Chinook salmon alive or use them for subsistence purposes. Commercial fishermen were required to report any Chinook salmon caught but not sold on fish tickets.

The preliminary summer chum salmon commercial harvest for Districts 1 and 2 combined was 427,347. The summer chum salmon harvest was 79% above the 5-year (2009–2013) average harvest of 238,929. The dip net harvest (259,771) was a significant contributor in making the 2014 summer chum salmon commercial harvest in the Lower Yukon the largest on record since 1989. A total of 5,439 Chinook salmon were reported as caught and released alive back to the water, and 470 Chinook salmon were recorded on fish tickets as caught but not sold for Districts 1 and 2 combined.

Subdistrict 4-A was opened to summer chum salmon directed commercial fishing periods on June 23 with fish wheel gear only. Fish wheels were required to be attended at all times, and all Chinook salmon caught in the fish wheels were to be immediately released into the water alive. A total of thirty-five 24-hour periods were implemented for a total of 840 fishing hours. The Subdistrict 4-A summer chum salmon harvest was 96,385, with the majority of the harvest being female to provide for a salmon roe market. The summer chum salmon harvest was 50% above the most recent 5-year average (2009–2013). A total of 344 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.

The first commercial fishing period to target summer chum salmon in District 6 was on July 11. As in Subdistrict 4-A, commercial fishing gear was restricted to fish wheels that had to be attended at all times, and all Chinook salmon caught in the fish wheels had to be immediately released into the water alive. These gear restrictions were relaxed on August 1 after the Chinook salmon run in the Tanana River was nearly over. There were 8 commercial fishing periods with a total harvest of 6,912 summer chum salmon. A total of 190 Chinook salmon were reported as caught and released alive back to the water, and 11 Chinook salmon were recorded on fish tickets as caught but not sold.

A total of 416 permit holders participated in the summer chum salmon fishery, which was approximately 15% below the 2004–2013 average of 487. 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 405 permit holders fished in the lower Yukon Area in 2014, which was approximately 14% below the 10-year (2004–2013) average of 472. In the upper Yukon Area, 11 permit holders fished, which was approximately 28% below the 10-year (2004–2013) average of 15. The exvessel value was an estimated $1.86 million for summer chum salmon, including $54,699 from the sale of pink salmon in Districts 1 and 2. The exvessel value of the summer season fishery was approximately 4.4% above the 10-year (2004–2013) average of $1.79 million.

Chinook salmon escapement goals for the East Fork Andreafsky River weir, West Fork Andreafsky River aerial survey, and Anvik River aerial survey in the Alaskan portion of the drainage were achieved. Unfortunately, due to high water, escapement projects on the Chena and Salcha rivers did not operate. Sonar was implemented on the Chena River and preliminary counts and species apportionment estimates suggest the Chena River escapement goal for Chinook salmon was met. Preliminary Chinook salmon passage at Eagle sonar, and subsequently U.S./Canada border passage estimate, was approximately 64,500, which met the 42,500 to 55,000 Yukon River Panel interim management escapement goal and harvest sharing agreement.

Most tributaries producing summer chum salmon experienced below average escapement. The Anvik River BEG was achieved, but counts at the East Fork Andreafsky River Weir were below the

SEG for that system. The estimated passage of summer chum salmon at the Gisasa River weir was below average. Henshaw Creek weir and Chena and Salcha river counting towers did not operate in 2014 due to high water conditions.

Fall Season

The Yukon Area fall season began by regulation on July 16 in District 1. The prohibition of Chinook salmon sales continued through the fall season. Initial management was based on the preseason run projection of greater than 850,000 fall chum salmon. All districts and subdistricts were placed on their full regulatory subsistence fishing schedules commensurate with switching over to fall management.

Initially, Districts 1 and 2 were placed on a twice-weekly commercial fishing schedule. Based on Pilot Station mainstem sonar passage estimates, from mid-July through the end of July, fall chum salmon entered Yukon River in below average to average numbers. Unseasonably hot, dry, and calm weather in conjunction with above average water temperature at the mouth likely contributed to the low numbers of fall chum salmon that entered Yukon River between August 3 and August 13. During this period, near the historical midpoint of the run, the number of fall chum salmon passage at the mainstem sonar fell well below the historical median. No commercial fishing periods were announced in either Districts 1 or 2 between August 3 and August 15.

A third pulse of approximately 92,000 fall chum entered Yukon River on August 13. Fall chum salmon passage at the mainstem sonar remained below the historical median, however, the inseason run size projection improved to 600,000 to 723,000 fish, and commercial fishing in Districts 1 and 2 resumed.

The fourth and largest pulse of approximately 252,000 fall chum salmon entered Yukon River August 18 and August 19. After the pulse passed the mainstem sonar, fall chum salmon passage was above the historical median and the run projection remained at 850,000 to 950,000 fish for the remainder of the season.

Daily and cumulative coho salmon passages past the mainstem sonar were mostly above average the entire season. ADF&G identified an additional surplus of coho salmon in addition to what was harvested in the fall chum salmon commercial fishery and allowed a coho salmon directed fishery in District 1 from September 1 through September 5.

There were a total of 38 commercial periods during the fall season in 2014. A regular schedule of commercial fishing periods was established in Districts 5 and 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 was 115,593 fall chum and 104,638 coho salmon. Fall chum salmon commercial harvest was below, while coho salmon harvest was above, their most recent 10-year (2004–2013) averages. The fall chum salmon harvest was the 10th largest since 1990, and the coho salmon harvest was the second largest since 1990. The exvessel value of the harvest was $1,338,746; $630,073 for fall chum and $708,673 for coho salmon. Fall chum salmon exvessel value was below, while coho salmon value was above, the most recent 5-year (2009–2013) averages. The average price paid for fall chum salmon in Districts 1 and 2 was $0.75/lb, and the average price paid for coho salmon was $1.00/lb. A total of 445 individual permit holders participated in the fall chum and coho salmon fishery: 441 in Districts 1 and 2 combined and 4 in Districts 5 and 6 combined.

The preliminary 2014 fall chum salmon run size is estimated to be 923,000, 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 672,000, which exceeds the upper end of the SEG range (300,000–600,000). Most fall chum salmon escapement goals were exceeded (drainagewide, Mainstem Yukon, Chandalar, Tanana, and Delta rivers) with the exception of the Porcupine River drainage (Sheenjek and Fishing Branch rivers).

The estimated passage of 247,000 coho salmon past Pilot Station sonar was the second highest on record and well above the historical average of 140,000. The Delta Clearwater River has the only established escapement goal for coho salmon, an SEG range of 5,200 to 17,000 fish. A boat survey conducted in the Delta Clearwater River in late October observed 4,285 coho salmon.

NORTON SOUND AREA

Highlights of the 2014 Norton Sound District salmon fishery included the highest exvessel value on record and the fourth year out of the last 5 years that the exvessel value exceeded 1 million dollars. Also, Subdistricts 3 (Elim) and 4 (Norton Bay) had record coho salmon harvests. Disappointments in 2014 were weak Chinook salmon runs that occurred throughout Norton Sound, requiring long closures to southern Norton Sound subsistence fisheries, and a closure to subsistence fishing on Pilgrim River for the fifth time in 6 years because of sockeye salmon escapement concerns. However, Chinook salmon escapements were much improved, likely as a result of fishing restrictions, and Pilgrim River was reopened to subsistence fishing after a 2-week closure, when sockeye salmon escapement was ensured of being reached.

Large chum and coho salmon harvests in conjunction with high prices paid for coho salmon accounted for the majority of the $1,897,972 paid to 128 permit holders. This year's record exvessel value was 49% above the previous record set in 2011. Permit holder participation, although the highest in over 20 years, was similar to last year when 124 permit holders fished. Commercial salmon harvests were 289 Chinook, 500 sockeye, 111,372 coho, 182,053 pink, and 107,167 chum salmon.

The 2014 forecasted commercial chum salmon harvest range was 70,000–100,000. However, the run was much stronger than expected. Commercial chum salmon fishing was delayed until July in Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) to protect Chinook salmon, but the chum salmon harvest was still the fourth year out of the last 5 years that the harvest exceeded 100,000. Previous to 2010, the commercial harvest had not exceeded 100,000 in over 20 years.

The 2014 pink salmon commercial harvest ranked eighth out of 27 even-numbered year harvests and was 17% above the even-year average harvest of 155,367. However, the harvest was below the forecast (250,000–500,000). A combination of a slightly below expected run size and limited processor capacity resulted in the forecast not being reached.

The 2014 coho salmon harvest exceeded the forecast range (60,000–90,000). Southern Norton Sound Subdistricts 4, 5, and 6 combined represented the majority (83%) of the harvest, and the 19,075 coho salmon harvested in Subdistricts 2 and 3 established a new record for northern Norton Sound.

The average price paid was $2.00/lb for Chinook, $0.63/lb for sockeye, $0.60/lb for chum, $0.29/lb for pink, and $1.60/lb for coho salmon. Prices were down for sockeye and coho salmon this season, but up slightly for chum and pink salmon. Chinook salmon were purchased for the first time since 2011.

Chinook salmon escapement goals were met throughout Norton Sound, including the Kwiniuk River counting tower, which made its goal for the first time since 2009. The Pilgrim River sockeye salmon escapement goal was achieved for the fourth consecutive season. Based upon available escapement monitoring information, chum, coho, and pink salmon escapement goals were likely achieved throughout Norton Sound.

KOTZEBUE SOUND AREA

The Kotzebue Sound chum salmon run in 2014 allowed for the second largest commercial harvest on record. The Kobuk River chum salmon aerial survey count was one of the highest recorded and the Noatak River chum salmon aerial survey count was a record. The Kobuk River test fish index was the highest on record for the 22-year project history and was over 50% higher than the previous record set last year. The commercial harvest of 633,261 chum salmon was second only to the harvest of 677,239 in 1981. Buyers only purchased chum salmon, but harvest retained for personal use included 10 Chinook, 16 sockeye, 320 pink, and 28 coho salmon, 620 Dolly Varden, 228 sheefish, and 28 whitefish.

The commercial fishing season began on July 10. There were 3 major buyers this year instead of 1 major buyer like the previous 10 years. Fishing periods were generally 6 to 8 hours per day, 6 days a week. However, during an 8-hour fishing period on July 28, nearly one-quarter of the July harvest occurred, and from then until late August fishing periods were 3 to 5 hours in length. The reduction in fishing time was to limit the harvest because of limited airplane cargo space. No salmon processing occurs in Kotzebue and air transport was limited.

Ninety-five permit holders sold chum salmon in 2014. This was the most permit holders fishing since 1994 and was a 43% increase compared to last year. The average price of $0.56/lb was over double last year's price. The season closed after August 31, but the last buyers closed their operations after August 28.

A total of 5,229,664 pounds of chum salmon (average weight 8.4 lb) were harvested. The total exvessel value was $2.93 million—second only to the $3.25 million exvessel value in 1981. The average permit holder earned over $30,000, and that was triple last year's average earnings.

Table 6.–Preliminary 2014Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kuskokwim River		3	118	0	19	139
Kuskokwim Bay	2	79	104		18	204
Kuskokwim Area Total	2	82	222	0	37	344
Lower Yukon River			103	55	538	696
Upper Yukon River			1		108	109
Yukon River Total			105	55	646	806
Norton Sound	0	1	111	182	107	401
Kotzebue Sound					633	633
AYK Region Total	3	83	438	237	1,424	2,184

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.

WESTWARD REGION

KODIAK MANAGEMENT AREA

The 2014 Kodiak Management Area (KMA) commercial salmon fishery began on June 5, and the last commercial landing occurred on October 2. Commercial fishing effort increased slightly during 2014. Of the 594 eligible commercial salmon permits, 334 (56%) made commercial landings. By gear type, a total of 186 purse seine, 3 beach seine, and 145 set gillnet permit holders fished in 2014. 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 2014 commercial harvest in the KMA was 8,382 Chinook salmon, 3,259,037 sockeye salmon, 472,035 coho salmon, 10,674,898 pink salmon, and 336,572 chum salmon (Table 7). The total harvest of approximately 14.8 million salmon is below the 2014 forecast and the previous 10-year average of approximately 25 million salmon.

The estimated exvessel value of the 2014 fishery was approximately $46 million, which is the second highest since 1995. This was also well above the previous 10-year average exvessel value of $32.6 million.

Purse seine fishermen accounted for 94.1% of the total harvest (in number of fish) and their earnings averaged $198,521 per fished permit. Set gillnet fishermen accounted for 5.8% of the total harvest (in number of fish) and their earnings averaged $62,026 per permit fished, the second highest since 1999. Beach seine fishermen harvested 0.1% of the total catch and averaged $34,894 per permit fished.

2012 Commercial Harvest Summary

Chinook Salmon

There are no directed Chinook salmon commercial fisheries in the KMA, but incidental commercial harvest occurs during targeted sockeye salmon fisheries. The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the KMA. Nonretention of Chinook salmon was implemented for the seine fleet areawide from June 5 through July 5. Nonretention of Chinook salmon was implemented for the seine fleet from July 6 until 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. The 2014 commercial harvest of Chinook salmon in the KMA totaled 8,382, which was below the previous 10-year average (18,697) and below the 2014 forecast (20,000).

Sockeye Salmon

The 2014 commercial harvest of sockeye salmon totaled 3,259,037. The harvest was well above the recent 10-year average (2,285,966) and forecast (2,222,228).

Early season management for much of the Westside and north end of Kodiak Island is driven by Karluk early-run sockeye salmon (through July 5). The Karluk early-run sockeye salmon escapement goal (110,000–250,000) was achieved. Extended fishing was allowed along the Westside of Kodiak in the Central, North Cape, Southwest Afognak, and Outer Karluk sections until the management focus turned to pink salmon (July 6). A total of 565,442 sockeye salmon were harvested in early season (through July 15). Westside areas opened based on Karluk early-run sockeye salmon, which was above the forecasted Karluk early-run harvest of 108,000.

Late season management for much of the Westside and north end of Kodiak Island is driven by the Kodiak Island pink salmon fishery (beginning July 6) and Karluk late-run sockeye salmon (after August 16). A total of 1,481,176 sockeye salmon were harvested in late season (after July 15). Westside areas were opened based on Karluk late-run sockeye salmon and during the Kodiak Island pink salmon fishery. This was well above the forecasted Karluk late-run harvest of 400,000. A total of 1,078,596 sockeye salmon were harvested in Westside areas opened and closed based solely on Karluk late-run sockeye salmon (after August 25).

Westside sockeye salmon numbers include an estimated contribution of approximately 269,651 from the enhanced Spiridon Lake sockeye salmon run.

The Ayakulik River was forecasted to have a surplus of sockeye salmon (288,000) available for harvest. The first commercial opening occurred in the Outer Ayakulik Section on June 5. The first commercial fishing period in the Inner Ayakulik Section also occurred on June 5, and there were several extended openings throughout the season. A total of 359,121 sockeye salmon were harvested from westside sections attributed to Ayakulik.

The early-run sockeye salmon to Upper Station was weak. The Frazer Lake sockeye salmon run came in stronger than expected, and openings and closures were executed mainly in the Dog Salmon Flats Section to allow harvest opportunity on Frazer Lake sockeye salmon while allowing passage of Upper Station sockeye salmon. The Alitak District early-run sockeye salmon harvest was 186,761, above the projected harvest of 50,644. The Upper Station late-run sockeye salmon run came in as expected and very few fishing periods were permitted after August 9 (management focus changes to Upper Station late-run sockeye salmon). The total harvest of the Alitak District late-run sockeye salmon was 67,756, which was above the forecasted harvest of 35,061.

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.

Both Chignik sockeye salmon runs were extremely weak, and the allocative and biological criteria were never met to allow fishing in the Cape Igvak Section. No sockeye salmon were harvested in the Cape Igvak Section through July 25, which was below the preseason forecast of approximately 126,939.

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.

Adepartment ADF&G biologist was present on the grounds to determine the sockeye salmon catch and to facilitate orderly and short notice closures if the harvest limits were met. A Seaward Zone closure was implemented in the North Shelikof Unit at 5:00 p.m. July 8 when it was

estimated that the cumulative sockeye salmon harvest had approached the 15,000 fish limit. The total July 6 to July 25 harvest in the North Shelikof Unit was 143,909, which included both the Shoreward and Seaward Zone harvests. A Seaward Zone closure did not take place in the Southwest Afognak Section; however, the harvest cap of 50,000 was exceeded. Approximately 12,652 sockeye salmon were harvested on the last day of the fishery (July 24), and a total of 56,688 were harvested in the Southwest Afognak Section between July 6 and July 25.

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 14,633 sockeye salmon harvested from both areas.

In the Spiridon Bay SHA (Telrod Cove), 98,892 sockeye salmon were harvested. This includes a cost-recovery fishery harvested 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. It is estimated that 164,487 Spiridon enhancement fish were harvested outside of Telrod Cove, bringing the total Spiridon enhancement sockeye salmon harvest to 269,651 fish.

The Kitoi Bay Hatchery harvest was an estimated 93,020 sockeye salmon, which was above the forecast of 70,900. 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 472,035 was above the forecast (158,690) and above the previous 10-year average (331,698).

The majority of the coho salmon were caught in the Northwest Kodiak and Afognak districts. The largest amount of coho salmon came from the areas associated with Kitoi Bay Hatchery (the Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections). A total of 230,590 coho salmon were harvested, which was well above the forecast of 113,321.

Pink Salmon

The 2014 pink salmon harvest of 10,674,898 was below forecast (14,585,758 million) and below the previous 10-year average harvest of 21,506,831.

Wild stock pink salmon harvest was well below the forecast (12.0 million), with only 4,897,922 pink salmon harvested in the KMA. Extensive closures were necessary for much of August, and most pink salmon were harvested on the Westside of Kodiak and around Kitoi Bay Hatchery. Westside fisheries (Southwest Afognak to Ayakulik) accounted for 2,619,571; the Alitak District had a harvest of 661,789, and the Eastside and Northeast Kodiak districts had a combined harvest of 356,210.

The Kitoi Bay Hatchery pink salmon run came in stronger than expected with 5,776,060 pink salmon harvested in sections near the hatchery (2,544,666 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, ADF&G 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 336,572 was well below the forecast (777,261) and the smallest harvest since 1998. Extensive closures in Alitak, the Mainland, and the Eastside Kodiak Districts (due to a weak pink salmon run) were partly to blame for the below average harvest numbers. However, the Kitoi Bay Hatchery chum salmon production was also weaker than expected with only 45,582 chum salmon harvested, which is below the preseason forecast of 125,977.

Escapement Summary

Fish counting weirs were operated on 9 systems in 2014, including the Karluk, Ayakulik, Upper Station, Dog Salmon, Litnik, Buskin, Saltery, Pauls Bay, and Pasagshak systems. Two observers also flew 28 aerial surveys, and several observers conducted foot and skiff survey escapement estimates.

Chinook Salmon

The total Chinook salmon escapement (2,011) 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 (1,182) was below the escapement goal range (3,000–6,000). Chinook salmon escapement through the Ayakulik weir (789) was the lowest ever recorded (since the weir was moved near the ocean shoreline) and below the escapement goal range (4,000–8,000). However, the Ayakulik weir was out due to high water for 2 weeks during the peak of the Chinook salmon run, and the estimates during that timeframe are minimal.

Sockeye Salmon

Sockeye salmon runs to many systems in the KMA were strong (particularly Karluk and Ayakulik). Most of the major systems either met or exceeded their established escapement goals. However, the sockeye salmon runs to Uganik River, Pasagshak River, and Upper Station early-run all did not achieve the minimum escapement goal value. The entire KMA estimated sockeye salmon escapement (1,639,940) was well above the previous 10-year average (1,228,171).

Coho Salmon

The only established coho salmon escapement goals occur in the Northeast Kodiak and Eastside Kodiak districts for the following systems: the American (400), Olds (1,000), Buskin (3,200–7,200), and 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 (77,713) was below the previous 10-year average (85,603). However, due to limited funding ADF&G no longer flies late season coho salmon surveys, and the areawide coho salmon escapement numbers do not reflect the actual KMA coho salmon escapement.

Pink Salmon

The KMA pink salmon escapement of 2,987,932 was below 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. Even with the extensive area closures, the escapement for the Kodiak Archipelago (2,733,282) was below the escapement goal range (3.0–6.0 million). The Mainland District pink salmon escapement of 254,650 was within the established escapement goal range (250,000–750,000).

Chum Salmon

Overall chum salmon escapement (245,872) was well below the previous 10-year average (383,753). Escapement goals have been established for the Kodiak Archipelago and the Mainland District. The escapement in the Kodiak Archipelago was below the escapement goal (151,000), with an estimated 138,441 fish, and the Mainland District escapement (107,431) was above the escapement goal of 104,000.

CHIGNIK MANAGEMENT AREA SEASON SUMMARY

The Chignik River watershed supports 2 distinct sockeye salmon runs that traditionally provide the majority of directed harvest opportunities within the Chignik Management Area (CMA). In 2014, the combined early- and late-run Chignik-bound sockeye salmon run was well below recent averages. The CMA was open to commercial salmon fishing for 42 days (July 12–August 28) and a total of 70 permits were fished (excluding ADF&G'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 2014 season. The first count occurred on May 25 when weir installation was complete, and the last count of the season took place on September 3, 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 goals. Pink and chum salmon escapements were measured against established areawide SEGs.

Chinook Salmon

The Chignik River is the only Chinook salmon-producing stream within the CMA and one of the largest Chinook salmon streams on the South Alaska Peninsula. The BEG for Chinook salmon in the Chignik River watershed is 1,300 to 2,700. The 2014 Chignik River Chinook salmon escapement, above the weir (2,895), was above the 5-year and below the 10-year average. 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 2015.

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 (350,000–450,000) sockeye salmon through July 4 was met with an estimated escapement of 360,424.

The late-run objectives include an additional 50,000 sockeye salmon that are incorporated into the late-run SEG to provide for additional freshwater subsistence fishing opportunity. The late-run (post-July 4) SEG (250,000–400,000) was met with an estimated escapement of 291,228. Postweir sockeye salmon escapement estimates were produced for the September 4 to September 15 (12,910) and the September 16 to September 26 (10,257) periods and were included in the total late-run escapement estimate.

Both the early- and late-run escapements were below their 5- and 10-year average escapements. 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 2014 Chignik River coho salmon weir escapement estimate through September 3 was 15,572, 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 3,171 pink salmon passed the Chignik River weir in 2014, 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 pink salmon SEG for all districts combined (200,000–600,000) was met with an estimated total peak escapement of 235,159.

Chum Salmon

The 2014 Chignik River chum salmon escapement was 58, 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 101,378.

Commercial Fishery Summary

The CMA was open to commercial salmon fishing for 42 days during the 2014 commercial salmon season. The first fishing period occurred on July 12 and the CMA was closed to commercial salmon fishing (August 28) shortly after area salmon processors ceased operations. In 2014, 71 permit holders (including ADF&G's test fishery permit) made a total of 1,526 landings.

Harvest Summary

Chinook Salmon

A total of 8,846 Chinook salmon were commercially harvested (excluding home pack and ADF&G's test fishery) in 2014, which was well above recent average harvests. The majority of the 2014 CMA Chinook salmon harvest occurred in the Central and Western districts.

Sockeye Salmon

A total of 620,339 sockeye salmon were commercially harvested (excluding home pack and ADF&G's test fishery) in the CMA during 2014, which was well below the prior 5- and 10-year average harvests. The majority of the 2014 CMA sockeye salmon harvest came from the Chignik Bay and Western districts.

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

Coho Salmon

A total of 132,459 coho salmon were commercially harvested in 2014, which was well above than the 5- and 10-year average harvest. The majority of the harvest in 2014 took place during July and August in the Western District.

Pink Salmon

A total of 352,115 pink salmon were commercially harvested (excluding ADF&G's test fishery and home pack) in the CMA in 2014, which was well below the 5-year and 10-year average harvests. The majority of the pink salmon harvest occurred in the Western and Central districts during late July and early August.

Chum Salmon

A total of 55,152 chum salmon were commercially harvested in 2014, which was well below the 5-year and 10-year average harvests. The majority of the chum salmon harvest in 2014 took place in the Central and Western districts in late July.

Economic Value Summary

The exvessel value of the 2014 CMA commercial salmon fishery was about $7.0 million, or approximately $100,000 per active permit holder. A majority of the value was from the sale of sockeye salmon (86%), with a total of approximately $86,346 per active permit holder. Additionally, the harvest provided, per active permit holder, approximately $956 for Chinook, $6,210 for coho, $4,108 for pink, and $2,666 for chum salmon.

ADF&G Test Fishery Summary

ADF&G conducted test fisheries on 4 occasions in 2014. Data from these test fisheries were used to assess the buildup of sockeye salmon in Chignik Lagoon. An estimated 3,460 sockeye salmon were harvested, which provided approximately $30,000 that was used to offset the cost of vessel charters and general operations at the Chignik River weir.

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

The 2014 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas totaled 8,058 Chinook, 3,390,712 sockeye, 405,290 coho, 854,264 pink, and 624,571 chum salmon (Table 7). Subsistence salmon harvest will be reported in the 2014 annual management report. Preliminary exvessel value of salmon harvested in Area M totaled $27,822,034. 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 2,271 Chinook, 664,728 sockeye, 2,502 coho, 179,248 pink, and 388,124 chum salmon.

Southeastern District Mainland

From June 1 to July 25, the SEDM (excluding the Northwest Stepovak Section [NWSS] beginning July 1) is managed based on the strength of the Chignik sockeye salmon run. Due to weak sockeye salmon returns to Chignik River in 2014, the CMA remained closed to commercial salmon fishing until July 12. During years in which it appears that the sockeye salmon harvest will be less than 600,000 in the CMA, commercial salmon fishing will remain closed in the East Stepovak, Stepovak Flats, Southwest Stepovak, Balboa Bay, and Beaver Bay sections of SEDM according to the management plan. Since the CMA did not open to commercial salmon fishing until July 12, it was unlikely that 600,000 sockeye salmon would be harvested, so the areas in SEDM remained closed throughout July.

Beginning July 1, the NWSS of SEDM is managed on the strength of the Orzinski Lake sockeye salmon run. The return of sockeye salmon to Orzinski Lake lagged behind interim escapement goals, indicating there was not an adequate surplus of fish to allow commercial harvest opportunity in the NWSS from July 1 through July 25. The cumulative sockeye salmon escapement in Orzinski Lake of 16,100 fish was within the SEG (15,000–20,000).

From July 26 through 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 through October 31, SEDM is open concurrently by emergency order with the remainder of the Southeastern District based on the abundance of coho salmon stocks. During this timeframe, a weekly fishing period was established (Monday through Wednesday) with additional fishing time based on coho salmon abundance. In 2014, 4 fishing periods occurred in September with 48-hour extensions added to the first 3 periods.

South Peninsula post-June fishery

Prior to the South Peninsula post-June fishery, ADF&G conducts a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishing resulted in approximately 91

(July 2), 167 (July 3), and 29 (July 5) immature salmon per set, for an average of less than 100 immature salmon per set.

From July 6 through 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 4,775 Chinook, 741,823 sockeye, 287,450 coho, 526,711 pink, and 108,096 chum salmon.

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

South Peninsula Escapement

The South Peninsula indexed sockeye salmon escapement of 38,120 fish was below the management objective range (48,200–86,400). Mortensen Lagoon and Thin Point did not meet their respective SEGs from aerial surveys due to poor surveying conditions. However, reports from sport and subsistence groups suggest that sockeye salmon returns were considerably stronger than what could be estimated from aerial surveys. Pink salmon total escapement of 1,340,380 was below the SEG range (1,864,600–3,729,300). The hum salmon indexed total escapement of 313,545 was below the cumulative district escapement goal range (330,400–660,800). A total of 9,050 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 preventing aerial surveys from being conducted.

Aleutian Islands Fishery and Escapement

The Aleutian Islands Area may open to commercial salmon fishing by emergency order if adequate escapement is observed and there is interest from the fishing industry. During an aerial survey in August of the Aleutian Islands, an adequate amount of pink salmon (approximately 430,000) were observed in streams to allow for a commercial salmon fishery. In 2014, a total of 121,938 pink salmon were harvested during one 60-hour commercial salmon fishing period from August 24 until August 26 in the Aleutian Islands Area. McLees Lake had a sockeye salmon escapement of 12,424 and met the SEG (10,000–60,000).

North Alaska Peninsula

In 2014, 161 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 2014 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 2014, the North Alaska Peninsula harvest of Chinook, sockeye, pink, and chum salmon were well below the previous 10-year (2004–2013) averages for each species, and the harvest of sockeye, coho, and pink salmon were above projected levels.

Northwestern District

In the 2014 Northwestern District commercial salmon fishery, a total of 36 Chinook, 37,364 sockeye, 6,311 coho, 1,617 pink, and 98,246 chum salmon were harvested. A total of 13 permit holders participated in the fishery, consisting of 5 purse seiners, 7 drift gillnetters, and 1 set gillnetter.

In the Northwestern District, the chum salmon escapement of 54,525 was below the SEG (100,000–215,000). This escapement estimate represents a minimum; the actual escapement was likely greater due to very poor survey conditions in one of the major chum salmon producing streams in the Northwestern District streams.

Black Hills Section

Due to the lack of extensive closures during 2014 in the Bear, Three Hills, and Ilnik sections in the Northern District, effort by the drift gillnet fleet in the Black Hills Section was limited. A total of 19,173 sockeye and 7,510 chum salmon were harvested in the Black Hills Section in 2014. Weekly fishing periods occurred throughout the season in the Black Hills Section. North Creek is the only river in the Black Hills Section with a sockeye salmon escapement goal. The 2014 North Creek salmon escapement of 7,500 sockeye salmon (determined by aerial surveys) was within the escapement goal (4,400–8,800).

Nelson Lagoon Section

The Nelson (Sapsuk) River total run of 460,858 sockeye salmon (includes harvest and escapement) was close to the estimated forecast of 465,000. From the total run, 210,858 sockeye salmon were harvested in Nelson Lagoon and 250,000 escaped in the Nelson River. The 2014 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 2014. Beginning August 15, the Nelson Lagoon Section may be managed on local coho salmon runs. In 2014, 25,000 coho salmon were observed in the Nelson River exceeding the Nelson River SEG threshold of 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 in the Bear and Sandy rivers. In 2014, the Bear and Sandy rivers experienced strong salmon runs and extensive closures that occurred in recent years were not necessary. A total of 400,981 sockeye salmon were harvested in the Bear River Section, and 84,868 sockeye salmon were harvested in the Three Hills Section.

The Bear River early-run (through July 31) sockeye salmon escapement of 259,046 met the escapement goal (176,000–293,000). The Bear River late-run (after July 31) sockeye salmon escapement of 206,954 exceeded the late-run escapement goal (117,000–195,000). After the weir was removed on August 23, the postweir estimate of 39,568 brought the Bear River season

sockeye salmon escapement to 466,000, which was within the season escapement goal (293,000–488,000).

The 2014 Sandy River sockeye salmon escapement of 59,000 met the season ending escapement goal range (34,000–74,000).

Ilnik Section

In 2014 the Ilnik River sockeye salmon escapement through the weir was 59,000 and met the Ilnik River escapement goal (40,000–60,000). By regulation, the Ilnik Section can open to commercial salmon fishing on June 20. Sockeye salmon escapement into Ilnik River tracked interim escapement objectives throughout the season. No commercial fishing effort occurred in Ilnik Lagoon in 2014 despite weekly fishing periods.

In 2014, 779,733 sockeye salmon were harvested in the Ilnik Section. Beginning August 15, the Ilnik Section may be managed for coho salmon runs into Ilnik Lagoon. Effort occurred in the Ilnik Section after August 15, targeting sockeye salmon and harvesting coho salmon during weekly fishing periods open to commercial salmon fishing.

Inner and Outer Port Heiden Sections

Aerial escapement surveys began on the Meshik River on June 20. A survey conducted on June 28 documented 28,000 sockeye salmon in the Meshik River, meeting the season-ending escapement goal (25,000–100,000). Subsequent surveys occurred throughout the season and the final sockeye salmon escapement into the Inner Port Heiden Section was 108,800 fish. 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 23 and had openings of 2½ days per week until the section closed on July 31. In 2014, a total of 429,153 sockeye salmon were harvested from the Outer Port Heiden Section. No commercial fishing occurred in the Inner Port Heiden Section in 2014.

Cinder River Section

Little effort occurred in the Cinder River Section in 2014 despite weekly fishing periods of 2½ days per week for the entire season. No directed harvest occurred on sockeye salmon. There was limited effort on coho salmon in August and September in the Cinder River Section. The total Cinder River sockeye salmon escapement estimate of 104,500 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 2014 Nelson River Chinook salmon escapement was 3,900 and met the escapement goal (2,400–4,400). The total Northern District Chinook salmon escapement of 6,390 was also well below the most recent 10-year average of 20,252.

Chum Salmon

The Northern District has a districtwide chum salmon escapement goal (119,600–239,200). This goal was met with an escapement of 137,251, yet 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 25,000 coho salmon met the threshold goal of 18,000. The coho salmon run continues through September, and the last aerial survey was on September 5. The Ilnik River escapement of 33,000 coho salmon 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. There was no directed coho salmon fishery in the Ilnik Section in 2014. The coho salmon escapement into the Cinder River was 19,000, and 141,000 coho salmon escaped into the Meshik River system (Meshik River and Mud Creek) as observed by aerial survey during early September.

Table 7.–Preliminary 2014 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak	8	3,259	472	10,675	337	14,751
Chignik	9	620	132	352	55	1,169
South Peninsula and Aleutians Islands[a]	7	1,427	298	843	496	3,070
North Peninsula[a]	1	1,964	108	11	129	2,213
Alaska Peninsula Total	8	3,391	405	854	625	5,283
Westward Region Total	25	7,270	1,010	11,881	1,016	21,203

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

[a] Catches include test fishery catch.

PRELIMINARY FORECASTS OF 2015 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 2015 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	
Kodiak Management Area	pink salmon
Spiridon Lake	sockeye salmon
Ayakulik River	sockeye salmon
Karluk River	sockeye salmon (early and late runs)
Alitak District (Frazer Lake and Upper Station)	sockeye salmon
Chignik	
Chignik River	sockeye salmon (early and late runs)
Bristol Bay	sockeye salmon
Alaska Peninsula	
South Alaska Peninsula	pink salmon
Bear River	sockeye salmon (late run)
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, PWS, Cook Inlet, Kodiak, and the Alaska Peninsula. Forecasts for large hatchery runs including sockeye, pink, and chum salmon runs to the Southeast Alaska, PWS, and Kodiak areas are provided by private nonprofit operators. For 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.

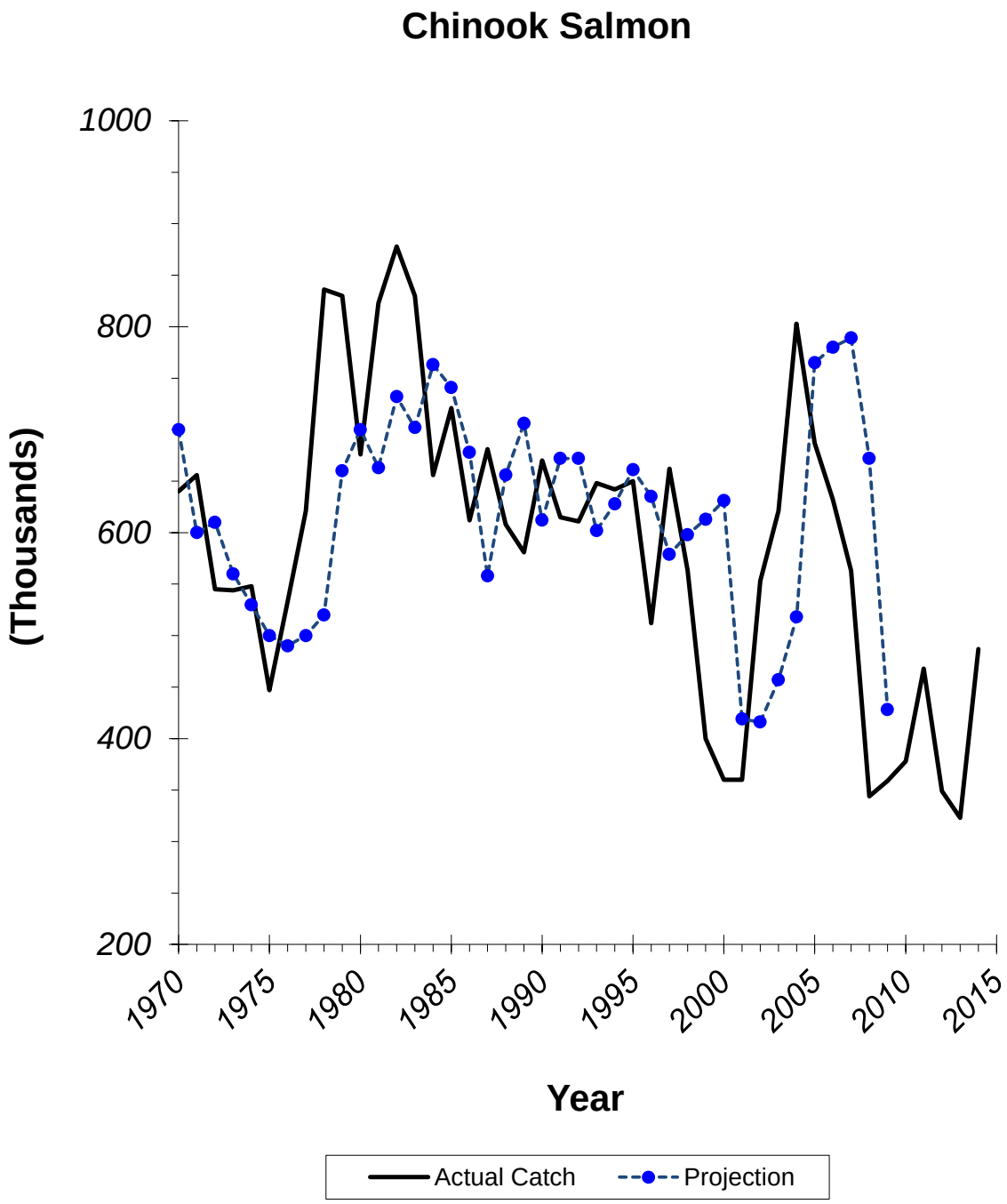

Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2014, 2010–2015 projections are not available.

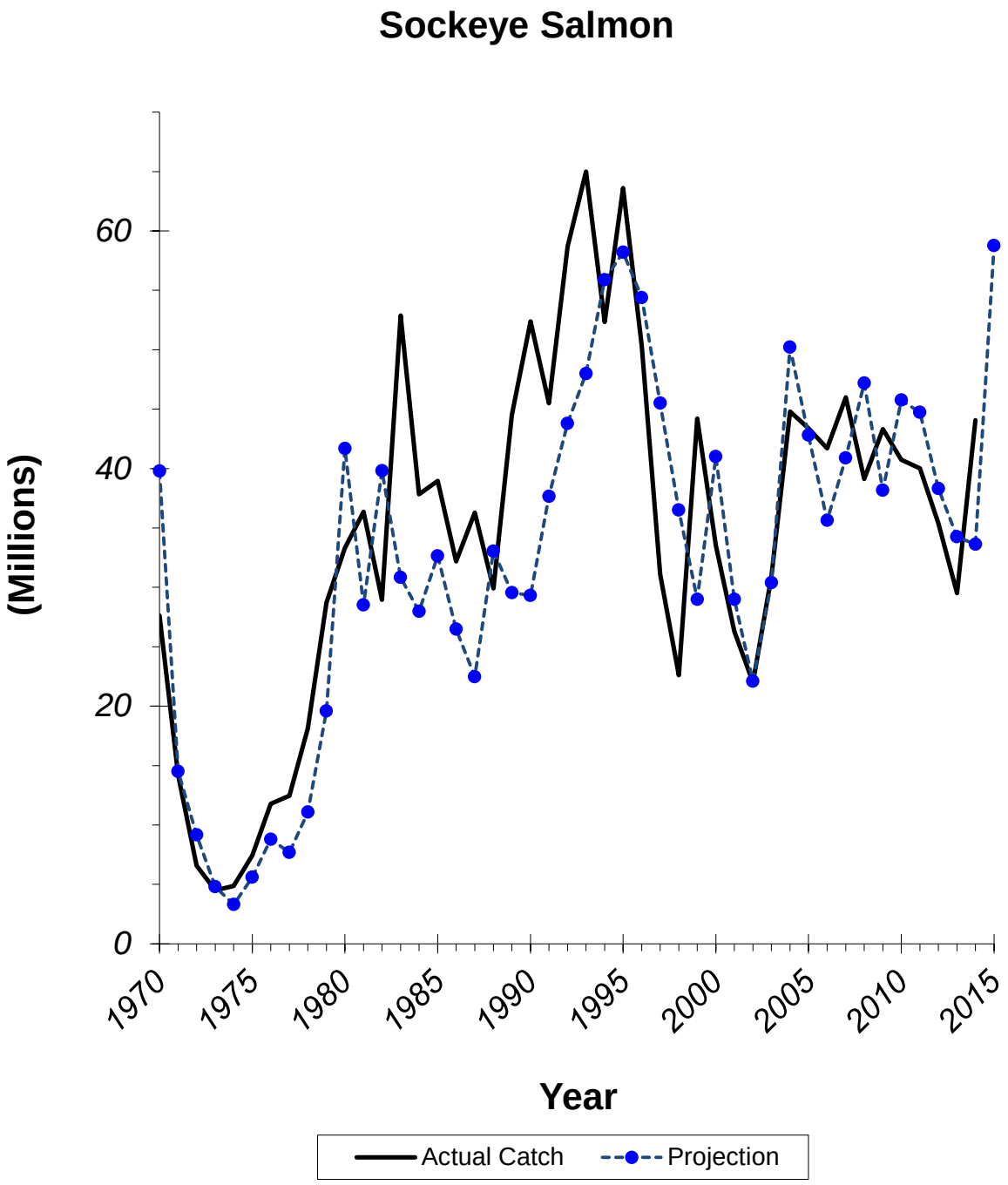

Figure 3.–Relationship between actual catch and projected catch in millions, for Alaskan sockeye salmon fisheries from 1970 to 2014, with the 2015 projection.

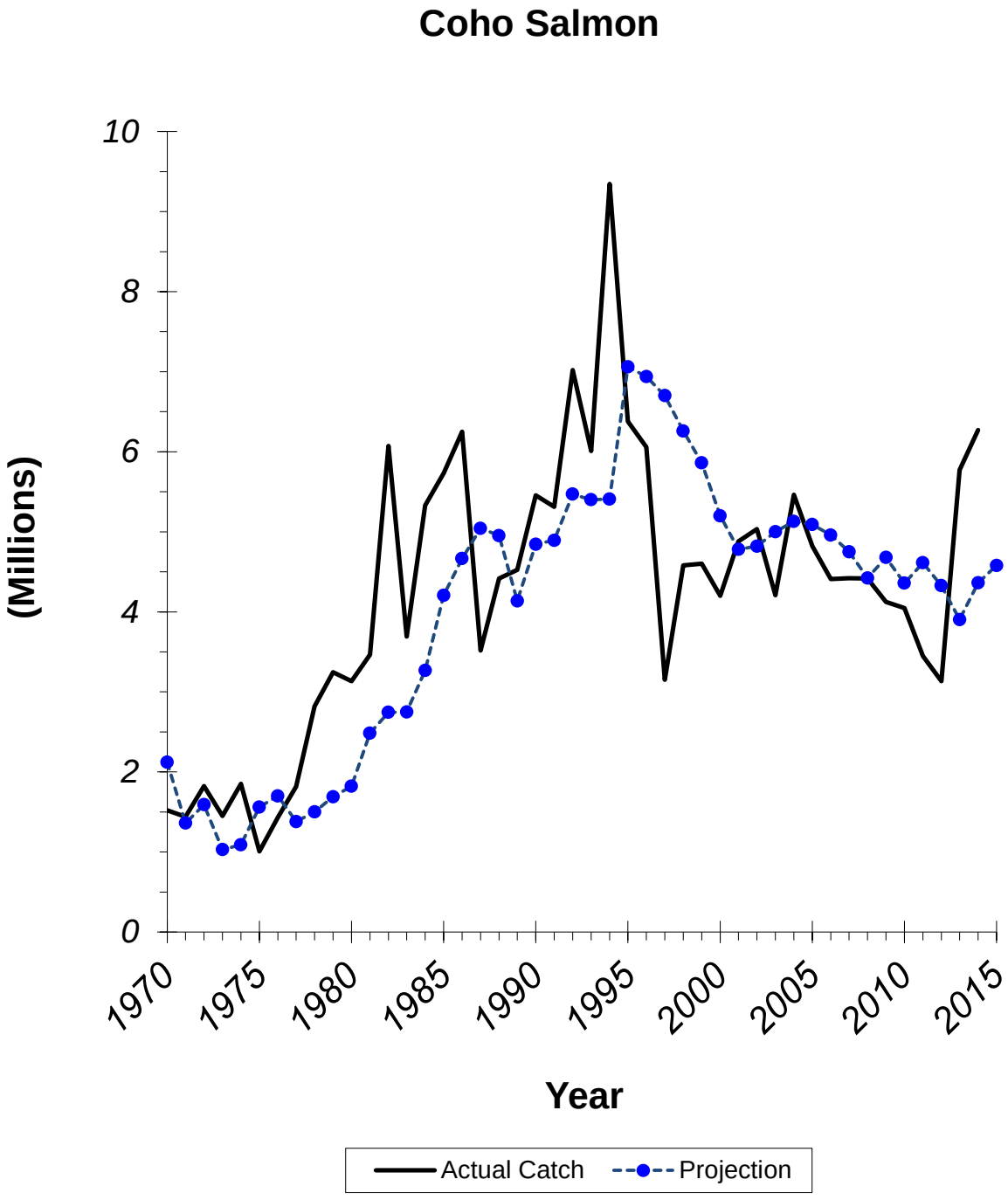

Figure 4.–Relationship between actual catch and projected catch in millions, for Alaskan coho salmon fisheries from 1970 to 2014, with the 2015 projection.

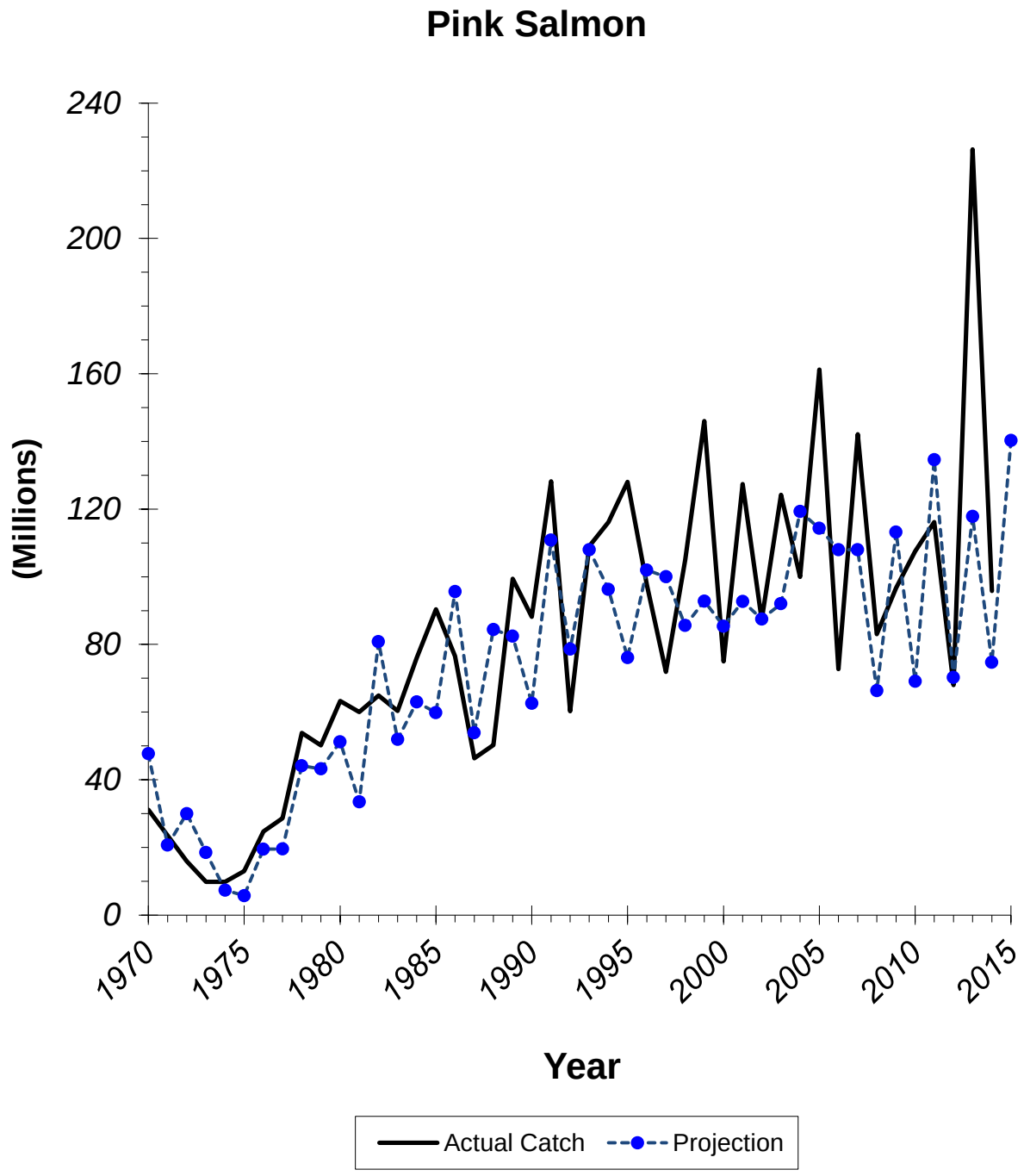

Figure 5.–Relationship between actual catch and projected catch in millions, for Alaskan pink salmon fisheries from 1970 to 2014, with the 2015 projection.

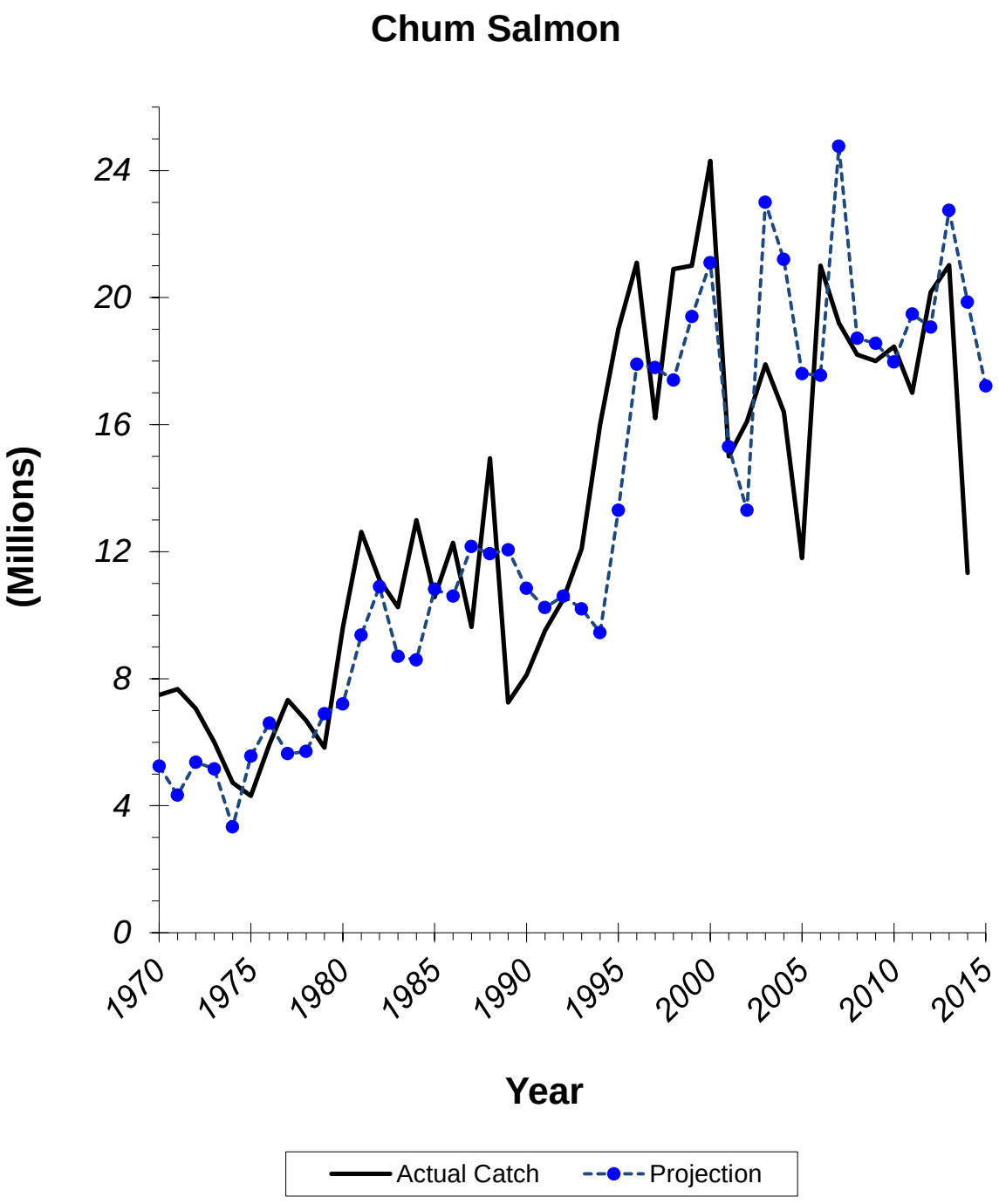

Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2014, with the 2015 projection.

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 2015 is predicted to be in the *excellent* range with a point estimate of 58 million fish (80% confidence interval: 37–79 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 from 1960 to 2010:

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

Forecast Methods

The 2015 forecast was produced in 2 steps: (1) a forecast of the trend in harvest, and (2) the forecast trend adjusted using 2014 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 0.22 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. This analysis produced a forecast of 46 million pink salmon (Figure A1).

We adjusted the forecast using peak June through July juvenile pink salmon catch-per-unit-effort (CPUE) statistics provided by the National Atmospheriec and Oceanic Administration (NOAA) Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (Joe Orsi, Auke Bay Laboratories, personal communication). These data were obtained from systematic surveys conducted annually in upper Chatham and Icy straits in conjunction with NOAA's Southeast Coastal Monitoring Project (see Wertheimer et al. 2011[a]) and are highly correlated with the harvest

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[a] We gratefully acknowledge the assistance and advice of Joe Orsi, 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 Lab., 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 March 9, 2015).

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 residuals from 1998 to 2014 on the corresponding NOAA CPUE data from 1997 to 2013 (Figure A2). The forecast error residuals were simply the exponential smooth forecast subtracted from the actual harvest. The predicted forecast error for 2015 was 11.5 million, which, when added to the exponential-smooth forecast, brought the forecast up to 58 million pink salmon (Figure A3). The forecast range (37–79 million) is based on an 80% confidence interval calculated from the mean squared error of the adjusted hind-cast predictions.

Forecast Discussion:

Forecasting the 2015 pink salmon harvest was made exceptionally challenging due to the unprecedented harvest of 95 million pink salmon in the parent year of 2013. This harvest was nearly 20 million fish higher than any other pink salmon harvest since commercial fisheries began in Southeast Alaska in the late 1800s. We looked at over a dozen different forecasting models, many of which produced forecasts for 2015 that were near or above this anomalously high harvest, driven primarily by the steep trend in recent odd-year harvests. Although we have typically started our trend analysis with the parent year harvest, we took a more conservative approach for the 2015 forecast and used both odd- and even-year data in our trend analysis. Our decision to be conservative in our trend analysis is supported by the improved fit in the relationship between the NOAA CPUE index and the residuals of the trend analysis using both odd and even years—$r^2 = 0.55$ (Figure A2) versus $r^2 = 0.41$ for the trend analysis beginning with parent year and only incorporating odd-year data.

The 2015 harvest forecast of 58 million pink salmon is well above the recent 10-year average harvest of 41 million, and a harvest of that magnitude would be in the top 10 harvests since 1960. The NOAA Auke Bay Lab's 2014 peak June through July juvenile pink salmon CPUE statistic from upper Chatham and Icy straits in northern Southeast Alaska ranked fifth out of the 18 years that they have collected juvenile salmon abundance information, which indicates the very large escapements in 2013 had good spawning success and that there were no major freshwater and early marine survival issues for pink salmon set to return in 2015. Pink salmon harvests associated with juvenile indices similar to the 2014 index (±20%) ranged from 45 to 95 million fish. Perhaps the largest potential source of uncertainty regarding the 2015 pink salmon return is the anomalously warm conditions present in the Gulf of Alaska during the summer of 2014—the effect of these unusual environmental conditions on the marine survival of pink salmon is not known (http://www.nwfsc.noaa.gov/news/features/food_chain/index.cfm).

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 Southeast Alaska since 2004. The 2015 NOAA forecast can be found at the following link: http://www.afsc.noaa.gov/ABL/EMA/EMA_PSF.htm

ADF&G forecasts that were adjusted using NOAA's juvenile pink salmon data were much improved over previous forecasts (Figure A4). Hindcasts of past harvests (1998–2006) using this forecast method also exhibited fair to good performance in predicting the direction of forecast error

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(Figure A3). Even though these hindcast values were not always precise (e.g., in 2006), the ability to predict if the harvest will be greater than average or less than average is an immense improvement over past ADF&G forecasts. For these reasons, we are using this method to forecast the pink salmon harvest for a ninth consecutive year.

ADF&G will manage the 2015 commercial purse seine fisheries *inseason* based on the strength of salmon runs. Aerial escapement surveys and fishery performance data will continue, as always, to be essential in making inseason management decisions.

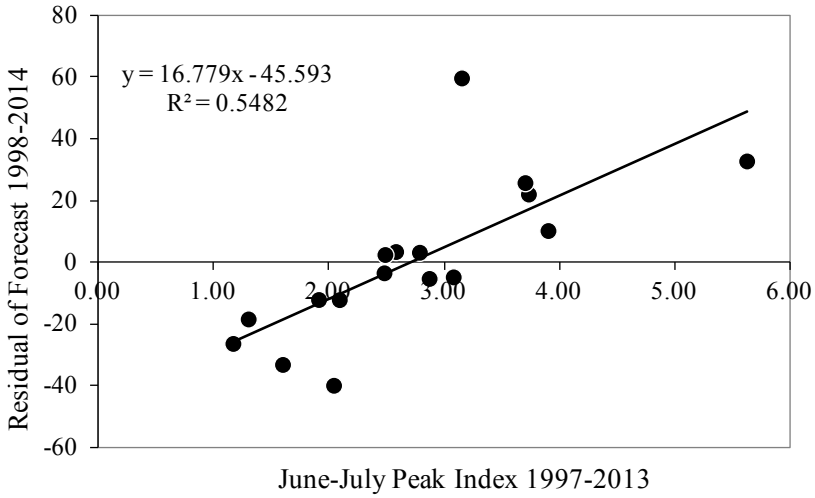

Figure A2.–Regression of ADF&G forecast error on the peak June–July juvenile pink salmon CPUE index from Icy Strait one year prior.
Note: Pink salmon fry index data provided by Joe Orsi, NOAA Auke Bay Laboratories, pers. comm.

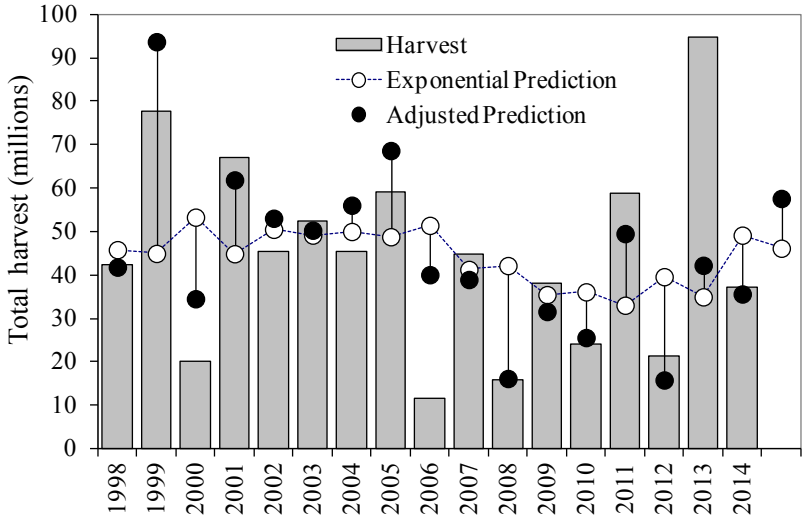

Figure A3.–Annual harvest of pink salmon in Southeast Alaska, 1998–2014, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory juvenile pink salmon data.

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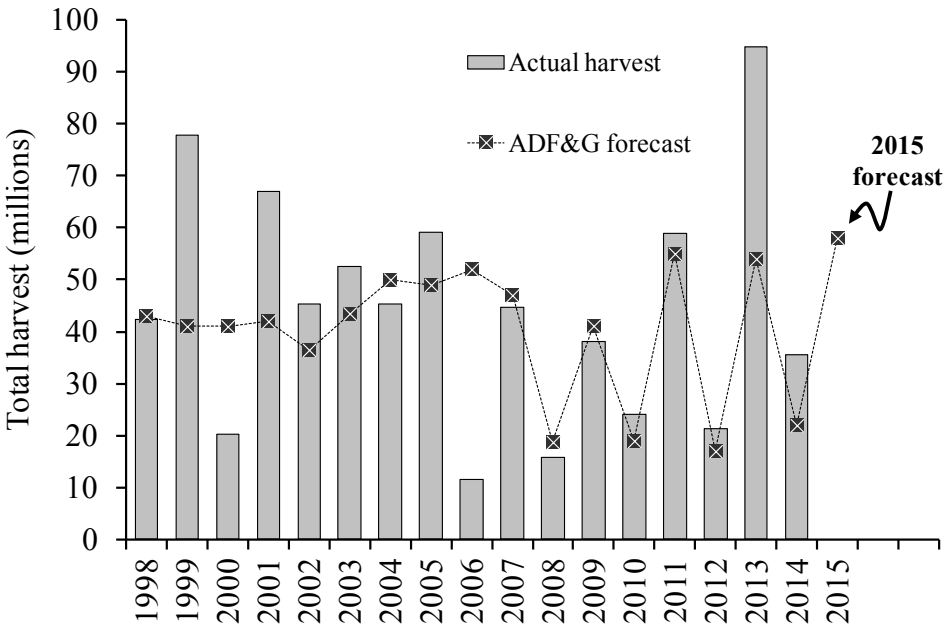

Figure A4.–Annual harvest of pink salmon in Southeast Alaska compared to the ADF&G pre-season harvest forecast, 1998–2014. The 2007–2015 ADF&G harvest forecasts were adjusted using NOAA's juvenile pink salmon data.

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 (natural run only)

Preliminary Forecast of the 2015 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	16,800	6,900–26,900
Escapement Goal[a]	1,450	
Harvest Estimate[b]	15,400	5,400–25,400

[a] The PWS pink salmon escapement goal is the sum of the median historical even-year (1966–2010) escapement for each district in PWS with an SEG. The escapement goals were changed in 2011 from a single soundwide 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] 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 (1997–2015), 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 2015 forecast is based on an exponential smoothing technique that is heavily dependent upon the total run size of the previous brood year (2013). This forecast method differs from the 2013 forecast that used the average of the 2 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 2015 was selected by comparing the mean absolute percentage error (MAPE) and the standard deviation of the MAPE among the models examined (odd return years 1965–2013). 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 method described above, $\sigma_{min/max}$ is the minimum and maximum proportional forecast error from all previous forecasts using this same method (1965–2013), σ_i is the proportional forecast

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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 2015 is a naïve forecast that uses a lag 1 exponential smoothing to minimize MAPE. Beginning in 2004, ADF&G stopped producing hatchery pink salmon forecasts because the hatchery operators were already producing forecasts for their releases. Forecast methods examined for the 2015 natural run included (1) previous odd brood year total run (most naïve forecast method), (2) total run averages with 2 to 10 years of data (odd years), (3) linear regression of log-transformed total PWS escapement versus log-transformed total PWS return by brood line, (4) lag 1 exponential smoothing, and (5) lag 1 exponential smoothing with dampening. The 2015 forecast (lag 1 exponential smoothing) had the lowest MAPE for odd brood year models examined, and lowest standard deviation of MAPE. None of the models examined for natural pink salmon returning in odd years produced forecasts with MAPE values below 70%, resulting in considerable uncertainty in the forecast point estimate.

The brood year 2013 escapement index (4.68 million) was above the sum of the current district-specific SEG ranges (990,000–2.28 million) and was greater than the median of the observed odd-year escapements since 1961 (1.52 million). If the 2015 total run forecast (16.8 million) is realized, it will be also be greater than the median odd brood year return since 1961 (7.98 million). Environmental factors, which likely play a significant role in determining pink salmon returns in PWS, have been quite dynamic during the past 7 to 8 years. A warm regime, coinciding with generally high productivity of salmon, began in approximately 1977. However, beginning in 2007, ocean temperatures at GAK1 along the Seward line were well below average (http://www.ims.uaf.edu/gak1/). The last several years have also been one of the longest periods of cold conditions, as measured by Pacific Decadal Oscillation (PDO) index values, since the 1970s (http://jisao.washington.edu/pdo/). An El Niño event that spanned 2009 to 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 to 2010 El Niño, PDO values again became negative in June of 2010 and remain negative through December 2013. PDO values were positive throughout 2014, corresponding with above average water sea surface temperatures throughout the Gulf of Alaska during this period.

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Forecast Area: Prince William Sound
Species: Chum Salmon (natural run only)

Preliminary Forecast of the 2015 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound General Districts		
Total Run	484	185–888
Escapement Goal[a]	200	
Harvest Estimate[b]	284	0–688

[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 2015 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 2015. 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 method described above, $\sigma_{min/max}$ is the minimum and maximum proportional forecast error from all previous forecasts using this same method (1990–2014), 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, ADF&G stopped producing hatchery chum salmon forecasts because the hatchery operators were already producing forecasts for their releases. Our ability to accurately forecast natural chum salmon stocks is limited by the small amount of data available. Estimates of natural stock contributions to CPF were unavailable prior to 2003. From 2003 through 2014 natural chum salmon contribution estimates based on thermally marked otoliths were available for the

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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 2015 natural chum salmon forecast of 484,200 is realized, it would be the 34th 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.

Cold ocean temperatures and negative PDO index values discussed previously for pink salmon may also negatively affect the run of chum salmon in 2015. However, North Pacific waters have been significantly warmer throughout 2014.

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Forecast Area: Prince William Sound
Species: Sockeye Salmon (natural run only)

Preliminary Forecast of the 2015 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Prince William Sound, Coghill Lake		
Total Run	123	74–246
Escapement Goal[a]	30	
Harvest Estimate[b]	93	44–216
Prince William Sound, Eshamy Lake		
Total Run	53	29–77
Escapement Goal[c]	21	
Harvest Estimate[b]	32	9–57
Total Production		
Run Estimate	176	120–300
Escapement Goal	51	
Common Property Harvest[b,d]	126	70–250

[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 10-year 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 5 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 sockeye salmon in 2015 used the return of age-1.2 fish in 2014 as the input parameter. Predicted returns of age-1.1, -1.2, -2.2, and -2.3 sockeye salmon were calculated as the 1974 to 2014 mean return of that age class. Harvest, escapement, and age composition data are available for Coghill Lake sockeye salmon runs back to 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 and 2014 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 estimates of age-1.3 returns to Coghill Lake have a much lower MAPE (~32.5%) than the sibling model used to predict returns of age-1.2 fish (~88%).

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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 2015 forecast is simply the average annual runs since 1989. Eshamy Lake escapement has been enumerated at a weir since 1950, except in 1987, 1998, and from 2012 to the present. 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. Starting in 2012 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, ADF&G 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 ADF&G 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 ADF&G 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, except 2013. If achieved, the 2015 total run forecast midpoint (123,300) would be the 12th largest run since 1988 and slightly below the median run size of 127,000. The majority (77,300) of the overall Coghill Lake sockeye salmon forecast is predicted to come from age-1.3 fish (5 years old) from the 2010 brood year. Relatively few age-1.1 (jacks) were observed in 2014 compared to other years, which could indicate a small run of age-1.2 (4 years old) sockeye salmon in 2015. 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 (35,500) rather than sibling model estimates (22,600) for the 2015 forecast. Environmental factors that may influence the Coghill Lake sockeye salmon run in 2015 are as discussed for the pink salmon forecast.

Historically, Eshamy Lake was the largest natural stock contributor to common property fishery harvests of sockeye salmon in PWS outside of the Coghill District, and contributed to a substantial incidental harvest by the purse seine fishery in the Southwestern District. Although escapements into Eshamy River were counted at a weir for 50 years, only periodic collection of age, sex, and size data has occurred for the Eshamy and Southwestern districts commercial common

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

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 2015 Run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	35.5	22–58
Escapement Goal[a]	27	
Harvest Estimate[b]	8.5	0–31

[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 projected commercial common property harvest is 5,500.

Forecast Methods

Forecast methods examined for the Chinook salmon forecast included (1) the previous year's run size (most naïve method; (2) mean total run size estimates (2-, 3-, 4-, and 5-year averages); and (3) pseudo-sibling models that examined linear relationships between log-transformed returns of younger fish to predict returns of fish from the same brood class the following year (e.g., returns of age-1.2 fish to predict returns of age-1.3 fish). Historically, sibling model estimates of age-1.3 returns to the Copper River have a much lower MAPE (approximately 38%) than the sibling model used to predict returns of age-1.4 fish (approximately 68%); therefore, the only sibling model evaluated was to predict returns of age-1.3 fish. Retrospective forecasts using the previous year's run size had a smaller MAPE (26%) and a smaller standard deviation of the MAPE (14%) than other mean run forecasts and was used as the forecast for 2015. The range for the total run forecast was calculated as

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

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 (2000–2014), σ_i is the proportional forecast error for individual past years and y_i and $\hat{y}_i$ are the actual and forecast total run sizes for individual previous years using this same method, respectively.

The harvest forecast is the total run estimate minus the average escapement of 27,000 since 1980 as determined from catch-age analysis and mark–recapture point estimates. The commercial harvest was calculated with the projected total harvest multiplied by the 5-year average proportion of harvest by the commercial fishery (~0.65).

Forecast Discussion

ADF&G 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

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made prior to 1998 used aerial survey indices adjusted to approximate the total escapement. These forecasts performed poorly, especially after the number of aerial surveys was significantly reduced in 1994. In 1999 the ADF&G Division of Sport Fish began a mark–recapture program to estimate the inriver abundance of Chinook salmon. The native village of Eyak became a collaborator on the project and eventually took the lead role. There are currently 16 years (1999–2014) of inriver abundance estimates. Thus, while estimates of commercial harvest of Chinook salmon to the Copper River date to 1890, only data collected since 1999 were used to estimate model parameters, calculate individual age class forecasts, and calculate the ranges.

The 2015 total run forecast point estimate of 35,500 is approximately 28,800 less than the 16-year average total run size (1999–2014 average = 64,400). If realized, the 2015 forecast total run would rank 33rd in the recent 36 annual runs (since 1980).

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Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2015 Run

Natural Production	Forecast Estimate(thousands)	Forecast Range (thousands)
Total Run	2,750	1,960–3,530
Escapement Goal[a]		
Upper Copper River	450	
Copper River Delta	169	
Common Property Harvest[b]	2,130	1,480–2,770
Hatchery and Supplemental Production		
PWSAC - Gulkana Hatchery		
Hatchery Run	450	320–570
Broodstock Needs	20	
Supplemental Escapement[c]	100	
Common Property Harvest[b]	310	220–410
Total Production		
Run Estimate	3,190	2,280–4,100
Natural Escapement Goal	619	
Broodstock Needs	20	
Supplemental Escapement[c]	110	
Upper Copper River Inriver Goal[d]	715	
All Harvest[e]	2,440	1,760–3,120

[a] The upper Copper River escapement goal of 450,000 sockeye salmon is the historical average spawning escapement (1979–2010). The 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) was calculated from 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 2014 are available.

[e] The commercial common property harvest midpoint estimate is 2,240,000 and the 80% prediction interval is 1,560,000–2,910,000. The point estimate for the total common property harvest is calculated as the forecast total run estimate minus the sockeye salmon portion of the inriver goal and the Copper River Delta escapement goal.

Forecast Methods

Forecast methods examined for natural Copper River sockeye salmon for 2015 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

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estimates for 6 age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2 and -2.2 sockeye salmon while untransformed data were used to predict the return of age-1.3 fish. These 3 age classes were predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year (sibling model). The predicted return of age-1.1, -0.3, and -2.3 sockeye salmon were calculated as the 5-year (2010–2014) 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 to 2014 were used in the calculation of mean squared error.

Forecast models examined to predict the 2015 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 (2.10%) 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 2015. 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 to 1998.

Historical estimates of Gulkana Hatchery production prior to 1995 are considered imprecise. Improved contribution estimates for brood years 1995 to 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.

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The spawning escapement goals for the upper Copper River and Copper River Delta were reviewed in 2014 and no changes were made to the existing goals. The upper Copper River spawning excapement goal was changed in 2011 (from 300,000–500,000 to 360,000– 750,000). This change was because of the conversion of Bendix sonar counts to DIDSON sonar equivalent counts and an update in the years used in the goal calculation. There was no change to the Copper River Delta SEG (55,000–130,000).

The 2015 run will be composed primarily of returns from brood years 2010 and 2011. Five-year-old fish (brood year 2010) are expected to predominate Copper River Delta and upper Copper River runs. The Copper River Delta escapement indices for 2010 (83,300) and 2011 (76,500) were within the SEG range (55,000–130,000).

The Gulkana Hatchery run will include fish from Crosswind Lake smolt migrations of 970,000 fish in 2012 (13th largest in 25 years) and 850,000 in 2013 (16th largest). For brood years 1993 to 2012 the average migration from Crosswind Lake was 1.2 million smolt. The run will also include 5-year-old fish from a moderate Summit Lake smolt outmigration (314,900, the 12th largest in 30 years). No smolt data are available for Summit Lake outmigration in 2013.

The 2015 total run forecast (3.19 million) is similar to the recent 4-year average total run (3.18 million). If realized, the 2015 forecast total run would be the fifth largest in the last 36 years (since 1980). The 2.75 million natural run would be similar to the recent 4-year average (2.68 million), and a 450,000 Gulkana Hatchery run would be below the recent 4-year average (490,000). The natural run forecast is driven by the large 4-year-old (age-1.2) fish estimate in 2014 (696,000; largest since 1965) and the subsequent prediction for 5-year-old (age-1.3) fish in 2015. There have been 8 additional years with run estimates of age-1.2 fish greater than approximately 400,000. The return of age-1.3 fish the following year has been significantly larger than expected in 5 of the 8 years. The enhanced run forecast is driven by moderate smolt outmigration numbers from both Crosswind and Summit lakes that have had good survivals in recent years. Returns of salmon that entered the ocean in 2012 have had excellent survival so far, but the significantly warmer North Pacific waters in 2014 will increase the uncertainty in the 2015 run projection. However, the main factor in the uncertainty of this forecast is that the number of age-1.2 fish used as input to the model to predict the age-1.3 return is 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 2015 Run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	5.8	4.4–7.2
Escapement	2.1	
Harvest Estimate	3.7	

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 2015: (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 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 Kenai River sockeye salmon in 2015 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 2014. A spawner-recruit model prediction of the age-1.2 salmon return was based upon escapement in 2011. The Kenai River return of age-2.3 salmon was forecasted using a smolt model based upon age-2 smolt data available after brood year 2002 and age-1 fall fry abundances available for brood years 1984 to 2002. The returns of Kasilof River age-1.3 and -2.2 sockeye salmon were forecasted using sibling models based upon the abundance of age-1.2 and -2.1 salmon in 2014. A spawner-recruit model was used to forecast the return of Kasilof River age-1.2 salmon, and a smolt model was used to forecast the return of Kasilof River age-2.3 salmon.

The total run of Susitna River sockeye salmon was forecasted using mean return per spawner by age class for brood years 2006 to 2010. 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 17% of the aggregate forecast for the 4 monitored 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. In 2015, a forecast was not developed for the Crescent River sockeye salmon run, because the escapement for this river is no longer monitored.

The 2015 total harvest by all user groups was estimated using the average harvest rate in all fisheries from 2012 to 2014. The total run forecast range was calculated by multiplying the forecast by the MAPE of the actual runs from published forecast runs from 2005 through 2014.

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Forecast Discussion

In 2014, the harvest of sockeye salmon by all user groups in UCI (3.2 million) was 1.1 million less than the preseason forecast of 4.3 million. In 2014, the total run was 3.3 million to the Kenai River, 1,105,000 to the Kasilof River, 201,000 to the Susitna River, 73,000 to the Crescent River, and 65,000 to Fish Creek. The 2014 run forecast was 3.8 million to the Kenai River, 1,062,000 to the Kasilof River, 264,000 to the Susitna River, 92,000 to the Crescent River, and 79,000 to Fish Creek.

A run of approximately 5.8 million sockeye salmon is forecasted to return to UCI in 2015, with a harvest by all user groups of 3.7 million. The forecasted harvest in 2015 is equal to the 20-year average harvest.

The run forecast for the Kenai River is approximately 3.6 million, which is 200,000 less than the 20-year average run of 3.8 million. 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 2014 (315,000; 411,000 20-year average) 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 2011 (11.8 million; 17.9 milion 20-year average) predicted a return of 1.4 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 (46%). Age-2.3 salmon typically comprise about 18% of the Kenai River run. A sibling model based upon the return of age-2.2 salmon in 2014 (215,000; 254,000 20-year average) predicted a return of 404,000 age-2.3 salmon in 2015. A smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2012 (7.6 million) predicted a return of 1.0 million age-2.3 salmon. The smolt model was used for this forecast due to the high age-2 smolt abundance in 2012 and the failure of the sibling model to accurately predict large returns of age-2.3 salmon like that seen from 2011 to 2013. The forecasted age-2.3 return is 46% greater than the 20-year average return for this age class (695,000). The predominant age classes in the 2015 run should be age 1.3 (52%), age 1.2 (11%), and age 2.3 (29%). The 10-year MAPE for the set of models used for the 2015 Kenai sockeye salmon run forecast was 19%.

The Kasilof River sockeye salmon run forecast is 1,092,000, which is 12% greater than the 20-year average run of 953,000. Age-1.3 salmon typically comprise about 34% of the Kasilof River run. The forecast for age-1.3 salmon is 374,000, 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 2014 was used to forecast the return of age-1.3 salmon in 2015. The abundance of age-1.2 salmon in 2014 was 419,000, which is 36% greater than the 20-year average abundance (308,000) for this age class. A smolt model predicted a return of 322,000 age-1.3 salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (33%) than the smolt model (58%). Age-1.2 salmon typically comprise about 32% of the run. The forecast for age-1.2 salmon is 328,000, which is 6% greater than the 20-year average return (308,000) for this age class. A spawner-recruit model based upon spawner abundance (244,000) in 2011 was used to forecast the return of age-1.2 salmon in 2015. A smolt model based upon the abundance of age-1 smolt (4.0 million) in 2013 forecasted a return of 248,000 age-1.2 salmon. The spawner-recruit model was used for this forecast because the 10-year

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MAPE was lower for the spawner-recruit model (42%) than the smolt model (50%). Age-2.2 salmon typically comprise about 24% of the run. The forecast for age-2.2 salmon is 250,000, which is 9% greater than the 20-year average return (230,000) for this age class. A sibling model based upon the abundance of age-2.1 salmon in 2014 was used to forecast the return of age-2.2 salmon in 2015. The spawner-recruit model forecast for age-2.2 salmon was 314,000. The sibling model was used for this forecast, because the 5-year MAPE was lower for the sibling model (7%) than the spawner-recruit model (19%). The predominant age classes in the 2015 run should be age 1.2 (30%), age 1.3 (34%), and age 2.2 (23%). The 10-year MAPE for the set of models used for the 2015 Kasilof sockeye salmon run forecast was 19%.

The Susitna River sockeye salmon run forecast is 276,000, which is 31% less than the 9-year average of 402,000. This forecast was derived using mean return per spawner by age class for brood years 2006 to 2010 and mark–recapture estimates of spawner abundance from 2009 to 2011. 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 third year this forecast method has been used, so MAPE is not available. The 9-year average run (2006–2014) was calculated using mark–recapture estimates of inriver run and genetic estimates of commercial harvests.

The Fish Creek sockeye salmon run forecast is 61,000, which is 38% less than the 20-year average of 98,000. Age-1.2 and -1.3 salmon typically comprise 87% of the Fish Creek run. A smolt model based upon the abundance of age-1 smolt emigrating from Fish Creek in 2013 (422,000; 419,000 14-year average) predicted a return of 46,000 age-1.2 salmon. A smolt model based upon the abundance of age-1 smolt in 2012 (178,000) predicted a return of 6,500 age-1.3 salmon in 2015. The age-1.2 forecast is 7% less than the 20-year average return (50,000) for this age class, while the age-1.3 forecast is 73% less than the 20-year average return (24,000) for this age class. The predominant age classes in the 2015 run should be age 1.2 (76%) and age 1.3 (11%).

Run forecasts to individual freshwater systems are as follows:

System	Run	Goals[a]
Kenai River	3,550,000	1,000,000–1,200,000[b]
Kasilof River	1,092,000	160,000–340,000
Susitna River	276,000	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	61,000	20,000–70,000
Unmonitored Systems	851,000	NA
Total	5,830,000	

[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 2015 Commercial Harvest

Natural Production	Forecast Estimate (thousands)
Pink Salmon	98
Chum Salmon	176
Coho Salmon	161
Chinook Salmon	6.7

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2015. The forecast for pink salmon was based upon the average harvest during the past 5 odd-numbered years.

Forecast Discussion

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

Mark Willette, Research Project Leader, Upper Cook Inlet

-continued-

Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary forecast of the 2015 run

Natural Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	626	313–1,177
Escapement	229	88–501
Commercial Harvest	397	225–676
Supplemental Production		
Total Run	1,536	1,023–2,048
Broodstock	206	200–211
Commercial Harvest	1,330	823–1,854
Total Area Production		
Total Run	2,162	1,336–3,225
Broodstock and Escapement	435	288–712
Commercial Harvest	1,727	1,048–2,530

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 9 harvest areas in the Lower Cook Inlet (LCI) Management area was based on a logarithmic regression of total run and escapement from 40 to 49 years of observations. The total run forecast for LCI natural production was the sum of the 9 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. 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 escapement was the sum of midpoints from the individual escapement goals minus any expected escapement shortfall. The forecast for supplemental production by the Tutka Bay Lagoon Hatchery was based on a marine survival rate of 3.0% (range: 2.0–4.0%). 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 from 2 to 6 generations, before the opposing line becomes dominant. Despite the relative parity between odd- and even-year pink salmon returns in LCI over broad time scales, we continue to stratify run size comparisons by odd and even years to account for the short term dominance cycles.

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In 2013, the last odd-numbered year and also a year with record pink salmon returns to Outer District, 5 of 9 forecasted systems had runs within the forecast range (the remaining 4 were above the forecast range). The 2015 forecast for natural production of 626,000 pink salmon has a forecast range of 313,000 to 1,177,000. Generally excellent parent-year escapements in 2013 and good marine survival from 2013 to 2014 suggest there is a strong likelihood of reaching at least the midpoint of this forecast range. If realized, a natural run of 626,000 pink salmon would be approximately two-thirds of the mean run size of 935,000 fish for odd-year returns between 1963 and 2013. If the midpoint of the forecast range is achieved, only one of 9 index areas (Humpy Creek) will not meet the low end of its escapement goal range.

Four districts make up the LCI management area. The harvestable surplus of naturally produced pink salmon in Southern District is projected to be 26,000, with 20,000 coming from Seldovia Bay and the balance from Port Graham Bay. Hatchery production of pink salmon in LCI recently resumed after several years of inactivity and significant adult returns are expected to Southern District in 2015. Tutka Bay Lagoon Hatchery is expecting 1,533,000 pink salmon to return to Tutka Lagoon in 2015. An additional 2,820 enhanced pink salmon are forecasted to return to Port Graham Bay. The 2015 brood stock and cost-recovery goals for the Tutka Bay Lagoon Hatchery have not been finalized, so the proportion of the forecasted return available for common property harvest cannot be estimated at this time.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 370,000, with over half of the harvest expected to occur in the Port Dick Subdistrict. If realized, the Port Dick harvest would be approximately 78% of the mean odd-year catch since 1963. The projected harvests are 60,300 from Port Chatham, 64,900 from Windy Bay, and 44,100 from Rocky Bay.

No pink salmon harvest is expected from the Eastern District in 2015. Commercial fishing specifically directed at pink salmon has not been allowed in the 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.

Relatively poor runs are forecasted for 3 of the major pink salmon producers in the Kamishak Bay District. Depending on where the actual run falls within the forecast range, escapement shortfalls may occur for Bruin Bay and Ursus and Rocky Cove Subdistricts. Therefore, no commercial harvest of pink salmon is anticipated for the Kamishak Bay District in 2015.

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 2015 run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
KMA Wild Stock Total Run	10.9	8.4–14.2
KMA Escapement Goal [a]	4.0	
KMA Wild Stock Harvest	6.9	4.4–10.2
Kitoi Bay Hatchery Harvest [b]	7.4	5.4–9.3
Total KMA Pink Salmon	14.3	9.8–19.5

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

[a] The 2015 estimated escapement is roughly the midpoint of the odd-year aggregate escapement goals for the Kodiak Archipelago (2.0–5.0 million) and the Mainland District (250,000–1.0 million).

[b] This figure is the total expected return (8.3 million) minus the broodstock collection goal of 425,000.

The 2015 Kodiak Management Area (KMA) predicted pink salmon harvest is expected to be in the *Average* category with a point estimate of 14.3 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 2014.

KMA Harvest Category	Range (millions)	Percentile
Poor	Less than 7.6	Less than 20th
Weak	7.6–11.0	21st–40th
Average	11.0–16.0	41st–60th
Strong	16.0–22.0	61st– 80th
Excellent	Greater than 22.0	81st–100th

Forecast Methods

The KMA wild stock pink salmon harvest forecast is derived from a total run forecast minus the estimated KMA escapement (4.0 million). The total run estimates were derived from a combination of Karluk and Ayakulik weir count, aerial survey index, and harvest estimates.

For the 2015 KMA wild stock pink salmon forecast, a generalized Ricker model was fit to the odd-year KMA returns from 1997 to 2013 utilizing KMA pink salmon indexed escapement for the spawner index. Three additional terms were included in this generalized Ricker model: (1) March and April average air temperature, (2) May total precipitation, (3) early April average ocean temperature.

This generalized model assumes that the environmental conditions affect the survival at early life history stages of pink salmon, in this case during emergence (March) and migration toward estuary and near shore habitats. Environmental conditions were estimated from Kodiak Airport (PADQ) climate observations and Trident Basin (10 m). In constructing and evaluating the regression model standard regression diagnostic procedures were used. Eighty percent prediction intervals were estimated based on the generalized Ricker model.

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The 2015 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survivals from odd brood years 1995 through 2011, when releases from the facility were in excess of 100 million fry. Brood years 1995 through 2011 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 that experiences exceptional marine survival every fourth year dating back to the first releases in 1977 (with the exception of 1997). The primary forecasting consideration for 2015 relates to this 4-year cyclical return, which is above average, but is not the stronger of the 2 odd-year cycles. The midpoint estimate of 7.8 million reflects a marine survival of 4.1% for the 191.5 million fry released, which were above average size (0.8 g).

Forecast Discussion

The 2015 KMA wild stock pink salmon total run (10.9 million) may be a weak odd-year return (Figure E1). Climate variables correlated with odd-year returns suggest a below average return in 2015. While brood year escapement in 2013 was robust, ancillary information during the spring of 2014 showed low abundance of pink fry during the ADF&G Arnie Shaul Memorial pink salmon fry abundance index estimated in Kodiak area harbors. Arnie Shaul worked as an ADF&G Area Management Biologist on the Alaska Peninsula from 1973 until 2005 and often predicted pink salmon abundance based on prior-year pink fry indices estimated in the nearshore waters. Despite the strength of the forecast model, the authors recognize that environmental corollaries are often fleeting due to the dynamic nature of the Gulf of Alaska. Confidence in the 2015 forecast estimate is only fair considering the unpredictable nature of the KMA wild stock pink salmon returns.

The 2015 Kitoi Bay Hatchery pink salmon production is expected to be 7.8 million fish. The brood stock collection goal is 425,000, resulting in a total hatchery harvest projection of about 7.4 million. It is estimated that roughly 1 to 2 million fish will be harvested in the cost recovery fishery.

This forecast level should allow an initial weekly fishing period length of 57 hours for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2015). 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 pink salmon harvest will occur on the Westside and the Afognak districts with a strong hatchery return predicted.

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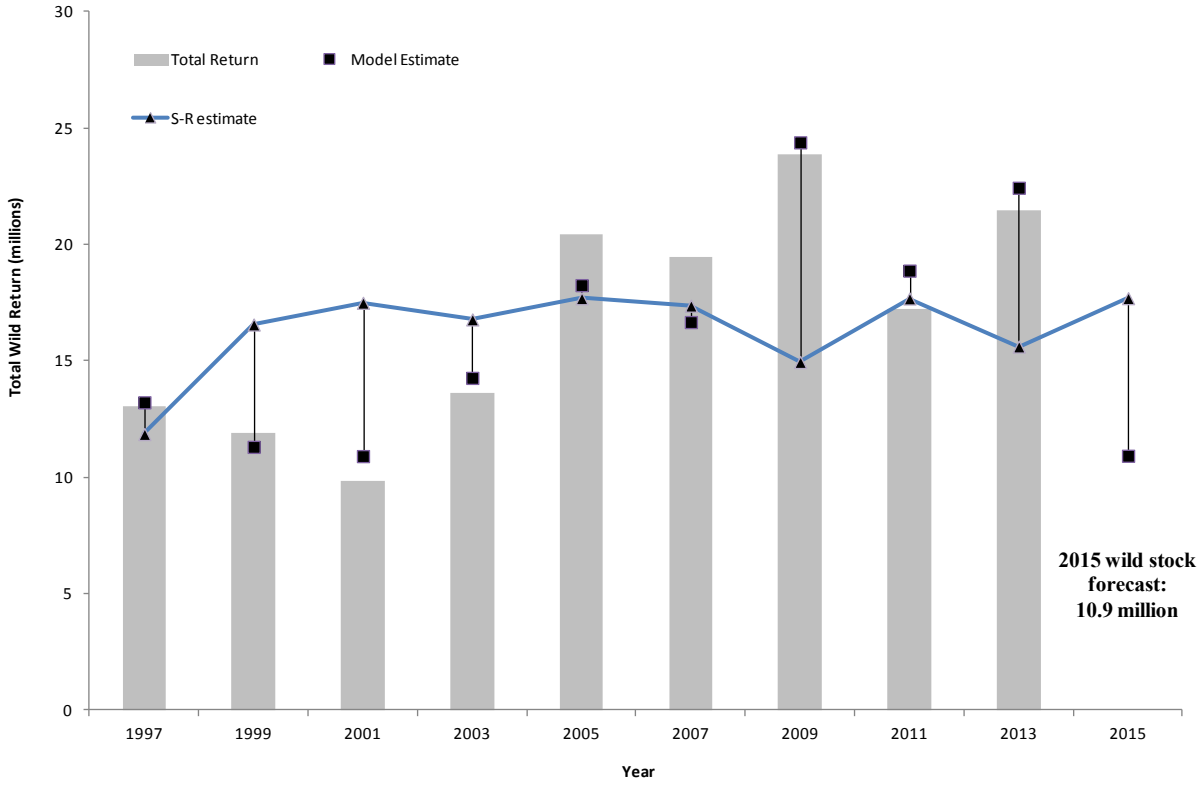

Figure E1.–Kodiak odd-year pink salmon wild stock total return compared to S-R estimates and environmental model estimates, 1997 to 2013, and 2015 forecast.

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 2015 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Spiridon Lake	232	127–337
Telrod Cove Net Pen	64	53–71
Total Run	296	181–408
Escapement Goal	0	NA
Harvest Estimate	296	181–408

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

Forecast Methods

The 2015 Spiridon Lake sockeye salmon forecast was prepared by investigating simple linear regression models, utilizing 1999 to 2012 outmigration-to-return relationships for 3 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 (2003–2014). Returns of age-1.2 sockeye salmon from 2013 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 SHA in Telrod Cove. The point estimate forecast of 296,000 in 2015 is 95,000 less than the 2014 forecast (391,000) and 26,000 more than the actual 2014 run estimate of 270,000. In the 2014 season, ADF&G estimated 61% of the total run was harvested outside and the remaining 39% of fish were available for harvest inside Telrod Cove. Based on this proportion, it is estimated that approximately 115,000 fish will be available for harvest within Telrod Cove.

The 2015 run will likely be composed of approximately 30% age-1.2 fish, 28% age-2.2 fish and 35% 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 40,000 more than the recent

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10-year average (2005–2014) run of 192,000. The 2015 season will mark the second 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.

Nate Weber, Kodiak Regional Aquaculture Association

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Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2015 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	401	296–507
Escapement Goal [a]	300	200–400
Harvest Estimate	101	

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 (140,000–280,000) and late run (60,000–120,000).

Forecast Methods

The 2015 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year ocean-age class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction intervals (80%) for the regression estimates were calculated using the variances of the regression models. The age classes that could not be estimated with one of these models were estimated using pooled medians and the 10^{th} and 90^{th} 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 returns using recent outmigration years (2000–2012). Age-.1, -.3, and -.4 sockeye salmon were predicted by the 5-year median return. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2015. 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 2015 Ayakulik forecast of 401,000 sockeye salmon is about 226,000 less than the actual 2014 run estimate of 627,000, which was the largest since 1999. The 2015 run will likely be composed of approximately 64% age-.2 fish and 28% age-.3 fish. If realized, this run will be 1,000 more than the recent 10-year average (2005–2014). The confidence in the 2015 Ayakulik forecast is good, due to the strong regression relationship. The projected harvest of 101,000 is based on the achievement of the midpoint of the combined escapement goal ranges (300,000). Ayakulik is managed based on both early- and late-run (post July 15) components. Based on brood year escapement proportions from what will be the major contributing brood years (2009–2011), approximately 69% of the total run will occur in the early portion of the run.

M. Birch Foster, Finfish Research Biologist, Westward Region

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Forecast Area: Kodiak, Karluk River
Species: Sockeye Salmon

Preliminary Forecast of the 2015 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run	Total Run Estimate	427	203–651
	Escapement Goal [a]	250	110–250
	Harvest Estimate	177	
Late Run	Total Run Estimate	1,204	677–1,731
	Escapement Goal [a]	380	170–380
	Harvest Estimate	824	
Total Karluk River	Total Run Estimate	1,631	880–2,383
System	Escapement Goal [a]	630	280–630
	Harvest Estimate	1,001	

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 (110,000–250,000) and late run (170,000–380,000) and summed for the total run.

Forecast Methods

The 2015 Karluk River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent 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 10^{th} and 90^{th} 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 recent outmigration years (1996–2012) and natural log (ln) transformation of the predictor. The age-.1, -.2, and -.4 return predictions were calculated using their pooled 15-year median contribution.

For the late run, age-.2 sockeye salmon returns were predicted based on the abundance of the prior-year return of age-1.2 and age-.1 sockeye salmon for brood years 1981 to 2010 using multiple linear regression. The age-.1, -.3, and -.4 return predictions were calculated using their pooled 15-year median contribution.

Regression and median estimates were summed to estimate the total Karluk sockeye salmon run for 2015. 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 2 runs.

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Forecast Discussion

The total 2015 sockeye salmon run to the Karluk River is expected to be approximately 1,631,000. The early run is expected to be approximately 427,000, which is about 126,000 above the recent 10-year average (301,000) and 3,000 below the 2014 run (430,000). The late run is expected to be approximately 1,204,000, which is 600,000 above the recent 10-year average (604,000) and 73,000 less than the 2014 run (1,277,000).

The projected harvest estimate for the early run (177,000) is based on achievement of the upper end of the early-run escapement goal. The projected harvest estimate for the late run (824,000) is based on achievement of the upper end of the late-run escapement goal. The vast majority of both runs is expected to be age-.2 fish. The 2014 return was the largest since 2003 and likely the fourth largest return since the 1930s. The extremely large smolt migrating out of the lake in 2013 and high abundance of age class predictors like age-.1 and age-1.2 fish in 2014 suggest a 2015 return which will again be robust. More uncertainty, in absolute terms, exists in the 2015 forecast due to the high anticipated return. Therefore, the overall confidence in the Karluk sockeye salmon forecast is only fair.

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 2015 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Upper Station	Total Run Estimate	96	62–129
	Escapement Goal[a]	66	43–93
	Harvest Estimate[b]	30	
Late Upper Station	Total Run Estimate	217	140–294
	Escapement Goal	186	120–265
	Harvest Estimate[b]	31	
Frazer Lake	Total Run Estimate	441	287–595
	Escapement Goal	137	95–190
	Harvest Estimate[b]	304	
Total Alitak District	Total Run Estimate	753	489–1,018
	Escapement Goal	389	258–548
	Harvest Estimate[b]	364	

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 of 30,000 fish in 2014, that is in effect only if ADF&G determines that the upper end of the Frazer system sockeye salmon escapement goal will be exceeded. Upper Station early run has a BEG (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.

Forecast Methods

The 2015 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 -.2 returns respectively (outmigration years: 1999–2012 and 1999–2011). Upper Station early-run age-.1 and -.4 sockeye salmon predictions were calculated using the pooled 10-year median contributions. Frazer age-.2 salmon were predicted based on the abundance of prior-year return age-.1 sockeye salmon counted at the Dog Salmon Weir (outmigration years: 2003–2012) using a natural log (ln) transformation of the predictor. Frazer age-.3 salmon were predicted based on prior year age-.2 returns (outmigration years: 2002–2011). Frazer age-.1 and -.4 returns were calculated using the pooled median contributions from the last 10 years. Upper station late-run age-.3 sockeye salmon were predicted based on prior year age-.2 returns using recent outmigration years (1998–2011). Upper Station late-run age-.1, -.2, and -.4 return predictions were calculated using the pooled median contributions from the most recent 10 years.

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Regression and median estimates were summed to estimate the total Alitak District sockeye salmon run for 2015. 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 2 runs.

Forecast Discussion

The 2015 sockeye salmon run to the Alitak District is expected to be approximately 753,000, approximately 95,000 more than the recent 10-year average run (658,000) and 95,000 more than the 2014 run (658,000). The Upper Station early run is expected to be approximately 96,000, which exceeds the recent 10-year average run (67,000). The Upper Station late run is expected to be approximately 217,000, which is below the recent 10-year average run (240,000). The Frazer Lake run is expected to be approximately 441,000, which is above the recent 10-year average (351,000). The 2014 Alitak District sockeye salmon run should be composed of approximately 60% age-.2 fish, 36% age-.3 fish, and 4% 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 364,000 is based on achieving the S_{MSY} estimates for both the Upper Station early and late runs 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 Wattum and Heather Finkle, Finfish Research Biologists, Kodiak

APPENDIX F: CHIGNIK

Forecast Area: Chignik
Species: Sockeye Salmon

Preliminary Forecast of the 2015 Run

Total Production		Forecast Estimate (thousands)	Forecast Range (thousands)
Early Run (Black Lake)	Total Run Estimate	1,320	308–2,331
	Escapement Goal [a]	350	350–450
	Harvest Estimate [b]	970	
Late Run (Chignik Lake)	Total Run Estimate	1,217	658–1,775
	Escapement Goal [a]	250	250–400
	Harvest Estimate [b]	967	
Total Chignik System	Total Run Estimate	2,536	966–4,106
	Harvest Estimate [b]	1,936	
	Chignik Area	1,588	
	SEDM Area	113	
	Cape Igvak Section	235	

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 2015 escapement goals for early (350,000–450,000), late (200,000–400,000), and combined (600,000–850,000) runs. An inriver run goal of 50,000 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 were used to forecast the 2015 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. 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 using data from the 1992 outmigration year to the present. Remaining age class components of the run were predicted by calculating median returns since the 1985 outmigration year (14% of the run).

The 2015 late run was predicted using parent escapement, ocean-age class, and sibling relationships. Age-1.3 sockeye salmon were predicted by simple linear regression from prior year age-1.2 returns from 1959 to the present using natural log-transformed values and back-transforming the prediction. Age-2.3 sockeye salmon were predicted by simple linear regression from prior year age-2.2 returns from 1984 to the present, excluding 1989. Age-.1,-.2 and -.4 sockeye salmon were predicted by calculating median returns since the 1985 outmigration year. Remaining age class components of the run were predicted by calculating median returns since the 1985 outmigration year (<2% of the run).

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The early- and late-run regression and median estimates were summed to estimate the total Chignik River sockeye salmon run for 2015. 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 2 runs.

Forecast Discussion

The 2015 Chignik sockeye salmon early run is forecasted to be 1.32 million, which is 31,000 more than the 10-year average of 1.29 million and 909,000 more than the 2014 early run of 410,000. The early run is predicted to comprise 87% age-.3 fish, 13% age-.2 fish, and less than 1% of remaining age class components. The late run is forecasted to be 1.22 million, which is 190,000 more than the 10-year average of 1.03 million and 355,000 more than the 2014 late run of 862,000. The 2015 late run is predicted to comprise less than 1% age-.1, 12% age-.2, 87% age-.3 (22% age-1.3 and 64% age-2.3), and less than 1% age-.4 fish. The total Chignik sockeye salmon run is expected to be 2.54 million, which is approximately 219,000 more than the 10-year average of 2.32 million, and 1.26 million less than the 2014 total run of 1.27 million.

Inseason genetic estimates of each run were used to manage the fishery for the first time in 2014, and will continue to be used in 2015. The projected early-run harvest estimate of 970,000 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 967,000 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 2015 forecast for the early run approximates the most recent 10-year average run size, while the late-run forecast is larger than the most recent 10-year average run size. Predicting future runs of salmon is always difficult, and the wide confidence interval around the point estimate of the 2015 forecasts is due to the substantial uncertainty included within each of forecast models. The magnitude of the early run is typically more variable than the late run, resulting in wider confidence intervals for early run. When reviewed over the most recent 10 years, the average deviation of the early run prediction from the actual run is about 485,000, heavily influenced by the extremely large early run in 2011. The average deviation of late-run prediction from the actual run is approximately 249,000. Exploratory analysis using other sibling relationships, smolt outmigration data, and environmental variables yielded results similar to this formal forecast. Similar methods have been used for forecasting the early and late runs since 2004. Due to the range of variation in the relationships used in these forecasts and their historical accuracy, our confidence in them is fair to good.

Mary Beth Loewen, Finfish Research Biologist, Alaska Peninsula

APPENDIX G: BRISTOL BAY

Forecast Area: Bristol Bay
Species: Sockeye Salmon

Forecast of the 2015 Run:

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	53.98	44.83–63.13
Escapement	13.46	
Commercial Common Property Harvest	40.52	
Bristol Bay Harvest	38.51	
South Peninsula Harvest	2.01	

Forecast Methods

The 2015 Bristol Bay sockeye salmon forecast is the sum of individual predictions for 9 river systems (the Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak rivers) and 4 age classes (ages 1.2, 1.3, 2.2, and 2.3, plus ages 0.3 and 1.4 for Nushagak River). Adult escapement and return data from brood years 1972 to 2011 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. Models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, MAPE, and mean percent error between forecasts and actual returns for 2 time periods, 2012 through 2014 and 2010 through 2014.

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 2014.

Forecast Results

A total of 53.98 million sockeye salmon (range 44.83–63.13 million) are expected to return to Bristol Bay in 2015. This prediction is 40% greater than the previous 10-year mean of total runs and 51% greater than the long-term mean of 32.43 million. All systems are expected to meet their spawning escapement goals.

A run of 53.98 million sockeye salmon can produce a potential total harvest of 40.52 million fish. The projected harvest includes 38.51 million fish in Bristol Bay and 2.01 million fish in the South Peninsula fisheries. A Bristol Bay harvest of 38.51 million would be 45% greater than the previous 10-year mean harvest (26.48 million; range of 15.42–31.10 million), and 60% greater than the long-term mean of 24.05 million.

The run forecast to each district and river system is as follows: 28.80 million to the Naknek-Kvichak District (15.38 million to the Kvichak River, 1.24 million to the Alagnak River, 12.18 million to the Naknek River); 12.50 million to the Egegik District; 3.70 million to the Ugashik District; 8.37 million to the Nushagak District (5.55 million to the Wood River, 1.81 million to the Nushagak River, 1.02 million to the Igushik River); and 610,000 to the Togiak District (Table G1).

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The total run forecast of 53.98 million sockeye salmon is expected to be comprised of 18.37 million age-1.3 fish (34%) followed by 16.87 million age-2.2 fish (31%), 13.61 million age-1.2 fish (25%), 5.01 million age-2.3 fish (9%), with minor age classes contributing to the remainder of the return (Table G1).

Forecast Discussion

Forecasting future salmon returns is inherently difficult and uncertain. 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 Baywide forecast. Forecasts since 2001 have averaged 8.2% below the actual total run. Run forecast differences have ranged from 35.9% below actual run in 2014 to 20.6% above actual run in 2011. Forecasted harvests have averaged 2.2% below actual harvest since 2001 and harvest differences have ranged from 39% below actual harvest in 2014 to 35% above actual harvest in 2011.

Individual river forecasts have greater uncertainty compared to baywide forecasts. Since 2001, on average, we have underforecasted the returns to the Alagnak (–24%), Togiak (–15%), Kvichak (–11%), Wood (–7%), and Naknek (–3%) rivers and overforecasted returns to the Igushik (56%), Egegik (29%), Ugashik (13%), and Nushagak (1%) rivers.

The overall Bristol Bay forecasts have been fairly accurate since 2001 in spite of a large amount of individual river forecast variability. This is the result of overforecasting returns to some rivers and underforecasting returns to other rivers. The forecasts to individual rivers offset each other such that the overall Bristol Bay forecast has been more accurate than the individual forecasts.

Historically, total runs of sockeye salmon to Bristol Bay have been highly variable. The 2015 forecast of 53.98 million is above the long-term (1963–2014) historical average of 32.43 million, and above the recent 10-year (2005–20014) average of 38.64 million from 2005 to 2014.

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 2015.

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	3.15	9.71	1.68	0.83	15.38	7.69	7.12	0.57
	Alagnak	0.48	0.04	0.61	0.12	1.24	0.62[b]	0.58	0.05
	Naknek	2.97	1.26	7.32	0.63	12.18	1.10	10.63	0.45
	Total	6.60	11.01	9.60	1.58	28.80	9.41	18.32	1.07
Egegik		2.63	5.12	1.62	3.14	12.50	1.10	10.94	0.46
Ugashik		2.05	0.52	0.97	0.16	3.70	0.85	2.71	0.14
Nushagak[c]									
	Wood	1.93	0.17	3.36	0.09	5.55	1.10	4.24	0.21
	Igushik	0.16	0.02	0.82	0.02	1.02	0.23	0.76	0.04
	Nushagak	0.12	0.01	1.56	0.01	1.81[d]	0.60	1.14	0.07
	Total	2.20	0.20	5.74	0.11	8.37	1.93	6.14	0.31
Togiak[e]		0.12	0.03	0.43	0.03	0.61	0.18	0.41	0.02
Bristol Bay		13.61	16.87	18.37	5.01	53.98	13.46	38.51	2.01
		25%	31%	34%	9%	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 3.7% of the total Bristol Bay sockeye salmon production during the last 5 years.

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

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

[d] Nushagak River forecast includes age-0.3 (16,756) and age-1.4 (101,994) 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 2015 run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	419	231–608
Escapement Goal[a]	150	97–219
Harvest Estimate	269	

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) for 2015, and based on discussions with area management biologists.

Forecast Methods

The 2015 Nelson River sockeye salmon run was forecasted using simple linear regression and generalized Ricker models of ocean-age class and air temperature 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 from 1984 to 2010 and temperature anomalies of averaged November air temperatures from the year prior to and the year during outmigration. Simple linear regression was used to predict age-.3 sockeye salmon from prior year age-.2 returns using natural log-transformed values from 1992 to the present and back-transforming the prediction. The remaining age-.1 and age-.4 returns were calculated from median estimates for each ocean age class using run data from 1985 to the present.

Regression and median estimates were summed to estimate the total Nelson River sockeye salmon run for 2015. 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 2015 Nelson River forecast of 419,000 is approximately 38,000 more than the 10-year average of 382,000 and approximately 41,000 less than the 2014 run of 461,000. The 2015 run is expected to comprise 59% age-.2 and 39% age-.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; therefore, confidence in this forecast is fair. The projected harvest of 269,000 is based on achieving roughly the midpoint (150,000) of the escapement goal range.

Mary Beth Loewen and Heather Finkle, Finfish Research Biologists, Alaska Peninsula

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

Preliminary forecast of the 2015 run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	505	256–754
Escapement Goal[a]	156	117–195
Harvest Estimate	349	

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) for 2015.

Forecast Methods

The 2015 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 (November–March) air temperatures recorded at the Cold Bay airport, based on brood year from 1990 to the present. Age-2.3 sockeye salmon were predicted from prior year age-2.2 returns since the 1991 brood year to the present. Remaining age class components of the run were predicted by calculating median returns since the 1989 brood year.

Regression and median estimates were summed to estimate the total Bear late sockeye salmon run for 2015. 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 2015 Bear Lake late-run forecast (505,000) is 60,000 more than the 10-year average (approximately 445,000) and 35,000 more more than the 2014 run (470,281). The 2015 late run is expected to comprise 3% age-.1, 74% age-.2, (71% age-2.2), 23% age-.3, and 0.1% age-.4 fish. The projected harvest (349,000) 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. All major age classes 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, especially in spring 2012. Additionally, Bear River late-run sockeye salmon returns have shown a general decline in total run since 1989, and a decline in return per spawner over the most recent 5 years. Based on uncertainty associated with the variable predictive capabilities of sibling age class and environmental relationships, our confidence in this forecast is fair.

Mary Beth Loewen, Finfish Research Biologist, Alaska Peninsula

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

Preliminary forecast of the 2015 run

Total Production	Forecast Estimate (millions)	Forecast Range (millions)
Total Run Estimate	16.5	11.4–21.5
Escapement Goal[a]	3.3	
Harvest Estimate	13.2	8.0–18.2

Note: Column numbers may not total or correspond exactly with numbers in text due to rounding.
[a] The escapement estimate is the lower end of the aggregate goal range (1.6–3.3 million) for 2015.

The 2015 South Alaska Peninsula predicted pink salmon harvest is expected to be in the *Excellent* category with a point estimate of 14.4 million (8.2–20.6 million). Harvest categories were delimited from the 20th, 40th, 60th, and 80th percentiles of historical commercial harvest on the South Alaska Peninsula from 1978 to 2014.

S. Pen Harvest Category	Range (millions)	Percentile
Poor	Less than 2.8	Less than 20th
Weak	2.8–4.7	21st–40th
Average	4.7–7.2	41st–60th
Strong	7.2–9.0	61st–80th
Excellent	Greater than 9.0	81st–100th

Forecast Methods

The 2015 South Alaska Peninsula pink salmon harvest forecast is derived from a total run forecast minus the upper end (3.3 million) of the odd-year South Alaska Peninsula escapement goal range. The total run was forecasted with a simple linear regression model using the average temperature (measured in Cold Bay) between emergence (April) and migration and juvenile ocean survival (November). The regression model was fit to the odd-year South Peninsula pink salmon returns from 1983 to 2013. The range was estimated as the 80% prediction intervals based on the error structure of the regression.

Forecast Discussion

The 2015 South Alaska Peninsula pink salmon total harvest (13.2 million) is forecast to be excellent. The average temperatures used in the model are very warm and suggest that run will be above average; however, temperatures were so warm that there are few comparable years. While not used in the model, ancillary information of below average precipitation in May of 2013 could have negatively impacted fry outmigration. Due to a relative lack of strength in the regression model, confidence in the forecast is only fair.

Elisabeth Fox, 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 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 2015.

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 2014. Chum salmon collected in the NBS surveys in 2012 and 2011 would correspond to the age-4 (2012) and age-5 (2011) returns in 2015. Both years indicated moderate to high abundance of juvenile chum salmon. Juvenile Chinook salmon collected in the NBS surveys in 2011 and 2012 would correspond to age-6 (2011) and age-5 (2012) returns in 2015. Juvenile Chinook salmon abundance was extremely poor in 2012 but higher in 2011. A large abundance of juvenile Chinook salmon was observed in 2013, which may indicate a larger than average return of age-4 fish in 2015. A collaborative effort between ADF&G and NOAA is in progress to test the applicability of BASIS juvenile salmon indices for run size forecasting.

In general, management for anticipated low Chinook salmon abundance, and small processing capacity in some areas, will likely result in chum salmon harvests that are lower than the outlook projections in the AYK region.

Appendix Table I1.–The 2015 commercial harvest outlook by management area, in thousands of fish.

	Salmon Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	0	5–15	80–140	0	50–150	
Kuskokwim Bay	0–2	60–100	40–80	0	40–100	
Kuskokwim Area Total	0–2	65–115	120–220	0	90–250	
Yukon	0	0	60–80	0	800–1,400	250–470
Norton Sound	0	0	60–90	25–75	70–100	
Kotzebue Sound					300–500	

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Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2015 Run

Total Production	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run Estimate	900	800–1,020
Escapement Goal	450	300–600
Harvest Estimate[a]	450	350–570

[a] Includes harvests from subsistence (approximately 100,000) and commercial fisheries.

Forecast Methods

The forecast for the 2015 Yukon Area fall chum salmon run is based on run reconstruction of 5 river systems (Tanana, Chandalar, Sheenjek, Fishing Branch and the mainstem Yukon River in Canada) and 4 age classes age-3 through age-6, with age-4 fish dominating followed by age-5 fish. Adult escapement and return data were used from the complete brood years 1974 to 2008, production from incomplete brood years 2009 and 2010 was estimated based on return per spawner from brood year returns, and an auto-regressive Ricker model was used to predict returns from the 2011 and 2012 parent years.

Predicted returns were multiplied by corresponding average maturity schedules for odd and even-numbered parent years to estimate 2015 run size, and rounded to the nearest thousand fish. The even/odd maturity schedule from 1974 to 2008 was used to estimate the 2015 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 2014.

The 2015 projected run size of fall chum salmon for the Yukon Area is approximately 900,000 fish. This projection is below average for odd-numbered runs; however, recent runs have fluctuated more widely and have produced runs as low as 380,000 in 2001 to as high as 2.3 million in 2005. The 80% confidence bounds for the 2015 forecast range from 800,000 to 1,020,000 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 514,000 fall chum salmon. The mean subsistence harvest from 2004 to 2013 for Alaskan subsistence and Canadian aboriginal harvests is 90,000 fall chum salmon. Commercial harvests may be allowed on the amount above 500,000 based on inseason assessments of run size. Targeting the midpoint of the escapement goal of 450,000 fall chum salmon, ADF&G anticipates a subsistence harvest of at approximately 100,000 and a commercial harvest between 250,000 and 470,000. In mid-July a projection based on the relationship of summer chum salmon to fall chum salmon returns to the Yukon River will be developed and used for inseason management. 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 900,000 fall chum salmon is expected to be composed of 73% age-4 and 24% 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 odd-even abundance cycle (averaging >1,000,000 in odd-numbered years and 700,000 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 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.

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 beginning in 1999. From 1999 to 2005 adjustments to the point estimates were made by reducing them by the average ratio of observed to predicted returns in attempts to reflect expected poor runs. From 2006 through 2015 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 (Figure I1). High and low cycles in production have changed approximately 35-fold (based on 35 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, 31% were below, and 25% were above. Returns of age-4 fish in odd-numbered years are typically 17% higher than even-numbered years. Sibling relationships for this stock are weak. The age-4 component is returning from a large escapement well above the upper end of the drainagewide escapement goal while the age-5 component is returning from an escapement within the goal. Productivity was at its lowest in 2005 with the most recent peak in the 2009 brood year (2.52 return per spawner). The forecasted run in 2015 may be affected by an apparent decrease in productivity, estimated as 1.28 and 1.03 return per spawner for the 2010 and 2009 brood years that will contribute as age-5 and age-4 components of the run. The 2015 point estimate of 900,000 fall chum salmon should be dominated by age-4 component and the age-5 return is forecasted to make up less than a quarter of the run. The upper end of the forecasted run size of 1,020,000 fall chum salmon would provide for a commercial harvest of near 470,000 fish.

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

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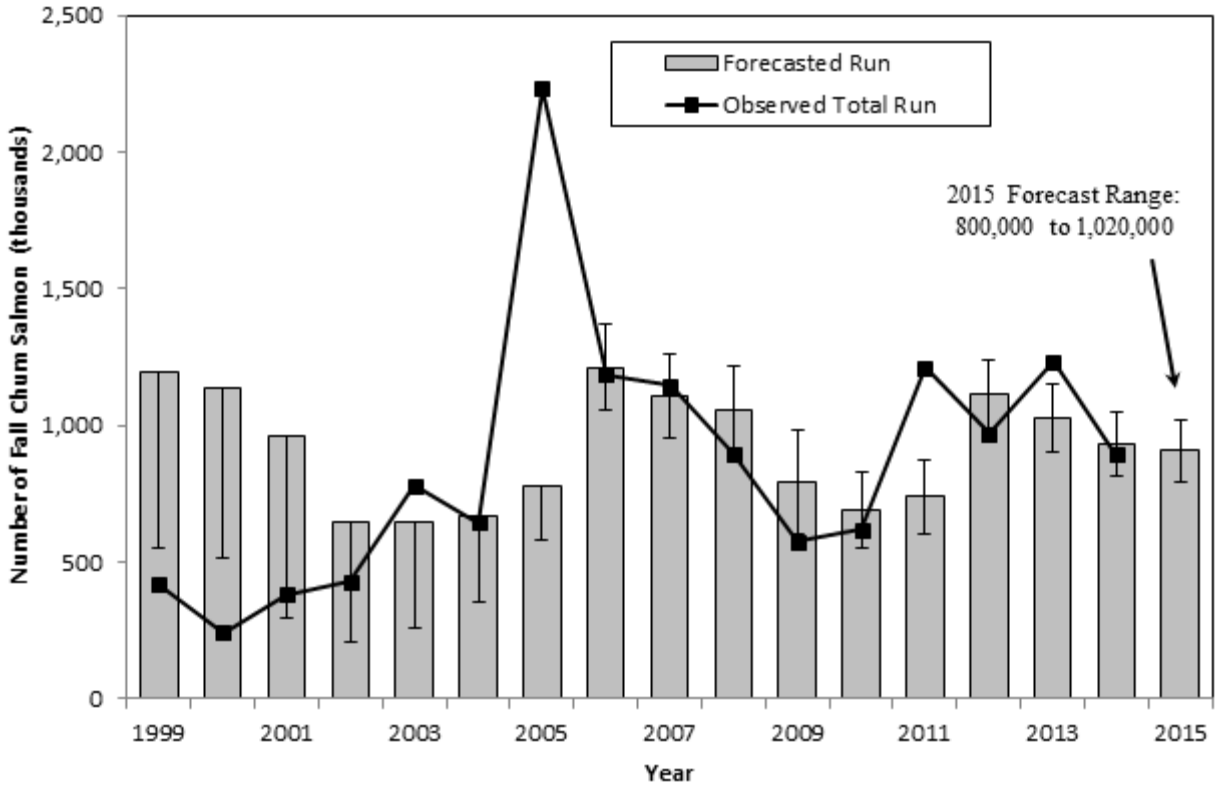

Figure I1.–Observed total run of fall chum salmon compared to the S-R estimates used in the annual forecast, Yukon River, 1999-2015.

Note: Different methods were used for determining bounds and are documented in annual Yukon River U.S./Canada Joint Technical Committee reports.