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Run Forecasts and Harvest Projections for 2007 Alaska Salmon Fisheries and Review of the 2006 Season

by

Doug Eggers

February 2007

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

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by

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February 2007

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LIST OF ACRONYMS

ADF&G	Alaska Department of Fish and Game
BEG	biological escapement goal
BOF	Board of Fisheries
CIAA	Cook Inlet Aquaculture Association
CPF	Commercial Common Property Fishery
CPUE	catch per unit effort
DIPAC	Douglas Island Pink and Chum
LCI	Lower Cook Inlet
NOAA	National Oceanic and Atmospheric Administration
NSRAA	Northern Southeast Regional Aquaculture Association
PWS	Prince William Sound
PWSAC	Prince William Sound Aquaculture Corporation
SDM	Southeast District Mainland
SEG	sustainable escapement goals
SSRAA	Southern Southeast Regional Aquaculture Association
UCI	Upper Cook Inlet
VFDA	Valdez Fisheries Development Association

ABSTRACT

The Alaska Department of Fish and Game (ADF&G) is expecting a significant increase in commercial salmon catches in 2007. The pink salmon (*Oncorhynchus gorbuscha*) harvest is expected to be higher than in 2006, the expected sockeye salmon (*O. nerka*) is expected to be similar to that in 2006, and chum salmon (*O. keta*) harvests are expected to be slightly higher than 2007. The 2007 commercial catch all-species projection of 179 million is distributed as 789,000 Chinook salmon (*O. tshawytscha*), 40.9 million sockeye salmon, 4.8 million coho salmon (*O. kisutch*), 108 million pink salmon, and 24.8 million chum salmon. Catch projections in Southeast Alaska, Kodiak, and Prince William Sound areas, where large hatchery runs occur, are 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 are based on averages of recent catch levels. Fishing effort influences average catch levels, and effort is partly determined by market conditions and size of salmon runs. Therefore these projections may not be indicative of potential harvest levels.

The primary goal of Alaska managers is to maintain spawning population sizes, and that goal may or may not coincide with reaching preseason catch projections. The 2006 exvessel value of the commercial harvest showed a slight decrease over the value of the catch in 2005. The preliminary estimate for the total value of Alaska's 2006 harvest is $308 million and below the $334 million in 2005; but above the $272 million for 2004, $212 million for 2003, $163 million in 2002, and $229 million for 2001.

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

The 2007 commercial salmon catch levels for 2007 are projected to be significantly increased from the harvest levels of 2006. The 2007 commercial catch all-species projection of 179 million is distributed as 789,000 Chinook salmon (*O. tshawytscha*), 40.9 million sockeye salmon, 4.8 million coho salmon (*O. kisutch*), 108 million pink salmon, and 24.8 million chum salmon. Table 1 shows specific projection numbers by species and fishing area. Catch projections generally reflect potential harvests for most of the major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon to the Southeast Alaska, Kodiak, and Prince William Sound areas. These projections are based on quantitative projections of next year's salmon run, using information on previous spawning levels, smolt outmigrations, returns of sibling age classes, and recent survival rates observed for hatchery releases. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, Prince William Sound, Kodiak, and the South Alaska Peninsula areas, the catch projections are based on averages of recent catch levels that are affected, to some extent, by recent levels of fishing effort. Recent levels of catch have been constrained in many areas by low fishing effort, thus catch levels are affected by both market conditions and size of salmon runs. Harvest projections for these fisheries may not be indicative of potential harvest levels. With the exception of the Southeast Alaska Chinook salmon fisheries, Alaskan salmon management will be based on actual observed salmon run strength. Alaska managers have the primary goal of maintaining spawning population sizes—not of reaching preseason catch projections.

At this time last year, department biologists were expecting an all-species commercial catch of 167 million for the 2006 season. As it turned out, the all-species catch reached 141 million. In 2006, the overall catch of pink salmon was 73 million compared to the preseason projection of 108 million. The lower-than-expected pink salmon catch in 2006 was due to a very weak 2006 pink salmon run to southern Southeast Alaska. The overall chum salmon catch was 21.1 million compared to the preseason projection of 17.6 million. Table 2 shows 2006 harvest numbers by

salmon species and fishing area, in units of fish harvested, and Table 3 provides this information in units of pounds harvested.

The 2006 exvessel value of the commercial harvest showed a slight decrease over the value of the catch in 2005. The preliminary estimate for the total value of Alaska's 2006 harvest is $308 million and below the $334 million in 2005; but above the $272 million for 2004, $212 million for 2003, $163 million in 2002, and $229 million for 2001.

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

Table 1.–Projections of 2007 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		1,462 [a]	2,784 [a]	47,000	2,500	53,746
Hatchery Production					13,248 [b]	13,248
Southeast Region Total	434 [c]	1,462	2,784	47,000	15,748	67,427
Prince William Sound						
Natural Production	44 [a]	1,377	316 [d]	10,900	254	12,892
Hatchery Production		1,073 [e]	239 [f]	30,068 [f]	3,505 [f]	34,884
Upper Cook Inlet	20 [a]	3,300	210 [a]	50 [g]	130 [a]	3,710
Lower Cook Inlet	1 [a]	304 [a]	15 [a]	1,065	82 [a]	1,467
Bristol Bay	145	26,340	56 [a]	1 [g]	1,017 [a]	27,558
Central Region Total	210	32,395	835	42,084	4,987	80,512
Kodiak						
Natural Production	20 [a]	1,469	459 [a]	8,000	896 [a]	10,844
Hatchery Production				4,550		4,550
Chignik	2 [a]	1,320	40 [a]	904 [g]	38 [a]	2,305
South Alaska Peninsula	5 [a]	1,838 [a]	165 [a]	5,253 [a]	1,177 [a]	8,438
North Alaska Peninsula	7 [a]	2,166 [a]	56 [a]	25 [a]	56 [a]	2,310
Westward Region Total	35	6,793	720	18,732	2,167	28,447
Arctic-Yukon-Kuskokwim Region Total	111	245	413	126	1,860	2,754
Statewide Total	789	40,895	4,751	107,942	24,762	179,139

Columns and rows may not total exactly due to rounding.

[a] Average harvest for the 5-year, 2002–2006, period.

[b] Projection of southeast Alaska hatchery chum salmon return of 8.539 million less broodstock (0.5 million). Hatchery projections made by Southeast Regional Aquaculture Association (SRAA), Northern Southeast Regional Aquaculture Association (NSRAA), and Douglas Island Pink and Chum (DIPAC).

[c] Average harvest for 3-year, 2004–2006, period.

[d] Average harvest for the 10-year, 1997–2006, period.

[e] Includes the harvest of Gulkana sockeye and preliminary forecasted return of Main Bay hatchery sockeye less broodstock requirements. Forecasts made by Prince William Sound Aquaculture Association (PWSAA).

[f] Preliminary forecasted returns to PWSAA and Valdez Fisheries Development Association (VFDA) hatcheries less broodstock requirements. Forecasts made by PWSAC and VFDA.

[g] 5-year average of even-year harvests.

Table 2.–Preliminary 2006 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	370 [a]	1,332	2,100	11,663	13,990	29,455
Prince William Sound	32	2,524	761	21,673	2,181	27,172
Upper Cook Inlet	18	2,214	175	399	65	2,871
Lower Cook Inlet	1	224	32	1,472	72	1,801
Bristol Bay	106	28,660	79	145	1,818	30,808
Central Region Total	156	33,623	1,047	23,689	4,136	62,651
Kodiak Area	20	1,584	553	31,693	1,081	34,932
Chignik	2	896	39	384	62	1,383
South Peninsula & Aleutians	5	1,838	165	5,253	1,177	8,438
North Peninsula	8	2,375	94	64	132	2,673
Westward Region Total	35	6,693	851	37,394	2,452	47,425
Arctic-Yukon-Kuskokwim Region Total	71	149	421	0	510	1,151
Total Alaska	632	41,797	4,419	72,746	21,088	140,682

Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
Columns may not total exactly due to rounding.
[a] Total commercial harvest of Chinook salmon for the October 1, 2005 to September 30, 2006 catch accounting period.

Table 3.–Preliminary 2006 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	5,422	7,321	14,043	46,945	124,657	198,388
Prince William Sound	646	14,112	6,796	78,024	19,001	118,579
Upper Cook Inlet	333	11,177	1,117	1,738	486	14,851
Lower Cook Inlet	9	1,013	239	5,235	599	7,095
Bristol Bay	1,770	165,200	375	500	13,700	181,545
Central Region Total	2,758	191,502	8,527	85,497	33,786	322,070
Kodiak Area	209	8,086	4,315	117,383	9,095	139,088
Chignik	32	5,805	291	1,403	451	7,982
South Peninsula & Aleutians	94	10,947	998	17,829	8,854	38,724
North Peninsula	86	13,316	703	224	966	15,295
Westward Region Total	421	38,155	6,307	136,839	19,366	201,089
Arctic-Yukon-Kuskokwim Region Total	1,203	948	2,673	0	3,608	8,432
Total Alaska	9,800	237,900	31,600	269,300	181,400	730,000

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

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

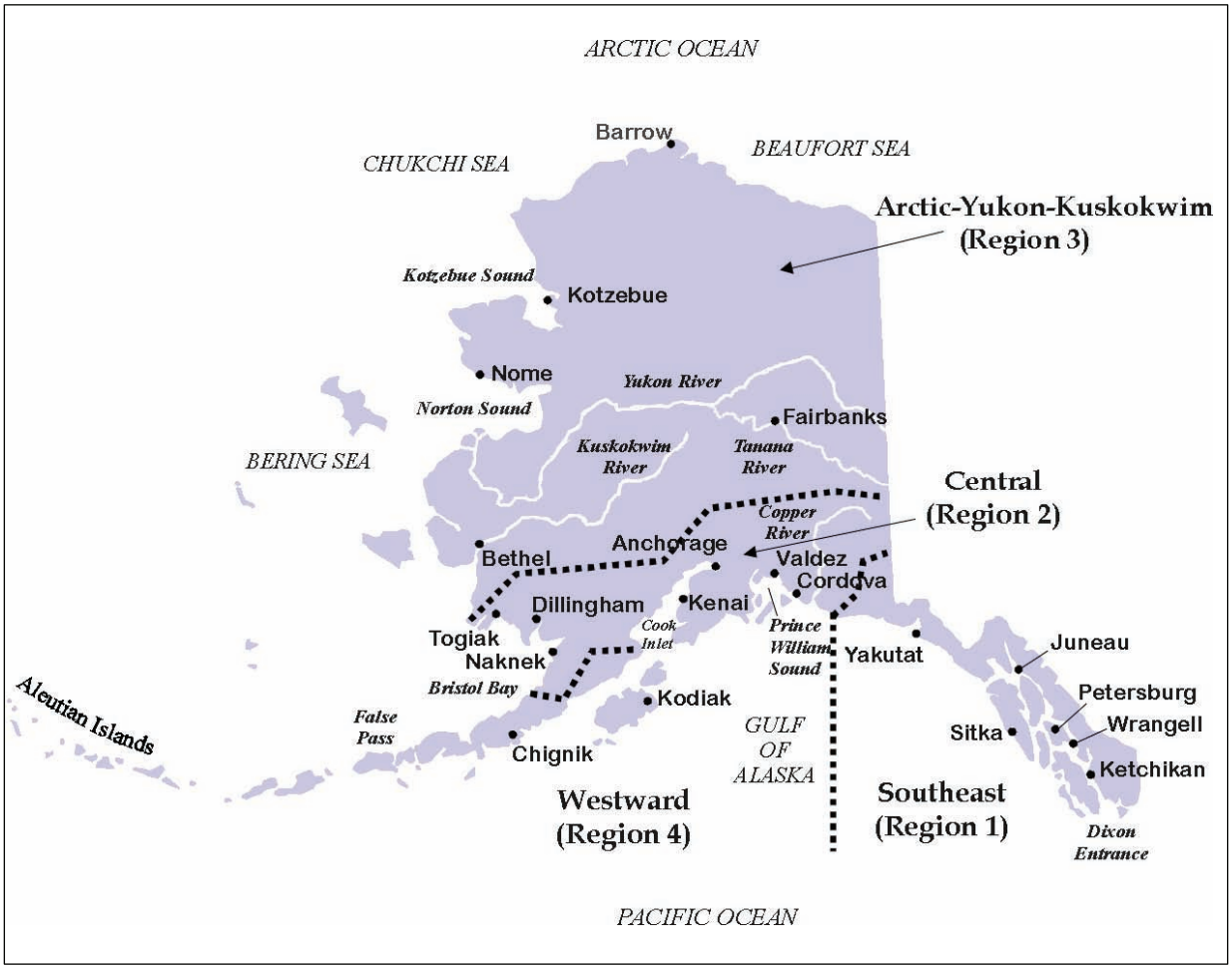

Figure 1.–The four fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Alaska Department of Fish and Game, Division of Commercial Fisheries.

Forecasts of runs (catch+escapement) for major salmon fisheries and projections of the statewide commercial salmon harvest have been published every year by ADF&G since 1969 (ADF&G 1969–1973, 1975–1983; Eggers 1985, 1986; Eggers and Dean 1987, 1988; Geiger and Savikko, 1989 to 1993; Geiger and Simpson 1994, 1995; and Geiger and Frenette 1996, 1997; Geiger et. al. 1997; Hart et. al. 1998; Geiger and Hart 1999; Scott and Geiger 2000; Geiger and McNair 2001, Eggers 2002, Eggers 2003, Plotnick and Eggers 2004, Eggers 2005, Eggers 2006). Though the department does not produce formal run size forecasts for all salmon runs in the state, local salmon biologists prepare harvest projections or harvest outlooks for all areas. Projections are based on formal forecasts when available. When the formal forecasts are not available, local biologists use average historical catches and local knowledge of recent events to develop these outlooks. Projections for the 2007 Alaska commercial salmon harvest, by species and area, are found in Table 1. Harvest outlooks for the Arctic-Yukon-Kuskokwim Region are developed as

ranges; these ranges are listed in Appendix A.9. Trends in total statewide salmon harvests and catch projections in numbers of fish, by species, are found in Figures 2–6 (pages 44–48). Tables 2–7 provide detailed information on the 2006 harvest.

This report contains a detailed review of Alaska's 2006 commercial salmon season. We normally release it before final catch figures are available to provide preliminary information to the Board of Fisheries (BOF), the fishing industry, and the public.

Predominant ages and brood years for 2007 salmon runs, by species, are as follows:

	Age of Returning Salmon in Years				
Species	2	3	4	5	6
Pink	2005				
Chum		2004	2003	2002	
Coho		2004	2003		
Sockeye			2003	2002	2001
Chinook			2003	2002	2001

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

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

DEFINITIONS OF TERMS

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

PRELIMINARY REVIEW OF THE 2006 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT

The most remarkable feature of the 2006 Southeast Alaska commercial fishery was the large drop in pink salmon catch. Although exvessel values are estimated inaccurately at this time of the year, as the final processor reports have not yet been submitted, the exvessel value of the 2006 commercial

harvest was estimated to be about $95 million. That figure is up from the value of $85 million, reported for the 2005 fishery or the $84 million reported for the 2004 fishery. Notably, the chum salmon harvest was worth over $43 million in 2006, up from an average value of around $20 million over the last five years; the chum salmon harvest was worth $17 million in 2005. Additionally, 1,815 limited entry permits reported landings this year, which is an increase in participation in the commercial salmon fishery over the 1,797 permits that reported landings in 2005.

The Southeast region's cumulative all-gear commercial harvest, including hatchery cost recovery, was 29.5 million fish (Tables 2 and 4). The harvest was distributed among species as follows: <2% Chinook, 5% sockeye, 7% coho, 39% pink, and 48% chum salmon. In contrast, the 2005 the all-gear commercial harvest was 85% pink salmon and only 9% chum salmon.

The all-gear commercial pink salmon harvest of 11.7 million is the lowest since 1987 and is significantly below the preseason expectation of 52 million fish. This forecast was based on recent year catch trends and adequate escapements in 2003. Only 10.9 million pink salmon were harvested in traditional common property fisheries (not including hatchery cost recovery or the Annette Island fishery). The purse seine fleet harvested 93% of these pink salmon in the common property fishery. Pink salmon runs and harvests were uneven throughout the region, with harvests stronger in the northern end. The biological escapement goals (BEG) for all three subregions were met, although escapement distribution was somewhat uneven. Additionally, the escapement was just inside of the goal range in Southern Southeast (Districts 101–108) because of weak runs to Districts 101, 105, 106, and 107 (and parts of 103). The total southern Southeast Alaska pink salmon harvest was just 3.3 million—the lowest harvest in this area since 1975.

The total harvest of chum salmon by all fisheries was 14 million, including 4.9 million (35%) harvested in private hatchery fisheries, 4.7 million (34%) in hatchery terminal fisheries and 4.1 million (29%) in traditional area fisheries. This was the largest chum salmon return to Southeast Alaska since 2000—and coupled with weak pink returns represented 46% of the value of salmon fisheries in the region. Of the 8.9 million chum harvested in common property fisheries 63% were harvested by purse seine and 35% were harvested by drift gillnet fleets. Strong hatchery returns to Douglas Island Pink and Chum (DIPAC), Northern Southeast Regional Aquaculture Association (NSRAA) and the Southern Southeast Regional Aquaculture Association (SSRAA) hatchery programs, supplemented by good wild returns, all contributed to the harvest. Chum salmon escapements were generally good. The weighted chum salmon index of peak survey counts was just above the 21-year average, well above the 2005 index value. The total harvest of wild summer-run chum salmon at Tenakee Inlet was about 46% higher than the recent 10-year average, and the peak escapement count was 80% higher than the recent 10-year average.

The commercial harvest of sockeye salmon was slightly below recent average catch levels. The all-gear commercial catch was 1.3 million, down from 1.6 million in 2005 but near the average for this species. The traditional common property harvest (not including hatchery cost recovery or the Annette Island fishery) amounted to 1.2 million sockeye salmon. The drift gillnet fleet captured 51% of the commercial sockeye harvest, the seine fleet 34%, and set gillnet harvested 10% in the Yakutat area. Sockeye escapements throughout the region were generally good although estimated escapements to McDonald Lake in southern Southeast were notably poor. Ten of thirteen sockeye stocks with escapement goals were within or above the goal ranges.

The commercial harvest of coho salmon was 2.1 million, near the long-term average but below the previous two years, which were near 3.0 million. The common property harvest of coho salmon was 1.8 million, of which 75% were harvested by commercial troll fisheries, and the rest was divided

among drift gillnet, purse seine and Yakutat area setnet fisheries. Commercial troll harvests were generally stronger in northern southeast areas and harvest patterns indicated late return timing. Coho escapements were at or above escapement goal ranges throughout the region.

The Chinook harvest for 2006 was 370,000 fish valued at $18 million. By gear type, 76% of Chinook salmon were harvested by troll fisheries and 12% by drift gillnet fisheries. Chinook harvests in Alaska are controlled by the Pacific Salmon Treaty harvest sharing agreements, abundance, and hatchery production. In 2006, around 40,000 transboundary river Chinook salmon, returning to the Taku and Stikine rivers, were harvested in recently re-established, directed fisheries. Overall, Chinook harvests were down from 462,000 fish in 2005, 497,000 fish in 2004 and 437,000 fish in 2003. The Chinook fishery value in 2006 was at a record level—the highest since the onset of the Pacific Salmon Treaty in 1985.

Table 4.–Preliminary 2006 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

Fishery	Chinook	Sockeye	Coho	Pink	Chum	Total [a b]
Southern Seine[c] Total	20	346	63	2,570	1,803	4,801
Northern Seine[d] Total	6	68	47	7,522	3,811	11,454
Drift Gillnet	46	625	252	744	3,127	4,794
Tree Point	0	140	55	85	696	975
Prince of Wales	2	92	69	150	268	581
Stikine	29	61	34	57	344	525
Taku-Snettisham	11	135	59	185	382	772
Lynn Canal	2	63	29	213	269	576
Hatchery Terminal	2	134	6	54	1,168	1,364
Set Gillnet	1	139	86	89	1	316
Hand Troll [e]	16	0	74	3	0	95
Traditional	12	0	74	3	0	90
Hatchery Terminal	1	0	0	0	0	1
Experimental	4	0	0	0	0	4
Power Troll [e]	266	8	1,289	57	153	1,772
Traditional	233	8	1,282	53	117	1,693
Hatchery Terminal	0	0	3	0	11	14
Experimental	33	0	4	4	25	66
Total Annette Island Res.	1	21	30	263	160	476
Seine	0	13	5	126	29	173
Drift Gillnet	1	8	25	137	132	303
Total Annette Island Troll [e]	0	0	0	0	0	0
Hand Troll	0	0	0	0	0	0
Power Troll	0	0	0	0	0	0
Trap	0	0	0	0	0	0
Hatchery Cost Recovery	13	124	254	371	4,908	5,671
Miscellaneous [f]	1	2	5	43	26	78
Southeast Region Total	370	1,332	2,100	11,663	13,990	29,455

[a] Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.
[b] Columns may not total exactly due to rounding error.
[c] Districts 101–108.
[d] Districts 109–114.
[e] Catch accounting period for the 2006 Chinook salmon season goes from October 1, 2005 through September 30, 2006.
[f] Includes salmon that were confiscated, caught in sportfish derbies, or commercial test fisheries, and sold.

PRINCE WILLIAM SOUND

The 2006 Prince William Sound (PWS) Area commercial salmon harvest was 27.2 million fish. The harvest was comprised of 21.7 million pink, 2.5 million sockeye, 2.2 million chum, 761,000 coho, and 32,000 Chinook salmon (Table 5). Harvest estimates are preliminary at this time and may change. The 2006 harvest was composed of 16.3 million Commercial Common Property Fishery (CPF) fish (60%), and 10.9 million fish (40%) for hatchery cost recovery.

Copper River District. The commercial season began on Monday, May 15. As per modifications made to the Copper River King Salmon Management Plan, (5 AAC 24.361) at the December 2005 BOF meeting, there was only one period per week during statistical weeks 20 and 21 where commercial fishing was permitted inside of the barrier islands as defined in 5 AAC 24.350(1)(B).

The 2006 commercial harvest forecast for the Copper River District was 46,800 Chinook, 1,007,400 sockeye, and 294,200 coho salmon. The Gulkana Hatchery was expected to contribute 152,800 sockeye salmon to the 2006 commercial harvest. The actual 2006 sockeye salmon harvest of 1,497,000 ranked as the fifth largest in the last 116 years. The preliminary harvest composition was 1,274,000 (87%) wild sockeye, 132,000 (9%) Gulkana hatchery sockeye, and 56,800 (3%) Main Bay sockeye salmon. The harvest of 30,000 Chinook salmon was below the 10-year average harvest of 49,900 fish. The current coho salmon harvest of 318,000 fish is above the 10-year average harvest of 262,800 fish.

The 2006 inriver goal for salmon passing the Miles Lake sonar site was set at 637,000 to 837,000 fish. The 2006 sonar escapement estimate was 959,731 fish.

Bering River District. Opening in early June, the Bering River District is managed concurrently with the Copper River District. The 2006 harvest of 36,800 sockeye salmon was above the recent 10-year average of 18,500 fish. The coho salmon harvest of 57,000 fish was above the 10-year harvest average of 48,200 fish.

Coghill District (Drift Gillnet). The common property harvest totaled 564,000 chum salmon—a seine harvest of 298,300 fish and a drift gillnet harvest of 266,000 fish. Prince William Sound Aquaculture Corporation (PWSAC) harvested 1,036,800 chum salmon for cost recovery and broodstock. The Coghill Lake sockeye salmon escapement of 23,479 fish was within the BEG range (20,000–40,000 fish). The total common property harvest was 102,000 sockeye salmon with 89,500 of Main Bay Hatchery origin. The majority of the sockeye salmon, 97,000, were harvested by the drift gillnet fleet. The coho salmon harvest of 97,000 exceeds the PWSAC forecast of 54,000 enhanced fish. The majority of those fish were harvested by the drift gillnet fleet. Additionally, a small portion of those fish were likely wild stock.

Eshamy District. The ADF&G preseason forecast for Eshamy Lake was 45,200 wild sockeye salmon, and PWSAC forecast a return of 512,000 Main Bay Hatchery sockeye salmon. The harvest of ~854,000 Main Bay sockeye salmon to the Eshamy District was almost double the forecast. The PWSAC achieved their 2006 sockeye salmon cost recovery goal. The Eshamy District harvest was composed of 348,000 (41%) cost recovery fish, 124,000 (15%) set gillnet fish, and 382,000 (44%) drift gillnet fleet fish. Additionally, 56,800 sockeye salmon of Main Bay origin were harvested in the Copper River District and 89,600 were harvested in the Coghill District. Hatchery sockeye salmon contributions (91%; August 7–9) in the Eshamy District remained above wild sockeye salmon well into August. Set gillnet effort dropped off markedly after July 31. The BEG range (20,000–40,000 fish) at Eshamy Lake was surpassed with 41,823 sockeye salmon passing through the weir between July 8 and August 25.

Unakwik District. The ADF&G preseason harvest forecast for the Unakwik District was 7,902 sockeye salmon. The Unakwik District CPF was 698 sockeye salmon by the drift gillnet fleet. This was below the 10-year average of 7,902 sockeye salmon. Harvests over the last 25 years ranged from 247 in 1990 to 48,947 in 1982.

Purse Seine Fisheries. The 2006 PWS chum salmon preseason forecast was 3.5 million fish. The majority (2.9 million fish, or 84%) was anticipated to be the result of PWSAC hatchery production. The Wally Noerenberg Hatchery had a total return of ~1.6 million chum salmon out of a preseason forecast of ~2.0 million fish. The PWSAC harvested 1.0 million chum salmon (64%) for cost recovery and broodstock, but did not achieve their 2006 chum salmon cost recovery goal. The Coghill District had a seine harvest of 298,300 fish and a drift gillnet harvest of 266,000 fish. The proportion of wild chum salmon is unknown at this time. Port Chalmers remote release chum salmon harvest of ~480,000 fish was almost exactly on forecast. However, the Armin F. Koernig Hatchery remote release chum salmon experienced a run failure with a harvest of 100,000 fish out of the forecast 380,000 fish.

The 2006 PWS pink salmon preseason harvest forecast was 28.5 million fish. This estimate included 2.7 million wild fish, 11.6 million Valdez Fisheries Development Association (VFDA) fish, and 15.3 million PWSAC hatchery fish. Pink salmon returns were below forecast for both PWSAC and VFDA. The PWSAC total return was ~12.6 million fish and the VFDA total return was ~9.0 million fish. The total 2006 harvest was 21.7 million fish composed of 12.0 million CPF harvest, 6.5 million fish for PWSAC cost recovery, and 3.2 million fish for VFDA cost recovery. The proportion of wild stock pink salmon is unknown at this time. The PWSAC harvested approximately 54% of the 12.6 million pink salmon return for cost recovery, but did not achieve their 2006 pink salmon cost recovery goal. The VFDA harvested approximately 41% of the 9.0 million pink salmon return for cost recovery and broodstock, and achieved their 2006 pink salmon cost recovery goal.

The 2006 VFDA coho salmon return was anticipated to be 240,100 fish. The purse seine fleet harvested ~216,000 fish in the Eastern District. The majority of these fish are assumed to be VFDA stock. The seine fleet also harvested 17,000 fish in the Coghill District (the majority assumed to be PWSAC enhanced fish).

A couple of noteworthy events occurred in 2006 that affect allocation. First, the seine fleet had exclusive access to the Esther Subdistrict and the Granite Bay Subdistrict was closed. However, the seine fleet only had two fishing periods in Granite Bay Subdistrict and one in the Esther Subdistrict because of slow chum salmon run entry and cost recovery progress. In late June, large numbers of chum salmon were present in the Granite Bay Subdistrict and the department was concerned about deteriorating quality. The PWS Allocation Plan states that an emergency order opening shall be used to prevent fish quality deterioration in the Granite Bay Subdistrict. The Esther and Granite Bay subdistricts were opened, most of the enhanced chum salmon were harvested, and quality concerns were alleviated. With exclusive access to the Esther Subdistrict and Granite Bay Subdistrict closed, the seine fleet harvested only 52% of Wally Noerenberg Hatchery CPF chum salmon.

Second, PWSAC enhanced salmon did not return according to forecast. The PWSAC pink and chum salmon returns were below anticipated levels and the Main Bay Hatchery sockeye salmon and Wally Noerenberg Hatchery coho salmon returned higher than expected. The affect on allocation was to reduce harvest for the seine fleet and increase harvests for the drift and set gillnet fleets.

Table 5.–Preliminary 2006 Central Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Purse Seine						
Eastern	0	5	221	5,708	113	6,046
Northern	0	1	14	1,332	51	1,398
Coghill	0	6	17	1,348	298	1,669
Southwestern	0	24	14	3,269	108	3,415
Montague	0	2	0	144	446	592
Southeastern	0	0	0	22	17	39
Unakwik	0	0	0	0	0	0
Drift Gillnet						
Bering River	0	37	57	0	0	94
Copper River	30	1,497	318	31	17	1,893
Unakwik	0	1	0	0	0	1
Coghill	0	96	97	25	266	484
Eshamy	0	382	5	90	31	508
Set Gillnet						
Eshamy	0	124	0	21	10	155
Hatchery [a]	0	348	17	9,684	825	10,874
Misc. PWS [b]	1	2	0	0	0	3
Prince William Sound	32	2,524	761	21,673	2,181	27,172
Southern District	1	90	3	264	2	359
Kamishak District	0	65	24	82	57	228
Outer District	0	3	1	1,122	13	1,139
Eastern District	0	67	4	3	0	75
Lower Cook Inlet Total	1	224	32	1,472	72	1,801
Central District	14	2,203	156	397	65	2,835
Northern District	4	11	19	2	0	36
Upper Cook Inlet Total	18	2,214	175	399	65	2,871
Naknek-Kvichak District	2	7,154	5	24	220	7,405
Nushagak District	84	11,062	44	39	1,151	12,380
Egegik District	1	7,391	27	1	78	7,498
Ugashik District	3	2,427	3		129	2,562
Togiak District	16	626	0	81	240	963
Bristol Bay Total	106	28,660	79	145	1,818	30,808
Central Region Total	156	33,623	1,047	23,689	4,136	62,651

[a] Hatchery sales for operating expenses. Includes meal production/roe salvage sales, processor discards. Excludes post egg-take roe sales at hatcheries.
[b] Does not include salmon taken for home use as reported on fish tickets.
Missing data indicates no harvest and zeros indicate harvest activity but <1,000.
Columns may not total exactly due to rounding

COOK INLET

Upper Cook Inlet

The 2006 Upper Cook Inlet (UCI) commercial harvest of 2.9 million salmon is significantly below the average long-term and short-term harvest in UCI (Table 5). While all five species of

Pacific salmon are present in UCI, the primary focus of the commercial fishery is sockeye salmon. Sockeye salmon escapement goals to the five monitored systems in UCI were within or above the escapement goal range for all of the sockeye stocks. The Kenai, Kasilof and Crescent Rivers were all above the upper end of the inriver sonar goal ranges. The Kenai River sonar count was approximately 60% over the upper range, and the Kasilof and Crescent Rivers were both approximately 30% over the upper end of the BEG ranges. The final inriver sonar estimate for the Yentna River of 92,896 and the Fish Creek weir escapement estimate of 32,562 were both just above the lower ends of the escapement goal ranges for each system.

Sockeye Salmon. The preseason forecast for the 2006 season projected a run of 3.6 million fish, with a harvest estimate (sport, personal use, and commercial) of 2.1 million fish. The total run to the Kenai River was forecasted to be 1.8 million fish. For most of the season, this resulted in managing for an inriver sonar goal range of 650,000–850,000 fish. By August 7, the actual return to the Kenai River was projected to be between 2.2 million and 2.5 million fish, resulting in the inriver sonar goal range changing to 750,000–950,000 fish. The run in 2006 was more than five days late. Nearly 530,000 fish passed the Kenai River sonar after the commercial season ended on August 10, and 860,000 fish (or 57%) passed in August, the largest August component of sonar passage on record. The final inriver sonar count in the Kenai River was 1.5 million fish—550,000 fish over the upper end of the sonar goal range. The runs to both the Kenai and Susitna Rivers were significantly later than normal, resulting in long-term restrictions to the majority of the commercial fishery in UCI. Because the Kasilof River run was exceeding escapement objectives early in the run, the Kasilof River Special Harvest Area was used aggressively in an attempt to harvest sockeye surplus to escapement needs. In 2006 approximately one-third of the entire inlet harvest was taken in approximately three square miles of water in the river terminus. The aggressive use of this terminal harvest area impacted product quality, price, and "traditional" harvest areas and gear types to a degree that was not contemplated when this management plan was crafted.

The UCI commercial harvest of 2.2 million fish was slightly above the preseason forecast harvest estimate, while the total run of sockeye salmon to UCI of 5.0 million was 38% more than the preseason forecast. Returns to systems other than the Kenai and Kasilof Rivers were reasonably close to the forecasted returns. The Kasilof River run was 77% over the forecast and the Kenai River run was nearly 40% over the forecast. Because these two runs are generally much larger than other systems within the inlet, the overall run in 2006 was 38% larger than forecasted.

Sockeye salmon prices at the beginning of the season ranged from $1.00 to $1.50 per pound. Typically this price is adjusted upwards by the end of the season, but because of the large number of small, poor quality fish harvested in the Kasilof River Special Harvest Area this price dropped to a range of $0.90 to $0.95 per pound for most of the season. The total exvessel value in UCI for sockeye salmon was $12.3 million, which was 89% of the total UCI exvessel value.

Coho Salmon. The 2006 coho salmon harvest of 175,000 was below the recent 10-year average harvest and approximately half of the 1966–2005 long-term average coho salmon harvest. The coho salmon run in 2006 was judged to be very strong. The relatively 2006 low coho salmon harvest in UCI was caused by restrictions to the Northern District set gillnet fishery and the Central District drift gillnet fishery, both of which were closed or restricted for the majority of the season due to sockeye concerns in the Susitna and Kenai Rivers. Commercial coho salmon harvests in UCI during the 1980s and early 1990s were much higher than the long-term average due to good coho salmon production and strong sockeye salmon returns to UCI, resulting in

more fishing time in the Central District. Since 1996, BOF regulations have reduced the fishing time of the drift fleet in the Central District and eliminated additional fishing time directed at coho salmon surpluses in the Northern District, Kalgin Island and Upper Subdistricts of the Central District, resulting in marked reductions in the commercial exploitation of this species. The only significant coho salmon return to UCI that is monitored with an escapement goal is the Little Susitna River. In 2006, the escapement count was slightly below the escapement goal range. However, the weir was flooded for approximately 14 days at the height of the return and no estimation has been made for what was missed. The exvessel value of coho salmon to the commercial fishery was approximately $667,000, or 4.8% of the total UCI exvessel value.

Pink Salmon. Approximately 400,000 pink salmon were harvested in 2006. This figure is a little less than the recent 10-year average even-year pink salmon harvest and about half of the long-term average even-year harvest since 1966. Pink salmon harvests were impacted by the restrictions implemented for sockeye salmon, but were augmented by more effort remaining at the end of the season. Pink salmon escapements are not monitored in UCI to an appreciable degree, but it appears that escapements to most river systems were very good. Prices paid for pink salmon were approximately $0.10 per pound, resulting in an exvessel value for this species of $175,000, which is just over 1% of the total UCI exvessel value.

Chum Salmon. The 2006 harvest of 65,000 chum salmon was well below the long-term average harvest of approximately 500,000 fish. The 2006 chum salmon harvest was approximately 50% less than the recent 10-year average harvest. Much of this reduction in harvest is the result of reduced fishing time in traditional areas, primarily by the drift fleet, due to sockeye salmon concerns. Since the flood of 1986, chum salmon production in much of south central Alaska has been poor, with recent harvests well below the long-term average harvest. From 1995–1996, chum salmon production has increased. Chum salmon runs to most of Cook Inlet in 2006 were good by recent standards. The exvessel value of chum salmon to the commercial fishery was approximately $121,000, or 1% of the total UCI exvessel value.

Chinook Salmon. The 2006 harvest of 18,000 Chinook salmon is slightly above both the long- and short-term average harvest. The two fisheries where Chinook salmon are harvested in appreciable numbers in UCI are in the setnet fisheries in the Northern District and in the Upper Subdistrict of the Central District. After experiencing a significant downturn in the early to mid-1990s, Northern District Chinook salmon stocks continue to trend sharply upward and most escapement goals are being met or exceeded. Harvests in the Northern District fishery remain well below the harvest cap of 12,500 fish due to reduced participation and regulatory closures of the highest producing fishing sites located north of Theodore River. Changes made by the BOF to the 2005 regulations—which lengthened the fishing periods from six hours to twelve hours on Mondays—likely increased harvests in 2006. The 2006 harvest of 4,400 fish in the Northern District is double the recent 10-year average harvest of 2,200 fish. In 2006, the commercial harvest of 10,800 fish in the Upper Subdistrict set gillnet fishery was about equal to the average Chinook salmon harvests since 1966, when harvest records specific to fishery are available. Late-run Kenai River Chinook salmon runs have been relatively stable and escapement objectives have been consistently achieved or exceeded. Beginning in 1999, one 24-hour closed period per week was mandated for the set gillnet fishery in the Upper Subdistrict. Since that time, longer closed periods of 48 hours or two shorter closed periods each week, a 24-hour and a 36-hour closed period, have also been put into regulation. The purpose of these closed periods was to pass fish into the inriver recreational fishery for the weekend; however, the closed periods may be increasing commercial Chinook salmon harvests instead. In essence, during the window

periods large numbers of sockeye salmon may escape into the Kenai and Kasilof Rivers, which in turn requires fishing all the hours remaining in the plans in an attempt to keep sockeye salmon escapements within the escapement goal ranges. This may result in increased Chinook salmon harvest in the set gillnet fishery. In 2006, the exvessel value for Chinook salmon was $584,000, which is approximately 4.2% of the total UCI exvessel value.

Lower Cook Inlet

The preliminary 2006 Lower Cook Inlet (LCI) all-species commercial salmon harvest of 1.8 million fish was the fifth highest during the past decade, exceeding the most recent 20-year average but falling short of the recent 10-year average. The overall harvest exceeded the preseason forecast by more than 50%, yielding an estimated exvessel value of just over $1.9 million, which surpassed that of the 2005 season but was approximately equal to the average value over the past 10 years. As has been the case for many years, LCI commercial salmon harvests in 2006 relied heavily on the success of hatchery and enhanced fisheries production. An estimated 83% of the sockeye salmon catch was attributed to Cook Inlet Aquaculture Association (CIAA) lake stocking and fertilization projects at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District. Pink salmon production from Port Graham Hatchery failed to achieve the preseason forecast of 691,000 fish, with a preliminary total return estimated at around 281,000 fish. The harvest of this species returning to the facility, at 248,000 fish, comprised about 14% of the all-species catch for the management area and about 17% of the pink salmon catch. As is usually the case since LCI hatchery programs were taken over by private non-profit agencies, a significant portion of the salmon harvest was taken and utilized for hatchery cost recovery this season. An estimated 19% of the total salmon catch was taken by CIAA and Port Graham Hatchery Corporation as hatchery cost recovery to support the sockeye lake stocking programs and Port Graham Hatchery operations, which is about 20% of the exvessel value of the 2006 LCI salmon fishery.

Returns of naturally produced sockeye salmon were reasonably good, with sustainable escapement goals (SEG) attained at all five major systems in the management area. Additionally, returns to the two sockeye systems with a combination of natural and enhanced production also achieved their established goals. Natural returns of pink salmon in LCI were considered mixed, with several systems (Port Dick-Outer District, Bruin Bay-Kamishak Bay District) experiencing exceptionally strong runs this season. All of the major monitored pink salmon systems in the management area met or exceeded their SEGs. Another bright spot in the management area was the continuation of relatively strong chum salmon returns. Chum salmon SEGs were achieved at nearly all systems while commercial harvests totaled almost 72,000 fish—the fifth highest total for this species in LCI since 1988. The LCI chum salmon harvest in 2006 represented the seventh consecutive year of good catches. Additionally, escapement of chum salmon into McNeil River in the Kamishak Bay District achieved the established SEG for a second consecutive season but only the fifth time since 1990. Coho catches in LCI represented the second highest total on record at nearly 31,000 fish, providing another highlight for the management area.

Sockeye Salmon. The 2006 commercial sockeye salmon harvest of 224,000 fish represents the third lowest catch for the LCI management area over the past decade and about 70% of the recent 10-year average. As is typical, sockeye salmon accounted for a relatively low percentage (~13%) of the landings in numbers of fish this season, but due to the price differential, comprised over 50% of the exvessel value of the fishery. With a combined preseason forecast of 149,000

fish returning to Leisure and Hazel Lakes in the Southern District, actual harvests of these enhanced runs were substantially less than expected, with a catch estimated at only 75,000 fish, representing roughly one-third of the entire LCI sockeye total. At Bear Lake in Resurrection Bay of the Eastern District, the actual catch of nearly 62,500 fish virtually achieved the forecasted harvest of 63,300 fish. Additionally, management efforts to equalize sockeye harvest in Resurrection Bay between hatchery and common property user groups, as required by regulation, resulted in a harvest slightly favoring CIAA, with an estimated 55% of the catch taken for hatchery harvest versus 45% for seiners. This was a significant improvement over the previous season, the first for the aforementioned Resurrection Bay regulatory scheme, when the catch ratio was approximately 66%/34% in favor of CIAA. In the Kamishak Bay District, the enhanced return to Kirschner Lake produced a harvest of 49,000 fish—over twice the preseason forecast of 24,200 fish.

The 2006 commercial set gillnet harvest of about 14,000 sockeyes represented the third consecutive year of poor catches for that gear group in LCI and was lowest total since 1994. The closure of the Port Graham Subdistrict set gillnet fishery for nearly all but the last month (September) of the 2006 season, primarily to protect sockeyes returning to English Bay Lakes for escapement purposes, contributed to the low set gillnet catches. The closure did, however, aid in attaining the SEG for English Bay Lakes, with a final escapement into the lake system estimated at over 15,000 fish. The forecasted weak sockeye return to that system also forced a closure of the local subsistence and sport fisheries for the early portion of that run, but those fisheries were reopened near the end of June once attainment of the SEG was projected. The success of an ongoing sockeye salmon enhancement/rehabilitation project at English Bay Lakes, originally initiated by ADF&G in the late 1980s and presently being conducted by Chugach Regional Resources Commission in conjunction with the village of Nanwalek, is expected have a significant effect on future harvest levels in Port Graham Subdistrict subsistence, commercial, and sport fisheries.

Natural returns of sockeye salmon were considered relatively good, with all five major systems achieving their respective SEGs. In the Outer District, Delight Lake achieved an escapement near the upper end of its SEG range with a combined weir/aerial count of about 11,000 fish, while escapement at nearby Desire Lake slightly exceeded the SEG with a peak aerial estimate of 19,000 fish. Marine waters around Delight Lake remained closed to commercial fishing for the entire season to protect fish for escapement, but seiners near Desire Lake harvested just over 3,100 fish. The sockeye return to Mikfik Lake in the Kamishak Bay District experienced only minimal directed effort in 2006, resulting in a catch of 1,200 fish, while escapement exceeded the SEG (6,000–12,000 fish), with a final peak aerial estimate of nearly 18,000 fish into the lake. Also in the Kamishak Bay District, the sockeye return to Chenik Lake was strong for a fourth straight season, slightly exceeding the SEG with a total of just under 14,000 fish into the lake, while additionally providing seiners with an estimated harvest totaling 14,000 fish. At Aialik Lake in the Eastern District, nearby marine waters were opened to seining in mid-July, but by then the run had already peaked and the minimal effort resulted in a harvest of 4,600 fish. This harvest is considered quite good given the small size of the system. With an estimate of 4,800 fish, the final escapement at Aialik Lake fell within the SEG range (3,700–8,000 fish).

Pink Salmon. Harvest of pink salmon, the dominant species in numbers of fish in LCI, substantially exceeded preseason forecasts in 2006, with an overall catch of nearly 1.5 million fish. Although natural returns of pinks were relatively mixed, returns to Port Dick in the Outer District were astonishing given the modest preseason outlook, and catches from this location

dominated commercial harvests this season. Despite the surprisingly good catches from Port Dick, the area-wide catch of pink salmon fell slightly short of the most recent 10-year average, primarily because operation of the LCI area's major hatchery at Tutka Bay in the Southern District was suspended, and therefore no hatchery-produced adult pink salmon returned to that facility for the first time since 1977. Approximately 257,000 fish, or about 18% of the management area total, were taken in the Southern District and were comprised principally of Port Graham Hatchery production. However, virtually all (96%) of these fish were utilized in an unsuccessful effort to attain the cost recovery revenue goal established for the Port Graham hatchery facility. The estimated hatchery return to Port Graham was estimated at 281,000 fish, about 40% of the preseason projection of 691,000 fish. Of the total return, an estimated 28,000 fish were collected at Port Graham Hatchery for broodstock purposes, with the remainder harvested for hatchery cost recovery. Since 1997, adult pink salmon returns to Port Graham Hatchery have failed to achieve the preseason forecast in all but one year.

Naturally produced pinks contributed over 80% of the area-wide harvest for that species this season. This is significantly greater than the historical average contribution in LCI and is largely because of the lost production from Tutka Hatchery. The vast majority of natural harvests in 2006 came from Port Dick in the Outer District, with a catch totaling over 1.0 million fish. Overall, natural pink salmon returns were relatively mixed, but SEGs were achieved at all of the major monitored pink systems in the management area this season. The overwhelmingly good pink salmon returns to Port Dick were a complete surprise given the preseason harvest forecast totaling only around 119,000 fish.

Chum Salmon. The 2006 LCI commercial chum salmon harvest of nearly 72,000 fish was the fifth highest since 1988, exceeding the recent 10-year and 20-year averages of 57,000 and 61,000 fish, respectively. This marked the seventh consecutive season of relatively strong chum returns coupled with good catches. Once again, most of the chum salmon catch this season came from Kamishak Bay, with the majority of effort and targeted harvest occurring in the northern end of the district at Cottonwood Creek, a system that has dominated chum catches in recent seasons. Reasonable chum salmon returns elsewhere in the management area resulted in attainment of SEGs at a majority of streams. At McNeil River in the Kamishak Bay District, the chum salmon SEG was reached for second consecutive year.

Coho Salmon. Coho salmon resources in LCI are limited and therefore little or no directed effort traditionally occurs on this species. However, the commercial harvest (to date) of almost 32,000 fish salmon in 2006 represents the second highest total on record for coho salmon in LCI and was nearly three times the 20-year average. The majority of the LCI harvest (79%) came from the commercial seine fishery in the Kamishak Bay District, where returns appeared strongest. Surprisingly, the Southern District contributed approximately 10% to the area-wide catches this season, thanks in large part to good catches in the Port Graham Subdistrict set gillnet fishery during September. The Eastern District contributed about 7% to LCI coho catch totals, primarily due to the Seward Silver Salmon Derby, where catches entered into that recreational contest are subsequently sold by the event's organizer (City of Seward) to a commercial processor. A marginal increase in the coho salmon catch total is expected due to anticipated hatchery cost recovery at Bear Lake in Resurrection Bay of the Eastern District.

Although coho run assessment in LCI is limited, commercial, sport, and personal use harvests usually provide the best indicators of run strength. Returns during 2006 were considered above average throughout the management area based on these indicators. One aerial survey was conducted for coho salmon on a major index stream at the head of Kachemak Bay, indicating

very good escapement into Clearwater Slough, while a second survey at Douglas (reef) Creek in Kamishak Bay revealed an escapement exceeding 10,000 fish in late August, considered outstanding for this system.

Chinook Salmon. Chinook salmon are not normally a commercially important species in LCI. The 2006 LCI harvest of Chinook salmon totaled just over 600 fish, similar to the previous year's catch but falling well short of the recent 10-year and 20-year averages. All of the catch came from the Southern District, with the majority attributed to enhanced production at Halibut Cove Lagoon and Seldovia Bay. Set gillnetters accounted for 91% of the Southern District Chinook catch, with purse seiners taking the remaining 9%.

BRISTOL BAY

The inshore Bristol Bay sockeye salmon run of slightly more than 43.1 million fish was the ninth largest inshore run since 1952. The harvest of nearly 29.0 million fish was the eighth largest since 1893. This year's total inshore run of 43.1 million fish was 23% above the 20-year average, and it was approximately 33% above the preseason forecast of 32.6 million fish. The Egegik District was the only district that came in below forecast at 3% below. The Naknek-Kvichak District sockeye salmon run was 18% above, Togiak District was 61% above, Nushagak District was more than double the forecast, coming in at 16.0 million fish and Ugashik District was 5% above. The commercial harvest of nearly 29.0 million fish was 23% above the 23.6 million fish forecast. A total escapement of nearly 14.0 million fish was achieved.

The commercial harvest of approximately 106,000 Chinook salmon was the fifth largest in the last 20 years and 51% above the 20-year average of 70,000 fish. The chum salmon harvest of approximately 1.8 million fish was the largest since 1984. The coho salmon harvest of approximately 79,000 fish was well below the 20-year average of 103,000 fish.

The 2006 harvest of all salmon species in Bristol Bay totaled approximately 31 million fish. A preliminary estimate of the exvessel value of the fishery was obtained by applying average price per pound reported by processors to the catch by species. These figures represent a rough estimate since the contribution of future price adjustments, loyalty bonuses, and differential prices for refrigerated versus non-refrigerated fish were not included. The calculated exvessel value of the 2006 Bristol Bay salmon fisheries totaled nearly $94 million. Although $94 million is only 80% of the 20-year average value for Bristol Bay, the value of the 2006 fishery is the highest since 1999 and more than three times that of the 2002 harvest.

Sockeye Salmon. The 2006 inshore sockeye salmon run of 43.1 million fish was 10 million fish more than the forecast of 32.6 million fish. Escapements to the Kvichak, Ugashik, Igushik, and Nushagak Rivers fell within their BRGs. Escapements to Togiak, Naknek, and Wood Rivers were above their escapement goal ranges. The Alagnak River had another very strong escapement, with a tower count of 1.8 million fish, despite an inriver setnet fishery that harvested over 225,000 fish. The exceedingly high escapement to the Wood River was due to the large 2006 run. Nearly continuous fishing early in the run still allowed an escapement of over 4.0 million fish—the largest ever recorded.

The story of the Bay this year was the normal timing of an unprecedented run to the Wood River and the delayed run timing to the east side rivers, which all began their fisheries in the special harvest areas. The run timing to the east-side rivers was eight to ten days later than average. The combination of these two factors resulted in a somewhat slow start to the season followed by very intense fishing beginning around July 12. Every system in Bristol Bay in which sockeye

salmon are enumerated achieved or exceeded the biological escapement goal. This includes the Kvichak River for the second consecutive year. The initial price of $0.55 per pound paid by most processors is slightly less than the $0.60 per pound paid in 2005.

Chinook Salmon. The Chinook salmon harvests in Bristol Bay districts were below average in every district except the Nushagak. There were 10 directed Chinook fishing periods in the Nushagak District resulting in approximately 50,000 fish landed. The Nushagak harvest of 84,000 fish was well above the 1986–2005 average catch of 51,000 fish. The Portage Creek sonar count of 125,000 fish was 66% above the 75,000 Nushagak goal.

Chum salmon. The total Bristol Bay chum salmon harvest of approximately 1.8 million fish was the largest harvest since 1984. All five districts produced harvests above their 20-year average. The Nushagak harvest of nearly 1.2 million fish was the highest in 20 years and nearly three times the 20-year average of 407,000 fish.

Pink Salmon. Pink salmon were observed in large numbers in the escapement but little effort was seen by the commercial industry.

Coho Salmon. The total Bay-wide coho salmon harvest of approximately 79,000 fish was 23% below the recent 20-year average of 103,000 fish. All of the districts, except Nushagak, produced catches below their 1986–2005 average harvests. The Nushagak District harvest of 44,000 fish was 57% above its 20-year average of 28,000. It is important to note that in some districts harvest was limited by market availability rather than fish abundance.

KUSKOKWIM AREA

The 2006 Kuskokwim Area Chinook, sockeye, chum, and coho salmon runs returned similar to what was anticipated. Kuskokwim River salmon fisheries were managed according to the Kuskokwim River Salmon Management Plan, with Chinook and chum salmon stocks identified as stocks of yield concern. Amounts of salmon necessary for subsistence use were expected to be achieved throughout the area.

There were two chum and sockeye salmon directed commercial openings in the Kuskokwim River in late June. A directed commercial coho fishery was implemented in the Kuskokwim River in August. Kuskokwim Bay commercial salmon fisheries were managed according to their associated management plans and regulations. A total of 493,291 fish were commercially harvested from the Kuskokwim Area. A total of 453 permit holders participated in the Area fishery with an exvessel value estimated at $1,143,806. Limited processor capacity, low prices, and low fishing effort dominated the season and resulted in an unharvested surplus of salmon other than coho salmon.

The Kuskokwim River, District 1, commercial harvest in 2006 was 2,777 Chinook, 12,618 sockeye, 44,070 chum, 185,598 coho, and 1 pink salmon from 19 periods. The 2006 salmon harvest by species was below the recent 10-year averages. A total of 373 individual permit holders recorded landings during the 2006 season. This level of fishing effort was 22% below the recent 10-year average of 476 fishers. The total exvessel value of the fishery was $451,390—just 30% of the recent 10-year average.

Kuskokwim River Chinook salmon escapements were evaluated through aerial surveys on 13 index streams, enumeration at weirs on six tributary streams, and by catch abundance at a mainstem tagging project near Upper Kalskag. Chinook escapements in 2006 were above average at nearly all monitored locations with the exception of Tatlawiksuk River where

escapement was near average. Kogrukluk River Chinook escapement exceeded the escapement goal range and all aerial survey escapement goals were either exceeded or were within their respective escapement goal ranges. Chinook salmon escapements in 2006 were consistent with the general trend of increasing Chinook salmon abundance in the Kuskokwim River since the low abundance years of 1998, 1999, and 2000.

Sockeye salmon escapements in the Kuskokwim River were monitored at each of six tributary weir projects; however, sockeye are not a prominent species in many of these systems. Among these locations, Kogrukluk and Kwethluk Rivers receive the largest sockeye escapements. Kogrukluk and Kwethluk River sockeye salmon passage in 2006 was at a record high. Sockeye salmon catch at the mainstem tagging project near Upper Kalskag also indicated a stronger abundance of sockeye salmon in 2006 compared to the previous record escapement year of 2005. A pilot sockeye salmon radio telemetry project initiated in 2005 was expanded to full operation in 2006. Preliminary results from the sockeye salmon radio telemetry project indicate the Holitna River drainage is a larger producer of Kuskokwim River sockeye salmon than previously known.

Kuskokwim River chum salmon escapements were evaluated through enumeration at weirs on six tributary streams, a tributary sonar project on the Aniak River, and by catch abundance at the tagging project near Upper Kalskag. Chum escapements in 2006 were at record highs at the Kwethluk, George, and Takotna monitoring projects and above average at the Tuluksak and Tatlawiksuk monitoring projects. Escapements were well above the Kogrukluk and Aniak River escapement goal ranges and near record highs. Chum escapements were exceptionally low in 1999 and 2000; nearly all chum salmon escapements observed since that time have been above those years.

Coho salmon escapements in 2006 were average to below average at the majority of monitored locations. Exceptions were the Kalskag tagging project where coho salmon catches were higher than in 2005 and the Takotna River where coho salmon escapement was above average. Escapement at Kogrukluk River was within the escapement goal range. Coho salmon abundance in the Kuskokwim River was extremely low in the late 1990s, but has generally improved since that time.

In Kuskokwim Bay, the District 4 commercial harvest was 19,184 Chinook, 106,308 sockeye, 26,831 coho, and 39,151 chum salmon from 29 periods. Sockeye salmon harvest was at a record high and 56% above the recent 10-year average. Chum salmon harvest was 11% above the recent 10-year average while Chinook and coho salmon harvests were 4% and 46% below the recent 10-year average respectively. A total of 132 individual permit holders recorded landings in District 4 during the 2006 season. This level of fishing effort was 27% below the recent 10-year average of 181 fishers. The total exvessel value of the District 4 fishery was $551,182, 29% above the recent 10-year average value.

Chinook and sockeye salmon aerial surveys were flown over the Kanektok River drainage on July 31 and August 1. A total of 8,433 Chinook and 382,800 sockeye salmon were observed—exceeding escapement goal ranges. The sockeye salmon aerial survey count was at a record high and almost three and a half times higher than the previous record count of 110,730 fish in 2005. The Kanektok River weir was not operated in 2006 because the majority of the weir was damaged beyond repair from remaining inriver during the winter of 2005 to 2006. The weir will be repaired for operation in 2007.

District 5, primarily in Goodnews Bay, commercial harvests in 2006 were 2,892 Chinook, 29,857 sockeye, 12,436 coho, and 11,568 chum salmon from 27 periods. Chinook, sockeye, and

chum salmon harvest was 24%, 14% and 33% above the recent 10-year average respectively, and coho salmon harvest was 15% below the recent 10-year average. A total of 24 permit holders recorded landings in District 5 during the 2006 season. This level of fishing effort was 44% below the recent 10-year average of 43 fishers. The total exvessel value of the District 5 fishery was $141,235, 2% above the recent 10-year average value.

The Middle Fork Goodnews River weir was operational from June 26 to September 7 with preliminary escapement counts of 4,595 Chinook, 124,256 sockeye, 13,050 coho, and 54,422 chum salmon. Sockeye and chum salmon counts were the highest on record, exceeding previous record counts of 111,458 sockeye salmon in 2005 and 40,450 chum salmon in 1996. The Chinook and sockeye salmon escapement goal ranges were exceeded and the chum and coho salmon escapement goal thresholds were achieved. Coho salmon escapement is believed to be at a minimum because weir counts were suspended prematurely on September 7 as a result of continuous high water conditions. Chinook and sockeye salmon aerial surveys were flown over the Goodnews River drainage on August 2. A total of 4,159 Chinook and 78,100 sockeye salmon were observed in the North Fork Goodnews River. The North Fork Goodnews River Chinook and sockeye salmon aerial survey escapement goal ranges were exceeded with sockeye salmon counts at a record high.

YUKON AREA

The 2006 Yukon River total commercial harvest was 45,829 Chinook, 92,116 summer chum, 174,542 fall chum, and 64,942 coho salmon for the Alaskan portion of the drainage. A total of 43,906 Chinook, 47,475 summer chum, 141,159 fall chum, and 53,805 coho salmon were harvested in the Lower Yukon River and 1,923 Chinook, 44,641 summer chum, 33,383 fall chum, and 11,137 coho salmon were harvested in the Upper Yukon River. All salmon were sold in the round with no salmon roe sold separately.

The 2006 Chinook salmon run was anticipated to be similar to the 2005 run, and below average to average in abundance. Given the uncertainties associated with recent declines in productivity, it was anticipated the Chinook salmon run would provide for escapements, support a normal subsistence harvest, and a below average commercial harvest. The 2006 preseason outlook anticipated a commercial harvest of 30,000–60,000 fish. The 2006 Chinook salmon harvest was the sixth lowest commercial harvest since statehood and 14% below the 1996–2005 average harvest of 53,183 fish. The summer chum salmon harvest was the twelfth lowest since 1967 and 22% below the 1996–2005 average harvest of 118,583 fish. Although there was a large surplus of summer chum salmon, most of the harvest was taken incidentally to fishing directed at Chinook salmon, except in District 6 where a chum salmon directed fishery occurred.

A total of 594 permit holders participated in the Chinook and summer chum salmon fishery during 2006, which was 6% below the 1996–2005 average of 631 permit holders. The Lower Yukon Area (Districts 1–3) and Upper Yukon Area (Districts 4–6) are separate Commercial Fisheries Entry Commission permit areas. A total of 569 permit holders fished the summer season in the Lower Yukon Area in 2006, which was 4% below the 1996–2005 average of 592 permit holders. In the Upper Yukon Area, 25 permit holders fished, which was 44% below the 1996–2005 average of 45 permit holders.

Yukon River fishers in Alaska received an estimated $3.4 million for their Chinook and summer chum salmon harvest in 2006, approximately 4% above the 1996–2005 summer season average of $3.26 million.

Chinook salmon escapement goals throughout the drainage were either met or exceeded. The BEGs have been established for the Chena and Salcha rivers in the Tanana River drainage. An estimated 2,936 Chinook salmon were counted by the Chena River tower project (2,800–5,700 fish). The Salcha River tower project estimated an escapement of 10,400 fish (3,300–6,500 fish). The much lower escapement in the Chena River compared to the Salcha River was very unusual. The Canadian Yukon River mainstem escapement objective of 28,000 was exceeded.

The 2006 summer chum salmon escapements were above average in most tributaries. Escapement goals have been established for the Andreafsky and Anvik Rivers. There is also a drainage-wide optimum escapement objective for the Yukon River, based on the Pilot Station sonar project of 600,000 fish. The Pilot Station passage estimate of 3.7 million fish was the highest on record since 1995. The Anvik River sonar-based escapement count of 599,146 fish was within the BEG range (350,000–700,000 fish). However, this was a minimum passage estimate in 2006, because of high water conditions impacting the project most of the season. The estimated escapement of 101,465 fish for the East Fork Andreafsky River was within the BEG range (65,000–135,000 fish). Spawning escapements were well above average in the Koyukuk and Tanana River drainages with the Gisasa River escapement of 225,225 fish being a record. The Salcha River escapement of approximately 112,000 fish was the second highest on record. It appears that production remains lower for spawning areas closer to the ocean such as the East Fork Andreafsky River whereas production is higher for spawning areas further upriver.

The 2006 Alaskan commercial harvest of fall chum salmon was the second largest since 1995 and the commercial harvest of coho salmon was the largest since 1991. The Yukon Area fall chum commercial harvest was approximately 360% above the 1996–2005 average of 37,908 fish. The Yukon Area coho harvest was 232% above the 10-year average of 19,549 fish. However, weak market conditions and limited buying capacity affected the commercial harvest throughout the drainage.

The preliminary 2006 commercial fall chum and coho salmon season value for the Yukon Area was $297,879 ($252,936 for the Lower Yukon Area, $44,943 for the upper Yukon Area). The previous 10-year average value for the Yukon Area was $93,093 ($77,968 for the Lower Yukon Area, $15,070 for the Upper Yukon Area).

Yukon River fishers received an average price of $0.20 per pound for fall chum salmon in the Lower Yukon Area and $0.14 per pound in the Upper Yukon Area in 2006. This compares to the 1996–2005 average of $0.22 per pound and $0.13 per pound, respectively. For coho salmon, fishers received an average price of $0.20 per pound and $0.19 per pound in the Lower and Upper Yukon Areas compared to the recent 10-year average price of $0.29 and $0.10 per pound, respectively.

An average of 117 permit holders fished the fall chum and coho salmon fishery (110 for the Lower Yukon Area, 7 for the Upper Yukon Area) during the previous 10 fall seasons as compared to 306 fishers who participated in 2006 (289 for the Lower Yukon Area, 17 for the Upper Yukon Area).

The preseason outlook for the 2006 fall commercial fishery anticipated commercial harvest opportunity based on the record large return of four-year-old fall chum salmon in 2005. Although both parent year escapements were less than 400,000 fall chum salmon, the 2001 brood year resulted in tremendous production providing a record return in 2005 and also provided the majority of the 2006 run which was above average. In 2006, limited markets, along with

inseason run assessment, resulted in fishing time that was well above normal levels. Nevertheless a large surplus remained unharvested.

Drainage-wide fall chum salmon BEG ranges have been established for the Yukon River as well as several major tributary stocks. All escapement goals including interim Canadian objectives were exceeded. Although the Pilot Station Sonar passage estimate was 800,000 fish, the post-season run reconstruction using escapement projects upriver along with the harvests resulted in an estimated 2006 total run of approximately 1.0 million fish.

There is only one established escapement goal for coho salmon in the Yukon River drainage, which is a SEG for the Delta Clearwater River (5,200–17,000 fish). The 2006 boat count survey of the Delta Clearwater River estimated an above average escapement of 20,262 fish. The 2006 Pilot Station Sonar passage index of 131,919 fish was below the 1995, 1997–2005 average of 148,000 fish. Although the lower Yukon projects indicated the coho salmon run was below average, the upper Tanana River projects suggested the run was fairly strong.

NORTON SOUND AREA

Near-record to record runs of chum, coho, pink and sockeye salmon occurred in many areas of Norton Sound in 2006. The commercial coho salmon harvest was a record, but there was no market interest in a chum or pink salmon directed fishery. Once again the Chinook salmon run was poor and no commercial fishing for Chinook salmon was allowed.

The department test net in the Unalakleet River had record catches of coho and pink salmon and the chum catch was the second highest on record. The first commercial fishing period occurred in the Shaktoolik and Unalakleet Subdistricts on July 21. The first two commercial fishing periods were only 24 hours as the buyer was concerned about the incidental catch of chum salmon. Coho salmon catches were well above average and the department opened the Shaktoolik and Unalakleet Subdistricts for the regular twice weekly 48-hour commercial fishing periods beginning on July 26. Record catches of coho salmon in the commercial fishery and record catches at the test net allowed for commercial fishing to continue on the normal schedule through August. In September, the commercial fishing season was extended another week beyond the September 7 closure date because of continued record commercial and test net catches.

The combined commercial harvest of all salmon species ranked third in the last 10 seasons in Norton Sound and ranked first with pink salmon harvest excluded. The number of commercial permits fished (61) was the second highest in the 2000s, but seventh lowest on record. The 2006 fishery value to the fishers of $389,707 was above the 10-year average of $173,974. The average value per permit holder was $6,389 and was fourth best on record without adjusting for inflation.

The coho salmon harvest of 130,808 was nearly 400% above the recent 10-year (1996–2005) average. There were no chum salmon directed periods and harvest of chum salmon was incidental during the coho salmon fishery. Though the pink salmon run was near record to record-breaking in many areas, there was no market interest. The Unalakleet River test net had record catches of pink and coho salmon, and the chum salmon catch ranked second highest. The 61 permit holders participating in the commercial fishery was an increase of over 50% from last season. The previous 10-year average was 58 permits fished. The average price per pound paid was $1.49 for Chinook salmon, $0.45 for sockeye salmon, $0.44 for coho salmon, and $0.14 for chum salmon.

KOTZEBUE AREA

The overall chum salmon run to Kotzebue Sound in 2006 was estimated to be average based on the commercial harvest rates, subsistence fishers reporting average to above average catches, and the Kobuk test fish index being average. The commercial harvest consisted of 137,567 fish. Also harvested during the commercial fishery, but retained for personal use were 9 Chinook salmon, 5 sockeye salmon, 3 pink salmon, 278 Dolly Varden and 13 whitefish. There were likely some chum salmon kept for personal use that did not get reported on fish tickets.

In 2006, there was a new buyer in Kotzebue and fishers were no longer limited by market availability. Since 2001 there had been limited market interest. In 2002 and 2003 there was no onsite buyer and less than five permit holders fished each year. In 2004 and 2005, one onsite buyer was present and fish were processed locally, but fishing time was limited because of limited buying capacity.

The department opened the 2006 commercial fishery continuously beginning on July 10 and let the buyer determine the fishing time for their fleet. Low catches at the Kobuk River test net and lower than normal catches in the commercial fishery resulted in several multi-day closures in early August. Improved commercial catches resulted in reopening the commercial fishery continuously in mid-August. There were 42 permit holders who sold fish to the buyer, including one catcher-seller who sold fish to the buyer and also sold some of his catch from his boat to Kotzebue area residents. The number of permit holders that fished has been in the low 40s the last three years, and is less than half the permit holders that fished in the 1990s, and well below the nearly 200 permit holders that fished in the early 1980s.

A total of 1,037,001 pounds of chum salmon (average weight 7.5 pounds) were sold at an average of $0.22 per pound. The total exvessel value was $228,421 to Kotzebue Sound fishers. The average value for each participating permit holder was $5,439. The total exvessel value represents 20% of the $605,937 historical average.

Table 6.–Preliminary 2006 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [a b]
Kuskokwim River	3	13	186	0	44	246
Kuskokwim Bay	22	136	39	0	51	248
Kuskokwim Area Total	25	149	225	0	95	494
Lower Yukon River	44	0	54	0	189	287
Upper Yukon River	2	0	11	0	78	91
Yukon River Total	46	0	65	0	267	378
Norton Sound	0	0	131	0	10	141
Kotzebue Area	0	0	0	0	138	138
Arctic-Yukon-Kuskokwim Region Total	71	149	421	0	510	1,151

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

KODIAK AREA

The 2006 Kodiak Area commercial salmon fishery began on June 1 and the last commercial landing occurred on September 27. Commercial fishing effort was once again low for the 2006 commercial salmon season. Of the 608 eligible Kodiak commercial salmon permits, only 285 (46.9 %) made commercial landings, and 57 permits were not renewed for the 2006 season. By

gear type, a total of 153 set gillnet, 131 purse seine, and 1 beach seine permit holder(s) fished in 2006. The number of permits actually fished at any given time varied throughout the season.

Approximately 34.9 million fish were commercially harvested in the Kodiak Area, which is above the previous 10-year (1996–2005) average of 20.8 million fish (Table 7). Of the total fish harvested in 2006, ADF&G commercial test fisheries took 332 fish, and 5,596 fish were retained from commercial catches for the permit holder's own use (i.e. home-pack, taken but not sold). Subsistence and sport fishery salmon harvests will not be known until after permits and questionnaires are returned to the department in the late spring of 2007.

The 2006 Kodiak Area Chinook salmon harvest was higher than the previous 10-year average (1996–2005) and slightly above the 2006 forecast. The sockeye salmon harvest was below the 10-year average, and below the point forecast. The coho salmon harvest was well above the 10-year average and above the 2006 forecast. The pink salmon commercial harvest was above the 10-year average (1996–2005), and was over 15.0 million fish more than the recent even-year harvest average (1996–2005) of 15.0 million fish. The pink salmon harvest was also above the forecast range (15.5 million to 21.9 million fish). The chum salmon harvest was above average and over 100,000 fish more than forecast.

The estimated total exvessel value of the 2006 fishery was approximately $25.77 million, above the 10-year (1996–2005) average exvessel value of $23.79 million. The estimated exvessel value is based on inseason price estimates and will increase as final processor reports become available. The inseason values may not reflect additional payments made to fishermen for dock deliveries, refrigerated sea water, iced fish, or other settlements.

Purse seine fishermen accounted for 88.6% of the total number of salmon harvested and averaged approximately $157,062 per fished permit. This is an increase from the 2005 season, and is more than the previous 10-year average earnings of $90,945 for purse seine permit holders. Set gillnet fishermen accounted for 11.4% of the total number of salmon harvested and earnings averaged approximately $27,732 per fished permit. This was a decrease from last year, and less than the previous 10-year average set gillnet permit holder earnings of $40,624.

Fish counting weirs were operated on six systems for the 2006 Kodiak Area commercial salmon season. Continued erosion of funding has reduced the number of weirs from 12 in 2000 and eight in 2005. In addition, three observers flew 26 individual aerial surveys, and seven observers conducted foot and skiff survey escapement estimates.

The total Chinook salmon escapement was substantially lower than the previous 10-year (1996–2005) average but escapement goals were met for one of two stocks. The total sockeye salmon escapement met escapement goals for 9 of 12 stocks and was lower than the recent 10-year average sockeye salmon escapement. The coho salmon escapement was well below the recent 10-year average and the escapement goals were met for three of four stocks. Overall, the pink salmon escapement was above the 1996–2006 even-year average and the aggregate escapement was above the escapement goal range for the Kodiak and Mainland District Areas. The overall chum salmon escapement was above the 10-year average and below the goal and chum salmon escapements were above the SEG threshold goals in all areas.

Chinook Salmon. The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the Kodiak Area. Commercial harvest occurs during targeted sockeye salmon fisheries; there are no directed Chinook salmon commercial fisheries in the Kodiak Area. The

2006 Kodiak Area Chinook salmon commercial harvest of 20,283 fish was above the previous 10-year average of 18,466 fish and above the forecast of 20,000 fish.

The total Chinook salmon escapement of 7,463 fish was well below the previous 10-year average of 24,338 fish. Escapement goals for Chinook salmon have been developed for the Karluk and Ayakulik rivers and the escapements are estimated using fish counting weirs. The Chinook salmon escapement of 4,112 fish through the Karluk weir was within the range of the established goal (3,600–7,300 fish). Early in the 2006 commercial salmon season, it appeared that the Chinook salmon escapement into the Karluk River would be weak. The department implemented the non-retention of Chinook salmon (over 28 inches) for the Inner and Outer Karluk Sections in order to increase escapement numbers. Chinook salmon escapement of 3,106 fish through the Ayakulik weir was below the established range of the escapement goal (4,800–9,600 fish) with no commercial fishing effort near the Ayakulik River until after the Chinook salmon run into the Ayakulik system was over.

Sockeye Salmon. The 2006 Kodiak Area sockeye salmon commercial harvest of 1.6 million fish was below the recent 10-year average of 3.4 million fish and below the point forecast of 2.1 million fish. The overall sockeye salmon escapement of 984,658 fish was below the average of 1.8 million fish.

The Karluk early-run (through July 15) began late and weak for the 2006 season. Earlier migration timing has occurred for the past five years and in anticipation of another early run, and to slow the early escapement, the initial commercial fishing period began on June 1. The sockeye salmon early-run passed through the weir later than usual; however, lagoon buildups were sufficient to continue short openings in those areas managed for the Karluk early-run sockeye salmon.

The lower end of the Karluk early run escapement goal was exceeded by June 11 and fishing was allowed along the westside of Kodiak in the Central, North Cape, Southwest Afognak, and Outer Karluk Sections through early July, until the management focus turned to pink salmon. Approximately 674,427 fish were harvested in early-season (through July 15) westside fisheries, which was above the early-run sockeye salmon point forecast of 314,000 fish. The Karluk early-run sockeye salmon escapement was 200,641 fish which was within the established escapement goal range (100,000–210,000 fish).

Approximately 556,693 sockeye salmon were harvested in the late-season westside fishery which was below the late-run sockeye salmon point forecast of 876,000 fish. The Karluk late-run sockeye salmon escapement was approximately 289,732 fish, which was within the established escapement goal range (170,000–380,000 fish).

The Ayakulik River was expected to have a small surplus of sockeye salmon available to commercial fishing but escapements were weak throughout the 2006 season. There were no fishing periods targeting Ayakulik sockeye salmon. The Ayakulik sockeye salmon escapement was 87,780 fish and well below the lower end of the escapement goal range (200,000–500,000 fish). The Inner and Outer Ayakulik sections were opened to commercial salmon fishing on August 21 in order to provide opportunity to harvest pink and coho salmon. Approximately 17,142 sockeye salmon were harvested incidentally in the Ayakulik Sections when pink and coho salmon were the targeted species. The total sockeye salmon harvest was below the 2006 point forecast of 94,000 fish.

The department tentatively scheduled a commercial salmon fishing period for June 5 in the Alitak District if certain criteria were met prior to June 3. Generally, the early-run sockeye salmon appear in Upper Station earlier than they do in Frazer Lake. The intent of the early opening was to allow an opportunity to harvest Upper Station early-run sockeye salmon prior to the Frazer Lake sockeye salmon peak run timing. The Upper Station sockeye salmon early-run did not materialize as expected and a commercial salmon fishing period did not occur until June 9. In order to ascertain the strength or weakness of the Upper Station run, a 33-hour test fishery was conducted on June 9. The resulting sockeye salmon harvest indicated a late or weak run. As the season progressed, it became evident that the early-run sockeye salmon to Upper Station was weak. No other fishing periods were allowed targeting early-run sockeye salmon. The forecast for the early run to the Upper Station system was 120,000 sockeye salmon (61,000–179,000 fish), with a harvestable surplus of approximately 90,000 fish. The Upper Station early-run sockeye salmon escapement was 24,997 fish, which was below the lower end of the escapement goal range (30,000–65,000 fish).

The 2006 forecast for Frazer Lake was estimated at 204,000 fish (7,000–398,000 fish) with a harvestable surplus of approximately 99,000 fish. However, the Frazer Lake sockeye salmon run also appeared to be late or weak and resulted in no further commercial fishing periods through July 15 in the Alitak District. The Alitak District early-run sockeye salmon commercial harvest was approximately 8,151 fish, which was below the point forecast of 189,000 fish.

The 2006 forecast for late-run sockeye salmon (post July 15) to the Upper Station system, was 283,000 fish (112,000–454,000 fish), with a harvestable surplus of approximately 97,000 fish. Early escapement counts of late-run sockeye salmon were within escapement objectives, and by July 27 sockeye salmon escapement counts were sufficient to allow a short fishing period in the Alitak District. Subsequent fishing periods were conducted to ensure the escapement goals of sockeye, pink and chum salmon were met.

The Upper Station late-run escapement of 153,153 fish met the established escapement goal (120,000–265,000 fish). Sockeye salmon escapement through the Dog Salmon weir of 89,516 fish exceeded the minimum escapement goal (70,000–150,000 fish). The harvests from the late Alitak fisheries was about 78,135 fish, and fell below the 2006 projection of 97,000 fish.

The Malina Lake weir did not operate during the 2006 season and salmon escapements were monitored by aerial surveys. Commercial salmon fishing was not allowed in the Malina Creek Terminal Harvest Area. While there was no directed sockeye salmon commercial fishery in the Malina Creek Terminal Harvest Area, there were likely some Malina-bound sockeye salmon harvested in adjacent areas (catches from adjacent areas cannot be separated from other Kodiak stocks moving through those areas).

The Pauls Lake weir did not operate during the 2006 season. Pauls Lake sockeye salmon escapement was monitored by aerial surveys in 2006. The escapement goal was not met (10,000–30,000 fish) with a count of only 150 fish. However, without a weir, it is exceedingly difficult to spot sockeye salmon in the Pauls Lake system using aerial surveys and it is likely the escapement was higher.

The Afognak Lake (Litnik) sockeye salmon run was weak for the sixth consecutive year. No commercial salmon fishery targeting sockeye salmon was allowed. Sockeye salmon subsistence fishing was again restricted in 2006. Lower than expected returns prompted Kodiak Area managers to move subsistence markers to the outside waters in Afognak Bay. Subsequent returns improved and the sockeye salmon escapement fell within the escapement goal range. The

sockeye salmon escapement of 22,933 fish into Afognak Lake was within established escapement goals (20,000–50,000 fish). When the minimum escapement goal was assured subsistence markers were moved back to normal closed waters at the head of the bay.

The Saltery Lake weir has not operated since 2004. However, aerial surveys were conducted and the Saltery Lake sockeye salmon run proved again to be strong. The sockeye salmon escapement of 28,000 fish was within the established escapement goal range (15,000–30,000 fish) and provided liberal fishing opportunities. This system has a mid- to late-season run timing. The commercial harvest from the Inner Ugak Bay Section included approximately 5,037 fish. The Saltery sockeye salmon run was not forecasted for 2006.

The Pasagshak River system does not have a weir and is heavily used by sport, subsistence, and commercial fishermen. The past two years have seen relatively good returns for the Pasagshak River and the 2006 season was similar. Aerial surveys indicated a minimum escapement of 6,300 fish which was within the established escapement goal range (3,000–12,000 fish). No forecast was made for the Pasagshak River sockeye salmon run or harvest.

The Cape Igvak Salmon Management Plan (5 AAC 18.360) allocates up to 15% of the total Chignik-bound sockeye salmon harvest to Kodiak Area fishermen in the Cape Igvak Section. Based on regulations, 90% of all sockeye salmon caught prior to July 25 in the Cape Igvak Section are considered to be Chignik-bound.

Allocative and biological criteria of the management plan were met in 2006 and commercial fisheries were allowed in the Cape Igvak Section with four days of fishing allowed in June during the early run to Chignik. However, as the season progressed, it became evident the early-run portion of the Chignik sockeye salmon run was below forecast. The Cape Igvak Section was closed and did not reopen until Chignik permit holders were assured of catching 600,000 fish. By July 16 the allocative and biological criteria of the management plan were again met and another fishing period was announced for July 20. That period was extended until July 25, after which Cape Igvak was managed for local stocks.

Through July 25, the Cape Igvak harvest of sockeye salmon considered to be Chignik-bound (90%) was approximately 41,834 fish and represented 4.95% of the total Chignik sockeye salmon harvest (15% allocation). Overall, the total sockeye salmon harvest in the Cape Igvak Section through July 25 was 46,482 fish, which is below the point forecast of 143,300 fish.

From July 6–25, the North Shelikof Sockeye Salmon Management Plan (5 AAC 18.363) places harvest limits on two areas of the Kodiak Area bordering northern Shelikof Strait to limit interception of sockeye salmon that are considered Cook Inlet-bound. During the period that this management plan is in effect, Kodiak Area fisheries are targeting local pink salmon runs and the fishing periods are based on the projected pink salmon run strength. If it appears that the sockeye salmon harvest will meet or exceed limits set by the BOF, then fisheries are to be restricted to inshore waters only, and offshore “Seaward Zones” are closed. In 2006, a department biologist was present on the grounds to determine the sockeye salmon catch and facilitate orderly, short notice closures if the harvest limits were met.

A Seaward Zone closure was required in the North Shelikof Unit (mid- to north Mainland and northwest Afognak/Shuyak Islands). Soon after the July 12 commercial fishing period, the department biologists estimated that the harvest would meet or exceed the North Shelikof sockeye salmon harvest cap of 15,000 fish. The Seaward Zone of North Shelikof Unit was closed at noon July 14. At the closure of the Seaward Zone, the harvest was estimated to include

approximately 15,000 fish. The total July 6–25 harvests in the North Shelikof Unit was 82,538 fish, which includes both the Shoreward Zone harvests and the Seaward Zone harvests prior to the closure. There was no closure of the Seaward Zone in the Southwest Afognak Section as the harvest cap of 50,000 fish was not met. The July 6–25 harvest in the Southwest Afognak Section was about 24,182 sockeye salmon.

Terminal and special harvest areas are located in restricted areas where sockeye salmon enhancement projects create surplus production. Sockeye salmon harvests occurred as follows.

There was no reported commercial harvest of sockeye salmon in the Settler Cove Terminal Harvest Area (Crescent Lake). Sockeye salmon returning to this system may be taken in commercial fisheries in adjacent sections; however, no stock separation studies are available to determine the extent. Additionally, a local subsistence fishery harvests a significant portion of this enhanced run. While no estimate of the subsistence harvest is currently available, personal communications with Port Lions subsistence fishermen indicate that this run was below average.

There was no commercial salmon harvest in the Waterfall Special Harvest Area (Little Waterfall Lake). The Foul Bay Special Harvest Area (Hidden Lake) commercial harvest was minimal.

In the Spiridon Special Harvest Area (Telrod Cove), 36,435 fish were harvested. The Spiridon Special Harvest Area represents an estimated 41% of the total harvest of Spiridon enhancement fish; the other 59% are harvested in traditional net fisheries along the westside of the Kodiak Area. If expanded, the total Spiridon sockeye salmon commercial harvest would be an estimated 88,866 fish (forecast 161,000 fish; range 143,000–183,000 fish).

The Kitoi Bay Hatchery harvest was an estimated 23,882 fish, and was below the point forecast of 40,100 fish. This includes the commercial harvest of both enhanced and wild salmon from the Inner Kitoi Bay, Outer Kitoi Bay, Duck Bay, and Izhut Bay sections. Additional enhanced sockeye salmon may have been harvested in adjacent sections, but stock separation data are not available.

Coho Salmon. The commercial coho salmon harvest of 553,364 fish was above forecast of 422,700 fish and above the 1996–2005 average of 376,737 fish. Commercial interest for coho salmon increased in the 2006 season due to higher prices. The 2006 harvest of over 550,000 fish is the highest coho salmon harvest in the Kodiak Area on record.

The Kitoi Bay Hatchery coho salmon commercial harvest was approximately 151,729 fish and close to the forecast of 152,200.

The only established coho salmon escapement goals occur in the Northeast Kodiak and Eastside Kodiak districts and includes the following rivers: American (400–900 fish), Olds (1,000–2,200 fish), Buskin (3,200–7,200 fish) and the Pasagshak rivers (1,200–3,300 fish). Escapement goals were met for the Olds (1,912 fish), Buskin (13,348 fish) and American rivers (2,033 fish) rivers but were below the escapement goal for the Pasagshak system (937 fish; Table 6). Further surveys are expected for the Pasagshak system and it is anticipated that goals will be met. For the entire Kodiak Area, the estimated coho salmon escapement of 61,732 fish was well below the previous 10-year average of 162,256 fish. Coho salmon escapement estimates are a minimum number and more coho salmon entered Kodiak Area systems after the removal of the weirs and conclusion of the aerial survey projects. Many weirs were not operated as late as in past years. Aerial surveys were not conducted past September 8, even though fresh coho salmon were still migrating into area streams into late October. The lack of sufficient funding will further hamper the management of coho salmon in the Kodiak Area, and if prices continue to climb, managers

will most likely take a more conservative approach to coho salmon management. At this time the Kodiak Area has very little coho salmon monitoring.

Pink Salmon. Overall, the pink salmon harvest of 31.7 million fish was well over the harvest forecast (18.7 million fish) and above the past five even-year (1996–2004) average harvest of 15.0 million fish.

Wild stock pink salmon harvests were excellent, as over 27.5 million wild stock pink salmon were harvested (forecast 10.0 million to 14.0 million fish). Westside fisheries (Southwest Afognak to Ayakulik), accounted for 19.0 million pink salmon (forecast 8.3 million fish) and the Eastside Kodiak District harvested 3.8 million pink salmon.

The Kitoi Bay Hatchery pink salmon return was weaker than expected. In those sections near the hatchery about 4.1 million pink salmon were harvested (forecast 5.5 million to 7.9 million fish). Additional Kitoi-bound pink salmon were likely harvested along the westside and eastside of Kodiak and Afognak islands. However, the department does not have a stock separation program for pink salmon and is unable to differentiate stocks. There was a cost recovery fishery near the hatchery, with Kitoi pink salmon harvested and sold by the Kodiak Regional Aquaculture Association.

Overall, the pink salmon escapement of 5.8 million fish was above the 1996–2005 year average of 5.2 million fish, but below the 1996–2004 even-year average of 6.4 million fish. Pink salmon escapement goals have been established as an aggregate goal for the entire Kodiak Archipelago and the Mainland District. The escapement goal range (2.0 million to 5.0 million fish) was exceeded for the combined Kodiak Archipelago (5.0 million fish). The Mainland District pink salmon escapement of 778,200 fish was above the established escapement goal range (250,000–750,000 fish).

Chum Salmon. The chum salmon harvest of 1,081,189 fish was above the forecast of 878,630 fish and above the 1996–2005 average of 794,319 fish. The commercial harvests from all districts were greater than forecast.

Kitoi Bay Hatchery chum salmon production was weaker than expected. The Kitoi Bay Hatchery chum salmon harvest of 177,548 fish was below the 2006 forecast of 208,630 fish.

The overall chum salmon escapement of 786,049 fish was above the aggregated escapement goal of 300,300 fish for the Kodiak archipelago and above the recent 10-year average of 526,176 fish. Escapement goals have been established in all districts of the Kodiak Area except the Afognak District. The Southwest Kodiak District, Eastside Kodiak District, Northeast Kodiak District, and the Mainland District met current escapement goals. The Northwest Kodiak District was slightly below the escapement goal of 53,000 fish with an estimate of 41,800 fish and the Alitak District was below the escapement goal of 28,000 fish with an estimate of 21,423 fish.

CHIGNIK AREA

The Chignik cooperative purse seine salmon fishery management plan has been legally scrutinized since its adoption by the Alaska BOF in January 2002. In March of 2005, the Alaska Supreme Court ruled that the original regulation (5 AAC 15.359) contradicted the intent of the Limited Entry Act, and it was subsequently repealed. During May, 2005, the BOF adopted an emergency regulation (5 AAC 15.358) that re-established the Chignik cooperative. The emergency regulation attempted to address the concerns of the court by defining active participation by requiring a cooperative member to make a minimum of 10 deliveries in order to

receive economic benefit from the fishery. The emergency regulation was then challenged in the Anchorage Superior Court, where the trial court judge ruled that the emergency regulation still violated the spirit and purposes of the Limited Entry Act, as described in the Alaska Supreme Court decision. However, the state appealed the Anchorage Superior Court decision to the Alaska Supreme Court and moved for stay of the decision until after the 2005 season, which was granted. The emergency regulation remained in effect for the 2005 fishing season. The BOF met again in November of 2005 and adopted the emergency management plan (with some modification) into regulation. In February of 2006 the Alaska Supreme Court ruled that the emergency regulation, and therefore the newly adopted cooperative plan, was not legal. Hence, the 2006 Chignik commercial salmon fishery was not managed under a cooperative management plan.

A total of 1,944 Chinook salmon were commercially harvested in 2006, which was only slightly more than half the 2005 harvest and well below historic average harvests. The majority of the 2006 Chignik Area Chinook salmon harvest occurred in the Chignik Bay District. Most Chinook salmon were harvested from late June through July in 2006.

A total of 895,801 sockeye salmon were commercially harvested in the Chignik Area during 2006, which was approximately 600,000 fish (40%) less than the average harvests since 1986. The majority of the 2006 Chignik Area sockeye salmon harvest came from the Chignik Bay District, although substantial catches were made in the Central and Western Districts. Over half of these sockeye salmon were harvested before mid-July.

An additional 103,844 sockeye salmon considered Chignik-bound were harvested as part of the Southeast District Mainland (SEDM) and Cape Igvak fisheries during 2006. The Chignik-bound component of the SEDM harvest was 62,010 fish and totaled 7.33% of the total Chignik-bound harvest (allocation 6.0%). The Chignik-bound portion of the Cape Igvak harvest was 41,834 fish and totaled 4.95% of the total Chignik-bound harvest (allocation 15.0%).

A total of 39,046 coho salmon were commercially harvested in 2006, which was less than the prior 5-year, 10-year, and about 110,000 fish less than the prior 20-year average harvests. The majority of the coho salmon harvest in 2006 took place in the Western District, and most were harvested during July and August.

A total of 383,574 pink salmon were commercially harvested in 2006, which was well below the prior 5-year, 10-year, and 20-year average harvests. The largest portion of the Chignik Area pink salmon harvest came from the Western District, although the Central, Eastern, and Chignik Bay districts also yielded substantial catches. Most were harvested between mid-July and mid-August.

A total of 61,630 chum salmon were commercially harvested in 2006, which was less than the prior 5-year, 10-year, and 20-year average harvests. The majority of the chum salmon harvest in 2006 took place in the Western District, although the Central District also yielded substantial catches. Most chum salmon were harvested between mid-July and early August.

The exvessel value of the 2006 Chignik Area commercial salmon harvest was about $5.0 million, or approximately $105,000 per active permit holder. The vast majority of the value was from the sale of sockeye salmon, although coho, pink, and chum salmon provided, on average, about $2,000 for each species per active permit holder. The average harvest of Chinook salmon provided less than $500 per active permit holder.

The Chignik River watershed supports two distinct sockeye salmon runs and a Chinook salmon run which provide the majority of the salmon harvest within the Chignik Area. There are several streams within the Chignik Area that support strong runs of pink, chum, and coho salmon, but in recent years the commercial effort directed at these species has been minimal. In 2006, the sockeye salmon early run was below both the average 2002–2005 early run (the cooperative years) and the prior 10-year average. The late run was approximately 204,000 fish above the 2002–2005 late run average and slightly below the prior 10-year average. The total for both runs combined was approximately 147,000 fish less than the average 2002–2005 combined runs and about 559,000 fish less than the prior 10-year average. A total of 48 Chignik Area permits were fished in 2006.

Escapement through the Chignik River weir was monitored using underwater digital video equipment. There were two gates in the weir, which were generally always 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 then expanded to obtain hourly escapement estimates, and then summed to provide an estimate of daily fish passage. A digital video archive was kept of these 10-minute periods. The first count of the 2006 season occurred when weir installation was complete on May 30, and the last weir count of the season took place on September 4, after which the weir was removed.

Escapements for the remainder of Chignik Area streams were measured against established escapement goals, which were apportioned into district-wide management objectives. Aerial surveys were flown regularly on individual index streams. Peak aerial survey counts, by index stream and species, were summed and compared to escapement goals as established by Witteveen et al. (2005).

Chinook Salmon. The BEG for Chinook salmon in the Chignik River watershed is 1,300–2,700 fish (Witteveen et al. 2005). The 2006 Chignik River Chinook salmon escapement of 3,535 exceeded the BEG by approximately 800 fish, but was still less than the most recent 5-year, 10-year, and 20-year averages. The Chignik River is the only Chinook salmon-producing stream within the Chignik Area.

Sockeye Salmon. Sockeye salmon escapement to the Chignik River is managed based on interim escapement objectives. These objectives target a final escapement of 50,000 fish greater than the combined SEG of the watershed to provide for additional freshwater subsistence fishing opportunity. The early-run SEG (350,000–400,000 fish) through July 4 was achieved with an estimated escapement of 366,497. Post-weir sockeye salmon escapement estimates were produced for the September 4–15 and the September 16–30 periods, which were included in the total late-run escapement estimate. The late-run (post-July 4) SEG (200,000–250,000 fish) was exceeded with an estimated escapement of 368,996 sockeye salmon. The 2006 early-run escapement was below, and the late-run escapement was above the most recent 5-year, 10-year, and 20-year averages. Sockeye salmon escapements into other Chignik Area streams were relatively minor.

Coho Salmon. Coho salmon begin to enter Chignik Area drainages in mid-August and continue through November. The coho salmon run is generally building when the weir is removed; therefore coho salmon escapement estimates are considered incomplete. The 2006 Chignik River coho salmon escapement estimate through September 4 was 37,113 fish. This was the largest recorded Chignik River coho salmon escapement on record. Although no coho salmon

escapement goals have been established for the Chignik Area (Witteveen et al. 2005), coho salmon escapements were monitored in area streams and appeared healthy.

Pink Salmon. The 2006 Chignik River pink salmon escapement estimate was 18,401 fish, which was the largest recorded Chignik River pink salmon escapement on record. Pink salmon escapement to other Chignik Area streams were estimated via aerial survey and summarized by district. The Chignik Bay, Eastern, Western, and Perryville District pink salmon management objectives were met in 2006. The Central District management objective was not met having approximately 26,000 fewer pink salmon than the lower end of the management objective for the district. However, pink salmon run timing in 2006 was later than usual and many pink salmon were observed staged at the mouths of Central District spawning streams. Because these fish had not yet entered the streams, they were not included in the total escapement estimate. Weather conditions and aircraft availability precluded the surveys necessary to document these fish once they entered the streams. Despite this, and given the lack of commercial fishing effort on these stocks, it was assumed these staging fish eventually entered their respective spawning streams and the total pink salmon escapement into the Central District was healthy. Overall, the lower end of the BEG of 327,000 fish for all districts combined (Witteveen et al. 2005) was achieved with an estimated total peak escapement of 356,425 fish.

Chum Salmon. The 2006 Chignik River chum salmon escapement was 99 fish, which was slightly below average for the Chignik River. Chum salmon escapements to other Chignik Area streams were estimated via aerial survey and summarized by district. Similar to pink salmon, all district management objectives for chum salmon were met in 2006 with the exception of the Central District. The SEG of 50,400 fish for all districts combined (Witteveen et al. 2005) was met with an estimated total peak escapement of 93,390 fish.

ALASKA PENINSULA-ALEUTIAN ISLANDS

The following is an overview of the 2006 Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Areas commercial salmon fishing season. Fishing has been completed and preliminary harvest totals should closely approximate final harvest numbers for all species. The 2006 total commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management Areas was 13,037 Chinook, 4,212,705 sockeye, 258,917 coho, 5,317,124 pink, and 1,309,095 chum salmon (Table 7), The commercial harvests of Chinook, sockeye, pink, and chum salmon harvests were all above the most recent 10-year average harvest. Chinook, sockeye, coho, and chum salmon harvests were all above the 2006 harvest projections (Table 1). The harvest of pink salmon was only slightly below the 2006 harvest projection. The exvessel value of salmon harvested in Area M totaled $16,998,925.

South Alaska Peninsula June Fishery

In February 2004, the Alaska Board of Fisheries made three changes to the South Unimak and Shumagin Islands June Salmon Management Plan.

(1) Opening the season on June 7 (previously June 10).

(2) Establishing fishing periods that start at 6:00 a.m. and run for 88 hours until 10:00 p.m. three days later. The fishing periods are separated by 32-hour closures with the fishery ending at 10:00 p.m. June 29.

(3) Expanding the South Unimak fishery to include the entire Southwestern District and the West Pavlof Bay and East Pavlof Bay Sections of the South Central District.

The South Unimak and Shumagin Islands fishing season began at 6:00 a.m. on June 7 with an 88-hour fishing period for all gear types (purse seine, drift gillnet, and set gillnet gear). During the June fishery, there were four 88-hour and one 64-hour fishing period for purse seine, set, and drift gillnet gear. During the South Unimak and Shumagin Islands June fishery, there were 4,497 Chinook, 932,291 sockeye, 2,629 coho, 1,332,319 pink, and 299,827 chum salmon harvested.

The harvest from the expanded area of the South Unimak June fishery (Poperechnoi Island, north side of Dolgoi Island, West Pavlof Bay Section, and East Pavlof Bay Section) was 226 Chinook, 210,080 sockeye, 84 coho, 50,851 pink, and 7,633 chum salmon. This represented 15.4% of the Chinook, 42.8% of the sockeye, 19.4% of the coho, 27.3% of the pink, and 7.9% of the chum salmon harvested in the South Unimak June fishery. It should be noted that the expanded area is only open to seine and set gillnet gear types.

The number of purse seine permit holders participating in the 2006 South Unimak and Shumagin Islands June fisheries was 36 as compared to 40 in 2005. The number of drift gillnet permit holders was 85 in 2006 as compared to 94 in 2005, while the number set gillnet permit holders was 67 in 2006—up from 56 in 2005. Preliminary total exvessel value for the June fishery was $3,412,473.

Southeastern District Mainland Fishery

The Southeastern District Mainland (SEDM) fishery is managed based on the total estimated Chignik Area-bound sockeye salmon harvest from June 1 to July 25. Due to a late run and small commercial harvest in the Chignik Area, managers were unable to open the SEDM until 12:00 p.m. on July 20. During July 20–21, there were 36 hours of commercial fishing time in the SEDM, with a harvest of 29 Chinook, 77,513 sockeye, 2,805 coho, 77,685 pink, and 13,259 chum salmon. The estimated SEDM harvest considered Chignik-bound through July 25 was 62,010 sockeye salmon. This constituted 7.3% (6.0% allocation) of the total Chignik-bound sockeye salmon harvest through July 25.

Beginning July 1, the Northwest Subsection of the SEDM is managed on the strength of the Orzinski Lake sockeye salmon run. Due to the poor Orzinski Lake sockeye salmon escapement, commercial salmon fishing was curtailed in Orzinski Bay for the entire 2006 season. The Orzinski Lake sockeye salmon escapement of 6,747 fish was below interim escapement objectives through August 7, when the weir was removed. On September 1, an aerial survey conducted in the Southeastern District indicated that there were 18,000 sockeye salmon in Orzinski Lake, suggesting that the escapement goal (15,000–20,000 fish) was achieved, though substantially later than previously recorded.

From July 26 to September 30, the SEDM is managed as a part of the Post-June Management plan, which is based on the abundance of local salmon stocks. Processors in Sand Point curtailed buying salmon from August 23 to September 1 so that they could focus their processing operations on walleye pollock. The harvest in the SEDM from July 26 to August 23 was 247 Chinook, 162,665 sockeye, 23,067 coho, 389,344 pink, and 50,341 chum salmon, and was valued at $838,345.

From September 1–30 the SEDM is opened concurrently with the remainder of the Southeastern District based on the abundance of coho salmon stocks. The fall fishery was open for 14 days during the September 1–26 time frame. All harvest came from set gillnet gear. The SEDM harvest in September of 15 Chinook, 32,282 sockeye, 8,212 coho, 490 pink, and 802 chum salmon, was valued at $152,969.

South Peninsula Post-June Fishery

The Post-June South Peninsula salmon management can be separated into four time periods: (1) July 6–21 management mostly based on early pink and chum salmon stocks, the presence of immature salmon, and a few terminal harvest areas, (2) July 22–31 management based mostly on pink and chum salmon stocks with expanded terminal harvest areas including the SEDM beginning on July 26, (3) August 1–31 management is based on the abundance of local stocks, and (4) September 1–30 management based on the abundance of coho salmon with consideration for local pink and chum salmon stocks.

Prior to the South Peninsula Post-June fishery, ADF&G conducted a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishery results on July 5 indicated that the number of immature salmon was below the threshold (100 per set) at 69 immatures per set. The Shumagin Islands fishery was opened to seine and gillnet gear on July 6. Inseason monitoring of the seine fishery indicated that the harvest of immature salmon remained below the threshold for the entire fishery. Due to inadequate salmon run strength, fishing time in terminal areas through July 31 was limited.

From July 6–21, the majority of the non-terminal harvest took place in the Shumagin Islands. During July the majority of the terminal harvest took place in Canoe Bay and inner Pavlof Bay in response to a strong and early pink salmon run. Chum salmon runs into Canoe Bay also appeared to be moderately strong. From July 22–31, the majority of the non terminal fishing also took place in the Shumagin Islands.

In August, fishing time was liberal and harvests were recorded on all but four days. As mentioned earlier, processors suspended salmon buying operations in the Southeastern district on August 23. Limited fishing occurred from August 23–31 in the Unimak, Southwest, and South Central districts. The majority of the South Peninsula September harvest was from set gillnet permit holders in the Southeastern District. Fishing time in September is based on coho salmon abundance. Coho harvest rates were average.

The total South Peninsula Post-June harvests of sockeye and chum salmon were above the most recent 10-year average (1996–2005); however, Chinook, coho, and pink total harvests were below the most recent 10-year average.

The South Peninsula indexed sockeye salmon escapement of 87,783 fish was above the lower end of the escapement goal (48,200–86,400 fish). The South Peninsula indexed total pink salmon escapement of 3,102,445 was near the upper end of the even-year goal range (1,864,600–3,729,300 fish). The South Peninsula indexed total chum salmon escapement of 785,485 was above the upper end of the goal range (330,400–660,800 fish). A total of 196,758 coho salmon were documented in 30 South Peninsula streams. Some of the major coho salmon systems are typically not surveyed or surveyed during off-peak times. There are few escapement goals on the South Peninsula for coho salmon due to their late run timing

North Alaska Peninsula

In 2006, 156 Area M permit holders and 6 Area T permit holders participated in commercial salmon fisheries along the North Alaska Peninsula. Effort was similar as in 2005, when 155 Area M permit holders and 11 Area T permit holders participated, and in 2004, when 144 Area M and 1 Area T permit holders fished. The numbers of permit holders from 2004–2006 were far below the historic numbers observed during the 1990s.

The North Alaska Peninsula fishery is predominantly a sockeye salmon fishery, although depending on market conditions, directed Chinook, coho, and chum salmon fisheries occur in some locations. During odd-numbered years, pink salmon catches are incidental to the targeting of other salmon species, but during even-numbered years, and depending on market conditions, pink salmon are frequently targeted, as occurred in 2006 in Bechevin Bay.

In 2006, the North Alaska Peninsula harvests of all salmon species were above previous 10-year (1996–2005) averages. While the Chinook salmon harvest of 7,637 fish was below the projected 8,000 fish, the sockeye salmon harvest of 2.4 million (2.1 million fish projected) and the coho salmon harvest of 93,955 (70,000 fish projected) were above projected levels, mostly due to market interest by processors and commercial fishermen and run strength. The pink salmon harvest of 64,207 fish (25,000 fish projected), which occurred mainly in the Bechevin Bay Section, and the chum salmon harvest of 131,718 fish (40,000 fish projected) were also above the projected levels. The relatively large harvest levels of chum and pink salmon were due in some degree to favorable market conditions and run strength.

The North Alaska Peninsula total Chinook salmon escapement for 2006 was 32,173 fish. The Nelson River final weir count totaled 2,516 Chinook salmon, which was well within the escapement goal range (2,400–4,400 fish). The Black Hills Creek escapement was 4,500 fish and Steelhead Creek escapement was 5,800 fish. The indexed total escapement objectives were 600 fish for Black Hills and 1,200 fish for Steelhead Creek. King Salmon River had an escapement of 1,300 fish and Bear River had an escapement of 300 fish that migrated mainly up Ridgerunner Creek, a tributary of the Bear River. Sandy River had a good escapement of approximately 2,500 fish, the Meshik River system had an escapement of 10,900 fish, and the Cinder River system escapement was 4,200 fish.

The 2006 North Alaska Peninsula sockeye salmon escapement was an estimated 1,158,121 fish. All sockeye salmon system escapement goals were met or exceeded. The weired systems (Bear, Sandy, Nelson, and Ilnik rivers) accounted for 69% of North Alaska Peninsula sockeye salmon escapement. Non-weired North Alaska Peninsula sockeye salmon systems were surveyed by air to estimate escapement. These systems included the Christianson Lagoon system (41,505 fish), Joshua Green River (28,575 fish), North Creek (7,530 fish), Meshik River system (142,610 fish), Mud Creek (49,000 fish), and Cinder River (52,100 fish).

The North Alaska Peninsula coho salmon escapements were strong in major coho salmon systems. The Nelson River escapement was at least 19,000 fish compared to the escapement goal of 18,000 fish. Estimated escapements on other major streams surveyed, include the Meshik River (47,000 fish), Cinder River (9,000 fish), and the Ilnik Lagoon system (42,000 fish). In all, approximately 229,440 coho salmon were documented in 41 North Alaska Peninsula streams during 2006. However, it should be noted that because of limited budgets and fall weather conditions intensive aerial surveys were not flown for coho salmon during 2006. Many of these streams were not surveyed, or surveyed prior to the peak of the run.

The North Alaska Peninsula pink salmon escapement for 2006 was 252,462 fish, which exceeded the 1996–2004 even-year average of 180,080 fish. The North Alaska Peninsula is normally a minor pink salmon producer. The largest escapement occurred in the Bechevin Bay Section where the pink salmon escapement was estimated at 116,075 fish and exceeded the even-year escapement goal of 31,000 fish.

The 2006 North Alaska Peninsula indexed total chum salmon escapement of 576,043 fish exceeded the escapement goal range (219,600–454,200 fish). Due to low prices, there was little

fishing effort directed toward North Alaska Peninsula chum salmon. Those locations with the largest chum salmon indexed total escapements were Izembek-Moffet Bay (131,860 fish), Bechevin Bay (53,025 fish), Meshik River (124,500 fish), and Herendeen-Moller Bay (188,250 fish).

ALEUTIAN ISLANDS AND ATKA-AMLIA ISLANDS AREAS

The department opened the Aleutian Islands Area to commercial salmon fishing by seine gear in August. The first commercial harvest of salmon since 2000 occurred mostly in Unalaska and Makushin Bays, with a total of 2,329 sockeye, 991,687 pink, and 1,534 chum salmon harvested. On August 13 an aerial survey of Unalaska and Makushin Bays was performed by ADF&G. Pink salmon were surveyed in three streams in Unalaska Bay for an escapement estimate of 116,000 fish. Pink salmon were also surveyed in six streams in Makushin Bay for an escapement estimate of 297,000 fish.

Table 7.–Preliminary 2006 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak	20	1,584	553	31,693	1,081	34,931
Chignik	2	896	39	384	62	1,383
South Peninsula and Aleutian Islands	5	1,838	165	5,253	1,177	8,438
North Peninsula	8	2,375	94	64	132	2,673
Alaska Peninsula Total	13	4,213	259	5,317	1,309	11,111
Aleutian Islands	0	0	0	0	0	0
Westward Region Total	35	6,693	851	37,394	2,452	47,425

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

PRELIMINARY FORECASTS OF 2007 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 2007 fishing year, forecast fisheries are as follows:

Southeast	—	pink salmon
Prince William Sound	—	pink, chum, and sockeye salmon
Copper River/ Copper River Delta	—	sockeye salmon
Upper Cook Inlet	—	sockeye salmon
Lower Cook Inlet	—	pink salmon
Kodiak	—	pink salmon
Upper Station (early and late)	—	sockeye salmon
Frazer Lake	—	sockeye salmon
Ayakulik River	—	sockeye salmon
Spiridon Lake	—	sockeye salmon
Karluk Lake (early and late)	—	sockeye salmon
Chignik	—	sockeye salmon
Bristol Bay	—	sockeye and Chinook salmon
Alaska Peninsula, Bear Lake (late run)	—	sockeye salmon
Alaska Peninsula, Nelson River	—	sockeye salmon

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

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

ACKNOWLEDGMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Hal Geiger, Lowell Fair, Linda Brannian, and Steven Honnold assembled the forecasts for their respective regions. Individual credit for forecast material is contained in area forecast discussions in the Appendix. Area biologists throughout the state supplied reviews of the 2007 fishing season. The editor would also like to acknowledge Amy Carroll for her editorial advice and assistance with the report figures, tables and layout.

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FIGURES
SALMON SPECIES CATCH AND PROJECTIONS

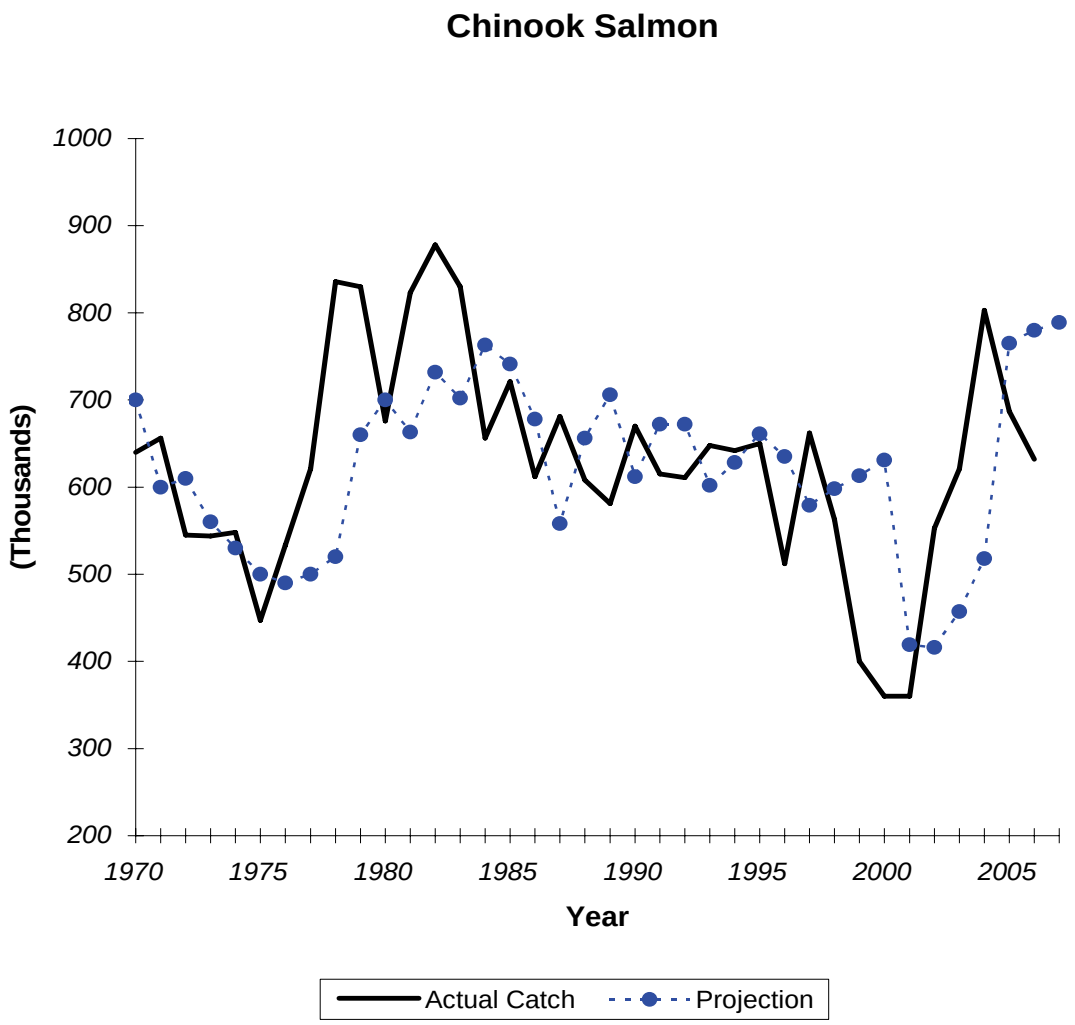


Figure 2.–Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970–2006, with the 2007 projection.

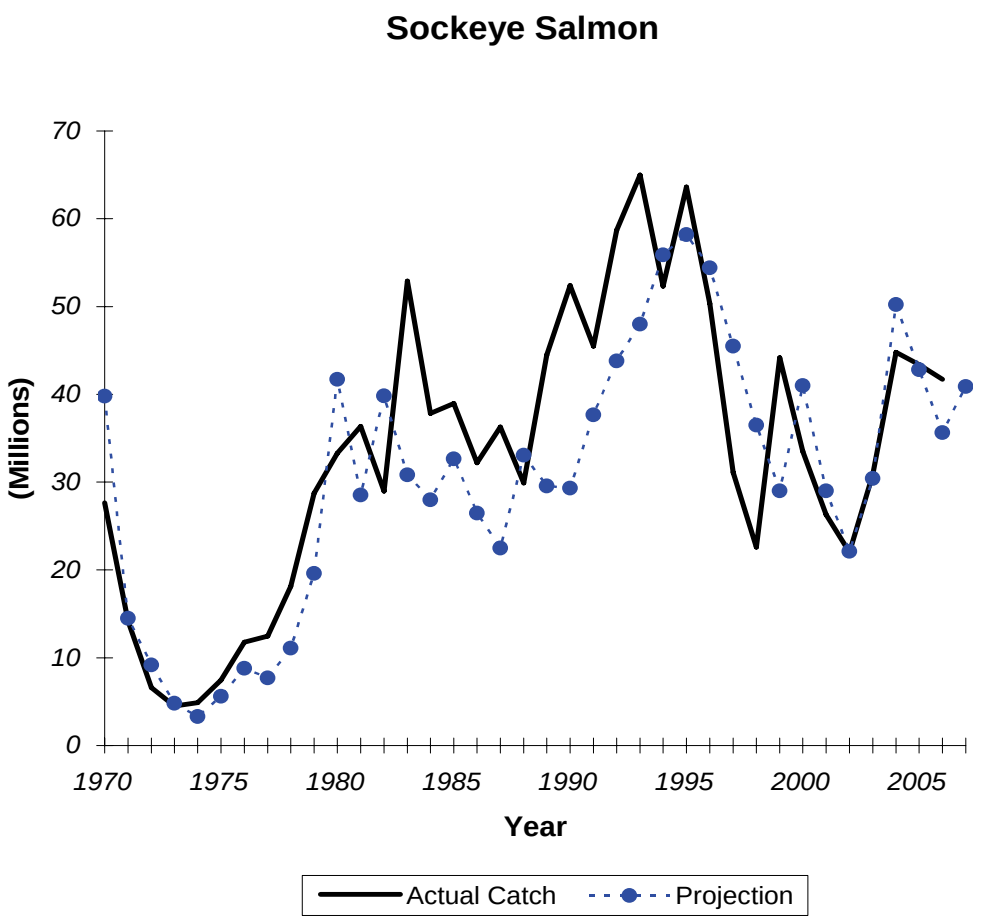


Figure 3.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2006, with the 2007 projection.

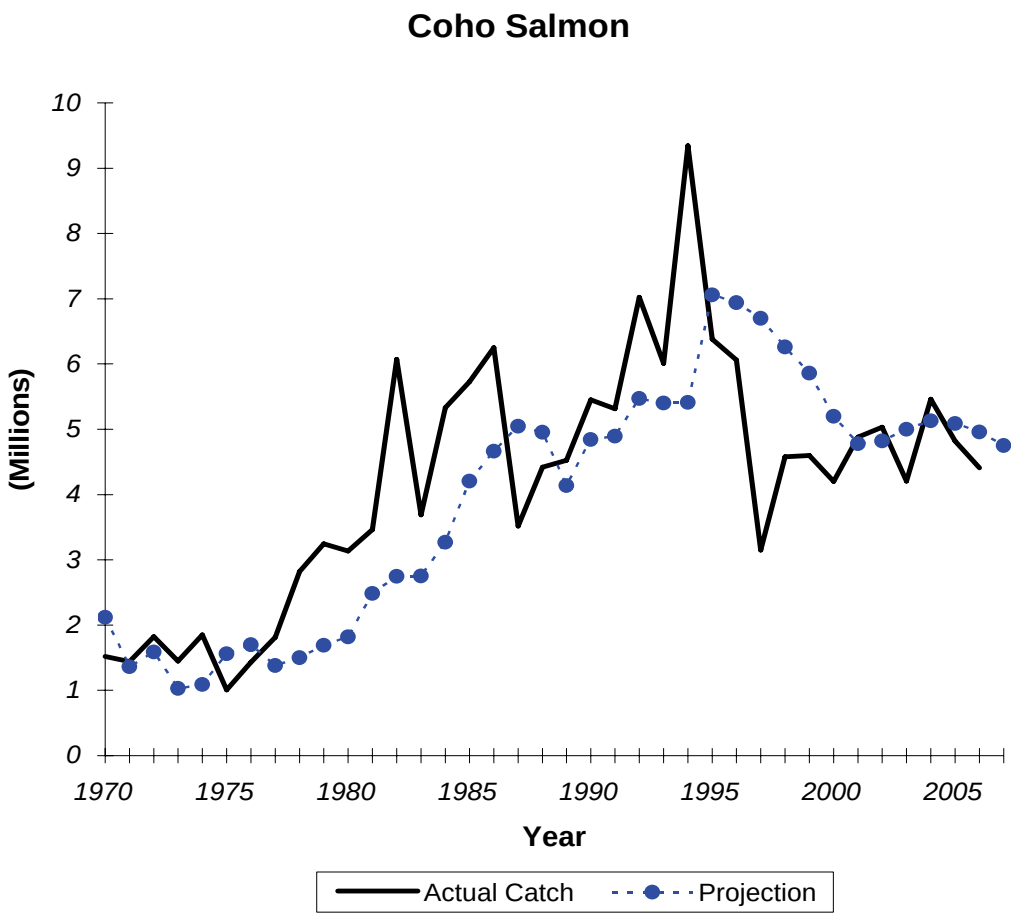


Figure 4.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2006, with the 2007 projection.

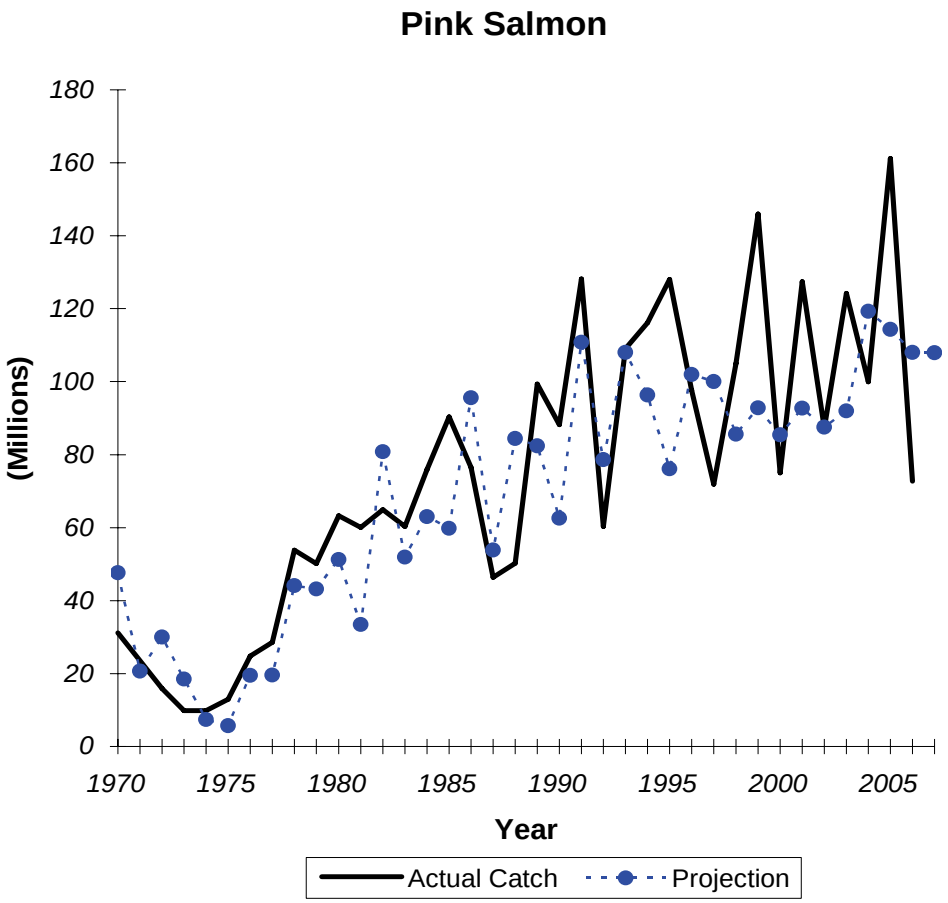


Figure 5.–Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2006, with the 2007 projection.

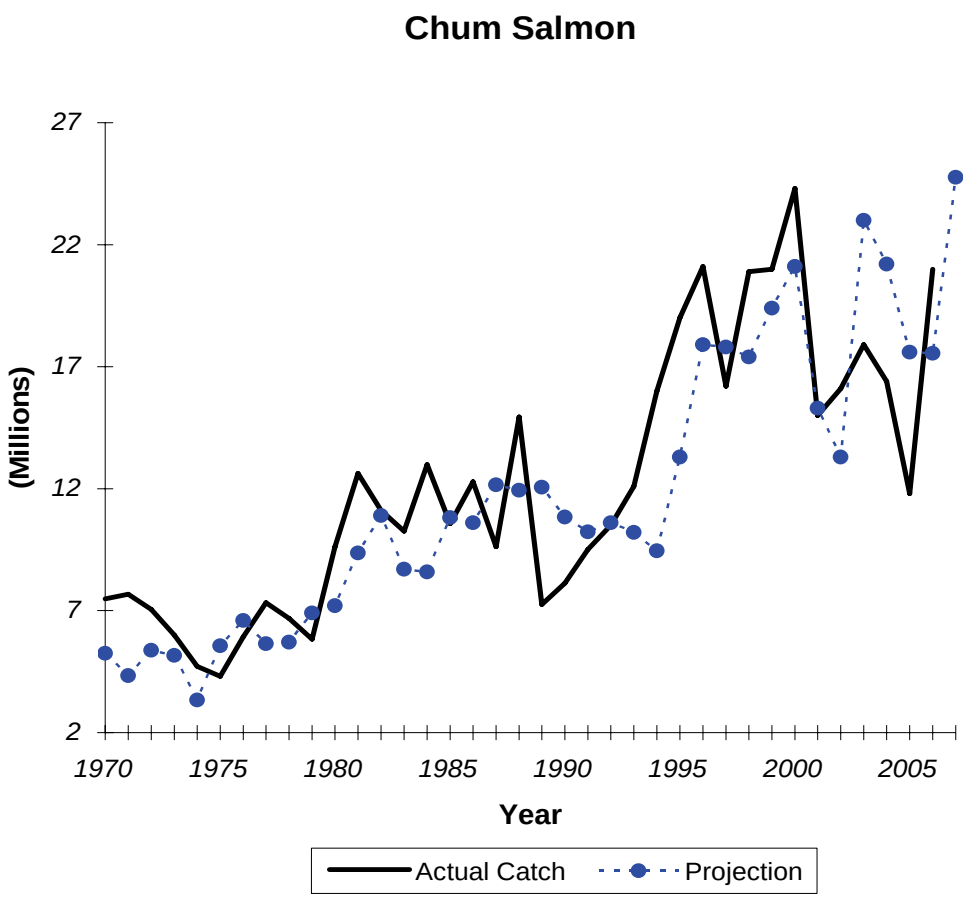


Figure 6.–Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2006, with the 2007 projection.

APPENDIX

Appendix A. 1.– Southeast Alaska

Forecast Area: Southeast Alaska
Species: Pink Salmon

The pink salmon return in 2007 is predicted to be strong, with a potential total Southeast Alaska harvest of 47 million fish (with an 80% CI range of 36 million to 58 million fish). The Strong category represents harvests between the 61st and 80th percentiles of the historical Southeast Alaska pink salmon harvest from 1960–2006:

Category	Range (millions)	Percentile
Disaster	Less than 11	Less than 20th
Weak	11 to 16	21st to 40th
Average	17 to 28	41st to 60th
Strong	29 to 51	61st to 80th
Excellent	Greater than 51	Greater than 80th

Forecast Methods

The ADF&G forecast of the potential pink salmon harvest in Southeast Alaska over the past three years 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 annual 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 data, the less influence it has on the forecast. If x_t, x_{t-1}, ... denotes the observed harvests in year t, t-1, and so on, then the forecast in year t+1 is given by,

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

The forecast for year t, that is $\hat{x}_t$, is also a weighted average of the observed catch in year t-1, and the forecast in year t-2. This is a kind of recursive equation that contains all of the data in the series. In this case, we choose a value of c to be approximately 0.44, based on minimizing the sum of past squared errors. This method is excellent for tracking the underlying, long-term trend in pink salmon abundance, but it is not useful for tracking annual fluctuations in pink salmon abundance, and it is not useful for forecasting a surprise event, such as an extremely large or small run. The Southeast Alaska pink salmon harvest contains a long-term increasing trend in the harvest, up to the 1990s, as well as considerable year-to-year change in harvest level (Appendix Figure 1).

We have made two changes for our 2007 forecast. First, because we feel that this series may be developing an odd and even year cycle, we let t be 2005, the parent year for the 2007 return. That is, we used all of the data up to 2005, and excluded the 2006 catch from the exponential-smooth algorithm, assuming the 2005 parent year will better predict the 2007 return than the 2006 return year. Second, we took the additional step of using pink salmon fry catch per unit effort (CPUE) statistics from the National Oceanic and Atmospheric Administration (NOAA) Fisheries,

Alaska Fisheries Science Center, Auke Bay Laboratory (Joe Orsi[1], unpublished data) to adjust the exponential smooth. These observations are based on the catches of juvenile pink salmon in a scientific cruise the year prior to the pink salmon return, and as such provide information on the early marine survival and abundance in the ocean. Although we only have nine paired exponential-smooth forecasts and CPUE statistics, we developed an equation to predict the forecast error in the exponential-smooth using linear regression (Appendix Figure 2). This approach had fair to good performance in predicting the direction of error and this technique may help forecast exceptionally big or exceptionally small harvests (Appendix Figure 3). The forecast range is based on an 80% confidence interval, calculated by cross-validation estimates of the forecast error.

Forecast Discussion

As was typical in recent years, the parent-year escapement in 2005 appears to have been ample to provide a strong total return in 2007 if marine conditions remain favorable for pink salmon. Brood-year escapement indices in 2005 were the fourth highest since 1960, and were above the recently established subregional biological escapement goals. However, there were very warm conditions in many streams in 2005, which may have resulted in some reduced spawning success.

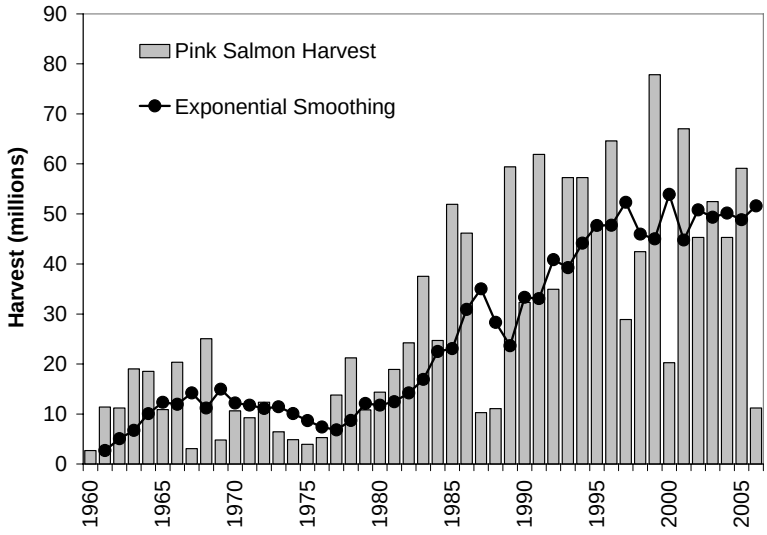
The current forecast does not rely on estimates of total escapement or total run size, as did prior forecasts, because accurate measures of these variables are not currently available. Because it is strictly based on historical harvests, this new method of forecasting does not directly forecast the amount of fish that might be available for harvest. This is the third year we have used exponential smoothing to forecast the harvest. The first two exponential-smooth forecasts were accurate to within 5 million fish and 10 million fish; or about 10% to 20% of the forecast, as the harvests were about average for recent years. Last year this forecast method failed to predict the unusually small run and harvest. The actual harvest of 11.2 million pink salmon in 2006 was far below the lower end of our forecast range of 29 million to 74 million fish (Appendix Figure 1).

This is the first year we have tried to adjust the exponential-smooth forecast based on information from the NOAA Auke Bay Lab. Their CPUE statistic from 2006 is only slightly below the average for 10 years we have CPUE statistics. The data set includes three out of ten observations smaller than this year's value. Harvests from those three years ranged from 11.2 million to 42.4 million fish, while all harvests during those nine years we have paired CPUE and catch statistics ranged from 11.2 million to 77.8 million fish.

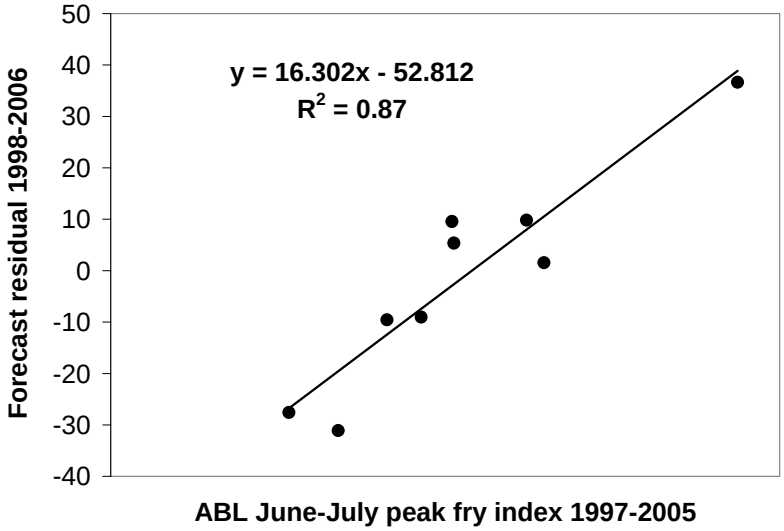
The department will manage fisheries *inseason* based on the strength of salmon runs. Aerial escapement surveys and fishery performance data will continue, as always, to be essential in making inseason management decisions.

[1] We gratefully acknowledge the assistance and advice of Joe Orsi and Alex Wertheimer of NOAA Auke Bay Lab. However, we accept responsibility for this forecast, and we accept sole responsibility for this use of their data.

Appendix A. 1. Southeast Alaska. Page 3 of 4.

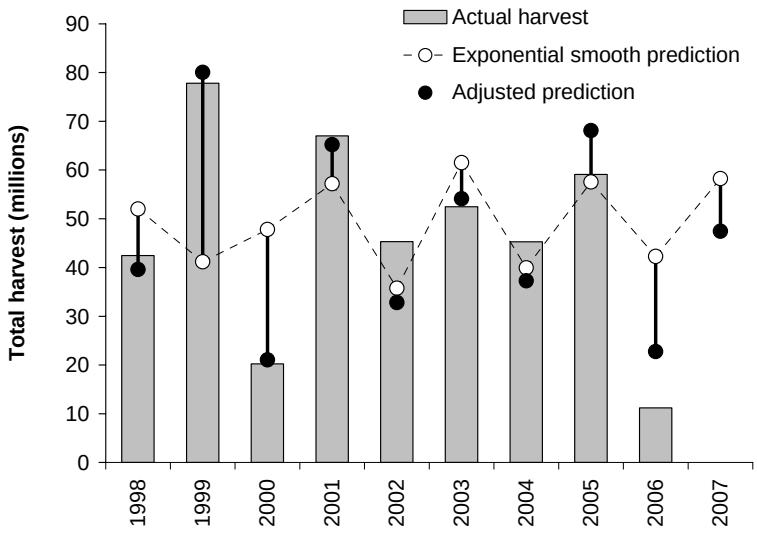


Appendix Figure 1.–Comparison of annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2006 forecast model. Note that the 2006 harvest of 11.2 million pink salmon was well below the forecast.



Appendix Figure 2.–Regression of ADF&G forecast residual on the peak June-July pink salmon fry index from Icy Strait one year prior. (Pink salmon fry index provided by Joe Orsi, NOAA Auke Bay Laboratory, personal communication).

Appendix A. 1. Southeast Alaska. Page 4 of 4.



Appendix Figure 3.–Annual harvest of pink salmon in Southeast Alaska, 1998 to 2006, compared to the exponential smoothed hindcast predictions of the harvest (based on the parent year harvest) adjusted from NOAA Auke Bay Laboratory pink salmon fry data. The 2007 harvest prediction is 47 million pink salmon.

Steve Heinl, Pink and Chum Salmon Project Leader, Ketchikan
Xinxian Zhang, Biometrician, Douglas
Hal Geiger, Fishery Biologist, Douglas

Appendix A. 2.–Prince William Sound

Forecast Area: Prince William Sound
Species: Pink Salmon

Preliminary Forecast of the Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Prince William Sound General Districts		
Total Run	12,900	0–33,260
Escapement Goal [a]	2,000	
Harvest Estimate	10,900	0–31,260

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

Forecast Methods

The predicted natural run of pink salmon is the average total run for the odd years 2003–2005. The total run by year was estimated as the total natural contribution to commercial harvests combined with the escapement index calculated as the area under the curve of weekly aerial escapement surveys adjusted for an estimate of stream life. The natural pink salmon contributions to the CPF were estimated by subtraction of hatchery contributions based on thermal marked otolith recoveries (1997–2005), coded wire tag recoveries (1985–1996), or average fry-to-adult survival estimates multiplied by fry release numbers and an estimate of exploitation rate. The prediction procedure differs from the 1997–1999 method that used linear regressions of adult production versus brood year escapement index. Prior to 1997, forecast methods employed surveys of pre-emergent fry; however, surveys of pre-emergent fry have not been conducted since 1995. The forecast range is the 80% prediction interval around the mean total brood year return. The prediction interval is the average total run plus or minus the standard deviation times the t value.

Forecast Discussion

Beginning in 2004, the department stopped producing hatchery pink salmon forecasts because the hatchery operators were already producing forecasts for their releases. Forecast methods examined for the 2007 natural run included using (1) the previous odd-brood-year total run (most naïve forecast method), (2) total run averages with 2–20 years of data, and (3) linear regression of log-transformed total PWS escapement versus log-transformed total PWS return by brood line. These methods were only moderately successful when tested against the estimated actual total runs. The forecast was generated from the 2003–2005 odd-brood year average run because the previous 2-year average had the lowest mean absolute percentage forecast error.

The brood year 2005 escapement index (4,736,377) was the largest observed since 1960. If the total run forecast is realized, it will be the sixth largest among the 22 odd brood years, 1961–2005.

Future enhancements to forecasting accuracy may come from projects conducted by the Prince William Sound Science Center documenting zooplankton abundance and distribution and the relative contribution of oceanic and coastal carbon to early marine food web of juvenile pink salmon.

Steve Moffitt, Fisheries Biologist III, PWS Research Biologist, Cordova

Appendix A. 2.–Prince William Sound. Page 2 of 4.

Forecast Area: Prince William Sound
Species: Chum Salmon

Preliminary Forecast of the Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Prince William Sound General Districts		
Total Run	454	343–565
Escapement Goal [a]	200	
Harvest Estimate	254	143–365

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

Forecast Methods

The forecast of the total natural chum salmon run was calculated as the 2002–2006 average. The total natural run by year was estimated as the total commercial harvest contribution combined with the escapement index calculated as the area under the curve of weekly aerial escapement surveys adjusted for an estimate of stream life. The CPF harvest contributions of natural stock chum salmon were estimated using prehatchery average wild runs (2001 and 2002) or thermally marked otolith estimates (2003–2006) for the Coghill, Eshamy, and Montague districts. The forecast range is the 80% prediction interval about the 5-year mean run size. The prediction interval was calculated as the average total run (2002–2006) plus or minus the standard deviation times the *t* value.

Forecast Discussion

Beginning in 2004, the department stopped producing hatchery chum salmon forecasts because the hatchery operators were already producing forecasts for their releases. Our ability to accurately forecast natural chum salmon stocks is limited by the small amount of data available. Estimates of natural stock contributions to CPF were unavailable prior to 2003. From 2003–2006, natural chum salmon contribution estimates based on thermally marked otoliths were available for the Coghill and Montague districts and for the Eshamy District in 2004 and 2005. Historical age data from escapements and CPF harvests are unavailable for most districts of PWS. If this total run is realized it will be the twenty-third largest since 1970.

Steve Moffitt , Fisheries Biologist III, PWS Research Biologist, Cordova

Forecast Area: Prince William Sound
Species: Sockeye Salmon

Preliminary Forecast Of The Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Prince William Sound - Coghill Lake		
Total Run	140	0–311
Escapement Goal [a]	25	
Harvest Estimate	115	0–286
Prince William Sound - Eshamy Lake		
Total Run	36	26–46
Escapement Goal [a]	25	
Harvest Estimate	11	1–21
Total Production:		
Run Estimate	176	26–314
Escapement Goal	50	
Common Property Harvest	126	0–264

[a] The escapement goal of 30,000 sockeye salmon for both Coghill and Eshamy Lakes is the midpoint of the escapement goal range. The escapement goal range for both systems is 20,000–40,000 fish.

Forecast Methods

The forecast of the natural sockeye salmon run to Coghill Lake is the total of estimates for five age classes. Linear regression models with log-transformed data were used to predict returns of age-1.2 and -1.3 sockeye salmon. The return of these two age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the run of age-1.2 fish in 2007 used the run of age-1.1 fish in 2006 as the input parameter. The predicted returns of age-1.1, -2.2, and -2.3 sockeye salmon were calculated as the 1974–2006 mean return of that age class. Although harvest and escapement numbers, as well as age composition data, are available for Coghill Lake sockeye salmon runs since 1962, escapement numbers prior to installation of a full weir in 1974 are considered unreliable. Therefore, only data collected since 1974 were used to estimate model parameters, calculate individual age class forecasts, and generate 80% prediction intervals. The 80% prediction intervals were calculated using the mean square error of the preseason forecasts, from 1988–2006.

For an off-cycle year such as 2007, the forecast of the natural run to Eshamy Lake is the mean of the runs from low year in the four-year cycle. Eshamy Lake escapements have been enumerated at a weir since 1950, except 1987 and 1998. Commercial harvest data are available for the same period, but age composition data are available for only some years since 1962. Data collected since 1970, excluding 1987 and 1998, were used to calculate the forecast and the 80% prediction interval.

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

Forecast Discussion

Beginning in 2004, ADF&G stopped forecasting hatchery runs of sockeye salmon to the Main Bay Hatchery because the hatchery operators were already producing forecasts for these releases. Coghill Lake has very dynamic limnological characteristics that can significantly impact the sockeye salmon population. Studies conducted in the mid 1980s and early 1990s found the lake may be zooplankton limited. As a result, the BEG midpoint was lowered in 1992 from 40,000 fish 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; although the goal type was changed from a BEG to a SEG. Also, in 2002 the department began collecting limnological data to monitor the basic lake characteristics.

The Coghill Lake natural run escapement has been within or above the BEG range every year since 1995. If achieved, the 2007 total run forecast midpoint would rank as the seventh largest run since 1988.

The Eshamy Lake natural stock appears to exhibit a four-year cycle. The 2007 run should be the low abundance year in the cycle. The spawning escapement goal was met in 2006 with 42,473 sockeye salmon enumerated past the Eshamy River weir.

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

Steve Moffitt, Fisheries Biologist III, PWS Research Biologist, Cordova

Appendix A. 3.–Copper River

Forecast Area: Copper River/Copper River Delta
Species: Sockeye Salmon

Preliminary Forecast of the Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Total Run	1,763	1,033–2,523
Escapement Goal [a]	530	
Common Property Harvest [b]	1,233	580–1,886
Hatchery And Supplemental Production		
Prince William Sound Aquaculture Corp. - Gulkana Hatchery		
Hatchery Run	193	110–276
Broodstock Needs	20	
Supplemental Escapement [c]	44	
Common Property Harvest [b]	129	61–197
Total Production		
Run Estimate	1,956	1,113–2,799
Natural Escapement Goal	530	
Broodstock Needs	20	
Supplemental Escapement [c]	44	
Common Property Harvest [d]	1,362	749–1,975

[a] The escapement goal of 530,000 sockeye salmon is the historical average spawning escapement (361,000 fish) of the upper Copper River (spawning escapement range: 300,000–500,00 fish) combined with the historical average Copper River delta aerial survey peak count times two (spawning escapement range 55,000–130,000 fish). The average Copper River delta peak count of 84,500 is multiplied by two to adjust for surveyor efficiency, i.e., we assume surveyors count 50% of the total fish. No adjustment is made for freshwater residence time.
[b] Includes the harvests from commercial, subsistence, personal use, and sport fisheries.
[c] Hatchery production that will not be harvested to ensure that natural escapement to the upper Copper River is achieved, because natural stocks cannot sustain the higher exploitation levels of hatchery stocks.
[d] Includes the harvests from commercial, subsistence, personal use, and sport fisheries. The commercial common property harvest is estimated to be ~1,362 thousand fish.

Forecast Methods

Forecast methods for 2007 are similar to forecast methods used since 1998. The forecast of natural run sockeye salmon to the Copper River is the total of estimates for six age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2, -1.3, and -2.2 sockeye salmon. The return for these three age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the return of age-1.3 fish in 2007 used the return of age-1.2 fish in 2005 as the input parameter. Finally, predicted return of age-1.1, -0.3, and -2.3 sockeye salmon were calculated as the mean return of those age classes since 1961. The 80% prediction bounds for the total run and harvest forecasts were calculated using the mean square error of the 1984 to 2006 total run or harvest forecasts.

Supplemental production from Gulkana Hatchery remote releases to Crosswind and Summit Lakes was predicted using age specific smolt-to-adult survival estimates from brood years 1995 to 1998. The survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements. The forecast of supplemental production from Gulkana I and Gulkana II Hatcheries was estimated from the total fry release and a fry to adult survival of 0.8%. The return was apportioned to return year using a maturity schedule of 13% age 4 and 87% age 5. The average estimated exploitation rate (67%) between 2000 and 2004 was used to project the total harvest of Gulkana Hatchery stocks in 2007. The 80% prediction interval for the forecast of supplemental production was calculated using mean square error estimates calculated for total runs.

Forecast Discussion

Forecast methods for 2007 are similar to forecast methods used since 1998. The forecast of natural run sockeye salmon to the Copper River is the total of estimates for six age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2, -1.3, and -2.2 sockeye salmon. The return for these three age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the return of age-1.3 fish in 2007 used the return of age-1.2 fish in 2005 as the input parameter. Finally, predicted return of age-1.1, -0.3, and -2.3 sockeye salmon were calculated as the mean return of those age classes since 1961. The 80% prediction bounds for the total run and harvest forecasts were calculated using the mean square error of the 1984 to 2006 total run or harvest forecasts.

Supplemental production from Gulkana Hatchery remote releases to Crosswind and Summit Lakes was predicted using age specific smolt-to-adult survival estimates from brood years 1995 to 1998. The survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements. The forecast of supplemental production from Gulkana I and Gulkana II Hatcheries was estimated from the total fry release and a fry to adult survival of 0.8%. The return was apportioned to return year using a maturity schedule of 13% age 4 and 87% age 5. The average estimated exploitation rate (67%) from 2000–2004 was used to project the total harvest of Gulkana Hatchery stocks in 2007. The 80% prediction interval for the forecast of supplemental production was calculated using mean square error estimates calculated for total runs.

Steve Moffitt, Fisheries Biologist III, PWS Research Project Leader, Cordova

Appendix A. 4.–Upper and Lower Cook Inlet

Forecast Area: Upper Cook Inlet
Species: Sockeye Salmon

Preliminary Forecast Of The 2007 Run	Forecast Estimate (Millions)	Forecast Range (Millions)
Natural Production		
Total Run	4.9	1.6–8.3
Escapement Goal	1.6	
Harvest Estimate	3.3	

Forecast Methods

The major sockeye salmon systems in UCI are the Kenai, Kasilof, Susitna and Crescent Rivers, and Fish Creek. Spawner, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the return of sockeye salmon to UCI in 2007: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fry, (3) the relationship between adult returns and smolts, and (4) the relationship between adult returns and siblings. In most cases, sibling relationships were used. The return of age 1.3 sockeye salmon to the Kenai River in 2007 was forecast using the fry model. The fry-model prediction was based on the abundance of sockeye salmon fry rearing in Skilak and Kenai lakes in the fall of 2003. The abundance of smolts emigrating from Tustemena Lake (estimated by the Cook Inlet Aquaculture Association) was used to forecast returns of age 1.2 and 2.2 sockeye salmon to the Kasilof River in 2007. Sibling models were used to forecast the returns of age 1.3 and 2.3 sockeye salmon to the Kasilof River. The aggregate escapement is the sum of the upper end of the escapement goal ranges for each of the major sockeye salmon producing systems in UCI corrected for the total escapement into the Susitna River (estimated as 1.95 times the Yentna River sonar escapement) and the escapement into minor (unmonitored) systems (estimated as 15% of the escapement into monitored systems). The estimated sport harvest upstream of the sonar at river mile 19 on the Kenai River was also subtracted from the aggregate escapement. An approximate 80% confidence interval for the total forecasted run was calculated using the squared deviations between past forecasts and actual runs as the forecast variance (mean square error).

Forecast Discussion

In 2006, the harvest of sockeye salmon by all user groups in UCI was 2.7 million fish, while the preseason forecast was 2.1 million fish. The higher than expected harvest in 2006 was largely due to stronger than expected returns of age 2.3 sockeye salmon to the Kenai River and age 1.2 sockeye salmon to the Kasilof River. In 2006, the total run of sockeye salmon was 2.5 million fish to the Kenai River, 1.6 million fish to the Kasilof River, 208,000 fish to the Susitna River, 130,000 fish to the Crescent River, and 36,000 fish to Fish Creek. The forecasted run of sockeye salmon in 2006 was 1.8 million fish to the Kenai River, 937,000 fish to the Kasilof River, 190,000 fish to the Susitna River, 125,000 fish to the Crescent River, and 44,000 fish to Fish Creek.

A run of 4.9 million sockeye salmon is forecasted to return to UCI in 2007 with a harvest by all user groups of 3.3 million sockeye salmon. The forecasted harvest in 2007 is about 1.2 million fish below the 20-year average harvest by all user groups. The sockeye salmon run forecast for the Kenai River is 37% less than the 20-year average run of 3.8 million fish. Age 1.3 sockeye salmon typically comprise about 65% of the run to the Kenai River. A fry model based upon the abundance of age-0 fry rearing in Kenai and Skilak lakes in 2003 was used to forecast the return of age 1.3 sockeye salmon to the Kenai River. The fry population estimate in 2003 (12.7 million fish) was 26% less than the 20-year average. The fry model predicted a return of 1.6 million age 1.3 sockeye salmon to the Kenai River, and the sibling model forecast for this age class was the same as the fry model forecast. Age 2.3 sockeye salmon typically comprise about 20% of the run to the Kenai River. A sibling model based upon the return of age 2.2 sockeye salmon in 2006 was used to forecast the return of age 2.3 sockeye salmon to the Kenai River in 2007. The return of age 2.2 sockeye salmon in 2006 was 68% less than the 20-year average return for this age class.

The sockeye salmon run forecast for the Kasilof River is 36% greater than the 20-year average run of 915,000 fish. Age 1.3 sockeye salmon typically comprise about 35% of the run to the Kasilof River. A sibling model based upon the return of age 1.2 sockeye salmon in 2006 was used to forecast the return of age 1.3 sockeye salmon to the Kasilof River in 2007. The return of age 1.2 sockeye salmon in 2006 was more than double the 20-year average return for this age class. Age 1.2 and 2.2 sockeye salmon typically comprise about 53% of the run to the Kasilof River. Smolt models were used to forecast the returns of age 1.2 and 2.2 sockeye salmon to Kasilof River. These fish emigrated from Tustemena Lake as smolts in 2005. The age-1 smolt population estimate in 2005 (10.2 million fish) was about double the 20-year average, while the age-2 smolt population estimate in 2005 (1.0 million fish) was about one half of the 20-year average.

The sockeye salmon run forecast for the Susitna River is 12% greater than the 20-year average run of 436,000 fish. Age 1.2 and 1.3 sockeye salmon typically comprise 72% of the run to the Susitna River. A spawner-abundance model was used to forecast the return of age 1.2 sockeye salmon to the Susitna River. The brood-year spawner abundance for this age class was about 38% greater than the 20-year average spawner abundance. A sibling model based upon the return of age 1.2 sockeye salmon in 2006 was used to forecast the return of age 1.3 sockeye salmon to the Susitna River in 2007. The return of age 1.2 sockeye salmon in 2006 was 37% greater than the 20-year average run for this age class. The sockeye salmon run forecast for Fish Creek is 77% less than the 20-year average run of 161,000 fish. Age 1.2 and 1.3 sockeye salmon typically comprise 79% of the run to Fish Creek. Smolt models were used to forecast the returns of age 1.2 and 1.3 sockeye salmon to Fish Creek. These fish emigrated from Big Lake as smolts in 2004 and 2005. The age-1 smolt population estimate in 2004 of 231,000 fish was 53% less than the long-term average, while the age-1 smolt population estimate in 2005 of 128,000 fish was 74% less than the long-term average.

Appendix A. 4.–Upper and Lower Cook Inlet. Page 3 of 5.

Forecast runs to individual freshwater systems of Upper Cook Inlet are as follows:

System	Run	Inriver Goal
Crescent River	109,000	30,000–70,000
Fish Creek	44,000	20,000–70,000
Kasilof River	1,247,000	150,000–250,000
Kenai River	2,411,000	750,000–950,000
Susitna River	487,000	90,000–160,000[1]
Minor System	644,000	N/A

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

Mark Willette, Research Project Leader, Upper Cook Inlet

Appendix A. 4.–Upper and Lower Cook Inlet. Page 4 of 5.

Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary Forecast Of The 2007 Run	Forecast Estimate (Thousands)	Forecast Range (Thousands)
Natural Production		
Total Run	1,348	412–5,173
Escapement	370	126–604
Commercial Harvest	988	286–4,568
Supplemental Production		
Total Run	277	208–347
Broodstock And Escapement	200	200
Commercial Harvest	77	8–147
Total Area Production		
Total Run	1,635	620–5,519
Broodstock And Escapement	570	326–804
Commercial Harvest	1,065	296–4,715

Columns may not total exactly due to rounding to the nearest thousand fish.
Escapement values include an escapement goal shortfall of 10,000 fish for systems with a forecast in 2007.
Commercial Harvest = Total Run - Escapement/Broodstock.
Commercial harvests of supplemental production include both common property and cost recovery harvests.
Additional harvests may be expected from systems not included in the forecast.

Forecast Methods

The forecast of wild pink salmon returns to 11 harvest areas in the Lower Cook Inlet Management area was based on log-log regression of total return on escapement from 30–41 years of observations. An 80% confidence range about the forecast of natural production was developed using cross-validation methods. Projected harvest from natural production was obtained by subtracting the escapement goal from the forecasted run for each of our 11 index areas and then summing the resulting values. The supplemental production forecast for the Port Graham Hatchery was based on a marine survival rate of 2%. Projected harvest from supplemental production was obtained by subtracting broodstock goals from the supplemental production forecast.

Forecast Discussion

The natural production forecast model was tested using cross-validation methods. The model has correctly predicted 38 out of 45 changes in direction of annual run size. In 2005, the last odd-numbered year, eight of eleven systems forecasted had runs within the forecast range. The 2007 forecast for natural production of 1.36 million pink salmon has an 80% confidence interval of 412,000 to 5.17 million fish. Strong parent-year escapement and fair marine survival from 2005–2006, as indicated by 2006 returns, suggests there is a good likelihood of reaching the mid-point estimate of this forecast. If realized, a natural run of 1.36 million pink salmon would be nearly 2.7 times higher than the median run size of 505,000 fish for odd-year returns from 1961–2005. The pink salmon escapement goal is 370,000 fish (range 136,000–604,000 fish) for systems with a forecast. If the run comes in as forecast, the mid-point of the escapement goal range should be

met for all eleven of our eleven index streams. If the lower end of the forecast range is realized, an escapement shortfall of 10,000 fish is expected, all from Bruin Bay. The resulting escapement forecast would then be 126,000 fish.

The harvestable surplus of naturally produced pink salmon in the Southern District is projected to be 177,000 fish, relatively evenly split between Humpy Creek and Seldovia and Port Graham rivers. Supplemental production of pink salmon in the Southern District has historically contributed from 24% to 90% of the total Lower Cook Inlet commercial harvest. However, the Tutka Hatchery, which previously generated the majority of the supplemental production of pink salmon in Lower Cook Inlet, ceased egg-take operations in 2004 and realized its final adult return in 2005. The winter of 2005 to 2006 produced relatively poor ocean survival for Port Graham Hatchery pink salmon (0.9%). The Port Graham Hatchery released 13.9 million fry in 2006. That facility is anticipating an improved marine survival rate of 2.0% and is expecting nearly 277,000 pink salmon to return to Port Graham Bay in 2007 (P. McCollum, personal communication, Sound Fisheries). The 2007 brood stock goal for the Port Graham Hatchery is 200,000 fish. Because cost recovery requirements are dependent upon inseason fish prices, the allocation of hatchery-produced salmon returns between common property and cost-recovery fisheries cannot be determined at this time.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 666,000 fish, with over 50% (335,000 fish) of the harvest expected to occur in the Port Dick subdistrict. If realized, the Port Dick harvest would be nearly 1.6 times the mean odd-year catch since 1961. Harvests ranging from 10,000–155,000 fish are anticipated from Port Chatham, Nuka Island, Windy Bay, and Rocky Bay.

In the Eastern District, a harvestable surplus of 40,000 pink salmon is projected for Resurrection Bay. However, commercial fishing specifically directed at pink salmon has not been allowed in that area in recent years due to a combination of erratic production and potential conflicts with the Resurrection Bay Salmon Management Plan, which limits commercial interference with the sport coho salmon fishery.

In the Kamishak Bay District, the number of naturally produced pink salmon available for harvest is projected to be 105,000 fish, over 96% of which are expected to occur in the Ursus/Rocky Cove subdistrict. If realized, the Ursus/Rocky Cove harvest of 101,000 fish would be over 6.7 times the mean odd-year catch since 1961 for this index area. However, low market value and lack of tender service and available buyers have limited the incentive to harvest pink salmon in the Kamishak District in recent years.

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

Appendix A. 5.–Kodiak

Forecast Area: Kodiak
Species: Pink Salmon

Preliminary Forecast of the 2007 Harvest	Harvest Forecast (millions)
Wild Stock Production: Average	6.0–10.0
Kitoi Bay Hatchery Production	3.8-5.3
2007 Total Kodiak Area Pink Salmon Harvest	9.8-15.3
Wild Stock Production by Area	
Afognak	0.5–0.8
Westside	2.4–4.1
Alitak	1.5–2.5
Eastside	1.1–1.8
Mainland	0.5–0.8

Forecast Methods

The Kodiak Area wild stock pink salmon harvest forecast is derived from a total run forecast minus the Kodiak Area escapement goal (2.0 million to 5.0 million). Return is forecasted based on escapement estimates from weirs and aerial surveys from indicator systems and total run estimates. The total run estimates were derived from a combination of several weir estimates, from aerial surveys, and from harvest data. For the 2007 Kodiak Area forecast, Ricker spawner-recruit models were fit to the odd-year Kodiak Area returns from 1979–2003 (not including the Mainland District). Because of the uncertainty associated with an estimate that is modeled from a large return of multiple stocks, the harvest forecast is given as a category rather than a point estimate.

Harvest categories were delimited by melding harvest quintiles with the forecast categories previously used by management biologists to determine the length of initial fishing periods. This forecasting method has been used since 1999. Categories are shown below.

Harvest Category	Range (millions)
Very Weak	Less than 3
Weak	3 to 6
Average	6 to 10
Strong	10 to 14
Excellent	Greater than 14

The 2007 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survivals from brood years 1991–2003, when releases from the facility were in excess of 100 million fry. Brood years 1996–2003 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. This release strategy has proven to significantly improve fry to adult survival.

In 2006, 115.7 million fry were released at an average size of 0.83 grams. These fry were the second largest fry released using the current release strategy; however, release numbers were approximately 15% lower than previous levels. Thus, while numbers of fry released were lower, condition of fry was better than average.

Over the past 12 years a four-year cyclical return pattern has been observed. The pink salmon return to Kitoi Bay Hatchery is an odd-year dominant return which experiences higher than average strength returns every fourth year and average returns in between. The return in 2007 is an average for the four-year cyclical pattern. The mid-point estimate reflects a marine survival of 4.07% which is an average of the previous two four-year-cycle returns (Brood Year 1997 and Brood Year 2001; returning in 1999 and 2003, respectively).

Forecast Discussion

Two Ricker spawner-recruit models were used to examine the relationship of the 1978–2002 even-year Ayakulik and Karluk River escapements to the total Kodiak Area return. When escapement goals (2.0 million to 5.0 million fish) are applied, harvest projections for wild pink salmon stocks in the Kodiak Area are in the *strong* category.

The 2007 Kodiak Area wild stock pink salmon production will be in the average category (6.0 million to 10 million fish) after escapement goals (2.0 million to 5.0 million fish) is subtracted.

For the Kitoi Bay Hatchery pink salmon, the estimated return is 4.7 million pink salmon. The broodstock requirement is 335,000 fish, so that the midpoint projected harvest is 4.4 million pink salmon. This includes a portion that Kitoi Bay Hatchery will need for cost recovery to supplement the FY 08 funding for the facility. Cost recovery levels for 2007 have not yet been established by the Kodiak Regional Aquaculture Association Board of Directors, but previous levels have ranged between 1.6 million and 2.6 million fish. The 2007 cost recovery is expected to fall within the previous levels.

Combining the 2007 pink salmon wild and hatchery production suggests that the total Kodiak Area pink harvest will likely be strong, and possibly excellent. This forecast level will allow an initial weekly fishing period length of 105 hours (4½ days) for most of the Kodiak Area during the initial general pink salmon fisheries (beginning July 6, 2007). By the fourth week of July, fishing time may be extended or restricted, by section or district, as true run strengths become known. Due to the high variability of pink salmon returns in the spawner-recruit model, our confidence in this forecast is fair.

Ivan Vining, Biometrician, Kodiak
Jeff Wadle, Assistant Area Management Biologist, Kodiak
Kevin Brennan, Area Management Biologist, Kodiak
Drew Aro, Kitoi Bay Hatchery Manager, Kodiak

Forecast Area: Kodiak, Spiridon Lake
Species: Sockeye Salmon

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	354	215–492
Escapement Goal	0	
Harvest Estimate	354	215–492

Forecast Methods

The 2007 Spiridon Lake sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing brood year (1989–2000) sibling relationships for three age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Ages 1.2 and 1.3 were predicted from age-1 smolt. Age 2.2 was predicted from age-2 smolt. All "other" age classes were estimated by summing the minor age classes (0.2, 1.1, 0.3, 2.1, 3.1, 1.4, 2.3 and 3.2) by year (1996–2006) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Intervals of 80% for the regression estimates were calculated using the variances of the regression models. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

Adult sockeye salmon are prevented from returning to Spiridon Lake due to a barrier fall blocking upstream migrations in the outlet creek (Telrod Creek). Therefore, all returning adult sockeye salmon are available for harvest, primarily in the Central Section of the Northwest Kodiak District and in the Spiridon Bay Special Harvest Area located at Telrod Cove. The 2007 forecast of 354,000 fish is 193,000 fish greater than the 2006 forecast of 161,000 fish and 265,000 fish greater than the actual 2006 run estimate of 89,000. The 2007 run should be composed of approximately 80% age 1.2 and 15% age 1.3 fish. If realized, this run will be about 83,000 fish greater than the recent 10-year average (1997–2006) run of 271,000 fish. Spiridon Lake sockeye salmon are expected to return in late June with the run ending by mid August. Due to the strong smolt outmigration to adult return relationships, our confidence in this forecast is good.

Steve Schrof, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	220	0–446
Escapement Goal	200	200–500
Harvest Estimate	20	

Forecast Methods

The 2007 Ayakulik River sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing outmigration year saltwater-age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Ocean-age-2 (2-ocean) sockeye salmon were predicted from prior year 1-ocean returns ($P = 3.0\times10^{-6}$) using only recent outmigration years (1990–2005). The 3-ocean sockeye salmon were predicted from prior year 2-ocean returns ($P = 2.9\times10^{-8}$) using outmigration years from 1967–2004. Predication intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return (last 15 years) and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2007. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Ayakulik forecast of 220,000 sockeye salmon is 74,000 fish less than the 2006 forecast of 294,000 fish and about 100,000 fish more than the actual 2006 run estimate of 120,000 fish. The 2007 run should be composed of approximately 59% 2-ocean fish and 35% 3-ocean. If realized, this run will be 302,000 fish less than the recent 10-year average (1997–2006) run of 522,000 fish. The 2006 season marks the weakest Ayakulik sockeye salmon annual run production since 1975; the 2007 run should demonstrate a rebound from this 30-year low. Overall, the confidence in the 2007 Ayakulik forecast is good, due to the strong regression relationships. However, an alternative forecast incorporating ocean age-class relationships and a temperature index (Cold Bay Airport) with multiple linear regression predicts a run of 318,000 fish, suggesting the 2007 Ayakulik sockeye run will fall in the upper portion of the range. The projected harvest of 20,000 fish is based on achievement of the lower end (200,000 fish) of the escapement goal range.

M. B. Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	505	351–660
Escapement Goal	150	100–210
Harvest Estimate	355	

Forecast Methods

The 2007 Karluk Lake early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent brood year (1979–2002) sibling relationships for three age classes. Linear regression models were also used to investigate the relationship between saltwater-age-one (1-ocean) and 2-ocean sockeye salmon. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Ages-1.3, -2.3, and -3.3 were predicted from age-1.2, -2.2, and -3.2 siblings, respectively. Two-ocean fish (age-1.2, -2.2, -3.2, and -4.2) were predicted from one-ocean fish (ages-1.1, -2.1, and -3.1). All "other" age classes were estimated by summing 12 minor age class run estimates (ages-0.2, -1.1, -0.3, -2.1, -0.4,-3.1, -1.4, -4.1, -2.4, -3.4, -4.3 and -4.4) by year (1997–2006) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Predication intervals of 80% for the regression estimates were calculated using the variances of the regression models. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 forecast of 505,000 is about 41,000 fish more than the 2006 forecast (464,000) and about 30,000 fish more than the actual 2006 run estimate of 475,000 fish. The 2007 run should be composed of approximately 61% 2-ocean fish and 35% 3-ocean fish. If realized, this run will be 72,000 fish less than the recent 10-year average (1997–2006) run of 577,000 fish. The projected harvest of 355,000 fish is based on achievement of the mid-point of the escapement goal range (150,000 fish). Age-2.2 fish have been the dominant age class in each of the past nine seasons.

The 2005 age 2. smolt outmigration estimate was slightly smaller than the 2004 estimate, but the number of age 2.1 siblings that returned in 2006 were slightly above average. The smolt outmigration information corroborates the saltwater age and sibling relationships, both suggesting a run slightly below average. Our confidence in this forecast is good.

Mark Witteveen, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	751	510–991
Escapement Goal	270	170–380
Harvest Estimate	481	

Forecast Methods

The 2007 Karluk Lake late-run sockeye salmon forecast was prepared by investigating simple linear regression models utilizing recent brood year (1980–2001) alternative sibling relationships for one age class, a smolt outmigration to return relationship for one age class and estimating median returns for four individual age classes and one pooled age class group. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). A significant alternative sibling regression relationship was employed to estimate the age-3.2 component of the run from 2006 returns of age-2.2 sockeye salmon. A significant regression relationship was employed to estimate the age-2.2 component of the run from the outmigration of age-2. smolt. Following non-significant regression results, the median return by age class was used to estimate the age-1.2, -1.3, -2.3, and -3.3 components of the run. All "other" age classes were estimated by summing 12 minor age class run estimates (ages-0.1, -0.2, -1.1, -0.3, -2.1, -0.4, -3.1, -1.4, -2.4, -4.2, -3.4, and -4.3) by year (1997–2006) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Predication intervals of 80% for the regression estimates were calculated using the variances of the regression models. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 forecast of 751,000 fish is about 399,000 fish less than the 2006 forecast (1.15 million fish) and about 181,000 fish more than the actual 2006 run estimate of 570,000 fish. Median estimates were used for most age classes due to relatively poor sibling relationships. The 2007 run should be composed of approximately 60% age-2.2 fish, 21% age-2.3 fish, and 12% age-3.2 fish. If realized, this run will be 76,000 fish less than the recent 10-year average (1997–2006) of 827,000 fish. The projected harvest of 481,000 fish is based on achievement of the mid point of the escapement goal range of 270,000 fish. Age-2.2 fish have been the dominant age class in seven of the past nine seasons, but were in unexpectedly low abundance in 2006.

Smolt outmigration estimates from the 2005 season indicate a slightly smaller number of age-2. smolt outmigrated than in the 2004 season, suggesting that a lower number of age-2.2 sockeye will return in 2007 than in 2006; however, the 2006 return was much lower than expected. An alternative forecast using a temperature index and historical escapements suggests that the 2007 run will fall in the lower portion of the confidence bounds. The Karluk late run continues to be difficult to forecast due to very few significant sibling relationships. Our confidence in this forecast is fair.

Mark Witteveen, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	258	66–450
Escapement Goal	105	70–150
Harvest Estimate	153	

Forecast Methods

The 2007 Frazer Lake (Dog Salmon Creek) sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing outmigration year (1993–2004) saltwater-age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year 1-ocean (jacks) returns ($P = 5.0\times10^{-5}$) and 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 7.3\times10^{-3}$). Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Frazer sockeye salmon run for 2007. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Frazer Lake forecast of 258,000 sockeye salmon is 54,000 fish more than the 2006 forecast of 204,000 and about 140,000 fish more than the actual 2006 run estimate of 118,000 fish. The 2007 run should be composed of approximately 70% 2-ocean fish and 18% 3-ocean fish. If realized, this run will be 148,000 fish less than the recent 10-year average (1997–2006) run of 406,000 fish. Overall, the confidence in the 2007 Frazer Lake forecast is good, due to the abundance of the 1-ocean predictor age class. The 2007 run should also have a strong number of jacks (13%); a return of 33,000 jacks is predicted, yet auxiliary smolt information suggests that figure will likely be much higher. The projected harvest of 153,000 fish is based on the achievement of the S_{msy} estimate (105,000).

M.B. Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	63	19–108
Escapement Goal	30	30–65
Harvest Estimate	33	

Forecast Methods

The 2007 Upper Station early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing outmigration year (1973–2004) saltwater age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year age-1.1 returns ($P = 2.0\times10^{-4}$). The 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 1.1\times10^{-6}$) using data from the most recent 10 years only. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the recent 10-year median return and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon early run for 2007. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Upper Station early-run forecast of 63,000 sockeye salmon is 57,000 fish less than the 2006 forecast of 120,000 fish, and about 31,000 fish more than the actual 2006 run estimate of 32,000 fish. The 2007 run should be composed of approximately 71% 2-ocean fish and 23% 3-ocean fish. If realized, this run will be 53,000 fish less than the recent 10-year average (1997–2006) run of 116,000 fish. The 2007 run should show a rebound from the weak 2006 run—the smallest since 1977. Overall, the confidence in the 2007 Upper Station early-run forecast is good; regression relationships are strong. The projected harvest of 33,000 fish is based on achievement of the lower end (30,000 fish) of the escapement goal range.

M. B. Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	259	90–428
Escapement Goal	186	120–265
Harvest Estimate	73	

Forecast Methods

The 2007 Upper Station late-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year (1994–2004) saltwater age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year 1-ocean returns ($P = 0.07$) and 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 1.5\times10^{-3}$). Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return and prediction intervals were calculated using the 10th and 90th percentiles of the returns. Regression and median estimates were summed to estimate the total Upper Station sockeye salmon late run for 2007. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Upper Station late-run forecast of 259,000 sockeye salmon is 24,000 fish less than the 2006 forecast of 283,000 fish and about 44,000 fish more than the actual 2006 run estimate of 215,000 fish. The 2007 run should be composed mostly of 2-ocean fish (86%). If realized, this run will be 88,000 fish less than the recent 10-year average (1997–2006) run of 347,000 fish. The late-run sockeye production from Upper Station has been weak since the late 1990s and it appears will remain below average in 2007. Overall, the confidence in the 2007 Upper Station late-run forecast is fair due to the strength of the 2-ocean sockeye regression relationship which represents the greatest source of uncertainty. The projected harvest of 73,000 fish is based on the achievement of the S_{msy} estimate (186,000).

M. B. Foster, Finfish Research Biologist, Kodiak

Appendix A. 6.–Chignik

Forecast Area: Chignik
Species: Sockeye Salmon

Preliminary Forecast of the 2007 Run		Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production			
Early Run (Black Lake)	Total Run Estimate	1,020	381–1,670
	Escapement Goal	350	350–400
	Harvest Estimate [a]	674	
Late Run (Chignik Lake)	Total Run Estimate	901	384–1,420
	Escapement Objective [b]	250	250–300
	Harvest Estimate	651	
	Total Run Estimate	1,920	765–3,090
	Escapement Objective [b]	600	600–700
Total Chignik System	Harvest Estimate [a]	1,320	

[a] These figures include harvests of Chignik-bound sockeye salmon from the Southeastern District Mainland and the Cape Igvak fisheries; approximately 1.08 million sockeye salmon are projected to be harvested in the Chignik Area.

[b] The Chignik Lake late-run escapement goal is 200,000 to 250,000 sockeye salmon, resulting in an escapement goal for the entire run of 550,000 to 650,000. However, managers try to achieve an additional escapement objective of 50,000 sockeye salmon in August and September.

Forecast Methods

The 2007 Chignik early- and late-run sockeye salmon forecasts were prepared by investigating simple linear regression models utilizing available sibling and outmigration data from 1980 to the present. Each regression model was assessed with standard regression diagnostic procedures. Regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$).Prediction intervals of 80% were calculated using the variance of each regression estimate. Median estimators were used to estimate production of age classes where regression relationships were not significant.

The early-run age-1.3 and -2.3 sockeye salmon returns were predicted from significant ($P = 1.1\times10^{-5}$ and $P = 6.3\times10^{-4}$ respectively) linear regressions with the prior years age-1.2 and -2.2 returns, respectively. The rest of the age-class predictions were estimated from the median returns.

Ocean age class and sibling relationships were analyzed for the late-run forecast. The 2-ocean sockeye salmon were predicted from prior year 1-ocean returns using simple linear regression, ($P = 1.0\times10^{-4}$). Age-2.3 sockeye salmon were predicted from the prior year abundance of age 2.2 ($P = 0.15$). The 4-ocean sockeye salmon were predicted from 3-ocean returns using simple linear regression ($P = 8.4\times10^{-3}$). The 1-ocean and 3-ocean sockeye salmon (excluding age-2.3 fish) were predicted by calculating the median return.

Estimates of variance were calculated from each regression. The variances associated with individual regression estimates by age class were used to calculate 80% prediction intervals for those estimates. Prediction intervals for median estimates were calculated using the 10th and

90th percentiles of the returns. For each run (early and late), the overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

The early- and late-run regression and median estimates were summed to estimate the total Chignik watershed sockeye salmon run for 2007. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the two runs.

Available smolt data were analyzed and a significant multiple linear regression relationship was found using the total number of outmigrating smolt and a temperature index to predict the subsequent 3-ocean returns (about 82% of the run). This estimate was then expanded proportionally to account for other ocean ages not calculated by the simple regressions. Temperature data were obtained from the King Salmon Airport climate database. The temperature index was constructed using the average temperatures during April through November from the corresponding outmigration year.

Forecast Discussion

The 2007 sockeye salmon run to the Chignik River is expected to be approximately 1.92 million fish. The early run is expected to be approximately 1.02 million fish. The late run is expected to be approximately 901,000 fish. The 2007 Chignik sockeye salmon run is expected to be approximately 390,000 fish less than the recent 10-year average run of 2.31 million fish, and 180,000 fish more than the 2006 run of 1.74 million fish.

The projected harvest estimate for the early run of 674,000 fish is based on achievement of the lower end of the early-run escapement goal range of 350,000 fish. The projected harvest estimate for the late run of 651,000 fish is based on achievement of the lower end of the late-run management objective range through September 15 (250,000 fish). Harvest estimates for the both runs include Chignik-bound sockeye salmon harvested in the Cape Igvak Section of the Kodiak Area and the Southeastern District Mainland of the Alaska Peninsula Management Area.

In 2006, returns predicted using the smolt and temperature data underestimated the total run by about 45%. The smolt-based forecast of the 2007 Chignik total sockeye salmon run is 2.06 million sockeye salmon, which is slightly more (140,000 fish) than that predicted from ocean-age and sibling relationships and median estimates (1.92 million fish).

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

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Appendix A.7.–Bristol Bay

Forecast Area: Bristol Bay
Species: Sockeye Salmon

Forecast of the 2007Return	Forecast Estimate (millions)	Forecast Range (millions)
Total Production		
Total Run	34.4	26.0 – 43.0
Escapement Goal	8.1	
Commercial Harvest	26.3	

Forecasted sockeye harvests for inshore Bristol Bay fishing districts are as follows:

Naknek-Kvichak	7.44 million
Egegik	8.1 million
Ugashik	3.33 million
Nushagak	7.04 million
Togiak	0.44 million

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2007 is the sum of individual predictions for nine river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak) and four age classes (ages 1.2, 1.3, 2.2, and 2.3, plus ages 0.3 and 1.4 for Nushagak River). Adult escapement and return data from brood years 1976–2003 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 five-year averages. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2004–2006.

The forecast range was the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 2001 through 2006 runs.

A total of 34.4 million sockeye salmon are expected to return to Bristol Bay in 2007. This prediction is 14% higher than the previous 10-year mean of total runs of 30.2 million fish (17.8 million to 43.4 million fish). The 80% confidence bounds for the 2007 forecasted run ranged from 26.0 million to 43.0 million fish. All systems are expected to exceed their minimum spawning escapement goals.

A run of 34.4 million sockeye salmon can potentially produce a total harvest of 26.3 million fish if escapement goals are met for managed stocks and industry is capable of taking the surplus fish. A harvest of this size would be 40% higher than the previous 10-year mean harvest of 18.7 million fish (9.9 million to 28.6 million fish).

The forecasted run to each district and river system is as follows: 11.54 million fish to Naknek-Kvichak District (3.88 million fish to Kvichak River; 2.03 million fish to Alagnak River; 5.64 million fish to Naknek River); 9.20 million fish to Egegik District; 4.18 million fish to Ugashik District; 8.91 million fish to Nushagak District (5.85 million fish to Wood River; 1.87 million fish to Nushagak River; 1.20 million fish to Igushik River) and 590,000 fish to Togiak District (Table 1).

The forecasted total run of 34.4 million sockeye salmon is expected to be comprised of 15.65 million age 1.3 fish (45%) followed by 9.86 million age 1.2 fish (29%), 5.43 million age 2.2 fish (16%), 3.19 million age 2.3 fish (9%) and 0.30 million age 0.3 and age 1.4 fish (1%).

Forecast Discussion.

Similar methods have been used to produce the Bristol Bay sockeye salmon forecast since 2001. The forecast methods during this recent time have performed fairly well. However, there is still a tendency for the forecasts and projected harvests to be biased low in recent years. The six previous forecasts (2001–2006) have averaged 11% below the total run. The forecast run differences have ranged from 24% below in 2006 to 9% above in 2001. The expected harvests have averaged 6% below since 2001. The expected harvest differences have ranged from 17% below in 2006 to 33% above in 2004.

There is always uncertainty in forecasting returns of sockeye salmon to Bristol Bay. The 2007 forecast is no different than previous years. The greatest uncertainty in the 2007 forecast is in forecasting the return of age 1.3 fish. We had large returns of age 1.2 fish throughout Bristol Bay in 2006. We are forecasting 45% of the total run will be age 1.3 fish in 2007. There is also uncertainty in forecasting the return of age 1.2 fish. We under forecast the return of age 1.2 fish in 2006. The actual return of age 1.2 fish was 75% greater than the forecast in 2006. We are forecasting 28% of the total run to be age 1.2 fish in 2007. We observed large numbers of age 1.1 fish in a number of rivers during 2006. The presence of age 1.1 fish often suggests a large return of age-1.2 fish the following year. There is also a large amount of uncertainty with regard to our ability to forecast returns to individual river systems. The Baywide forecast was 23% below the total run in 2006. The difference between the forecast and total run occurred primarily in the forecasts to the Wood and Kvichak Rivers in 2006. We observed a record run to the Wood River and observed increased productivity in the Kvichak River in 2006. We will continue to look for ways to improve our ability to forecast sockeye salmon returning to Bristol Bay in the future.

Tim Baker, Fred West and Chuck Brazil
Bristol Bay Fishery Research Staff
Anchorage

Appendix Table A.7-1.-Forecasted production, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay river systems in 2007.

	Millions of Sockeye Salmon						
DISTRICT	Forecasted Production by Age Class					Forecasted	
River	1.2	2.2	1.3	2.3	Total	Escapemen	Harvest
NAKNEK-KVICHAK							
Kvichak	1.28	0.95	1.39	0.26	3.88	2.00	1.88
Alagnak	0.40	0.13	1.43	0.06	2.03	1.00[a]	1.03
Naknek	0.96	0.61	3.38	0.68	5.64	1.10	4.54
Total	2.64	1.69	6.20	1.00	11.54	4.10	7.44
EGEGIK	2.29	2.89	2.47	1.55	9.20	1.10	8.10
UGASHIK	2.19	0.71	1.01	0.28	4.18	0.85	3.33
NUSHAGAK [b]							
Wood	2.18	0.04	3.42	0.21	5.85	1.10	4.75
Igushik	0.17	0.01	0.99	0.03	1.20	0.23	0.97
Nushagak	0.29	0.03	1.23	0.02	1.87[c]	0.55	1.32
Total	2.64	0.08	5.63	0.26	8.91	1.88	7.04
TOGIAK [d]	0.10	0.06	0.34	0.09	0.59	0.15	0.44
BRISTOL BAY [e]	9.86	5.43	15.65	3.19	34.42	8.08	26.34
	29%	16%	45%	9%	100%		

[a] The forecasted escapement to the Alagnak River was estimated based on exploiting the Alagnak River at approximately the same rate (50%) as the Kvichak River.

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

[c] Nushagak River forecast includes ages 0.3 (166,000 fish) and 1.4 (132,000 fish).

[d] Forecasts for Kulukak, Kanik, Osviak, and Matogak River systems were not included. These systems may contribute an additional 54,000 fish (1997–2006 mean catch) to Togiak District harvest.

[e] The total harvest does not account for South Peninsula harvest or inseason capacity concerns.

Forecast Area: Bristol Bay
Species: Chinook Salmon

Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Run	215	159–271
Inriver Run Goal [a]	70	
Commercial Common Property Harvest	145	

[a] The Nushagak inriver goal is 70,000 Chinook salmon, which provides for a biological escapement goal of 60,000 spawners and a harvest of 10,000 Chinook salmon by upriver subsistence and sport fisheries.

A total of 215,000 Chinook salmon are forecast to return to the Nushagak River in 2007. This forecast is 30% higher than the 10-year mean of 165,000 (75,000 fish in 2000 to 245,000 fish in 2005). The 80% confidence bounds for the forecast ranged from 159,000–271,000 fish. A run of 215,000 Chinook salmon can potentially produce a harvest of 145,000 fish. With present management practices we anticipate an actual harvest ranging from 70,000–145,000 fish.

Forecast Methods

The 2007 Nushagak District Chinook salmon forecast is the sum of individual predictions of five age classes (age-1.1, -1.2, -1.3, -1.4, and -1.5). Data sets in the analyses included adult escapement and return data from brood years 1978–2004.

Predictions for each age class were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models included simple linear regression, and averages. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2004–2006.

A simple average of recent returns was used to forecast age-1.1, age-1.2, and age-1.5 abundance. The best age-1.3 and age-1.4 models were based on the relationship between sibling returns in succeeding years (e.g., age-1.3 returns for 2007 based on age-1.2 returns in 2006).

Age composition of the forecasted total run is <1% (<1,000) age-1.1, 22% (47,000) age-1.2, 45% (96,000) age-1.3, 32% (68,000) age-1.4, and 1% (2,000) age-1.5.

The forecast range is the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 2001 through 2006 runs.

Forecast Discussion

There is always uncertainty when forecasting returns of Chinook salmon to the Nushagak River. The 2007 forecast is no different than previous years. The greatest uncertainty in the 2007 forecast is predicting the return of age-1.3 and -1.4 Chinook salmon. We anticipate a large return of age-1.3 and -1.4 Chinook salmon based on the large sibling return of age-1.2 and -1.3 fish that occurred in 2006.

The 2006 return of age-1.2 fish was the second largest while age-1.3 fish produced the fifth largest return in the last 20 years. However, we have under-forecasted age-1.3 and over-forecasted age-1.4 returns in 4 of the last 5 years. Forecasted differences the past 5-years (2002–2006) for Chinook salmon age-1.3 have ranged from 41% below in 2004 to 39% above in 2002 and age-1.4 have ranged from 16% below in 2002 to 39% above in 2004.

Similar methods have been used to produce the Nushagak Chinook salmon forecast since 2001. The forecast methods during this recent time have performed fairly well on average. There is still a tendency for the forecasts to be biased low and expected harvests to be high. The five previous total run forecasts (2002–2006) have averaged 10% below the total run. The forecast run differences have ranged from 57% below in 2004 to 8% above in 2003. The expected harvests have averaged 56% above the actual harvest for the last five years. The expected harvest differences have ranged from 43% below in 2004 to 63% above in 2005. We will continue to work on improving our ability to forecast Chinook salmon returning to the Nushagak River.

Chuck Brazil, Fred West, and Tim Baker, Bristol Bay Research Staff

Appendix A. 8.–Alaska Peninsula

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	599	328–869
Escapement Goal	117	117–195
Harvest Estimate	482	

Forecast Methods

The 2007 Bear River late-run sockeye salmon forecast was prepared primarily using median estimates and investigating simple linear regression models of saltwater-age-class relationships with data from the past 17 years. In constructing and evaluating the regression models, standard regression diagnostics were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The saltwater-age-3 (3-ocean) sockeye salmon returns were predicted from the previous year 2-ocean returns using simple linear regression ($P = 0.02$). An estimate of variance was calculated from the regression. The remaining sockeye salmon, 1-, 2-, and 4-ocean fish were calculated from the median estimates for each of the age class run estimates. The total run forecast was calculated by summing individual regression and pooled age class estimates. When the median return by age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Prediction intervals of 80% were calculated for the regression model using the variances estimated from the model. The overall 80% prediction interval was calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Bear Lake late-run forecast of 599,000 sockeye salmon is about 79,000 fish less than the 2006 forecast of 678,000 fish, and about 54,000 fish greater than the actual 2006 run of 545,000 fish. The 2007 run should be composed of approximately 66% 2-ocean fish, estimated from a median, and 31% 3-ocean fish. If realized, this run will be 99,000 fish greater than the recent (1997–2006) 10-year average of 500,000 fish. On average, 2-ocean sockeye salmon comprise about 70% of the Bear Lake late run. Regression models failed to significantly predict 2-ocean returns therefore a median estimate was used. Because of the uncertainty associated with the variable predictive capabilities of the sibling data and that a majority of the run has been estimated based on a median, our confidence in this forecast is fair. The projected harvest of 482,000 fish is based on the achievement of the lower bound of the escapement goal range (117,000 fish).

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Appendix A.8.–Alaska Peninsula. Page 2 of 2.

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

Preliminary Forecast of the 2007 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	502	260–744
Escapement Goal	150	97–219
Harvest Estimate	352	

Forecast Methods

The 2007 Nelson River sockeye salmon forecast was prepared primarily by investigating simple linear regression models of saltwater-age-class relationships and temperature data from the past 19 years. The temperature indices were constructed from the King Salmon and Cold Bay airports average annual air temperature for corresponding outmigration years. In constructing and evaluating each of the regression models, standard regression diagnostics were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The saltwater-age-2 (2-ocean) sockeye salmon returns were predicted from the King Salmon temperature index using simple linear regression ($P = 0.05$). The 3-ocean sockeye returns were predicted by linear regression of the ratio between 3- and 2-ocean fish (same outmigration year) on the Cold Bay temperature index ($P = 0.01$). Estimates of variance were calculated from each regression. The remaining sockeye salmon, 1- and 4-ocean fish were calculated from the median estimates for each of the age class run estimates. The total run forecast was calculated by summing individual regression and pooled age class estimates. When the median return by age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. Prediction intervals of 80% for the regression estimates were calculated using the variances of the regression models. The overall 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for each age class forecasted.

Forecast Discussion

The 2007 Nelson River forecast of 502,000 sockeye salmon is about 53,000 fish less than the 2006 forecast of 555,000 fish, and about 32,000 fish greater than the actual 2006 run of 470,000 fish. The 2007 Nelson River sockeye salmon run is expected to be 34,000 fish less than the recent 10-year average run of 536,000 fish. The 2007 run should be composed of approximately 77% 2-ocean fish and 21% 3-ocean fish. Since the regression relationships predicting 2- and 3-ocean sockeye are significant and represent a vast majority of the run, the confidence in this forecast is good. The projected harvest of 352,000 fish is based on the achievement of the approximate midpoint of the escapement goal range (150,000 fish).

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Appendix A. 9.–Arctic-Yukon Kuskokwim

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

The ADF&G does not produce formal run forecasts for most salmon runs in the Arctic-Yukon-Kuskokwim Region. The salmon run outlooks presented in this report are qualitative in nature because of the lack of information with which to develop more rigorous forecasts. Consequently, these commercial harvest outlooks are typically based upon available parent year spawning escapement indicators, age composition information, recent year trends and the likely level of commercial harvest that can be expected to be available from such indicators, given the fishery management plans in place. While the commercial harvest outlooks provide for a general level of expectation, the fisheries are managed based upon inseason assessments of the actual runs. Formal forecasts of Yukon River fall chum salmon and Canadian Origin Yukon River Chinook salmon are made prior to the meeting of US/Canada Yukon River Panel in the spring of 2007.

In the AYK region, as in some other areas of the state, salmon production notably decreased for many stocks from 1998–2002. Causes for the loss of productivity have been the subject of much interest and concern, but to date unknown. Consequently, Chinook salmon stocks in the Yukon and Kuskokwim Rivers and Eastern Norton Sound have been classified as stocks of concern under the guidelines established in the Sustainable Salmon Fisheries Policy for the State of Alaska. Similarly, chum salmon from the Kuskokwim, Yukon (summer and fall), and Nome Areas have also been classified as stocks of concern. However, beginning in 2003, there has been an increasing trend of returning Chinook, chum and coho salmon particularly in the Yukon and Kuskokwim Rivers. Overall, salmon production increased during the last four years. Additionally, the Bering Sea trawl bycatch have indicated the presence of large numbers of salmon in the Bering Sea in the summers of 2003 through 2006. In contrast the BASIS study did show a decline in the presence of immature chum and Chinook salmon in 2005 and 2006. During this Board of Fisheries meeting cycle, 2006–2007, the department has recommended discontinuing the stock of concern classification for several AYK stocks that no longer meet the stock of concern definition.

The commercial harvest outlooks for the year 2007 take recent abundance trends into account. Market conditions have not been accounted for in the harvest outlooks. Declining salmon markets, particularly for chum salmon flesh since 1994, salmon roe since 1997 and pink salmon flesh since 2000, have had a major impact on the commercial fisheries in the AYK Region. A continuation of these market trends in 2007 will likely result in harvests that are lower than the available harvest outlook projections and a lower exvessel value.

Appendix Table 1.–Commercial salmon harvest outlook for the AYK Region, year 2007, in thousands of fish.

	Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	30–50	30–50	150–300	0–1	500–800	
Kuskokwim Bay	17–31	110–300	33–52	0–1	80–130	
Kuskokwim Total	47–81	140–350	183–352	0–2	580–930	
Yukon	30–60		50–100		500–900	100–400
Norton Sound	1–2	0	60–80	250	25–50	
Kotzebue Sound					100–150	