

Special Publication 08-09

**Run Forecasts and Harvest Projections for 2008
Alaska Salmon Fisheries and Review of the 2007
Season**



Edited by

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and

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Division of Sport Fish, Research and Technical Services
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LIST OF ACRONYMS

ADF&G	Alaska Department of Fish and Game
AFK	Armin F Koernig Hatchery
BEG	biological escapement goal
BOF	Alaska Board of Fisheries
CPF	Commercial Common Property Fishery
CPUE	catch per unit effort
LCI	Lower Cook Inlet
NOAA	National Oceanic and Atmospheric Administration
PWS	Prince William Sound
PWSAC	Prince William Sound Aquaculture Corporation
SEDM	Southeast District Mainland
SEG	sustainable escapement goals
UCI	Upper Cook Inlet
VFDA	Valdez Fisheries Development Association
WNH	Wally Noerenberg Hatchery

ABSTRACT

This report contains salmon run forecasts and harvest projections for 2008 as well as a detailed review of Alaska's 2007 commercial salmon season. The Alaska Department of Fish and Game is expecting a significant decrease in commercial salmon catches in 2008 primarily due to the projected reduction in pink salmon *Oncorhynchus gorbuscha* harvests. The 2008 total commercial salmon catch (all-species) projection of 132.5 million is expected to comprise 672,000 Chinook salmon *O. tshawytscha*, 47.2 million sockeye salmon *O. nerka*, 4.4 million coho salmon *O. kisutch*, 61.5 million pink salmon, and 18.7 million chum salmon *O. keta*. The projected pink salmon harvest is about 57% less than the harvest experienced in 2007 (142 million) and about 30% less than the recent five even-year average. The sockeye salmon harvest projection is slightly higher than the harvest that occurred in 2007. This projected increase is primarily the result of the expected increase in the sockeye salmon harvest in Bristol Bay. Chum salmon harvests are expected to be slightly less than those experienced in 2007.

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

The Alaska salmon harvest of all species combined for 2007 totaled 213 million fish, which was about 34 million fish greater than the preseason forecast of 179 million and the 4th largest salmon harvest since 1960. This combined harvest was composed of 563,000 Chinook salmon, 46.3 million sockeye salmon, 4.4 million coho salmon, 142 million pink salmon and 19.2 million chum salmon.

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

INTRODUCTION

This report contains salmon run forecasts and harvest projections for 2008 as well as a detailed review of Alaska's 2007 commercial salmon season.

The Alaska Department of Fish and Game (ADF&G) is expecting a significant decrease in commercial salmon catches in 2008 primarily due to the projected reduction in pink salmon *Oncorhynchus gorbuscha* harvests. The 2008 total commercial salmon catch (all-species) projection of 132.5 million is expected to comprise 672,000 Chinook salmon *O. tshawytscha*, 47.2 million sockeye salmon *O. nerka*, 4.4 million coho salmon *O. kisutch*, 61.5 million pink salmon, and 18.7 million chum salmon *O. keta*. The projected pink salmon harvest is about 57% less than the harvest experienced in 2007 (142 million) and about 30% less than the recent 5 even-year average. The sockeye salmon harvest projection is slightly higher than the harvest that occurred in 2007. This projected increase is primarily the result of the expected increase in the sockeye salmon harvest in Bristol Bay. Chum salmon harvests are expected to be slightly less than those experienced in 2007. Table 1 shows specific harvest projection numbers by species and fishing area. These projections generally reflect potential harvests for most of the major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon to the Southeast Alaska, Kodiak, and Prince William Sound areas. Fishing effort influences average catch levels, and effort is partly determined by market conditions in addition to the size of salmon runs. Therefore these projections may not be indicative of potential harvest levels. With the exception of the Southeast Alaska Chinook salmon fisheries, 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.

Table 1. –Projections of 2008 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Southeast Alaska						
<i>Natural Production</i>				19,000	2500 ^a	21,500
<i>Hatchery Production</i> ^b				1,700	7,750	9,450
Southeast Region Total	390 ^c	1,682 ^a	2,547 ^a	20,700	10,250	35,569
Prince William Sound						
<i>Natural Production</i>	47 ^d	742 ^e	331 ^f	1,510	246 ^a	2,876
<i>Hatchery Production</i> ^g	0	1,244	148	20,711	3,363	25,466
Upper Cook Inlet	20 ^a	3,873	200 ^a	380 ^h	100 ^a	4,573
Lower Cook Inlet	1 ⁱ	373 ^j	14 ⁱ	826 ^j	39 ^k	1,252
Bristol Bay	98	31,350	64	56	1,018	32,586
Central Region Total	166	37,582	757	23,483	4,766	66,753
Kodiak						
<i>Natural Production</i>	20 ^l	1,708 ^m	280 ^m	5,800	700 ⁿ	8,508
<i>Hatchery Production</i> ^o	0	292	161	3,900	215	4,568
Chignik	2.5 ^l	907	75 ^l	738 ^l	86 ^l	1,809
South Alaska Peninsula	5 ^b	1,973 ^b	165 ^b	6,380 ^b	805 ^b	9,328
North Alaska Peninsula	7 ^m	2,800 ^m	70 ^m	50 ^m	150 ^m	3,077
Westward Region Total	35	7,680	751	16,868	1,956	27,290
Arctic-Yukon- Kuskokwim Region Total						
	82	245	368	501	1,750 ^q	2,945
Statewide Total	672	47,189	4,422	61,552	18,722	132,557

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

^a Average harvest for the 5-year, 2003–2007 period.

^b Hatchery projections made by Southeast Regional Aquaculture Association (SRAA), Northern Southeast Regional Aquaculture Association (NSRAA), Douglas Island Pink and Chum (DIPAC).

^c Average harvest for the 3-year, 2005–2007 period.

^d Forecast based on 5-year average total run size and commercial exploitation rate (2003–2007).

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

^g Hatchery projections made by Prince William Sound Aquaculture Corporation

^f Ten-year average harvest (1998–2007) in the Copper River and Bering River districts.

^g Hatchery projections made by Prince William Sound Aquaculture Corporation (PWSAC) and Valdez Fisheries Development Association (VFDA).

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

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

^j Includes common property plus cost recovery harvests.

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

^l 10-year average harvest (1998–2007).

^m Based on 5-year median of harvests, 2003–2007 period.

ⁿ Based on 10-year median of harvests, 1998–2007 period.

^o Hatchery projections made by Kodiak Regional Aquaculture Association (KRAA; enhanced Spiridon sockeye run harvest projection was developed by department staff).

^p 10-year average; sockeye includes formal forecasts for Bear late run and Nelson stocks.

^q Includes 225,000 fall chum.

When the appropriate quantity and quality of data were available, harvest projections were arrived at through quantitative projections based on information on previous spawning levels, smolt outmigrations, returns of sibling age classes, and recent survival rates observed for hatchery releases. Other projections were based on averages of recent catch levels.

The Alaska salmon harvest of all species combined for 2007 totaled 213 million fish, which was about 34 million fish greater than the preseason forecast of 179 million and the 4th largest salmon harvest since 1960. This combined harvest was composed of 563,000 Chinook salmon, 46.3 million sockeye salmon, 4.4 million coho salmon, 142 million pink salmon and 19.2 million chum salmon. Table 2 shows 2007 harvest numbers by salmon species and fishing area, in units of fish harvested, and Table 3 provides this information in units of pounds harvested. Tables 4–7 provide detailed information on the 2007 harvest by species and area.

Table 2.—Preliminary 2007 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Southeast Region Total	351 ^a	1,904	2,057	44,869	9,420	58,602
Prince William Sound	43	3,240	337	63,453	3,577	70,647
Upper Cook Inlet	18	3,300	175	147	77	3,740
Lower Cook Inlet	0	366	6	290	2	660
Bristol Bay	63	29,463	50	1	2,040	31,600
Central Region Total	124	36,400	600	63,900	5,700	106,700
Kodiak Area	17	2,013	356	24,809	729	27,924
Chignik	2	835	73	2,020	79	3,009
South Peninsula & Aleutians	5	2,428	149	8,315	678	11,575
North Peninsula	7	3,410	69	138	181	3,805
Westward Region Total	31	7,853	1,408	33,335	3,608	46,312
AYK Region Total	57	155	360	4	542	1,118
Total Alaska	563	46,312	4,426	142,108	19,290	212,732

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

Note: Columns may not total exactly due to rounding.

^a Total commercial harvest of Chinook salmon for the Oct. 1, 2006 to Sept. 30, 2007 catch accounting period.

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

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

Though the department does not produce formal run size forecasts for all salmon runs in the state, local salmon biologists prepare harvest projections or harvest outlooks for all areas. Projections are based on formal forecasts when available. When the formal forecasts are not available, local biologists use average historical catches and local knowledge of recent events to develop these outlooks.

This report contains a detailed review of Alaska's 2007 commercial salmon season. We normally release it before final catch figures are available to provide preliminary information to the Alaska Board of Fisheries (BOF), the fishing industry, and the public.

Table 3.—Preliminary 2007 Alaska commercial salmon harvests, by fishing area and species, in thousands of pounds.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Southeast Region Total	5,175	12,152	12,899	161,355	77,106	268,687
Prince William Sound	877	20,233	2,840	213,834	24,768	262,553
Upper Cook Inlet	366	20,868	1,122	523	561	23,440
Lower Cook Inlet	8	1,656	42	924	12	2,642
Bristol Bay	1,023	171,178	337	3	12,849	185,390
Central Region Total	2,300	214,000	4,300	215,000	38,200	473,800
Kodiak Area	164	11,363	2,627	90,183	5,610	110,007
Chignik	30	5,809	544	7,388	648	14,419
South Peninsula & Aleutians	92	13,390	912	30,328	5,824	50,546
North Peninsula	74	19,577	563	520	1,312	22,046
Westward Region Total	360	50,139	4,646	121,410	13,394	189,949
AYK Region Total	917	1,016	2,706	11	3,771	8,421
Total Alaska	8,800	277,300	24,600	497,800	132,500	941,000

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

Note: Columns may not total exactly due to rounding.



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

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

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

DEFINITIONS OF TERMS

<i>Biological escapement goal (BEG)</i>	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 <i>optimum escapement goal</i> .)
<i>Commercial harvest</i>	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.
<i>Commercial common property harvest (CPF)</i>	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.
<i>Common property harvest</i>	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.
<i>Cost recovery harvest</i>	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
<i>Enhancement of runs</i>	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.
<i>Escapement, spawning population, or brood stock</i>	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.
<i>Harvest projections or harvest outlooks</i>	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.
<i>Optimum escapement goal</i>	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.
<i>Run forecast</i>	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.
<i>Salmon run</i>	The total number of mature salmon returning in a given year from ocean-rearing areas to coastal waters.

PRELIMINARY REVIEW OF THE 2007 ALASKA COMMERCIAL SALMON FISHERIES

SOUTHEAST ALASKA AND YAKUTAT REGION

Region I salmon harvests totaled 58.6 million salmon and 269 million pounds in 2007 (Tables 2, 3, and 4). The exvessel value as reported on fish tickets was \$99 million. Harvest was up substantially from 29.4 million fish in 2006, and value was up slightly from \$95 million in 2006 and \$85 million in 2005. Cumulative all-gear commercial harvest included 351,000 Chinook, 1.9 million sockeye, 2.1 million coho, 9.4 million chum, and 44.8 million pink salmon. The proportional harvest by species included 0.6% Chinook, 3.5% sockeye, 3.2% coho, 16.1% chum, and 76.6% pink salmon. The species mixture returned to more typical proportions for the region in 2007 from 2006, which included both unusually low pink harvests and high chum harvests. Landings were made by 1,870 limited entry permit holders in 2007, which represents a slight increase in effort from the prior year.

The 2007 pink salmon harvest of 44.9 million was well above the long-term average, about equal to the most recent 10-year average harvest of 45.1 million, and close to the forecast of 47 million. The Southeast purse seine fishery provided 94% of this harvest—41.1 million pinks. This 2007 harvest follows the lowest seine harvest in 18 years in 2006. Early-run and mainland area pink salmon stock groups had weak and late returns in July, but coastal area pinks were strong with somewhat compressed run timing. Districts 3, along the west coast of Prince of Wales Island, and District 4, west of Noyes and Dall Islands, combined, produced about half of the seine harvest for the season. Recent year trends, with relatively strong northern district harvests, were reversed. The sustainable escapement goals (SEG) for the subregions were exceeded in the Southern Southeast and the Northern Outside areas and escapements were within the goal range for the Northern Inside area. Escapements were robust and well distributed. Only 4 out of 44 stock groups fell below escapement target ranges and 22 stock groups exceeded target ranges. Pink salmon weights averaged 3.6 pounds per fish.

Total commercial chum salmon harvests were 9.4 million in 2007. The harvest was 80% of the recent 10-year average harvest. The major portions of this harvest included 3.5 million (37%) in hatchery cost recovery harvests, 3.0 million (32%) in purse seine fisheries, and 2.5 million (26%) in drift gillnet fisheries. Although only 29% of seine harvests and 25% of drift gillnet harvests took place in hatchery terminal areas, around 75% of the region's chum production is known to originate from salmon enhancement programs, and substantial harvests also occur in traditional common property fisheries. The 2007 chum salmon returns were considerably below forecast levels of 15.7 million for the region as a whole, and hatchery returns generally came in much lower than expected. Reasons for low marine survivals are not well understood, although fishermen and hatchery operators noticed frequent occurrences of net-marked salmon as well as somewhat lower average weights. Wild chum salmon escapements were generally lower than average. The weighted rank index of peak survey estimates to 82 chum salmon streams was 70% of the 10-year average.

Sockeye harvest was 1.9 million, above the recent 10-year average harvest of 1.6 million. Harvests included 1.1 million in purse seine fisheries, 0.5 million in drift gillnet fisheries, and 237,000 in the

Yakutat set net fisheries. Seine harvest of sockeye is the 6th highest since statehood, and includes a large bycatch component of Canadian sockeye harvested in the District 4 fishery. The drift gillnet harvest was 86% of the recent 10-year average. Transboundary area fisheries off the Stikine and Taku Rivers are managed based on harvest sharing agreements with Canada under the Pacific Salmon Treaty. Significant conservation measures were taken in the District 6 fishery to provide escapements to McDonald Lake, and significant conservation measures were taken in Lynn Canal to provide escapements to Chilkat Lake while harvesting strong returns to Chilkoot Lake. Yakutat setnet harvest of sockeye salmon was nearly double the recent 10-year average of 120,000 with good runs to the Situk River and the best returns to the East River since 1993. Escapements in 2007 were mixed; of the 13 sockeye systems in Southeast and Yakutat that have escapement goals, 4 were under goals, 5 were within goals, and 4 were over goals.

Regional harvest of coho salmon was 2.1 million in 2007. This harvest is close to the long-term average harvest, but well below the recent 10-year average of 2.8 million. Troll fisheries harvested 1.4 million coho—about 67% of the total. Coho weights tended to be smaller than average in 2007, only reaching 6.0 lb average in the troll fishery by the last week of August. Of about 2,000 coho systems around the region representing a wide range of productivity, relatively few are monitored for escapements, so it is difficult to characterize how escapements turned out overall. Of 4 researched indicator stocks with coded wire tag data only the Berners River in Lynn Canal was somewhat below the escapement goal range. Other observations indicated somewhat lower than usual escapements in 2007.

Regional Chinook harvest was 351,000 for the October 1, 2006 to September 30, 2007 catch accounting year. The exvessel value of this harvest is estimated at \$17.9 million, similar to the 2006 value, but with 20,000 fewer fish harvested. By gear type 75% was harvested by troll, and 8% each by seine, gillnet and cost recovery. In 2006 the all-gear treaty Chinook quota for Southeast Alaska was 329,400, based on the coast-wide Chinook model under the Pacific Salmon Treaty. Quota allocations included 243,741 to troll fisheries, 14,164 to purse seine fisheries, 10,552 to drift and set gillnet fisheries, and 60,935 to sport fisheries. In addition to the treaty Chinook quota, in 2006 a directed fishery targeting Stikine River Chinook took place in District 8 to harvest the U.S. Allowable Catch of 13,350 fish based on a harvest sharing agreement with Canada under the Pacific Salmon Treaty. There was no directed fishery on the Taku River in 2006 due to low forecast returns.

Table 4.—Preliminary 2007 Southeast Region commercial salmon harvests, by fishing area and species in thousands of fish.

Fishery	Chinook ^a	Sockeye	Coho	Pink	Chum	Total ^{b,c}
Southern Seine ^d Total	15	970	188	30,058	1,527	32,758
Northern Seine ^e Total	1	88	54	11,606	634	12,383
Hatchery Terminal	11	7	5	400	886	1,310
Drift Gillnet						
Tree Point	2	67	28	340	233	669
Prince of Wales	2	92	81	383	298	856
Stikine	17	71	20	40	178	325
Taku-Snettisham	1	112	22	100	590	826
Lynn Canal	1	144	18	73	564	800
Hatchery Terminal	6	15	7	47	621	697
Set Gillnet	2	237	77	88	3	405
Hand Troll						
Traditional	10	<1	90	4	1	106
Hatchery Terminal	1		0	0	<1	1
Experimental	6	0	1	<1	<1	8
Power Troll ^f						
Traditional	205	6	1,276	99	183	1,769
Hatchery Terminal	1	0	1	0	6	8
Experimental	42	<1	7	1	1	52
Total Annette Isl. Res.						
Seine	<1	6	5	604	37	652
Drift Gillnet	1	13	29	242	153	438
Total Annette Isl. Troll						
Hand Troll						
Power Troll	<1	<1	1	<1	<1	2
Trap						
Hatchery Cost Recovery	28	74	147	606	3,485	4,340
Miscellaneous ^g	<1	2	<1	177	19	199
Southeast Region Total	351	1,904	2,057	44,869	9,420	58,602

^a Chinook adults, not jacks are reported.

^b Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.

^c Columns may not total exactly due to rounding error.

^d Districts 101–108. Harvest codes 11.

^e Districts 109–114. Harvest code 11.

^f Catch accounting period for the 2007 Chinook salmon season goes from October 1, 2006 through September 30, 2007.

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

CENTRAL REGION

PRINCE WILLIAM SOUND

The 2007 Prince William Sound (PWS) Area commercial salmon harvest was 70.6 million fish. The harvest was composed of 63.5 million pink salmon, 3.2 million sockeye salmon, 3.6 million chum salmon, 337,000 coho salmon, and 43,000 Chinook salmon. The 2007 harvest was composed of 57.2 million (81%) Commercial Common Property Fishery (CPF), and 13.4 million (19%) hatchery cost recovery fish.

Copper River District

The commercial salmon fishing season in the Copper River District began on Monday, May 14. In accordance with modifications made to the Copper River King Salmon Management Plan, (5 AAC 24.361) at the December 2005 Board of Fish meeting, there was only one period per week during statistical weeks 20 and 21 when commercial fishing was permitted inside of the barrier islands as defined in 5 AAC 24.350(1)(B).

The 2007 preseason commercial harvest forecast for the Copper River District was 44,277 Chinook, 1,157,000 sockeye, and 278,161 coho salmon. The Gulkana Hatchery was expected to contribute 111,000 sockeye salmon to the 2007 commercial harvest. The actual 2007 sockeye salmon harvest of 1,899,635 ranked as the 3rd largest in the last 117 years. The preliminary harvest composition was 1,835,775 (97%) wild sockeye, 59,472 (3%) Gulkana Hatchery sockeye, and 4,388 (<1%) Main Bay Hatchery sockeye salmon. The harvest of 39,456 Chinook salmon was below the previous 10-year average harvest of 44,277. The coho salmon commercial harvest of 117,273 is below the previous 10-year average harvest of 275,369 coho salmon. The 2007 inriver goal for salmon passing the Miles Lake sonar site was set at 576,600 to 776,600 salmon. The 2007 sonar escapement estimate was 926,438 salmon.

Bering River District

Opening in early June, the Bering River District is managed concurrently with the Copper River District. The 2007 harvest of 16,470 sockeye salmon was below the recent 10-year average of 18,451. The coho salmon harvest of 9,305 fell below the 10-year harvest average of 44,462 coho salmon.

Coghill District (Drift Gillnet)

The commercial common property harvest of chum salmon in the Coghill District was 1,455,117 fish: 1,006,252 (drift gillnet) and 448,865 (purse seine gear). Prince William Sound Aquaculture Corporation (PWSAC) harvested 920,198 chum salmon for corporate cost recovery. The Coghill Lake sockeye salmon escapement of 70,001 fish was above the biological escapement goal (BEG) range of 20,000 to 40,000 sockeye salmon and is a likely result of low fishing effort in the vicinity of the Coghill River terminus. The majority of the commercial fishing effort in the district is focused in the area of Esther Island and the Wally Noerenberg Hatchery. The total commercial common property harvest of sockeye salmon in the Coghill District was 188,052 fish. The majority of the sockeye salmon, 175,580 fish, were harvested by the drift gillnet fleet. The coho salmon harvest of 97,522 fish exceeded the PWSAC preseason forecast of 67,700 enhanced fish. The majority (60,966 fish) were harvested by the drift gillnet fleet. Additionally, the purse seine fleet harvested 24,602 coho salmon and 11,954 were harvested for cost recovery. A small portion of the Coghill District coho salmon harvest was likely of wild stock origin.

Eshamy District

The department's preseason forecast for Eshamy Lake was 36,000 wild sockeye salmon, and PWSAC forecasted a run of 1.13 million Main Bay Hatchery sockeye salmon. The harvest of 1.05 million Main Bay Hatchery sockeye salmon in the Eshamy District was below the preseason forecast. PWSAC achieved their 2007 sockeye salmon cost recovery goal. The Eshamy District sockeye salmon harvest was composed of 329,806 (31%) cost recovery and broodstock fish, 195,307 (18%) set gillnet fish and 538,011 (51%) drift gillnet fish. Additionally 4,388 sockeye salmon of Main Bay origin were harvested in the Copper River District. The sockeye salmon escapement to Eshamy Lake of 16,646 fish was below the BEG range of 20,000–40,000 fish.

Unakwik District

The department's preseason harvest forecast for the Unakwik District was 7,366 sockeye salmon. The Unakwik District CPF harvest was 15,693 sockeye salmon with 15,146 harvested by the drift gillnet fleet. This is above the 10-year average of 7,366 sockeye salmon.

Purse Seine Fisheries

Chum Salmon. The 2007 chum salmon total run forecast for PWS was 3.4 million fish. The majority of the forecast, 2.9 million fish (84%), were PWSAC hatchery production. The PWSAC forecast a run of 1.9 million chum salmon to Wally Noerenberg Hatchery (WNH), 625,000 fish to Port Chalmers, and 404,000 fish to Armin F Koernig Hatchery (AFK). Approximately 844,000 chum salmon (44%) out of the forecast 1.9 million WNH run were required for corporate cost recovery. Approximately 246,000 chum salmon (60%) out of the forecast 404,000 AFK run and were required for hatchery cost recovery. All Port Chalmers chum salmon and 158,000 of the AFK chum salmon were for harvest in the purse seine CPF. Based on the department's wild chum salmon forecast of 454,000 fish, there was a potential CPF harvest of 254,000 wild chum salmon.

The WNH exceeded the preseason forecast of about 1.9 million fish with a total run of 2.3 million chum salmon. The PWSAC harvested 920,000 (40%) of the chum salmon run for cost recovery. The Coghill District had a purse seine harvest of 449,000 chum salmon and a drift gillnet harvest of 1.0 million chum salmon. The proportion of wild chum salmon is unknown at this time. The Port Chalmers remote release harvest of chum salmon exceeded the preseason forecast of 625,000 fish with a harvest of 756,000 fish. The AFK remote release of chum salmon experienced a 47% shortfall with a harvest of 216,000 fish (174,000 cost recovery and 42,000 CPF) compared to the preseason forecast of 404,000 fish. The PWSAC did not achieve the AFK chum salmon cost recovery goal and was unable to get tenders or processor capacity for AFK chum salmon; approximately 30,000 poor quality fish were left in the water. The department documented straying of these chum salmon into streams in the surrounding area.

Pink Salmon. The 2007 preseason forecast for the pink salmon harvest in PWS was 40.6 million fish. This estimate included 12.9 million wild stock fish, 12.2 million Valdez Fisheries Development Association hatchery (VFDA) fish, and 17.6 million PWSAC hatchery fish. Approximately 7.2 million pink salmon (41%) of the projected 17.6 million pink salmon returning to the PWSAC hatcheries were required for cost recovery and broodstock. The remaining 10.4 million PWSAC fish would be available for CPF harvest. Approximately 3.8 million pink salmon (31%) of the projected 12.2 million pink salmon returning to the VFDA Hatchery were required for cost recovery and broodstock. The remaining 8.4 million VFDA fish would be available for CPF

harvest. A total of 10.9 million wild stock pink salmon would be available for CPF harvest leaving 2.0 million fish for escapement.

The 2007 pink salmon harvest was the largest on record for PWS. The harvest of 63.5 million pink salmon was composed of 12.0 million hatchery cost recovery fish and 51.5 million CPF fish. Pink salmon returns were above the preseason forecast for both PWSAC and VFDA. Both PWSAC and VFDA achieved their 2007 pink salmon cost recovery goals with a harvest of 8.0 million fish for PWSAC, and 4.0 million fish for VFDA. The proportion of wild stock pink salmon is unknown at this time.

Coho Salmon. The 2007 VFDA coho salmon run was anticipated to be 162,000 fish. The purse seine fleet harvested 63,000 coho salmon in the Eastern District. The majority of these fish are assumed to be VFDA stock. The seine fleet also harvested 25,000 coho salmon in the Coghill District (the majority assumed to be PWSAC enhanced fish).

COOK INLET

Upper Cook Inlet

The 2007 Upper Cook Inlet (UCI) commercial harvest of 3.3 million sockeye salmon is slightly above the average long-term and short-term harvest in UCI (Table 5). While all 5 species of Pacific salmon are present in UCI, the primary focus of the commercial fishery is sockeye salmon. Sockeye salmon escapement goals to the 6 monitored systems in UCI were within the goal range in only 2 systems, the Kenai River and Fish Creek. The Kasilof and Crescent Rivers were above the upper end of the inriver sonar goal ranges. The Packers Creek escapement was also above the upper end of the range for that system. The inriver sonar estimate for the Yentna River of 79,901 was below the lower end of the escapement goal range for that system.

Sockeye Salmon. The preseason forecast for the 2007 season projected a run of 4.9 million sockeye salmon, with a harvest estimate (sport, personal use, and commercial) of 3.3 million fish. The total run to the Kenai River was forecasted to be 2.4 million sockeye salmon. This resulted in managing for an inriver sonar goal range of 750,000 to 950,000 sockeye salmon. Two scheduled fishing periods plus up to 51 hours of additional fishing time in the Upper Subdistrict set gillnet fishery were allowed. In addition, this run strength mandated 2 closed periods (windows) per week, a 24- and a 36-hour period. Prior to 2007 the Commercial Fisheries staff has waited until all other options within the management plans were utilized before requesting additional authority from the Commissioner to go outside of the plans when the department was having problems managing to stay within the escapement goals. In 2007 this request was made prior to these problems cropping up. Due in large part to this increased flexibility, much of the additional fishing time allowed in the plans was not used. The final inriver sonar count in the Kenai River was 867,572 sockeye salmon, at the mid point in the escapement goal range—the first time we have been within the inriver sonar goal range in 5 years. The 2007 run was approximately 4 days late. The returns during each of the last 3 years have been the latest on record.

The UCI commercial harvest of 3.3 million sockeye salmon was slightly above the preseason forecast harvest estimate, while the total run of sockeye salmon to UCI of 5.1 million was 4% more than the preseason forecast. Returns to all systems were significantly different than the forecast. The Kenai, Crescent and Fish Creek runs were significantly better than forecast, while the Kasilof, Susitna and minor systems were significantly below forecast. Overall these errors canceled each other so that the overall return was within 4% of forecast.

Sockeye salmon prices at the beginning of the season were in the range of \$1.20 per pound. Typically this price is adjusted upwards by the end of the season, but because of the large number of fish caught during 2 peak drift periods saturating the fresh markets, this price dropped to a range of \$0.90 to \$1.10 per pound for most of the remaining season. The total exvessel value in UCI for sockeye salmon was \$22.8 million, which was 94% of the total UCI exvessel value.

Coho Salmon. The 2007 coho salmon harvest of 174,828 was slightly below the recent 10-year average harvest and approximately half of the 1966 to 2006 long term average coho salmon harvest. Commercial coho salmon harvests in 2007 were likely reduced due to restrictions in area to the drift fleet endeavoring to achieve the Yentna Sockeye escapement goal, as well as several periods closed in the Northern District set gillnet fishery for the same reason. The coho salmon run in 2007 was judged to be above average. Commercial coho salmon harvests in UCI during the 1980's and early 1990's were much higher than the long term average due to good coho salmon production, and also due to strong sockeye salmon returns to UCI, which resulted 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, which has resulted 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 2007, the final escapement count of 17,573 was slightly below the upper end of the escapement goal range of 17,700. The exvessel value of coho salmon to the commercial fishery was approximately \$693,000 or 2.9% of the total exvessel value in UCI.

Pink Salmon. Approximately 144,000 pink salmon were harvested in 2007. This figure is a little less than the recent 10-year average pink salmon harvest and about one-third of the average harvest since 1966. Pink salmon harvests were affected by the restrictions implemented for Yentna River sockeye salmon. Pink salmon escapements are not monitored in UCI to an appreciable degree; however 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 \$52,000, which is less than 1% of the total exvessel value.

Chum Salmon. The 2007 harvest of 76,749 chum salmon was well below the long-term average harvest of approximately 500,000 chum salmon. The 2007 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 in Northern Cook Inlet. Following the flood of 1986 and through the mid 1990s, chum salmon production in much of south central Alaska was poor. From 1995 to 1996, chum salmon production has increased. Chum salmon runs to most of Cook Inlet in 2007 were good by recent standards. The exvessel value of chum salmon to the commercial fishery was approximately \$141,000, or less than 1% of the total.

Chinook Salmon. The 2007 harvest of 17,934 Chinook salmon is slightly above both the long and short-term average harvest. The 2 fisheries where Chinook salmon are harvested in appreciable numbers in UCI are in the setnet fisheries in the Northern District king salmon fishery and in the Upper Subdistrict of the Central District. After experiencing a significant downturn in the early to mid-1990s, Northern District Chinook salmon stocks 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 Chinook salmon due to reduced participation and regulatory closures of the highest producing fishing sites located north of Theodore River. The 2007 Northern District

harvest of 3,800 Chinook salmon is about 1,400 fish higher than the recent 10-year average harvest of 2,400 Chinook salmon. This is most likely due to changes made by the BOF in 2005—lengthening the fishing periods from 6 hours to 12 hours on each Monday. In 2007, the commercial harvest in the Upper Subdistrict set gillnet fishery of 12,000 Chinook salmon was about equal to the average Chinook salmon harvest since 1966 when harvest records were available. Late-run Kenai River Chinook salmon runs have been relatively stable and escapement objectives have been consistently achieved or exceeded. Beginning in 1999, 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 2 shorter closed periods each week, a 24- 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. The overall impact of these closed periods, however, may be increasing commercial Chinook salmon harvests over what would occur if these window periods were not in regulation. 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 in the management plans in an attempt to keep sockeye salmon goals within their ranges. This may result in increased Chinook salmon harvest in the set gillnet fishery. In 2007, the exvessel value for Chinook salmon was \$611,000 which is approximately 2.5% of the total exvessel value.

Lower Cook Inlet

The 2007 Lower Cook Inlet (LCI) all-species commercial salmon harvest of just over 662,000 fish was easily the lowest during the past decade, representing only one-third of the recent 10-year average of 2.027 million fish. The overall harvest failed to achieve the cumulative preseason forecast of 1.45 million fish, in large part due to much smaller than anticipated harvests of natural runs of pink salmon. Additionally, relatively weak returns of chum salmon occurred for the first time in the past 8 years, resulting in a commercial catch of less than 1,800 fish, the lowest since statehood. The bright spot in LCI this season was sockeye salmon, with a commercial harvest of just over 366,000 fish, exceeding the recent 10-year average of 298,000 by about 23%. Prices paid for salmon this season yielded an estimated exvessel value of approximately \$1.6 million, making the value of the 2007 LCI harvest approximately 13% less than the recent 10-year average and the fourth lowest during that time period.

For the second consecutive season, but a departure from a long-term trend, LCI commercial salmon harvests in 2007 were not dominated by hatchery and enhanced fish production, primarily because no pink salmon returned to the Tutka Hatchery facility since Cook Inlet Aquaculture Association suspended operations after the 2004 season. Hatchery production did contribute to sockeye catches, however, with nearly 40% of the LCI sockeye salmon harvest in numbers of fish attributed to lake stocking and fertilization projects, most of which were originally begun by ADF&G but are currently maintained by the Cook Inlet Aquaculture Association. These projects were conducted at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District. Another traditional sockeye salmon enhancement project, conducted by the Nanwalek Salmon Enhancement Project in conjunction with Chugach Regional Resources Commission at English Bay Lakes in the Southern District, contributed a small number of sockeyes to commercial set gillnet harvests this season while additionally providing fish for local subsistence users. The pink salmon return to Port Graham Hatchery failed to achieve the preseason forecast, with an estimated total return of only around 120,000 fish. Although a sizeable percentage of the LCI salmon harvest was utilized for hatchery cost recovery, the proportion in 2007, at 28% in numbers of fish, was significantly less than the historical average normally taken by the Cook Inlet Aquaculture

Association and Port Graham Hatchery Corporation as hatchery cost recovery to support the sockeye lake stocking programs and pink salmon hatchery operations. Hatchery harvest in 2007 generated approximately 13% of the exvessel value of the 2007 LCI salmon fishery.

Sockeye Salmon. The 2007 sockeye catch of 366,200 sockeyes accounted for about 55% of the LCI commercial salmon harvest in total numbers of fish, yet provided over 90% of the exvessel value of the entire salmon fishery this season. The 2007 LCI commercial sockeye harvest was characterized by much weaker than expected returns to key enhanced systems at Leisure and Hazel Lakes (Southern District) and Bear Lake (Eastern District). In contrast, natural sockeye returns within the management area ranged from good to outstanding, with all 5 major systems achieving or exceeding their respective SEGs. One additional system with both natural and enhanced production also attained its desired inriver return. Of particular note was the formerly enhanced system of Chenik Lake, located in the Kamishak Bay District on the west side of LCI, where the sockeye return this season was one of the best on record. The resulting 2007 commercial catch in nearby waters totaled over 160,000 fish, which was over 5 times the average catch during the previous 3 seasons. Stocking of Chenik Lake was discontinued after the 1996 season, thus all present production is considered natural, and this season's return was estimated at approximately 180,000 sockeyes, continuing a 5-year trend of good returns to the system.

Pink Salmon. Natural returns of pink salmon, usually the dominant species in numbers of commercially harvested salmon in LCI, were considered relatively good this year. Unfortunately, despite the numerous and fairly liberal openings to target these natural stocks, overall catches (both natural and hatchery) totaled only 287,400 fish, primarily because of erratic tender service to remote LCI districts. The 2007 harvest figure is less than one-fifth of the most recent 10-year average and represents the lowest catch of this species since 1987, the last year that pink salmon were not the most numerous salmon species in the LCI commercial harvest. The catch of 118,000 pinks at Port Graham Hatchery was used entirely in an unsuccessful attempt to achieve the facility's annual revenue goal, while no fish were taken for hatchery broodstock purposes by the facility.

Chum Salmon. After a 7-year string of relatively strong returns, chum salmon were a disappointment in the 2007 LCI commercial salmon season. The chum salmon harvest of less than 1,800 fish was the lowest catch on record for the species in LCI. For the first time in many seasons, several areas of Kamishak Bay District on the west side of LCI were closed to commercial fishing in order to protect chum salmon for escapement purposes. Escapements into most Kamishak Bay chum systems were sufficient to achieve goals, with the exception of McNeil River, where the escapement fell short of its established goal range for the 13th time in the last 18 years (but only by 200 fish). Elsewhere in the management area, Outer District chum returns were considered weak, and no directed openings were allowed.

Coho Salmon. The coho salmon resource is not extensive in the LCI management area, and as a result this species rarely attains commercial prominence. The commercial harvest of 6,000 coho salmon in 2007 was only about half of the recent 10-year average for this species. The Eastern District, which frequently dominates coho catches because of the Seward Silver Salmon Derby and the Cook Inlet Aquaculture Association hatchery cost recovery at Bear Lake, accounted for around 45% of the area-wide coho harvest, but all harvest from that district this season was entirely attributed to the derby. The remainder of the LCI commercial coho catch was about equally split between seiners and set gillnetters in the Southern District. Two aerial surveys were flown specifically for coho salmon this season, indicating excellent escapement into Clearwater Slough, the major coho salmon index stream at the head of Kachemak Bay.

Chinook Salmon. The 2007 harvest of Chinook salmon, not normally a commercially important species in LCI, totaled just under 500 fish, or less than 40% of the average during the last decade and only one-third of the long-term average of just over 1,400 fish. Virtually all of the catch came from the Southern District, with the majority taken in Halibut Cove Subdistrict. Set gillnetters accounted for 94% of the Southern District Chinook catch, with purse seiners taking the remaining 6%.

Table 5.– Preliminary 2007 Central Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Purse Seine						
Eastern						
Northern	0	9	63	22,059	81	22,212
Coghill	0	13	3	6,221	10	6,246
Southwestern ^a	0	12	25	2,335	449	2,820
Montague	0	23	26	17,900	42	17,992
Southeastern	1	8	1	878	756	1,643
Unakwik	0	5	1	1,865	14	1,884
Drift Gillnet						
Bering River ^a	0	16	9	0	0	26
Copper River ^a	39	1,902	117	81	10	2,148
Unakwik	0	15	0	0	0	15
Coghill	0	173	61	65	1,009	1,309
Eshamy	0	538	3	43	81	665
Set Gillnet						
Eshamy	0	197	0	14	25	235
Hatchery ^b	0	321	30	11,991	1,100	13,441
Misc. PWS ^c	2	8	0	1	0	11
Prince William Sound Total	43	3,240	339	63,453	3,577	70,647
Southern District						
Southern District	0	113	3	129	2	247
Kamishak District	0	197	0	11	0	209
Outer District	0	32	0	147	0	180
Eastern District	0	24	3	0	0	27
Lower Cook Inlet Total	0	366	6	290	2	660
Central District						
Central District	14	3,299	156	143	77	3,689
Northern District	4	17	22	4	1	47
Upper Cook Inlet Total	18	3,300	177	147	78	3,740
Naknek-Kvichak District						
Naknek-Kvichak District	2	9,022	2	0	380	9,406
Nushagak District						
Nushagak District	52	8,143	30	0	1,021	9,246
Egegik District						
Egegik District	1	6,494	16	0	167	6,678
Ugashik District						
Ugashik District	1	5,005	2	0	251	5,259
Togiak District						
Togiak District	8	799	0	1	221	1,029
Bristol Bay Total	63	29,500	50	1	2,040	31,600
Central Region Total	124	36,400	600	63,900	5,720	106,600

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

Note: Columns may not total exactly due to rounding.

^a Does not include salmon taken for home use as reported on fish tickets.

^b Hatchery sales for operating expenses. Includes meal production/roe salvage sales, processor discards. Excludes post egg-take roe sales at hatcheries.

^c Some of these fish were donations landed by Coghill District and Copper River District drift gillnet permit holders.

BRISTOL BAY

The 2007 inshore Bristol Bay sockeye salmon run of approximately 44.3 million fish and preliminary catch of 29.5 million sockeye rank 9th and 8th, respectively, since statehood. This year's total inshore run was 23% above the 20-year average (1987–2006) of 36.0 million and approximately 29% above the preseason forecast of 34.4 million fish. Egegik was the only district that came in under forecast at 13% below. Above forecast were Togiak (81%), Ugashik (79%), Naknek-Kvichak (49%), and Nushagak (19%) districts. The commercial harvest of sockeye salmon was 12% above the 26.3 million preseason forecast. Baywide total escapement was nearly 14.9 million sockeye salmon.

Approximately 63,000 Chinook salmon were harvested in Bristol Bay in 2007; this is 92% of the average harvest for the last 20 years. It is significantly below the preseason expected harvest of 145,000 fish. The chum salmon harvest of approximately 2.0 million fish follows the 2.1 million fish harvest in 2006, and is indicative of a second consecutive strong chum run and is well above the 20-year average of 998,000. The coho salmon harvest of approximately 50,000 fish was 51% of the 20-year average of 98,000.

The 2007 harvest of all salmon species in Bristol Bay was approximately 31.6 million fish. The calculated preliminary exvessel value of the 2007 Bristol Bay salmon fisheries was approximately \$108 million and is 84% of the 20-year average. The value of the 2007 fishery ranks 12th over the same period.

Sockeye Salmon. The 2007 inshore sockeye salmon run of 44.3 million fish was approximately 10 million fish more than the preseason forecast of 34.4 million. Limitations in processor capacity also affected the department's ability to control sockeye escapements into most systems in Bristol Bay in 2007. Escapements into the Kvichak, Nushagak, and Togiak Rivers fell within established SEG ranges. All other systems were above established ranges. A record run to the Ugashik District and a strong Naknek River run contributed to high escapement in those systems. Run timing this year was staggered by district with the Nushagak District showing the first significant push on June 25, followed shortly by the other districts. All Eastside Districts began the fishing season in their full areas based on the preseason forecast for a run approaching 4.0 million fish to the Kvichak River. However, the Kvichak run was slow to develop, resulting in the Naknek-Kvichak and Egegik districts being confined to their Special Harvest Areas on June 28 for a period of 12 days ending July 9, when escapement into the Kvichak was projected to exceed the 2.0 million fish minimum SEG. Processor capacity became an issue beginning July 5 when limits were placed on permit holders after 2 consecutive days of total Baywide catches of approximately 2.0 million fish. Daily limits continued until around July 13 when Baywide abundance began to taper off, except in the Ugashik District where limits were in place for most of the season.

Chinook Salmon. Chinook salmon harvests in Bristol Bay districts were below average in every district except Nushagak. Directed fishing for Chinook in the Nushagak District in the early part of the season produced approximately 2,100 Chinook until management was switched to sockeye salmon based on the increasing abundance of that species. Several planned directed Chinook openings did not occur because Chinook escapement into the Nushagak River was below desired levels. Catches of Chinook increased in the Nushagak District to the point where a near average harvest was achieved, but this catch was incidental to the directed sockeye fishery. The final Chinook escapement of 60,494 was less than the 75,000 inriver goal established in the Nushagak

Mulchatna King Salmon Management Plan, but within the SEG range. Runs of Chinook salmon to all districts were below average and exhibited late run timing.

Chum Salmon. The total Bristol Bay chum salmon harvest in 2007 was approximately 2.0 million fish. All 5 districts produced harvests above their 20-year average. As in 2006, the Nushagak District had the largest chum harvest of nearly 1 million fish; over twice the 20-year average. The Ugashik District was slightly over 4 times higher than the 20-year average, with a harvest of approximately 250,000 fish.

Pink Salmon. Pink salmon have strong runs during even years in Bristol Bay. With 2007 being an off-cycle year coupled with low demand for pink salmon originating in Bristol Bay, commercial harvest of pink salmon was incidental. A total of 992 pinks were reported caught, mostly in the Nushagak (435) and Togiak Districts (545). No prices were reported but using the 2006 price of \$0.06 the value of the pink salmon catch in Bristol Bay was approximately \$200.00.

Coho Salmon. The Baywide harvest of approximately 50,000 coho salmon was 51% below the recent 20-year average of 98,000. Based on available information it appears the 2007 coho run was early, weak, and compressed in most districts. A relatively strong pulse of fish began in late July but declined by the second week in August. Fishing in the Nushagak District, a major producer of coho salmon in the Bay, was closed on August 13 because of the lack of market interest and low catch per unit effort (CPUE). In some districts, harvest was limited by market availability.

AYK REGION

Arctic-Yukon-Kuskokwim (AYK) Region salmon harvests totaled 1,118,000 salmon and 8,421,000 pounds in 2007 (Tables 2, 3, and 6). The exvessel value was estimated to be \$4.6 million. Cumulative all-gear commercial harvest included 57,000 Chinook, 155,000 sockeye, 360,000 coho, 542,000 chum, and 4,000 pink salmon. Generally poor chum and pink salmon markets resulted in substantially lower harvest than available surpluses. Landings were made by 1,169 limited entry permit holders in 2007.

KUSKOKWIM AREA

The 2007 Kuskokwim Area (Kuskokwim River and Kuskokwim Bay districts) sockeye, chum, and coho salmon runs were similar to what was anticipated. Although the Kuskokwim River Chinook run was above average in 2007, it was approximately 100,000 fish less than the preseason projection. Kuskokwim River salmon fisheries were managed according to the Kuskokwim River Salmon Management Plan. Recent action by the BOF discontinued the Kuskokwim River Chinook and chum salmon stock of concern designations. The Kuskokwim River subsistence fishing schedule was not implemented in 2007 given anticipated above average runs of Chinook and chum salmon and discontinuation of the stock of concern designations. Although subsistence fishing was sometimes described as difficult because of low and clear water conditions persisting through June, harvests of salmon necessary for subsistence were expected to be achieved throughout the area.

A total of 445,584 salmon were commercially harvested from the Kuskokwim Area. A total of 456 permit holders participated in Area fisheries with the exvessel value estimated at \$1,265,035. Prices paid for sockeye and coho salmon increased by \$0.05 per pound compared to last year. Limited processor capacity and low fishing effort dominated the season and resulted in an unharvested surplus of salmon other than coho salmon.

In the Kuskokwim River, a lack of processing capacity, commercial interest, and continued poor chum salmon market conditions resulted in no commercial openings in June and July during the bulk of the Chinook, sockeye, and chum salmon runs. However, a directed commercial coho fishery was implemented in August. The Kuskokwim River, District 1, commercial harvest in 2007 was 179 Chinook, 703 sockeye, 10,763 chum, and 141,049 coho salmon from 12 periods. The 2007 coho salmon harvest was 28% below the recent 10-year average. A total of 366 individual permit holders recorded landings during the 2007 season. This level of fishing effort was 19% below the recent 10-year average of 452 fishers. The total exvessel value of the fishery was \$380,842, 44% below the recent 10-year average-value.

Kuskokwim River Chinook salmon escapements were evaluated through aerial surveys on 13 index streams, by enumeration at weirs on 6 tributary streams, and through mainstem mark and recapture at a tagging project near Kalskag. Chinook escapements in 2007 were characterized as average to above average at nearly all monitored locations with the exception of Tuluksak River where escapement was below average. Kogruklu River Chinook escapement was within the escapement goal range and all aerial survey escapement goals were either exceeded or were within their respective escapement goal ranges. Weir-based Chinook salmon escapement goals were established for the Kwethluk, Tuluksak, and George Rivers in 2007. The Kwethluk River escapement goal was exceeded, the Tuluksak River escapement goal was not achieved, and escapement to the George River was within the escapement goal range. Data collection and analysis for the mark and recapture project will continue into the winter with preliminary findings expected in late 2007.

Kuskokwim River sockeye salmon escapements were monitored at each of the 6 tributary weir projects; however, sockeye are not a prominent species in many of these systems. Among these locations, the Kogruklu and Kwethluk Rivers receive the largest sockeye escapements. Kogruklu and Kwethluk River sockeye salmon passage in 2007 was above average, but below the record escapements observed in 2005 and 2006. Sockeye salmon distribution and stock composition was also evaluated through radio telemetry at a tagging project near Kalskag. Preliminary results from the sockeye salmon radio telemetry project have been consistent with previous years and indicate the Holitna River drainage produces the majority of Kuskokwim River sockeye salmon.

Kuskokwim River chum salmon escapements were evaluated through enumeration at weirs on 6 tributary streams and a tributary sonar project on the Aniak River. Chum escapements in 2007 ranged from above average to the highest on record at nearly all monitored locations, with the exception of Tuluksak River where escapement was average. Although the Kogruklu River weir and Aniak River sonar escapements were above average and exceeded their escapement goal ranges in 2007, they were below the record to near-record escapements observed in 2005 and 2006.

Kuskokwim River coho salmon escapements were evaluated through enumeration at weirs on 6 tributary streams. Coho salmon escapements in 2007 ranged from above average to below average at all monitored locations. Coho salmon escapement at the George River was the second highest on record behind the record year of 2003, while escapements at the Kwethluk and Tuluksak Rivers were the lowest on record. Escapement at Kogruklu River was near the upper end of the escapement goal range.

Kuskokwim Bay commercial salmon fisheries were managed according to their associated management plans and regulations. In Kuskokwim Bay, the 2007 District 4 (Quinhagak) commercial harvests were 19,573 Chinook, 109,343 sockeye, 61,228 chum, and 34,710 coho salmon from 33 periods. Sockeye salmon harvest was at a record high for the second consecutive

year and was 53% above the recent 10-year average. Chum salmon harvest was 50% above the recent 10-year average while Chinook and coho salmon harvests were 5% and 14% below the recent 10-year average respectively. A total of 125 individual permit holders recorded landings in District 4 during the 2007 season. This level of fishing effort was 27% below the recent 10-year average of 172 fishers. The total ex-vessel value of the District 4 fishery was \$660,865, 40% above the recent 10-year average value.

The Kanektok River weir, the primary escapement assessment project for District 4 (Quinhagak), maintained consistent operation from June 19 through September 11. Heavy rains and high water rendered the weir inoperable from September 12 through the remainder of the season. Preliminary weir escapement counts were 14,216 Chinook, 307,738 sockeye, 26,516 coho, and 133,215 chum salmon. Sockeye and chum salmon counts were the highest on record exceeding previous record counts of 242,208 sockeye and 53,580 chum salmon in 2005. Coho salmon escapement is believed to be higher because weir counts were suspended prematurely on September 12. Chinook and sockeye salmon aerial surveys were flown over the Kanektok River drainage; however, all surveys were incomplete because of poor weather conditions.

District 5 (Goodnews Bay) commercial harvests in 2007 were 3,112 Chinook, 43,716 sockeye, 7,519 chum, and 13,689 coho salmon from 33 periods. Chinook, sockeye, and coho salmon harvest was 25%, 42% and 16% above the recent 10-year average respectively, and chum salmon harvest was 3% below the recent 10-year average. A total of 28 permit holders recorded landings in District 5 during the 2007 season. This level of fishing effort was 30% below the recent 10-year average of 40 fishers. The total ex-vessel value of the District 5 fishery was \$223,329, 42% above the recent 10-year average value.

The Middle Fork Goodnews River weir, the primary escapement assessment project for District 5, maintained consistent operation from June 25 through September 10. Heavy rains and high water rendered the weir inoperable from September 11 through the remainder of the season. Preliminary weir escapement counts were 3,593 Chinook, 70,780 sockeye, 17,006 coho, and 48,241 chum salmon. The Chinook and sockeye salmon escapement goal ranges were exceeded and the chum and coho salmon escapement goal thresholds were achieved. Sockeye escapement counts were the third highest on record and chum salmon counts were the second highest on record since 1981. Similar to the Kanektok River weir, coho salmon escapement is believed to be higher because weir counts were suspended prematurely on September 11. No aerial surveys were flown over the Goodnews River drainage in 2007 because of poor weather and water conditions.

YUKON AREA

The 2007 Yukon River total commercial harvest was 33,634 Chinook, 198,201 summer chum, 90,677 fall chum, and 44,575 coho salmon for the Alaskan portion of the drainage. A total of 32,112 Chinook, 176,223 summer chum, 74,678 fall chum, and 43,207 coho salmon were harvested in the Lower Yukon River (Districts 1–3) and 1,522 Chinook, 21,978 summer chum, 15,999 fall chum, and 1,368 coho salmon were harvested in the Upper Yukon River (Districts 4–5). All salmon were sold in the round with no salmon roe sold separately.

The 2007 Chinook salmon run was anticipated to be similar to the 2006 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 of 30,000 to 60,000 fish. However, the 2007 Chinook run was approximately 60,000 to 70,000 fish less than anticipated. The Chinook salmon

harvest was 30% below the 1997–2006 average harvest of 48,254 fish. The summer chum salmon harvest was the tenth lowest since 1967, but 247% above the 1997–2006 average harvest of 53,014 fish. The commercial market for summer chum salmon showed improvement. For the first time since 1997, commercial fishing occurred in Subdistrict 4-A and 15 periods restricted to 6-inch maximum mesh size targeted summer chum salmon in the Lower Yukon Area.

A total of 591 permit holders participated in the Chinook and summer chum salmon fishery during 2007, which was 4% below the 1997–2006 average of 614 permit holders. The Lower Yukon Area and Upper Yukon Area are separate Commercial Fisheries Entry Commission (CFEC) permit areas. A total of 564 permit holders fished the summer season in the Lower Yukon Area in 2007, which was 4% below the 1997–2006 average of 585 permit holders. In the Upper Yukon Area, 27 permit holders fished, which was 16% below the 1997–2006 average of 32 permit holders.

Yukon River fishers in Alaska received an estimated \$2.2 million for their Chinook and summer chum salmon harvest in 2007, approximately 29% below the 1997–2006 summer season average of \$3.1 million.

Chinook salmon escapement goals throughout the Alaskan portion of the drainage were either met or exceeded. Biological escapement goals have been established for the Chena and Salcha rivers located in the Tanana River drainage. An estimated 3,576 Chinook salmon were counted by the Chena River tower project (BEG 2,800 to 5,700) and 5,700 were counted by the Salcha River Tower project (BEG 3,300 to 6,500). Both the estimates are considered minimums due to high water events that affected the counts. The Canadian Yukon River mainstem Chinook salmon run was less than expected with the preliminary escapement estimate of 19,000 fish well below the spawning escapement target of 33,000 to 43,000 fish.

The 2007 summer chum salmon escapements were average in most tributaries. Escapement goals have been established for the Andreafsky and Anvik Rivers. There is also a drainage-wide optimum escapement objective of 600,000 summer chum salmon for the Yukon River, as estimated by the Pilot Station sonar project. The Pilot Station passage estimate of 1.7 million summer chum salmon was slightly below the average of 2.0 million. The Anvik River sonar-based escapement estimate of 459,517 summer chum salmon was within the BEG range of 350,000 to 700,000. The escapement of 69,642 summer chum salmon for the East Fork Andreafsky River was within the BEG range of 65,000 to 135,000 fish. Preliminary postseason analysis indicates summer chum escapements were generally good in the Koyukuk River drainage.

The 2007 Yukon River fall chum salmon run was exceptionally late and compressed which contributed to a commercial harvest of both fall chum and coho salmon well below the preseason outlook for both species. The Yukon Area commercial harvest of fall chum salmon was approximately 102% above the 1997–2006 average of 44,800 fish and the coho harvest was 117% above the 10-year average of 20,600 fish.

The 2007 commercial fall chum and coho salmon season value for the Yukon Area was estimated to be \$290,400 (\$272,100 for the Lower Yukon Area, \$18,300 for the upper Yukon Area). The previous 10-year average value for the Yukon Area was \$102,400 (\$88,700 for the Lower Yukon Area, \$13,700 for the Upper Yukon Area).

In 2007 Yukon River fishers received an average price for fall chum salmon was \$0.27 per pound in the Lower Yukon Area and \$0.20 per pound in the Upper Yukon Area. This compares to the 1997–2006 average of \$0.23 per pound in the Lower Yukon Area and \$0.13 per pound in the Upper

Yukon Area. For coho salmon, fishers received an average price of \$0.39 per pound in the Lower Yukon Area and \$0.20 per pound in the Upper Yukon Area compared to the recent 10-year average price of \$0.28 per pound in the Lower Yukon Area and \$0.12 per pound in the Upper Yukon Area.

An average of 118 permit holders fished the fall chum and coho salmon fishery (113 for the Lower Yukon Area, 5 for the Upper Yukon Area) during the previous 10 fall seasons as compared to 313 fishers who participated in 2007 (303 for the Lower Yukon Area, 10 for the Upper Yukon Area).

The outlook for the 2007 fall commercial fishery anticipated a commercial harvest of 50,000 to 400,000 fall chum salmon based on the brood year returns and recent production levels. Parent year escapements for fall chum salmon in 2002 were 398,000 fish and in 2003 were 695,000 fish. Additionally, continued exceptional returns from the 2001 brood year were anticipated which provided a record age-6 return. The preseason run size projection was for 900,000 to 1.2 million fall chum and an above average run of coho salmon.

Late run timing of fall chum salmon, indicating a below average run, led to a more conservative management approach and a low harvest rate on the front half of the run in the lower river. The fall season was extended and fishing time was increased as fish continued to enter the river late in the season. A large surplus of fall chum salmon was identified by the time they reached the upriver districts, but the primary market did not develop until late in the season when cooler weather temperatures could maintain product quality. Unfortunately, freezing temperatures forced the end of the fall season even though catch rates and abundance remained high in the Tanana River drainage.

Fall chum salmon BEG ranges have been established drainage-wide for the Yukon River as well as several major tributary stocks. All escapement goals including interim Canadian objectives were met and upper ends of the ranges were exceeded in several locations. Although the Pilot Station Sonar passage estimate was 684,000 fish, the post-season run reconstruction using escapement projects upriver along with the harvests resulted in an estimated 2007 total run of approximately 1.0 million fall chum salmon.

There is only one established escapement goal for coho salmon in the Yukon River drainage, which is a SEG for the Delta Clearwater River of 5,200 to 17,000 fish. The 2007 boat count survey of the Delta Clearwater River estimated an above average escapement of 18,611 coho salmon. The 2007 Pilot Station Sonar passage index of 173,289 was above the 1995, 1997–2006 average of 147,000 fish. The Yukon coho salmon run was between 3 and 7 days early in 2007 with lower river projects indicating well above average returns while upper river projects showed only average abundance. Escapements into other monitored areas of the upper Tanana River resulted in observations slightly above average.

NORTON SOUND AREA

Well above average runs of chum and sockeye salmon occurred in many areas of Norton Sound and a near record run of coho salmon occurred in southern Norton Sound. There was limited commercial interest in chum salmon and a small scale commercial sockeye fishery occurred in Port Clarence. The pink salmon run was average for an odd-numbered year, but much smaller than expected after the near record run for an odd-numbered year in 2005. There was little interest in pink salmon, except for a small commercial fishery to obtain bait for the crab fishery. Once again Chinook salmon runs were poor.

The first commercial salmon fishing period occurred in the Moses Point Subdistrict on July 10 to target chum salmon. Commercial fishing was allowed for two 24-hour or two 30-hour fishing periods

per week for the remainder of the season. In the Shaktoolik and Unalakleet Subdistricts, the first commercial salmon fishing period occurred on July 18 and was a 24-hour period targeting chum salmon, although it also allowed the department to determine early coho salmon run strength. Catches were good for both chum and coho salmon and after a second 24-hour fishing period with similar catches, the department, in concurrence with the buyer, switched to the regular schedule of two 48-hour fishing periods a week.

In the Port Clarence District there was a commercial salmon fishery for the first time since 1966. Although the commercial fishery targeted sockeye salmon, the harvest of chum salmon to sockeye salmon was nearly 3 to 1. The fishery started one week after the allowed start date of July 1 as the buyer set up the logistics for the inaugural season. The catch was 1,152 sockeye salmon and 3,183 chum salmon.

The combined commercial harvest of all salmon species ranked third in the last 10 seasons in Norton Sound and ranked first with the pink salmon harvest excluded. The number of commercial permits fished (71) was the second highest in the 2000s, but eighth lowest on record. The coho salmon harvest of 126,115 was nearly 230% above the recent 5-year average and 300% above the recent 10-year average. There was limited market interest in pink salmon for crab-hanging bait and a buyer purchased 3,769 pink salmon in the Norton Sound District. Also, there was a limited market for chum salmon and a buyer purchased 22,341 chum salmon. The average price paid for Chinook salmon was \$.55 per pound, \$.55 per pound for sockeye salmon, \$.53 per pound for coho salmon, \$.14 per pound for pink salmon, and \$.24 per pound for chum salmon. The estimated 2007 exvessel fishery value of \$572,195 was well above the 5-year average of \$175,196 and the 10-year average of \$183,719. The average earnings were a record \$8,059 per permit holder without adjusting for inflation.

KOTZEBUE AREA

The overall chum salmon run to Kotzebue Sound in 2007 was estimated to be above average based on the commercial harvest rates, average to above average subsistence catches, and the Kobuk test fish index being above average. The commercial harvest consisted of 147,085 chum salmon. Also harvested during the commercial fishery and kept for personal use were 2 chum salmon, 15 Chinook salmon, 3 pink salmon, 2 coho salmon, 960 Dolly Varden and 13 sheefish. There were likely some additional fish kept for personal use that did not get reported on fish tickets.

As in recent years the department opened the commercial fishery continuously and allowed the buyer to set the fishing time for their fleet. There were 46 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 in the past 3 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 1,209,842 pounds of chum salmon (average weight 8.2 lbs) were sold at an average of \$.20 per pound. The total exvessel value was \$243,149 to Kotzebue Sound fishers. The average value for each participating permit holder was \$5,286. The total exvessel value represents 41% of the \$597,286 historical average (1962–2006).

Table 6.—Preliminary 2007 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total ^{b,c}
	Chinook	Sockeye	Coho	Pink	Chum	
Kuskokwim River		1	141		11	153
Kuskokwim Bay	23	153	48		69	293
Kuskokwim Area Total	23	154	189		80	446
Lower Yukon River	32		43		251	326
Upper Yukon River ^a	2		2		38	42
Yukon River Total ^a	34		45		289	368
Norton Sound		1	126	4	26	157
Kotzebue Area					147	147
AYK Region Total	57	155	360	4	542	1,118

^a The Upper Yukon River catch includes the estimated harvest to produce roe sold.

^b Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

^c Columns and rows may not total exactly due to rounding error.

WESTWARD REGION

KODIAK AREA

The 2007 Kodiak Area commercial salmon fishery began on June 5 and the last commercial landing occurred on October 3.

Commercial fishing effort was once again low during the 2007 commercial salmon season although effort did increase slightly from 2006. Of the 608 eligible commercial salmon permits, only 301 (49.5 %) made commercial landings. Sixty-four permits were not renewed for the 2007 season.

By gear type, a total of 157 set gillnet, 141 purse seine, and 3 beach seine permit holder(s) fished in 2007. While below the previous 10 year average, it is an increase from the 2006 commercial salmon season. The number of permits actually fished at any given time varied throughout the season.

The 2007 total Kodiak Area commercial harvest was 17,222 Chinook salmon, 2,012,564 sockeye salmon, 356,063 coho salmon, 24,809,213 pink salmon and 728,912 chum salmon (Table 7). Approximately 27.9 million salmon were commercially harvested, which is above the previous 10-year (1997–2006) average of 23.4 million salmon. Of the total salmon commercially harvested in 2007, 4,377 salmon were retained for the permit holder's own use (homepack, taken but not sold).

The estimated total exvessel value of the 2007 fishery was approximately \$28.19 million, which was above the 10-year average exvessel value of \$23.60 million.

Purse seine fishermen accounted for 88.4% of the total number of salmon harvested; averaging \$152,119 per fished permit. This is a slight decrease from the 2006 season, but more than the previous 10-year average (\$99,545) for purse seine permit holders. Set gillnet fishermen accounted for 11.5% of the total number of salmon harvested. Earnings averaged approximately \$41,068 per fished permit, which was an increase over 2006, and higher than the previous 10-year average permit holder earnings of \$38,134. Beach seine fishermen accounted for less than 1% of the total number of salmon harvested and averaged \$3,484 per fished permit. This was an increase over the 2006 earnings and slightly below the previous 10-year average.

Chinook Salmon. The Ayakulik and Karluk river systems support the largest Chinook salmon populations in the Kodiak Area. There are no directed Chinook salmon commercial fisheries in the KMA but incidental commercial harvest occurs during targeted sockeye salmon fisheries. Non-retention of Chinook salmon was implemented in the Inner and Outer Karluk sections in 2007 due to low returns. The 2007 commercial harvest of Chinook salmon in the Kodiak Area totaled 17,222 fish which was lower than the previous 10-year average (19,188 fish) and below the 2007 forecast.

Sockeye Salmon. The 2007 commercial harvest of sockeye salmon in the Kodiak Area totaled 2,012,564 fish. The harvest was below the recent 10-year average (3,100,377 fish) but above the point forecast of 1,923,800 fish.

Early season management for much of the west side and north end of Kodiak Island is driven by the Karluk early-run sockeye salmon (through July 15). The lower end of the Karluk early-run sockeye salmon escapement goal (100,000 fish) was exceeded by June 14 and fishing was allowed along the west side of Kodiak in the Central, North Cape, Southwest Afognak, and Outer Karluk sections through June and early July, until the management focus turned to pink salmon (July 6). Approximately 527,704 sockeye salmon were harvested in early-season (through July 15) westside fisheries, which was above the early-run sockeye salmon point forecast of 355,000 fish.

Approximately 879,111 sockeye salmon were harvested in the late-season westside fishery which was above the late-run sockeye salmon point forecast of 481,000 fish.

The Ayakulik River was expected to have a small surplus of sockeye salmon available to commercial fishing. Escapements proved to be strong enough to provide commercial fishing opportunity in the 2007 season. The Inner and Outer Ayakulik sections were first opened to commercial salmon fishing on July 21. Several subsequent fishing periods occurred throughout the remainder of the season. Ayakulik sockeye salmon harvest totaled approximately 98,283 fish. The total sockeye salmon harvest was well above the 2007 point forecast of 20,000 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 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. However, the Upper Station lower escapement goal was met for early-run sockeye salmon by July 7. The 2007 forecast for Frazer Lake was estimated at 258,000 fish with a harvestable surplus of approximately 153,000 fish. Frazer Lake sockeye salmon escapements were within escapement goal ranges and a commercial salmon fishing period fishery was prosecuted for the Alitak District on July 9. However, it became apparent that the jack percentage was exceedingly high for the Frazer escapement. Commercial fishing was curtailed in order to allow a higher percentage of older age class sockeye salmon into Frazer Lake. The Alitak District early-run sockeye salmon commercial harvest was approximately 19,322 fish, well below the point forecast of 189,000 fish.

The late-run sockeye salmon forecast for Upper Station predicted a total return of 259,000 fish with 73,000 fish available for harvest. Escapements were sufficient to allow several commercial fishing openings in the Alitak District. The total late-run sockeye salmon harvest (66,147 fish) was slightly below forecast (73,000 fish).

Cape Igvak Salmon Management Plan. This regulatory management plan (5 AAC 18.360) allocates up to 15% of the total Chignik-bound sockeye salmon harvest to 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 expected to be met in 2007 and a 48-hour fishing period was allowed in the Cape Igvak Section (June 19–21). 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.

Through July 25, the Cape Igvak harvest of sockeye salmon considered to be Chignik-bound (90%) was approximately 52,527 fish and represented 8% of the total Chignik sockeye salmon harvest (15% allocation). Overall, the total sockeye salmon harvest in the Cape Igvak Section through July 25 was 58,363 fish, which is well below the point forecast of 193,100 fish.

North Shelikof Sockeye Salmon Management Plan. From July 6 to 25, this regulatory management plan (5 AAC 18.363) places harvest limits on 2 areas of the Kodiak Area bordering northern

Shelikof Strait (mid to north Mainland and northwest Afognak/Shuyak Islands) to limit interception of sockeye salmon that are considered Cook Inlet-bound. During the period that this management plan is in effect, 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 “Shoreward Zones” only, and offshore “Seaward Zones” are closed. In 2007, 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. During the first commercial fishing period (July 6–8), the department biologists estimated that the harvest would meet or exceed the North Shelikof sockeye salmon harvest cap of 15,000 fish by the end of the period. The Seaward Zone of North Shelikof Unit was closed for subsequent periods. At the closure of the Seaward Zone, the harvest was estimated to include approximately 12,695 fish. The total July 6 to 25 harvests in the North Shelikof Unit was 17,407 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 to 25 in the Southwest Afognak Section was about 20,704 fish.

Terminal and Special Harvest Areas. Some fisheries occur in areas where 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 Special Harvest Area (SHA; 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 SHA (Little Waterfall Lake). The Foul Bay SHA (Hidden Lake) commercial harvest was minimal (795 fish).

In the Spiridon SHA (Telrod Cove), 70,250 sockeye salmon were harvested. The Spiridon SHA represents an estimated 41% of the total harvest of Spiridon enhancement fish; the other 59% are harvested in traditional net fisheries along the westside of the KMA. If expanded the total Spiridon sockeye salmon commercial harvest was an estimated 171,341 fish (forecast 247,800 fish).

The Kitoi Bay Hatchery harvest was an estimated 35,263 sockeye salmon, and was below the point forecast of 71,900 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 356,063 fish was below forecast of 434,500 fish and below the 1997 to 2006 average of 411,906 fish.

The majority of the coho salmon commercial harvest occurred in those sections associated with west side fisheries (Southwest Afognak to Ayakulik), with a total harvest of 138,773 fish. In those sections near the Kitoi Bay Hatchery, approximately 125,781 fish were harvested which was below the forecast of 149,781 fish.

Pink Salmon. Overall, the 2007 pink salmon harvest of 24,809,213 fish was well over the harvest forecast (12,162,000 fish), above the past 5 odd-year (1997–2005) average harvest of 17,341,086 fish, and above the previous 10 year average harvest of 19,015,708 fish.

Wild stock pink salmon harvests were excellent, with 16,924,346 harvested in the Kodiak Area. Westside fisheries (Southwest Afognak to Ayakulik), accounted for 7,378,307 fish and the Eastside Kodiak District harvested 6,119,466 fish.

The Kitoi Bay Hatchery pink salmon return was stronger than expected. In those sections near the hatchery about 7,866,293 fish were harvested. Additional Kitoi-bound pink salmon were likely harvested along the west side and east side of Kodiak and Afognak islands. However, the department does not have a stock separation program for pink salmon and is unable to differentiate stocks. There was a cost recovery fishery near the hatchery, with Kitoi pink salmon harvested and sold by the Kodiak Regional Aquaculture Association.

Chum Salmon. The chum salmon harvest of 728,912 fish was below the forecast of 1,019,400 fish and below the 1997 to 2006 average of 848,145 fish. Chum salmon run timing appeared to be later during the 2007 season. A significant harvest of chum salmon occurred in late September, which is unusual for Kodiak. The Eastside and Northeast Kodiak Districts accounted for 217,396 fish. Kitoi Bay Hatchery chum salmon production was weaker than expected. The Kitoi Bay Hatchery chum salmon harvest of 229,223 fish was substantially below the 2007 forecast of 415,000 fish.

CHIGNIK AREA

The 2007 commercial salmon fishery was the second season since the cooperative management plan was deemed invalid in 2005. The first fishing period in the CMA occurred on June 15 and the last fishing period occurred on September 5, after which the local processor closed for the season.

The exvessel value of the 2007 commercial salmon fishery was about \$5.6 million (approximately \$101,000 per active permit holder). The vast majority of the value was from the sale of sockeye salmon, although the substantial pink harvest contributed a greater proportion of the fishery value than past years—roughly \$19,000 per active permit holder. Per active permit holder, the harvest provided about \$500 for Chinook, \$3,600 for coho, and \$3,000 for chum salmon.

Chinook Salmon. A total of 1,773 Chinook salmon were commercially harvested in 2007, which was below historic average harvests. The majority of the 2007 Chinook salmon harvest occurred in the Chignik Bay, Central, and Western districts in roughly equal proportions. Most Chinook salmon were harvested in July.

Sockeye Salmon. A total of 834,547 sockeye salmon were commercially harvested during 2007, which was approximately 575,000 (41%) less than the recent 10-year average harvest and 104,000 (11%) less than the recent 5-year average harvest. The majority of the 2007 sockeye salmon harvest came from the Chignik Bay District, although substantial harvests also occurred in the Central and Western districts. Approximately half of these sockeye salmon were harvested before mid-July.

An additional 52,527 sockeye salmon considered Chignik-bound were harvested as part of the Cape Igvak fishery during 2007. The Southeast District Mainland (SEDM) fishery was not opened during the allocation period as the Chignik Area sockeye harvest did not exceed the required 600,000 fish during this time. The Chignik-bound portion of the Cape Igvak harvest totaled approximately 8% of the total Chignik-bound harvest (allocation 15%).

Coho Salmon. A total of 73,277 coho salmon were commercially harvested in 2007, which was less than the prior 10- and 20-year average harvests, and about 29,000 more coho salmon than the prior 5-year average harvest. The majority of the coho salmon harvest in 2007 took place in the Western District, and most were harvested during July and August.

Pink Salmon. A total of 2,019,748 pink salmon were commercially harvested in 2007, which was well above the prior 5-, 10-, and 20-year average harvests and was the third largest harvest on record. The largest portion of the pink salmon harvest came from the Western District, although the Central District also yielded a substantial portion of the catch. Most were harvested between mid-July and mid-August.

Chum Salmon. A total of 78,553 chum salmon were commercially harvested in 2007, which was less than the prior 10-, and 20-year average harvests and about 36,000 more than the recent 5-year average. The majority of the chum salmon harvest in 2007 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

ALASKA PENINSULA ALEUTIAN ISLANDS AREA

The following is an overview of the 2007 Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands areas commercial salmon fishing season. Fishing has been completed and harvest totals presented here should closely approximate final harvest numbers for all species. The 2007 commercial salmon harvest in the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Islands Management areas totaled 12,921 Chinook, 5,838,316 sockeye, 217,607 coho, 8,453,409 pink, and 859,297 chum salmon (Table 7). The commercial harvests of Chinook, sockeye, and pink salmon were all above 2007 harvest projections and the most recent 10-year average harvest. Conversely, the harvest of coho and chum salmon were slightly below the 2007 harvest projection and the 10 year average. The preliminary exvessel value of salmon harvested in Area M totaled \$26,535,289.

South Alaska Peninsula June Fishery

In February 2007, the BOF made changes to the South Unimak and Shumagin Islands June Salmon Management Plan. These changes are:

- 1) Modified the description of the Sanak Island Section which is now defined as the waters of the Unimak District surrounding the Sanak Islands, south of Hague Rock lat 54°33.17'N, and east of long 163°03.70'W and;
- 2) Allowed the use of drift gillnet gear in the following portion of the Southwestern District; south and east of a line from Cape Pankof Light (lat 54°39.60'N, long 163°03.70'W) to Thin Point (lat 54°57.32'N, long 162°33.50'W); south of a line from Thin Point (lat 54°57.32'N, long 162°33.50' W) to the northernmost tip of Stag Point (lat 54°59.10'N, long 162°18.10'W) on Deer Island to the southernmost tip of Dolgoi Cape (lat 55°03.15'N, long 161°44.35'W) on Dolgoi Island and south of the latitude of the northeastern tip of Dolgoi Island (lat 55°07.50'N, long 161°38.30'W);
- 3) Allowed the use of salmon net pens in the Alaska Peninsula Area and;
- 4) Allowed 2 Commercial Fisheries Entry Commission (CFEC) set gillnet permit holders aboard a registered set gillnet fishing vessel to tow a second registered CFEC set gillnet vessel that has a second aggregate of set gillnet gear onboard.

The South Unimak and Shumagin Islands fishing season began at 6:00 AM on June 7 with an 88-hour fishing period for all gear types (purse seine, drift gillnet, and set gillnet gear). During the June fishery, there were four 88-hour and one 64-hour fishing periods. The commercial salmon harvest in June consisted of 4,566 Chinook, 1,589,841 sockeye, 1,633 coho, 266,511 pink, and 297,539 chum salmon.

The number of purse seine permit holders participating in the 2007 South Unimak and Shumagin Islands June fisheries was 37, up from 36 in 2006. The number of drift gillnet permit holders was 87, up from 85 in 2006, and the number set gillnet permit holders was 61 in 2007, down from 67 in 2006.

Southeastern District Mainland Fishery

In February 2007, the BOF made changes to the Southeastern District Mainland Salmon Management Plan. These changes included;

- 1) The allocation of Chignik River sockeye salmon harvested within the Southeastern District Mainland (SEDM) was modified to 7.6% of the sockeye salmon harvested within the Chignik Management Area (CMA) prior to July 25.
- 2) During the period of July 26 through September 30, there shall be at least one 36-hour closed period within a 7-day period;
- 3) If the Orzinski Lake escapement reaches or exceeds 25,000 sockeye salmon, the Northwest Stepovak Section, including all of Orzinski Bay may be open to set gillnet gear continuously through 12:00 midnight July 25 and to seine gear for no more than four 24-hour periods with nor more than 48-hours continuous fishing during a 7-day period;
- 4) From July 26 through September 30, the department shall manage the fishery based on the abundance of local pink, chum, and coho salmon stocks.

Due to a weak early-run and small commercial harvest in the CMA, the SEDM remained closed and no commercial salmon harvest occurred during the allocation period (June 1 through July 25).

Beginning July 1, the Northwest Stepovak Section (NWSS) 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 2007 season. The Orzinski Lake sockeye salmon escapement of 10,665 was below interim escapement objectives through August 14, when the weir was removed.

From July 26 to September 30, the SEDM is managed based on the abundance of local salmon stocks. The department suspended commercial salmon fishing August 21–31 to allow for additional pink and chum salmon escapement.

From July 26 to August 21, approximately 1.5 million fish were harvested in the SEDM, consisting of 17 Chinook, 145,954 sockeye, 9,035 coho, 1,356,092 pink, and 38,209 chum salmon. This fishery had an estimated exvessel value of \$1,411,048.

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 17 days during the September 1–26 time frame. In September, all commercial salmon were harvested with set gillnet gear and consisted of 1 Chinook, 10,506 sockeye, 2,487 coho, 1,477 pink, and 928 chum salmon. The estimated exvessel value from this timeframe was \$57,020.

South Peninsula Post-June Fishery

Prior to the South Peninsula Post-June fishery, ADF&G conducts a test fishery to determine immature salmon abundance in the Shumagin Islands. Test fishery results on July 5 indicated there were 12.2 immature salmon per set, which was below the threshold of 100 immature salmon per set. Continued inseason monitoring of the seine fishery indicated that the harvest of immature salmon remained below the threshold throughout the season.

The Post-June commercial salmon fishery opened on July 6 for 21 hours in the Unimak, Southwestern and South Central districts and in the Shumagin Islands Section of the Southeastern District. From July 6–21, there were 6 fishing periods, each consisting of a 24-hour opening followed by a 48-hour closure. From July 22–31, there were 3 fishing periods that consisted of a 36-hour opening followed by a 48-hour closure. Additional fishing time in terminal areas was first allowed on July 21.

From July 6–21, the majority of the non-terminal harvest occurred in the Shumagin Islands and the majority of terminal harvest occurred in Pavlof Bay. The commercial salmon harvest from July 6–21 was 520 Chinook, 392,002 sockeye, 59,270 coho, 619,716 pink, and 96,247 chum salmon. From July 22–31, the majority of the non-terminal harvest also occurred in the Shumagin Islands. As for terminal areas from July 22–31, the majority of sockeye salmon were harvested in Pavlof Bay with the majority of chum salmon came from Canoe Bay and the majority of pink salmon harvest was from the Mino Creek-Little Coal Bay Section. The total harvest from July 22–31 for the Post-June fishery was 112 Chinook, 223,345 sockeye, 33,392 coho, 1,355,145 pink and 91,193 chum salmon.

During August, the post-June salmon fishery is managed based on the abundance of local stocks. The fishery was open for 30 days in August with harvest reported on all days. The total harvest for August was 25 Chinook, 65,008 sockeye, 41,968 coho, 3,689,719 pink, and 138,615 chum salmon.

The post-June fishery is managed during September based on the abundance of coho salmon with consideration for local pink and chum salmon stocks. In the Shumagin Islands Section, fishing was allowed for 14 days from September 1–26. Fishing was allowed from September 1–6 in the Unimak and Southwestern districts and from September 1–3 in the South Central District.

The total commercial harvest for the South Peninsula post-June fishery was 658 Chinook, 681,534 sockeye, 135,437 coho, 5,673,266 pink, and 341,599 chum salmon. A total of 113 permit holders participated in the 2007 South Peninsula post-June salmon fishery. Permit composition consisted of 44 purse seine, 6 drift gillnet, and 63 set gillnet permits. Preliminary total exvessel value for the post-June fishery was \$5,568,494. The total South Peninsula post-June harvests of sockeye and pink salmon were above the most recent 10-year average; however, Chinook, coho, and chum salmon total harvests were below the most recent 10-year average.

North Alaska Peninsula

In 2007, 157 Area M permit holders participated in commercial salmon fisheries along the North Alaska Peninsula. Area T permit holders are allowed to participate in fisheries during certain times of the year in the Cinder River and Inner Port Heiden sections, and that portion of the Ilnik Section located inside Ilnik Lagoon. There were no deliveries made by Area T permit holders from Area M and Area T overlap fishing sections in 2007. Effort by Area M permit holders was similar to 2005 (155 permit holders) and 2006 (156 permit holders).

The North Alaska Peninsula fishery is predominantly a sockeye salmon fishery, although depending on market conditions, directed Chinook, coho, and chum salmon fisheries occur in some locations. During even-numbered years, depending on market conditions, pink salmon are frequently targeted in the Northwestern District. During odd-numbered years, pink salmon catches are normally incidental to the targeting of other salmon species, but in 2007 in Bechevin Bay, a directed pink salmon fishery harvested over 130,000 fish.

In 2007, the North Alaska Peninsula harvests of all salmon species were above previous 10-year (1997–2006) averages. The harvests for all salmon species except coho were above the levels projected. The 2007 Chinook salmon harvest was 7,609 fish (7,000 projected), the sockeye salmon harvest was 3,408,818 fish (2,100,000 projected), the coho salmon harvest was 69,010 fish (80,000 projected), the pink salmon harvest was 137,882 fish (10,000 projected), and the chum salmon harvest was 181,009 fish (50,000 projected). Sockeye salmon harvests were well above projections due to unexpectedly strong returns. The pink salmon harvest occurred mainly in the Bechevin Bay Section.

ALEUTIAN ISLANDS AND ATKA-AMILA ISLANDS AREAS

The department opened the Aleutian Islands Area to commercial salmon fishing by seine gear on July 29. Commercial harvest of salmon occurred in Unalaska and Makushin Bays, with a total of 1,017,164 pink salmon harvested. On August 6 an aerial survey of Unalaska Bay was performed by the department. Pink salmon were surveyed in 3 streams in Unalaska Bay and an estimated 109,600 pink salmon were observed. Weather hampered efforts to survey Makushin Bay, and subsequently no escapement information was collected there.

Table 7.– Preliminary 2007 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishing Area	Species					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Kodiak	17	2,013	356	24,809	729	27,923
Chignik	2	835	73	2,020	79	3,009
South Peninsula	5	2,428	149	7,298	678	10,558
North Peninsula	7	3,410	69	138	181	3,805
Alaska Peninsula Total	12	5,838	218	7,436	859	14,363
Aleutian Islands	0	0	0	1,017	0	1,017
Westward Region Total	31	7,853	1,408	33,335	3,608	46,312

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

Note: Columns may not total exactly due to rounding.

PRELIMINARY FORECASTS OF 2008 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 2008 fishing year, forecast fisheries are as follows:

Southeast	pink salmon
Prince William Sound	chum, sockeye, and pink salmon
Copper River/ Copper River Delta	Chinook and sockeye salmon
Upper Cook Inlet	sockeye, pink, chum, coho and Chinook salmon
Lower Cook Inlet	pink salmon
Kodiak	pink salmon
Spiridon Lake	sockeye salmon
Ayakulik River	sockeye salmon
Karluk Lake (Early Run)	sockeye salmon
Karluk Lake (Late Run)	sockeye salmon
Frazer lake (Dog Salmon Creek)	sockeye salmon
Upper Station (Olga Lakes, Early Run)	sockeye salmon
Upper Station (Olga Lakes, Late Run)	sockeye salmon
Chignik	sockeye salmon
Bristol Bay	Sockeye, pink, chum, coho and Chinook salmon
Nushagak District	Chinook salmon
Alaska Peninsula, Bear Lake (late run)	sockeye salmon
Nelson River	sockeye salmon
Arctic-Yukon-Kuskokwim	Chinook, sockeye, coho, pink, and chum salmon
Yukon Area	chum salmon

A variety of information was used to make salmon run forecasts. In most cases the principal indicator of future abundance is the escapement magnitudes of parental stocks. Other information that might have been considered includes spawning stock distribution, 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 PWS areas. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, PWS, 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, Eric Volk, 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.

SALMON SPECIES CATCH AND PROJECTIONS

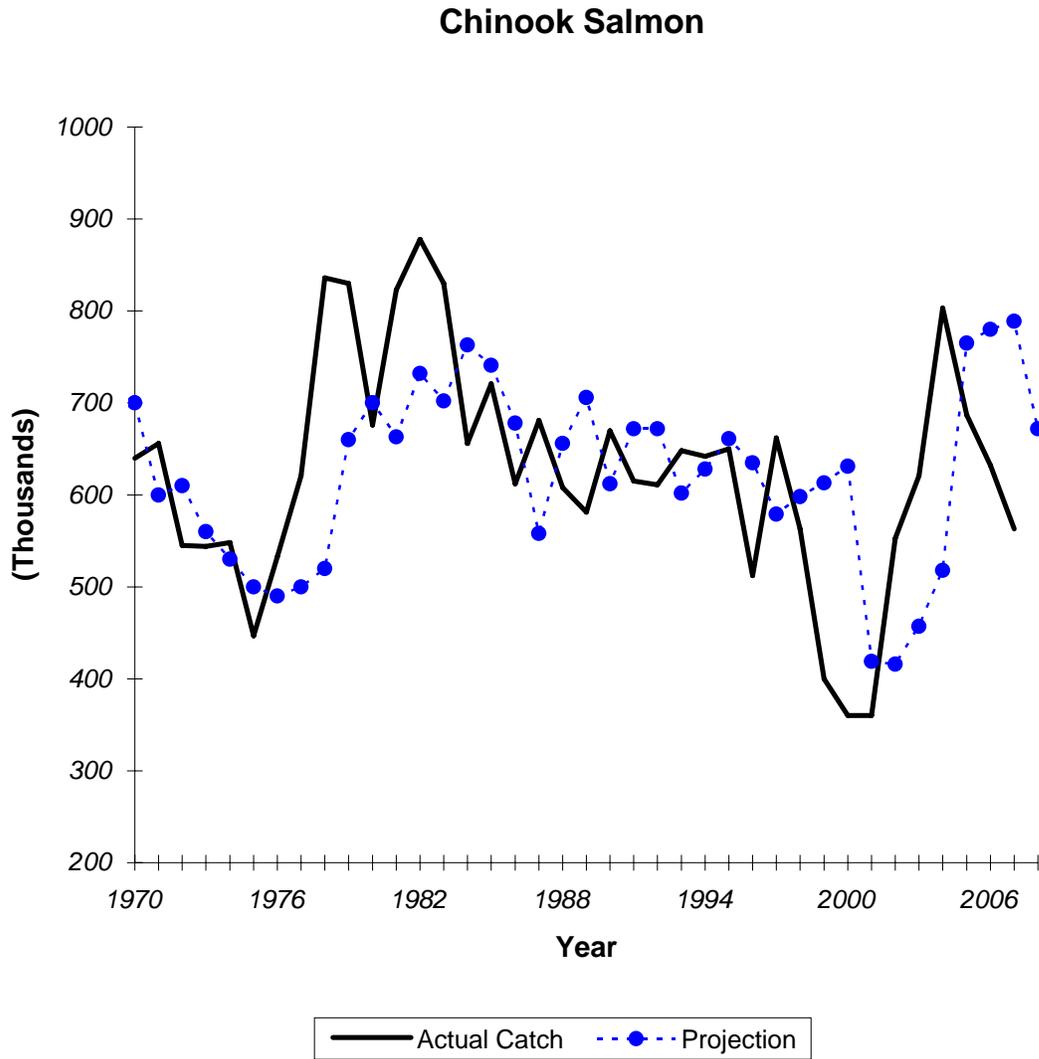


Figure 2.—Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2007, with the 2008 projection.

Sockeye Salmon

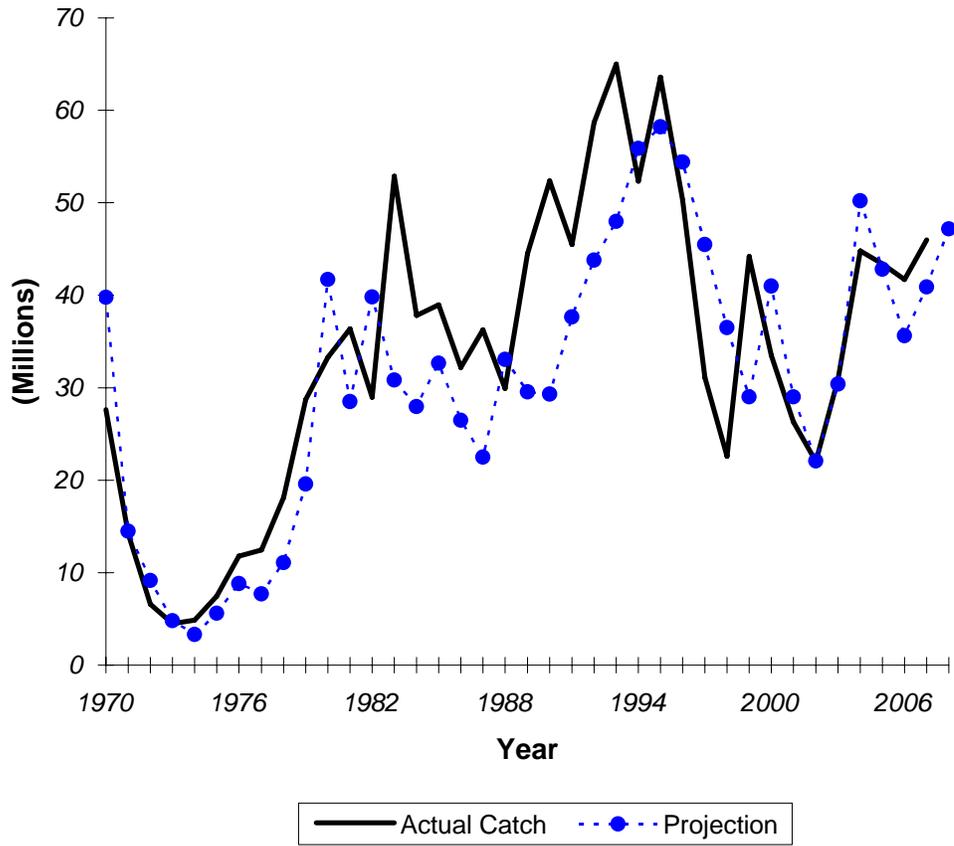


Figure 3.—Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon fisheries from 1970 to 2007, with the 2008 projection.

Coho Salmon

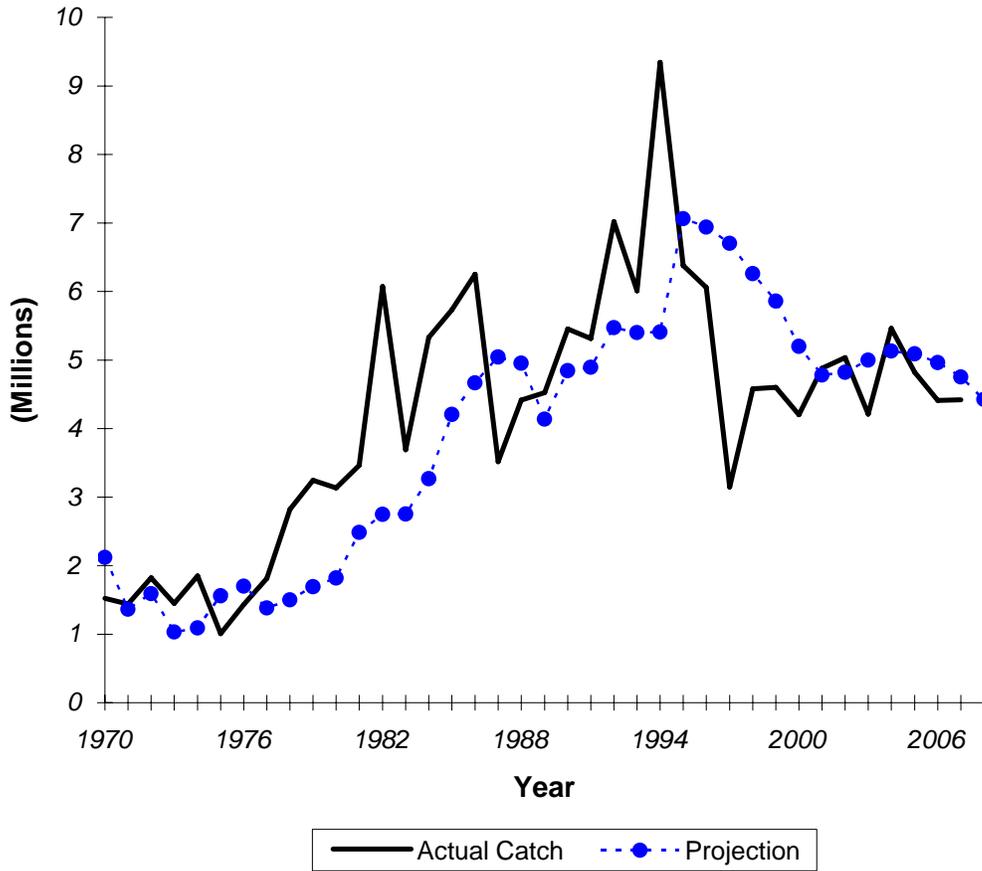


Figure 4.—Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2007, with the 2008 projection.

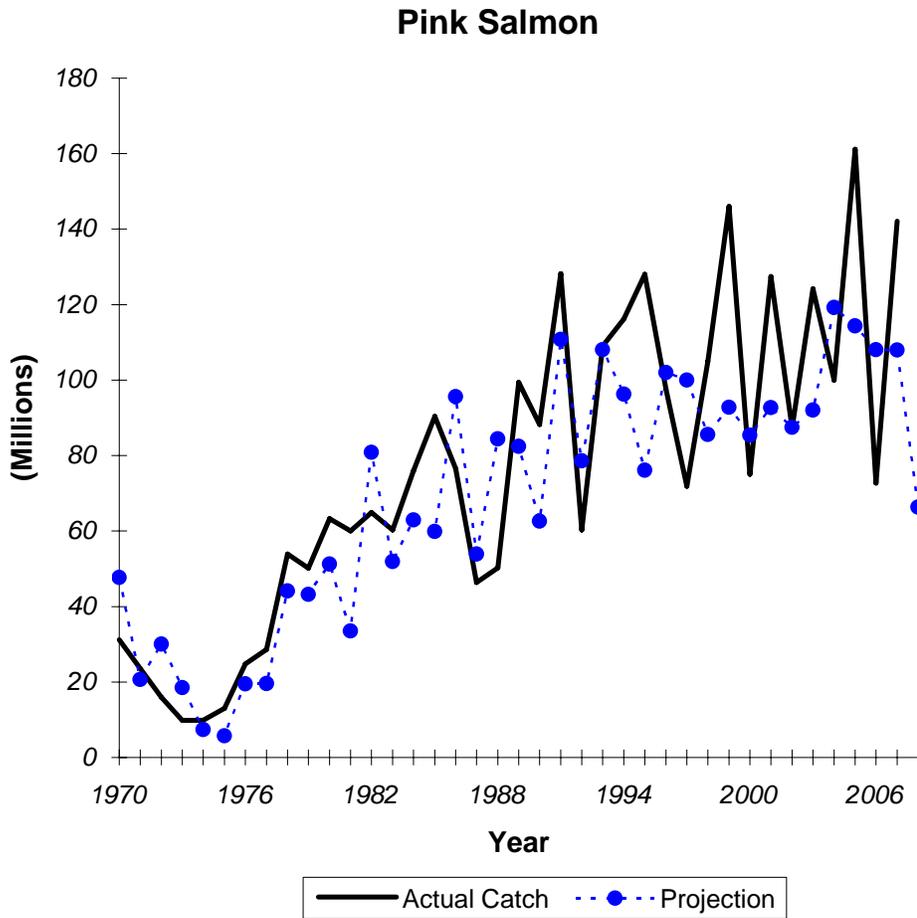


Figure 5.—Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2007, with the 2008 projection.

Chum Salmon

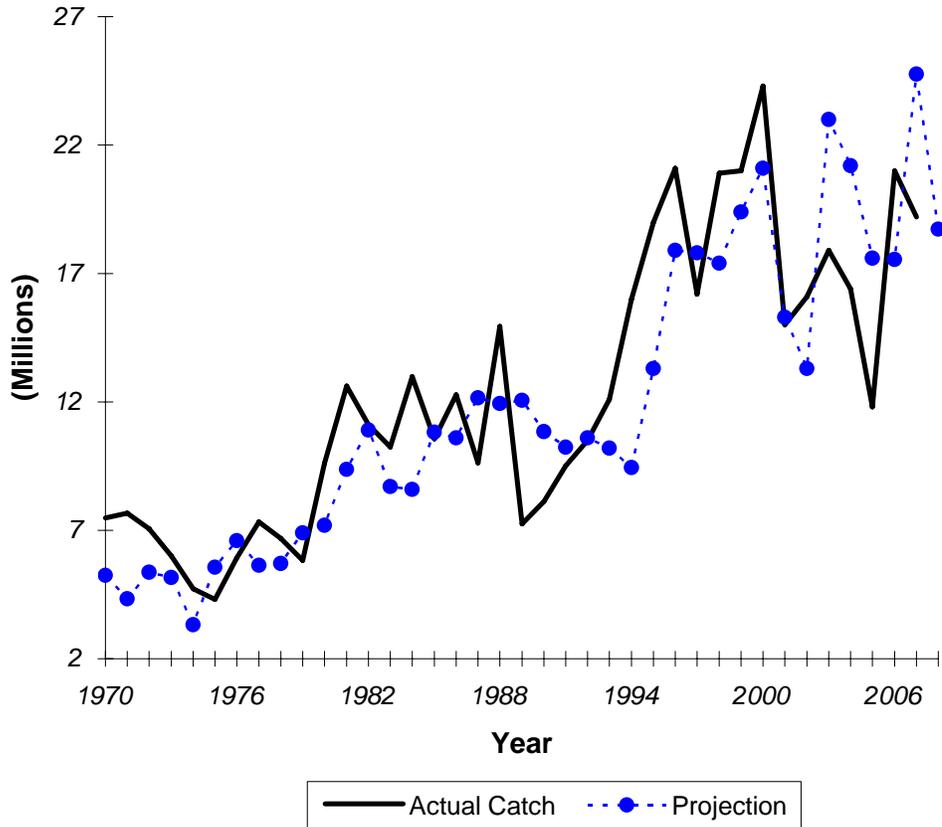


Figure 6.—Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2007, with the 2008 projection.

APPENDIX

Appendix A1.—Southeast Alaska

Forecast Area: Southeast Alaska

Species: Pink Salmon

The Southeast Alaska pink salmon harvest in 2008 is predicted to be in the range of weak to average, with a point estimate of 19 million fish (80% confidence interval: 10–34 million fish). The categorical ranges of pink salmon harvest in Southeast Alaska were formulated from the 20th, 40th, 60th, and 80th percentiles of historical harvest from 1960 to 2007:

Category	Range (millions)	Percentile
Poor	Less than 10	Less than 20th
Weak	10 to 17	21st to 40th
Average	17 to 30	41st to 60th
Strong	30 to 53	61st to 80th
Excellent	Greater than 53	Greater than 80th

Forecast Methods

The 2008 forecast is an average of 2 forecasts: 1) a forecast of the trend in the harvest, and 2) the forecast trend adjusted using 2007 pink salmon fry abundance data. The forecast of the trend in pink salmon harvests was based on a time-series technique called *exponential smoothing*. This technique is similar to a running average, except that all harvests since 1960 were used in the forecast estimate. Recent harvest observations were given more weight in the analysis, while past harvest observations were increasingly down-weighted with time; i.e., the older the data, the less influence it has on the forecast. If x_t, x_{t-1}, \dots denotes the observed harvests in year $t, t-1$, and so on, then the forecast in year $t+1$ is given by,

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

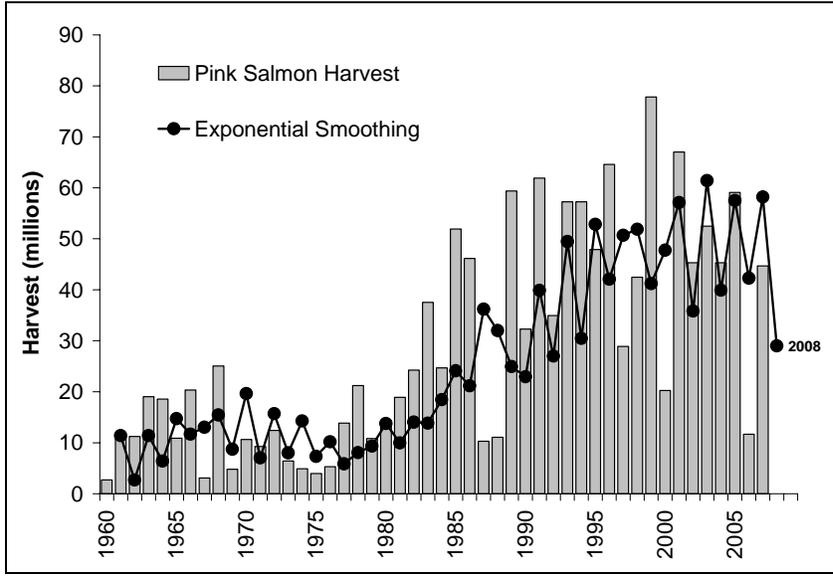
The forecast for year t , that is \hat{x}_t , is also a weighted average of the observed catch in year $t-1$, and the forecast in year $t-2$. This is a kind of recursive equation that contains all of the data in the series. Because we feel that the recent harvest series may be developing an odd-year and even-year cycle, we let t be 2006, the parent year for the 2008 return. That is, we used all of the harvest data up to 2006, and excluded the 2007 catch from the exponential-smooth algorithm, assuming that the 2006 parent year will better predict the 2008 return than the 2007 return year. We chose a value of c to be approximately 0.43, based on minimizing the sum of past squared errors. This analysis produced a forecast of 29 million pink salmon (Appendix Figure 1).

We adjusted the forecast using peak June–July pink salmon fry CPUE statistics provided by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories (Joe Orsi, Auke Bay Laboratories, personal communication). These data were obtained from systematic surveys conducted annually in upper Chatham and Icy straits in conjunction with NOAA’s Southeast Coastal Monitoring Project, and are highly correlated with the harvest of adult pink salmon in the following year (Orsi et al. 2006^a).

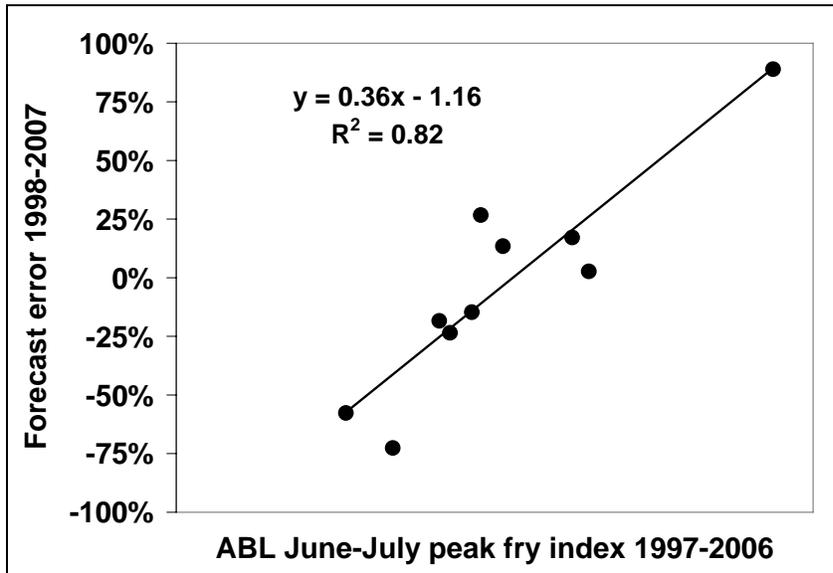
^a We gratefully acknowledge the assistance and advice of Joe Orsi and Alex Wertheimer and their colleagues at the NOAA Auke Bay Lab. However, we accept responsibility for this forecast, and we accept sole responsibility for this use of their data. For a detailed description of these NOAA research activities see Orsi, J. A., E. A. Fergusson, M. V. Sturdevant, B. L. Wing, A. C. Wertheimer, and W. R. Heard. 2006. Annual Survey of Juvenile Salmon and Ecologically Related Species and Environmental Factors in the Marine Waters of Southeastern Alaska, May–August 2005 (NPAFC Doc. 955) Auke Bay Lab, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, http://www.npafc.org/new/pub_documents.html.

Appendix A1. Southeast Alaska. Page 2 of 4.

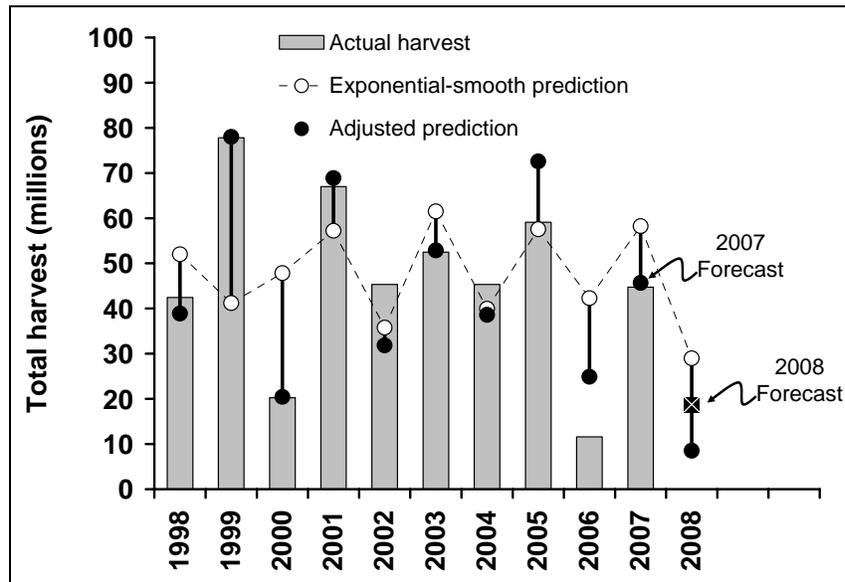
We developed a simple equation to predict the forecast error in the exponential smooth by regressing the forecast error proportions from 1998 to 2007 on the corresponding NOAA CPUE data from 1997 to 2006 (Appendix Figure 2). The forecast error proportion was simply the forecast error (the exponential smooth forecast subtracted from the actual harvest) divided by the forecast point estimate. We predicted the 2008 forecast error and adjusted the exponential-smooth forecast downward, from 29 million to 9 million pink salmon (Appendix Figure 3).



Appendix Figure 1.—Comparison of the annual harvest of pink salmon in Southeast Alaska, and exponential smoothed hindcast values of the harvest used in the 2008 forecast model. This method produced a 2008 harvest forecast of 29 million pink salmon.



Appendix Figure 2.—Regression of ADF&G forecast error on the peak June-July pink salmon fry index from Icy Strait one year prior. (Pink salmon fry index data provided by Joe Orsi, NOAA Auke Bay Laboratory, personal communication). The forecast error is a proportion calculated by dividing the forecast error (the annual ADF&G forecast subtracted from the actual harvest) by the forecast point estimate.



Appendix Figure 3.—Annual harvest of pink salmon in Southeast Alaska, 1998–2007, compared to the exponential smoothed hindcast predictions of the harvest adjusted using NOAA Auke Bay Laboratory pink salmon fry data. The 2007 ADF&G harvest forecast of 47 million pink salmon was very close to the actual harvest of 45 million. The 2008 forecast of 19 million pink salmon is the average of the adjusted prediction (9 million) and the exponential-smooth prediction (29 million).

Finally, because we were concerned that the 2007 CPUE observation was outside the range of past data, we took a “model average” of the exponential-smooth estimate and the CPUE-error-adjusted estimate. We gave equal weight to both the exponential-smooth forecast (29 million) and the adjusted forecast (9 million), and present the point estimate of 19 million pink salmon as the 2008 pink salmon harvest forecast. We used this “equal-weight” approach to produce hindcast predictions for 1998–2007, and estimated the sample standard deviation from the sum of the squared errors of the log of the observed values minus the log of the predicted values. The 80% confidence interval was calculated as the harvest forecast plus or minus the sample standard deviation times the appropriate *t*-value (1.383).

Forecast Discussion

The 2008 forecast of 19 million pink salmon is 40% of the recent 10-year average harvest of 47 million pink salmon. Several indicators suggest the harvest will be below average in 2008. Although Southeast Alaska BEGs were met in the parent year (2006), the pink salmon escapement index was the smallest in more than 15 years, and the index of 4.4 million for the Southern Southeast sub-region narrowly met the escapement goal of 4.0–9.0 million. In addition, the NOAA Auke Bay Lab’s 2007 peak June–July juvenile pink salmon CPUE statistic from upper Chatham and Icy straits in northern Southeast Alaska was the smallest in the 11 years that NOAA has collected that information. Pink salmon harvests associated with the 2 previous smallest years in their data set were 20 million (2000) and 12 million (2006). The NOAA Auke Bay Lab has also conducted 3 years of studies in Clarence Strait in southern Southeast Alaska; while this time series is not yet long enough to use directly for forecasting purposes, their 2007 pink salmon fry abundance data were similar to 2005, the year prior to the weak 2006 run.

We point out that this year's ADF&G forecast reflects a more cautious approach than in 2007. In 2007, we used the exponential smooth to forecast the trend in the harvest, and adjusted that forecast using NOAA's juvenile pink salmon CPUE data. The 2007 ADF&G forecast of 47 million pink salmon was very close to the actual 2007 harvest of 45 million pink salmon (Appendix Figure 3). When we used this method again for the 2008 harvest forecast, it produced a prediction of only 9 million pink salmon, which would be the smallest Southeast Alaska pink salmon harvest since 1976. Though our forecast method had fair to good performance in predicting the direction of forecast error (Appendix Figure 3), we are uneasy assigning full weight to such an extreme forecast given only one year of success. The NOAA Auke Bay Lab continues to conduct research that offers great potential to improve pink salmon forecasts in Southeast Alaska—whether or not our current application of their data is one such improvement will become more apparent in time.

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

Steve Heintz, Pink and Chum Salmon Project Leader, Ketchikan

Appendix A2.–Prince William Sound

Forecast Area: Prince William Sound Species: Chum Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
<i>Prince William Sound General Districts</i>		
Total Run	446	334–557
Escapement Goal ^a	200	
Harvest Estimate	246	134–357

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

Forecast Methods

The forecast of the total natural chum salmon run was calculated as the 2003 to 2007 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 estimates of stream life. The CPF harvest contributions of natural stock chum salmon were estimated using prehatchery average wild runs (2002 and 2003) or thermally marked otolith estimates (2003–2007) 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 (2003–2007) 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 the CPF were unavailable prior to 2003. From 2003 through 2007 natural chum salmon contribution estimates based on thermally marked otoliths were available for the Coghill and Montague districts. Contribution estimates from thermal marked otoliths in other districts have been available since 2004. Historical age data from escapements and CPF harvests are unavailable for most districts of PWS. If this total run is realized it will be the 24th largest since 1970.

The cold ocean temperatures measured along the GAK1 line off Seward may negatively affect the run of chum salmon in 2008; however, chum salmon are buffered somewhat because fish from multiple brood years return in a given run year.

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

Forecast Area: Prince William Sound
Species: Sockeye Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
<i>Prince William Sound - Coghill Lake</i>		
Total Run	120	0–287
Escapement Goal ^a	30	
Harvest Estimate	90	0–257
<i>Prince William Sound - Eshamy Lake</i>		
Total Run	84	69–98
Escapement Goal ^a	30	
Harvest Estimate	54	39–68
Total Production:		
Run Estimate	204	69–303
Escapement Goal	60	
Common Property Harvest	144	9–243

^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 5 age classes. Linear regression models with log-transformed data were used to predict returns of age-1.2 and age-1.3 sockeye salmon. The return of these 2 age classes was predicted from the relationship between returns of that age class and returns of the age class one year previous from the same brood year. For example, the model to predict the return of age-1.2 fish in 2008 used the return of age-1.1 fish in 2007 as the input parameter. The predicted returns of age-1.1, -2.2, and -2.3 sockeye salmon were calculated as the 1974–2007 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 back to 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 to 2007.

The forecast of the natural run to Eshamy Lake is the mean of the runs from high years in the 4-year cycle. Eshamy Lake escapements have been enumerated at a weir since 1950, except for 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. The 80% prediction intervals were calculated as the square root of the sum of the squared 80% prediction intervals for Coghill and Eshamy lakes.

Forecast Discussion

Beginning in 2004, the department stopped forecasting hatchery runs of sockeye salmon to the Main Bay Hatchery because the hatchery operators were already producing forecasts for these releases. Coghill Lake has very dynamic limnological characteristics that can significantly impact the sockeye salmon population. Studies conducted in the mid-1980s and early 1990s found the lake may be zooplankton limited. As a result, the BEG midpoint was lowered in 1992 (from 40,000 to 25,000) 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 escapement goal range every year since 1995. If achieved, the 2008 total run forecast midpoint would rank as the 10th largest run since 1988.

The Eshamy Lake natural stock appears to exhibit a 4-year cycle. The 2008 run should be the high abundance year in the cycle. The Eshamy Lake natural stock is the largest natural stock contributor to the 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 the CPF harvests in western PWS of sockeye salmon produced by the MBH 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 on-going 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, Area Finfish Research Biologist, Cordova
Rich Brenner, Finfish Research Biologist, Cordova

Forecast Area: Prince William Sound
Species: Pink Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
<i>Prince William Sound General Districts</i>		
Total Run	3,510	0–9,560
Escapement Goal ^a	2,000	
Harvest Estimate	1,510	0–7,560

^a The escapement goal of 2.0 million pink salmon is the midpoint of the SEG range (1.25 million to 2.75 million).

Forecast Methods

The predicted natural run of pink salmon is the average total run for the even years 2004 and 2006. The total run by year was estimated as the total natural (non hatchery) contribution to commercial harvests combined with the escapement index calculated as the area under the curve of weekly aerial escapement surveys adjusted for estimates of stream life. The natural pink salmon contributions to the CPF were estimated by subtraction of hatchery contributions based on thermal marked otolith recoveries (1997–2007), coded wire tag recoveries (1985–1996), or average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates. 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 preemergent fry; however, these surveys have not been conducted since 1995. The forecast range is the 80% prediction interval around the mean total brood year return. The prediction interval is calculated as 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 2008 natural run included using 1) the previous even-brood-year total run (most naïve forecast method), 2) total run averages with 2 to 20 years of data, and 3) linear regression of log-transformed total 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. This forecast was generated from the 2004 and 2006 even-brood year average run because the previous 2-year average had the lowest mean absolute percentage forecast error.

The brood year 2006 escapement index (1,187,595) was below the SEG range and ranked 14th of the observed even year escapements since 1960. If the total run forecast is realized, it will be the 7th smallest among the 24 even brood years, 1960-2005. There are several environmental factors that could have a substantial impact on pink salmon returns to PWS in 2008. The degree to which these factors will affect natural pink salmon returns is unknown; however, these factors could have had serious effects on pink salmon survival in both the fresh and marine waters. Severe flooding in August and again in October of 2006 may have scoured eggs from stream gravel. Additionally, the winter of 2006/2007 had an extended cold, dry period that may have killed eggs and fry in streams.

Appendix A2. Prince William Sound. Page 5 of 5.

Ocean temperatures along the GAK1 line off of Seward in the winter of 2006/2007 and going into the winter of 2007/2008 were the lowest recorded since the early 1970s (<http://www.ims.uaf.edu/gak1/>). Salmon production in the Gulf of Alaska is generally positively correlated with ocean temperatures.

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

Appendix A3.–Copper River

Forecast Area: Copper River Species: Chinook Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Total Run	86	60–111
Escapement Goal ^a	24 or greater	
Harvest Estimate ^b	62	36–87

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

^bThe maximum harvest by all fisheries (subsistence, personal use, sport, and commercial). Given the recent 5-year average exploitation rate, the commercial harvest would be about 47,000 fish.

Forecast Methods

The 2008 Chinook salmon forecast is the recent 5-year (2003–2007) mean total run. The department has not generated a formal Chinook salmon total run forecast since 1997. The 80% prediction interval was calculated as the average total run plus or minus the standard deviation times the *t* value. The harvest forecast is the total run estimate minus the escapement threshold.

Forecast Discussion

The department has not generated a formal Chinook salmon total run forecast since 1997 because of inadequate estimates of inriver abundance or spawning escapement. Forecasts made prior to 1998 used aerial survey indices adjusted to approximate the total escapement. These forecasts performed poorly, especially after the number of aerial surveys was significantly reduced in 1994. In 1999 the ADF&G Division of Sport Fisheries began a mark–recapture program to estimate the inriver abundance of Chinook salmon. The Native Village of Eyak became a collaborator on the project and there are currently 9 years (1999–2007) of inriver abundance estimates.

Forecast methods examined for the Chinook salmon forecast included 1) a pseudo-sibling model using commercial harvest age data and inriver abundance estimated as the Miles Lake sonar count times the proportion of Chinook salmon in the Chitina Subdistrict Personal Use Fishery (brood years 1977–2002), 2) a pseudo-sibling model using commercial harvest age data and inriver abundance data from the mark–recapture program (brood years 1993–2002), 3) the previous years run size (most naïve method), and 4) mean total run size estimates (2-, 3-, 4-, and 5-year averages). The first pseudo-sibling model using log transformed data produced good model fits for age 1.2 to predict age 1.3 ($p = 4.1 \text{ E-}07$), but only marginal fits for the model using age 1.3 to predict age 1.4 ($p = 0.046$). The pseudo-sibling model using only the last 9 years with mark–recapture estimates produced poor model fits for both age 1.2 to predict age 1.3 ($p = 0.56$) and age 1.3 to predict age 1.4 ($p = 0.081$). Additionally, retrospective forecasts using the pseudo sibling models had mean absolute percentage forecast errors (MAPE) greater than those from any of the mean run size models. Retrospective forecasts using a 2-year total run average had the lowest MAPE, but a higher standard deviation than all the other mean total run forecasts. The 5-year mean total run size forecast had the best compromise of low MAPE and low variability to the absolute percentage error.

Appendix A3. Copper River. Page 2 of 4.

The 2008 total run forecast point estimate is ~3,000 fish above the 9-year average (1999–2007 average = 83,000). If realized, the 2008 forecast total run would be the fifth largest since 1999 and slightly below the 2007 run.

Steve Moffitt, Area Finfish Research Biologist, Cordova

Forecast Area: Copper River
Species: Sockeye Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Total Run	1,332	719–1,925
Escapement Goal ^a	530	
Common Property Harvest ^b	792	328–1,256
Hatchery And Supplemental Production		
<i>Prince William Sound Aquaculture Corp. - Gulkana Hatchery</i>		
Hatchery Run	252	137–167
Broodstock Needs	20	
Supplemental Escapement ^c	64	
Common Property Harvest ^b	168	70–267
Total Production		
Run Estimate	1,574	681–2,466
Natural Escapement Goal	530	
Broodstock Needs	20	
Supplemental Escapement ^c	64	
Common Property Harvest ^d	960	282–1,638

^aThe escapement goal of 530,000 fish 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 2 (spawning escapement range 55,000–130,000 fish). The average Copper River delta peak count of 84,500 is multiplied by 2 to adjust for surveyor efficiency, i.e., we assume surveyors count 50% of the total fish. No adjustment is made for freshwater residence time. Therefore, the escapement goal is 361,000 (upriver) + 84,500 × 2 (delta) = 530,000 fish.

^bIncludes the harvests from commercial, subsistence, personal use, and sport fisheries.

^cHatchery 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.

^dIncludes the harvests from commercial, subsistence, personal use, and sport fisheries. The commercial common property harvest is estimated to be ~704,000 fish.

Forecast Methods

Forecast methods for 2008 are similar to forecast methods used since 1998. The forecast of natural run sockeye salmon to the Copper River is the total of estimates for 6 age classes. Linear regression models with log-transformed data were used to predict returns for age-1.2, age-1.3, and age-2.2 sockeye salmon. The return for these 3 age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the return of age-1.3 fish in 2008 used the return of age-1.2 fish in 2007 as the input parameter. Finally, predicted return of age-1.1, age-0.3, and age-2.3 sockeye salmon were calculated as the 5-year mean return of those age classes. The total common property harvest forecast was calculated by subtracting the Gulkana Hatchery broodstock, hatchery surplus, and wild stock escapement goal needs from the total run forecast. The 80% prediction bounds for the total run and harvest forecasts were calculated using the mean square error of the 1984–2007 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 1%. 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%) for 2000–2006 was used to project the total harvest of Gulkana Hatchery stocks in 2008. The 80% prediction interval for the forecast of supplemental production was calculated using mean square error estimates calculated for total runs.

Forecast Discussion

Forecasts prior to 1998 relied on the relationship between number of spawners and subsequent returns, using return-per-spawner values for parent year abundance similar to the dominant age class (age 5) of the forecast year. Because average return-per-spawner values do not reflect recent production trends, and because returns are still incomplete from the most recent brood years, linear regressions of brood-year sibling returns were used to produce forecasts beginning in 1998. Additionally, more precise estimates of survival and contributions from supplemental production for individual brood years and release locations were available through coded wire tag recoveries in harvest and escapements for brood years 1995 to 1998.

Historical estimates of Gulkana Hatchery production prior to 1995 are considered imprecise. Improved contribution estimates for brood years 1995 to 1998 indicate large contributions from supplemental production and smolt-to-adult survival estimates for Crosswind Lake releases that averaged ~20%. Fish marked with strontium chloride (Sr) began returning in 2003 (age-4 fish) and the majority of the adult run (age-4 and age-5 fish) was marked beginning in 2004. Fish from all release locations (Gulkana I and Gulkana II hatchery sites and Crosswind and Summit lakes) are now marked, but all fish now have the same mark. We can now estimate the total contribution of enhanced fish from all Gulkana Hatchery releases, but unless different marks for individual releases can be developed, forecasts will be limited to using fry-to-adult survival estimates and estimated maturity schedules to forecast total enhanced production.

The 2008 run will be composed primarily of returns from brood years 2003 and 2004; 5-year-old fish (brood year 2003) are expected to predominate Copper River delta and upper Copper River runs. The 2003 and 2004 Miles Lake cumulative sonar counts were above the minimum objective from the beginning of the season and remained above the minimum cumulative objective all season. The Copper River delta escapement indices for 2003 (73,150) and 2004 (69,385) were below the recent 10-year average of 82,139.

The 2008 total run forecast is ~ 760,000 fish below the 5-year average (2003–2007 = 2.33 million). If realized, the 2008 forecast total run would be the 6th lowest since 1980 and just below the 1990 total run. The 1.32 million natural run would be well below the recent 20-year average (1988–2007 = 1.97 million), and a 250,000 Gulkana Hatchery run would be similar to the 2002–2007 average (240,000). The low forecast is driven by the low number of age-4 fish in 2007 and the subsequent prediction for a low number of age-5 fish in 2008.

Steve Moffitt, Area Finfish Research Biologist, Cordova

Appendix A4.–Upper and Lower Cook Inlet

Forecast Area: Upper Cook Inlet

Species: Sockeye Salmon

Preliminary Forecast Of The 2008 Run	Forecast Estimate (millions)	Forecast Range (millions)
Natural Production		
Total Run	5.6	2.4–8.8
Escapement Goal	1.7	
Harvest Estimate	3.9	

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 2008: 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. Models providing the smallest mean absolute percent error between the forecasts and actual returns over the past 5 years were generally used. In most cases, these were sibling models. The returns of ages 1.3, 2.2 and 2.3 sockeye salmon to the Kenai River in 2008 were forecast using sibling models. The sibling-model prediction for the return of age-1.3 sockeye salmon was based on the abundance of age-1.2 sockeye salmon in 2007. The mean weight of sockeye salmon fry rearing in Skilak Lake in the fall was used as a significant covariate in this model. Fall fry weight was used as a proxy for smolt size, which is known to affect age at maturity, with larger smolts typically returning at a younger age. A spawner-recruit model was used to forecast the return of age-1.2 sockeye salmon to the Kenai River. Sibling models were used to forecast the returns of age-1.2, -1.3, and -2.2 sockeye salmon to the Kasilof River, but the return of age-2.3 sockeye salmon was forecasted using a spawner-recruit model. 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 2007, the harvest of sockeye salmon by all user groups in UCI was 3.7 million, while the preseason forecast was 3.3 million. The higher than expected harvest in 2007 was largely due to stronger than expected returns of age-1.3 and age-2.2 sockeye salmon to the Kenai River. In 2007, the total run of sockeye salmon was 3.1 million to the Kenai River, 1.1 million to the Kasilof River, 321,000 to the Susitna River, 136,000 to the Crescent River, and 49,000 to Fish Creek. The forecasted run of sockeye salmon in 2007 was 2.4 million to the Kenai River, 1.2 million to the Kasilof River, 487,000 to the Susitna River, 109,000 to the Crescent River, and 37,000 to Fish Creek.

Appendix A4. Upper and Lower Cook Inlet. Page 2 of 6.

A run of 5.6 million sockeye salmon is forecasted to return to UCI in 2008 with a harvest by all user groups of 3.9 million sockeye salmon. The forecasted harvest in 2008 is about 200,000 fish below the 20-year average harvest by all user groups. The sockeye salmon run forecast for the Kenai River of 3.1 million is 16% less than the 20-year average run of 3.7 million. Age-1.3 sockeye salmon typically comprise about 65% of the run to the Kenai River. The sibling model predicted a return of 2.6 million age-1.3 sockeye salmon to the Kenai River, while the fry model predicted a return of 2.5 million age-1.3 sockeye salmon. 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 2007 was used to forecast the return (286,000) of age-2.3 sockeye salmon to the Kenai River in 2008. The return of age-2.2 sockeye salmon in 2007 was 58% less than the 20-year average return for this age class. The predominant age classes in the 2008 run should be age-1.3 (85%) and age-2.3 (9%).

The sockeye salmon run forecast for the Kasilof River of 1.3 million is 33% greater than the 20-year average run of 968,000. 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 2007 was used to forecast the return (37,000) of age-1.3 sockeye salmon in 2008. The return of age-1.2 sockeye salmon last year was 57% greater than the 20-year average return for this age class. Age-1.2 sockeye salmon typically comprise about 30% of the run to the Kasilof River. A sibling model based upon an above average return of age-1.1 sockeye salmon in 2007 was used to forecast the return of age-1.2 sockeye salmon to Kasilof River. The sibling model predicted a return of 484,000 age-1.2 sockeye salmon. However, we are less confident in this forecast, because a smolt model predicted a return of only 252,000 age-1.2 sockeye salmon. Age-1.2 sockeye salmon migrated as smolts from the Kasilof River in 2006, when their estimated abundance was only 2.6 million, about one-half of the 20-year average. The predominant age classes in the 2008 run should be age 1.2 (38%) and age 1.3 (29%).

The sockeye salmon run forecast for the Susitna River of 344,000 is 24% less than the 20-year average run of 453,000. Age-1.2 and age-1.3 sockeye salmon typically comprise 72% of the run to the Susitna River. A spawner-recruit model was used to forecast the return (80,000) of age-1.2 sockeye salmon to the Susitna River. The spawner abundance for this age class was about 37% less than the 20-year average spawner abundance. A sibling model based upon the return of age-1.2 sockeye salmon in 2007 was used to forecast the return (170,000) of age-1.3 sockeye salmon to the Susitna River in 2008. The return of age-1.2 sockeye salmon in 2007 was 44% less than the 20-year average. The predominant age classes in the 2008 run should be age 1.3 (49%) and age 1.2 (23%).

The sockeye salmon run forecast for Fish Creek of 53,000 is 67% less than the 20-year average run of 159,000. Age-1.2 and age-1.3 sockeye salmon typically comprise 79% of the run to Fish Creek. Sibling models based upon the abundances of age-1.1 and age-1.2 sockeye salmon in 2007 were used to forecast the returns of age-1.2 (36,000) and age-1.3 (10,000) sockeye salmon in 2008. The abundances of age-1.1 and age-1.2 sockeye salmon returning to Fish Creek in 2007 were 74% less than the 20-year average. The predominant age classes in the 2008 run should be age 1.2 (67%) and age 1.3 (19%).

Appendix A4. Upper and Lower Cook Inlet. Page 3 of 6.

The sockeye salmon run forecast for Crescent River of 100,000 is 7% less than the 20-year average run of 108,000. Sibling models based upon returns of age-1.2 and age-2.2 sockeye salmon in 2007 were used to forecast returns of age-1.3 (48,000) and 2.3 (28,000) sockeye salmon to the Crescent River in 2008. The predominant age classes in the 2008 run should be age 1.3 (48%) and age 2.3 (28%).

Forecast runs to individual freshwater systems are as follows:

System	Run	Inriver Goal
Crescent River	100,000	30,000–70,000
Fish Creek	53,000	20,000–70,000
Kasilof River	1,286,000	150,000–250,000
Kenai River	3,064,000	750,000–950,000
Susitna River	344,000	90,000–160,000 ^a
Minor System	727,000	N/A

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

Mark Willette, Research Project Leader, Upper Cook Inlet

Forecast Area: Upper Cook Inlet

Species: Other Salmon Species

Preliminary Forecast of 2008 Commercial Harvest	Forecast Commercial Harvest Estimate (thousands)
Pink Salmon	380
Chum Salmon	100
Coho Salmon	200
Chinook Salmon	20

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and chinook salmon in 2008. The forecast for pink salmon was based upon the average harvest during the past 5 even-numbered years.

Forecast Discussion

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

Mark Willette, Research Project Leader, Upper Cook Inlet

Forecast Area: Lower Cook Inlet
Species: Pink Salmon

Preliminary Forecast Of The 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Natural Production		
Total Run	1,196	310–5,983
Escapement	370	135–604
Commercial Harvest	826	175–5,378
Supplemental Production		
Total Run	0	0
Broodstock And Escapement	0	0
Commercial Harvest	0	0
Total Area Production		
Total Run	1,196	310–5,983
Broodstock And Escapement	370	135–604
Commercial Harvest	826	175–5,378

Note: Columns may not total exactly due to rounding to the nearest thousand fish. Escapement values include an escapement goal shortfall of 1,000 fish for systems with a forecast in 2008. 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 LCI Management area was based on log-log regression of total return on escapement from 30 to 42 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.

Forecast Discussion

The natural production forecast model was tested using cross-validation methods. The model has correctly predicted 38 out of 46 changes in direction of annual run size. In 2006, the last even-numbered year, 10 of 11 systems forecasted had runs within the forecast range. The 2008 forecast for natural production of 1.2 million pink salmon has an 80% confidence interval of 310,000 to 5.98 million fish. Strong parent-year escapement and fair marine survival from 2006 to 2007, as indicated by 2007 returns, suggests there is a good likelihood of reaching the mid-point estimate of this forecast. If realized, a natural run of 1.2 million pink salmon would be 2.1 times higher than the median run size of 561,000 fish for even-year returns between 1962 and 2006. The pink salmon escapement goal is 370,000 fish (range 136,000 to 604,000 fish) for systems with a forecast. If the run comes in as forecast, the midpoint of the escapement goal range should be met for all of our 11 index streams. If the lower end of the forecast range is realized, an escapement shortfall of 1,000 fish is expected from Nuka Island Creek. The resulting escapement forecast would then be 135,000 fish.

The harvestable surplus of naturally produced pink salmon in the Southern District is projected to be 79,000 fish, with 47,000 coming from Seldovia Bay and the balance relatively evenly split between Humpy Creek and Port Graham River. Supplemental production of pink salmon in the Southern District has historically contributed from 24% to 90% of the total LCI commercial harvest. However, pink salmon are no longer being produced by hatcheries in LCI. The Tutka Hatchery, which previously generated the majority of the supplemental production of pink salmon in LCI, ceased egg-take operations in 2004 and realized its final adult return in 2005. The Port Graham Hatchery collected brood stock and incubated eggs from 2006 to 2007. However, financial difficulties forced them to close the hatchery prior to completing their normal feeding and rearing schedule and only minimal adult returns are expected from the fry they released prematurely.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 474,000 fish, with over 68% (325,000 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 even-year catch since 1962. Harvests ranging from 1,000 to 87,000 fish are anticipated from Port Chatham, Nuka Island, Windy Bay, and Rocky Bay.

In the Eastern District, a harvestable surplus of 12,000 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 260,000 fish, over 71% of which is expected to occur in the Bruin Bay subdistrict. If realized, the Bruin Bay harvest of 185,000 fish would be over 3.9 times the mean even-year catch since 1962 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.

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Lee F. Hammarstrom, Area Finfish Management Biologist, Homer

Appendix A5.–Kodiak

Forecast Area: Kodiak Species: Pink Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (millions)	Forecast Range (millions)
Total Production		
KMA Wild Stock Total Run	9.3	2.1–16.6
KMA Escapement Goal	3.5	2.0–5.0
KMA Wild Stock Harvest (<i>Weak</i>)	5.8	0.1–11.6
Kitoi Bay Hatchery Harvest	3.9	2.5–5.4
Total KMA Pink Salmon Harvest	9.8	2.6–17.0
Wild Stock Harvest by area:		
Afognak	0.4	0.0–0.7
Westside	3.8	0.1–7.4
Alitak	0.7	0.0–1.5
Eastside	0.6	0.0–1.2
Mainland	0.4	0.0–0.7

Forecast Methods

The Kodiak Management Area wild stock pink salmon harvest forecast is derived from a total run forecast minus the escapement goal (2.0 to 5.0 million). Return is forecasted based on average winter air temperatures (October to February) at 3 equally weighted North Pacific Ocean temperature index sites (Kodiak, King Salmon, and St. Paul) prior to the outmigration of progeny from the 2006 pink salmon escapement. The total run estimates were derived from a combination of several weir estimates, aerial surveys and harvest data.

For the 2008 Kodiak Management Area wild stock forecast, a linear regression model was fit to the even-year returns from 1978 to 2006 and the average air temperature index ($P = 5.2 \times 10^{-4}$). In constructing and evaluating the regression model standard regression diagnostic procedures were used. For the regression estimates 80% prediction intervals were calculated using the variance of the regression model and used to estimate the forecast range.

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. These harvest categories have been used since 1999.

KMA Wild Stock Harvest Category	Range (millions)
<i>Very Weak</i>	Less than 3
<i>Weak</i>	3 to 6
<i>Average</i>	6 to 10
<i>Strong</i>	10 to 14
<i>Excellent</i>	Greater than 14

The 2008 Kitoi Bay Hatchery pink salmon forecast was prepared by evaluating pink salmon survivals from even brood years 1990 through 2004, when releases from the facility were in excess of 100 million fry. Brood years 1996 through 2005 are particularly important to the forecasting model because all pink fry were released on the same day in order to saturate the release area with fry (predator satiation). This release strategy has proven to significantly improve fry to adult survival.

At Kitoi Bay Hatchery, over the past 12 years a 4-year cyclical return pattern has been observed. The pink salmon return to Kitoi Bay Hatchery is an odd-year dominant return which exhibits higher than average strength returns every fourth year and average returns in between. The return in 2008 is an average for the 4-year cyclical pattern. The mid-point estimate reflects a marine survival of 3% which is an average of the previous two 4-year-cycle returns (Brood Year 1998 and Brood Year 2002; returning in 2000 and 2004, respectively).

Forecast Discussion

The 2008 Kodiak Management Area wild stock pink salmon harvest (5.8 million) will be in the *Weak* category. The temperature index predictor for the 2008 pink salmon return is very low and colder than all but 2 points in the dataset, which were the predictors for 1992 and 2000 return years. Pink salmon returns in 1992 and 2000 were both well below average. The prediction of a weak return of pink salmon in 2008 is corroborated by ancillary information provided by commercial salmon fisherman regarding the health of juvenile pink salmon observed in the near-shore waters during the 2007 season.

The 2008 Kitoi Bay Hatchery pink salmon production is expected to be 4.3 million fish. The brood stock collection goal is 350,000 fish, resulting in a midpoint harvest projection of 3.9 million fish. The Kodiak Regional Aquaculture Association Board of Directors has yet to set a cost recovery goal for 2008, but it is estimated that 1.4 to 2.0 million fish will be harvested in the cost recovery fishery. In 2007, 140.9 million fry were released at an average size of .60 grams. In terms of fry numbers this was one of the larger releases in recent years, but due to the particularly severe winter and cold water temperatures during the rearing period, fry size was slightly smaller than average.

Combining the 2008 pink salmon wild and hatchery production produces a total Kodiak Management Area pink salmon harvest of 9.8 million. This forecast level should allow an initial weekly fishing period length of 57 hours (2½ days) for most of the area during the initial general pink salmon fisheries (beginning July 6, 2008). By the third week of July, fishing time likely will be restricted, by section or district, to ensure escapement goals will be met.

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

Forecast Area: Kodiak, Spiridon Lake
Species: Sockeye Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	226	93–359
Escapement Goal	0	
Harvest Estimate	226	93–359

Forecast Methods

The 2008 Spiridon Lake sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing brood year (1989–2003) sibling relationships for 2 age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Age-1.2 fish were predicted from age-1 smolt ($P = 0.14$). The age-1.3 fish component was forecasted using the past 5-year median return because the regression model prediction was outside of the statistically valid range of the data. Age-2.2 adults were predicted from age-2 smolt ($P=1.33 \times 10^{-07}$). All “other” age classes were estimated by summing the age classes (0.2, 1.1, 0.3, 2.1, 3.1, 1.4, 2.3 and 3.2) by return year (1996–2007) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and median age class estimates. When the median return by age class was used, prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. For the regression estimates, 80% prediction intervals 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 because barrier falls block upstream migrations in the outlet creek (Telrod Creek). Therefore, all returning adult sockeye salmon are available for harvest, primarily in the Central Section of the Northwest Kodiak District and in the Spiridon Bay Special Harvest Area in Telrod Cove. The 2008 forecast of 226,000 is 128,000 less than the 2007 forecast (354,000) and 55,000 greater than the actual 2007 run estimate of 171,000. The 2008 run should be composed of approximately 53% age-1.2 and 33% age-1.3 fish. Based on the age-1 smolt outmigration, the age-1.3 component would be expected to be higher; however, a failure of the age-1.2 component from the same smolt cohort in 2007 has prompted a more conservative forecast for 2008. Our confidence in this forecast is fair because of the uncertainty associated with using median return as a predictor of a major age class. If realized, this run will be about 48,000 fish less than the recent 10-year average (1998 to 2007) run of 274,000. Spiridon Lake sockeye salmon are expected to return in late June with the run ending by mid August.

Switgard Duesterloh, Finfish Research Biologist, Kodiak

Forecast Area: Kodiak, Ayakulik River
Species: Sockeye Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	371	121–621
Escapement Goal	200	200–500
Harvest Estimate	171	

Forecast Methods

The 2008 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 ($P = 5.2 \times 10^{-6}$) using only recent outmigration years (1989 to 2006). The 3-ocean sockeye salmon were predicted from prior year 2-ocean returns ($P = 1.2 \times 10^{-5}$) using outmigration years from 1979 to 2005. For the regression estimates 80% prediction intervals were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return (last 20 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 2008. 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 2008 Ayakulik forecast of 371,000 sockeye salmon is 151,000 fish more than the 2007 forecast (220,000 fish) and about 12,000 less than the actual 2007 run estimate of 383,000. The 2008 run should be composed of approximately 46% 2-ocean fish and 49% 3-ocean. If realized, this run will be 145,000 fish less than the recent 10-year average (1998–2007) run of 516,000 fish. The 2007 Ayakulik sockeye run marks a significant rebound in run production from the 2006 run which was a 30-year low (120,000 fish). Overall, the confidence in the 2008 Ayakulik forecast is good, due to the strong regression relationships. The projected harvest of 171,000 fish is based on achievement of the lower end (200,000 fish) of the escapement goal range.

M. Birch Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	401	234–569
Escapement Goal	150	100–210
Harvest Estimate	251	

Forecast Methods

The 2008 Karluk Lake early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent brood year (1979–2003) sibling relationships for 3 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 ($P = 6.7 \times 10^{-7}$, $P = .03$, $P = .01$). 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; $P = 1.6 \times 10^{-3}$). All “other” age classes were estimated by summing 11 minor age class run estimates (ages-1.1, -0.3, -2.1, -0.4, -3.1, -1.4, -4.1, -2.4, -3.4, -4.3 and -4.4) by year (1998–2007) 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. For the regression estimates, 80% prediction intervals 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 2008 forecast of 401,000 is about 105,000 fish less than the 2007 forecast (505,000 fish) and about 92,000 fish less than the actual 2007 run estimate of 493,000 fish. The 2008 run should be composed of approximately 60% 2-ocean fish and 35% 3-ocean fish. If realized, this run will be 187,000 fish less than the recent 10-year average (1998–2007) run of 588,000 fish. The projected harvest of 251,000 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 for 9 straight years prior to the 2007 season; it is unknown whether age-2.2 fish will be dominant in 2008.

The 2006 age 2. smolt outmigration estimate was very small compared to the 2005 estimate and the number of age 2.1 siblings that returned in 2007 was about average. The smolt outmigration information suggests that the run will fall in the lower portion of the range. Our confidence in this forecast is fair.

Mark Witteveen, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	461	90–833
Escapement Goal	270	170–380
Harvest Estimate	191	

Forecast Methods

The 2008 Karluk Lake late-run sockeye salmon forecast was prepared by investigating simple linear regression models utilizing recent brood year (1980–2002) alternative sibling relationships for one age class, a smolt outmigration to return relationship for one age class and estimating median returns for 4 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 2007 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. While the predicted value from the smolt relationship is outside the range of data, it is similar to past years and all other indicators suggest a low value. 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 (1989–2007) 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. For the regression estimates, 80% prediction intervals 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 2008 forecast of 461,000 fish is about 290,000 fish less than the 2007 forecast (751,000 fish) and about 260,000 fish less than the actual 2007 run estimate of 722,000 fish. Median estimates were used for most age classes due to relatively poor sibling relationships. The 2008 run should be composed of approximately 29% age-2.2 fish, 34% age-2.3 fish, and 26% age-3.2 fish. If realized, this run will be 394,000 fish less than the recent 10-year average (1998–2007) of 855,000 fish. The projected harvest of 191,000 fish is based on achievement of the midpoint of the escapement goal range (270,000 fish). Age-2.2 fish have been the dominant age class in 8 of the past 10 seasons, but were in unexpectedly low abundance in 2006 and 2007; it is unknown if this trend will continue. Smolt outmigration estimates from the 2006 season indicate a much smaller number of age-2. smolt outmigrated than in the 2005 season, suggesting that a lower

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number of age-2.2 sockeye will return in 2008 than in 2007. 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 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	420	235–604
Escapement Goal	125	90–170
Harvest Estimate	295	

Forecast Methods

The 2008 Frazer Lake (Dog Salmon Creek) sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent years (post Frazer Lake fertilization) saltwater-age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year 1-ocean (jacks) returns ($P = 4.0 \times 10^{-5}$) using the 1994 to 2006 outmigration years. The 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 2.9 \times 10^{-3}$) using the 1994 to 2005 outmigration years. For the regression estimates, 80% prediction intervals were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return (post fertilization) 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 2008. 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 2008 Frazer Lake forecast of 420,000 sockeye salmon is 162,000 fish more than the 2007 forecast (258,000 fish) and about 251,000 fish more than the actual 2007 run estimate of 169,000 fish. The 2008 run should be composed of approximately 74% 2-ocean fish and 16% 3-ocean fish. If realized, this run will be 39,000 fish more than the recent 10-year average (1998–2007) run of 381,000 fish. Overall, the confidence in the 2008 Frazer Lake forecast is good, due to the good abundance of the 1-ocean predictor age class. The 2006–2007 seasons mark the weakest 2-year Frazer Lake sockeye salmon annual run production since 1986–1987; the 2008 run should demonstrate a rebound from this 20-year low. The projected harvest of 295,000 fish is based on the achievement of 125,000 fish through the Dog Salmon Creek weir. The targeted escapement is the Frazer Lake S_{msy} estimate of 105,000 fish (range 70,000 to 150,000) plus an additional 20,000 fish to account for the average natural mortality (e.g., bear predation) occurring between the 2 weirs.

M. Birch Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	92	31–152
Escapement Goal	30	30–65
Harvest Estimate	62	

Forecast Methods

The 2008 Upper Station early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year saltwater age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year age-1.1 returns ($P = 5.4 \times 10^{-4}$) using the 1989 to 2006 outmigration years. The 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 5.4 \times 10^{-3}$) using the 1988 to 2005 outmigration years. For the regression estimates, 80% prediction intervals were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return (1988–2007) 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 2008. 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 2008 Upper Station early-run forecast of 92,000 sockeye salmon is 28,000 fish more than the 2007 forecast (63,000 fish) and about 54,000 fish more than the actual 2007 run estimate of 38,000 fish. The 2008 run should be composed of approximately 77% 2-ocean fish and 19% 3-ocean fish. If realized, this run will be 22,000 fish less than the recent 10-year average (1998–2007) run of 114,000 fish. Overall, the confidence in the 2008 Upper Station early-run forecast is good; however, residual trends in the 2-ocean predictor regression suggest the run will fall in the lower part of the range. The projected harvest of 62,000 fish is based on achievement of the lower end (30,000 fish) of the escapement goal range.

M. Birch Foster, Finfish Research Biologist, Kodiak

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	241	81–402
Escapement Goal	186	120–265
Harvest Estimate	55	

Forecast Methods

The 2008 Upper Station late-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent outmigration year saltwater age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Saltwater-age-2 (2-ocean) sockeye salmon were predicted from prior year 1-ocean returns ($P = 0.04$) using the 1995 to 2006 outmigration years. The 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 7.5 \times 10^{-4}$) using the 1994 to 2005 outmigration years. For the regression estimates, 80% prediction intervals were calculated using the variances of the regression models. Both 1- and 4-ocean sockeye salmon were predicted by calculating the median return (1996–2007) 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 2008. 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 2008 Upper Station late-run forecast of 241,000 sockeye salmon is 18,000 fish less than the 2007 forecast (259,000 fish) and about 48,000 fish more than the actual 2007 run estimate of 194,000 fish. The 2008 run should be composed mostly of 2-ocean fish (86%). If realized, this run will be 74,000 fish less than the recent 10-year average (1998–2007) run of 315,000 fish. The late-run sockeye production from Upper Station has been weak since the late 1990s and it appears will remain below average in 2008. Overall, the confidence in the 2008 Upper Station late-run forecast is good due to the strength of the 2-ocean sockeye regression relationship, which comprises the majority of the run. The projected harvest of 55,000 fish is based on the achievement of the S_{msy} estimate (186,000 fish).

M. Birch Foster, Finfish Research Biologist, Kodiak

Appendix A6.–Chignik

Forecast Area: Chignik Species: Sockeye Salmon

Preliminary Forecast of the 2008 Run		Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production			
Early Run (Black Lake)	Total Run Estimate	1,070	472–1,670
	Escapement Goal	350	350–400
	Harvest Estimate ^a	720	
Late Run (Chignik Lake)	Total Run Estimate	651	143–1,160
	Escapement Objective ^b	250	250–300
	Harvest Estimate	401	
Total Chignik System	Total Run Estimate	1,720	615–2,710
	Escapement Objective ^b	600	600–700
	Harvest Estimate ^a	1,120	

^a These figures include harvests of Chignik-bound sockeye salmon from the Southeastern District Mainland and the Cape Igvak fisheries; approximately 907,000 fish are projected to be harvested in the Chignik Management Area.

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

Forecast Methods

The forecasts for the 2008 early and late Chignik sockeye salmon runs were based on available data from 1977 to the present. Simple linear regressions were modeled using sibling and outmigration year relationships. 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 ($P < 0.25$). The variance of each estimate was calculated from the error structure of the regression. Prediction intervals were estimated at a coverage probability of 80%. Median estimators were used to estimate production of age classes where regression relationships were not significant.

The predicted 2008 early-run ocean-age-3 (3-ocean; ages-0.3, -1.3, -2.3, and -3.3) sockeye salmon returns were estimated based on the abundance of prior 2-ocean sockeye salmon (ages-0.2, -1.2, -2.2, and -3.2; $P = 4.6 \times 10^{-6}$). Following non-significant regression results, the early-run 1-ocean (age-1.1 and -2.1 fish), 2-ocean (age-0.2, -1.2, -2.2, and -3.2 fish), and 4-ocean (age-0.4, -1.4 and -2.4 fish) age class components were predicted by calculating the median returns since 1981.

Ocean-age-class and temperature relationships were analyzed for the late-run forecast. The 2-ocean sockeye salmon were predicted from prior year's 1-ocean returns using simple linear regression, ($P = 5.1 \times 10^{-5}$). Returns of 3-ocean sockeye salmon were predicted from an index of average summer temperatures ($P = 0.03$). Temperature data were obtained from the Cold Bay Airport climate database. The temperature index was constructed using a 5-year average of temperatures from June through August beginning in the year prior to the year of outmigration. The 4-ocean sockeye salmon were predicted from 3-ocean returns using simple linear regression ($P = 0.08$). The 1-ocean sockeye salmon 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 forecasted age class.

Regression analyses were examined for serial autocorrelation AR(1). When detected, an estimate of the bias from the serial autocorrelation was calculated from the regression residuals and applied to the original point estimate. Prediction intervals were re-estimated utilizing the standard error from a regression of the residuals.

The early- and late-run regression and median estimates were summed to estimate the total Chignik watershed sockeye salmon run for 2008. The combined early- and late-run 80% prediction interval was calculated by summing the lower prediction bounds and upper prediction bounds of the 2 runs.

Forecast Discussion

The 2008 sockeye salmon run to the Chignik River is expected to be approximately 1.72 million fish. The early run is expected to be approximately 1.07 million fish. The late run is expected to be approximately 651,000 fish. The 2008 Chignik sockeye salmon run is expected to be approximately 588,000 fish less than the recent 10-year average run (2.31 million) and 179,000 fish more than the 2007 run (1.54 million).

The projected harvest estimate for the early run of 720,000 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 401,000 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 Management Area and the Southeastern District Mainland of the Alaska Peninsula Management Area.

Available smolt data were analyzed and a significant simple linear regression relationship ($P = 0.009$) was found using the number of outmigrating age-2. smolt to predict the subsequent 3-ocean adult returns (about 84% of the run). This estimate was then expanded proportionally to account for other ocean ages (1-, 2-, and 4-ocean fish). The smolt-based forecast of the 2008 Chignik total sockeye salmon run is 1.52 million sockeye salmon, which is less (205,000) than that predicted from ocean-age relationships and median estimates (1.72 million).

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

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

Appendix A7.—Bristol Bay

Forecast Area: Bristol Bay Species: Sockeye Salmon

Forecast of the 2008 Run	Forecast Estimate (millions)	Forecast Range (millions)
Total Production		
Total Run	40.3	29.9–50.6
Escapement Goal	8.9	
Commercial Harvest	31.4	

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2008 is the sum of individual predictions for 9 river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak) and 4 age classes (ages 1.2, 1.3, 2.2, and 2.3, plus ages 0.3 and 1.4 for Nushagak River). Adult escapement and return data from brood years 1976 to 2004 were used in the analyses.

Predictions for each age class returning to a river system were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models included simple linear regression and recent year averages. 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 2005 through 2007.

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 2007 runs.

Forecast Results

A total of 40.3 million sockeye salmon are expected to return to Bristol Bay in 2008. This prediction is 22% higher than the previous 10-year mean of total runs (33.0 million fish; range of 17.8 to 46.0 million fish). The 80% confidence bounds for the 2007 forecasted run ranged from 29.9 to 50.6 million fish. All systems are expected to exceed their minimum spawning escapement goals.

A run of 40.3 million sockeye salmon can potentially produce a total harvest of 31.4 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 53% higher than the previous 10-year mean harvest (20.4 million fish; range was 9.9 to 29.4 million fish). ADF&G anticipates the actual harvest will be between 25 and 29 million sockeye salmon based on actual harvests from recent runs of similar size.

The forecasted run to each district and river system is as follows: 14.65 million fish to Naknek-Kvichak District (3.56 million to Kvichak River; 3.32 million to Alagnak River; 7.78 million to Naknek River); 8.02 million fish to Egegik District; 6.48 million fish to Ugashik District; 10.41 million fish to Nushagak District (7.10 million to Wood River; 1.93 million to Nushagak River; 1.37 million to Igushik River) and 740,000 fish to Togiak District (Table 1).

The forecasted total run of 40.3 million sockeye salmon is expected to be comprised of 19.80 million age-1.3 fish (49%) followed by 13.33 million age-1.2 fish (33%), 3.47 million age-2.2 fish (9%), 3.50 million age-2.3 fish (9%), 4,000 age-0.3 (<1%) and 178,000 age-1.4 fish (>1%).

Forecast Discussion

Similar methods have been used to produce the Bristol Bay sockeye salmon forecast since 2001. These forecast methods have performed fairly well. However, there has been a tendency for the forecasts and projected harvests to be biased low in recent years. The 7 previous forecasts (2001–2006) have averaged 10% below the total run. The forecast run differences have ranged from 25% below in 2007 to 9% above in 2001. The expected harvests have averaged 4% 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 2008 forecast is no different than previous years. The greatest uncertainty in the 2008 forecast is in forecasting the return of age-1.3 fish. Some of the largest returns of age-1.2 fish ever observed were seen throughout Bristol Bay in 2007. It is unknown if the large age-1.2 return in 2007 will result in a large age-1.3 return in 2008. ADF&G is forecasting almost half (49%; 19.8 million) of the total run will be age-1.3 fish in 2008. There is also uncertainty in forecasting the return of age 1.2 fish. ADF&G underforecast the return of age-1.2 fish in 2006 and 2007. The actual return of age-1.2 fish was 75% greater than the forecast in 2006 and 130% greater than the forecast in 2007. We are forecasting 33% of the total run to be age-1.2 fish in 2008. ADF&G staff observed large numbers of age-1.1 fish in a number of rivers during 2007. 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 ~25% below the total run in 2006 and 2007. The total run exceeded the forecasted run in all the rivers in Bristol Bay except the Egegik River in 2007. ADF&G 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

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

Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run	160	87–233
Escapement ^a	75	
Harvest Estimate	85	

^a The Nushagak inriver goal is 75,000 Chinook salmon based on 5 AAC 06.361 Nushagak-Mulchatna King Salmon Management Plan.

Forecast Methods

The 2008 Nushagak District Chinook salmon forecast is the sum of individual predictions of 5 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 1978–2005.

Predictions for each age class were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models included simple linear regressions and averages. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2005 through 2007.

A simple average of recent returns was used to forecast age-1.1 and age-1.2 Chinook salmon. A Ricker stock-recruitment model using spawning escapements and total returns was used to forecast age-1.3 abundance. The best age-1.4 model was based on the relationship between sibling returns in succeeding years (e.g., age-1.3 returns for 2007). The best age-1.5 model was based on the log normal relationship between adult returns (recruits) and spawners.

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 2007 runs.

Forecast Results

A total of 160,000 Chinook salmon are forecast to return to the Nushagak River in 2008. This forecast is 1.1% less than the 10-year mean (162,000 fish; range of 77,000 fish in 2000 to 245,000 fish in 2005). The 80% confidence bounds for the forecast ranged from 87,000 to 233,000 fish. A run of 160,000 Chinook salmon can potentially produce a harvest of 85,000 fish. We anticipate an actual harvest closer to 56,000 fish based on the average exploitation rate of 36% during the previous 5 years (2003–2007).

Age composition of the forecasted total run is <1% (<1,000) age-1.1 fish, 33% (53,000) age-1.2 fish, 45% (56,000) age-1.3 fish, 32% (48,000) age-1.4 fish, and 1% (2,000) age-1.5 fish.

Forecast Discussion

There is always uncertainty when forecasting returns of Chinook salmon to the Nushagak River. The 2008 forecast is no different than previous years. The greatest uncertainty in the 2008 forecast is predicting the return of age-1.3 and -1.4 Chinook salmon. The 2007 return of age-1.2 Chinook salmon was the largest in the last 20 years. We do not know what the effect of the large 2007 age-1.2 return will be on the return of age-1.3 fish in 2008. In addition, we overforecast both age-1.3 (160% above) and age-1.4 (122% above) Chinook salmon in 2007. The actual returns of both age-1.3 and age-1.4 Chinook salmon were substantially lower than what we forecast to return in 2007. We have also had fairly large forecast differences for age-1.3 and age-1.4 Chinook salmon in the last 5 years. Forecast differences in the past 5 years (2003–2007) for Chinook salmon age-1.3 have ranged from 41% below in 2004 to 160% above in 2007 and age-1.4 have ranged from <1% above in 2003 to 122% above in 2007.

Similar methods have been used to produce the Nushagak Chinook salmon forecast since 2001. The forecasts have varied widely in the last 5 years (2003–2007). The forecast run differences have ranged from 59% below in 2004 to 41% above in 2007. Overall, there has been a tendency for the forecasts to be biased low and expected harvests to be high. The 5 previous total run forecasts (2003–2007) have averaged 3% below the total run. The expected harvests have averaged 75% above the actual harvest for the last 5 years. The expected harvest differences have ranged from 43% below in 2004 to 63% above in 2005 and 2007. There is greater uncertainty around the 2008 forecast because of total run being 41% below forecast in 2007. ADF&G does not know how this will impact the 2008 forecast.

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

Forecast Area: Bristol Bay
Species: Other Salmon Species

Preliminary Forecast of 2008 Commercial Harvest	Forecast Commercial Harvest Estimate (thousands)
Pink Salmon	56
Chum Salmon	1,018
Coho Salmon	64
Chinook Salmon	98

Forecast Methods

The commercial harvest forecast for Chinook salmon in Bristol Bay was the harvest estimate from the Nushagak River Chinook salmon forecast and the recent 5-year average commercial harvest for the Naknek-Kvichak, Egegik and Ugashik districts. The recent 5-year average commercial harvest was used to forecast the coho, chum, coho, and pink salmon in 2008. The forecast for pink salmon was based upon the average harvest during the past 5 even-numbered years.

Forecast Discussion

The recent 5-year average commercial harvest was used to forecast Chinook, coho, pink and chum salmon in Bristol Bay because we do not have good long-term production information for these species in this area.

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

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	826	542–1,110
Escapement Goal	117	117–195
Harvest Estimate	709	

Forecast Methods

The 2008 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 18 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 ($P = 0.02$). Returns of 2-ocean sockeye salmon were predicted from an index of a 4-year average of winter (October through April) temperatures that encompassed temperatures from the year of outmigration and the 3 years prior to the outmigration ($P = 0.02$). Temperature data were obtained from the Cold Bay Airport climate database. Estimates of variance were calculated from the regressions. The remaining sockeye salmon 1- and 4-ocean returns were predicted from 15-year median estimates for each of the age class run estimates. The total run forecast was calculated by summing individual regression and median age class estimates. When the median return by ocean age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. For the regression model, 80% prediction intervals were calculated 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 2008 Bear Lake late-run forecast of 826,000 sockeye salmon is about 227,000 fish more than the 2007 forecast (599,000 fish) but about 119,000 fish less than the actual 2007 run of 945,000 fish. The 2008 run should be composed of approximately 61% 2-ocean fish and 37% 3-ocean fish. If realized, this run will be 286,000 fish greater than the recent (1998 to 2007) 10-year average (540,000 fish). On average, 2-ocean sockeye salmon comprise about 69% of the Bear Lake late run. The projected harvest of 709,000 fish is based on the achievement of the lower bound of the escapement goal range (117,000 fish). Because the uncertainty associated with the variable predictive capabilities of the sibling data, our confidence in this forecast is fair.

Heather Finkle, Finfish Research Biologist, Alaska Peninsula

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

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	523	288–757
Escapement Goal	150	97–219
Harvest Estimate	373	

Forecast Methods

The 2008 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 20 years. The temperature indices were constructed from annual average winter (October through April) air temperatures from the King Salmon Airport and annual average summer (May through September) temperatures from the Cold Bay Airport for corresponding outmigration years. In constructing and evaluating each of the regression models, standard regression diagnostics were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The saltwater-age-2 (2-ocean) sockeye salmon returns were predicted from the annual average winter 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 annual average summer temperature index ($P = 0.01$). Estimates of variance were calculated from each regression. The remaining 1- and 4-ocean returns were calculated from the median estimates for each of the age class run estimates. The total run forecast was calculated by summing individual regression and pooled age class estimates. When the median return by age was used, the 80% prediction intervals were estimated by calculating the 10th and 90th percentiles of the data. For the regression estimates, 80% prediction intervals 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 2008 Nelson River forecast of 523,000 sockeye salmon is about 21,000 fish more than the 2007 forecast (502,000 fish) and about 5,000 fish more than the actual 2007 run of 518,000 fish. The 2008 Nelson River sockeye salmon run is expected to be 27,000 fish less than the recent 10-year average run (549,000 fish). The 2008 run should be composed of approximately 69% 2-ocean fish and 29% 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 fair. The projected harvest of 373,000 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 A9.—Arctic-Yukon-Kuskokwim

Forecast Area: Arctic-Yukon-Kuskokwim

Species: All Salmon

ADF&G does not produce formal run forecasts for most salmon runs in the AYK Region. The salmon run outlooks presented in this report are qualitative in nature because of the lack of information with which to develop more rigorous forecasts. Consequently, these commercial harvest outlooks are typically based upon available parent year spawning escapement indicators, age composition information, recent year trends and the likely level of commercial harvest that can be expected to be available from such indicators, given the fishery management plans in place. While the commercial harvest outlooks provide for a general level of expectation, the fisheries are managed based upon inseason run assessment. A formal forecast of Yukon River fall chum salmon is provided. A Canadian Origin Yukon River Chinook salmon forecast is made prior to the meeting of US/Canada Yukon River Panel in the spring of 2008.

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

Market conditions have not been accounted for in the 2008 commercial 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. Continuation of these market trends in 2008 will likely result in harvests that are lower than the harvest outlook projections.

The 2008 commercial harvest outlook by management area and in thousands of fish:

Management Area	Salmon Species					
	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	30–50	20 – 40	100–250	0–1	400–700	
Kuskokwim Bay	17–31	110–300	33–52	0–1	80–130	
Kuskokwim Area Total	47–81	130–340	133–302	0–2	480–830	
Yukon	5–30		50–70		500–900	50–400
Norton Sound	0	10	80–100	500	40–50	
Kotzebue Sound					100–150	

Forecast Area: Yukon Area
Species: Fall Chum Salmon

Preliminary Forecast of the 2008 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production		
Total Run Estimate	1,000	900–1,200
Escapement Goal		300–600
Harvest Estimate		50–400

Forecast Methods

The forecast for the fall chum salmon run to Yukon Area in 2008 is based on the run reconstruction of 5 river systems (Tanana, Chandalar, Sheenjek, Fishing Branch and the mainstem Yukon River into Canada) and 4 age classes age-3 through age-6 with age-4 fish dominating followed by age-5 fish. Adult escapement and return data from the complete brood years 1974 to 2001, production from incomplete brood years 2002 and 2003 was estimated based on return per spawner from brood year returns, while an auto-regressive Ricker model was used to predict returns from the 2004 and 2005 parent years.

The predicted returns were multiplied by average maturity schedule for even or odd-numbered parent years to estimate the 2008 run size, and rounded to the nearest thousand fish. The even/odd maturity schedule from 1984 to 2001 was used to estimate the 2008 return, since current production is reduced from the pre-1984 level.

The forecast range is the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds are calculated using deviation of the point estimates and the observed returns from run projections from 1987 to 2007.

A total of 1.0 million fall chum salmon are expected to return to Yukon Area in 2008. This projection is 35% higher than the previous 10-year mean of even-numbered runs of 646,000 fish. The occurrence of 1.0 million fish returning for an even-numbered year is 12% for the last 17 even years. The 80% confidence bounds for the 2008 forecast range from 907,000 to 1.2 million fish. If the run returns that strong all river systems are expected to be above the low ends of the BEGs and above the minimum requirements to meet Canadian obligations.

Escapements between 300,000 and 600,000 provide a mean yield of 425,000 fish. The mean subsistence harvest from 1978 to 2006 for Alaskan subsistence and Canadian aboriginal harvests is 150,000 fish. Commercial harvests are prosecuted on the amount above 600,000 fish based on inseason assessments of run size. Due to the drastic fluctuations of pulses of fish entering the Yukon River mouth and the lateness of the stocks as a whole considering the length of their migration, fishery management is most challenging. ADF&G anticipates the harvest to be between 50,000 and 400,000 fish depending on inseason assessment of run size and the application to the 5 AAC 01.249 Yukon River Drainage Fall Chum Salmon Management Plan.

The forecasted total run of 1.0 million fall chum salmon is expected to be comprised of 64% age-4 and 33% age-5 fish; however, the age-4 fish have varied greatly ranging between 37% and 94%. Although this wide range is typically accounted for by the even-odd fall chum salmon abundance cycle, the affect was restricted between 1993 and 2002 during which most years (1993 and 1997 to 2002) the stocks were severely depressed. The even-odd cycle of fall chum salmon abundance is thought to be a result of competition with pink salmon in the ocean. The mean odd-numbered year fall chum salmon run size is 1.0 million fish whereas the mean even-numbered year run size is 682,000 fish.

Forecast Discussion

Point projections for expected returns have been developed since 1987 for fall chum salmon in the Yukon River drainage. Forecast methods changed from point estimates to ranges beginning in 1999. Additionally, during development of ranges, attempts were made to adjust the point estimates by reducing the projection of run size by the average ratio of observed to predicted returns through 2005 in attempts to reflect failures, and in some instances adjusting the low end of the range based on predicted improvements in the run. From 2006 to 2008 the ranges were developed around the point estimate based on the 80% confidence bounds using the standard deviation between the annual point estimates and observed returns. Production has changed some 25-fold (based on 28 brood year returns) with the most drastic fluctuations occurring between 1995 and 2001 therefore projections of run size remain extremely difficult to predict.

Since ranges were established in 1999, 56% were within the range, and 22% each were below and above the range. Applying 80% confidence bounds from 1999 to 2007, only 33% of the observed return fell within the projected range of run size. The greatest uncertainty in the 2008 forecast is in forecasting the age-4 return. Although typically the return of age-3 fish is low, there were zero age-3 estimated in the 2007 run. The point estimate for 2008 appeared extremely high considering the lack of age-3 fish in 2007 and historical trend of lower abundance in even-numbered years therefore a time-series analysis was conducted that resulted in a range of return between 600,000 and 800,000 fish. Under normal production levels an average run size for even-numbered years is 680,000 fish, which is within the time-series range and would provide for a commercial harvest of approximately 50,000 fish; the low end of the harvest forecast.

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