State of Alaska Tony Knowles, Governor

REGIONAL INFORMATION REPORT NO. 5J95-01

Preliminary Run Forecasts and Harvest Projections for 1995 Alaska Salmon Fisheries and Review of the 1994 Season

Edited by

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and

Ellen Simpson

April 1995

Alaska Department of Fish and Game
P.O. Box 25526, Juneau, Alaska 99802-5526

Frank Rue
Commissioner

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ACKNOWLEDGMENTS

This report is based on information contributed by Commercial Fisheries Management and Development Division biologists located in field offices throughout the state. Individual credit for forecast material is contained in area forecast discussions in the Appendix. Area biologists throughout the state supplied reviews of the 1994 fishing season.

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EXECUTIVE SUMMARY

In 1995 the Alaska Department of Fish and Game is expecting slightly more chinook and sockeye salmon, slightly fewer chum and coho salmon, and considerably fewer pink salmon in Alaska's commercial fisheries. Most notably, we are projecting a commercial harvest of 76.1 million pink salmon[1/] — down from the 117 million harvested in 1994. This pink salmon projection is based on a weak outlook for Southeast Alaska, fewer salmon released from Prince William Sound hatcheries in 1993, but a fairly good outlook for Kodiak. The 1995 catch projections can be found in Tables 1 and 2.

The current 1994 all-species catch estimate is 196 million. The actual catch was greater than our 1994 harvest projection of 167 million salmon. Table 3 contains preliminary harvest estimates for the 1994 season. Nearly 864 million pounds of Alaska salmon entered fish markets in 1994, with an estimated exvessel value of $427 million. The exvessel value is up from the estimated $390 million for the 1993 season but down from our estimate of $575 million for the 1992 season.

Last year's all-species Alaska salmon catch set yet another new record. The previous record, set in 1993, was 193 million. In Alaska, the all-species record commercial catch remained unbroken for 44 years between 1939 and 1983. During the 11 years from 1983 to 1994, the all-species salmon harvests broke records eight times. With very few exceptions, Alaska's salmon runs are in excellent shape; most spawning stock sizes are very near levels the Alaska Department of Fish and Game considers ideal. Record-breaking commercial catches and all-time-high run sizes are so commonplace in Alaska they are no longer newsworthy, whereas run declines and even extinctions continue to make news about salmon in the Pacific Northwest.

The 1995 sockeye salmon outlook is generally good across all regions of the state. Biologists in Bristol Bay forecast another large sockeye run of 58.7 million and an inshore catch of 40.3 million — slightly above the 1994 inshore catch of 35.3 million. A small sockeye run is forecasted for Upper Cook Inlet. This area has been closely watched because of an anticipated drop in production due to overescapements into the Kenai River during the 1980s. Greater-than-expected returns of age-1.3 sockeye salmon in 1994 helped boost the 1995 outlook for the Kenai River. The Upper Cook Inlet sockeye catch is expected to be near 2.7 million. If realized, this will be the lowest catch for the area in 10 years. The outlook for sockeye harvests in the Kodiak area is similar to the 1994 catch. Kodiak biologists are expecting drops in Ayakulik (Red River) and Spiridon Lake runs and runs similar to 1994 levels to Upper Station and Karluk Lakes. Biologists in Chignik expect a sockeye run of 2.8 million and a local harvest of 1.68 million; a harvest of 470 thousand is expected for the Igvak and Southeast Mainland Districts. This catch projection is slightly above Chignik's 1991–1994 harvests.

News around the state is mixed for pink salmon. Programs that collected data for forecasting pink salmon runs have been eliminated in Southeast Alaska. Biologists there have gone to a system of classifying their harvest outlook into one of five categories for northern and southern Southeast Alaska combined: *Disaster* (14 million or less harvest), *Weak* (15 to 25 million harvest), *Average* (26 to 37 million harvest), *Strong* (38 to 57 million harvest), or *Excellent* (58 million or more harvest). The *Weak* pink salmon harvest

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[1/] This projection corrects an error in an earlier release.

outlook for 1995 is based on presumed drought-induced, prespawn mortalities in 1993. Approach this forecast cautiously, because we lack basic forecast information about these pink salmon-producing systems. If the effects of the drought are overstated, then the harvest will probably be *Average*. After a disastrous 1993 pink salmon harvest in Prince William Sound, last year's forecast was very low for wild-stock returns. Much better-than-anticipated marine survival and careful openings resulted in a total catch of 36.9 million pink salmon and improvements over recent even-year spawning-stock levels and distributions. This year's forecasts include a wild-stock run of 7.7 million, with 6.3 million available for harvest, and a 21.1 million hatchery run, with all but 1.2 million available for harvest. Hatchery managers are expected to harvest 8.3 million salmon to recover their operating costs. In Kodiak, the parent escapement for the 1995 run was excellent. However, preemergent fry sampling in the Kodiak area indicated only fair overwinter survival of the eggs, but this still resulted in a high live-fry index. In spite of some concern over late-winter freezing, the Kodiak pink forecast is for a run of 21.5 million with a commercial harvest of 18.2 million. In Lower Cook Inlet the forecast for pink salmon is for runs above recent averages.

Chinook, coho, and chum salmon runs generally are not monitored with the same intensity as the major pink and sockeye runs. Chinook harvest outlooks are usually quite accurate because the Southeast Alaska troll fishery operates under a cap imposed by the Pacific Salmon Commission. Coho catches have been on an upward trend since the mid-1970s. The projections, which are based on recent average harvests, have not kept pace and since about 1975 have usually been slightly lower than the actual catch. Chum salmon runs fluctuate, but have not shown any trend since about 1980.

The Alaska Department of Fish and Game does not produce formal run forecasts for any salmon runs in the Arctic-Yukon-Kuskokwim Region. This area of the state has been closely monitored following the disastrous and unexplained 1993 chum salmon run failure. Our 1993 catch projection for the Arctic-Yukon-Kuskokwim Region was 1.84 million chum salmon, yet fishermen actually caught only 360 thousand. The 1995 chum catch projection for this area is 1.71 million, based on a qualitative evaluation of parental-year escapements and recent catch levels. The 1994 catch projection for the Arctic-Yukon-Kuskokwim Region was 600 thousand chum salmon, near the actual harvest of 796 thousand, but this harvest was lower than all recent-year catches going back to 1972, except for 1993. With recent, unexpected chum salmon production problems in mind, we are still uncertain as to what the 1995 season holds for the Arctic-Yukon-Kuskokwim Region.

INTRODUCTION

The major fishing areas within the Southeast, Central, and Western Statistical Areas are shown in Figure 1. These regions and areas are used in the department's statistical leaflet series and prior statistical reports.

Forecasts of runs (catch + escapements) for major salmon fisheries and projections of the statewide commercial salmon harvest have been published yearly by the Alaska Department of Fish and Game since

1969 (ADF&G 1969–1984; Eggers 1985, 1986; Eggers and Dean 1987, 1988; Geiger and Savikko, 1989–1993; Geiger and Simpson 1994). The Alaska Department of Fish and Game does not produce formal run-size forecasts for all salmon runs in the state, but local salmon biologists do 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. The projections for the 1995 Alaska commercial salmon harvest, by species and area, are found in Tables 1 and 2. Harvest outlooks for the AYK Region are developed as ranges; a table of these ranges is found in Appendix B. Trends in total statewide salmon harvests and catch projections in numbers of fish by species are found in Figures 2–6. Tables 3 and 4 provide detailed information on the 1994 harvest.

This report contains a detailed review of Alaska's 1994 commercial salmon season. We normally release it before final catch figures are available to provide preliminary information to the Board of Fisheries, the fishing industry, and the public well before the next season begins.

Predominate ages and brood years for 1995 salmon runs by species are as follows:

	Age of Returning Salmon in Years				
Species	2	3	4	5	6
Pink	1993				
Chum		1992	1991	1990	
Coho		1992	1991		
Sockeye			1991	1990	1989
Chinook			1991	1990	1989

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

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

DEFINITIONS OF TERMS

Biological escapement goal	The number of salmon in a particular stock that the Alaska Department of Fish and Game has determined should be allowed to escape the fishery to spawn to achieve the maximum yield for human use. This determination is based on biological information about the fish stock in question. (Also see Optimum escapement goal.)
Commercial harvest	Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery (see below) and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.
Commercial common property harvest	Harvests taken by the traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and the sale of confiscated fish.
Common property harvest	Harvests taken by the commercial common property fisheries (see above), as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost recovery harvests.
Cost recovery harvest	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
Enhancement of runs	Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques.
Escapement, spawning population or brood stock	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.

Harvest projections or harvest outlooks	Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts, when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.
Optimum escapement goal	The number of salmon in a particular stock that should be allowed to spawn to achieve sustainable runs based on biological needs of the stock, as well as social and allocative implications in managing for this level or other relevant considerations.
Run forecast	Forecasts of the run (harvests + escapements) are estimates of the fish returning in a given year based on information such as parent-year escapements, subsequent fry abundance, spring seawater temperatures, and escapement requirements. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.
Salmon run	The total number of mature salmon returning in a given year from ocean-rearing areas to coastal waters.

PRELIMINARY REVIEW OF THE 1994 ALASKA COMMERCIAL SALMON FISHERIES

The 1994 Alaska commercial salmon harvest of 196 million salmon is the largest ever recorded and surpasses the previous record of 193 million salmon established in 1993. The preliminary exvessel value was approximately $427 million, 8% more than the exvessel value of $390 million in 1993.

The 1994 season produced a sockeye catch of 52.4 million fish worth an exvessel value of $260 million. Sockeye salmon composed 27% of the statewide harvest. Commercial fishermen caught 117 million pink salmon statewide, 60% of the total salmon harvest. The exvessel value of the pink salmon harvest was only $61 million. This is more than last year's exvessel value of $43 million but fell far short of the record value of $135 million recorded in 1989. Chum harvests represented only 8% of the total Alaska harvest. Coho catches contributed 5% and chinook less than 1% to the statewide total harvest.

The strong catches resulted from near-record catches of pink salmon in Southeast Alaska and Prince William Sound, as well as a very strong Bristol Bay sockeye return. The Southeast Alaska pink salmon catch of 57.4 million is the fourth best on record. Prince William Sound had a comeback, with a pink salmon harvest of 36.9 million, the third largest ever. Although the Bristol Bay sockeye catch of

35.3 million was below preseason expectations, it still ranked as the third largest return. The Copper River sockeye return was also better than forecasted, and once again the catch exceeded 1.0 million fish. Copper River coho salmon similarly returned in near-record numbers. The Upper Cook Inlet sockeye catch exceeded the preseason forecast by a million fish.

Statewide, record numbers of chum and coho salmon were caught in 1994. This record was broken largely because of record returns of both species to Southeast Alaska. This year the all-species catch was the largest in history for Southeast Alaska.

Kodiak Island fishermen expected to harvest 13.7 million pink salmon in 1994; however, the run failed to develop as anticipated. Lower Cook Inlet fishermen followed last year's dismal fishery with yet another in 1994. Chum stocks are still rebuilding in the Yukon, Kuskokwim, and Norton Sound areas, but catches were better than in 1993. No directed fall chum fishery was allowed on the lower Yukon River in 1994. Kuskokwim fishermen harvested 361 thousand chum salmon, well below the recent 10-year average catch. Many fishermen in Norton Sound and Kotzebue had their season limited by processor capacities.

Southeast and Yakutat

Salmon returns to Southeast Alaska continued their upward trend with new harvest records again being set in 1994. The number of salmon harvested within the Southeast Alaska and Yakutat Areas has been continuously monitored since 1895. During that 110-year period, six of the top ten harvests have occurred since 1985. The 1993 record harvest of 72.3 million salmon was surpassed in 1994 with a harvest of 76.0 million salmon. The exvessel value of the 1994 harvest exceeded $107 million, which compares favorably with the exvessel values of the harvests in 1991, 1992, and 1993 of $71.8, $92.3, and $88.3 million, respectively. The exvessel values by species were: coho - $36.3; pink - $28.6; chum - $20.0; sockeye - $15.3; and chinook - $6.5 million.

The 1994 pink harvest of 57.4 million was the fourth highest harvest in Alaska's history and slightly above the forecast range of 38.0–57.0 million fish. The harvest of hatchery-produced pink salmon, including both common property and cost recovery, was only expected to reach approximately 1.0 million. Without an adequate tagging and tag-recovery program, an accounting of hatchery-produced pink salmon in the common property fisheries is very subjective. However, 4.9 million pink salmon were harvested from hatchery cost recovery areas, indicating the hatchery component of the harvest was well above expectations. The majority of fish harvested in cost recovery areas are believed to be of hatchery origin. Although a *Strong* pink salmon return was forecasted, and did materialize, the distribution of the return was not anticipated. During the last 10 years, the average harvests in southern and northern Southeast were 28.3 and 10.7 million, respectively. The harvests in 1994 were 21.1 million from southern Southeast and a record setting 36.4 million from northern Southeast. The 1994 northern Southeast harvest was 58% above the previous record harvest of 23.0 million set in 1941.

The 1994 chum harvest in Southeast was 10.3 million, 1.0 million above the previous record set in 1918. Both northern and southern Southeast experienced strong chum runs. The northern Southeast harvest of

6.9 million was the largest harvest in Alaska's history, and the southern Southeast harvest of 3.4 million was the largest since statehood and the eighth largest in Alaska's history. Hatchery-produced chum salmon were an important component of the 1994 harvest. A total of 5.3 million chum salmon were harvested in hatchery cost recovery and terminal areas. In addition, an estimated 958 thousand of the chum salmon harvested in the common property fisheries were of hatchery origin.

The coho harvest in Southeast also set an all-time record. The total harvest of 5.7 million was double the previous record set in 1992. Seven of the ten largest harvest years in the history of the coho fishery have occurred since 1985. The southern Southeast harvest of 1.7 million was the largest since statehood and the third largest in Alaska's history. The northern Southeast harvest of 3.2 million was the largest in Alaska's history. The hatchery component of the harvest included a total of 165 thousand coho salmon harvested in hatchery cost recovery and terminal areas, and an estimated 715 thousand hatchery coho salmon harvested in the common property fisheries.

The 1994 sockeye harvest in Southeast was above average, but not at a record-setting level. The Southeast harvest of 2.4 million sockeye salmon was above the 10-year average of 1.7 million fish. The southern Southeast sockeye harvest of 1.7 million was the third largest in Alaska's history, in spite of the implementation of management efforts aimed at reducing fishing time and effort in District 104 prior to week 31. The five highest sockeye catch years in the history of the southern Southeast sockeye fishery have all occurred since 1990. The harvest in northern Southeast of 480 thousand was below the 10-year average of 514 thousand.

The 1994 Yakutat Area (setnet plus offshore troll districts) reported a record harvest of 996 thousand salmon. The previous record, set just last year, was 893 thousand salmon. The 1994 harvest was made up of 761 thousand coho salmon, 208 thousand sockeye salmon, 13.7 thousand pink salmon, 8.5 thousand chinook salmon, and 5.23 thousand chum salmon.

A total of 2,336 permits, including 411 purse seine, 451 drift gillnet, 143 set gillnet, 802 power troll, and 529 hand troll, participated in 1994. Fish traps authorized on the Annette Island Reserve also reported landings.

Prince William Sound

The 1994 Prince William Sound Area commercial salmon harvest of 40.6 million fish was the second largest on record. The harvest was composed of 36.9 million pink salmon, 1.5 million sockeye salmon, 1.1 million chum salmon, 1.1 million coho salmon, and 49.0 thousand chinook salmon. The majority of the catch, 29.6 million fish, was common property commercial harvest, and 11.0 million fish were sold for hatchery cost recovery and test fisheries.

The Copper and Bering River Districts had strong sockeye returns and produced a drift gillnet catch of 1.2 million fish, the fourth largest catch in the history of the fishery. Escapement for the Copper River Delta systems fell short of escapement goals, but the upper Copper River minimum goal was exceeded

by 191 thousand sockeye salmon. The Copper and Bering River coho harvest of 937 thousand fish set a new record. Escapement estimates were hampered by heavy rains, but it appears escapement goals were exceeded.

Gillnet fisheries in Prince William Sound targeted salmon runs of varied strengths. The chum salmon run to the W. H. Noerenberg Hatchery was within preseason projections; the commercial harvest, including hatchery cost recovery, was 929 thousand fish. Although there was no directed fishery on the Coghill Lake sockeye stock, escapement to the lake was only 7.0 thousand fish, the lowest since statehood. Sockeye returns to the Eshamy District were also below preseason expectations. The gillnet catch was 159 thousand sockeye salmon, and the Main Bay Hatchery did not meet cost recovery objectives, harvesting only 80.0 thousand fish. Escapement to Eshamy Lake exceeded the goal; however, the upriver migration was a month later than normal. Fishing was restricted to bays and nearshore areas in both the Eshamy and Coghill Districts throughout the season. The Unakwik District yielded a harvest of less than 1.0 thousand sockeye salmon, far below the 10-year average catch of 13.0 thousand fish. The commercial sockeye harvest from all districts, including hatchery cost recovery and purse seine catches, was 331 thousand fish. This was only 67% of the preseason forecast.

The Prince William Sound pink salmon harvest of 36.9 million is the third highest on record, exceeding the preseason forecast estimate by almost 13 million fish. Pink salmon escapement goals were met in all districts except the Coghill and Montague Districts. The only district to achieve the chum salmon escapement goal was the Northwestern District. All other districts were at least 50% below the goal, even though there was no directed fishery on these chum stocks. The purse seine chum harvest was 82 thousand fish, the third lowest harvest since statehood.

The Valdez Fisheries Development Association (VFDA) began cost recovery harvesting pink salmon on June 20, and initial catches were good. Continued sales, harvests, and early commercial catches indicated a strong return. The purse seine harvest of 2.6 million fish by the fleet on July 17 was the season's highest daily catch. The run peaked on July 10, several days later than normal for an even-year pink return. VFDA exceeded their revenue goal of $2.37 million and attained their brood stock requirement. It was the largest pink return to the Solomon Gulch Hatchery since its inception.

The Prince William Sound Aquaculture Corporation (PWSAC) began collecting pink salmon for corporate (brood stock and cost recovery) escapement in late July. The PWSAC Board of Directors decided that 40% of the pink return was needed for corporate escapement, leaving the common property fishery with the remaining 60%. When PWSAC corporate escapement dropped to 18% of the return in early August, the commercial purse seine fleet was enlisted to help PWSAC harvest cost recovery fish. The commercial purse seine fishery was closed from August 6–9 to encourage fishermen to take advantage of this opportunity. This effort resulted in a catch of 1.9 million pink salmon and put PWSAC back on track towards attainment of their cost recovery goal. The common property purse seine fishery was open every other day until the end of August. The Cannery Creek Hatchery had the largest PWSAC pink return, followed by the W. H. Noerenberg Hatchery. The A. F. Koernig Hatchery pink return was weak. Generally, wild-stock performance mirrored hatchery performance in areas where hatchery performance was good.

The total value of the Prince William Sound commercial salmon harvest, including hatchery sales, was estimated at $43.8 million. The drift gillnet catch was valued at $20.2 million, resulting in average earnings for 510 permits of $39.5 thousand. The value of the set gillnet catch was $800 thousand, setting the average earnings for 26 permits at $29.9 thousand. The seine fishery was worth $13.3 million for an average exvessel value of $75.4 thousand for the 171 permit holders that participated this year. Test fishery revenue and revenue generated through fish sales for hatchery operations amounted to approximately $9.5 million.

Cook Inlet

Upper Cook Inlet

The Upper Cook Inlet harvest of 5.0 million salmon was just slightly below last year's catch and exceeded the long-term annual harvest by almost a million fish. Although the sockeye harvest declined, a substantial increase in price resulted in an overall slight increase in the exvessel value of the fishery from $31.0 million in 1993 to $34.6 million in 1994.

The harvest of 3.6 million sockeye salmon was the tenth highest catch on record, but it was a decrease of a million fish from the previous year. The catch was nearly double the preseason forecast of 2.0 million and was valued at $30.0 million. This is 87% of the total value of the fishery. The division of the catch between set gillnet (47%) and drift gillnet gear (53%) was close to the long-term average.

The disparity in sockeye stock strengths between the Susitna and Kenai Rivers was expected to be reduced this year because a substantially diminished Kenai River return was expected. When stocks had separated spatially, management efforts focused on reducing exploitation of Susitna sockeye stocks while harvesting the Kenai River surplus along the east side of the Central District. Through some area and time restrictions, escapement goals were met or exceeded in the Yentna, Kasilof, and Kenai Rivers. The Crescent River run was again very poor, and despite a prolonged closure of the fishery in that area, only 30.3 thousand fish were counted at the sonar site, well below the desired range of 50–100 thousand fish.

The 1994 harvest of 299 thousand chum salmon was only half the long-term average but a considerable improvement over the 1993 record-low harvest. The lack of any substantial directed effort and sockeye salmon-related restrictions of the drift fishery produced an average chum escapement index for the Yentna River. Weak Chinitna Bay chum stocks required complete closure of the bay for a period and the final escapement remained below desired levels. The chum harvest was valued at $819 thousand.

The Upper Cook Inlet harvest of 520 thousand pink salmon was well below average for an even-numbered year. The small numbers and low prices resulted in no directed effort for pink salmon. The pink salmon harvest was valued at just $274 thousand.

The coho salmon harvest of 581 thousand was the third highest on record and nearly double the long-term average. Freshwater abundance was generally good, although not exceptional. The early Kenai River coho run was subjected to intense commercial fishing pressure during the directed sockeye fishery and

escapement appeared, at best, average. Minor coho stocks in the northern and western portion of the Inlet were generally above average in run strength. The exvessel value of the commercial coho salmon harvest was estimated at $3.0 million.

The chinook salmon harvest of 19.6 thousand was slightly below the long-term average, but roughly average under the present regulatory structure. The Northern District directed chinook salmon fishery had an extremely poor catch of 2.9 thousand fish, the lowest in the fishery's 9-year history. The return of late-run Kenai River chinook salmon was well above average, and throughout the season escapement projections remained above the level needed to avoid conservation restrictions in either the recreational or the commercial fishery. The exvessel value of the Upper Cook Inlet chinook salmon harvest was $491 thousand.

Lower Cook Inlet

The total 1994 Lower Cook Inlet commercial salmon harvest of 1.8 million fish was the highest since 1981, but the increased catch did not result in a commensurate increase in the value of the fishery. The pink salmon harvest was almost three times the preseason forecast of 595 thousand fish, Tutka Hatchery production composing 87% of the catch. Sockeye catches were less than half of that forecasted. As a result the total exvessel value was only $1.5 million, 54% of the recent 20-year average.

Hatchery cost recovery played a dominant role in the Lower Cook Inlet fishery. Approximately 55% of the total salmon harvest was taken by the Cook Inlet Aquaculture Corporation (CIAA) to support their sockeye lake stocking program and Tutka Hatchery operations. This was close to 32% of the total exvessel value of the area's fishery. Cost recovery harvests from hatchery production at China Poot, Hazel Lake, Kirschner Lake, and Bear Lake composed 24% of the total sockeye catch. Cost recovery catches of pink salmon at Tutka Bay accounted for over half of the total Lower Cook Inlet pink harvest.

The total sockeye harvest of 115 thousand fish was less than the preseason forecast of 272 thousand and less than half of the recent 10-year average. Sockeye salmon only accounted for 6.5% of the total salmon catch in 1994 but composed 43% of the total exvessel value. Most of this year's sockeye catch came from enhancement projects, but production from this program has declined from previous years. Natural sockeye production also fell short of expectations. The early run to Mikfik Creek in Kamishak Bay failed to attract any commercial fishing effort, and the entire run, estimated at 9.5 thousand fish, entered the system to spawn. Commercial fishing was limited on other systems as well, but a small surplus at Desire Lake allowed a harvest of 5.9 thousand fish. Escapement goals were achieved in all but the Delight Lake system.

Pink salmon catches composed 93% of the Lower Cook Inlet harvest. Virtually all of these fish, which were harvested near Tutka Bay and Halibut Cove, were returning to Tutka Hatchery and its secondary fry-release site, Halibut Cove Lagoon. Most of the catch, 953 thousand fish, was taken by CIAA for hatchery cost recovery. The commercial purse seine fleet harvested approximately 613 thousand pink salmon in this area. Even though there was limited commercial fishing effort in other areas of Lower Cook Inlet, pink salmon escapements fell short of established goals.

The chum salmon harvest of 5.5 thousand fish was the second lowest ever recorded in Lower Cook Inlet. The catch was only 5% of the long-term average and continued the dramatic decline in catches for the sixth consecutive year. The returns were barely strong enough to achieve escapement goals and many systems fell below desired levels. The McNeil River chum escapement, estimated at 15 thousand, was significantly less than the goal of 20–40 thousand fish for the fifth consecutive year.

The coho harvest of 12 thousand fish exceeded the long-term average of 11.8 thousand. Coho salmon runs were strong throughout Lower Cook Inlet, although poor weather limited fishing effort. Aerial escapement surveys were also limited, but all indications point to an above-average return.

Bristol Bay

The inshore run of sockeye salmon totaled 50.6 million fish, the fourth largest return on record. It was only 3% smaller than the preseason forecast of 52.4 million. The commercial catch of 35.3 million fish was the third largest on record and 15.3 million sockeye salmon escaped into area streams, meeting or exceeding escapement point goals. The estimated exvessel value of the 1994 Bristol Bay salmon fishery was $140.9 million. This is the seventh largest exvessel value on record, well above the recent 20-year average of $110.3 million.

The Naknek-Kvichak District sockeye harvest of approximately 16.3 million fish was nearly double the 20-year average harvest of 8.7 million. The Egegik District harvest of 10.8 million fish is the third largest harvest on record, behind harvests of 21.9 million in 1993 and 15.7 million in 1992. The Ugashik District harvest of 4.4 million sockeye salmon was also the third largest on record for that district. The harvest of 3.4 million in the Nushagak District exceeded the 20-year average harvest of 3.2 million sockeye salmon. The Togiak District sockeye catch of 401 thousand fish was slightly below the 20-year average of 415 thousand fish.

A large component of the fleet began fishing the season in the Egegik District. However, early catches in that district were below expectations and the fleet dispersed as runs to other districts began to build. It appears the sockeye run to the inner portions of Bristol Bay peaked 3-4 days later than normal. The run also showed unusually good strength later into July than normal and fishermen continuing to fish following the emergency order period fared better than in the past. There were a large number of jacks returning to some districts (Egegik, Ugashik, and Naknek) and the Bay-wide average sockeye size was smaller than average.

The chinook run to most Bristol Bay districts was larger than in recent years, breaking a trend of eight consecutive years of below-average catches. Conservative early fishing measures in the Naknek-Kvichak, Egegik, and Togiak Districts were responsible for above-average chinook escapements. However, several fishing periods in the Nushagak District specifically targeted chinook salmon. The catch of 119 thousand chinook salmon in that district was above the recent 20-year average catch of 74.3 thousand fish.

The total chum harvest in Bristol Bay of 833 thousand fish was below the 20-year average of 1.18 million. With the exception of the Togiak District, where an average harvest was taken, all districts

produced below-average catches. Escapements appeared close to average in all districts except the Egegik District, where escapements were well below normal.

The 1994 pink salmon run produced a commercial harvest of 91 thousand fish, far below normal for an even-numbered year. Over the past 20 years the even-year pink salmon harvest has ranged from 401 thousand to 5.2 million fish and averaged 1.7 million fish. Escapement indicators from the Nushagak and Togiak Rivers indicate escapements were below average.

The 1994 coho harvest totaled 179 thousand fish, slightly less than the 20-year average of 197 thousand fish. Harvest rates were strong enough to target commercial fishing on coho salmon throughout Bristol Bay, except in the Nushagak District. A complete commercial fishing closure and restricted sport fishing bag limits were necessary in the Nushagak District during late summer to protect coho escapements. The Nushagak River coho escapement of 82 thousand fish was below the inriver goal of 100 thousand fish. The Togiak District had a commercial coho harvest of 97 thousand fish, the highest in the Bristol Bay area. Escapement surveys in other districts indicate that all eastside systems had average to good escapements.

Kuskokwim

The total commercial salmon catch for the Kuskokwim Area was 1.5 million fish. The chinook catch of 27 thousand fish was 42% of the recent 10-year average. An above-average sockeye harvest of 191 thousand fish was recorded. Fishermen caught 361 thousand chum salmon, 66% of the recent 10-year average. The pink salmon catch of 85 thousand fish was the second highest catch on record. The coho catch was 856 thousand fish, a new record.

Inriver salmon assessment projects had mixed results early in the season, possibly indicating low chum salmon abundance. After the first opening of the Kuskokwim River, the fishery was closed until chum abundance increased. Fishing time was limited by processing capacity for the remainder of the chum run. Increased fishing time was necessary late in the season to harvest the strong coho return, although area closures were implemented for a short time to ensure coho escapements. Chinook and sockeye salmon catches, taken incidentally during the chum fishery, were below average because of the late openings. However, the coho and pink salmon harvests were the largest on record. Chinook, coho, and chum salmon escapement goals were all achieved in the Kuskokwim River drainage in 1994.

After disappointing early-season chinook catches in the Quinhagak District, the commercial fishery was closed until July when sockeye normally dominate the catch. Sockeye, chum, and coho catches were above average in July, indicating strong runs. Fishing continued on a regular schedule for the rest of the season. Although the chinook catch was low, the escapement-index goal was achieved. The sockeye catch for this district was the third highest on record and escapement goals were met as well. Chum salmon escapements were below average.

The Goodnews Bay District opened in late June to direct the harvest at sockeye salmon and to protect chinook salmon, which have become a conservation concern because of weak returns. Sockeye and coho

harvests were strong throughout the season. The chinook catch was below average, but the escapement goal was met for only the second time since 1984. The sockeye catch set a new record for a second consecutive year. Sockeye escapement was also excellent, and exceeded the objective. The incidental chum catch was the largest recorded, and chum salmon escapement at the Goodnews Weir also set a record in 1994.

The exvessel value for the 797 Kuskokwim permit holders that participated in 1994 was $5.2 million. This is $400 thousand less than the recent 10-year average exvessel value of $5.6 million. The average exvessel earnings for each permit holder was $6.5 thousand, the fourth highest recorded.

Yukon Area

The 1994 Yukon Area commercial harvest was 382 thousand salmon. Sales were composed of 113 thousand chinook, 80 thousand summer chum, and 3.6 thousand fall chum salmon sold in the round. In addition, fishermen sold 1.9 thousand pounds of chinook roe, 101 thousand pounds of summer chum roe, 3.3 thousand pounds of fall chum roe, and 5.6 thousand pounds of coho roe. The total estimated commercial salmon harvest, including the estimated fish from which roe was sold, was 114 thousand chinook salmon, 257 thousand summer chum salmon, 8 thousand fall chum salmon, and 4 thousand coho salmon. The 1994 estimated chinook catch was 8% above the recent 5-year average of 105 thousand fish. The summer chum catch, however, was 60% below the recent 5-year average of 660 thousand fish and was the lowest harvest since 1972. The decreasing trend in commercial summer chum harvests since 1990 continued in 1994. Only limited commercial fishing was allowed for fall chum and coho salmon in 1994. The exvessel value of the salmon fishery was an estimated $4.8 million, approximately one-half the recent 5-year average of $8.6 million. Prices paid to fishermen were below average for all species.

Lower Yukon Area fishermen harvested 105 thousand chinook salmon and 55 thousand summer chum salmon. The estimated average price per pound was $2.07 for chinook and $0.21 for summer chum salmon. The exvessel value of the Lower Yukon Area fishery was $4.2 million. A total of 659 fishermen participated in the 1994 lower river fishery.

The commercial salmon harvest in the Upper Yukon Area, including the estimated harvest to produce roe, was 9 thousand chinook salmon, 202 thousand summer chum salmon, 8 thousand fall chum salmon, and 4 thousand coho salmon. Estimated average prices per pound in the Upper Yukon Area were $0.71 for chinook salmon, $3.04 for chinook roe, $0.18 for summer chum salmon, $3.69 for summer chum roe, $0.14 for fall chum salmon, $1.50 for fall chum roe, $0.43 for coho salmon, and $1.50 for coho roe. The exvessel value of the Upper Yukon Area fishery was $600 thousand. A total of 103 fishermen participated in the 1994 upper river fishery.

The 1994 chinook salmon run was above average in abundance. Chinook escapement objectives for all surveyed index streams in the Alaskan portion of the drainage were achieved. The estimated spawning escapement to the Canadian portion of the mainstem Yukon River was the second largest on record.

The Yukon River chum salmon runs were larger than expected primarily because of a higher-than-average return of 5-year-old fish. Because a poor fall chum salmon run was assessed inseason by the Pilot Station sonar, subsistence salmon fishing was restricted throughout the drainage and was closed in some areas during August. Subsistence fishing for fall chum salmon reopened throughout the Yukon Area in September when it became apparent that escapement goals would be met. All chum salmon escapement goals were achieved in 1994.

The 1994 coho salmon run to the Yukon River was above average in abundance. A record escapement was observed in the only area in the drainage with an established spawning-escapement objective.

Norton Sound

The 1994 Norton Sound commercial salmon harvest of 1.1 million fish was composed of 5.0 thousand chinook salmon, 0.8 hundred sockeye salmon, 102 thousand coho salmon, 982 thousand pink salmon, and 18 thousand chum salmon. The chinook harvest was 23% below the previous 5-year average (1989–1993) and 34% below the previous 10-year average (1984–1993). The coho harvest was the second highest on record, 63% above the 5-year average and 104% above the 10-year average. Historically, Norton Sound has had very limited markets for pink salmon. This year a market developed to take advantage of the strong pink return. The 1994 pink harvest far exceeded the previous record of 326 thousand fish set in 1978. There was no directed fishing for chum salmon because of conservation concerns, and as a result, the commercial chum harvest was the lowest on record.

A total of 119 permit holders made landings in 1994. The number of participating fishermen was below the 10-year average of 142. Because of the lack of a chum fishery and the difficulties transporting pink salmon, some fishermen in the northern subdistricts did not participate in 1994. Commercial fishermen received approximately $865 thousand for their catch in 1994, 113% above the previous 5-year average.

Kotzebue

The 1994 commercial salmon catch in the Kotzebue District was 153 thousand chum salmon and 4 chinook salmon. The chum harvest exceeded the upper end of the preseason forecast range of 75–150 thousand fish. This catch was about half of the recent 15-year average of 291 thousand. Only 109 permits fished this year, the lowest number of participants since 1972. The low fishing effort is largely attributed to local employment opportunities in the construction industry and low salmon prices.

The total exvessel value was $234 thousand, or an average of $2.3 thousand for each participating permit holder. Four buyers participated in the fishery in 1994. The entire harvest was iced in the round and flown out of the area for processing.

Catches and catch rates during the early part of the season indicated a run of at least average strength. Catch rates improved in late July and fishing time was extended. However, buyers in the area could not purchase the entire catch. Excess fish were distributed to the community for either human consumption

or for dog food. Fishing time was limited for the remainder of the season to keep the catch within the limits imposed by the buyers

An expected chum salmon surplus at the Sikusuilaq Hatchery prompted local buyers to again explore the possibility of a roe harvest. The Northwest Arctic Borough developed and sent bids to prospective buyers. All buyers contacted, however, declined to bid. There was no commercial harvest of excess salmon at the hatchery in 1994.

Kodiak

The total commercial salmon catch in the Kodiak Area was 12.1 million fish. Harvests of all species, except pink salmon, were close to preseason expectations. The harvest of 8.2 million pink salmon was only 60% of the preseason forecast.

This season's pink catch included approximately 2.0 million fish harvested in the vicinity of Kitoi Bay Hatchery. Overall, pink runs were highly variable, ranging from much better than expected in some systems to poor in some major systems: Ayakulik, Karluk, and streams in the Mainland District. Although this year's pink salmon harvest was better than in the last two even years, it was still below the previous five-year even-year average harvest of 9.3 million fish.

The chinook salmon harvest of 22.6 thousand was below the recent 5-year average of 25.8 thousand fish. Although there are two very healthy chinook spawning systems in the Kodiak Area, chinook salmon are only harvested incidentally during directed sockeye and pink fisheries.

The sockeye salmon harvest of 2.88 million fish was the lowest in recent years and was well below the recent 5-year average catch of 4.87 million fish. This year's sockeye harvest included approximately 260 thousand fish produced by a new fry-stocking project at Spiridon Lake. A poor sockeye run to Ayakulik River was a major factor in the lower overall harvest.

The 296 thousand coho salmon harvested this season was very near the recent 5-year average harvest of 303 thousand fish. The coho harvest included approximately 70 thousand fish produced by three enhancement projects: Kitoi Bay Hatchery, Crescent Lake, and Hidden Lake.

The chum salmon harvest of 739 thousand fish was near the recent 5-year average harvest of 719 thousand fish. The highest chum harvest for the Kodiak Area was 1.5 million fish in 1970.

The estimated exvessel value of the total Kodiak commercial salmon harvest was $24.5 million. This is the lowest value since 1985 and is well below the recent 5-year average value of $40.8 million. Only 460 of the 610 permit holders participated in 1994. The average earnings per permit by gear type were beach seiners — $8.6 thousand, set gillnetters — $42 thousand, and purse seiners — $60 thousand.

Chignik

The 1994 Chignik salmon fishery harvested 2.5 million salmon, including 1.6 million sockeye salmon. Although the season opened on June 21, when sockeye escapement at Chignik Lake reached expected levels, fishermen were on strike for higher prices until June 25. The sockeye run was within the forecast range.

The chinook salmon harvest was 4 thousand fish, well below the projected 7 thousand fish. The exvessel value of this harvest was $40 thousand.

The 1994 pink salmon harvest was 431 thousand fish, well below the projection of 1.3 million fish. Pink salmon abundance was higher than the catch indicates. Fishermen did not specifically target pink salmon because the price was so low. The exvessel value of the pink salmon catch was $179 thousand.

The Chignik Area coho salmon harvest totaled 237 thousand fish, slightly more than the preseason projection of 200 thousand fish. Fishing effort for coho salmon continued through most of September, and the good catch reflected general coho abundance across the state. The exvessel value of the coho catch was $897 thousand.

The total exvessel value of salmon harvested in the Chignik Area was $15.2 million, very close to the recent 20-year average value of $14.9 million.

Alaska Peninsula - Aleutian Islands

In 1994 the South Unimak-Shumagin Islands (False Pass) June fishery was allocated 3.6 million sockeye salmon, provided the incidental chum catch did not exceed 700 thousand fish. Prior to the commercial salmon fisheries, the Shumagin Islands test fishery indicated an alarmingly high number of chum salmon. Another test fishery was conducted in the South Unimak area on June 14. Results from three days of test fishing indicated favorable sockeye-chum ratios. The first fishing period in the South Unimak fishery was June 17 and June 18 in the Shumagin Islands. The harvest rates of both sockeye and chum salmon were low, and fishing time was nearly continuous for the remainder of June. The harvest of chum salmon increased towards the end of June at Cape Lutke and in the Shumagin Islands fishery. The sockeye harvest for both areas combined was 1.5 million, only about 41% of the allocation. According to fishermen, the reasons for the low harvest included cold inshore water temperatures, unusual currents, and nearly constant northwest winds. Whatever the reason, sockeye salmon were not available in large numbers along the South Peninsula. The combined chum harvest was 118 thousand fish below the 700 thousand chum cap.

Prior to July 25, 80% of the sockeye harvest in the Southeastern District Mainland fishery is assumed to be fish of Chignik origin. An estimated 142 thousand Chignik-bound sockeye salmon were harvested in this fishery. Local sockeye stocks in this area had strong runs in 1994. The Orzinski Lake sockeye escapement of 38 thousand exceeded the 20 thousand fish escapement goal. The July 10 set gillnet catch of 46.8 thousand sockeye salmon was the largest daily set gillnet catch ever recorded.

The North Peninsula chinook salmon harvest of 18 thousand was above the recent 10-year average harvest of 15.8 thousand. The indexed chinook escapement was 39 thousand, the largest on record. The 1994 sockeye harvest was 2.75 million fish, the third largest on record. The North Peninsula indexed sockeye escapement was 1.2 million; escapement goals for all systems were exceeded this year. The coho salmon harvest of 241 thousand fish was greater than the recent 10-year average catch of 186 thousand fish and was the largest on record. The coho harvest was limited because of processor availability. The North Peninsula chum harvest was the lowest since 1979: only 84 thousand fish. However, good escapements were observed. The indexed escapement of 480 thousand was the highest since 1988.

The 1994 Aleutian Islands harvest of 860 thousand pink salmon was the largest since 1984, and pink salmon escapements were generally above escapement goals. The lack of markets limited the salmon harvest in the Atka-Amlia Management Area. The few pink salmon harvested were not sold but instead were used as longline bait by local fishermen. The pink salmon escapement at Atka was exceptional, more than five times the 1992 escapement.

The Alaska Peninsula and Aleutian Islands Areas' exvessel value of all species combined was estimated at $40.9 million. Most of this value, $29.2 million, is attributed to sockeye sales.

PRELIMINARY FORECASTS OF 1995 SALMON RUNS TO SELECTED ALASKA FISHERIES

The Alaska Department of Fish and Game prepares forecasts for salmon runs that affect the 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 1995 fishing year, forecast fisheries are as follows:

Southeast	-	pink salmon
Prince William Sound	-	pink, chum, sockeye, coho, and chinook salmon
Copper River	-	sockeye and chinook salmon
Copper and Bering Rivers	-	coho salmon
Upper Cook Inlet	-	sockeye salmon
Lower Cook Inlet	-	pink salmon
Kodiak	-	pink salmon

Upper Station Lakes	-	sockeye salmon
Frazer Lake	-	sockeye salmon
Ayakulik River (early and late)	-	sockeye salmon
Spiridon Lake	-	sockeye salmon
Karluk Lake	-	sockeye salmon
Chignik	-	sockeye salmon
Bristol Bay	-	sockeye and chinook 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 the parental stocks. Other information that might have been considered includes spawning stock distribution, egg deposition, survival to intermediate life stages, environmental conditions, and historical age composition. 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. The 1994 forecast, together with information on forecast accuracy for 1994, is provided in Table 9.

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Table 1. Preliminary projections of 1995 Alaska commercial salmon harvests by fishing area and species, in thousands of fish.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region	281[a/]	2,490	3,820	21,200	5,740	33,500
Cordova	47	1,462	662	26,300	1,520	29,991
Upper Cook Inlet	15	2,700	400	100	250	3,465
Lower Cook Inlet	1	254	12	1,870	75	2,212
Bristol Bay	102	40,300	80	0	950	41,432
Central Region	165	44,700	1,150	28,300	2,790	77,100
Kodiak	25	2,400	310	18,200	800	21,735
Chignik	7	1,680	200	1,100	240	3,227
South Peninsula	10	4,000	300	7,000	1,800	13,110
North Peninsula	15	2,700	200	5	200	3,120
Aleutian Islands	0	0	0	5	0	5
Westward Region	57	10,800	1,010	26,300	3,040	41,200
AYK Region	158	165	1,080	250	1,710	3,360
TOTAL ALASKA	**661**	**58,200**	**7,060**	**76,100**	**13,300**	**155,000**

[a/] The harvest quota for 1995 has yet to be negotiated by the Pacific Salmon Commission.

Columns and rows do not total exactly due to rounding.

Corrected March 31, 1995. This table updates the table dated December 27, 1994.

Table 2. Preliminary projections of 1995 Alaska commercial salmon harvests by statistical region and species, in thousands of fish.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Statistical Region	281[a/]	2,490	3,820	21,200	5,740	33,500
Cordova	47	1,462	662	26,300	1,520	29,991
Upper Cook Inlet	15	2,700	400	100	250	3,465
Lower Cook Inlet	1	254	12	1,870	75	2,212
Kodiak	25	2,400	310	18,200	800	21,735
Chignik	7	1,680	200	1,100	240	3,227
South Peninsula	10	4,000	300	7,000	1,800	13,110
Central Statistical Region	105	12,500	1,880	54,600	4,690	73,700
North Peninsula	15	2,700	200	5	200	3,120
Aleutian Islands	0	0	0	5	0	5
Bristol Bay	102	40,300	80	0	950	41,432
AYK Region	158	165	1,080	250	1,710	3,363
Western Statistical Region	275	43,200	1,360	260	2,860	47,900
TOTAL ALASKA	**661**	**58,200**	**7,060**	**76,100**	**13,300**	**155,000**

[a/] The harvest quota for 1995 has yet to be negotiated by the Pacific Salmon Commission.

Columns and rows do not total exactly due to rounding.

Corrected March 31, 1995. This table updates the table dated December 27, 1994.

Table 3. Preliminary 1994 Alaska commercial salmon harvests by fishing area and species, in thousands of fish.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region	239	2,390	5,660	57,400	10,300	76,000
Prince William Sound	49	1,510	1,060	36,900	1,060	40,600
Upper Cook Inlet	20	3,570	581	520	299	4,990
Lower Cook Inlet	1	115	12	1,650	6	1,780
Bristol Bay	140	35,300	179	91	833	36,500
Central Region	210	40,500	1,830	39,200	2,200	83,900
Kodiak	23	2,880	296	8,160	739	12,100
Chignik	4	1,620	237	431	227	2,520
South Peninsula	10	2,110	256	9,180	2,190	13,700
North Peninsula	18	2,750	241	225	84	3,320
Aleutian Islands	0	0	0	860	1	861
Westward Region	55	9,360	1,030	18,900	3,240	32,600
AYK Region	146	191	962	1,070	796	3,170
TOTAL ALASKA	**650**	**52,400**	**9,480**	**117,000**	**16,500**	**196,000**

Columns and rows do not total exactly due to rounding.

Revised January 6, 1995

Table 4. Preliminary 1994 Alaska commercial salmon harvests by fishing area and species, in thousands of pounds.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region	3,870	14,300	42,800	172,000	78,700	312,000
Prince William Sound	1,090	8,700	10,300	115,000	8,980	144,100
Upper Cook Inlet	642	20,300	4,120	2,000	2,080	29,100
Lower Cook Inlet	18	469	150	4,970	35	5,640
Bristol Bay	2,530	197,000	1,450	340	4,640	206,000
Central Region	4,280	226,000	16,000	122,000	15,700	384,000
Kodiak	315	14,300	2,570	31,100	5,490	53,800
Chignik	72	10,100	2,000	1,490	1,630	15,290
South Peninsula	183	11,500	1,940	30,900	14,700	59,200
North Peninsula	344	15,200	2,130	727	533	18,900
Aleutian Islands	0	0	0	2,740	4	2,700
Westward Region	914	51,100	8,640	67,000	22,400	150,000
AYK Region	2,800	1,310	7,300	2,490	4,100	18,000
TOTAL ALASKA	**11,900**	**293,000**	**74,700**	**363,000**	**121,000**	**864,000**

Columns and rows do not total exactly due to rounding.

Revised January 11, 1995

Table 5. Preliminary 1994 Southeast Region commercial salmon harvests by fishing area and species, in thousands of fish.

Fishing Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	Total
Tree Point Drift Gillnet	1	100	47	264	490	902
Prince of Wales Gillnet	1	211	268	180	176	836
Stikine River Gillnet	2	97	45	35	28	207
Southern Districts Seine	9	1,250	500	19,900	1,450	23,100
Annette Island Fisheries	0	42	49	498	136	725
Southern Southeast Total	13	1,700	909	20,900	2,280	25,800
Taku-Snettisham Gillnet	5	106	188	402	214	915
Lynn Canal Gillnet	1	172	141	147	686	1,150
Yakutat Set Net	4	208	342	12	4	570
Northern Districts Seine	1	167	452	29,900	1,540	32,100
Northern Southeast Total	11	653	1,120	30,500	2,440	34,700
Southeast Troll[a/]	186	22	3,460	943	330	4,940
Hatchery Terminal Area Fisheries						
Gillnet	7	1	9	2	230	249
Seine	4	14	16	1,510	3,380	4,920
Private Hatchery Fishery	17	3	140	3,450	1,670	5,280
Miscellaneous[b/]	1	1	7	49	14	72
TOTAL SOUTHEAST REGION	**239**	**2,390**	**5,660**	**57,400**	**10,300**	**76,000**

[a/] Includes chinook salmon caught by troll gear from October 11, 1993 to September 16, 1994.
[b/] Includes salmon that were confiscated, sport fish derbies, or commercial test fisheries.

Columns and rows do not total exactly due to rounding.

Compiled January 6, 1995

Table 6. Preliminary 1994 Central Region commercial salmon harvests by fishing area and species, in thousands of fish.

Fishing Area	SPECIES					Total
	Chinook	Sockeye	Coho	Pink	Chum	
Bering River	0	28	259	0	0	287
Copper River	47	1,150	678	12	19	1,910
PWS General	0	59	16	21,700	78	21,900
PWS Hatcheries	1	80	22	10,500	380	11,000
Coghill District[a/]	0	34	81	3,600	558	4,270
Unakwik District[a/]	0	1	0	389	0	390
Eshamy District	0	159	1	566	16	743
PWS Miscellaneous[b/]	0	1	0	57	6	64
Prince William Sound Total	49	1,510	1,060	36,900	1,060	40,600
Southern District	1	64	1	1,590	3	1,660
Kamishak District	0	35	2	0	0	37
Outer District	0	6	1	13	0	20
Eastern District	0	9	7	45	3	64
Lower Cook Inlet Total	1	115	12	1,650	6	1,780
Central District	17	3,447	437	491	259	4,650
Northern District	3	120	144	29	40	337
Upper Cook Inlet Total	20	3,570	581	520	299	4,990
Naknek-Kvichak	6	16,300	7	12	201	16,500
Nushagak District	119	3,430	7	9	293	3,860
Egegik District	1	10,800	48	0	57	10,900
Ugashik District	4	4,370	20	0	49	4,440
Togiak District	11	401	97	70	233	811
Bristol Bay Total	140	35,300	179	91	833	36,500
CENTRAL REGION TOTAL	**210**	**40,500**	**1,830**	**39,200**	**2,200**	**83,900**

[a/] Includes both seine and gillnet catches.
[b/] Educational permits, confiscated fish, test fish, etc.

Columns and rows do not total exactly due to rounding.
Revised January 6, 1995

Table 7. Preliminary 1994 Westward Region commercial salmon harvests by fishing area and species, in thousands of fish.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kodiak Area	23	2,880	296	8,160	739	12,100
Chignik Area	4	1,620	237	431	227	2,520
South Peninsula	10	2,110	256	9,180	2,190	13,700
North Peninsula	18	2,750	241	225	84	3,320
Alaska Peninsula Total	28	4,860	497	9,410	2,270	17,100
Aleutian Islands	0	0	0	860	1	861
WESTWARD REGION TOTAL	**55**	**9,360**	**1,030**	**18,900**	**3,240**	**32,600**

Columns and rows do not total exactly due to rounding.

Revised January 6, 1995

Table 8. Preliminary 1994 Arctic-Yukon-Kuskokwim Region commercial salmon harvests by fishing area and species, in thousands of fish.

	SPECIES					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Kuskokwim River	16	49	725	31	271	1,090
Kuskokwim Bay	11	142	131	54	90	428
Kuskokwim Area Total	27	191	856	85	361	1,520
Lower Yukon River	105	0	0	0	55	160
Upper Yukon River[a/]	9	0	4	0	209	222
Yukon River Total	114	0	4	0	264	382
Norton Sound	5	0	102	982	18	1,110
Kotzebue Area	0	0	0	0	153	153
AYK REGION TOTAL	**146**	**191**	**962**	**1,070**	**796**	**3,170**

[a/] The Upper Yukon River catch includes the estimated harvest to produce roe sold.

Columns and rows do not total exactly due to rounding.

Revised January 6, 1995

Table 9. Comparison of actual and forecast 1994 salmon runs, with errors and relative errors for some major Alaska salmon fisheries, in millions of fish.[a/]

Area	Species	1994 Estimated Run[b/]	1994 Escapement	1994 Harvest	Forecast Run	Forecast Harvest	Error[c/]	Relative Error[d/]
Southeast Total	Pink	97.0	39.6	57.4	78.2	46.9	-18.800	-19%
Prince William Sound[e/]	Pink	40.2	3.30	36.9	26.7	24.1	-13.5	-34%
	Chum	1.28	0.22	1.06	1.46	1.09	0.18	14%
	Sockeye	0.456	0.098	0.358	0.566	0.494	0.110	24%
	Coho	Unknown	Unknown	0.123		0.158		
	Chinook	Unknown	Unknown	0.002		0.0089		
Copper River	Sockeye	1.84	0.69	1.15	1.35	0.68	-0.49	-27%
	Chinook	0.065	0.017	0.048	0.0496	0.0346	-0.015	-23%
	Coho	0.727	0.049	0.678		0.308		
Bering River	Coho	0.281	0.022	0.259		0.124		
Upper Cook Inlet	Sockeye	5.2	1.6	3.6	3.3	2.0	-1.90	-37%
Lower Cook Inlet	Pink	2.04	0.39	1.65	1.00	0.60	-1.04	-51%
Kodiak	Pink	12.45	4.29	8.16	17.9	13.7	5.450	44%
Karluk, early	Sockeye	0.52	0.261	0.259	0.6	0.4	0.080	15%
Karluk, late	Sockeye	0.694	0.587	0.107	0.65	0.175	-0.044	-6%
Ayakulik	Sockeye	0.424	0.38	0.044	0.425	0.175	0.001	0%
Frazer	Sockeye	0.65	0.241	0.409	0.7	0.525	0.050	8%
Upper Station, early	Sockeye	0.095	0.038	0.281	0.12	0.06	0.025	26%
Upper Station, late	Sockeye	0.457	0.222	0.235	0.425	0.25	-0.032	-7%
Chignik	Sockeye	3.03	1.00	2.03	2.59	1.94	-0.436	-14%
Bristol Bay	Sockeye	52.0	15.2	36.8	56.0	43.2	3.970	8%
Nushagak	Chinook	0.236	0.096	0.140	0.151	0.076	-0.085	-36%
TOTAL		**440**	**412**	**481**	**303**	**109**	**-137**	**-31%**

[a/] Table updated April 4, 1995.
[b/] Run is Harvest plus Escapement.
[c/] Error is Forecast Run minus Run.
[d/] Relative Error is Error divided by Run times 100%.
[e/] Excludes Copper River.

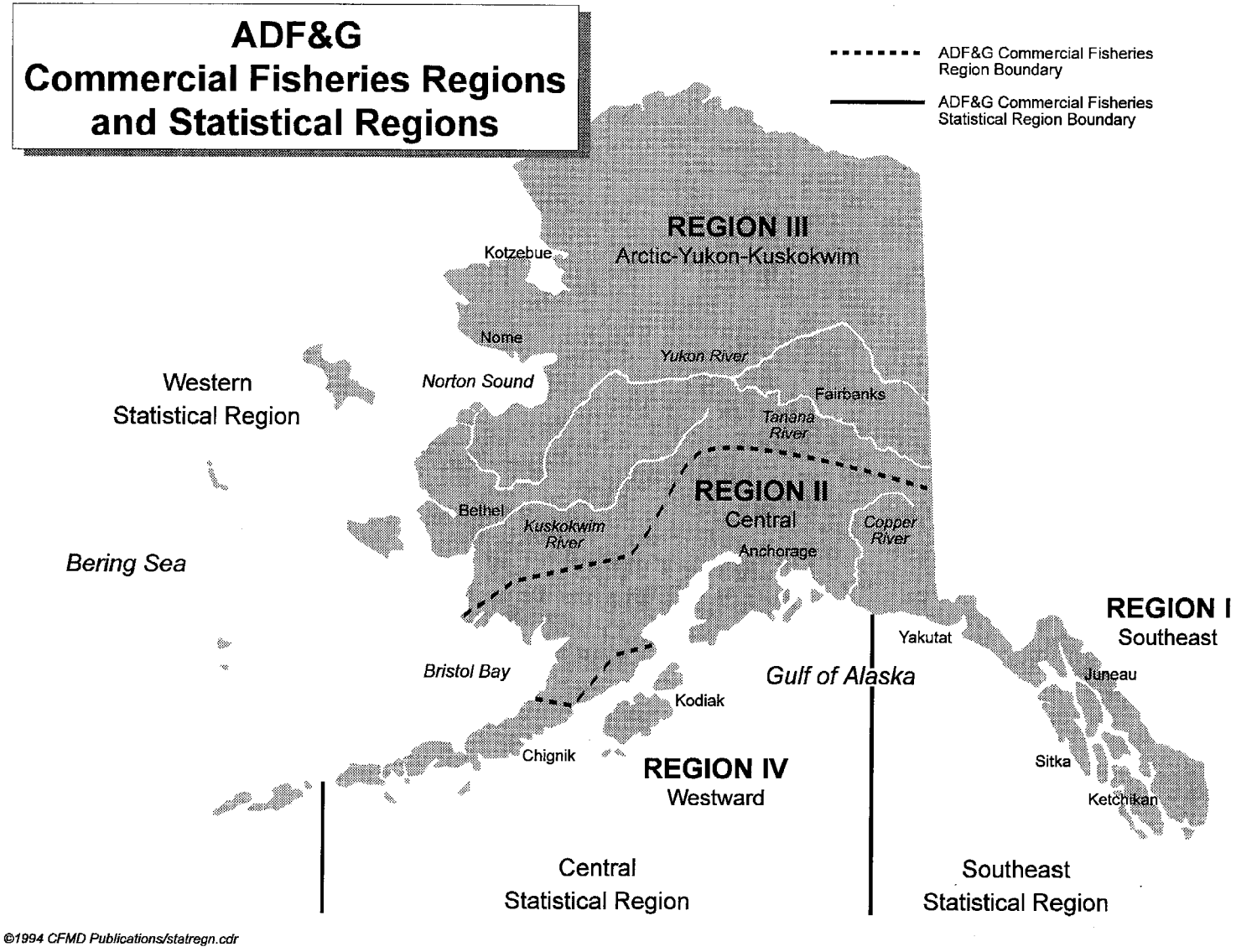

Figure 1. The three statistical regions (Western, Central, Southeast) and the four fisheries regions (Westward, AYK, Central, Southeast) of the Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division.

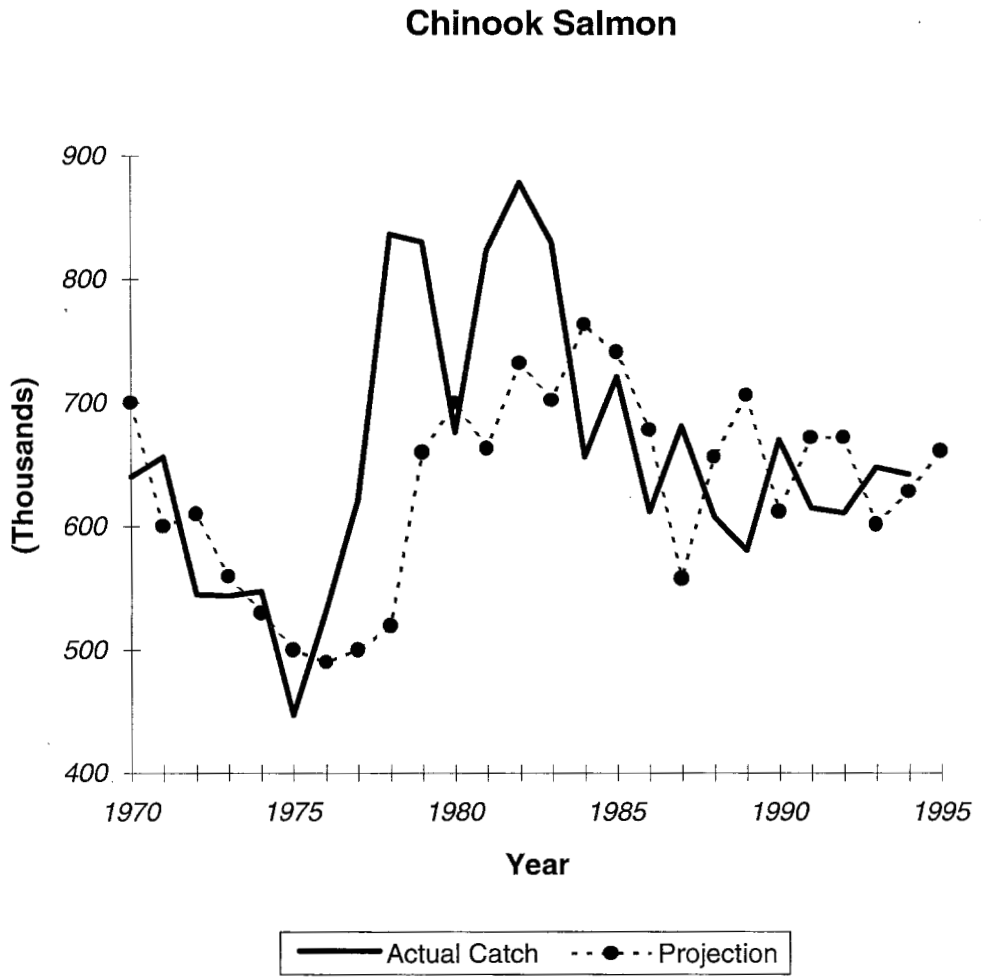

Figure 2. Relationship between actual catch (thousands) and projected catch (thousands) for Alaskan chinook salmon from 1970–1994, with the 1995 projection.

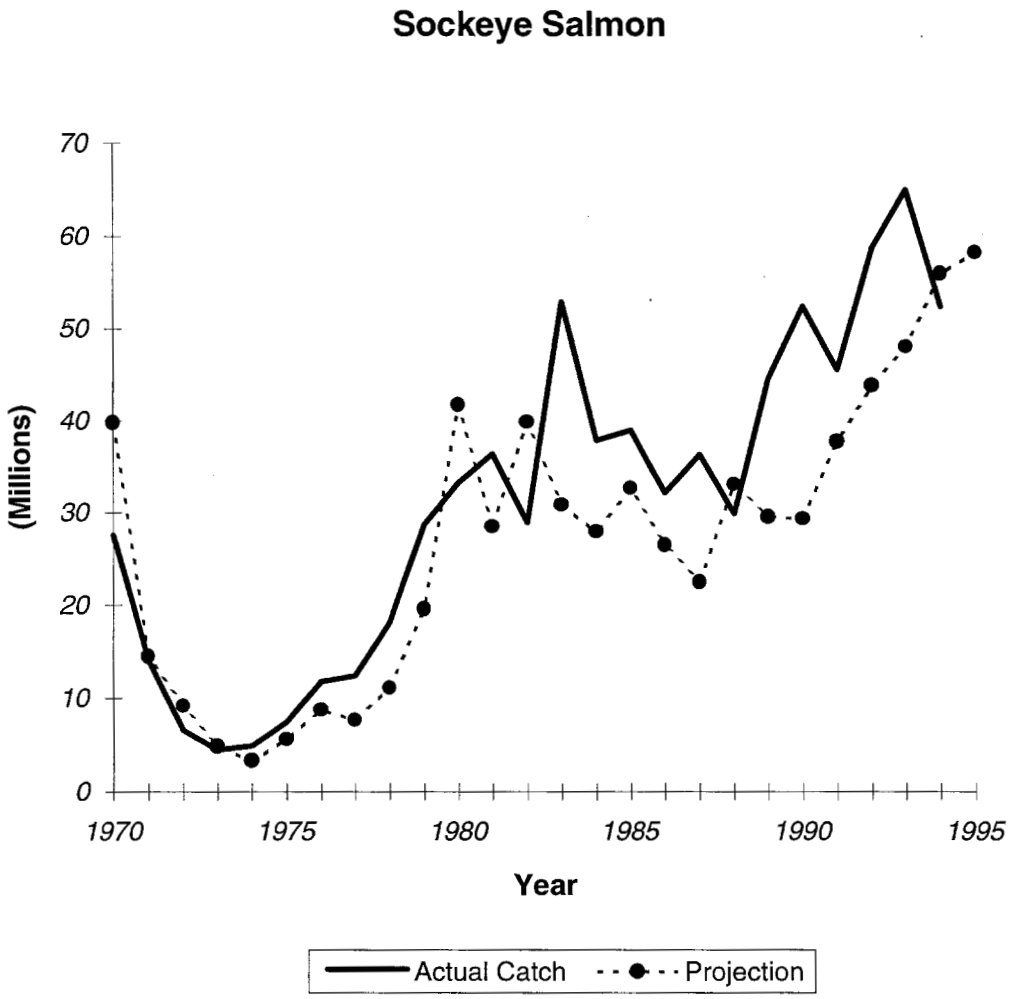

Figure 3. Relationship between actual catch (millions) and projected catch (millions) for Alaskan sockeye salmon from 1970–1994, with the 1995 projection.

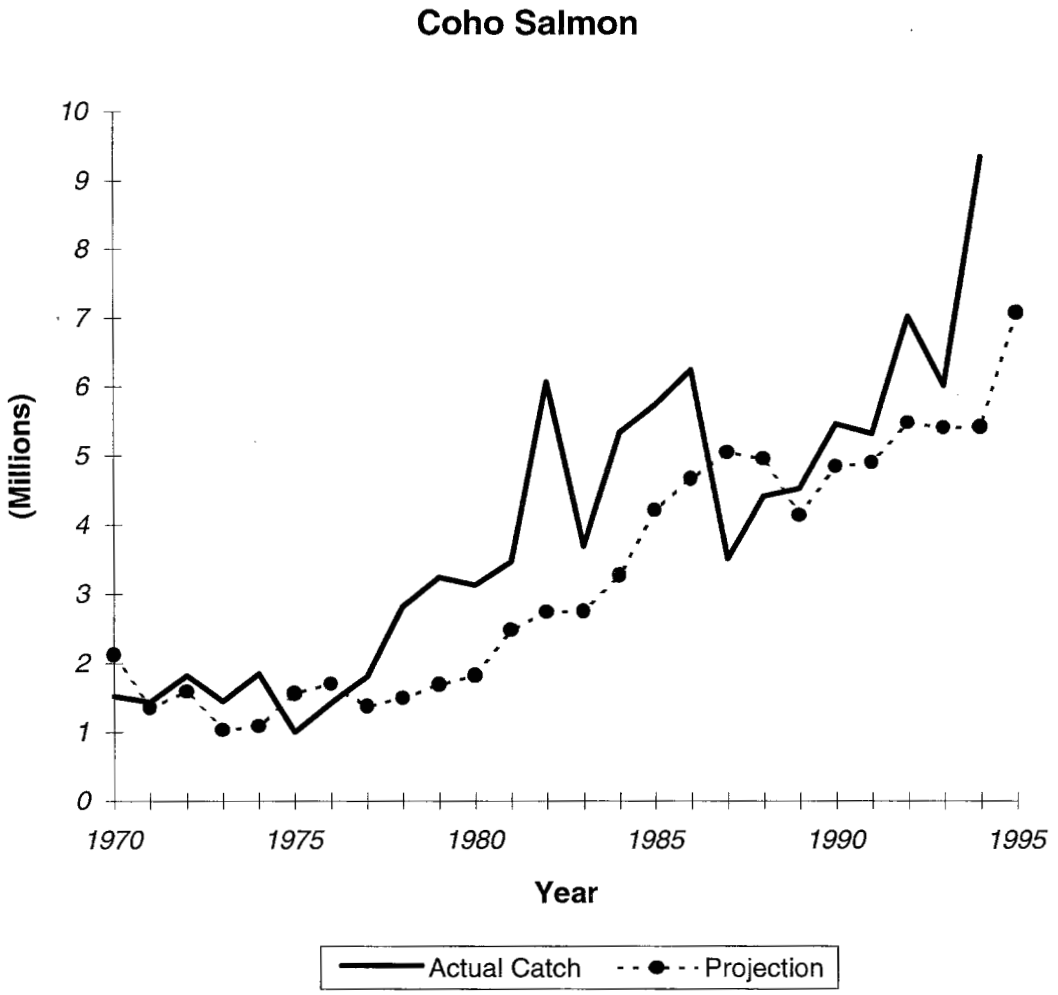

Figure 4. Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon from 1970–1994, with the 1995 projection.

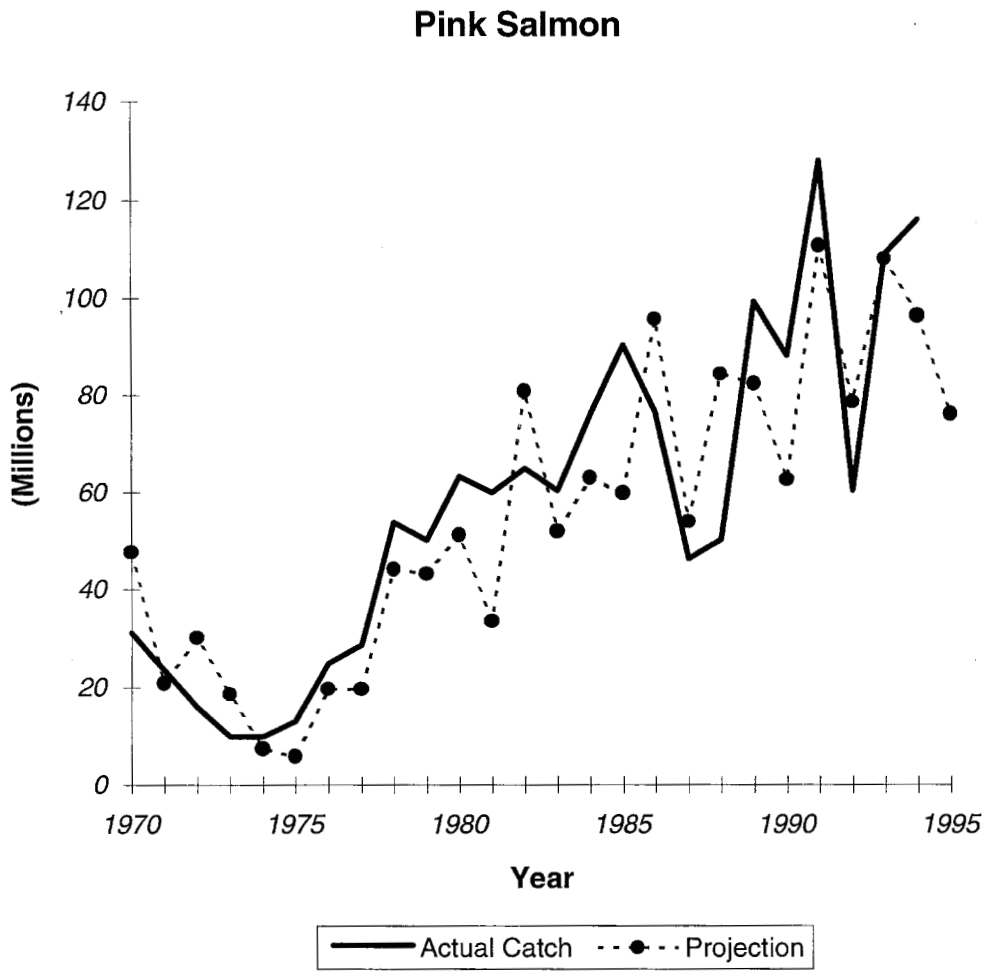

Figure 5. Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon from 1970–1994, with the 1995 projection.

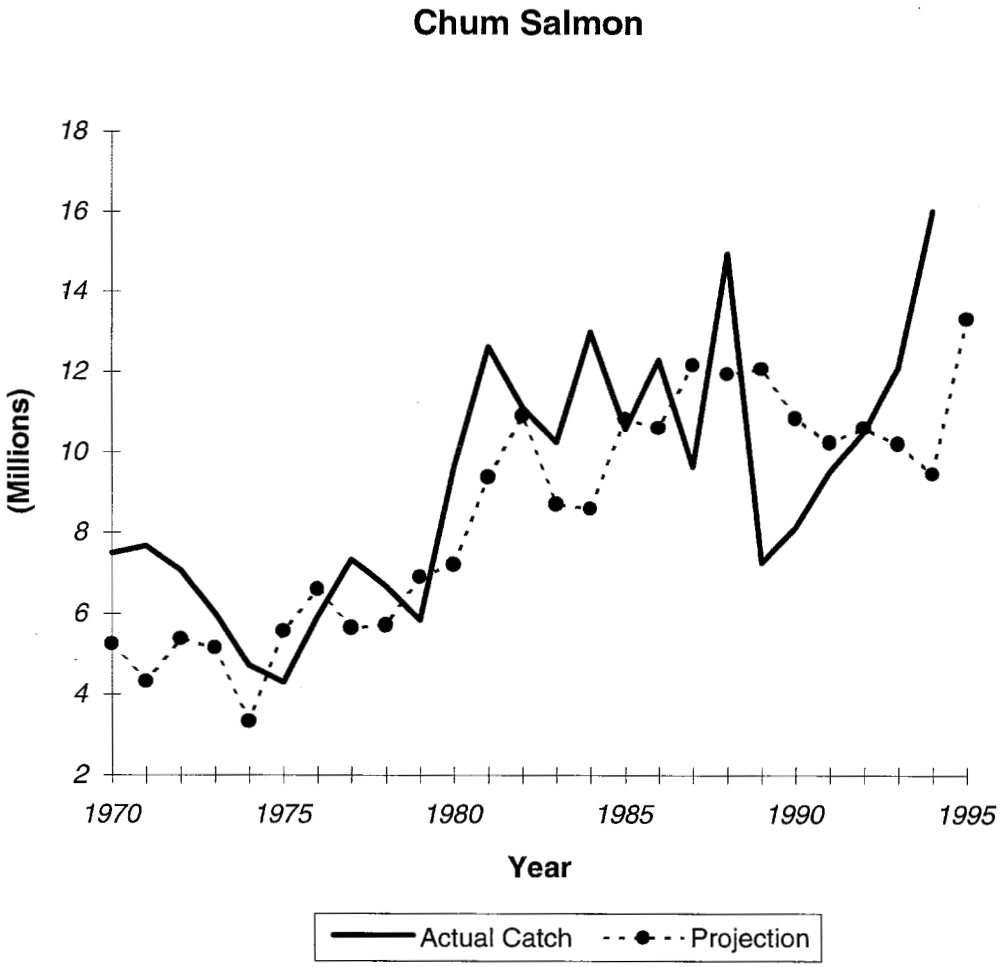

Figure 6. Relationship between actual catch (millions) and projected catch (millions) for Alaskan chum salmon from 1970–1994, with the 1995 projection.

APPENDIX

FORECAST AREA: **Southeast Alaska**

SPECIES: **Pink Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (millions)
NATURAL PRODUCTION:	
Natural Run	51.0
Escapement Goal	31.0[1/]
Commercial Common Property Harvest	20.0
HATCHERY AND SUPPLEMENTAL PRODUCTION:	
Hatchery Run	1.4
Brood Stock Needs	0.2
Commercial Common Property Harvest[2/]	1.2
TOTAL PRODUCTION:	
Total Run	52.4
Escapement Goal	31.2
Commercial Common Property Harvest[2/]	21.2

[1/] An expansion factor of 2.5 was applied to the escapement index to convert the index to an estimate of total escapement. In addition the escapement-index goal for southern Southeast was changed from a point goal of 6.0 million to a range of 6.0–9.0 million.

[2/] Includes commercial common property and hatchery cost recovery harvests.

INTRODUCTION:

Programs designed specifically for collecting data relevant to estimating the magnitude of Southeast Alaska's pink salmon returns have been eliminated. Consequently, we have deemed it inappropriate to make predictions based solely on formal statistical models. However, information available from other sources (National Oceanic and Atmospheric Administration [NOAA] temperature and precipitation data, management escapement data, management and fleet field observations) allows us to provide an estimate that we feel is more informative than a simple historic average. As a result, the 1995 Southeast Alaska pink salmon harvest estimate is a subjective combination of a model forecast, historic average harvests,

and expert opinion. We hope to refine this forecasting method in the future as we learn how to better weigh the various inputs.

FORECAST METHODS:

This year's prediction is based on selecting one of five different harvest magnitude categories. The categories were obtained by calculating the 20, 40, 60, 80, and 100th percentile of Southeast Alaska's pink salmon harvest during the 1980 through 1993 time period. The categories are:

DISASTER	14 MILLION OR LESS
WEAK	15 TO 25 MILLION
AVERAGE	26 TO 37 MILLION
STRONG	38 TO 57 MILLION
EXCELLENT	58 MILLION OR MORE

Category selection was made by subjective weighting of the following information:

1. During routine escapement surveying in 1993, biologists noted numerous streams in which drought-induced prespawn mortality had occurred. The majority of the drought-affected streams were on Prince of Wales Island, which produces a significant proportion of the southern Southeast return. Drought-induced mortality was also noted in several streams in the Petersburg Management Area. Major prespawn die-offs were not reported in the streams of the Sitka or Juneau Management Areas.

2. Precipitation records from five NOAA weather stations in southern Southeast indicate that the drought of 1993, as measured by total precipitation over the June 1 through September 30 time period, was the second worst in the history of NOAA precipitation records, which extends back to 1949. The all-time record drought year was 1965; the total harvest in southern Southeast in 1967 was only 0.6 million. However, the disastrous return in 1967 was influenced by both drought and a very poor brood year escapement index of 3.5 million. The brood year escapement index for 1995's return was 8.0 million. If the drought's severity is measured as the total precipitation from June 1 through October 15, the drought of 1993 was the most severe since 1949. Northern Southeast also experienced drought conditions; however, they were not the record-setting drought conditions present in southern Southeast, and no major prespawn die-offs were observed.

3. A small-scale early marine program was conducted in 1994 in southern Southeast Alaska in an attempt to evaluate the effect of the 1993 drought. The study involved visual fry abundance estimates within preselected transects. The transect areas were the same as had been used during the southern Southeast early marine study, which had been conducted from 1984 through 1989. This study did not provide the type of quantitative data that can be incorporated into a prediction model. However, the researcher who made the majority of the fry-abundance estimates prior to

1989 also made them in 1994. His impressions were that the fry abundance in all transect areas were well below those observed in 1984 and 1985, which produced the large returns in 1985 and 1986.

4. The escapements in 1993 in northern Southeast were unevenly distributed. Districts 109, 112, 113, and 114 all achieved adequate escapements, while Districts 110 and 111 only achieved approximately 50% of the desired escapement levels. The most extreme example of inadequate escapements was the Nakina River, which has had escapement estimates as high as 1.0 million in recent years and had an escapement estimate in 1991 (brood year for 1993's return) of 576 thousand. No estimate of the 1993 escapement could be made because an inadequate number of pink salmon could be caught and marked for a valid marked/unmarked ratio estimate. The peak aerial count in 1993 was only 350, and observers on the ground indicated that the 1993 escapement was no more than a few thousand pink salmon.

5. Independent variables used in a multiple linear regression analysis included: (1) brood year escapement index, (2) average daily minimum winter (November 1 through February 29) air temperatures from NOAA weather stations throughout Southeast Alaska, and (3) sum of the previous two brood year escapement indices. These are the same variables used in last year's forecast model. As with last year, the years 1987 and 1988 were considered outliers and were removed from the model. The 1995 harvest forecast from this model is 56.6 million with a 95% prediction interval of 41.6–71.6 million. Although this model has a very good fit with historical data ($R^2 = 0.90$, $n = 26$), it was felt that the model would greatly overestimate 1995's harvest because it does not have a parameter in it to account for the effects of droughts.

FORECAST DISCUSSION:

Based on a subjective evaluation of the above points, we believe the 1995 harvest will be *WEAK*. Please note that the forecast model used in the past predicted a strong harvest. This model proved reasonably accurate with hindcasts 26 out of the last 28 years ($R^2 = 0.90$). The model greatly overpredicted the harvests in 1987 and 1988, and we believe it is overestimating 1995's harvest. However, if the drought did not reduce survival to the extent we believe, we could see an *AVERAGE* harvest in 1995. We would like to stress that this year's prediction should be viewed with more than the normal degree of skepticism since it is a subjective evaluation of factors influencing return rather than a statistical model.

The number of fry released from pink hatcheries in Southeast Alaska was not available at the time this report was prepared. Hatchery production was estimated by assuming a 77% survival from eggs to fry and a 2% survival from release to return (91.4 million green eggs x 0.77 survival to fry stage x 0.02 survival to return = 1.4 million adults returning).

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FORECAST AREA: **Prince William Sound**

SPECIES: **Pink Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (millions)	Forecast Range (millions)
NATURAL PRODUCTION:		
Prince William Sound General Districts		
Natural Run	7.7	3.5–16.7
Escapement Goal	1.4	
Harvest Estimate	6.3	
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
Valdez Fisheries Development Assoc. - Solomon Gulch Hatchery		
Hatchery Run	6.1	4.4–7.8
Brood Stock Needs	0.4	
Cost Recovery Needs[1/]	3.1	
Commercial Common Property Harvest	2.6	
Prince William Sound Aquaculture Corp. - Cannery Creek Hatchery		
Hatchery Run	3.7	1.2–6.2
Brood Stock Needs	0.3	
Cost Recovery Needs	1.2	
Commercial Common Property Harvest	2.2	
Prince William Sound Aquaculture Corp. - W. H. Noerenberg Hatchery		
Hatchery Run	7.2	4.7–9.6
Brood Stock Needs	0.3	
Cost Recovery Needs	2.5	
Commercial Common Property Harvest	4.3	
Prince William Sound Aquaculture Corp. - A. F. Koernig Hatchery		
Hatchery Run	4.2	3.6–4.9
Brood Stock Needs	0.2	
Cost Recovery Needs	1.5	
Commercial Common Property Harvest	2.5	

[1/] Valdez Fisheries Development Association (VFDA) sales are based upon fixed revenue needs. The lower and upper bounds are based upon variations in fish weight and price per pound.

FORECAST AREA: **Prince William Sound**

SPECIES: **Pink Salmon** (continued)

PRELIMINARY FORECAST OF 1995 RUN (continued):

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Run Estimate	28.8	17.4–45.2
Natural Escapement Goal	1.4	
Brood Stock Needs	1.2	
Cost Recovery Needs	8.3	
Commercial Common Property Harvest[2/]	18.0	

[2/] The lower bound of the common property harvest is greater than the total return minus natural escapement, brood, and sales needs because the lower bound of the total wild return is less than the escapement goal and hatchery fish cannot be used to make up a wild escapement deficit.

FORECAST METHODS:

Natural returns are predicted from a multiple linear regression using an alevin index for wild spawning streams and April through June sea-surface temperature anomalies in the northern Gulf of Alaska to predict returning adult numbers. The alevin index is calculated using alevin-density estimates from a systematic spring sampling program in 31 streams in Prince William Sound.

The forecast for hatchery returns is the sum of hatchery-specific forecasts. The forecast for each hatchery is the product of the number of fry released and the hatchery-specific historic mean marine-survival rate. The forecast interval is derived from the confidence interval around the mean of the marine-survival data.

The projected brood stock needs for each facility are fairly accurate, but sales harvest (cost recovery) numbers are preliminary. Prince William Sound Aquaculture Corporation (PWSAC) brood stock and sales are currently limited to 40% of their total return by corporate policy. The actual brood stock and sales harvest will depend upon inseason estimates of their return.

FORECAST DISCUSSION:

The 1993 pink salmon spawning escapement in Prince William Sound was only 75% of the desired goal and was the second-smallest odd-year escapement in the last 30 years. Despite the poor brood year escapement, the 1994 alevin index was slightly above average. The sea-surface temperature anomaly in

the spring of 1994 was also above average. The regression of the alevin index alone on the logarithm of return has not performed well for recent odd-year forecasts (R^2 = 0.22). From data collected in recent years, Cooney (1991)[1/] suggested a correlation between poor marine survival in the Prince William Sound pink salmon and the coincidence of cool April through July temperatures and low zooplankton (forage for fry) abundance. Our investigations indicated that of these two new variables, the sea-surface temperature anomaly accounted for more variability in pink returns than did zooplankton data. Hence, the latter were excluded from our model. The time series of sea-surface temperatures is almost as long as the series for the alevin index, but zooplankton data are only available from the early 1980s to the present. The failure of zooplankton data to enhance the performance of the model may simply be a function of small sample sizes.

The release of 488 million pink salmon from hatcheries in Prince William Sound in 1994 was the smallest since the hatcheries reached permitted production capacity in the late 1980s. The forecast of 21.2 million fish returning to hatcheries in 1995 is correspondingly low. Hatchery-specific marine-survival estimates, used to forecast hatchery returns, have been based upon coded wire tag results since 1987 and are considered very reliable. The projected return from the 1994 fry release is slightly lower than for comparable releases in the past because the average marine survival has decreased following recent run failures.

Sea-surface temperatures were considerably warmer than average in 1994. These temperatures coincided with average zooplankton abundance. This suggests that hatchery and wild fry entered an environment conducive to growth and good marine survival in 1994. Nevertheless, in spite of consideration of the low temperatures and zooplankton abundance in 1992, the 1993 forecast for both hatchery and wild pink salmon was far too high. The failure of the 1993 forecast, which included temperature and forage variables, demonstrates that other factors are affecting marine survival of pink salmon fry. Predation is one possibility. Predators, such as juvenile pollock and cod, have increased in abundance in the Sound in the last two or three years. If predation is higher now than in the past, the present forecast model cannot account for it and predictions for 1995 returns may be too high.

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PWS Salmon Research Project Leader
Cordova

[1/] Cooney R., and M. Willette. 1991. Regional-level investigations of pink salmon production responses to inter-annual variations in ocean temperatures: Cooperative Fisheries and Oceanographic Studies. 1991 Pink and Chum Workshop, Parkersville, British Columbia.

FORECAST AREA: **Prince William Sound**

SPECIES: **Chum Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound General Districts		
Total Run	260	111–759
Escapement Goal	227	
Harvest Estimate	33	
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
Valdez Fisheries Development Assoc. - Solomon Gulch Hatchery		
Hatchery Run	40.2	31.1–49.2
Brood Stock Needs	6.0	
Cost Recovery Needs	0.0	
Commercial Common Property Harvest	34.2	
Prince William Sound Aquaculture Corp. - W. H. Noerenberg Hatchery		
Hatchery Run	1,580	1,223–1,934
Brood Stock Needs	126	
Cost Recovery Needs	464	
Commercial Common Property Harvest	989	
TOTAL PRODUCTION:		
Run Estimate	1,880	1,365–2,742
Escapement Goal	225	
Brood Stock Needs	132	
Cost Recovery Needs	463	
Commercial Common Property Harvest	1,060	

FORECAST METHODS:

The natural-stock forecast is the pooled results of three separate regressions. The returns of 3- and 4-year-old fish are predicted from same-brood year pink salmon returns. The return of 5-year-old fish is predicted from sibling 4-year-old returns in 1994. The predicted total returns for all age groups are the sums of the predictions for individual ages.

The hatchery returns for 1995 are projected from fry releases in 1990, 1991, 1992, and 1993. We used an estimated marine survival of 1.82% and an average age composition for wild chum salmon from brood years 1978 through 1986. The marine-survival rate is based on six years of fry-release and adult-return data from the Main Bay Hatchery in Prince William Sound. This is the only hatchery for which formal quantitative methods (coded wire tagging results) were used to estimate the portion of the adult returns intercepted in the commercial harvest.

The projected brood stock needs for each facility are fairly accurate, but sales harvest (cost recovery) numbers are preliminary. PWSAC brood and sales of pink, chum, and a portion of their sockeye salmon returns currently compose 40% of their total return by corporate policy. The actual percentage will vary depending upon inseason estimates of their return and additional sales required to fund operations at the Gulkana Hatchery. VFDA does not sell any of their chum salmon return.

FORECAST DISCUSSION:

The forecast for natural chum returns in 1995 is the fifth lowest since 1965. This predicted return is largely driven by the disastrous returns of pink salmon from the 1991 brood year and the very low abundance of 4-year-old chum salmon in 1994.

Projected wild returns in 1995 are not much higher than escapement needs. It is unlikely there will be directed fisheries on these fish. Despite the poor projection for wild returns, the overall harvest of chum salmon in 1995 should exceed the 1965–1993 average. The majority of the harvestable surplus will be from returns to the W. H. Noerenberg Hatchery, which is now at peak production for early-run-timing chum salmon. The brood years that will contribute most to the 1995 return originate from releases subsequent to the implementation of freshwater rearing procedures for chum salmon at W. H. Noerenberg Hatchery. Based upon the strong returns of 1991 and 1990 brood year fish in 1994, this rearing strategy appears to boost marine survival and should contribute to a good hatchery return of 3-, 4-, 5- and 6-year-old fish in 1995. A stock of chum salmon having a late-season run timing has been maintained at Solomon Gulch Hatchery and returns of that stock should contribute approximately 34 thousand fish to the total chum harvest in 1995.

The confidence in the prediction of hatchery chum returns is low. The database for marine survival is limited to a few years of tagged returns to the Main Bay Hatchery. Average age-at-return data are similarly lacking for hatchery returns and there are at least some indications that it may not follow trends observed in wild stocks.

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FORECAST AREA: **Prince William Sound**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound - Coghill Lake		
Total Run	32.8	11.6–101.6
Escapement Goal	25.0	
Harvest Estimate	7.8	
Prince William Sound - Eshamy Lake		
Total Run	82.6	14.5–150.6
Escapement Goal	40.0	
Harvest Estimate	42.6	
Prince William Sound - Unakwik District		
Harvest Estimate	11.2	0.00–25.5
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
PWSAC - Main Bay Hatchery (Coghill Stock On-Site Returns)		
Hatchery Run	360	346–374
Brood Stock Needs	5	
Cost Recovery Needs	113	114–119
Commercial Common Property Harvest	242	
PWSAC - Main Bay Hatchery (Coghill River Returns)		
Hatchery Run	24.6	21.5–27.8
Brood Stock Needs	0.0	
Cost Recovery Needs	0.0	
Commercial Common Property Harvest	24.6	
PWSAC - Main Bay Hatchery (Eshamy Stock On-Site Returns)		
Hatchery Run	1.1	0.0–1.5
Brood Stock Needs	3.1	
Cost Recovery Needs	0.0	
Commercial Common Property Harvest	0.0	

FORECAST AREA: **Prince William Sound**

SPECIES: **Sockeye Salmon** (continued)

PRELIMINARY FORECAST OF 1995 RUN (continued):

	Forecast Estimate (thousands)	Forecast Range (thousands)
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
PWSAC - Main Bay Hatchery (Eshamy Bay Remote Returns)		
Hatchery Run	67.2	66.2–75.1
Brood Stock Needs	0.0	
Cost Recovery Needs	0.0	
Commercial Common Property Harvest	67.2	
PWSAC - Main Bay Hatchery (Eyak Stock On-Site Returns)		
Hatchery Run	2.9	2.9–3.2
Brood Stock Needs	0.2	
Cost Recovery Needs	2.7	
Commercial Common Property Harvest	0.0	
PWSAC - Main Bay Hatchery (Other Remote Returns)[1/]		
Hatchery Run	15.2	13.0–18.2
Brood Stock Needs	0.0	
Cost Recovery Needs	15.2	
Commercial Common Property Harvest	0.0	
TOTAL PRODUCTION:		
Run Estimate	595	460–774
Natural Escapement Goal	65	
Brood Stock Needs	8	
Cost Recovery Needs	129	
Commercial Common Property Harvest	393	

[1/] These are all 4-year-old fish returning from brood year 1991 releases of presmolts of Coghill stock origin into Marsha Bay Lake on Knight Island.

FORECAST METHODS:

The forecast for the natural Coghill Lake returns is the pooled results of four separate regressions. The returns of 4-year-old fish (age 1.2) are predicted with a sibling model, which uses returns of age-1.1 fish

from the prior year. The same sibling model is used to predict returns of age-1.3 fish from returns of the previous year's age-1.2 fish, returns of age-2.2 fish from returns of the previous year's age-1.2 fish, and returns of age-2.3 fish from the previous year's age-2.2 fish. Although catch- and escapement-at-age data exist for Coghill sockeye salmon from as far back as 1962, escapement data prior to the installation of the full weir in 1974 are unreliable. Escapement- and catch-at-age data in the regressions are from 1974 to the present.

The forecast for wild returns to Eshamy Lake is the mean of returns since 1965. The harvest projection for wild stocks in the Unakwik District is the mean of purse seine and gillnet catches in that district since 1968.

The forecast for Main Bay Hatchery on-site returns, which originate from the Coghill stock, are based on age-specific marine-survival rates from brood year 1987 and 1991 hatchery returns. These are the first series of brood year survival data available since the conversion of the hatchery to a sockeye facility in 1986. They are based on fry releases, catch-contribution estimates from coded wire tag recoveries, and brood stock data. In the absence of survival data from multiple brood years, the age-specific survival estimates for 24 separate release groups from four complete brood years were treated independently. The mean and variance of the estimates were used to predict the 1995 on-site return.

Releases of smolts originating from the Eshamy Lake stock and remote releases of smolts at the mouths of Coghill and Eshamy Rivers did not begin until 1991. Hence, only one complete brood cycle of data is available. Survival for these releases appears to differ from the survivals for comparable on-site returns of the Coghill Lake stock. Given the differences, it did not seem likely that returns of Eshamy-stock fish to Main Bay, or Coghill- and Eshamy-stock fish to remote-release sites, could accurately predict survival for the on-site releases of Coghill-stock fish. Instead, the one complete cycle of age-specific survival data for on-site and remote Eshamy-stock releases were used to predict those returns in 1995.

The projected brood stock needs for each stock are fairly accurate but sales harvest (cost recovery) numbers are preliminary. PWSAC brood and sales are currently limited to 40% of their early chum and sockeye (Coghill stock) returns and 30% of their late sockeye (Eshamy stock) returns. The actual harvest will vary depending upon inseason estimates of their return and additional revenues needed to operate the Gulkana Hatchery. Previously, the only area designated for sales harvest was in Main Bay. However, in 1995 the first significant returns from a 1993 remote release of excess Coghill-stock fry into Marsha Bay Lake will be harvested in Marsha Bay.

FORECAST DISCUSSION:

The forecasted total return of approximately 33 thousand sockeye salmon to Coghill Lake in 1995 is the third lowest forecast in the last 20 years. The poor forecast for the natural stock in Coghill Lake is largely due to the extremely poor returns of 3- and 4-year-old fish in 1994. The majority (70%) of returns to Coghill Lake have historically been 5-year-old fish of age 1.3. The returns of 4-year-old fish in 1994 were well below average. This bodes poorly for 5-year-old returns of age-1.3 fish in 1995. The returns

of age-1.1 fish were also very small in 1994 and a very weak return of 4-year-old fish, age 1.2, is likely in 1995.

The poor returns of wild Coghill sockeye salmon in recent years appear to be due in part to limnological conditions in the lake. Based on recent limnological studies, the escapement goal for Coghill Lake has been temporarily lowered to allow plankton populations to recover. Several thousand Coghill Lake sockeye salmon will likely be intercepted in the fisheries directed at early returns of chum salmon to the W. H. Noerenberg and Main Bay Hatcheries. For this reason it is extremely unlikely there will be any directed fishery for sockeye salmon in the Coghill District in 1995.

The Eshamy Lake stock is by far the single largest wild-stock contributor to the harvests of sockeye salmon outside of the Coghill District. Many of these fish have historically been intercepted incidentally in the purse seine fishery in the Southwest District. The extent of these interceptions is not precisely known but can be approximated based upon run-timing and age-composition data. Weir counts of the escapement to Eshamy River are available for the last 50 years.

The forecasts for returns to other remote-release sites are those destined for Marsha Bay Lake. Excess sockeye salmon fry from the Main Bay/Coghill stock were planted in Marsha Bay Lake on Knight Island in 1993.

Samuel Sharr, Fishery Biologist
PWS Salmon Research Project Leader
Cordova

FORECAST AREA: **Prince William Sound**

SPECIES: **Coho Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound General Districts		
Harvest Estimate	11.4	0.00–24.5
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
Valdez Fisheries Development Assoc. - Solomon Gulch Hatchery		
Hatchery Run	60.6	46.1–75.1
Brood Stock Needs	1.0	
Cost Recovery Needs	32.2	
Commercial Common Property Harvest	27.4	
Prince William Sound Aquaculture Corp. - W. H. Noerenberg Hatchery		
Hatchery Run	126.5	88.1–164.8
Brood Stock Needs	1.6	
Cost Recovery Needs	36.4	
Commercial Common Property Harvest	88.6	
TOTAL PRODUCTION:		
Run Estimate	198.5	134.2–239.9
Natural Escapement Goal	-------	
Brood Stock Needs	2.6	
Cost Recovery Needs	68.6	
Commercial Common Property Harvest	127.5	

FORECAST METHODS:

The harvest projection for wild fish is the mean of the historic harvest of wild stocks of coho salmon in Prince William Sound from 1968 to 1992 and 1994. The 1993 harvest numbers are not included in the average because a large portion of the hatchery return was untagged and the true wild contribution was not known.

The forecasts for hatchery returns are the product of the number of smolts released from each facility in 1994 and the average marine survival for each facility.

FORECAST DISCUSSION:

The mean marine-survival rate for Solomon Gulch Hatchery is 6.4% and for the W. H. Noerenberg Hatchery 8.5%. The time series of survival estimates for coho salmon is short — eight years for one hatchery and seven years for the other — and not all estimates are based on tagging studies. Even so, the estimates have been consistent from year to year. Note most coho production comes from hatcheries in Prince William Sound.

Samuel Sharr, Fishery Biologist
PWS Salmon Research Project Leader
Cordova

FORECAST AREA: **Prince William Sound**

SPECIES: **Chinook Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
Prince William Sound Aquaculture Corp. - W. H. Noerenberg Hatchery		
Hatchery Run	5.4	1.4–9.5
Brood Stock Needs	0.4	
Cost Recovery Needs	1.3	
Commercial Common Property Harvest	3.8	
TOTAL PRODUCTION:		
Run Estimate	-----	
Natural Escapement Goal	-----	
Brood Stock Needs	0.4	
Cost Recovery Needs	1.3	
Commercial Common Property Harvest	3.8	

FORECAST METHODS:

The prediction for the hatchery return is the sum of predicted returns to the hatchery and remote sites, including Whittier, Valdez, and Cordova. These forecasts were generated by applying an overall average marine survival of 2% to the sum of the number of smolts released at each site. The marine-survival estimate is based on coded wire tag recovery data for two brood years.

FORECAST DISCUSSION:

There are a few tiny populations of wild chinook salmon in Prince William Sound that do not contribute significantly to area fisheries. W. H. Noerenberg Hatchery is still in the brood stock building phase for this species. The largest hatchery releases are at the W. H. Noerenberg Hatchery. Remote releases are smaller and are designed to contribute mostly to sport fisheries near the larger communities in Prince William Sound.

Samuel Sharr, Fishery Biologist
PWS Salmon Research Project Leader
Cordova

FORECAST AREA: **Prince William Sound/Copper River**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Natural Run	1,335	803–1,866
Escapement Goal[1]	480	
Commercial Common Property, Subsistence, Personal Use, and Sport Harvest	855	
SUPPLEMENTAL PRODUCTION:		
Gulkana Hatchery		
Hatchery Run	315	290–341
Brood Stock and Stream Escapement	110	
Commercial Common Property, Subsistence, Personal Use, and Sport Harvest	205	
TOTAL PRODUCTION:		
Total Run	1,650	1,090–2,210
Natural Escapement Goal[1/]	480	
Brood Stock and Surplus	110	
Commercial Common Property, Subsistence, Personal Use, and Sport Harvest	1,060	

[1/] Includes sonar counts and expanded aerial survey counts.

FORECAST METHODS:

Natural production was predicted using average return-per-spawner estimates for the most recent five years of 5-year-old parent-year escapements (1985–1989) and parent-year escapements weighted by age class (4-, 5-, and 6-year-olds) for the Copper River Delta and Upper Copper River. The 1995 predicted run was influenced heavily by the 1990 and 1991 brood years, and 5-year-old returns from the 1990 brood year are expected to be the strongest for both the Copper River Delta and Upper Copper River. Forecasts in previous years differed from current methods in that return-per-spawner estimates were

generally estimated using the five years of returns most similar in magnitude to the 5-year-old parent-year run.

Supplemental production from Gulkana Hatchery was predicted using survival estimates based on coded wire tag recoveries in escapement samples in Crosswind and Summit Lakes. Survival of Paxson Lake releases was assumed to be intermediate between these estimates. The estimated average harvest rate in all fisheries for 1966–1994, 65.3%, was used to forecast the harvest.

FORECAST DISCUSSION:

Previous forecasts relied on a weak, negative relationship between number of spawners and subsequent returns using return per spawner for parent-year abundances similar to that of the dominant age class of the year being forecasted. However, Copper River sockeye salmon return-per-spawner estimates since 1966 appear to be somewhat cyclic and the current trend is through a period of returns-per-spawner higher than the previous 5-year average. It is theorized that returns per spawner are linked to cyclic environmental conditions. If this is true and this trend continues, present conditions should produce returns per spawner similar to that of recent years. The average for the most recent five years was used to estimate 1995 returns.

John Wilcock, Fishery Biologist
CBR Salmon Research Project Leader
Cordova

FORECAST AREA: **Copper River**

SPECIES: **Chinook Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Total Run	65.4	43.3–87.5
Escapement Goal	15.0	
Commercial Common Property, Subsistence, Personal Use, and Sport Harvest	50.4	

FORECAST METHODS:

The 1995 chinook salmon forecast utilized historical aerial-index data. The sum of parent-year, age-specific contribution estimates was multiplied by the ratio of historical average escapement indices to average total harvests. In effect, the expected run is a return-per-spawner calculation that does not consider relative density, climatic conditions, or distribution of spawners.

FORECAST DISCUSSION:

During the past 12 years, chinook runs to the Copper River have tended to be above average and have established several of the top catches on record. Escapements have generally been maintained at high levels. No adverse climatic condition or other event is believed to have significantly affected any of the brood years involved.

John Wilcock, Fishery Biologist
CBR Salmon Research Project Leader
Cordova

FORECAST AREA: **Copper and Bering Rivers**

SPECIES: **Coho Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
HARVEST PROJECTION FOR NATURAL RUN:		
Copper River District	333	134–532
Bering River District	132	0–269

FORECAST METHODS:

The harvest projection for the 1995 run of coho salmon to the Copper and Bering River areas is based on the average catch in the commercial fishery for 1980–1994.

FORECAST DISCUSSION:

Although there were occasional departures from long-term averages for temperature, snow cover, water level, and weather conditions during the freshwater residency, the two major brood years (1991 and 1992) were generally within normal ranges and survival is expected to be good. The 1994 run was the highest on record and 2- and 3-year-olds contributed approximately equal numbers of returns. Although return-per-spawner and sibling-return relationships have not yielded satisfactory results for predicting run strength in the past, an average or above average return of 3-year-old salmon in 1995 seems probable.

Possibilities for forecast improvements include collection and examination of environmental data for freshwater residency years and inclusion of overwinter survival data from U.S. Forest Service spawning channels.

John Wilcock, Fishery Biologist
CBR Salmon Research Project Leader
Cordova

FORECAST AREA: **Upper Cook Inlet**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (millions)	Forecast Range (millions)
NATURAL PRODUCTION:		
Total Run	3.9	1.3–11.9
Escapement Goal	1.2	
Commercial Common Property Harvest	2.7	

Forecasted runs to individual systems are: Crescent River = 122 thousand; Fish Creek = 123 thousand; Kasilof River = 591 thousand; Kenai River = 2.3 million; Packers Creek = 84 thousand; and Susitna River = 652 thousand.

FORECAST METHODS:

Forecasts were made for each major age class in each of the six major sockeye salmon systems in Upper Cook Inlet: Kenai, Kasilof, Susitna and Crescent Rivers, and Packers and Fish Creeks. Spawner, sibling, fall fry, and smolt data were examined for each system, if available. Final forecasts for all systems were made from two regression models: one using spawner data and the other using sibling data. Individual system and age forecasts and 80% confidence bounds were then combined to provide a total Upper Cook Inlet run forecast estimate and range.

FORECAST DISCUSSION:

The actual total run to Upper Cook Inlet in 1994 was 5.2 million sockeye salmon, while the preseason forecast was only 3.3 million. The difference between the preseason forecast and the actual run was almost entirely due to a much greater-than-expected return of age-1.3 sockeye salmon to the Kenai River system, as well as a much greater-than-expected return of all ages to the Kasilof and Susitna River systems.

The total run to Upper Cook Inlet in 1995 is predicted to be 3.9 million sockeye salmon with a commercial common property harvest of 2.7 million. A harvest of this size would be about half of the 1985–1994 average harvest of 5.3 million sockeye salmon but similar to the 1975–1984 average harvest of 2.1 million sockeye salmon. Runs are expected to exceed spawning-escapement goals for all systems.

Several difficulties existed in formulating a 1995 forecast for the Kenai River. First, smolt data indicated the 1995 run would be small due to a high winter mortality of juveniles. However, these data were not used for the 1995 forecast since (1) the number of smolts caught in 1992 was insufficient to make a precise estimate of smolt population size, (2) available data for the Kenai River suggested that traps could not be used to accurately estimate smolt production consistently, and (3) smolt data used for the 1994 forecast did not accurately predict the 1994 adult run. If smolt data correctly reflected low survival of juveniles during the 1991–1992 winter, the actual 1995 run to the Kenai River could be about 1.0 million sockeye salmon less than the preseason forecast.

Second, spawner and sibling data often provided very different predictions for the same age class. The sibling model used to forecast the age-1.3 run component was only about half that of the prediction based on the spawner model, while the spawner model used to forecast the age-1.2 run was about twice that of the prediction based on the sibling model. This suggests that the actual run of age-1.3 sockeye salmon could be greater than the preseason forecast, while the actual run of age-1.2 sockeye salmon could be less than the preseason forecast.

Finally, the sibling model used to forecast age-2.3 sockeye salmon in 1995 was based on a record run of age-2.2 sockeye salmon in 1994. Since the data used to make the 1995 forecast were outside the range of data used to build the model, the actual run of age-2.3 sockeye salmon in 1995 could be 300 thousand sockeye salmon less than the preseason forecast.

Difficulties also existed in formulating 1995 forecasts for other Upper Cook Inlet systems. Most notably, the 1995 forecast for Crescent River age-1.3 sockeye salmon was based on a sibling model that did not fit existing data very well and, therefore, had a very wide confidence interval. Forecasts for both Susitna and Kasilof River age-1.3 sockeye salmon were based on sibling models that had slightly better statistical fits than spawner models, but predicted lower runs.

Kenneth E. Tarbox
Research Project Leader
Soldotna

FORECAST AREA: **Lower Cook Inlet**

SPECIES: **Pink Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Total Run	840	190–3,790
Escapement Goal[1/]	370	275–470
Commercial Common Property Harvest[2/]	470	
SUPPLEMENTAL PRODUCTION:		
Total Run	1,520	610–2,440
Brood Stock	120	
Commercial Harvest[3/]	1,400	
TOTAL AREA PRODUCTION:		
Total Run	2,360	800–6,230
Brood Stock and Escapement	490	
Commercial Common Property Harvest[4/]	1,870	

[1/] Escapement goal for systems included in the formal forecast. The total Lower Cook Inlet pink salmon escapement goal, including systems without a forecast, is 489 thousand.

[2/] Harvest = total run - escapement goal + escapement shortfall projected in Port Graham.

[3/] Common property + cost recovery.

[4/] Additional harvests may be expected in systems not included within the forecast.

FORECAST METHODS:

The forecast of wild pink salmon runs to 11 harvest areas in the Lower Cook Inlet Management Area was based on log-log regression and Ricker analysis using 19 to 33 years of escapement observations. The projected harvest from natural production was obtained by subtracting both escapement goals and escapement shortfalls from the forecast. The forecast range of supplemental production in Tutka Bay was

based on ocean-survival rates of 1–4%. The projected harvest from supplemental production was obtained by subtracting brood stock goals from the supplemental production forecast.

FORECAST DISCUSSION:

The natural production model was tested with computer simulation. The model was able to correctly forecast 28 out of 32 directions of change in annual run size. Accordingly, we have some confidence that the 1995 run will continue the odd-year cycle; that is, larger-sized runs during odd-numbered years. However, the model has performed poorly when forecasting the magnitude of the change in run size. Although 10 of the 11 systems with a forecast in 1994 had runs within the forecast range, we have less confidence in the magnitude of the forecast.

In the Southern District, harvests are projected to be 47 thousand in Humpy Creek and 31 thousand in Seldovia. No harvest is expected in Port Graham, which did not have escapement levels within its range of escapement goals during 1993. Additional harvests are expected in China Poot Bay and the Barabara Creek area. Southern District supplemental production of pink salmon has made significant contributions to the total Lower Cook Inlet commercial harvest. Contributions have ranged from 24–90% in recent years. However, recent hatchery cost recovery requirements have reduced the harvest available for the common property fishery. Short-term-rearing enhancement projects are expected to produce harvests of 1.4 million pink salmon in Tutka Bay and Tutka Lagoon. The Halibut Cove Lagoon short-term-rearing enhancement project was discontinued and no harvest is expected in Halibut Cove Lagoon.

In the Outer District, harvests are projected to be 9 thousand in Port Chatham, 14 thousand in Windy Bay, 5 thousand in Rocky Bay, 224 thousand in Port Dick, and 25 thousand in Nuka Bay.

In the Eastern District, a harvestable surplus of 21 thousand pink salmon is projected for Resurrection Bay.

In the Kamishak Bay District, a harvestable surplus of 98 thousand is expected in Bruin Bay and 50 thousand in Ursus and Rocky Coves.

Henry Yuen, Research Biologist
Lower Cook Inlet Management Area
Anchorage

Nick Dudiak, Area Resource Development Biologist
Lower Cook Inlet Management Area
Homer

FORECAST AREA: **Kodiak**

SPECIES: **Pink Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (millions)	Forecast Range (millions)
NATURAL PRODUCTION:		
Natural Run	13.3	12.2–14.4
Escapement Goal[1/]	3.0	3.0
Commercial Common Property Harvest	10.3	9.2–11.4
HATCHERY PRODUCTION:		
Hatchery Run[2/]	8.2	2.3–15.2
Brood Stock Needs	0.3	0.3
Commercial Common Property Harvest	7.9	2.0–14.9
TOTAL PRODUCTION:		
Total Run	21.5	14.5–29.6
Escapement Goal[1/]	3.3	3.3
Commercial Common Property Harvest	18.2	11.2–26.3

[1/] With the exception of hatchery production, all escapement values represent indexed escapement.

[2/] The Kitoi Bay Hatchery production forecast was prepared by Tim Joyce. See Afognak District in Forecast Discussion for details.

FORECAST METHODS:

The forecast for the 1995 natural or wild pink salmon run to the Kodiak Management Area was determined as follows: a point estimate for the total return to the Kodiak Management Area was calculated from a stepwise multiple regression analysis of the past 28 years of preemergent pink salmon sampling data. Variables used in the analysis were the indexed live-fry densities for Kodiak and Afognak, the March and April ambient air temperatures taken in Kodiak, and these temperatures' departure from the average. Eight combinations of variables were tested and the model with the lowest error and highest R^2 value was chosen. The model utilizing the unweighted live-fry index for Kodiak and Afognak and the average April temperature was chosen for the 1995 forecast. Because there has been an increase in the error of pink forecasts over the last several years, our confidence in the 1995 forecast is fair.

Odd-year survival rates from 1979–1993 brood years were used to forecast the 1995 Kitoi Bay Hatchery pink run. Due to good early marine rearing conditions and a record number of fry released, the Kitoi Bay Hatchery manager felt confident that the forecast of 8.2 million fish returning would be achieved.

FORECAST DISCUSSION:

Preemergent pink salmon fry sampling of Kodiak Management Area index streams, conducted during March and April of 1994, indicated only fair overwinter survival of eggs and sac fry. These fry were from an excellent brood year escapement in 1993; the indexed escapement estimate was 4.3 million pink salmon. Sampling resulted in an unweighted live-fry index of 190.64 live fry per square meter of spawning area. This live-fry index is the seventh highest odd-year index on record. Early spring conditions in 1994 were fair for outmigration and rearing in the nearshore ocean environment. Ambient air temperatures, as measured in Kodiak, were below average in March, but well above average from April through June. Kitoi Bay Hatchery Manager Tim Joyce noted that compared to recent years the spring plankton bloom seemed very good and should positively affect marine survival.

Late winter conditions for the eggs spawned in 1993 led to some concern for the 1995 return. Early winter conditions were fair but turned poor late winter near the timing of fry outmigration. For two weeks in late February and early March temperatures were below 0°F, with windchills driving the temperature down to -40°F along with heavy snowfall. This was followed by a warm period with heavy rain (on March 7 over 3 inches of rain fell in a 24-hour period). Some flooding damage to the pink salmon eggs was expected. Conditions throughout March were generally cold and blizzardy, but turned to warmer, rainy days in mid April. During the sampling period many of the index streams froze over, requiring our returning to those streams at later dates or modifying our sampling regimen. All lakes, including Karluk Lake, had begun to break up, but cold weather caused new ice to form. There were a few breaks in the ice on Karluk Lake and open water was present on the south end of Camp Island and on the north end of the lake at the outlet. Though signs of flooding and scouring were seen, fair to good survival was documented. March weather delayed sampling enough that there was not enough time to sample the Mainland District streams.

The 1995 forecast is broken down by district as follows:

Afognak District. The preemergent fry indices for this district were lower than the 1990 and 1992 indices; however, the densities are still high for an odd-year return. Fry densities for Seal Bay and Waterfall Creek (not included in the district summaries) were also lower than those found in 1990 and 1992. Due to fair to good early-marine conditions, a total return of approximately 1.4 million pink salmon is expected. The escapement goal is 250 thousand pink salmon, so the harvestable surplus is expected to be approximately 1.15 million pink salmon.

Afognak District Supplemental Production. Again, good early-marine conditions are expected to produce very good survival. The Kitoi Bay Hatchery manager commented that spring conditions, while cool to start, were much better than last year. He felt plankton production this spring was above

average. The condition of the fry upon release was excellent, so the Kitoi Bay Hatchery pink salmon return estimate is 8.2 million fish (from a release of 152 million reared fry and 11 million emergent fry). Only 250 thousand pink salmon are needed for escapement and brood stock requirements, leaving 8.0 million pink salmon available for harvest.

Westside Districts. Overall, live-fry densities for these districts were only fair. The upper portion of the Uyak River and the entire Uganik River showed signs of flood damage. Baumans, Terror, and Zachar Rivers all had above-average fry densities. Uganik River and Uyak 203 Creek had poor densities. The Uyak River had good fry densities but lower than the previous two samplings for odd-year returns. Good escapements of pink salmon in 1993 combined with fair early marine rearing conditions leads to a forecast of 5.4 million pink salmon expected to return to these districts. The escapement goal is 750 thousand pink salmon, leaving 4.7 million pink salmon available for harvest.

Alitak District. Live-fry densities for this district were well above the odd-year average. Flooding was evident on the Deadman River; however, fry densities remained above average. Humpy River had high densities of fry in the upper portion of the river, though only one site was sampled. The lower river had high numbers of dead, possibly frozen fry. Additionally, many dead fry were found along the gravel bars after a flood on March 29. Overall, fry densities for this system were still above average. As a result of high fry densities and favorable early marine conditions, a run of 3.0 million pink salmon is expected for this district. The escapement goal is 635 thousand pink salmon for the Alitak District, leaving about 2.4 million pink salmon available for harvest.

Eastside Districts. The overall live-fry index for this district is somewhat below average. There were high fry densities in the Seven, Kauignak, Saltery, and American Rivers. The Barling and Kiliuda Rivers showed signs of flooding damage and had low fry densities. The remaining streams had average to below average densities. If good spring conditions aid fry survival, the adult return in 1995 should be fair. Approximately 2.5 million pink salmon are forecasted to return to these districts, and subtracting the escapement goal of 750 thousand pink salmon, this leaves 1.8 million pink salmon available for harvest.

Mainland District. No sampling was conducted in the Mainland District because of weather. Pink salmon returns to the district have been weak for the past two years and the parent escapement for the 1995 return was the lowest since 1983. The pink salmon return in 1995 is not expected to exceed 1.0 million fish. Escapement requirements are 645 thousand, leaving a harvestable surplus of only 355 thousand pink salmon.

Kevin Brennan
Fishery Biologist
Kodiak

Ivan Vining
Biometrician
Kodiak

FORECAST AREA: **Kodiak, Upper Station Lakes**

SPECIES: **Sockeye Salmon, Early Run**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	100	80–120
Escapement Goal		50–75
Harvest Estimate		50

FORECAST METHODS:

The 1995 Upper Station early-run forecast is the pooled result of three separate regressions derived from the relationships of age-specific returns for post-1979 brood years. The age-1.3 prediction was determined from age-1.2 siblings; age-2.2 from age-2.1 late-run siblings, and age-2.3 from age-2.1 siblings. The lowest return of age-1.2s for the 1980–1990 brood years was used for the age-1.2 estimate.

FORECAST DISCUSSION:

In 1995 there should be about 5% more early-run Upper Station Lakes sockeye salmon in the Alitak Bay District than in 1994. The Alitak Bay District catch of early-run Upper Station sockeye salmon is expected to produce a 50 thousand-fish harvest, assuming the forecast is accurate and an escapement of 50 thousand is obtained.

About 65% of the early run is projected to be 2-ocean-age fish with the balance composed of 3-ocean fish. Age-2.2 fish should be 64% of the run followed by age-2.3 fish at 29%. Confidence in the forecast is fair. The sibling relationships used are not particularly strong.

In the Alitak Bay District, the early Upper Station sockeye run extends from early June to mid July; the peak is usually around mid June. Early-run Upper Station sockeye salmon are a bycatch of the targeted Frazer Lake sockeye salmon. Since the Frazer Lake run is expected to be strong in 1995, it is likely that only the lower end of the Upper Station early-run escapement goal will be met.

The error in the 1994 forecast was 26%.

FORECAST AREA: **Kodiak, Upper Station Lakes**

SPECIES: **Sockeye Salmon, Late Run**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	500	400–600
Escapement Goal		150–200
Harvest Estimate		300

FORECAST METHODS:

The 1995 Upper Station Lakes late-run forecast represents the sum of three age-specific estimates from regression equations developed from sibling- and escapement-return relationships for the post-1979 brood years and two age-specific estimates derived from smolt-abundance indices. The age-0.2 return was determined from brood year age-0. smolt numbers; age-0.3 from age-0.2 siblings; age-1.3 from age-1.2 siblings; and age-2.2 from age-1.2 siblings. The age-1.2 return was estimated from brood year age-1. smolt numbers.

FORECAST DISCUSSION:

The 1995 late sockeye run to Upper Station Lakes should be about 10% higher than the 1994 run. Two-ocean fish are expected to compose 77% of the run and 3-ocean fish 23%. About 30% of the 1995 run is expected to be ages-0.2 and -0.3 fish, combined. Age-1.2 fish are forecasted to compose 39%, age-2.2 fish 23%, and age-1.3 fish 8% of the return.

The 1995 Upper Station Lakes late-run forecast is for the Alitak Bay District only. If the fishing patterns and intensity are about the same on the west side of Kodiak Island as in 1994, the 1995 harvest of late Upper Station sockeye salmon in the Alitak Bay District should be about 300 thousand fish, 25% more than that harvested in 1994. The late Upper Station sockeye run timing extends from mid July to early September and peaks in mid August in the Alitak Bay District.

Our confidence in this forecast is good. Error in the 1994 forecast was 7%.

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Kodiak

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FORECAST AREA: **Kodiak, Frazer Lake**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	725	500–1,000
Escapement Goal	140–200	
Harvest Estimate	525	

FORECAST METHODS:

The 1995 Frazer Lake run forecast was derived from sibling relationships taken from recent brood year returns (1979–1991) and smolt (1990–1994) data. The run forecast is the product of six individual age class estimates. The age-1.1 return was determined from 1994 age-1. smolt numbers, age-1.2 from 1993 age-1. smolt numbers, and age-2.2 from age-2.1 siblings. The age-2.3 was derived from age-2.2 siblings, and the age-3.2 return was estimated using the 1993 age-3. smolt outmigrant estimate and the relationship of 1991–1993 age-2. and age-3. smolts to age-2. adult returns.

FORECAST DISCUSSION:

The 1995 Frazer Lake run should be similar in magnitude to the 1994 run. Two-ocean fish are expected to compose about 70% of the run and 3-ocean fish 30%. The dominant ages should be 2.2 (39%) and 3.2 (30%) fish.

The forecasted 1995 run of 725 thousand fish is for the Alitak Bay District only. We assume that fishing time and intensity on the west side of Kodiak Island will be about the same as in 1994. If this occurs, the Alitak Bay District catch should be about 525 thousand sockeye salmon of Frazer Lake origin. Frazer Lake run timing is from mid June to mid July; the peak is commonly in late June.

Our confidence in this forecast is fair, mainly because this is the first year we have forecasted an age-3.2 component. Typically, age-3.2 Frazer Lake fish constitute less than 5% of the return. In 1993 an estimated 4.7 million age-3. smolts outmigrated, which is about nine times more age-3 smolts than previously documented. For the 1995 run forecast, the estimated age-3.2 component is 215 thousand fish or 30% of the total run. Note, however, that the actual 1995 age-3.2 return could be much higher. Error in the 1994 forecast was 8%.

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FORECAST AREA: **Kodiak, Ayakulik River (Red River)**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	325	250–400
Escapement Goal	200–300	
Harvest Estimate	75	

FORECAST METHODS:

The 1995 Ayakulik sockeye run forecast represents the sum of six age-specific estimates determined from sibling relationships and smolt indices. The abundance of age-1.3 fish was estimated from age-1.2 siblings, while the age-2.3 return was estimated from age-2.2 siblings. Ages-1.1, -1.2, -2.1, and -2.2 returns were estimated from brood year smolt numbers.

FORECAST DISCUSSION:

The 1995 Ayakulik sockeye run is expected to be a 10-year record low, the product of unfavorable Red Lake rearing conditions from excessive brood year escapements. It can be expected that minimal, if any, commercial fishing time will occur within the Inner and Outer Ayakulik Sections of the Southwest Kodiak District. Poor Ayakulik runs should be expected for at least two more years. A recovery is expected in 1997 as preliminary data indicate a robust number of fry currently rearing in Red Lake. Another indicator is that food resources for the fry are good relative to zooplankton density, species composition, and size.

Although a portion of the 1995 run projection is derived from a limited smolt data set, our confidence in the forecast estimate is good. If the 1995 run materializes as projected, 2-ocean-age fish will compose about 35% of the run and 3-ocean-age fish 60%.

Error in the 1994 forecast was less than 1%.

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FORECAST AREA: **Kodiak, Spiridon Lake**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	160	75–250
Escapement Goal	0	
Harvest Estimate	160	

FORECAST METHODS:

The 1995 Spiridon Lake run forecast was derived from 1990–1991 brood year smolt numbers, 1994 run numbers, and parent-stock sibling-relationship data.

The run forecast is the product of three individual age class estimates. The age-1.2 return is based on 1991–1992 brood year age-1. smolt numbers and the 1993 age-1.2 return. The age-2.2 estimate is from the 1990 age-1. and age-2. smolt numbers and the 1994 age-1.2 adult return. Lastly, the age-1.3 estimate is derived using the 1993 age-1.2 return and the relationship of the logarithm of age-1.2 to age-1.3 siblings in the parent stock (Upper Station).

FORECAST DISCUSSION:

The 1995 Spiridon Lake sockeye run is expected to be 40% less than the 1994 run. Two-ocean-age fish should compose about 38% of the run and 3-ocean-age fish 62%. The dominant ages should be 1.3 (62%) and 1.2 (25%) fish.

The forecasted 1995 run of 160 thousand fish is for the Northwest Kodiak District only. Run timing is expected to extend from late July to mid September and the peak catch should occur in mid August. The confidence in this forecast is fair due to weakness in the data. More specifically, there is but one year of adult return data for Spiridon Lake sockeye salmon, and the relationship between age-1.2 and age-1.3 siblings in the parent stock is not strong.

Full (100%) exploitation of the 1995 Spiridon Lake sockeye run is expected. The Spiridon Lake sockeye run is the result of cooperative work between the Kodiak Regional Aquaculture Association and the Alaska Department of Fish and Game.

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FORECAST AREA: **Kodiak, Karluk Lake**

SPECIES: **Sockeye Salmon, Late Run**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run Estimate	825	700–950
Escapement Goal	400–550	
Harvest Estimate	350	

FORECAST METHODS:

The 1995 Karluk late-run forecast represents the sum of five age class estimates developed with sibling relationships. The age-2.2 return was estimated from age-1.2 siblings, while the age-2.3 return was calculated using age-1.3 siblings. The age-1.3 return was determined from age-1.2 siblings. The age-3.3 return was based on ages-2.2 and -1.3 siblings.

FORECAST DISCUSSION:

This is the second year that the late Karluk run has been forecasted. The data used in this forecast were limited to 1985–1994 run numbers, by age, that were assigned to the respective parent-year escapements to create a brood table. Smolt index data were not available.

If the late-run forecast is correct and the midpoint escapement goal of 475 thousand fish is obtained, a total of 350 thousand fish should be available for commercial harvest on Kodiak's westside from Raspberry Cape south to Sturgeon Head. In perspective, this would be a greater than three-fold increase over the estimated 1994 catch. Most of the 1995 late-run harvest is expected to occur between August 1 and September 15; the midpoint should be around August 25.

The 1995 late run is estimated to be about 75% 2-ocean-age fish and 25% 3-ocean-age fish. Age-2.2 fish from the 1990 brood (escapement) year is projected to be about 56% of the run.

Our confidence in this forecast is fair. Error in the 1994 forecast was estimated to be 6%.

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FORECAST AREA: **Kodiak, Karluk Lake**

SPECIES: **Sockeye Salmon, Early Run**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run	400	300–500
Escapement Goal	150–250	
Harvest Estimate	200	

FORECAST METHODS:

The 1995 Karluk early-run forecast represents the sum of four age class estimates mainly determined using sibling relationships. The return of age-2.2 fish was estimated using a regression relationship developed using the escapement to predict age-2.2 returns. The age-2.3 return estimate was determined using the sibling relationship of age-1.2 returns to age-2.3 returns. The age-3.2 return estimate was developed from an age-3.1 to age-3.2 sibling relationship, while the age-3.3 return estimate was based on a similar age-3.2 to age-3.3 sibling relationship.

FORECAST DISCUSSION:

This is the second year that a formal forecast has been prepared for the early Karluk sockeye run. All of the age-specific estimates were determined using 1985–1994 run numbers, by age, that were assigned to the respective parent-year escapements to create a brood table. While the data set is limited, the sibling relationships are statistically reasonable.

The expected total 1995 harvest of early-run Karluk sockeye salmon is 200 thousand fish from the Sturgeon Head north to Raspberry Cape reach. This is subject to the run materializing as forecasted and the escapement being held to the midpoint goal of 200 thousand. For comparison, the projected 1995 harvest represents about the same number of fish taken in 1994.

The 1995 early Karluk sockeye run is expected to be 60% 2-ocean-age fish and 40% 3-ocean-age fish. On Kodiak's westside, Karluk Lake early-run fish should be present from late May through mid July. The run midpoint should occur around June 15.

Error in the 1994 forecast was 15%. Confidence in the 1995 Karluk early-run forecast estimate is good.

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FORECAST AREA: **Chignik Management Area**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF THE 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Early Run (Black Lake)		
Total Run	1,900	1,300–2,400
Escapement	400	
Commercial Common Property Harvest	1,500	
Late Run (Chignik Lake)		
Total Run	900	650–1,250
Escapement	250	
Commercial Common Property Harvest	650	
Total Chignik Run		
Total Run	2,800	2,150–3,450
Escapement	650	
Commercial Common Property Harvest	2,150	

FORECAST METHODS:

The estimated run to Black Lake is the sum of a regression estimate for two major age classes (ages 1.3 and 2.3) and a 10-year average for minor age classes, while the Chignik Lake run is based on recruit-per-spawner relationships. The Black Lake forecast is based on the historical relationship between the number and length of prior-year age-1.2 fish. All other age classes are predicted from a 10-year average. The Chignik Lake forecast accuracy has historically been quite variable, and developing a model such as the one used for the Black Lake run has been unsuccessful. The 1995 Chignik Lake run forecast for 1995 was derived using post-1969 average return-per-spawner relationships for each year class.

FORECAST DISCUSSION:

Early Run. The 1995 Black Lake sockeye run is expected to be 1.9 million fish. This is approximately 300 thousand fish more than the 1984–1993 average run of 1.6 million fish and 100 thousand fish more than the 1993 forecast. This above-average run is expected because in 1994 age-1.2 fish were about 40% more abundant than the 10-year average.

Late Run. The estimated 1995 Chignik Lake sockeye run is 0.9 million fish, 0.3 million less than the 1984–1993 average of 1.2 million fish. The Chignik Lake run forecast accuracy has historically been quite poor when compared to actual returns. For the 6-year-olds, which typically dominate the run, the 1989 parent-year escapement of 557 thousand is 300 thousand over the optimum of 250 thousand. Overescapements of this magnitude have historically resulted in a low recruit-per-spawner relationship (< 1). Since 1970, when Black Lake runs have exceeded 1.5 million (eight times in the last 25 years), Chignik Lake runs have been low.

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Chignik Area

David Owen
Assistant Area Biologist
Chignik Area

Doug Pengilly
Westward Biometrician
Kodiak

FORECAST AREA: **Bristol Bay**

SPECIES: **Sockeye Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	58.7	44.5–72.9
Escapement Goal	14.8	
South Peninsula Quota	3.6	
Commercial Harvest (Inshore)	40.3	

Forecasted sockeye harvests for inshore Bristol Bay fishing districts are as follows: Naknek-Kvichak = 19.6 million; Egegik = 12.1 million; Ugashik = 4.7 million; Nushagak = 3.5 million; and Togiak = 0.4 million.

FORECAST METHODS:

The 1995 Bristol Bay forecast is the sum of individual predictions for nine river systems (Kvichak, Branch, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak) and four age classes (age-1.2, -1.3, -2.2, and -2.3 sockeye salmon). In addition to these four major age classes, a prediction was also made for age-0. sockeye salmon to Nushagak-Mulchatna River because of their relative importance to the total run of that system. Predictions for each age class returning to a river system were calculated by averaging results from simple linear regression models based on the relationship between returns and either spawners or siblings. Also the relationships between returns and smolt outmigrants were examined with regression models for Kvichak, Egegik, and Ugashik. Spawner-return models were not used for the 1995 Egegik River forecast because hindcasting showed that forecast accuracy was improved if only sibling and smolt information were used. Results from each regression model were excluded from final forecast calculations if the slope of the line was not significantly different from zero ($P < 0.25$). The mean return of an age class to a specific river system was used to predict returns when none of the models could be used.

We used production data from only recent years (since 1978) to predict returns to all systems in Bristol Bay. The number of returning adults produced from each spawner has shown a dramatic increase since 1978, and results from hindcasting have shown the use of recent data provides more accurate and less biased predictions of run size. Nushagak-Mulchatna predictions were based on all available production data (1980–1994).

To examine forecasting errors of models using only recent or all data, we made predictions for 11 years (1984–1994). For eastside Bristol Bay systems (Kvichak, Naknek, Egegik, and Ugashik), use of recent data increased accuracy (mean absolute percent error: 1984–1994 was 29.2% using recent data and 45.5% using all data) and decreased bias (mean percent error: 1984–1994 was -24.8% using recent data and -45.5% using all data). For westside systems (Wood, Igushik, and Togiak) use of recent data resulted in large overforecasting errors in 1984–1986, but reduced forecast errors for 1987–1994. Forecast errors from 1987–1994 for westside Bristol Bay predictions, collectively, were less for recent data (mean absolute percent error was 24.7% and mean percent error was 7.2%) than for all data (mean absolute error was 30.8% and mean percent error was -30.8%). Because use of recent data resulted in better forecasts for westside systems from 1987–1994, we decided to use only recent data for the 1995 prediction.

Although using recent production data rather than all data reduced prediction errors for eastside rivers during the years (1984–1994) tested, we still would have underforecasted eastside returns 9 out of 11 years. To further correct this tendency, we increased the 1995 forecast for each eastside river by its respective average prediction error for the years 1984–1994. For Kvichak River we used the average prediction error of dominant cycle years from 1984–1994 (1984, 1985, 1989, 1990, and 1994). The 1995 adjustments by river resulted in an overall increase of 32.9% for the total Bristol Bay forecast. The 1984–1994 prediction errors by river were 55% for Kvichak, 22% for Branch, 23% for Naknek, 40% for Egegik, and 32% for Ugashik. We did not adjust predictions for westside Bristol Bay rivers.

The mean squared error of the total run forecast was calculated from the deviations of actual runs from run predictions made for 1987–1994. Run predictions for 1987–1994 were based on the same methods used for the 1995 forecast (i.e., the use of recent year production data corrected by an eastside individual river's average error rate).

FORECAST DISCUSSION:

Based on the methods described above, 58.7 million sockeye salmon are expected to return to Bristol Bay in 1995. A run of this size would be the third greatest run since 1956, the first year total run information is available. The 1995 prediction is 59% greater than the previous 20-year mean (36.9 million; range 10.7 million - 66.3 million), and 44% greater than the previous 10-year mean (40.8 million; range 24.0 million - 55.0 million). Runs are expected to exceed spawning-escapement goals for all systems.

The inshore harvest is expected to be 40.3 million sockeye salmon. A harvest of this size would be the second largest in Bristol Bay since 1956. The largest harvest, 40.8 million, occurred in 1993. The previous 20-year mean is 21.9 million (range 1.4 million - 40.8 million) and the previous 10-year mean is 26.6 million (range 14.0 million - 40.8 million). An additional 3.6 million Bristol Bay sockeye salmon can be harvested during June in the Shumagin Islands and South Unimak fisheries under the current Alaska Board of Fisheries management plan (8.3% of the total projected 43.9 million harvest).

Differences in projections from the three linear regression models (spawner-return, sibling, and smolt) suggest possible deviations in the 1995 forecast. The run of age-2.2 sockeye salmon to the Kvichak River could be less than predicted because both the spawner and sibling databases predicted smaller runs than did the smolt data. The Egegik River run of age-2.2 sockeye salmon could be greater than predicted since spawner data were not used for the 1995 prediction and predicted more returns of age-2.2 sockeye salmon than either the sibling- or smolt-return models.

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FORECAST AREA: **Bristol Bay, Nushagak District**

SPECIES: **Chinook Salmon**

PRELIMINARY FORECAST OF 1995 RUN:

	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run	177	123–230
Inriver Run Goal[1/]	75	
Commercial Common Property Harvest	102	

[1/] The Nushagak inriver run goal is 75 thousand chinook salmon that provides for a biological escapement goal of 65 thousand spawners and an additional harvest of 10 thousand chinook salmon by upriver subsistence and sport fisheries.

FORECAST METHODS:

The 1995 chinook salmon forecast for the Nushagak District is the sum of individual predictions for five age classes (ages 1.1, 1.2, 1.3, 1.4, and 1.5). The prediction for each age class was first calculated from a simple linear regression model based on the relationship between sibling returns in succeeding years (e.g., age-1.4 returns for 1995 based on age-1.3 returns in 1994). However, predictions from regression models were only used if the slope of the line was significantly different from zero ($P < 0.25$). If this criterion was not met, the mean return of an age class was used to predict 1995 returns.

Regression models were used to predict age-1.3, age-1.4, and age-1.5 returns. Mean returns were used to predict age-1.1 and age-1.2 returns. In addition, the 1995 forecast was adjusted to account for overforecasting errors that have occurred for 9 out of the past 11 years. The 1995 prediction was reduced by the 1984–1994 average forecast error (13%). The average forecast error from 1984 to 1994 was used because the number of chinook salmon returning to the Nushagak River declined from 1984 to 1990. However, chinook runs have shown increases from 1991 to 1994. The mean squared error of the total run forecast was calculated from the deviations of actual runs from hindcasts for the years 1987–1994. Hindcasts were based on the same methods used for the 1995 forecast.

FORECAST DISCUSSION:

The age composition of the 1995 forecasted run is 0.3% (0.6 thousand) age 1.1; 12.3% (21.7 thousand) age 1.2; 30.8% (54.5 thousand) age 1.3; 52.2% (92.4 thousand) age 1.4; and 4.4% (7.8 thousand) age 1.5. The 1995 forecasted run of 177 thousand chinook salmon is 5% less than the previous 20-year

mean run of 187 thousand and 26% greater than the most recent 10-year mean run of 140 thousand. The projected harvest of 102 thousand is similar to the previous 20-year mean harvest of 97.9 thousand and 76% greater than the most recent 10-year mean harvest of 57.7 thousand. The chinook run to the Nushagak District declined from 1984 to 1990 but has increased since 1991.

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1995 COMMERCIAL HARVEST OUTLOOK FOR THE AYK REGION
(in thousands of fish)

	Species					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim	19–87	40–290	371–858	0	57–1,490	0
Yukon	88–108	0	30–60	0	300–600	100–150
Norton Sound	6–8	0	50–800	0–500	50–80	0
Kotzebue Sound	0	0	0	0	250–350	0