State of Alaska
Department of Fish and Game
Sportfish Division

Nomination Form
Fish Distribution Database

Region: SWT USGS Quad(s): Multiple

Fish Distribution Database Number of Waterway: multiple

Name of Waterway: ☐ USGS Name ☐ Local Name

☐ Addition ☐ Deletion ☐ Correction ☑ Backup Information

For Office Use

Nomination #: 05-079

Revision Year: 2006

Revision to: Atlas ____ Catalog ____ Both ____

Revision Code: F-1

ADF&G Fisheries Scientist	Date
ADNR OHMP Operations Mgr.	Date
FDD Project Biologist	10/29/05 Date
Cartographer	Date

OBSERVATION INFORMATION

Species	Date(s) Observed	Spawning	Rearing	Present	Anadromous
					☐
					☐
					☐
					☐
					☐

IMPORTANT: Provide all supporting documentation that this water body is important for the spawning, rearing or migration of anadromous fish, including: number of fish and life stages observed; sampling methods, sampling duration and area sampled; copies of field notes; etc. Attach a copy of a map showing location of mouth and observed upper extent of each species, as well as other information such as: specific stream reaches observed as spawning or rearing habitat; locations, types, and heights of any barriers; etc.

Comments:

Add stream numbers to F-nom table as backup info on Bristol Bay streams

Name of Observer (please print): _____

Signature: _____ Date: _____

Address: _____

_____

This certifies that in my best professional judgment and belief the above information is evidence that this waterbody should be included in or deleted from the Fish Distribution Database.

Signature of Area Biologist: _____ Date: _____ Revision 02/05

Name of Area Biologist (please print):

SALMON SPAWNING GROUND SURVEYS

IN THE BRISTOL BAY AREA, ALASKA, 2003

By

Charlotte Higgins
Tim Sands
Steve Morstad
Keith Weiland

Regional Information Report[1] No. 2A04-08

Alaska Department of Fish and Game
Division of Commercial Fisheries
333 Raspberry Road
Anchorage, Alaska 99518-1599

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INTRODUCTION

Aerial surveys of salmon spawning streams have been conducted in the Bristol Bay area of Alaska (Figure 1) for many years. Surveys provide biologists with information regarding the abundance and distribution of sockeye salmon *Oncorhynchus nerka*, Chinook salmon *O. tshawytscha*, chum salmon *O. keta*, pink salmon *O. gorbuscha*, and coho salmon *O. kisutch* escapements. This information is important to fishery managers for several reasons. It supplements data gathered at counting towers on the mainstem rivers, provides data from rivers where counting towers are not utilized, and provides data for time periods and species not covered by counting tower operations. Collected information is used to: (1) evaluate escapement goals and escapement/return relationships, (2) forecast future returns, (3) identify possible management problems relating to escapements, and (4) contribute to strategies designed to alleviate escapement problems. In this report, we summarize the 2003 salmon spawning ground surveys conducted in the Bristol Bay area.

Naknek/Kvichak District

The Naknek-Kvichak District is comprised of three major rivers: (1) the Kvichak River, issuing from Iliamna Lake and its tributaries, (2) the Alagnak or Branch River flowing from Kukaklek and Nonvianuk Lakes, and (3) the Naknek River emanating from Naknek Lake and its tributaries (Figure 2). All of these systems flow into Kvichak Bay.

Since 1955, Kvichak River sockeye salmon annual escapement has been estimated using counting towers located on the Kvichak's mainstem, approximately one-quarter mile downstream of Lake Iliamna's outlet. From 1957 to 1976, Alagnak River sockeye salmon annual escapement was estimated using a counting tower located near the upper extent of tidal influence. Since 1977, Alagnak sockeye annual escapement has been estimated using aerial surveys. From 1950 to 1957, annual sockeye escapement to the Naknek River system was counted using a weir on the mainstem of the river just upstream of the tidal influence. From 1958 to the present, escapement has been estimated using counting towers near the Naknek River 'Rapids' downstream of the outlet of Naknek Lake. Escapements of other salmon species into Naknek-Kvichak District drainages have been estimated using aerial surveys.

Egegik District

Egegik River system contains two major watersheds: (1) the Egegik River, flowing from Becharof Lake and nearby coastal lowlands, and (2) the King Salmon River, issuing from runoff from the Kejulik Mountains and southern portions of Katmai National Park (Figure 3). Both rivers flow into Egegik Bay near the village of Egegik.

From 1952 through 1956, a weir was used in the Egegik River to count sockeye salmon escapement. The weir was located near the bottom of the Egegik River rapids. From 1957 to the present, counting towers, situated between the outlet of Becharof Lake and Egegik Lagoon, have been used to estimate sockeye escapement. Escapements for other salmon species have been estimated using aerial surveys.

Ugashik District

The Ugashik River system is comprised of four major watersheds: (1) the Ugashik River, flowing from Lower Ugashik Lake and nearby coastal lowlands, (2) the Dog Salmon River, emanating from glacial melt and runoff from peaks in the Aleutian Range, (3) the King Salmon River, issuing from Mother Goose Lake and three major runoff tributaries, and (4) Dago Creek, issuing from a large lowland coastal area (Figure 4). All of these systems flow into the intertidal reaches of Ugashik River and Ugashik Bay.

From 1949 to 1956, a weir located downstream from the outlet of Lower Ugashik Lake was used to count sockeye salmon escapement. From 1957 to the present, sockeye escapement has been estimated using counting towers located between the outlet of Lower Ugashik Lake and Ugashik Lagoon. Escapements for other salmon species have been estimated using aerial surveys.

Nushagak District

The Nushagak watershed is comprised of four major rivers: (1) the Wood River, draining Grant, Kulik, Beverley, Nerka, and Aleknagik Lakes, (2) the Nushagak River, draining Tikchik Lakes and the Nuyakuk, upper Nushagak, and Mulchatna Rivers, (3) the Igushik River, draining Ualik and Amanka Lakes, and (4) the Snake River, draining Lake Nunavaugaluk (Figures 5 through 8). All of these systems empty into Nushagak Bay.

Abundance and age composition of annual sockeye salmon escapement into the Wood River Lake system has been estimated annually from counting towers at the outlet of Lake Aleknagik since 1953.

Sockeye salmon distribution in the Wood River Lake system is an important element in establishing escapement goals and measuring success in achieving escapement goals for this system. Interconnecting rivers between the large lakes in the system are primarily used by three-ocean sockeye salmon for spawning, while the lake beaches and tributary streams are used more by two-ocean sockeye salmon. Knowledge of the age composition of returning sockeye salmon gives managers the ability to use a variable escapement goal policy to minimize overcrowding of spawners in the interconnecting rivers while taking advantage of the extensive beach spawning areas and numerous tributary streams.

Periodically, ADF&G personnel conduct aerial surveys to assess sockeye salmon spawner distribution within the Wood River Lake system. Personnel from the University

of Washington, Fisheries Research Institute also conduct ground surveys on major creeks and some rivers of the system. Surveys of the actual spawning distribution within the creeks, rivers, and beaches of the system provide a measure of management success in obtaining the desired spawning distribution.

Salmon escapement in the Nushagak River is estimated by a sonar project, located on the Nushagak River below Portage Creek, approximately 32 km (20 miles) upstream from the river mouth. The Nushagak River sonar project has been used since 1980 to estimate annual escapements for all salmon species in the entire Nushagak drainage (Miller 1997). In 2003 budget cuts reduced the operation of the sonar camp by a month, eliminating the coho and pink salmon enumeration portion of the sonar project. Prior to the advent of the sonar project, sockeye escapement was estimated by a counting tower project on the Nuyakuk River (1959-1988). Aerial surveys of the Nushagak-Mulchatna system were conducted annually beginning in 1966. Initial surveys provided escapement estimates for Chinook and chum salmon, and surveys in the Nushagak and Mulchatna systems since 1977 were used to estimate sockeye abundance in that system. Together, the combined estimates from counting towers and aerial surveys were used by fishery managers as estimates of the Nushagak River drainage sockeye escapement.

ADF&G staff continued to survey the upper Nushagak and Mulchatna areas after the development of the sonar project to provide a comparison with sonar estimates and document spawner distribution for all species except coho salmon. Chum salmon surveys were discontinued in the Nushagak District in 1980, and surveys of the Nushagak-Mulchatna Rivers for all other species were discontinued in 1991 due to the success of the sonar project and limited funding. The Nuyakuk tower project was halted after the 1988 season, but was reinitiated for the 1995 season and has been operated since that time. Aerial surveys of the Nushagak and Mulchatna systems have been conducted sporadically since 1991 providing infrequent information on spawning sockeye distribution in the Nushagak River.

Aerial surveys were conducted sporadically in the Tikchik Lakes system from 1954 to 1987 to assess spawner distribution of sockeye salmon. Surveys of the Tikchik Lakes have been conducted, although infrequently, since 1990 to document an apparent change in spawner distribution, evidenced by changes observed in the age composition of Nushagak River sockeye escapement, and supported by reports of low numbers of spawners in the Tikchik Lake system. These changes were first noticed in 1990 when surveys documented lower than expected numbers of spawners in the Tikchik Lakes system, based on sonar estimates in the lower Nushagak River and historical distribution patterns (Russell et. al. 1991). However, few corresponding surveys were conducted in the Nushagak and Mulchatna drainages to completely assess distribution. In fact, due to funding cuts, no aerial surveys of the Upper Nushagak and Mulchatna drainages have been performed since 1991. The counting towers at the Nuyakuk River were not operational from 1989-1994, also as a result of budget cuts. Average escapement for the 20 years before tower operations ceased was 369,506 sockeye salmon (excluding 1980, the "strike year".) When tower counts resumed in 1995, escapement was low and has remained low with an average per year of 150,211 sockeye salmon. Therefore, any information that can be gained about this system is advantageous.

Sockeye escapement is measured in the Igushik Lakes system at a counting tower located at the outlet of Amanka Lake. Spawner distribution has not been documented annually, and surveys have not been conducted on the Igushik system for sockeye salmon and other species since 1991 (Russell, et. al. 1992). Spawning escapement and distribution of sockeye salmon in the Snake Lake system was estimated annually prior to 1998 by aerial surveys, but with the closure of the Snake River section and funding shortages in recent years, these surveys have not been continued.

Togiak District

Two major river drainages flow into the Togiak District: (1) the Togiak River, draining Togiak, Gechiak, Pungokepuk, and Ongivinuk Lakes and Nayorurun and Kemuk Rivers (Figure 9), and (2) the Kulukak River, draining Kulukak Lake (Figure 10). Various smaller systems within the district include the Kanik River draining Tithe Creek Ponds and the Quigmy, Matogak, Osviak, Slug, Negukthlik, and Ungalikthluk Rivers. Kulukak River and the Kanik River flow into Kulukak Bay, located in the eastern portion of the district. The Togiak and Quigmy Rivers flow into Togiak Bay, located in the middle of the district, and the Matogak, Osviak, and Slug Rivers flow into Hagemeister Straits and coastal waters in the western portion of the district (Figure 1).

Sockeye salmon escapement is estimated for the Togiak Lake system from counting towers operated at the outlet of Togiak Lake. Abundance and distribution of spawning populations of sockeye salmon in the Togiak River and tributaries below the counting towers, as well as other systems within the Togiak District, are estimated by aerial surveys. Abundance and distribution of Chinook, chum, pink, and coho salmon spawning in Togiak District watersheds are also estimated entirely from aerial surveys.

Since 1991, the operational budget has not had sufficient funds to conduct spawning ground aerial surveys in the Togiak District. The U.S. Fish and Wildlife Service Togiak National Wildlife Refuge (USFWS/TNWR) has provided funding for aircraft charters for aerial surveys, and has assisted with aerial surveys in the Togiak District to monitor salmon populations within drainages on the refuge.

METHODS

All survey flights were conducted from small fixed-wing, high-wing, wheeled aircraft (Super Cub, Cessna 180, Cessna 185, or Cessna 206) or helicopter (Robinson R-22) chartered from local air charter companies and flown by experienced survey pilots. Alaska Department of Fish and Game (ADF&G) or USFWS biologists familiar with the streams and target species counted salmon. USFWS pilots and aircraft flew several of the surveys in the Togiak National Wildlife Refuge. Counts were made from low

altitudes (200 to 400 feet) at air speeds of 50 to 90 mph. Polarized sunglasses and aircraft positioning were used to minimize effects of glare off the water. Surveys were scheduled to coincide as closely as possible to the historic peak of spawning for the target species, taking into account weather, water conditions, and aircraft availability. Peak of spawning was defined as that point when the greatest number of spawning salmon are occupying redds. Counts were registered on a hand tally counter or on a tape player. This information was transferred to survey data forms either sometime during the survey or upon returning to the office.

Aerial surveys account for only a portion of the known spawning populations (Evzerof, 1975; Nielson and Green, 1981; Rogers, 1984). At the time of each survey, some of the salmon have yet to reach the spawning grounds, some have already spawned and died, some are still schooled, and some are either misidentified or not seen. Methods used to interpret aerial survey counts are described below for each commercial fishing district.

Naknek/Kvichak District

Aerial surveys were flown during late summer and fall to assess escapements of sockeye, Chinook, and chum salmon in portions of the Naknek/Kvichak District. Salmon counts for these drainages are indices of the total number of each species present in the spawning area at the time of the survey. In the Alagnak drainage two surveys were flown, August 13 and August 20, providing estimates of sockeye, Chinook, chum, and pink salmon escapements. Additionally, all major Chinook spawning areas in the Naknek River Drainage were surveyed on August 1, and August 21; no survey was flown for the Kvichak River. Within the Naknek Lake drainage, sockeye surveys were flown for spawning distribution. Survey counts were not expanded to provide instantaneous population estimates, although expansions have been made in some earlier years based on subjective criteria. Counting towers were used to estimate total sockeye escapement to the Kvichak and Naknek Rivers. ADF&G, Commercial Fisheries Division staff made all aerial survey counts in the district.

Egegik District

No system-wide aerial surveys were flown for sockeye salmon in 2003. An aerial survey of known Chinook and chum salmon spawning areas in both the Egegik and King Salmon Rivers was flown on August 3. With funding provided by the U.S Fish and Wildlife Service (USFWS), an aerial survey was flown on September18 to estimate coho salmon escapement. All aerial survey counts in the Egegik drainage are the actual numbers of salmon sighted and should be considered a minimum indication of abundance.

Ugashik District

Salmon counts in the Ugashik District reflect only the actual numbers of salmon sighted on the spawning grounds for 2003. Aerial surveys of known Chinook and chum salmon spawning areas in the Ugashik drainage were flown on August 8. With funding provided by the Alaska Department of Fish and Game, an aerial survey was flown on September 21 to estimate coho salmon escapement. Aerial survey counts should be considered a minimum indication of abundance. Additionally, a USFWS project continued the state's tower project for the purpose of counting coho salmon escapement into the Ugashik Lakes.

Nushagak District

No spawning ground surveys were flown in the Nushagak District during the 2003 season.

Togiak District

Survey and data analysis methods used in the Togiak District were similar to those described by Nelson (1979), Bucher (1981), and Russell, et al. (1990). This year, surveys were flown on July 30, August 1, 4, 7, 8, 21, and 22 (Tables 11-14). Poor weather posed a severe limitation to survey completion this year. ADF&G staff surveyed the Kulukak River drainage and portions of the Togiak River drainages for Chinook, and chum salmon. USFWS/TNWR staff conducted surveys of the Quigmy, Negukthlik, Slug, Osviak, Matogak and Ungalikthluk Rivers for sockeye, Chinook, coho, and chum salmon and of the Kulukak River for sockeye salmon. The only systems that were surveyed for coho salmon were the Kulukak and Matogak Rivers.

Total escapement was estimated for sockeye salmon in systems without counting towers (i.e. Kulukak River, main-stem and tributaries of the Togiak River below the towers) by multiplying peak aerial counts by an expansion factor between 1.5 and 3.0 depending on survey and water conditions (Table 11 lists expansion factors by stream). Since 1980, total escapement for Chinook salmon in the Togiak District has been calculated by aerial counts using a multiplier of 2.5 if the survey was timed properly relative to the spawning peak and visibility conditions were average. In 2003 an expansion factor of 2.0 to 3.0 was used for Chinook surveys depending on the system surveyed. The expansion factor for chum salmon varied between 2.0 and 2.5, with the 2.5 factor applied only to sections of the Togiak River mainstem. An expansion factor of 3.0 has been used for coho salmon in all areas of the Togiak District since the initiation of coho surveys in 1980. Expansion factors have been subjectively adjusted based on weather conditions, visibility, and survey timing with respect to the peak spawning activity.

RESULTS AND DISCUSSION

Naknek/Kvichak District

An aerial survey of sockeye salmon escapement into the Alagnak River and its tributaries was conducted on August 21. The sockeye salmon escapement index count totaled 2,110,000 for all four systems (Table 1). This is the largest escapement ever documented to the Alagnak systems (Appendix Table 1). A tower on the Alagnak River in 2003 estimated 3,676,146 sockeye salmon.

Aerial surveys of Chinook salmon escapements into the Naknek River drainage were flown on July 31 (Pauls Creek and King Salmon Creek) and August 21 (Naknek mainstem). A total of 6,081 Chinook were observed in three of the four systems in the Naknek drainage (Big Creek was not flown in 2003). Over the period from 1971-2001 there have been 23 years in which Chinook salmon escapement indices have been obtained from all four main spawning areas (Appendix Tables 2-6). The Chinook escapement index for these 22 years has ranged from a low of 2,691 in 1992 to a high of 11,730 in 1988.

Alagnak River drainage Chinook salmon escapement was surveyed on August 13, estimating a total of 8,209 (Table 2). From 1970-2002, Alagnak Chinook salmon counts have ranged from a low of 824 in 1973 to a high of 15,210 in 1997 (Appendix Table 7). There was no aerial survey conducted on the Kvichak River for Chinook salmon in 2003 (Appendix Tables 8 and 9).

Chum salmon were counted only during the July 31 King Salmon Creek and August 13 Alagnak River surveys. The Alagnak River has been the principle chum salmon producing system in the Naknek/Kvichak District (Appendix Table 10). A total of 77,600 chum salmon were observed during the survey.

Egegik District

The 2003 Egegik River sockeye escapement past the counting towers totaled 1,152,030 fish, or 5% above the midrange objective of 1.1 million. The BEG range for Becharof Lake is 800 thousand to 1.4 million. Aerial survey counts of known Chinook salmon spawning areas in the Egegik drainage yielded a total count of 1,052 Chinook salmon. No additional Chinook salmon were counted at the Egegik River counting towers (Table 3). This total was 4% below the average count of 1,091 (Appendix Table 14), but it was the largest count in five years. The commercial Chinook harvest in the Egegik District totaled approximately 136 fish, or 93% below the 1983 to 2002 average harvest of 2,067. Since 1998, fishing time has been reduced to three days per week between June 1 and June 16. Using gillnets with larger than five and one half inch mesh in the commercial fishery from June 1 to July 1 has also been prohibited. Also, fishing time during the sockeye season has been reduced in

recent years. All of these factors probably contributed to the reduced commercial harvest of Chinook salmon, but in general, recent Chinook salmon runs to Egegik have been small. Given the catch and escapement figures above, the Egegik Chinook salmon removal rate for 2003 was likely less than 13%.

The chum salmon escapement index was 5,150 fish (Table 4). The 2003 index was 29% below the 1982-2002 average of 7,240 fish (Appendix Table 15). The 2003 commercial chum harvest from the Egegik District totaled approximately 41,900 fish, or 56% below the 1983 to 2002 average catch of 95,000. Escapement indices of less than 10,000 chum salmon have been recorded since 1989, but aerial surveys for chum salmon are not reliable indicators and it is believed that chum escapement indices documented over the last several years have probably greatly underestimated chum salmon escapements (Browning et al. 1998). In 1999, comparing the Gertrude Creek Weir count of 16,000 and an aerial survey count on August 6 showed that the aerial count was only about 2% of the weir count.

No pink salmon were noted during the August 3 aerial survey. No pink salmon were reported in the commercial catch. The 1974 to 2003 pink salmon escapement indices are listed in Appendix Table 16.

Coho salmon escapement was documented with an aerial survey conducted on September 18 (Table 5). The U.S. Fish and Wildlife Service in King Salmon provided funding for this survey. A total of 5,280 coho salmon were counted in the Egegik River and in several tributaries of Becharof Lake. The aerial counts were focused on main coho salmon producing areas, which are listed in Table 5. Compared to the last seven years, the 2003 index count of 5,280 was about 8% above average. The commercial harvest totaled approximately 40,000 fish, which was about 18 % above the 20-year (1983-2002) average of 34,000. Deliveries occurred through August 20, though the fishery remained open until September 30. Historical survey counts are listed in Appendix Table 17.

Ugashik District

The 2003 Ugashik sockeye salmon escapement tower count was approximately 758,500 fish, 11% below the midrange objective of 850,000. However, counts observed by a Federal project that continued counting salmon from July 24 through September 22, may add 28,000 sockeye salmon to the escapement. No system-wide aerial surveys were conducted due to a lack of funding. However, during a Chinook and chum salmon survey on August 8 an additional 4,000 and 27,620 sockeye salmon were counted in the Dog Salmon and King Salmon Rivers, respectively (Table 6).

Chinook salmon escapement surveys of Dog Salmon, King Salmon, and Ugashik Rivers were flown on August 8 and yielded a count of 3,050 fish. Additionally, 243 Chinook salmon were counted past the counting towers bringing the cumulative escapement count to about 3,293 (Table 7). The Federal tower project estimated approximately 36 Chinook salmon past the counting towers. The 2003 escapement count was 24% below the 1980 to

2002 average count of 4,308 Chinook salmon (Appendix Table 18), but it was the fifth largest count in nine years. The Ugashik District's commercial catch of approximately 400 Chinook salmon was 87% below the 20-year average harvest of 3,000 and about 71% below the recent 10-year average of 1,400.

Aerial surveys of Dog Salmon, King Salmon, and Ugashik Rivers on August 8, yielding a count of 21,800 chum salmon (Table 8). The survey was considered to be before the peak of spawning as only larger schools were observed. The 2003 aerial count was 27% below the 1980 to 2002 average of 29,800 (Appendix Table 19). The District's commercial chum salmon harvest of approximately 54,700 fish was 26% below the 20-year average of 74,400.

The Ugashik pink salmon returns have historically been very small. There were no pink salmon reported in the commercial harvest this year, and 66 pink salmon were counted past the Ugashik counting towers through July 23. An additional 90 pink salmon were estimated from federal escapement counts through September 22 (Appendix Table 20).

An aerial survey for coho salmon was again made this year in the Ugashik drainage (Table 9). A total of 19,670 coho salmon were observed on the September 21 flight. The majority of the count came from the Lower Ugashik Lake. The timing of this survey was very good as most coho salmon were still schooled-up along the creek mouths. For the Ugashik lakes a count of 17,880 was 515% above the average count of 2,900. Approximately 28,200 coho salmon were estimated from a federal tower project. The coho harvest of approximately 990 fish was 87% below the recent 10-year average of 7,400. Historical coho salmon escapement data are recorded in Appendix Table 21.

Nushagak District

There were no spawning ground surveys flown this year, for any species. The sonar project at Portage Creek produced apportioned estimates of 79,749 Chinook salmon (slightly above the inriver goal of 75,000), 579,643 sockeye salmon (within the range of the BEG), and 291,785 chum salmon in the Nushagak River for 2003. Coho were not counted this year because sonar operation ceased on July 19 due to lack of funding. A counting tower was operated on the Nuyakuk River again this year enumerating 116,646 sockeye salmon.

Spawning escapement of sockeye salmon in the Wood River system was estimated, by tower count, to be 1.46 million fish, and the Igushik River tower count was 194,088 sockeye. Escapements into both systems were within the BEG range. Two-ocean sockeye comprised approximately 55% of the Wood River escapement while three-ocean sockeye contributed the other 44% of the escapement.

Togiak District

Poor weather severely hindered survey completion in 2003. Although it is difficult to drawn any conclusions from partial data, data were collected in some systems of the Togiak District for some species (Table11). The Togiak River and its tributaries were not surveyed for sockeye salmon, however, 232,302 sockeye were counted past the towers just below Togiak Lake. The spawning escapement of sockeye salmon in the Kulukak Section, including the Kulukak River, Kulukak Lake, and Tithe Creek Ponds, was estimated at 8,000 fish, 43% of the 10-year average of 18,427 (Appendix Table 24). Total sockeye salmon escapement for the Togiak District (including only partial survey data) was 261,851 (Table 11). Expansion factors used to convert aerial survey numbers to actual escapement estimates varied on a stream-by-stream basis from 1.5 to 3.0 depending on survey conditions.

The expanded escapement estimate for Chinook salmon in the Togiak District (based on partial surveys) was 5,668 fish (Table 12). Peak aerial counts for Chinook salmon and historical counts are available in Appendix Table 28. The Kulukak River escapement estimate (360 Chinook) was 65% below the 10-year average count for the system and was 54% below the 20-year average.

Chum salmon counts were conducted coincidentally with the Chinook salmon surveys. Total chum salmon escapement to the Togiak District was poor compared with the 20-year and 10-year averages. Both the Slug and Negukthlik Rivers were well below their 20-year and 10-year average escapements. The Kulukak River escapement estimate was 3,425, 60% below the 10-year average for that system. As with other species discussed, only partial surveys for chum salmon on the Togiak River were performed. As a result, district-wide estimates of chum escapement are not available for year-to-year comparison (Table 13, Appendix Tables 29 and 30).

Only a few aerial surveys for coho salmon were done in 2003; the lack of a suitable survey plane and poor weather prevented these surveys. Total coho escapement for Togiak River and tributaries was, therefore, not estimated. USFWS/TNWR personnel conducted surveys on the Kulukak, Quigmy, and Matogak Rivers (Table 14). The Quigmy and Matogak Rivers were 42% and 44% higher than their 20-year averages, whereas the Kulukak River was 68% below its 20-year average (Appendix Table 32). There was very little commercial harvest of coho salmon reported in 2003 because there was not a market for them.

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Table 1. Aerial survey counts of sockeye salmon, Alagnak River system, 2003[a]

Location	Number of Fish	Percent of Total
Nonvianuk River	0	0.0
Nonvianuk Lake	60,000	2.8
Kulik River	70,000	3.3
Kulik Lake	65,000	3.1
Alagnak River	0	0.0
Kukaklek Lake	30,000	1.4
Nanuktuk Creek	330,000	15.6
Battle River	112,000	5.3
Battle Lake	120,000	5.7
Spectacle Creek	735,000	34.8
Funnel Creek	588,000	27.9
Total	2,110,000	100.0

[a] Aerial surveys were conducted with fixed-wing aircraft.

Table 2. Aerial survey counts of Chinook, chum, pink, and coho salmon, Naknek-Kvichak District, 2003.[a]

Location	Survey Date	Number of Salmon			
		Chinook	Chum	Pink	Coho
Kvichak River		No survey	No survey	No survey	No survey
Alagnak River	13-Aug	8,209	77,600		No survey
Naknek River :					
Paul's Creek	1-Aug	583	0	No count	No survey
King Salmon Creek	1-Aug	1,348	2,700	No count	No survey
Big Creek					
Mainstem Naknek River	21-Aug	4,150	No count	No count	No count
Total		14,290	80,300		

[a] Aerial surveys were conducted with fixed-wing aircraft.

Table 3. Aerial survey peak counts of Chinook salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Chinook Salmon Counted
Egegik River	3-Aug	0[a]
Shosky Creek	3-Aug	35
Whale Mountain Creek	3-Aug	0
Mossy Creek	3-Aug	20
Mink Creek	3-Aug	10
Gertrude Creek	3-Aug	297
Kaye's Creek	3-Aug	180
Takayoto Creek	3-Aug	313
Angle Creek	3-Aug	[b]
Contact Creek	3-Aug	197
Mainstem King Salmon River	3-Aug	[b]
Total		1,052

[a] Tower count.
[b] No Count.

Table 4. Aerial survey peak counts of chum salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Chum Salmon Counted
Egegik River	3-Aug	0[a]
Shosky Creek	3-Aug	0
Whale Mountain Creek	3-Aug	540
Mossy Creek	3-Aug	70
Mink Creek	3-Aug	50
Gertrude Creek	3-Aug	690
Kaye's Creek	3-Aug	0
Takayoto Creek	3-Aug	0
Angle Creek	3-Aug	[b]
Contact Creek	3-Aug	3,800
Mainstem King Salmon River	3-Aug	[b]
Total		5,150

[a] Tower count.
[b] No Count.

Table 5. Aerial survey counts of coho salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Coho Salmon Counted	Comments
Egegik River Drainage[1]			
Egegik River Rapids	September 18	675	4 small schools, no spawning observed.
Stream 115.8 (Featherly Creek)	September 18	700	None seen in the creeks, all were seen along the shore
Stream 107.6 (Burl's Creek)	September 18	650	between Featherly Cr.and Burls Cr..
Stream 90.3 (Salmon Creek)	September 18	575	
Stream 89.8	September 18	125	
Stream 87.0 (Bear Creek)	September 18	520	
Stream 73.5 (Becharof Creek)	September 18	1,500	Schooled up and mostly along in front of the creek mouth.
Stream 48.1 (Kejulik River)	September 18	535	Includes Margaret Cr., Albert Cr. And mainstem
Total		5,280	

[1] Streams tributary to Becharof Lake are designated by the number of miles between their mouth and the outlet of Becharof Lake (Egegik River) as one travels around the lake in a clockwise fashion from the Becharof lake outlet. This is the same system of designation used for years by previous investigators.

Table 6. Aerial survey peak counts of sockeye salmon escapement, King Salmon and Dog Salmon River, Ugashik District, 2003.

Location	Survey Date	Number of Sockeye Salmon Counted
King Salmon River System:		
Goose Lake and outlet	Aug. 8	120
Needle Lake	Aug. 8	1,500
Volcano Creek	Aug. 8	[a]
Painter Creek	Aug. 8	26,000
Indecision Creek	Aug. 8	0
Sub-total		27,620
Dog Salmon River System:		
Figure-Eight Creek	Aug. 8	2,300
Goblet Creek	Aug. 8	0
Oldham Creek	Aug. 8	1,400
Wandering Creek	Aug. 8	300
Mainstem Dog Salmon River	Aug. 8	0
Sub-total		4,000
Total		31,620

[a] No Count.

Table 7. Peak survey counts of Chinook salmon escapement, Ugashik District, 2003.

Location	Survey Date	Number of Chinook Salmon Counted
King Salmon River System		
Old Creek	Aug. 8	351
Pumice Creek	Aug. 8	596
Painter Creek	Aug. 8	490
Mainstem King Salmon River	Aug. 8	334
Indecision Creek	Aug. 8	0
Volcano Creek	Aug. 8	[a]
Sub-total		1,771
Dog Salmon River System		
Figure-Eight Creek	Aug. 8	774
Goblet Creek	Aug. 8	105
Oldham Creek	Aug. 8	65
Wandering Creek	Aug. 8	62
Mainstem Dog Salmon River	Aug. 8	47
Sub-total		1,053
Ugashik River System		
Mainstem Ugashik River	Aug. 7	414 [b]
Grassy Creek	Aug. 7	55
Sub-total		469
Total		3,293

[a] No Count.
[b] Tower and aerial survey count.

Table 8. Peak survey counts of chum salmon escapement, Ugashik District, 2003.

Location	Survey Date	Number of Chum Salmon Counted
King Salmon River System		
Old Creek	Aug. 8	3,000
Pumice Creek	Aug. 8	4,000
Painter Creek	Aug. 8	8,000
Mainstem King Salmon River	Aug. 8	5,500
Needle Lake	Aug. 8	0
Indecision Creek	Aug. 8	50
Volcano Creek	Aug. 8	[a]
Sub-total		20,550
Dog Salmon River System		
Figure-Eight Creek	Aug. 8	250
Goblet Creek	Aug. 8	30
Oldham Creek	Aug. 8	0
Wandering Creek	Aug. 8	600
Mainstem Dog Salmon River	Aug. 8	250
Sub-total		1130
Ugashik River System		
Mainstem Ugashik River	Aug. 4	12 [b]
Grassy Creek	Aug. 4	130
Sub-total		142
Total		21,822

[a] No Count.
[b] Tower count.

Table 9. Aerial survey counts of coho salmon escapement, Ugashik District, 2003. [a]

Location	Survey Date	Number of Coho Salmon Counted	Comments
	Ugashik Drainage		
Upper Ugashik Lake			
Crooked Creek	September 21	2,330	Most fish in front of the mouth.
Deer Creek	September 21	1,530	Most fish in front of the mouth.
Lower Ugashik Lake			
Black Creek to Cabin	September 21	1,420	Includes 120 in Cabin Creek.
Black Creek to Elizabeth Lake	September 21	7,000	Includes 4,000 in lower part of Black Creek.
Ugashik Outlet	September 21	5,600	Below counting towers
King Salmon River Tributaries			
Pumice Creek	September 21	480	Small schools, most in lower part of the creek.
Old Creek	September 21	440	Small schools, most in lower part of the creek.
Painter Creek	September 21	460	Small schools, most in lower part of the creek.
Dog Salmon River Tributaries			
Figure Eight Creek	September 21	410	Small schools, most in lower part of the creek.
District Total		19,670	

[a] Several thousand coho were also seen at the narrows joining Upper and Lower Ugashik Lakes.

Table 10. Peak aerial counts of live sockeye salmon and total escapement estimates, Wood River system, 2003.

Area	Date	Aerial Count	Tower Count	Population Estimate	Distribution %
Wood River			1,459,782		
Lake Aleknagik		No Surveys Done			
Eagle Creek[a]					
Hansen Creek[a]					
Happy Creek[a]					
Bear Creek[a]					
Yako Creek[a]					
Whitefish Creek[a]					
Ice Creek[a]					
Mission Creek[a]					
Sunshine Creek					
Youth Creek					
Northshore Beaches					
Southshore Beaches					
Yako Beaches					
Agulowok River & lower River Bay		No Surveys Done			
Lake Nerka		No Surveys Done			
Fenno Creek[a]					
Pike Creek[a]					
Stovall Creek[a]					
Bear Creek					
Teal Creek[a]					
Pick Creek[a]					
Elva Creek[a]					
Kema Creek[a]					
Hidden Lake Creek[a]					
Lynx Creek[a]					
Upper River Bay Beaches, NW					
Upper River Bay Beaches, SE					
Allan Cr. - Ross Cr. Beaches					
N6 - River Bay Beach					

(Continued)

Table 10. (Page 2 of 3)

Area	Date	Aerial Count	Population Estimate	Distribution %
Pick Creek Beach				
Elva Creek Beach				
Amakuk Arm Beaches				
Amakuk Arm - Ott's Bay Beach				
Ott's Bay Beach				
Anvil Bay Beaches				
Anvil Bay - Elbow Pt. Beach				
Elbow Pt. - Lynx Cr. Beach				
Lynx Cr. - Teal Cr. Beach				
Kema Lake Beaches				
Hidden Lake Beaches				
Lynx Lake Beaches				
Little Togiak River[a]		No Surveys Done		
Little Togiak Lake		No Surveys Done		
Northshore Beaches				
Southshore Beaches				
D Slough Beaches				
Agulukpak River		No Surveys Done		
Lake Beverley		No Surveys Done		
Tsun Creek				
Moose Creek[a]				
Hope Creek				
Hardluck Bay Beaches				
Sam's Beach				
Golden Horn Beaches				
Silver Horn Beaches				
B12 & B9 Beaches				
Hope Lake Beach				

(Continued)

Table 10. (Page 3 of 3)

Area	Date	Aerial Count	Population Estimate	Distribution %
Peace River		No Surveys Done		
Lake Mikchalk		No Surveys Done		
Narrows				
Northshore Beaches				
Southshore Beaches				
Wind River				
Lake Kulik		No Surveys Done		
K1 & K2 Creeks				
K5 Creek - Grant River Beaches				
Grant River - K2 Creek Beaches				
Southshore Beaches				
Grant River		No Surveys Done		
Total		0	0	0.0%

[a] Ground survey counts conducted by FRI, University of Washington.

[b] No aerial surveys were done in 2000. Information in this table is based soley on stream surveys conducted by FRI personnel. No population estimates or distribution information was calculated.

Table 11. Peak aerial counts of live sockeye salmon and total escapement estimates, Togiak District, 2003.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak Tower				232,302
Togiak River mainstem		No Surveys Done	2.0	0
Gechiak Lake System		No Surveys Done	1.5	0
Pungokepuk Lake		No Surveys Done	1.5	0
Nayorurun River		No Surveys Done	1.5	0
Kemuk River		No Surveys Done	1.5	0
Ongivinuk Lake System		No Surveys Done	1.5	0
Subtotal		0		0
Kulukak Section				
Kulukak River [b]	22-Aug	590	2.0	1,180
Kulukak Lake [b]	22-Aug	310	2.0	620
Tithe Creek Ponds [b]	22-Aug	4,136	1.5	6,204
Subtotal		5,036		8,004
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	500	3.0	1,500
Osviak River [b]	04-Aug	2,180	2.5	5,450
Slug River [b]	04-Aug	2,330	2.0	4,660
Subtotal		5,010		11,610
Other				
Quigmy River [b]	30-Jul	110	2.5	275
Negukthlik River [b]	01-Aug	1,500	3.0	4,500
Ungalikthluk River [b]	01-Aug	2,580	2.0	5,160
Subtotal		4,190		9,935
Total		14,236		261,851

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] USFWS estimate.

Table 12. Peak aerial counts of live Chinook salmon and total escapement estimates, Togiak District, 2003.

River	Aerial Counts		Total Escapement Estimates	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak River mainstem				
A	No Surveys Done		2.5	0
B	No Surveys Done		2.5	0
C	No Surveys Done		3.0	0
D	08-Aug	180	2.5	450
E	08-Aug	265	2.5	663
F	08-Aug	495	2.5	1,238
Subtotal		940		2,350
Gechiak River	No Surveys Done		2.0	0
Pungokepuk River	No Surveys Done		2.0	0
Nayorurun River	08-Aug	115	2.0	230
Kemuk River	08-Aug	100	2.0	200
Ongivinuk River	08-Aug	135	2.0	270
Subtotal		350		700
Togiak River Drainage Total		1,290		3,050
Kulukak Section				
Kulukak River	07-Aug	360	2.0	720
Matogak, Osviak, and Cape Pierce Sections				
Matogak River[b]	30-Jul	28	2.0	56
Osviak River[b]	04-Aug	99	2.0	198
Slug River[b]	04-Aug	66	2.0	132
Subtotal		193		386
Other				
Quigmy River[b]	30-Jul	17	2.0	34
Negukthlik River[b]	01-Aug	466	3.0	1,398
Ungalikthluk River[b]	01-Aug	40	2.0	80
Subtotal		523		1,512
Total		2,366		5,668

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b USFWS estimate.

Table 13. Peak aerial counts of live chum salmon and total escapement estimates, Togiak District, 2003.

River	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Estimate
Togiak Section				
Togiak River mainstem				
A	No Surveys Done		2.5	0
B	No Surveys Done		2.5	0
C	No Surveys Done		2.5	0
D	08-Aug	25	2.5	63
E	08-Aug	675	2.5	1,688
F	08-Aug	1,000	2.5	2,500
Subtotal		1,700		4,250
Gechiak River	No Surveys Done		2.0	0
Pungokepuk River	No Surveys Done		2.0	0
Nayorurun River	08-Aug	175	2.0	350
Kemuk River	08-Aug	1,125	2.0	2,250
Ongivinuk River	08-Aug	1,125	2.0	2,250
Subtotal		2,425		4,850
Togiak River Drainage Total		4,125		9,100
Kulukak Section				
Kulukak River	07-Aug	3,425	2.0	6,850
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	1,340	2.0	2,680
Osviak River [b]	04-Aug	3,480	2.0	6,960
Slug River [b]	04-Aug	1,030	2.0	2,060
Subtotal		5,850		11,700
Other				
Quigmy River [b]	30-Jul	720	2.0	1,440
Negukthlik River [b]	01-Aug	30	2.0	60
Ungalikthluk River [b]	01-Aug	4,970	2.0	9,940
Subtotal		5,720		11,440
Total		19,120		39,090

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b U.S. Fish and Wildlife Service estimate.

Table 14. Peak aerial counts of live coho salmon and total escapement estimates, Togiak District, 2003.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak River mainstem				
A	No Surveys Done			0
B	No Surveys Done			0
C	No Surveys Done			0
D	No Surveys Done			0
E	No Surveys Done			0
F	No Surveys Done			0
Subtotal		0		0
Gechiak River	No Surveys Done			0
Pungokepuk River	No Surveys Done			0
Nayorurun River	No Surveys Done			0
Kemuk River	No Surveys Done			0
Ongivinuk River	No Surveys Done			0
Subtotal		0		0
Togiak River Drainage		0		0
Kulukak Section				
Kulukak River	22-Aug	1,610	3.0	4,830
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	21-Aug	1,620	3.0	4,860
Osviak River [b]	No Surveys Done		3.0	0
Slug River [bc]	No Surveys Done		3.0	0
Subtotal		1,620		4,860
Other				
Quigmy River [b]	21-Aug	680	3.0	2,040
Negukthlik River	No Surveys Done			
Ungalikthluk River [b]	No Surveys Done		3.0	0
Subtotal		680		2,040
Total		3,910		11,730

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] U.S.F.W.S. survey.

[c] Survey precluded by muddy water.

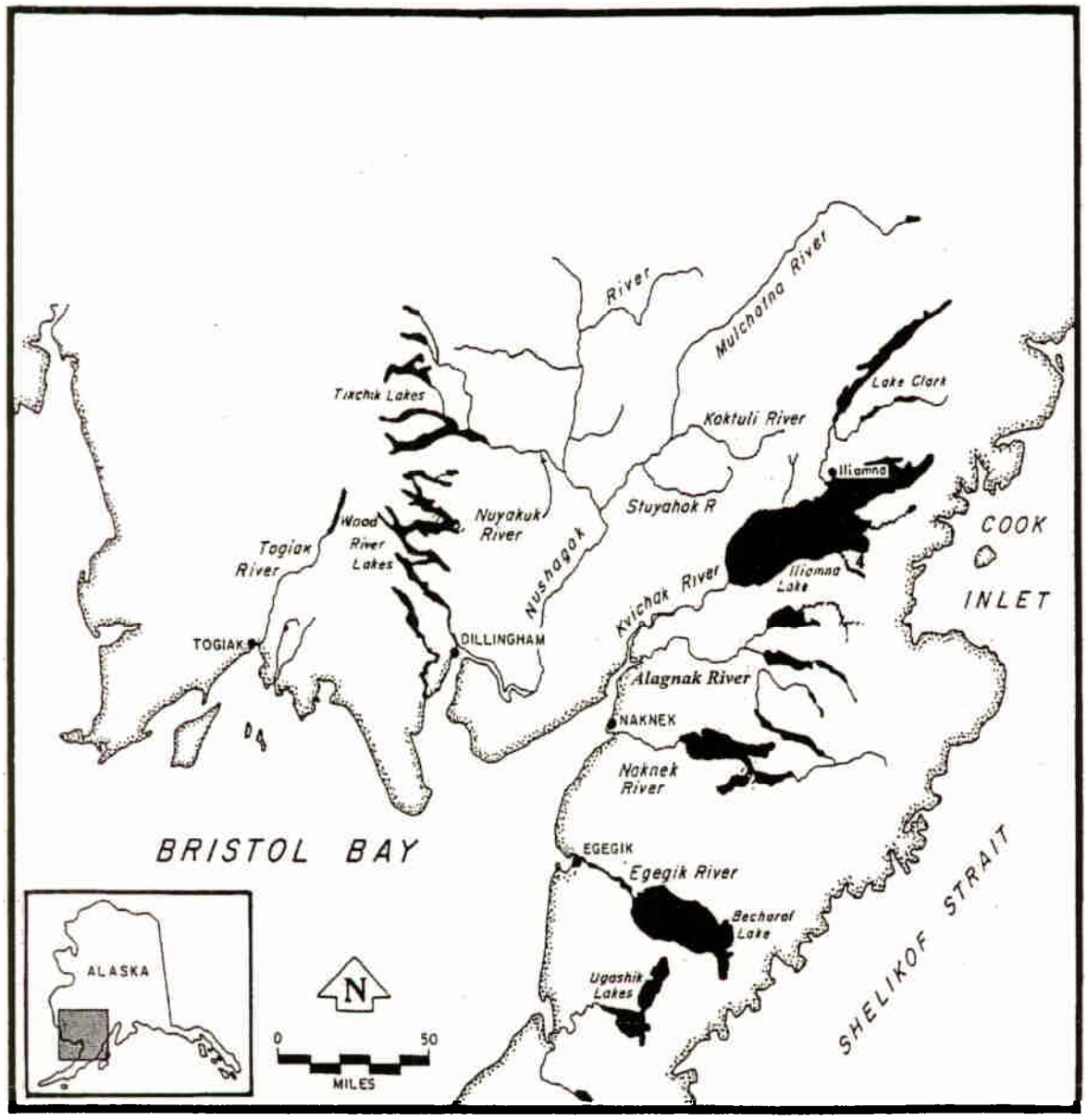

Figure 1. Bristol Bay management area, Alaska.

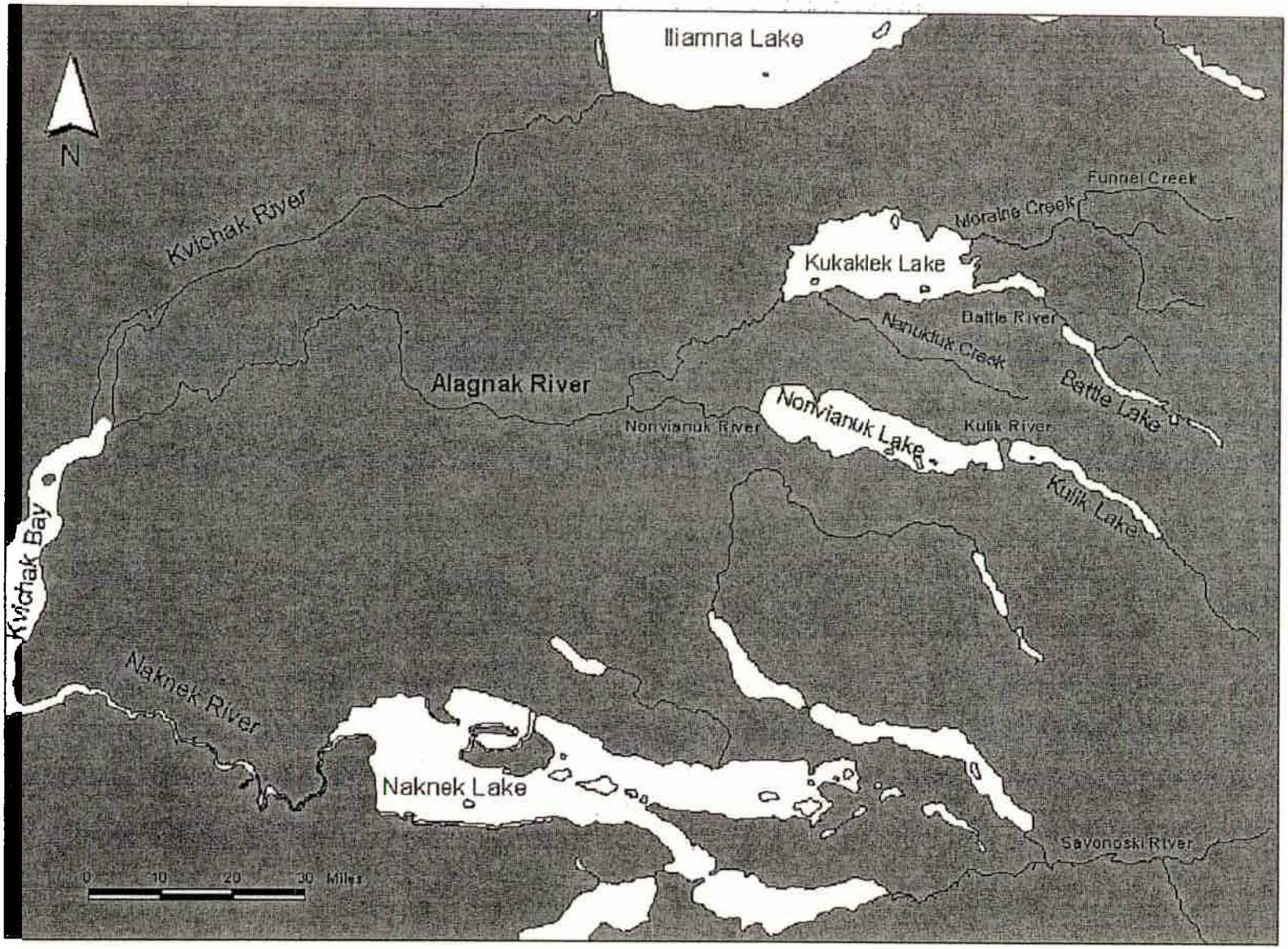

Figure 2. Alagnak River drainage, Bristol Bay, Alaska.

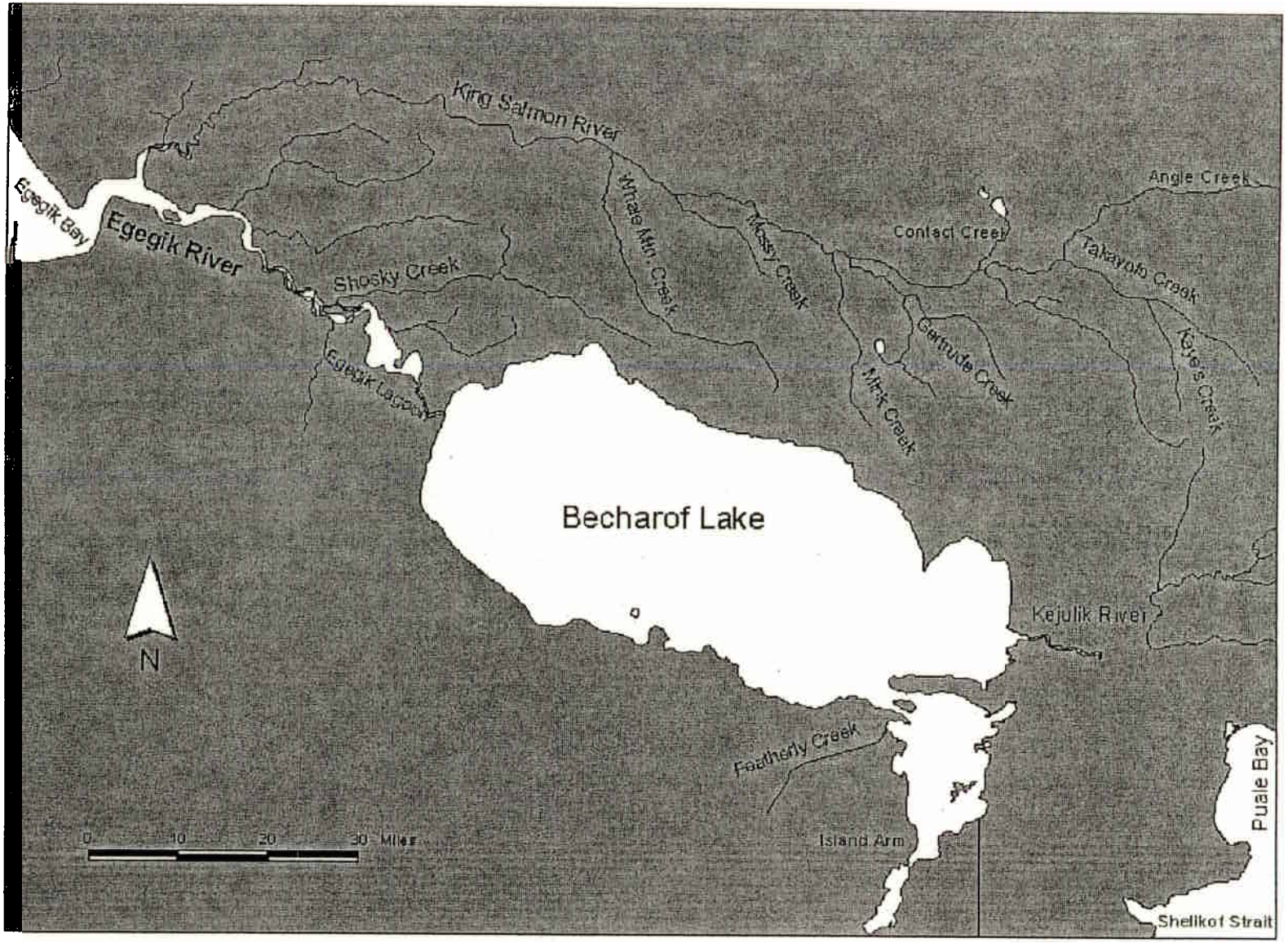

Figure 3. Egegik River drainage, Bristol Bay, Alaska

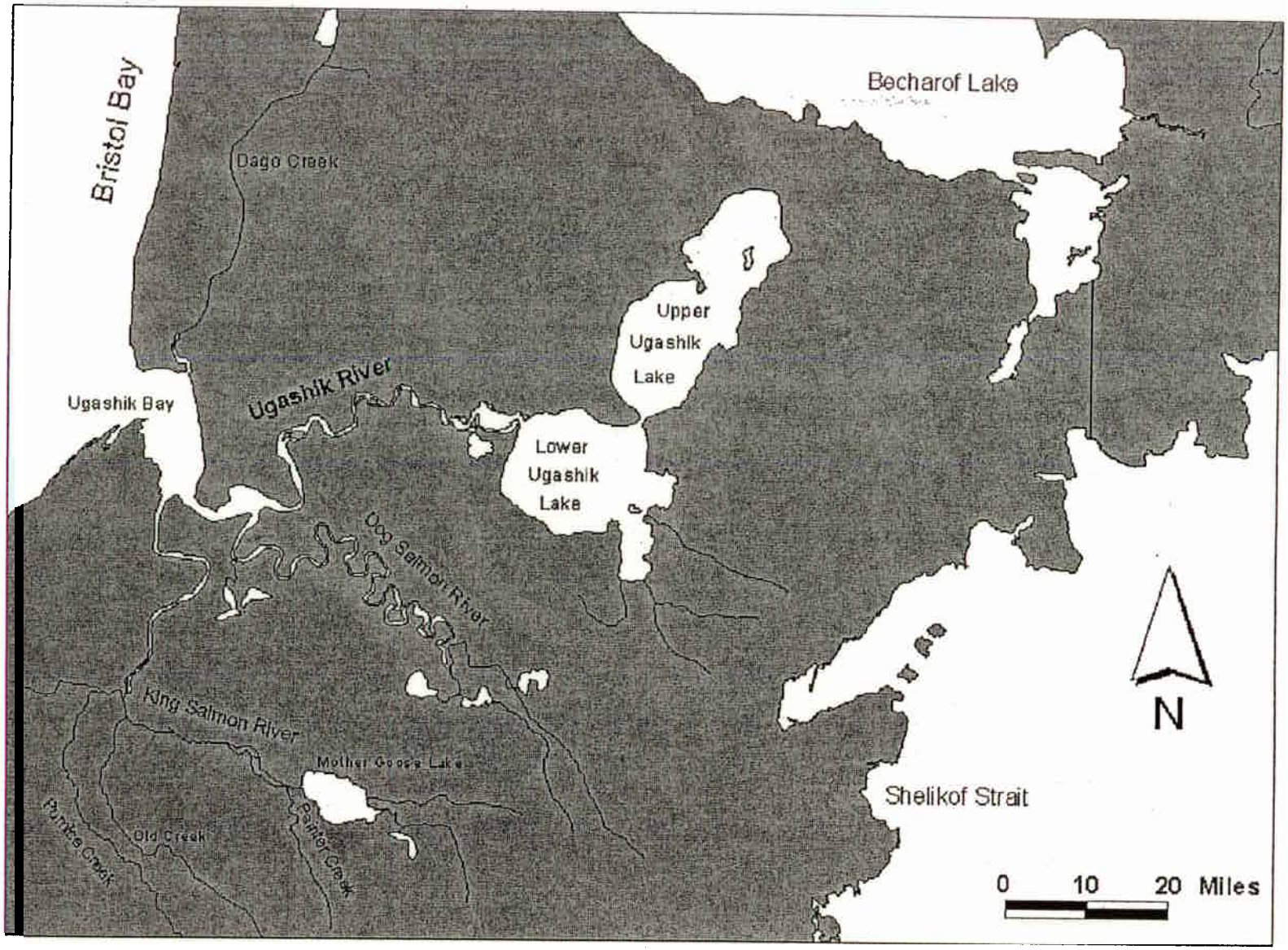

Figure 4. Ugashik River drainage, Bristol Bay, Alaska.

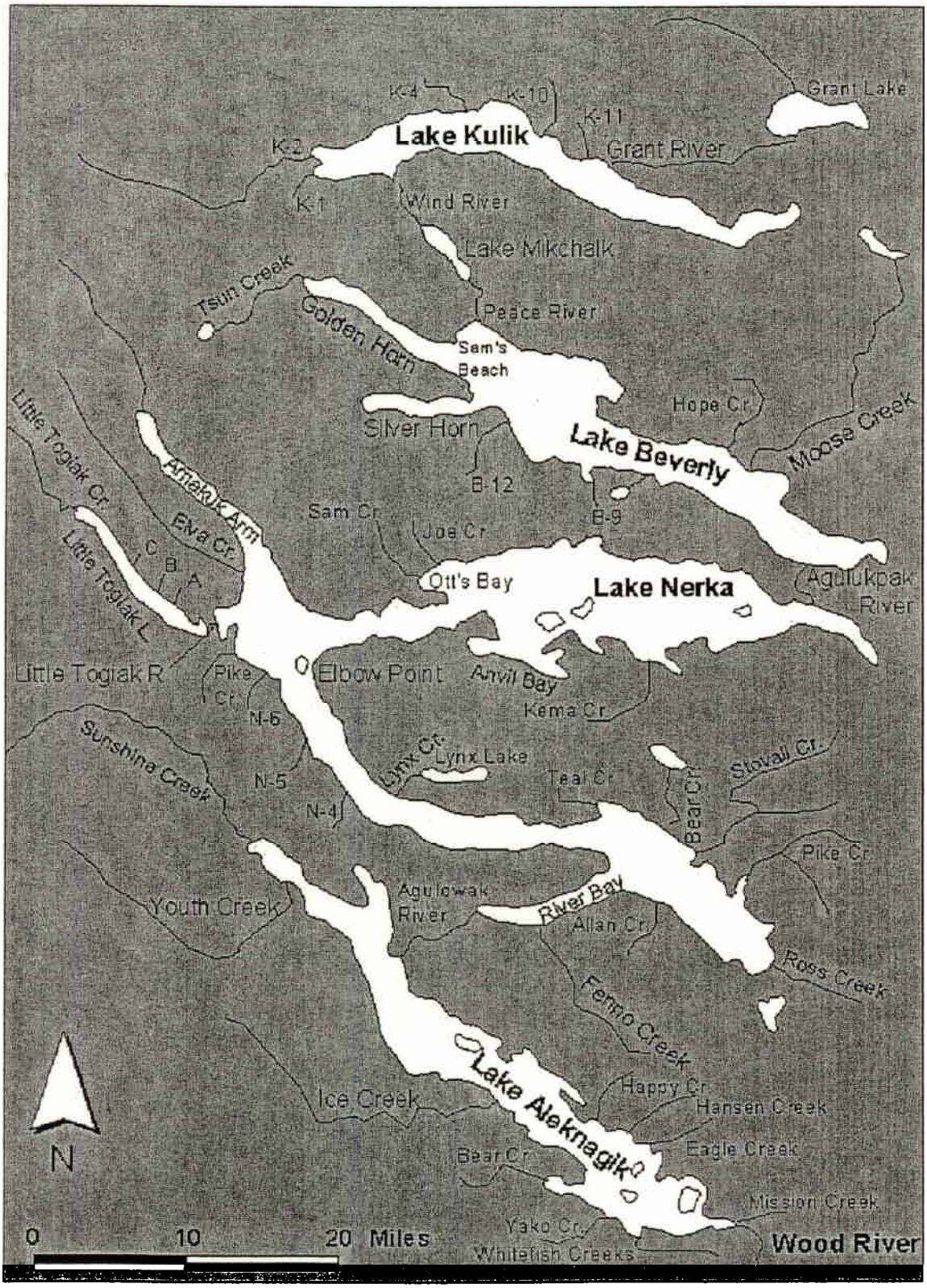

Figure 5. Wood River Lakes system, Bristol Bay, Alaska.

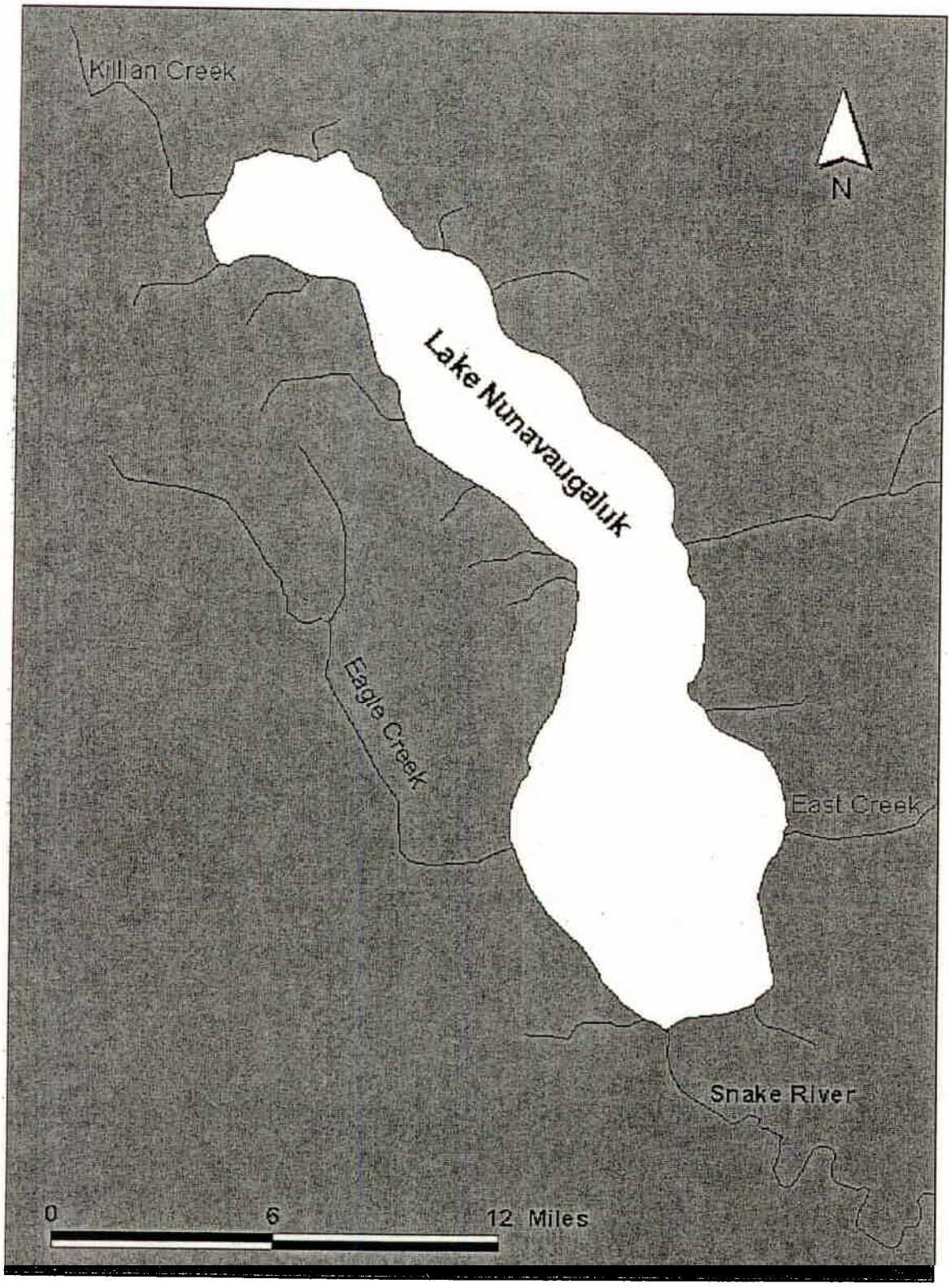

Figure 6. Lake Nunavaugaluk system, Bristol Bay, Alaska.

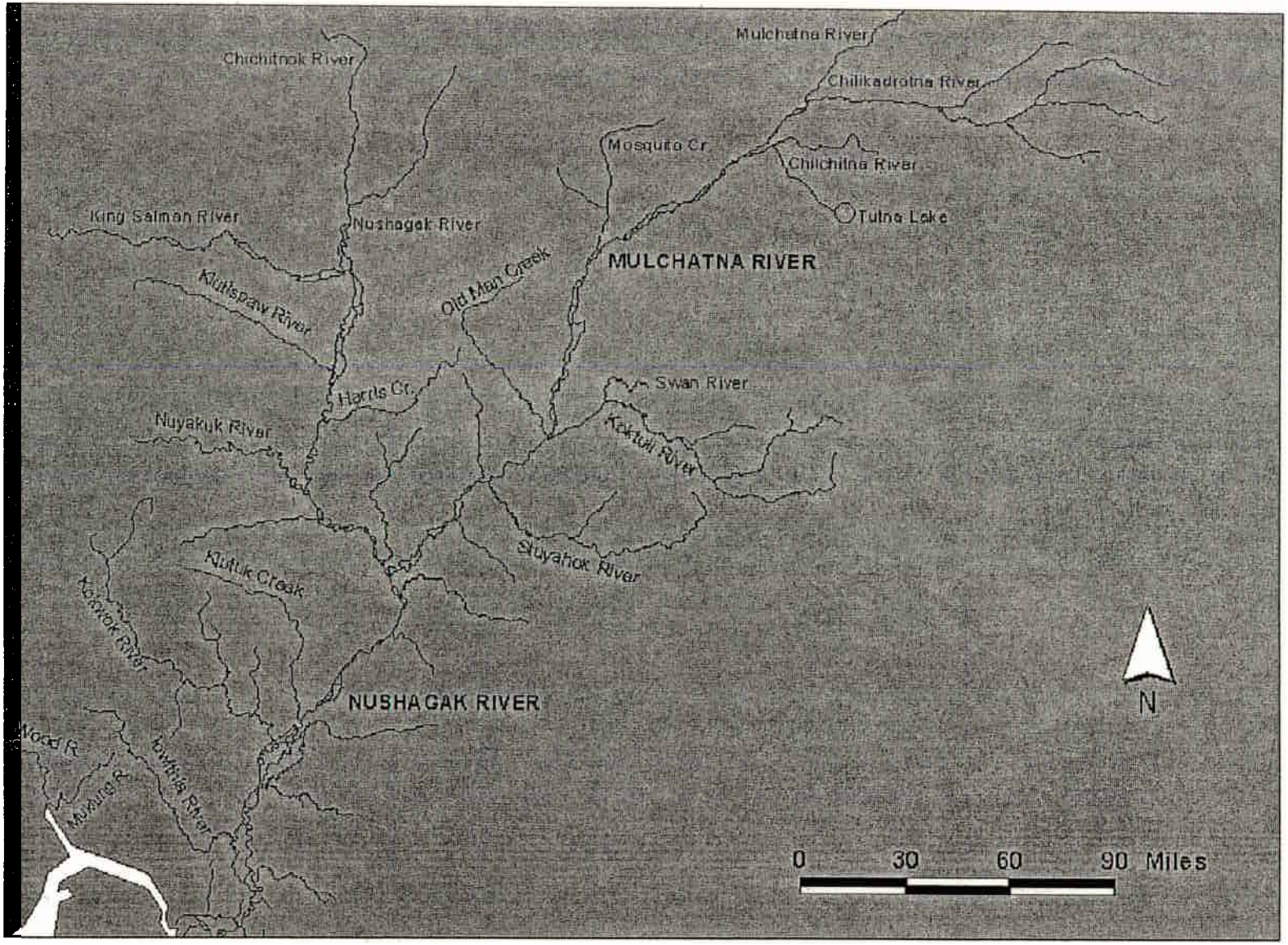

Figure 7. Nushagak-Mulchatna River system, Bristol Bay, Alaska.

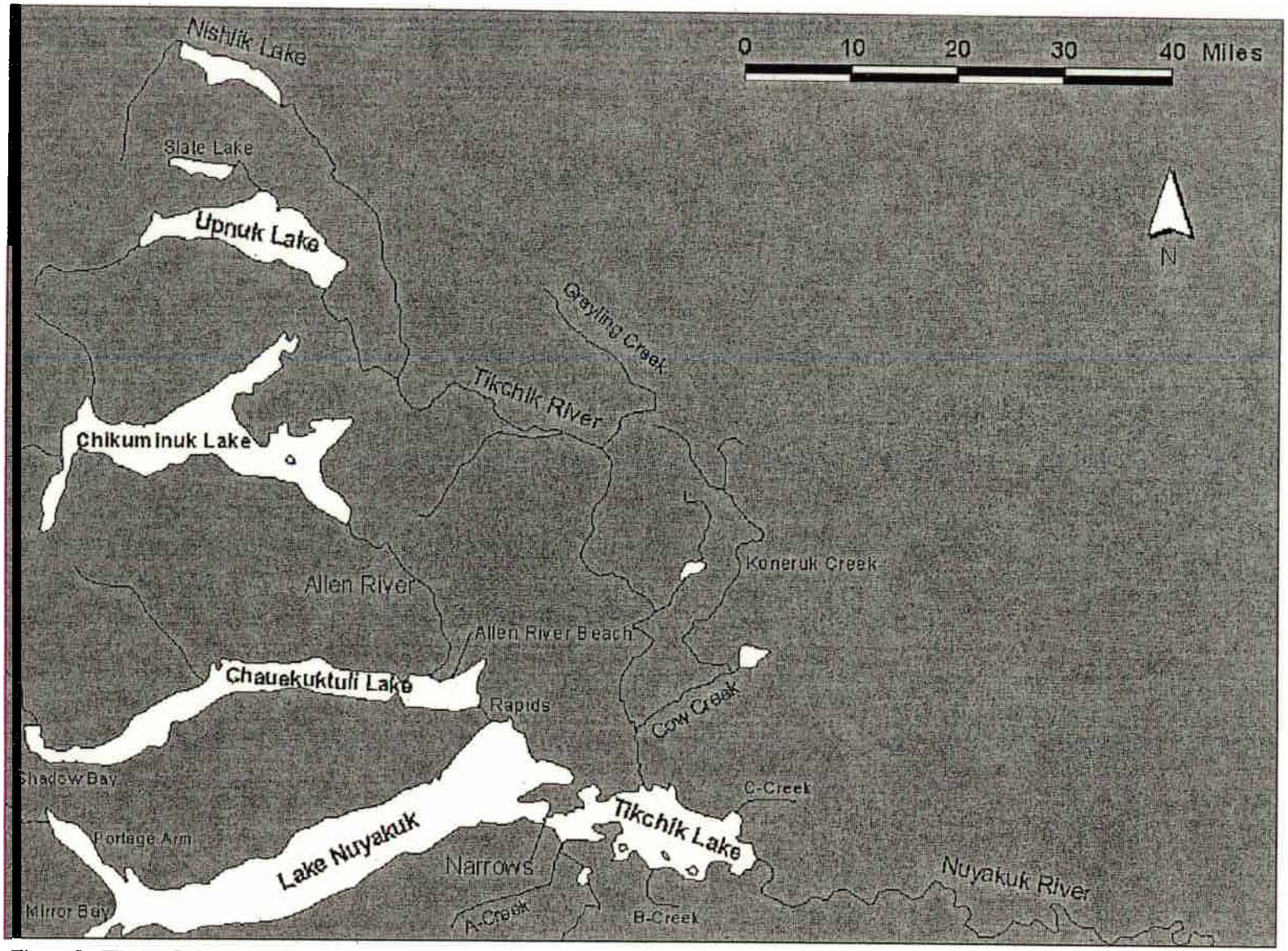

Figure 8. Tikchik Lakes system, Bristol Bay, Alaska.

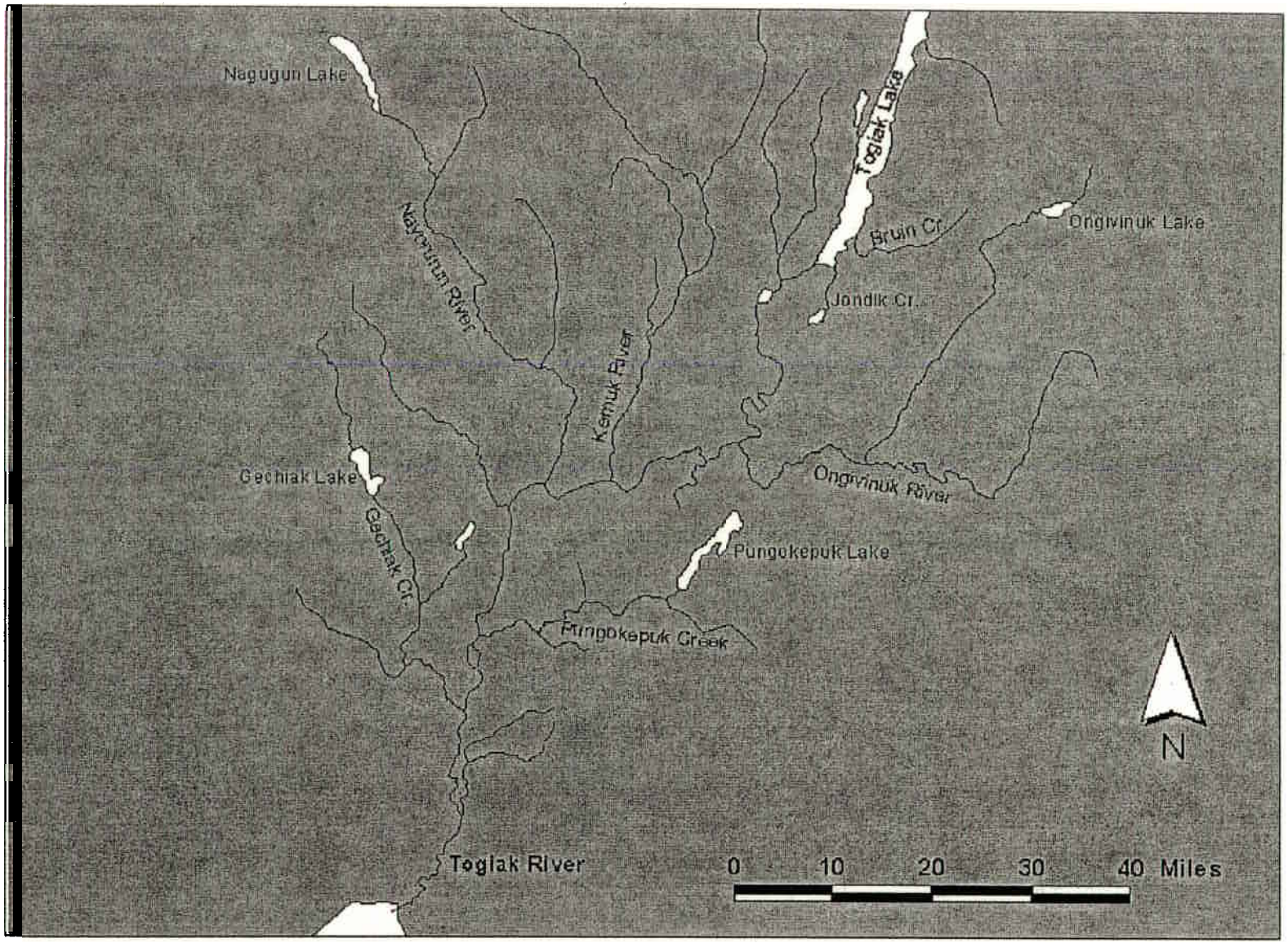

Figure 9. Togiak River system, Bristol Bay, Alaska.

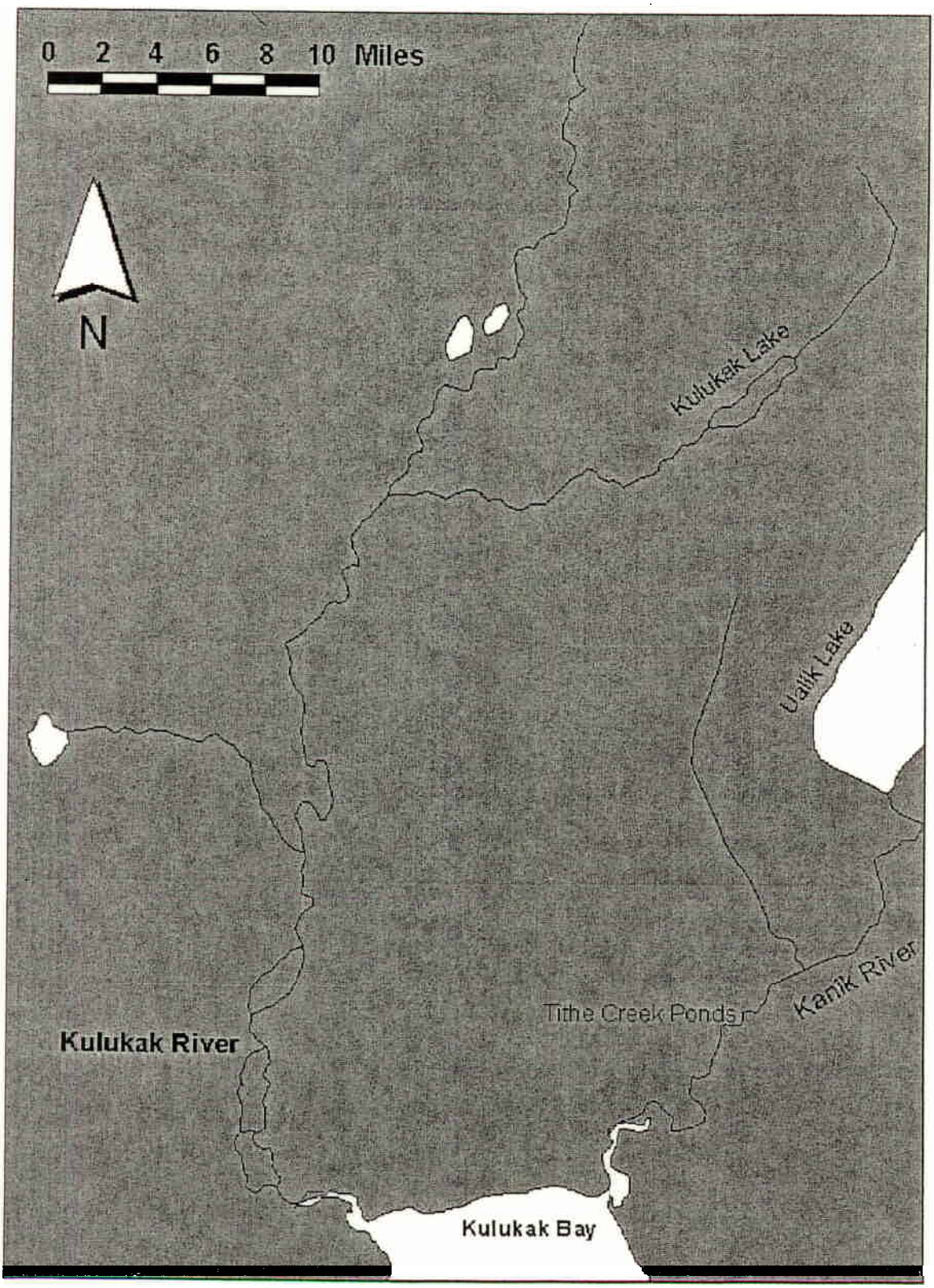

Figure 10. Kulukak River system, Bristol Bay, Alaska.

Appendix Table 1. Sockeye salmon total escapement estimates, Naknek-Kvichak District, 1983-2003. Estimates based on visual counts from towers unless otherwise noted.

Year	Kvichak	Naknek	Alagnak	Total	Alagnak Percent of Total
1983	3,569,982	888,294	96,220 [a]	4,554,496	2
1984	10,490,670	1,242,474	215,370 [a]	11,948,514	2
1985	7,211,046	1,849,938	118,030 [a]	9,179,014	1
1986	1,179,322	1,977,645	230,180 [a]	3,387,147	7
1987	6,065,880	1,061,806	154,210 [a]	7,281,896	2
1988	4,065,216	1,037,862	194,630 [a]	5,297,708	4
1989	8,317,500	1,161,984	196,760 [a]	9,676,244	2
1990	6,970,020	2,092,578	168,760 [a]	9,231,358	2
1991	4,222,788	3,578,508	277,589 [a]	8,078,885	3
1992	4,725,864	1,606,650	226,643 [a]	6,559,157	3
1993	4,025,166	1,535,658	347,975 [a]	5,908,799	6
1994	8,337,840	990,810	242,595 [a]	9,571,245	3
1995	10,038,720	1,111,140	215,713 [a]	11,365,573	2
1996	1,450,578	1,078,098	306,750 [a]	2,835,426	11
1997	1,503,732	1,025,664	218,115 [a]	2,747,511	8
1998	2,296,074	1,202,172	252,200 [a]	3,750,446	7
1999	6,196,914	1,625,364	463,600 [a]	8,285,878	6
2000	1,827,780	1,375,488	451,300 [a]	3,654,568	12
2001	1,095,348	1,830,360	267,000 [a]	3,192,708	8
2002	703,884	1,263,918	282,100 [a]	2,249,902	13
2003	1,686,804	1,831,170	2,110,000 [a]	5,627,974	37
Mean	4,570,530	1,493,694	335,035	6,399,259	7

[a] Aerial survey counts.
[b] Weir counts.
[c] Mean of counts from 1977 to present.

Appendix Table 2. Aerial survey counts of Chinook salmon escapements, Naknek River drainage, 1983-2003.

Year	Mainstem Naknek River	Paul's Creek	King Salmon Creek	Big Creek	Total
1983	2,860	290	460	4,220	7,830
1984	790	400	385	3,420	4,995
1985	590				590
1986	2,200	73	102	1,542	3,917
1987	2,800	7	290	1,353	4,450
1988	7,380	150	600	3,600	11,730
1989	1,700	50	100	860	2,710
1990	4,500	150	350	2,000	7,000
1991	1,655	121	275	2,340	4,391
1992	1,550	88	158	895	2,691
1993	5,520	86	700	1,710	8,016
1994	5,970	203	974	2,531	9,678
1995	2,790	26	239	1,905	4,960
1996	2,965	157	312	1,576	5,010
1997	7,520	248	902	1,783	10,453
1998	2,150	210	1,060	2,085	5,505
1999		223	847	2,250	3,320
2000	1,900	43	178	1,112	3,233
2001	3,800	118	413	2,009	6,340
2002	4,240	314	934	2,015	7,503
2003	4,150	583	1,348	[a]	6,081
Mean	3,352	177	531	2,063	5,733 [b]
Percent	58	3	9	36	107

[a] Counts unavailable.
[b] The sum of mean indices.

Appendix Table 3. Chinook salmon escapement survey history, mainstem Naknek River, 1983-2003.

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
1983	8/14	Bill		2,860	3,000	Pre-peak. Still fish holding in large groups.
1984	8/14	Bill		790	2,370	
1985	8/06	Bill			600	Pre-peak.
	8/27	Bill		590	700	
1986	8/18	Russell		1,990		Spawning pre-peak. Still many fish holding.
	8/19	Meyer		2,200		Peak of spawning drawing near.
1987	8/19	Meyer		2,800		Pre-peak. Fish still in large groups. Few redds.
	8/28	Bill		2,655	2,855	
1988	8/09	Minard		7,380	7,400	Approaching peak. Most fish on redds.
1989	8/14	Minard		1,700		Fish actively spawning. Few carcasses observed.
1990	8/06	Minard		4,500		
1991	8/20	Russell		1,655		Pre-peak. Still many fish schooled & waiting.
1992	8/21	Regnart		877		Water clarity poor in deeper pools.
	8/27	Regnart		1,550		At Peak...all fish on redds.
1993	8/23	Regnart		5,520		Near peak. Still some fish schooled.
1994	8/24	Regnart		5,970		Near peak. Most on redds.
1995	8/21	Regnart		2,790		Near peak. Most on redds.
1996	8/21	Regnart		2,965		At Peak...all fish on redds.
1997	8/16	Regnart		7,520		Near peak. Most on redds.
1998	8/18	Regnart		2,150		At Peak...all fish on redds.
1999	no survey					Survey flown September 8 no count available.

(Continued)

Appendix Table 3. (Page 2 of 2)

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
2000	8/07	Morstad		1,900		Early still fish schooled
2001	8/29	Morstad		3,800		Slightly after peak
2002	8/28	Morstad		4,240		Slightly after peak
2003	8/21	Morstad		4,150		Slightly after peak
Mean			3,124	3,154		

[a] Weir count did not account for estimated 15-20% of chinook that spawn downstream of weir site. Also does not account for fish that migrated upstream past the weir site before and after weir operation.

[b] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 4. Chinook salmon escapement survey history, Big Creek, Naknek River Drainage, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill		4,220	9,000	
1984	8/08	Bill		3,420	8,800	At peak of spawning.
1985	8/06	Bill			2,900	Survey conditions..high water & gusty winds.
1986	8/08	Meyer		1,542	6,000	Excellent conditions. Fish at spawning peak.
1987	8/21	Meyer		1,353	2,500	
1988	8/09	Minard		3,600		
1989	8/14	Minard		860		
1990	8/06	Minard		2,000		
1991	8/12	Regnart		2,340		At spawning peak..all fish on redds, only 20 dead.
1992	8/18	Regnart		895		Est. 5-6 days post-peak. Count includes 125 dead.
1993	8/17	Regnart		1,710		Estimated survey 3-4 days past peak.
1994	8/16	Regnart		2,531		Est. 2-3 days post-peak. Count includes 159 dead.
1995	8/15	Regnart		1,905		Estimate survey was several days past peak.
1996	8/12	Regnart		1,576		At spawning peak....38 dead observed
1997	8/7	Regnart		1,783		At spawning peak....48 dead observed
1998	8/18	Regnart		2,085		At spawning peak....no carcasses present
1999		Morstad		2,250		At spawning peak....no carcasses present
2000	8/07	Morstad		1,112		At spawning peak....4 dead observed
2001	8/08	Morstad		2,009		At spawning peak
2002	8/02	Morstad		2,015		At spawning peak
2003						NO survey completed
Mean			1,465	2,063		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 5. Chinook salmon escapement survey history, King Salmon Creek, Naknek River drainage, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill		460	1,400	Poor visibility. Muddy. 30% spawners dead already.
1984	8/08	Bill		385	1,155	
1988	8/08	Minard		600		At peak.
1989	8/14	Minard		100		Past peak.
1990	8/06	Minard		350		
1991	7/30	Russell		100		Pre-peak and water clarity only "Fair".
	8/05	Russell		275		Est. at spawning peak, most fish on redds, 2 dead.
1992	8/09	Russell		158		Post-peak as 47 dead counted & aband. redds numerous.
1993	7/31	Russell		700	900	Slightly pre-peak. Most fish on redds. Water clear.
1994	7/29	Russell		974		Slightly pre-peak. Most fish on redds. Only 6 carcasses.
1995	8/05	Russell		239		A little past peak. Several singles on redds. Vis. only
1996	8/05	Regnart		312		Slightly post peak. 26 dead counted.
1997	7/18	Regnart		902		Pre-peak and water clarity "Good".
1998	8/18	Regnart		1,060		Estimate is at peak of spawn.
1999	8/02	Morstad		847		Estimate near peak of spawn, fair to good conditions.
2000	8/01	Morstad		178		Estimate near peak, survey conditions fair
2001	8/02	Morstad		413		Estimate near peak, survey conditions fair
2002	31-Jul	Morstad		934		Estimate near peak, survey conditions excellent
2003	8/01	Morstad		1,348		Estimate near peak, survey conditions excellent
Mean				544		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for conditions, river areacounting at time of survey.

Appendix Table 6. Chinook salmon escapement survey history, Paul's Creek, Naknek River drainage, 1983-2003.

Year	Count Dates	Surveyors	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill	290	800	Poor visibility.
1984	8/08	Bill	400	800	Fair visibility. About 25% dead already.
1985	8/06	Bill		170	Pre-peak.
1986	8/08	Meyer	73	236	Approximately 30% dead already.
1987	8/13	Russell	7		Poor survey conditions. Past peak.
	??	Meyer		400	Estimat 400 present based on jet boat surveys.
1988	8/08	Minard	150		At peak.
1989	8/14	Minard	50		Past peak. Excellent visibility.
1990	8/06	Minard	150		Excellent survey conditions.
1991	7/30	Russell	121		Slightly pre-peak.Only 1 carcass noted.
1992	8/01	Russell	88		Slightly pre-peak.Stream clarity only "Fair".
1993	7/31	Russell	86	140	Slightly pre-peak.Overflew approx 60% of stream.
1994	7/29	Russell	203	300	Pre-peak...but many fish on redds.
1995	8/05	Russell	26		Water clarity poor. 5 carcasses noted
1996	8/05	Regnart	157		Peak of spawning. 12 dead counted.
1997	7/18	Regnart	248		Pre-peak. Excellent visibility
1998	8/18	Regnart	210		
1999	8/02	Morstad	223		Pre spawning, 10% on redds and two carcasses
2000	8/01	Morstad	43		Pre spawning, 10% on redds no carcasses
2001	7/31	Morstad	118		Near spawning peak conditions fair
2002	7/31	Morstad	314		Near spawning peak conditions good
2003	8/01	Morstad	583		Near spawning peak conditions good
Mean			177		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 7. Chinook salmon escapement survey history, Alagnak River, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/15	Bill		2,980	3,500	At peak of spawning.
1984	8/14	Bill		6,090	9,135	
1985	8/17	Bill		3,920	9,518	About peak for chinook spawning. 30% dead already.
1986	8/11	Bill		3,090	7,200	Peak of spawning.
1987	8/22	Bill		2,420		
1988	8/12	Bill		4,600		
1989	8/15	Bill		3,650		
1990	8/08	Bill		1,720		
1991	8/09	Regnart		2,023		Pre-peak. Most fish schooled yet. Few on redds.
	8/19	Regnart		2,531		Near peak. Most fish on redds.
1992	8/10	Regnart		3,042		Pre-peak. Most fish still schooled.
	8/21	Regnart		2,275		Near peak...but water clarity worse than earlier.
1993	8/09	Regnart		10,170		Near peak. Most on redds.
1994	8/08	Regnart		8,480		About half the fish on redds. Others schooled.
1995	8/10	Regnart		6,860		About 2/3 of chinook noted on redds.
1996	8/12	Regnart		9,885		Near peak. Most on redds.
1997	8/7	Regnart		15,210		Peak. Excellent visibility
1998	8/12	Anderson		4,148		About 1/3 of braids poor light; most on redds.
1999	8/10	Morstad		2,178		Peak of spawning, good survey conditions
2000	8/7	Morstad		2,220		Peak of spawning, good survey conditions
2001	8/8	Morstad		5,458		Near peak, high water survey conditions good
2002	8/2	Morstad		3,765		Near peak, survey conditions good
2003	8/13	Weiland		8,209		Near peak, survey conditions good
Mean			238	4,997		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 8. Chinook salmon escapement survey history, Kvichak River, 1932-2003.

Year	Count Dates	Surveyors	Weir Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1932	6/28-8/5		5,753			Peak count was on 7/05 (1,168 fish).
1976	8/16	Bill		35	45	Survey timed to count pink salmon.
1980[b]	8/08	Bill		900	1,000	Chinook actively spawning.
1984	8/14	Bill		200		
1988	8/13	Bill		190	570	Nearly all on redds.
1989	8/16	Bill		100	260	
1990	8/19	Bill		170	510	
1992	8/13	Regnart		264		All fish on redds in Kaskanak Flats.
1993	8/16	Regnart		115		All fish on redds in Kaskanak Flats.
1994	8/12	Regnart		306		
1995	8/14	Regnart		96		
1996	8/18	Regnart		132		
1997	8/15	Regnart		103		
1998	8/14	Anderson		187		All fish on redds in Kaskanak Flats
1999	8/10	Morstad		1,200		
2000	8/07	Morstad		6		
2001	8/08	Morstad		36		
2002	No survey					
2003	No survey					
Mean			5,753	222		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

[b] Pecks Creek, a Kvichak River tributary, was float surveyed 7/30-8/03, 1980 by R. Russell and 99 spawning chinook salmon were counted.

Appendix Table 9. Chinook salmon escapement data, Naknek-Kvichak District, 1983-2003.

Year	Non-expanded Escapement Indices by Drainage [a]			Total
	Naknek	Alagnak	Kvichak	
1983	7,830	2,980		10,810
1984	4,995	6,090	200	11,285
1985	590 [f]	3,920		4,510
1986	3,917	3,090		7,007
1987	4,450	2,420		6,870
1988	11,730	4,600	190	16,520
1989	2,710	3,650	100	6,460
1990	7,000	1,720	170	8,890
1991	4,391	2,531		6,922
1992	2,691	3,042	264	5,997
1993	8,016	10,170	115	18,301
1994	9,678	8,480	306	18,464
1995	4,960	6,860	96	11,916
1996	5,010	9,885	132	15,027
1997	10,453	15,210	103	25,766
1998	5,505	4,148	187	9,840
1999	3,320 [c]	2,178	1,200	6,698
2000	3,233	2,220	6	5,459
2001	6,340	5,458	36	11,834
2002	7,503	3,765		11,268
2003	6,081 [g]	8,209		14,290
Mean [h]	5,733	5,268	222	11,149

[a] Includes aerial indices from all streams surveyed in drainage.
[b] No index count for Paul's Creek.
[c] No index count for Naknek River.
[d] No non-expanded index counts exist for this year.
[e] Includes only index counts for mainstem Naknek River, Paul's Creek, & Big Creek.
[f] Naknek River mainstem only.
[g] No index count for Big Creek.
[h] Sum of mean indices.

Appendix Table 10. Chum salmon escapement survey history, Alagnak River, 1983-2003.

Year	Count Dates	Surveyors	Tower Counts	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/15	Bill		8,800		Pre-peak.
1984	8/14	Bill		48,000	87,500	
1990	8/08	Bill		8,500	30,000	Pre-peak.
	8/18	Bill		48,800		Close to peak of spawning.
1991	8/09	Regnart		43,000		Pre-peak.
	8/19	Regnart		64,300		Peak of spawning.
1992	8/10	Regnart		114,000		Near Peak.
1993	8/09	Regnart		4,600		Near Peak.
1994	8/08	Regnart		62,900		Near Peak.
1995	8/10	Regnart		132,000		Near Peak.
1996	8/12	Regnart		145,000		Near Peak
1997	8/07	Regnart		37,800		Near Peak
1998	8/12	Anderson		3,150		Poor survey conditions
1999	8/10	Morstad		11,800		Near Peak
2000	8/07	Morstad		10,120		Near Peak
2001	8/08	Morstad		70,800		At peak
2002	8/02	Morstad		157,800		At peak
2003	8/13	Morstad		78,000		At peak
Mean			3,575	58,298		

[a] Surveyor's subjective istimate of instantaneous population of chum salmon spawners in the river at time of aerial survey, based on survey conditions, coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for river area counting at time of survey.

Appendix Table 11. Pink salmon escapement survey history, Alagnak River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982	8/09	Bill	21,300	63,900	
	8/19	Bill	24,800	43,000	Pre-peak.
1984	8/14	Bill	296,500	567,100	Survey too early for peak. Most fish
1986	8/11	Bill	48,600	145,800	
1988	8/12	Bill	415,000	620,000	Pre-peak.
1990	8/08	Bill	45,100		
	8/18	Bill	240,500		Estimated to be about 1 week pre-peak.
1992	8/10	Regnart	15,000		Pre-peak.
1994	8/08	Regnart			No pinks noted.
1996	8/12	Regnart			No pinks noted.
1998	8/12	Anderson	3,200		High water poor light conditions
2000	8/7	Morstad	30,000		
2002	8/2	Morstad	127,500		Survey too early for peak. Most fish
Mean			115,227	205,686	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting a time of survey.

Appendix Table 12. Pink salmon escapement survey history, Kvichak River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982					No Survey.
1984	8/14	Bill	111,000	165,000	
1986					No survey.
1988	8/13	Bill	94,000		
1990	8/19	Bill	25,300	47,000	
1992					No survey.
1994					No survey.
1996					No Survey
1998					No Survey.
2000	8/07	Morstad	7,000		Still schooled.
2002					No survey
Mean			59,325	106,000	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 13. Pink salmon escapement survey history, Naknek River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982	8/19	Bill	33,600	34,000	Pre-peak.
1984	8/14	Bill	27,000	125,000	
1986	8/18	Russell	286,000	375,000	Most fish still schooled and holding. Pre-peak.
1988	8/24	Russell	187,000		
1990	8/18	Bill		65,000	
1992					No survey.
1994					No survey.
1996					No survey.
1998					No survey.
2000	8/07	Morstad	10,000		
2002	8/28	Morstad	20,000		Main stem only
Mean			15,000	65,000	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 14. Aerial survey counts of Chinook salmon escapement, Egegik District, 1983-2003.

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[f]	Contact Creek	King Salmon River	Total
1983						860		380		375		1,615
1984	40	300				600		350		110		1,400
1985	75	80	0	15	10	260	230	315		95		1,080
1986	65	150	48	0	0	150	46	40		18	15	532 [b]
1987	15	174	2	74	0	408	284	232	2	88		1,279
1988	50	151	0	12		248	120	177		110		868
1989	14	90	13	43	7	310	120	300		100		997
1990	24 [c]	85	7	35	2	260	175	175		205		968
1991	0 [c]	62	60	30	33	83	117	95		73		553
1992[d]	15	143	52	54	22	416	320	190		296		1,508
1993	80	58	6	38	6	350	170	200		235		1,143
1994[d]	66 [c]	48	32	118	77	840	214	230		705		2,330
1995[d]	60 [c]	32	10	53	103	456	248	130		275		1,367
1996	42 [c]	102	8	38	20	230	74	123	6	203	[g]	846
1997	30 [c]	39	2	18	10	260	173	374	[g]	740	[g]	1,646
1998	0 [c]	29	45	55	[g]	320	165	120	[g]	329	[g]	1,063
1999	6 [c]	75	10	51	[g]	165	6	115	[g]	145	[g]	573
2000	0 [c]	4	0	16	[g]	85	41	73	[g]	341	[g]	560
2001	0 [c]	32	0	35	[g]	116	120	153	[g]	299	[g]	755
2002	0 [c]	24	4	0	[g]	277	220	149	[g]	238	[g]	912
Mean	31	88	17	38	24	335	158	196	4	249	15	1,100
2003	0 [c]	35	0	20	10	297	180	313	[g]	197	[g]	1,052
Deviation [e]		-60%	-100%	-47%		-11%	14%	60%		-21%		-4%

[a] Peak aerial counts unless otherwise noted. Data not expanded.
[b] Survey 10-14 days later than normal.
[c] Tower count.
[d] Helicopter surveys.
[e] 2003 deviation from 1981-2002 average.
[f] Angle Creek is usually too turbid to survey.
[g] No Count.

Appendix Table 15. Aerial survey counts of chum salmon escapement, Egegik District, 1983-2003.

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[b]	Contact Creek	King Salmon River	Total
1983	6[c]					5,000		3,500		6,000		14,500
1984	800	200				13,000		2,400		10,000		26,400
1985	400	0	600	200	35	2,600	800	0		500	50	5,185
1986	0	0	6,025			140	3	5	0	15	25	6,213[d]
1987	150	0	19,000	16	1,000	3,770	2,780	0		2,850		29,566
1988	500	50	4,400	100	50	5,200	1,600	0		3,200		15,100
1989	0	10	3,200	25	100	1,100	0	0		200	14	4,649
1990	72[c]	0	2,000	0	150	1,675	80	0		750		4,727
1991	0[c]	0	1,500	70	100	990	280	0		480		3,420
1992[e]	50	0	680	15	25	4,500	400	0		3,630	200	9,500
1993	100	0	1,020	8	1	1,075	0	0		100		2,304
1994[e]	42[c]	0	1,700	5	7	760	175	30		260		2,979
1995[e]	144[c]	2	395	15	30	560	162	5		600		1,913
1996	12	[f]	438	4	20	530	[f]	24	[f]	633	[f]	1,661
1997	0[c]	[f]	220	8	10	495	290	60	[f]	640	[f]	1,723
1998	17[c]	8	1,480	4	[f]	920	4	4	[f]	140	[f]	2,577
1999	6[c]	[f]	1,040	4	[f]	243	[f]	4	[f]	140	[f]	1,437
2000	0[c]	[f]	492	4[f]	[f]	475	32	6	[f]	180	[f]	1,189
2001	0[c]	[f]	424	6	[f]	494	40	30	[f]	1,240	[f]	2,234
2002	0[c]	[f]	284	5	[f]	302	16		[f]	150	[f]	757
Mean	121	21	2,494	29	127	2,191	416	319	0	1,585	72	6,902
2003	0[c]	0	540	70	50	690	0	0	[f]	3,800	[f]	5,150

[a] Peak aerial counts unless otherwise noted. Data not expanded.
[b] Angle Creek is usually too turbid to survey.
[c] Tower count.
[d] Survey 10-14 days later than normal.
[e] Helicopter surveys.
[f] No Count.

Appendix Table 16. Aerial survey counts of pink salmon escapement, Egegik District, 1983-2003.[a]

Year	Egegik River	Whale Mountain Creek	Gertrude Creek	Contact Creek	Other	Total
1983			58 [c]			58
1984	17,000					17,000
1985						
1986	2,500					2,500
1987						
1988	23,000					23,000
1989	300					300
1990	17,000		40 [c]			17,040
1991		88 [d]	24 [d]	36 [d]		148
1992[e]	6 [b]	10			3	13
1993	50					50
1994	21,282 [b]					21,282
1995	24 [b]					24
1996	103,116 [b]					103,116
1997	0 [b]		1,290 [f]			1,290
1998	2 [b]		2,487 [f]			2,489
1999	6 [b]		1,125 [f]			1,131
2000 [g]	0 [b]					
2001 [g]	0 [b]					
2002 [g]	0 [b]					
Mean	13,161	49	837	36	3	12,629
2003 [g]	0 [b]					

[a] Non-expanded aerial peak counts unless otherwise noted.
[b] Tower counts.
[c] Float count.
[d] Foot survey (USFWS).
[e] Helicopter surveys.
[f] Gertrude Creek Weir count.
[g] No Counts.

Appendix Table 17. Aerial survey counts of coho salmon escapement, Egegik District, 1983-2003.

Year	Number of Surveys	Coho Salmon Count	Comments
1983	0	0	No surveys done.
1984	3	43,225	40,000 counted in Egegik Lagoon on August 15.
1985	3	5,260	Peak surveys on August 26.
1986	1	12,575	Surveyed August 19.
1987	6	6,930	Included King Salmon River & tributaries.
1988	6	13,715	Included King Salmon River & tributaries.
1989	9	4,485	Included Gertrude & Whale Mountain Creeks.
1990	7	13,400	Peak survey on August 17.
1991	0	220	Incidental observation made August 6.
1992 [b]	0	200	Incidental observation in Egegik River August 6.
1993	0	1,130	Incidental observation from Egegik River August 16.
1994 [b,c]	2	7,412	Included King Salmon River & tributaries.
1995 [d]	2	5,258	Included King Salmon River & tributaries.
1996 [e]	2	9,043	Included King Salmon River & tributaries.
1997	3	4,106	Gertrude Weir Count & selected Becharof Lake tributaries.
1998	1	6,075	Gertrude Weir Count & selected Becharof Lake tributaries.
1999	1	4,353	Gertrude Weir Count & selected Becharof Lake tributaries.
2000	1	4,870	Selected Becharof Lake tributariers
2001	1	5,100	Selected Becharof Lake tributariers
2002	1	7,050	Selected Becharof Lake tributariers
2003	1	5,280	Selected Becharof Lake tributariers

[a] Survey done by USFWS personnel.
[b] Helicopter surveys.
[c] The Egegik River Tower was maintained through September 11 and approximately 10,140 coho salmon were counted.
[d] The Egegik River Tower was maintained through August 30 and approximately 7,470 coho salmon were counted.
[e] The Egegik River Tower was maintained August 7 to September 11 and approximately 24,918 coho salmon were counted.

Appendix Table 18. Aerial survey counts of Chinook salmon escapement, Ugashik District, 1983-2003.

Year	Ugashik River	Dog Salmon River [g]	King Salmon	Painter Creed	Pumice Creek	Old Creek	Total
1983	50 [a]	1,635	525	635	1,800	660	5,305
1984	108 [a]	836	4,100	1,875	1,100	880	8,899
1985	150 [b]	560	4,600	410	930	410	7,060
1986	66 [b]	252	1,777	646	705	739	4,185
1987	54 [a]	751	981	1,051	1,602	1,155	5,594
1988	249 [c]	900	5,820	1,170	1,025	660	9,824
1989	226 [bc]	848	1,670	1,030	510	520	4,804
1990	67 [ac]	540	1,500	590	450	610	3,757
1991	131 [ac]	449	700	365	375	420	2,440
1992 [d]	260 [ac]	821	1,260	855	750	815	4,761
1993	188 [ac]	579	1,970	865	450	635	4,687
1994 [d]	233 [ac]	1,741	2,225	1,005	2,530	1,490	9,224
1995	149 [ac]	882	440	366	501	505	2,843
1996	76 [ac]	1,079	1,200	403	[f]	30 [f]	2,788
1997	839 [ac]	906	802	525	536	558	4,166
1998	458 [ac]	1,411	883	1,230	352	438	4,772
1999	237 [ac]	535	[f]	166	340	213	1,491
2000	26 [a]	425	[f]	314	339	246	1,350
2001	346 [abc]	929	828	563	646	530	3,842
2002	618 [abc]	1,121	430	472	586	408	3,635
Mean	227	860	1,762	727	817	596	4,771
2003	469 [abc]	1,053	334	490	596	351	3,293
Deviation [e]	107%	22%	-81%	-33%	-27%	-41%	-31%

[a] Tower counts
[b] Tower count plus later aerial survey counts of main river.
[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).
[d] Helicopter surveys.
[e] 2003 deviation from 1980-2002 average.
[f] No Count.
[g] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 19. Aerial survey counts of chum salmon escapement, Ugashik District, 1983-2003.

Year	Ugashik River	Dog Salmon River [i]	King Salmon River	Painter Creek	Pumice Creek	Old Creek	Other	Total
1983	0 [a]	1,650	2,700	4,000	20,000 [b]	3,300		31,650
1984	132 [a]	750	119,000	16,000	16,000	14,500	2,500	168,882
1985	42 [c]	350	20,000	1,925	6,000	670	300	29,287
1986	0 [c]	120	8,650	1,200	2,000	630	125	12,725
1987	130 [c]	340	9,750	2,290	10,340	2,090	40	24,980
1988	752 [c,d]	2,290	25,000	10,500	11,650	5,800	950	56,942
1989	600 [c,d]	1,005	7,500	3,700	2,200	2,010	625	17,640
1990	312 [c,d]	170	6,200	1,150	1,630	410	10	9,882
1991	315 [c,d]	240	7,400	750	2,550	2,525	130	13,910
1992[e]	510 [a,c,d]	1,210	8,525	4,000	14,000	15,000	0	43,245
1993	93 [c,d]	105	7,000	720	2,040	1,025	8	10,991
1994[e]	66 [a,c]	851	9,150	1,625	12,750	6,975	150	31,567
1995	6 [a,c]	160	3,900	1,370	2,600	1,800	0	9,836
1996	138 [a]	85	16,500	700	7,400	2,500	0	27,323
1997	100 [a,c]	450	10,500	4,200	5,300	9,480	115	30,145
1998	607 [a,c]	840	10,600	3,800	2,000	4,350	224	22,421
1999	278 [a,c]	400	[h]	650	1,660	2,020	50	5,058
2000	7 [a]	510	[h]	2,150	7,300	5,850		15,817
2001	78 [ac]	1,140	8,100	6,000	13,500	7,800	200	36,818
2002	0 [ac]	1,000	8,200	3,100	5,100	4,200	100	21,700
Mean	208	683	16,038	3,492	7,301	4,647	307	31,041 [f]
2003	142 [ac]	1,130	5,500	8,000	4,000	3,000	50	21,822
Deviation [g]	-32%	65%	-66%	129%	-45%	-35%	-84%	-30%

[a] State tower counts, (Federal tower count was 5,700 in 2001, 870 in 2002, and 630 in 2003.
[b] Float count done from a raft.
[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).
[d] Included tower count plus later aerial surver count.
[e] Helicopter surveys.
[f] Average of the sums of indices for all locations.
[g] 2003 deviation from 1980-2002 average.
[h] No Count.
[i] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 20. Aerial survey counts of pink salmon escapement, Ugashik District, 1983-2003.

Year	Number of Surveys [a]	Pink Salmon Count	Comments
1983	2	803	Survey of Dog Salmon River conducted by USFWS.
1984	3	656	650 counted in King Salmon River during September 21 float trip.
1985	3	0	
1986	1	350	Observed in King Salmon River on August 19.
1987	2	1	
1988	7	2,800	Peak count on August 23: 2,000 in King Salmon River.
1989	8	50	Observed in Ugashik River on August 9.
1990	5	2,000	Peak count on August 13.
1991	0	660	Ugashik River tower count.
1992 [b]	0	1,728	Ugashik River tower count.
1993	0	0	
1994 [b]	0	425	Observed near Ugashik Lake Outlet on August 11.
1995	0	36	Ugashik River tower count.
1996	0	550	Observed in King Salmon River on August 12.
1997	0	0	
1998	0	57	Ugashik River tower count.
1999	0	6	Ugashik River tower count.
2000	0	46	Ugashik River tower count.
2001 [c]	0	708	Ugashik River tower count.
2002 [d]	0	714	Ugashik River tower count.
2003 [e]	0	156	Ugashik River tower count.

[a] Zero indicates no surveys designated to look for pink salmon and any oberservations recorded would be incidental to surveying for other species.
[b] Helicopter survey.
[c] Includes 66 from State tower count and 642 from Federal tower count.
[d] Includes 24 from State tower count and 690 from Federal tower count.
[e] Includes 66 from State tower count and 90 from Federal tower count.

Appendix Table 21. Aerial survey counts of coho salmon escapement, Ugashik District, 1983-2003.

Year	Number of Surveys	Coho Salmon Counts	Comments
1983	0		
1984	1	6,100	Surveyed on August 31.
1985	2	18,880	16,500 in King Salmon River on September 12.
1986	2	8,455	Surveyed on August 19 and 25.
1987	2	17,000	16,700 in King Salmon River on August 23.
1988	7	28,280	12,900 in King Salmon River on September 7.
1989	4	11,515	7,615 observed on August 14.
1990	5	12,610	
1991	0	400	Incidental observation made August 12.
1992[a]	0	790	Incidental observation made August 11.
1993	0	705	Incidental observation made August 16.
1994[a]	0	760	Incidental observation made August 11.
1995	0		
1996[b]	1	8,275	Surveyed on September 27 and 28.
1997[b]	2	9,400	Surveyed on September 30 and October 17.
1998[b]	1	1,459	Surveyed on November 19.
1999[b]	1	10,210	Surveyed on October 14.
2000[b]	1	12,070	Surveyed on October 12.
2001[b]	1	4,540	Surveyed on September 27.
2002[b]	1	3,805	Surveyed on September 22.
2003[b]	1	19,670	Surveyed on September 21.

[a] Helicopter survey.

[b] Surveys are of selected areas in the Ugashik Lakes, King Salmon and Dog Salmon River drainages.

Appendix Table 22. Spawner distribution and total escapement estimates of sockeye salmon, Wood River system, 1983-2003.

	Spawner Distribution (%)			
Year	Creeks	Beaches	Rivers	Total Escapement[a]
1983	14.3	60.9	24.8	1,361,000
1984	11.4	27.6	61.0	1,002,800
1985	18.6	22.2	59.1	939,000
1986	16.1	23.3	60.6	819,000
1987	27.6	56.1	16.3	1,337,000
1988	31.0	44.4	24.6	866,800
1989	19.6	28.9	51.5	1,186,400
1990				1,069,400
1991			19.0	1,159,900
1992	24.9	56.7	18.4	1,286,300
1993	40.9	34.1	25.0	1,176,100
1994	25.5	36.4	38.1	1,471,900
1995	33.5	52.9	13.6	1,482,200
1996	25.8	39.3	34.9	1,649,600
1997	15.6	60.8	23.6	1,512,400
1998	20.0	66.2	13.8	1,755,800
1999				1,512,400
2000				1,300,000
2001				1,458,700
2002				1,283,700
Mean	23.2	43.6	32.3	1281520.0
2003				1,459,800

[a] Estimated from Wood River tower counts. Rounded to the nearest hundred.

Appendix Table 23. Total escapement estimates of pink salmon, Nushagak and Togiak District, 1982-2003.[a]

Year	Nushagak District[b]	Togiak District[c]
1982	1,656,660	44,300
1984	2,926,450	269,950
1986	72,190[e]	80,000[d]
1988	494,610[e]	142,500[d]
1990	801,730[e]	207,000
1992	[f]	235,000[d]
1994	192,780[e]	88,000[d]
1996	821,312[e]	[f]
1998	132,400[e]	134,780[d]
2000	135,285[e]	[f]
2002	317,659[e]	[f]
Mean	755,108	150,191

[a] Only those years of comprehensive aerial coverage are included: even years only; all counts rounded to the nearest 10 fish.

[b] Includes Wood, Igushik, Snake, Nushagak, and Nuyakuk Rivers, and Ice, Youth, and Sunshine Creeks, unless otherwise noted.

[c] Includes Togiak, Matogak and Osviak Rivers; 1982, 1990 and 1998 also Include Slug River.

[d] Togiak River estimate only.

[e] Sonar estimate of Nushagak-Mulchatna Rivers only.

[f] No escapement estimate.

Appendix Table 24. Aerial estimates of sockeye salmon escapements, Togiak District, 1983 - 2003.[a]

Year	Togiak River & Tributaries[b]	Kulukak Systems[c]
1983	13,200	27,000
1984	30,900	49,800
1985	8,800	36,600
1986	35,000	42,800
1987	28,600	37,800
1988	32,400	31,700
1989	19,800	10,800
1990	47,100	49,600
1991	23,700	23,900
1992	16,500	26,400
1993	15,900	31,800
1994	19,400	29,700
1995	25,500	14,600
1996	30,200	19,000
1997	20,600	8,000
1998	21,900	13,000
1999	40,200	12,300
2000	40,300	22,400
2001[d]	6,700	17,000
2002	16,175	8,500
1983-02 Mean (20-Year)	24,644	25,635
1983-92 Mean (10-Year)	25,600	34,444
1993-02 Mean (10-Year)	23,688	18,427
2003	•	8,000

[a] All counts are rounded to the nearest hundred.

[b] Estimates do not include fish spawning above the counting tower (Togiak Lake outlet); estimates for Ungalikthluk, Osviak,. Matogak and Slug Rivers are not included in the 1977-94 data as reported in Bristol Bay Data Reports 73 and 81.

[c] Includes Kulukak River, Kulukak Lake, and Tithe Creek Ponds.

[d] Togiak count includes only the Togiak mainstem and Ongivinuk Rivers.

[e] No aerial surveys performed due to weather

Appendix Table 25. Peak aerial counts of live sockeye salmon, Togiak River drainage, 1983 - 2003.

Year	Togiak Mainstem	Gechiak River	Pungokepuk River	Narogurum River	Kashaiak River	Ongivinuk River	Total
1983	4,800	1,100	700	0	0	1,200	7,800
1984	10,550	2,800	2,450	0	0	2,300	18,100
1985	1,800	400	500	0	0	1,700	4,400
1986	13,500						13,500
1987	5,200	3,600	600	0	0	4,900	14,300
1988	9,400	2,000	1,100	0	0	3,700	16,200
1989	7,600	1,500	630			150	9,880
1990	8,770	5,720	5,980	0	2,550	1,190	24,210
1991	7,990	1,640	1,220			1,010	11,860
1992	3,030	1,280	1,400			2,200	7,910
1993	2,300	1,270	540			2,950	7,060
1994	3,100	560	1,870			3,900	9,430
1995	3,260	1,745	1,000		4,200	2,330	12,535
1996	9,160	2,270	150	100	240	3,190	15,110
1997	8,200	1,600	450	50	650	2,800	13,750
1998	4,890	3,100	150	10	0	2,800	10,950
1999	5,400	11,275	1,475	100	75	6,700	25,025
2000	12,600	8,100	925	150	100	775	22,650
2001	3,260					100	3,360
2002	2,050	5,000	75	1,525	0	1,450	10,100
Mean	6,343	3,053	1,179	161	601	2,387	13,724 [a]
%	46.2%	22.2%	8.6%	1.2%	4.4%	17.4%	100.0%
2003	No surveys performed due to weather						

[a] Sum of means for all streams.

Appendix Table 26. Peak aerial counts of live sockeye salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Kulukak River [b]	Tithe Creek Ponds	Quigmy River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	7,800	8,430	2,720		80	20	2,000	230	940	22,220
1984	18,100	7,400	14,000		200	6,800		100	5,200	51,800
1985	4,400	6,700	11,600		0	200	2,300	260	1,310	26,770
1986	13,500	10,900	14,000							38,400
1987	14,300	10,500	8,400							33,200
1988	16,200	12,600	3,250	250	100	380	5,880	200	2,700	41,560
1989	9,880	2,920	2,500					5,000		20,300
1990	24,210	10,600	14,200	100	400	2,200	3,540	9,700	3,800	68,750
1991	11,860	8,650	3,320	35	860	2,530	560	3,400	2,650	33,865
1992	7,910	7,530	4,950	40	300	3,340	1,460	3,600	3,760	32,890
1993	7,060	9,600	6,300					3,100	5,680	31,740
1994	9,430	10,270	4,600	580	990	1,750	6,070	2,230	3,240	39,160
1995	12,535	3,000	4,310	200	610	1,470	2,820	390	1,720	27,055
1996	15,110	2,490	7,000		360	780	1,045	1,000		27,785 [d]
1997	13,750	2,300	3,000		360	780	1,045	1,000		22,235
1998	10,950	2,175	4,300	20	900	2,600	5,010	2,300	240	28,495
1999	25,025	3,250	3,200	1,100	2,400	750	1,400	1,625	625	39,375
2000	22,650	6,100	5,075	125	526	1,512	1,201	2,175	575	39,939
2001	3,360	5,140	3,500	160	370	210	4,620	740	2,340	20,440
2002	10,100	2,375	1,875	660	1,450	1,705	371	160	0	18,696 [f]
Mean	12,907	6,647	6,105	297	619	1,689	2,621	2,067	2,319	35,271 [e]
%	36.6%	18.8%	17.3%	0.8%	1.8%	4.8%	7.4%	5.9%	6.6%	100.0%
2003		900	4,136	110	500	2,180	2,330	1,500	2,580	14,236

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Includes surveys of Kulukak Lake. Counts prior to 1977 include Kulukak Lake only and are not included in the mean.

[c] Includes a combined count for the Negukthlik and Ungalikthluk of 4,500 fish.

[d] Complete count not available

[e] Sum of means for all streams.

[f] Togiak River count includes mainstem and Ongivinuk River only.

Appendix Table 27. Peak aerial counts of live Chinook salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
	A	B	C	D	E	F						
1983	120	220	370	290	360	850	820	240	340	430	350	4,390
1984	250	560	900	560	820	1,920	760	580	270	580	430	7,630
1985	270	320	640	340	470	970	470	250	290	310	460	4,790
1986	150	80	160	30	110	350						880
1987	20	70	170	120	200	480	610	180	100	120	320	2,390
1988	70	70	160	160	170	710	390	180	60	70	90	2,130
1989	10	30	370			940	190	80			40	1,660
1990	230	170	680	365	805	1,085	370	125	75	400	10	4,315
1991	505	165	475	225	520	455	460	105	90	100	150	3,250
1992	150	250	440	225	450	690	250	160	70	175	105	2,965
1993	170	120	220	160		1,810 [b]	595	240	130	65	440	3,950
1994				215	815	1,580	420	215	225	570	380	4,420
1995	120	220	750	255	800	800	715	140	425	520	295	5,040
1996	75	150	160	100	255	625	335	120	120	235	325	2,500
1997	100	350	1,300	600	820	1,000	275	180	150	275	100	5,150
1998	10	20	250	50	400	1,200	400	150	275	140	275	3,170
1999	150	210	540	510	225	480	365	90	240	305	270	3,385
2000	75	50	500	400	850	1,450	350	85	125	100	75	4,060
2001	610	500	500	200	300	950	700	270	550	1,050	160	5,790
2002	140	410	820	250	390	690	400	45	65	210	125	3,545
Mean	170	209	495	266	487	952 #	467	181	200	314	232	3,771 [c]
%	4.5%	5.5%	13.1%	7.1%	12.9%	25.2%	12.4%	4.8%	5.3%	8.3%	6.1%	100.0%
2003				180	265	495			115	100	135	1,290

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Nayorurun River
Section D; Nayorurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] Includes count for Section E.

[c] Sum of means for all streams.

Appendix Table 28. Peak aerial counts of live Chinook salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	4,390	40	2,460	190	120		1,080	260	8,540
1984	7,630	30	1,190	150	360		680	20	10,060
1985	4,790	0	540	100	50		80	90	5,650
1986	880								880
1987	2,390		300	30	40		660	80	3,500
1988	2,130	10	490	0	40	0	650	170	3,490
1989	1,660		740				560		2,960
1990	4,315	30	635	75	60	0	930	25	6,070
1991	3,250	25	285	75	100		1,175	55	4,965
1992	2,965	15	485	40	105	30	490	35	4,165
1993	3,950		1,140	80	110	100	830	70	6,280
1994	4,420	20	835	40	60	10	540	190	6,115
1995	5,040	35	430	65	135	50	740	80	6,575
1996	2,500	35	698	35	71	30	402		3,771
1997	5,150	10	310	50	65	33		10	5,628
1998	3,170	45	375	92	58	39	75	25	3,879
1999	3,385	10	240	105	40	150	345	130	4,405
2000	4,060	26	340	65	42	6	1,100	226	5,865
2001	5,790	24	330	58	84	2	201	74	6,563
2002	3,545	28	860	54	62	7	1,203	161	5,920
Mean	3,771	24	668	72	89	35	652	100	5,411 [b]
%	69.7%	0.4%	12.3%	1.3%	1.6%	0.6%	12.1%	1.8%	100.0%
2003	1290 [c]	17	360	28	99	66	466	40	1,076

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Partial aerial survey

Appendix Table 29. Peak aerial counts of live chum salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
	A	B	C	D	E	F						
1983	8,160	3,050	3,780	1,100	2,780	6,070	150	140	5,560	570	3,790	35,150
1984	3,900	6,300	800	0	2,600	6,400	3,700	2,000	4,200	700	3,500	34,100
1985	8,300	6,500	3,200	900	6,700	10,200	4,100	600	9,600	1,800	8,300	60,200
1986[b]												
1987	12,000	9,400	2,700	500	13,200	33,000	2,600	1,200	4,100	700	13,100	92,500
1988	10,000				4,900	3,800	3,700	5,000	3,500	200	3,800	34,900
1989		2,600	2,100		5,000	8,100	290	700			1,200	19,990
1990	2,200	1,275	1,350	400	650	4,200	3,150	1,150	3,400	250	125	18,150
1991	10,200	3,900	2,800	600	5,500	6,000	2,300	500	3,500	800	3,480	39,580
1992[c]	1,800	1,800	300	100	1,200	1,500	2,000	500	1,800	900	800	22,700 [d]
1993	6,500	3,500	2,300	60		4,400 [e]	1,950	450	4,380	620	3,500	27,660
1994				1,300	5,200	10,400	900	2,400	7,100	900	5,700	33,900
1995	15,700	7,100	4,700	1,800	6,800	5,900	4,800	1,900	9,700	2,700	8,200	69,300
1996	3,700	10,250	5,500	1,300	5,750	8,250	2,600	750	900	550	3,400	42,950
1997	3,900	3,100	3,800	2,750	7,100	4,550	3,200	800	4,750	1,800	3,900	39,650
1998	2,300	1,400	2,750	1,300	4,300	8,950	3,600	1,050	3,000	250	1,650	30,550
1999	3,975	1,950	2,375	1,300	1,725	2,200	1,840	440	4,230	480	2,540	23,055
2000[b]												
2001	9,400	6,500	5,250	1,000	3,500	9,850	7,800	2,850	200	21,450	6,000	73,800
2002	3,350	5,300	4,200	800	4,650	2,100	4,950	650	2,700	1,800	650	31,150
Mean	6,906	4,808	3,174	1,007	5,022	7,904	3,037	1,328	4,426	2,223	4,284	44,120 [f]
%	15.7%	10.9%	7.2%	2.3%	11.4%	17.9%	6.9%	3.0%	10.0%	5.0%	9.7%	100.0%
2003				25	675	1,000			175	1,125	1,125	4,125

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurun River
Section D; Narogurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] No aerial surveys conducted.

[c] Counts by section are not representative due to post-peak survey, and are not included in the mean.

[d] Preferred total estimate; management survey count conducted 7/15/92.

[e] Includes count for Section E.

[f] Sum of means for all streams.

Appendix Table 30. Peak aerial counts of live chum salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	35,150	4,900	12,960	7,600	11,900	1,210	300	7,360	81,380
1984	34,100	6,300	8,500	10,200	18,400		2,100	3,000	82,600
1985	60,200	1,800	7,800	2,860	5,460	8,800	130	14,650	101,700
1986									
1987	92,500	1,500	22,000	2,300	2,160				120,460
1988	34,900	10,800	35,000	12,000	17,400	7,600	400	11,300	129,400
1989	19,990	2,820	5,580	7,450	4,900		560		41,300
1990	18,150	555	5,550	1,475	2,300	3,650	750	1,300	33,730
1991	39,580	4,420	9,540	4,730	8,700		120	3,020	70,110
1992	22,700 [c]	600	4,800 [c]	4,400	7,100	1,700	100	4,000	45,400
1993	27,660		6,950	1,970	1,360	3,060	20	4,020	45,040
1994	33,900	890	10,700	1,630	2,000	4,360	230	1,090	54,800
1995	138,600	2,200	7,600	5,200	13,920	6,440	1,000	7,200	182,160
1996	42,950	960	7,560	560	810	2,670	40		55,550
1997	39,650	1,700	4,550	3,000	2,500	1,890			53,290
1998	30,550	2,630	2,700	4,980	3,870	1,060	150	1,300	47,240
1999	23,055	1,340	3,430	5,700	3,650	4,750	410	11,360	53,695
2000		2,870	4,950	9,090	10,880	4,150	200	5,520	37,660
2001	75,600	2,590	22,300	2,840	2,220	5,570	220	5,480	116,820
2002	31,150	3,300	15,400	7,600	6,360	800	530	6,940	72,080
Mean	44,466	2,899	10,414	5,031	6,626	3,847	427	5,836	79,546 [b]
%	55.9%	3.6%	13.1%	6.3%	8.3%	4.8%	0.5%	7.3%	100.0%
2003	4,125[d]	720	3,425	1,340	3,480	1,030	30	4,970	14,995

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Preferred estimate from a management survey due to post-peak spawning ground survey.

[d] Partial aerial survey data

Appendix Table 31. Peak aerial counts of live coho salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Mainstem Total	Gechiak River	Pungokepuk River	Narogurum River	Kashaiak River	Ongivinuk River	Total
	A	B	C	D	E	F							
1983													
1984	1,440	1,190	200	120	620	1,480	5,050	4,750	2,240	990	1,110	6,140	20,280
1985	800 [c]	660 [c]	110 [c]	70 [c]	150	820	2,610	1,340	750	40	80	6,250	11,070
1986			60	400	100	400	960					2,560	3,520
1987	340	500	250	200	240	530	2,060	1,020	70			1,060	4,210
1988	950	370		140	210	360	2,030	1,530				4,100	7,660
1989													
1990	1,650	390	400	0	540	660	3,640	920	450	260	130	1,730	7,130
1991	4,900	400	700	600	1,680	140	8,020					100	140 [d]
1992	4,420	1,120	1,180	540	2,940	3,080	13,280	5,240	1,440	780	1,500	4,460	26,700
1993													
1994								1,290 [d]	220 [d]	120 [d]	95 [d]	1,930	3,655
1995								1,450			200	1,180	2,830
1996	2,550	1,090	150	250	1,600	5,020	10,910	2,080	1,170	575	725	6,450	21,910
1997	600	200	400	100	400	1,800	3,500	1,000	650	350	475	900	6,875
1998	460	625	100	100	310	1,075	2,670	2,550	575	400	500	1,750	8,445
1999	250	75	50	25	100	75	575	275	35	100	25	175	1,185
2000													
2001													
2002													
Mean	1,669	602	327	212	741 #	1,287	4,609	1,954	760	402	484	2,770	10,979 [b]
%	15.2%	5.5%	3.0%	1.9%	6.7%	11.7%	42.0%	17.8%	6.9%	3.7%	4.4%	25.2%	100.0%
2003													

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurum River
Section D; Narogurum River - Kashaiak River
Section E; Kashaiak River - Ongivinuck River

[b] Sum of means for all streams.

[c] Proportional estimates based on 1984 data.

[d] Timing of aerial surveys did not coincide with the period of peak spawning activity, and therefore, counts were not included in the mean or percent.

Appendix Table 32. Peak aerial counts of live coho salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983									
1984	20,280		10,750	1,850	1,080	670			34,630
1985	9,430	200	7,790	610	420				18,450
1986	3,520								3,520
1987	4,210	30	910	440	120			130	5,840
1988	8,590	460	1,840	310	490	470	370	3,170	15,700
1989									
1990	7,130	1,029	5,195	2,675	1,491	810		4,153	22,483
1991[c]	140		4,200						4,340
1992	26,700		12,640						39,340
1993									
1994									
1995		855	1,185	1,392	1,080	1,149		5,196 [d]	10,857
1996	21,660	1,211	10,290	3,062	2,805	1,944	851	5,917	47,740
1997	6,875	325	1,675	150	1,046	1,397		1,690	13,158
1998	8,445	390	3,650	1,785	2,001	523		2,770	19,564
1999	1,185	169	500	220	213	117	95	450	2,949
2000									
2001		149		372	370	418			1,309
2002		421		597	539	62		1,027	2,646
Mean	9,847	476	5,052	1,122	971	756	439	2,723	16,168 [b]
%	60.9%	2.9%	31.2%	6.9%	6.0%	4.7%	2.7%	16.8%	100.0%
2003		680	1610	1620					3,910

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Timing of aerial surveys did not coincide with the period of peak spawning activity, and therefore, counts were not included in the mean or percent.

[d] Negukthlik and Ungalikthluk Rivers combined.

SALMON SPAWNING GROUND SURVEYS

IN THE BRISTOL BAY AREA, ALASKA, 2003

By

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[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic un-interpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

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INTRODUCTION

Aerial surveys of salmon spawning streams have been conducted in the Bristol Bay area of Alaska (Figure 1) for many years. Surveys provide biologists with information regarding the abundance and distribution of sockeye salmon *Oncorhynchus nerka*, Chinook salmon *O. tshawytscha*, chum salmon *O. keta*, pink salmon *O. gorbuscha*, and coho salmon *O. kisutch* escapements. This information is important to fishery managers for several reasons. It supplements data gathered at counting towers on the mainstem rivers, provides data from rivers where counting towers are not utilized, and provides data for time periods and species not covered by counting tower operations. Collected information is used to: (1) evaluate escapement goals and escapement/return relationships, (2) forecast future returns, (3) identify possible management problems relating to escapements, and (4) contribute to strategies designed to alleviate escapement problems. In this report, we summarize the 2003 salmon spawning ground surveys conducted in the Bristol Bay area.

Naknek/Kvichak District

The Naknek-Kvichak District is comprised of three major rivers: (1) the Kvichak River, issuing from Iliamna Lake and its tributaries, (2) the Alagnak or Branch River flowing from Kukaklek and Nonvianuk Lakes, and (3) the Naknek River emanating from Naknek Lake and its tributaries (Figure 2). All of these systems flow into Kvichak Bay.

Since 1955, Kvichak River sockeye salmon annual escapement has been estimated using counting towers located on the Kvichak's mainstem, approximately one-quarter mile downstream of Lake Iliamna's outlet. From 1957 to 1976, Alagnak River sockeye salmon annual escapement was estimated using a counting tower located near the upper extent of tidal influence. Since 1977, Alagnak sockeye annual escapement has been estimated using aerial surveys. From 1950 to 1957, annual sockeye escapement to the Naknek River system was counted using a weir on the mainstem of the river just upstream of the tidal influence. From 1958 to the present, escapement has been estimated using counting towers near the Naknek River 'Rapids' downstream of the outlet of Naknek Lake. Escapements of other salmon species into Naknek-Kvichak District drainages have been estimated using aerial surveys.

Egegik District

Egegik River system contains two major watersheds: (1) the Egegik River, flowing from Becharof Lake and nearby coastal lowlands, and (2) the King Salmon River, issuing from runoff from the Kejulik Mountains and southern portions of Katmai National Park (Figure 3). Both rivers flow into Egegik Bay near the village of Egegik.

From 1952 through 1956, a weir was used in the Egegik River to count sockeye salmon escapement. The weir was located near the bottom of the Egegik River rapids. From 1957 to the present, counting towers, situated between the outlet of Becharof Lake and Egegik Lagoon, have been used to estimate sockeye escapement. Escapements for other salmon species have been estimated using aerial surveys.

Ugashik District

The Ugashik River system is comprised of four major watersheds: (1) the Ugashik River, flowing from Lower Ugashik Lake and nearby coastal lowlands, (2) the Dog Salmon River, emanating from glacial melt and runoff from peaks in the Aleutian Range, (3) the King Salmon River, issuing from Mother Goose Lake and three major runoff tributaries, and (4) Dago Creek, issuing from a large lowland coastal area (Figure 4). All of these systems flow into the intertidal reaches of Ugashik River and Ugashik Bay.

From 1949 to 1956, a weir located downstream from the outlet of Lower Ugashik Lake was used to count sockeye salmon escapement. From 1957 to the present, sockeye escapement has been estimated using counting towers located between the outlet of Lower Ugashik Lake and Ugashik Lagoon. Escapements for other salmon species have been estimated using aerial surveys.

Nushagak District

The Nushagak watershed is comprised of four major rivers: (1) the Wood River, draining Grant, Kulik, Beverley, Nerka, and Aleknagik Lakes, (2) the Nushagak River, draining Tikchik Lakes and the Nuyakuk, upper Nushagak, and Mulchatna Rivers, (3) the Igushik River, draining Ualik and Amanka Lakes, and (4) the Snake River, draining Lake Nunavaugaluk (Figures 5 through 8). All of these systems empty into Nushagak Bay.

Abundance and age composition of annual sockeye salmon escapement into the Wood River Lake system has been estimated annually from counting towers at the outlet of Lake Aleknagik since 1953.

Sockeye salmon distribution in the Wood River Lake system is an important element in establishing escapement goals and measuring success in achieving escapement goals for this system. Interconnecting rivers between the large lakes in the system are primarily used by three-ocean sockeye salmon for spawning, while the lake beaches and tributary streams are used more by two-ocean sockeye salmon. Knowledge of the age composition of returning sockeye salmon gives managers the ability to use a variable escapement goal policy to minimize overcrowding of spawners in the interconnecting rivers while taking advantage of the extensive beach spawning areas and numerous tributary streams.

Periodically, ADF&G personnel conduct aerial surveys to assess sockeye salmon spawner distribution within the Wood River Lake system. Personnel from the University

of Washington, Fisheries Research Institute also conduct ground surveys on major creeks and some rivers of the system. Surveys of the actual spawning distribution within the creeks, rivers, and beaches of the system provide a measure of management success in obtaining the desired spawning distribution.

Salmon escapement in the Nushagak River is estimated by a sonar project, located on the Nushagak River below Portage Creek, approximately 32 km (20 miles) upstream from the river mouth. The Nushagak River sonar project has been used since 1980 to estimate annual escapements for all salmon species in the entire Nushagak drainage (Miller 1997). In 2003 budget cuts reduced the operation of the sonar camp by a month, eliminating the coho and pink salmon enumeration portion of the sonar project. Prior to the advent of the sonar project, sockeye escapement was estimated by a counting tower project on the Nuyakuk River (1959-1988). Aerial surveys of the Nushagak-Mulchatna system were conducted annually beginning in 1966. Initial surveys provided escapement estimates for Chinook and chum salmon, and surveys in the Nushagak and Mulchatna systems since 1977 were used to estimate sockeye abundance in that system. Together, the combined estimates from counting towers and aerial surveys were used by fishery managers as estimates of the Nushagak River drainage sockeye escapement.

ADF&G staff continued to survey the upper Nushagak and Mulchatna areas after the development of the sonar project to provide a comparison with sonar estimates and document spawner distribution for all species except coho salmon. Chum salmon surveys were discontinued in the Nushagak District in 1980, and surveys of the Nushagak-Mulchatna Rivers for all other species were discontinued in 1991 due to the success of the sonar project and limited funding. The Nuyakuk tower project was halted after the 1988 season, but was reinitiated for the 1995 season and has been operated since that time. Aerial surveys of the Nushagak and Mulchatna systems have been conducted sporadically since 1991 providing infrequent information on spawning sockeye distribution in the Nushagak River.

Aerial surveys were conducted sporadically in the Tikchik Lakes system from 1954 to 1987 to assess spawner distribution of sockeye salmon. Surveys of the Tikchik Lakes have been conducted, although infrequently, since 1990 to document an apparent change in spawner distribution, evidenced by changes observed in the age composition of Nushagak River sockeye escapement, and supported by reports of low numbers of spawners in the Tikchik Lake system. These changes were first noticed in 1990 when surveys documented lower than expected numbers of spawners in the Tikchik Lakes system, based on sonar estimates in the lower Nushagak River and historical distribution patterns (Russell et. al. 1991). However, few corresponding surveys were conducted in the Nushagak and Mulchatna drainages to completely assess distribution. In fact, due to funding cuts, no aerial surveys of the Upper Nushagak and Mulchatna drainages have been performed since 1991. The counting towers at the Nuyakuk River were not operational from 1989-1994, also as a result of budget cuts. Average escapement for the 20 years before tower operations ceased was 369,506 sockeye salmon (excluding 1980, the "strike year".) When tower counts resumed in 1995, escapement was low and has remained low with an average per year of 150,211 sockeye salmon. Therefore, any information that can be gained about this system is advantageous.

Sockeye escapement is measured in the Igushik Lakes system at a counting tower located at the outlet of Amanka Lake. Spawner distribution has not been documented annually, and surveys have not been conducted on the Igushik system for sockeye salmon and other species since 1991 (Russell, et. al. 1992). Spawning escapement and distribution of sockeye salmon in the Snake Lake system was estimated annually prior to 1998 by aerial surveys, but with the closure of the Snake River section and funding shortages in recent years, these surveys have not been continued.

Togiak District

Two major river drainages flow into the Togiak District: (1) the Togiak River, draining Togiak, Gechiak, Pungokepuk, and Ongivinuk Lakes and Nayorurun and Kemuk Rivers (Figure 9), and (2) the Kulukak River, draining Kulukak Lake (Figure 10). Various smaller systems within the district include the Kanik River draining Tithe Creek Ponds and the Quigmy, Matogak, Osviak, Slug, Negukthlik, and Ungalikthluk Rivers. Kulukak River and the Kanik River flow into Kulukak Bay, located in the eastern portion of the district. The Togiak and Quigmy Rivers flow into Togiak Bay, located in the middle of the district, and the Matogak, Osviak, and Slug Rivers flow into Hagemeister Straits and coastal waters in the western portion of the district (Figure 1).

Sockeye salmon escapement is estimated for the Togiak Lake system from counting towers operated at the outlet of Togiak Lake. Abundance and distribution of spawning populations of sockeye salmon in the Togiak River and tributaries below the counting towers, as well as other systems within the Togiak District, are estimated by aerial surveys. Abundance and distribution of Chinook, chum, pink, and coho salmon spawning in Togiak District watersheds are also estimated entirely from aerial surveys.

Since 1991, the operational budget has not had sufficient funds to conduct spawning ground aerial surveys in the Togiak District. The U.S. Fish and Wildlife Service Togiak National Wildlife Refuge (USFWS/TNWR) has provided funding for aircraft charters for aerial surveys, and has assisted with aerial surveys in the Togiak District to monitor salmon populations within drainages on the refuge.

METHODS

All survey flights were conducted from small fixed-wing, high-wing, wheeled aircraft (Super Cub, Cessna 180, Cessna 185, or Cessna 206) or helicopter (Robinson R-22) chartered from local air charter companies and flown by experienced survey pilots. Alaska Department of Fish and Game (ADF&G) or USFWS biologists familiar with the streams and target species counted salmon. USFWS pilots and aircraft flew several of the surveys in the Togiak National Wildlife Refuge. Counts were made from low

altitudes (200 to 400 feet) at air speeds of 50 to 90 mph. Polarized sunglasses and aircraft positioning were used to minimize effects of glare off the water. Surveys were scheduled to coincide as closely as possible to the historic peak of spawning for the target species, taking into account weather, water conditions, and aircraft availability. Peak of spawning was defined as that point when the greatest number of spawning salmon are occupying redds. Counts were registered on a hand tally counter or on a tape player. This information was transferred to survey data forms either sometime during the survey or upon returning to the office.

Aerial surveys account for only a portion of the known spawning populations (Evzerof, 1975; Nielson and Green, 1981; Rogers, 1984). At the time of each survey, some of the salmon have yet to reach the spawning grounds, some have already spawned and died, some are still schooled, and some are either misidentified or not seen. Methods used to interpret aerial survey counts are described below for each commercial fishing district.

Naknek/Kvichak District

Aerial surveys were flown during late summer and fall to assess escapements of sockeye, Chinook, and chum salmon in portions of the Naknek/Kvichak District. Salmon counts for these drainages are indices of the total number of each species present in the spawning area at the time of the survey. In the Alagnak drainage two surveys were flown, August 13 and August 20, providing estimates of sockeye, Chinook, chum, and pink salmon escapements. Additionally, all major Chinook spawning areas in the Naknek River Drainage were surveyed on August 1, and August 21; no survey was flown for the Kvichak River. Within the Naknek Lake drainage, sockeye surveys were flown for spawning distribution. Survey counts were not expanded to provide instantaneous population estimates, although expansions have been made in some earlier years based on subjective criteria. Counting towers were used to estimate total sockeye escapement to the Kvichak and Naknek Rivers. ADF&G, Commercial Fisheries Division staff made all aerial survey counts in the district.

Egegik District

No system-wide aerial surveys were flown for sockeye salmon in 2003. An aerial survey of known Chinook and chum salmon spawning areas in both the Egegik and King Salmon Rivers was flown on August 3. With funding provided by the U.S Fish and Wildlife Service (USFWS), an aerial survey was flown on September18 to estimate coho salmon escapement. All aerial survey counts in the Egegik drainage are the actual numbers of salmon sighted and should be considered a minimum indication of abundance.

Ugashik District

Salmon counts in the Ugashik District reflect only the actual numbers of salmon sighted on the spawning grounds for 2003. Aerial surveys of known Chinook and chum salmon spawning areas in the Ugashik drainage were flown on August 8. With funding provided by the Alaska Department of Fish and Game, an aerial survey was flown on September 21 to estimate coho salmon escapement. Aerial survey counts should be considered a minimum indication of abundance. Additionally, a USFWS project continued the state's tower project for the purpose of counting coho salmon escapement into the Ugashik Lakes.

Nushagak District

No spawning ground surveys were flown in the Nushagak District during the 2003 season.

Togiak District

Survey and data analysis methods used in the Togiak District were similar to those described by Nelson (1979), Bucher (1981), and Russell, et al. (1990). This year, surveys were flown on July 30, August 1, 4, 7, 8, 21, and 22 (Tables 11-14). Poor weather posed a severe limitation to survey completion this year. ADF&G staff surveyed the Kulukak River drainage and portions of the Togiak River drainages for Chinook, and chum salmon. USFWS/TNWR staff conducted surveys of the Quigmy, Negukthlik, Slug, Osviak, Matogak and Ungalikthluk Rivers for sockeye, Chinook, coho, and chum salmon and of the Kulukak River for sockeye salmon. The only systems that were surveyed for coho salmon were the Kulukak and Matogak Rivers.

Total escapement was estimated for sockeye salmon in systems without counting towers (i.e. Kulukak River, main-stem and tributaries of the Togiak River below the towers) by multiplying peak aerial counts by an expansion factor between 1.5 and 3.0 depending on survey and water conditions (Table 11 lists expansion factors by stream). Since 1980, total escapement for Chinook salmon in the Togiak District has been calculated by aerial counts using a multiplier of 2.5 if the survey was timed properly relative to the spawning peak and visibility conditions were average. In 2003 an expansion factor of 2.0 to 3.0 was used for Chinook surveys depending on the system surveyed. The expansion factor for chum salmon varied between 2.0 and 2.5, with the 2.5 factor applied only to sections of the Togiak River mainstem. An expansion factor of 3.0 has been used for coho salmon in all areas of the Togiak District since the initiation of coho surveys in 1980. Expansion factors have been subjectively adjusted based on weather conditions, visibility, and survey timing with respect to the peak spawning activity.

RESULTS AND DISCUSSION

Naknek/Kvichak District

An aerial survey of sockeye salmon escapement into the Alagnak River and its tributaries was conducted on August 21. The sockeye salmon escapement index count totaled 2,110,000 for all four systems (Table 1). This is the largest escapement ever documented to the Alagnak systems (Appendix Table 1). A tower on the Alagnak River in 2003 estimated 3,676,146 sockeye salmon.

Aerial surveys of Chinook salmon escapements into the Naknek River drainage were flown on July 31 (Pauls Creek and King Salmon Creek) and August 21 (Naknek mainstem). A total of 6,081 Chinook were observed in three of the four systems in the Naknek drainage (Big Creek was not flown in 2003). Over the period from 1971-2001 there have been 23 years in which Chinook salmon escapement indices have been obtained from all four main spawning areas (Appendix Tables 2-6). The Chinook escapement index for these 22 years has ranged from a low of 2,691 in 1992 to a high of 11,730 in 1988.

Alagnak River drainage Chinook salmon escapement was surveyed on August 13, estimating a total of 8,209 (Table 2). From 1970-2002, Alagnak Chinook salmon counts have ranged from a low of 824 in 1973 to a high of 15,210 in 1997 (Appendix Table 7). There was no aerial survey conducted on the Kvichak River for Chinook salmon in 2003 (Appendix Tables 8 and 9).

Chum salmon were counted only during the July 31 King Salmon Creek and August 13 Alagnak River surveys. The Alagnak River has been the principle chum salmon producing system in the Naknek/Kvichak District (Appendix Table 10). A total of 77,600 chum salmon were observed during the survey.

Egegik District

The 2003 Egegik River sockeye escapement past the counting towers totaled 1,152,030 fish, or 5% above the midrange objective of 1.1 million. The BEG range for Becharof Lake is 800 thousand to 1.4 million. Aerial survey counts of known Chinook salmon spawning areas in the Egegik drainage yielded a total count of 1,052 Chinook salmon. No additional Chinook salmon were counted at the Egegik River counting towers (Table 3). This total was 4% below the average count of 1,091 (Appendix Table 14), but it was the largest count in five years. The commercial Chinook harvest in the Egegik District totaled approximately 136 fish, or 93% below the 1983 to 2002 average harvest of 2,067. Since 1998, fishing time has been reduced to three days per week between June 1 and June 16. Using gillnets with larger than five and one half inch mesh in the commercial fishery from June 1 to July 1 has also been prohibited. Also, fishing time during the sockeye season has been reduced in

recent years. All of these factors probably contributed to the reduced commercial harvest of Chinook salmon, but in general, recent Chinook salmon runs to Egegik have been small. Given the catch and escapement figures above, the Egegik Chinook salmon removal rate for 2003 was likely less than 13%.

The chum salmon escapement index was 5,150 fish (Table 4). The 2003 index was 29% below the 1982-2002 average of 7,240 fish (Appendix Table 15). The 2003 commercial chum harvest from the Egegik District totaled approximately 41,900 fish, or 56% below the 1983 to 2002 average catch of 95,000. Escapement indices of less than 10,000 chum salmon have been recorded since 1989, but aerial surveys for chum salmon are not reliable indicators and it is believed that chum escapement indices documented over the last several years have probably greatly underestimated chum salmon escapements (Browning et al. 1998). In 1999, comparing the Gertrude Creek Weir count of 16,000 and an aerial survey count on August 6 showed that the aerial count was only about 2% of the weir count.

No pink salmon were noted during the August 3 aerial survey. No pink salmon were reported in the commercial catch. The 1974 to 2003 pink salmon escapement indices are listed in Appendix Table 16.

Coho salmon escapement was documented with an aerial survey conducted on September 18 (Table 5). The U.S. Fish and Wildlife Service in King Salmon provided funding for this survey. A total of 5,280 coho salmon were counted in the Egegik River and in several tributaries of Becharof Lake. The aerial counts were focused on main coho salmon producing areas, which are listed in Table 5. Compared to the last seven years, the 2003 index count of 5,280 was about 8% above average. The commercial harvest totaled approximately 40,000 fish, which was about 18 % above the 20-year (1983-2002) average of 34,000. Deliveries occurred through August 20, though the fishery remained open until September 30. Historical survey counts are listed in Appendix Table 17.

Ugashik District

The 2003 Ugashik sockeye salmon escapement tower count was approximately 758,500 fish, 11% below the midrange objective of 850,000. However, counts observed by a Federal project that continued counting salmon from July 24 through September 22, may add 28,000 sockeye salmon to the escapement. No system-wide aerial surveys were conducted due to a lack of funding. However, during a Chinook and chum salmon survey on August 8 an additional 4,000 and 27,620 sockeye salmon were counted in the Dog Salmon and King Salmon Rivers, respectively (Table 6).

Chinook salmon escapement surveys of Dog Salmon, King Salmon, and Ugashik Rivers were flown on August 8 and yielded a count of 3,050 fish. Additionally, 243 Chinook salmon were counted past the counting towers bringing the cumulative escapement count to about 3,293 (Table 7). The Federal tower project estimated approximately 36 Chinook salmon past the counting towers. The 2003 escapement count was 24% below the 1980 to

2002 average count of 4,308 Chinook salmon (Appendix Table 18), but it was the fifth largest count in nine years. The Ugashik District's commercial catch of approximately 400 Chinook salmon was 87% below the 20-year average harvest of 3,000 and about 71% below the recent 10-year average of 1,400.

Aerial surveys of Dog Salmon, King Salmon, and Ugashik Rivers on August 8, yielding a count of 21,800 chum salmon (Table 8). The survey was considered to be before the peak of spawning as only larger schools were observed. The 2003 aerial count was 27% below the 1980 to 2002 average of 29,800 (Appendix Table 19). The District's commercial chum salmon harvest of approximately 54,700 fish was 26% below the 20-year average of 74,400.

The Ugashik pink salmon returns have historically been very small. There were no pink salmon reported in the commercial harvest this year, and 66 pink salmon were counted past the Ugashik counting towers through July 23. An additional 90 pink salmon were estimated from federal escapement counts through September 22 (Appendix Table 20).

An aerial survey for coho salmon was again made this year in the Ugashik drainage (Table 9). A total of 19,670 coho salmon were observed on the September 21 flight. The majority of the count came from the Lower Ugashik Lake. The timing of this survey was very good as most coho salmon were still schooled-up along the creek mouths. For the Ugashik lakes a count of 17,880 was 515% above the average count of 2,900. Approximately 28,200 coho salmon were estimated from a federal tower project. The coho harvest of approximately 990 fish was 87% below the recent 10-year average of 7,400. Historical coho salmon escapement data are recorded in Appendix Table 21.

Nushagak District

There were no spawning ground surveys flown this year, for any species. The sonar project at Portage Creek produced apportioned estimates of 79,749 Chinook salmon (slightly above the inriver goal of 75,000), 579,643 sockeye salmon (within the range of the BEG), and 291,785 chum salmon in the Nushagak River for 2003. Coho were not counted this year because sonar operation ceased on July 19 due to lack of funding. A counting tower was operated on the Nuyakuk River again this year enumerating 116,646 sockeye salmon.

Spawning escapement of sockeye salmon in the Wood River system was estimated, by tower count, to be 1.46 million fish, and the Igushik River tower count was 194,088 sockeye. Escapements into both systems were within the BEG range. Two-ocean sockeye comprised approximately 55% of the Wood River escapement while three-ocean sockeye contributed the other 44% of the escapement.

Togiak District

Poor weather severely hindered survey completion in 2003. Although it is difficult to drawn any conclusions from partial data, data were collected in some systems of the Togiak District for some species (Table11). The Togiak River and its tributaries were not surveyed for sockeye salmon, however, 232,302 sockeye were counted past the towers just below Togiak Lake. The spawning escapement of sockeye salmon in the Kulukak Section, including the Kulukak River, Kulukak Lake, and Tithe Creek Ponds, was estimated at 8,000 fish, 43% of the 10-year average of 18,427 (Appendix Table 24). Total sockeye salmon escapement for the Togiak District (including only partial survey data) was 261,851 (Table 11). Expansion factors used to convert aerial survey numbers to actual escapement estimates varied on a stream-by-stream basis from 1.5 to 3.0 depending on survey conditions.

The expanded escapement estimate for Chinook salmon in the Togiak District (based on partial surveys) was 5,668 fish (Table 12). Peak aerial counts for Chinook salmon and historical counts are available in Appendix Table 28. The Kulukak River escapement estimate (360 Chinook) was 65% below the 10-year average count for the system and was 54% below the 20-year average.

Chum salmon counts were conducted coincidentally with the Chinook salmon surveys. Total chum salmon escapement to the Togiak District was poor compared with the 20-year and 10-year averages. Both the Slug and Negukthlik Rivers were well below their 20-year and 10-year average escapements. The Kulukak River escapement estimate was 3,425, 60% below the 10-year average for that system. As with other species discussed, only partial surveys for chum salmon on the Togiak River were performed. As a result, district-wide estimates of chum escapement are not available for year-to-year comparison (Table 13, Appendix Tables 29 and 30).

Only a few aerial surveys for coho salmon were done in 2003; the lack of a suitable survey plane and poor weather prevented these surveys. Total coho escapement for Togiak River and tributaries was, therefore, not estimated. USFWS/TNWR personnel conducted surveys on the Kulukak, Quigmy, and Matogak Rivers (Table 14). The Quigmy and Matogak Rivers were 42% and 44% higher than their 20-year averages, whereas the Kulukak River was 68% below its 20-year average (Appendix Table 32). There was very little commercial harvest of coho salmon reported in 2003 because there was not a market for them.

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Table 1. Aerial survey counts of sockeye salmon, Alagnak River system, 2003[a]

Location	Number of Fish	Percent of Total
Nonvianuk River	0	0.0
Nonvianuk Lake	60,000	2.8
Kulik River	70,000	3.3
Kulik Lake	65,000	3.1
Alagnak River	0	0.0
Kukaklek Lake	30,000	1.4
Nanuktuk Creek	330,000	15.6
Battle River	112,000	5.3
Battle Lake	120,000	5.7
Spectacle Creek	735,000	34.8
Funnel Creek	588,000	27.9
Total	2,110,000	100.0

[a] Aerial surveys were conducted with fixed-wing aircraft.

Table 2. Aerial survey counts of Chinook, chum, pink, and coho salmon, Naknek-Kvichak District, 2003.[a]

Location	Survey Date	Number of Salmon			
		Chinook	Chum	Pink	Coho
Kvichak River		No survey	No survey	No survey	No survey
Alagnak River	13-Aug	8,209	77,600		No survey
Naknek River :					
Paul's Creek	1-Aug	583	0	No count	No survey
King Salmon Creek	1-Aug	1,348	2,700	No count	No survey
Big Creek					
Mainstem Naknek River	21-Aug	4,150	No count	No count	No count
Total		14,290	80,300		

[a] Aerial surveys were conducted with fixed-wing aircraft.

Table 3. Aerial survey peak counts of Chinook salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Chinook Salmon Counted
Egegik River	3-Aug	0[a]
Shosky Creek	3-Aug	35
Whale Mountain Creek	3-Aug	0
Mossy Creek	3-Aug	20
Mink Creek	3-Aug	10
Gertrude Creek	3-Aug	297
Kaye's Creek	3-Aug	180
Takayoto Creek	3-Aug	313
Angle Creek	3-Aug	[b]
Contact Creek	3-Aug	197
Mainstem King Salmon River	3-Aug	[b]
Total		1,052

[a] Tower count.
[b] No Count.

Table 4. Aerial survey peak counts of chum salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Chum Salmon Counted
Egegik River	3-Aug	0[a]
Shosky Creek	3-Aug	0
Whale Mountain Creek	3-Aug	540
Mossy Creek	3-Aug	70
Mink Creek	3-Aug	50
Gertrude Creek	3-Aug	690
Kaye's Creek	3-Aug	0
Takayoto Creek	3-Aug	0
Angle Creek	3-Aug	[b]
Contact Creek	3-Aug	3,800
Mainstem King Salmon River	3-Aug	[b]
Total		5,150

[a] Tower count.
[b] No Count.

Table 5. Aerial survey counts of coho salmon escapement, Egegik District, 2003.

Location	Survey Date	Number of Coho Salmon Counted	Comments
Egegik River Drainage[1]			
Egegik River Rapids	September 18	675	4 small schools, no spawning observed.
Stream 115.8 (Featherly Creek)	September 18	700	None seen in the creeks, all were seen along the shore
Stream 107.6 (Burl's Creek)	September 18	650	between Featherly Cr.and Burls Cr..
Stream 90.3 (Salmon Creek)	September 18	575	
Stream 89.8	September 18	125	
Stream 87.0 (Bear Creek)	September 18	520	
Stream 73.5 (Becharof Creek)	September 18	1,500	Schooled up and mostly along in front of the creek mouth.
Stream 48.1 (Kejulik River)	September 18	535	Includes Margaret Cr., Albert Cr. And mainstem
Total		5,280	

[1] Streams tributary to Becharof Lake are designated by the number of miles between their mouth and the outlet of Becharof Lake (Egegik River) as one travels around the lake in a clockwise fashion from the Becharof lake outlet. This is the same system of designation used for years by previous investigators.

Table 6. Aerial survey peak counts of sockeye salmon escapement, King Salmon and Dog Salmon River, Ugashik District, 2003.

Location	Survey Date	Number of Sockeye Salmon Counted
King Salmon River System:		
Goose Lake and outlet	Aug. 8	120
Needle Lake	Aug. 8	1,500
Volcano Creek	Aug. 8	[a]
Painter Creek	Aug. 8	26,000
Indecision Creek	Aug. 8	0
Sub-total		27,620
Dog Salmon River System:		
Figure-Eight Creek	Aug. 8	2,300
Goblet Creek	Aug. 8	0
Oldham Creek	Aug. 8	1,400
Wandering Creek	Aug. 8	300
Mainstem Dog Salmon River	Aug. 8	0
Sub-total		4,000
Total		31,620

[a] No Count.

Table 7. Peak survey counts of Chinook salmon escapement, Ugashik District, 2003.

Location	Survey Date	Number of Chinook Salmon Counted
King Salmon River System		
Old Creek	Aug. 8	351
Pumice Creek	Aug. 8	596
Painter Creek	Aug. 8	490
Mainstem King Salmon River	Aug. 8	334
Indecision Creek	Aug. 8	0
Volcano Creek	Aug. 8	[a]
Sub-total		1,771
Dog Salmon River System		
Figure-Eight Creek	Aug. 8	774
Goblet Creek	Aug. 8	105
Oldham Creek	Aug. 8	65
Wandering Creek	Aug. 8	62
Mainstem Dog Salmon River	Aug. 8	47
Sub-total		1,053
Ugashik River System		
Mainstem Ugashik River	Aug. 7	414 [b]
Grassy Creek	Aug. 7	55
Sub-total		469
Total		3,293

[a] No Count.
[b] Tower and aerial survey count.

Table 8. Peak survey counts of chum salmon escapement, Ugashik District, 2003.

Location	Survey Date	Number of Chum Salmon Counted
King Salmon River System		
Old Creek	Aug. 8	3,000
Pumice Creek	Aug. 8	4,000
Painter Creek	Aug. 8	8,000
Mainstem King Salmon River	Aug. 8	5,500
Needle Lake	Aug. 8	0
Indecision Creek	Aug. 8	50
Volcano Creek	Aug. 8	[a]
Sub-total		20,550
Dog Salmon River System		
Figure-Eight Creek	Aug. 8	250
Goblet Creek	Aug. 8	30
Oldham Creek	Aug. 8	0
Wandering Creek	Aug. 8	600
Mainstem Dog Salmon River	Aug. 8	250
Sub-total		1130
Ugashik River System		
Mainstem Ugashik River	Aug. 4	12 [b]
Grassy Creek	Aug. 4	130
Sub-total		142
Total		21,822

[a] No Count.
[b] Tower count.

Table 9. Aerial survey counts of coho salmon escapement, Ugashik District, 2003. [a]

Location	Survey Date	Number of Coho Salmon Counted	Comments
	Ugashik Drainage		
Upper Ugashik Lake			
Crooked Creek	September 21	2,330	Most fish in front of the mouth.
Deer Creek	September 21	1,530	Most fish in front of the mouth.
Lower Ugashik Lake			
Black Creek to Cabin	September 21	1,420	Includes 120 in Cabin Creek.
Black Creek to Elizabeth Lake	September 21	7,000	Includes 4,000 in lower part of Black Creek.
Ugashik Outlet	September 21	5,600	Below counting towers
King Salmon River Tributaries			
Pumice Creek	September 21	480	Small schools, most in lower part of the creek.
Old Creek	September 21	440	Small schools, most in lower part of the creek.
Painter Creek	September 21	460	Small schools, most in lower part of the creek.
Dog Salmon River Tributaries			
Figure Eight Creek	September 21	410	Small schools, most in lower part of the creek.
District Total		19,670	

[a] Several thousand coho were also seen at the narrows joining Upper and Lower Ugashik Lakes.

Table 10. Peak aerial counts of live sockeye salmon and total escapement estimates, Wood River system, 2003.

Area	Date	Aerial Count	Tower Count	Population Estimate	Distribution %
Wood River			1,459,782		
Lake Aleknagik		No Surveys Done			
Eagle Creek[a]					
Hansen Creek[a]					
Happy Creek[a]					
Bear Creek[a]					
Yako Creek[a]					
Whitefish Creek[a]					
Ice Creek[a]					
Mission Creek[a]					
Sunshine Creek					
Youth Creek					
Northshore Beaches					
Southshore Beaches					
Yako Beaches					
Agulowok River & lower River Bay		No Surveys Done			
Lake Nerka		No Surveys Done			
Fenno Creek[a]					
Pike Creek[a]					
Stovall Creek[a]					
Bear Creek					
Teal Creek[a]					
Pick Creek[a]					
Elva Creek[a]					
Kema Creek[a]					
Hidden Lake Creek[a]					
Lynx Creek[a]					
Upper River Bay Beaches, NW					
Upper River Bay Beaches, SE					
Allan Cr. - Ross Cr. Beaches					
N6 - River Bay Beach					

(Continued)

Table 10. (Page 2 of 3)

Area	Date	Aerial Count	Population Estimate	Distribution %
Pick Creek Beach				
Elva Creek Beach				
Amakuk Arm Beaches				
Amakuk Arm - Ott's Bay Beach				
Ott's Bay Beach				
Anvil Bay Beaches				
Anvil Bay - Elbow Pt. Beach				
Elbow Pt. - Lynx Cr. Beach				
Lynx Cr. - Teal Cr. Beach				
Kema Lake Beaches				
Hidden Lake Beaches				
Lynx Lake Beaches				
Little Togiak River[a]	No Surveys Done			
Little Togiak Lake	No Surveys Done			
Northshore Beaches				
Southshore Beaches				
D Slough Beaches				
Agulukpak River	No Surveys Done			
Lake Beverley	No Surveys Done			
Tsun Creek				
Moose Creek[a]				
Hope Creek				
Hardluck Bay Beaches				
Sam's Beach				
Golden Horn Beaches				
Silver Horn Beaches				
B12 & B9 Beaches				
Hope Lake Beach				

(Continued)

Table 10. (Page 3 of 3)

Area	Date	Aerial Count	Population Estimate	Distribution %
Peace River	No Surveys Done			
Lake Mikchalk	No Surveys Done			
Narrows				
Northshore Beaches				
Southshore Beaches				
Wind River				
Lake Kulik	No Surveys Done			
K1 & K2 Creeks				
K5 Creek - Grant River Beaches				
Grant River - K2 Creek Beaches				
Southshore Beaches				
Grant River	No Surveys Done			
Total		0	0	0.0%

[a] Ground survey counts conducted by FRI, University of Washington.

[b] No aerial surveys were done in 2000. Information in this table is based soley on stream surveys conducted by FRI personnel. No population estimates or distribution information was calculated.

Table 11. Peak aerial counts of live sockeye salmon and total escapement estimates, Togiak District, 2003.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak Tower				232,302
Togiak River mainstem		No Surveys Done	2.0	0
Gechiak Lake System		No Surveys Done	1.5	0
Pungokepuk Lake		No Surveys Done	1.5	0
Nayorurun River		No Surveys Done	1.5	0
Kemuk River		No Surveys Done	1.5	0
Ongivinuk Lake System		No Surveys Done	1.5	0
Subtotal		0		0
Kulukak Section				
Kulukak River [b]	22-Aug	590	2.0	1,180
Kulukak Lake [b]	22-Aug	310	2.0	620
Tithe Creek Ponds [b]	22-Aug	4,136	1.5	6,204
Subtotal		5,036		8,004
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	500	3.0	1,500
Osviak River [b]	04-Aug	2,180	2.5	5,450
Slug River [b]	04-Aug	2,330	2.0	4,660
Subtotal		5,010		11,610
Other				
Quigmy River [b]	30-Jul	110	2.5	275
Negukthlik River [b]	01-Aug	1,500	3.0	4,500
Ungalikthluk River [b]	01-Aug	2,580	2.0	5,160
Subtotal		4,190		9,935
Total		14,236		261,851

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] USFWS estimate.

Table 12. Peak aerial counts of live Chinook salmon and total escapement estimates, Togiak District, 2003.

River	Aerial Counts		Total Escapement Estimates	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak River mainstem				
A	No Surveys Done		2.5	0
B	No Surveys Done		2.5	0
C	No Surveys Done		3.0	0
D	08-Aug	180	2.5	450
E	08-Aug	265	2.5	663
F	08-Aug	495	2.5	1,238
Subtotal		940		2,350
Gechiak River	No Surveys Done		2.0	0
Pungokepuk River	No Surveys Done		2.0	0
Nayorurun River	08-Aug	115	2.0	230
Kemuk River	08-Aug	100	2.0	200
Ongivinuk River	08-Aug	135	2.0	270
Subtotal		350		700
Togiak River Drainage Total		1,290		3,050
Kulukak Section				
Kulukak River	07-Aug	360	2.0	720
Matogak, Osviak, and Cape Pierce Sections				
Matogak River[b]	30-Jul	28	2.0	56
Osviak River[b]	04-Aug	99	2.0	198
Slug River[b]	04-Aug	66	2.0	132
Subtotal		193		386
Other				
Quigmy River[b]	30-Jul	17	2.0	34
Negukthlik River[b]	01-Aug	466	3.0	1,398
Ungalikthluk River[b]	01-Aug	40	2.0	80
Subtotal		523		1,512
Total		2,366		5,668

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b USFWS estimate.

Table 13. Peak aerial counts of live chum salmon and total escapement estimates, Togiak District, 2003.

River	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Estimate
Togiak Section				
Togiak River mainstem				
A	No Surveys Done		2.5	0
B	No Surveys Done		2.5	0
C	No Surveys Done		2.5	0
D	08-Aug	25	2.5	63
E	08-Aug	675	2.5	1,688
F	08-Aug	1,000	2.5	2,500
Subtotal		1,700		4,250
Gechiak River	No Surveys Done		2.0	0
Pungokepuk River	No Surveys Done		2.0	0
Nayorurun River	08-Aug	175	2.0	350
Kemuk River	08-Aug	1,125	2.0	2,250
Ongivinuk River	08-Aug	1,125	2.0	2,250
Subtotal		2,425		4,850
Togiak River Drainage Total		4,125		9,100
Kulukak Section				
Kulukak River	07-Aug	3,425	2.0	6,850
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	1,340	2.0	2,680
Osviak River [b]	04-Aug	3,480	2.0	6,960
Slug River [b]	04-Aug	1,030	2.0	2,060
Subtotal		5,850		11,700
Other				
Quigmy River [b]	30-Jul	720	2.0	1,440
Negukthlik River [b]	01-Aug	30	2.0	60
Ungalikthluk River [b]	01-Aug	4,970	2.0	9,940
Subtotal		5,720		11,440
Total		19,120		39,090

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b U.S. Fish and Wildlife Service estimate.

Table 14. Peak aerial counts of live coho salmon and total escapement estimates, Togiak District, 2003.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak River mainstem				
A	No Surveys Done			0
B	No Surveys Done			0
C	No Surveys Done			0
D	No Surveys Done			0
E	No Surveys Done			0
F	No Surveys Done			0
Subtotal		0		0
Gechiak River	No Surveys Done			0
Pungokepuk River	No Surveys Done			0
Nayorurun River	No Surveys Done			0
Kemuk River	No Surveys Done			0
Ongivinuk River	No Surveys Done			0
Subtotal		0		0
Togiak River Drainage		0		0
Kulukak Section				
Kulukak River	22-Aug	1,610	3.0	4,830
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	21-Aug	1,620	3.0	4,860
Osviak River [b]	No Surveys Done		3.0	0
Slug River [bc]	No Surveys Done		3.0	0
Subtotal		1,620		4,860
Other				
Quigmy River [b]	21-Aug	680	3.0	2,040
Negukthlik River	No Surveys Done			
Ungalikthluk River [b]	No Surveys Done		3.0	0
Subtotal		680		2,040
Total		3,910		11,730

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] U.S.F.W.S. survey.

[c] Survey precluded by muddy water.

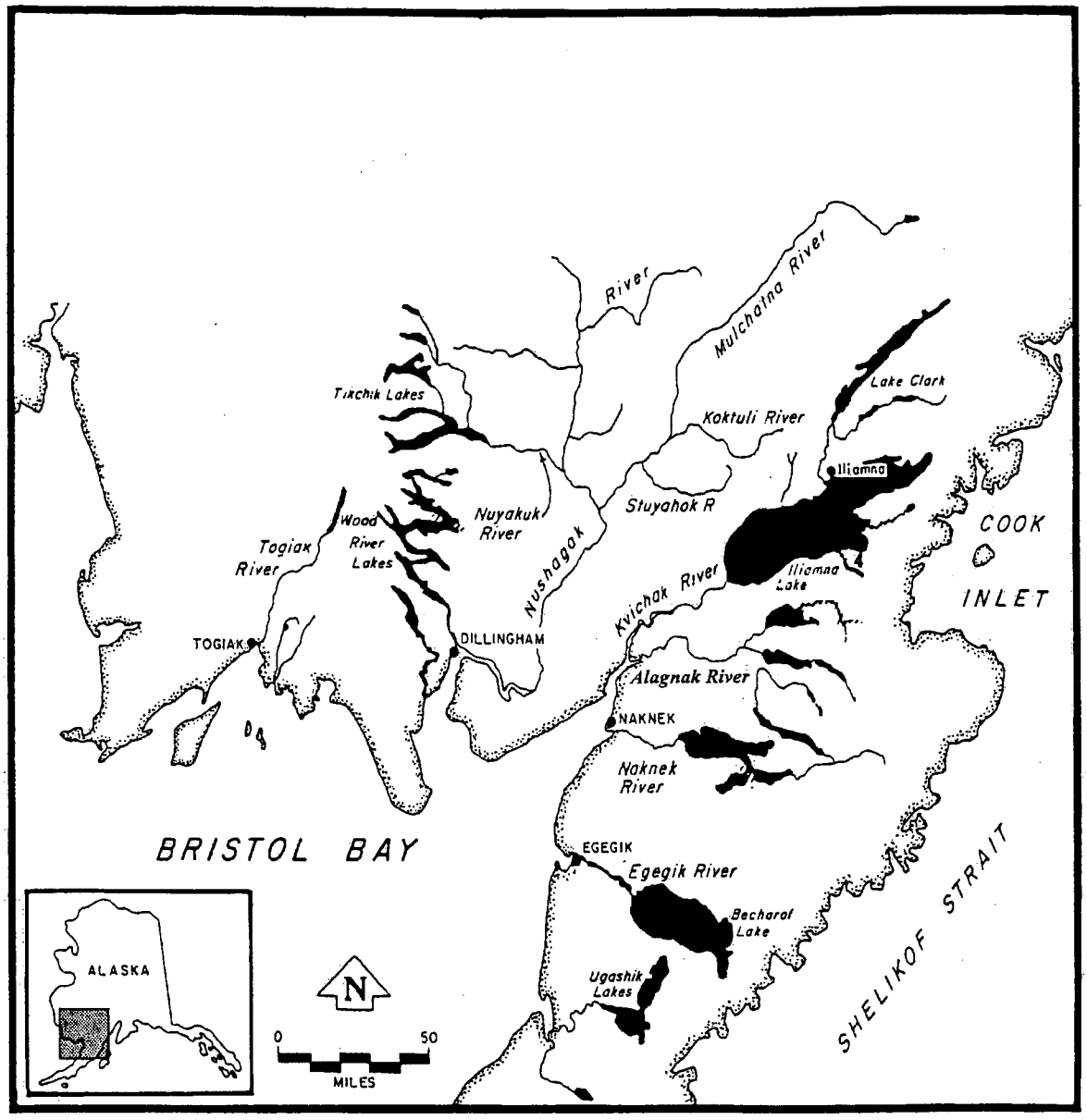

Figure 1. Bristol Bay management area, Alaska.

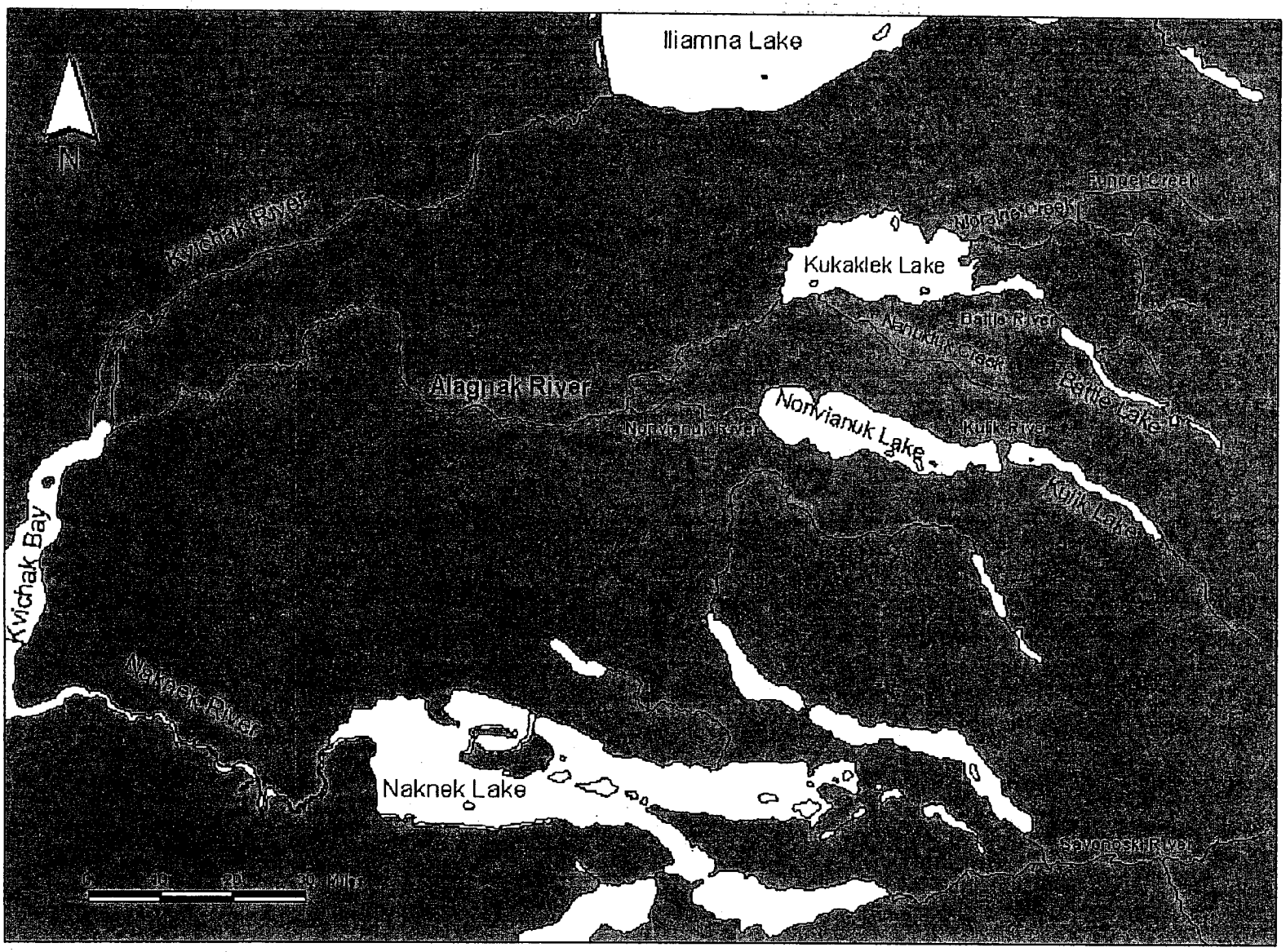

Figure 2. Alagnak River drainage, Bristol Bay, Alaska.

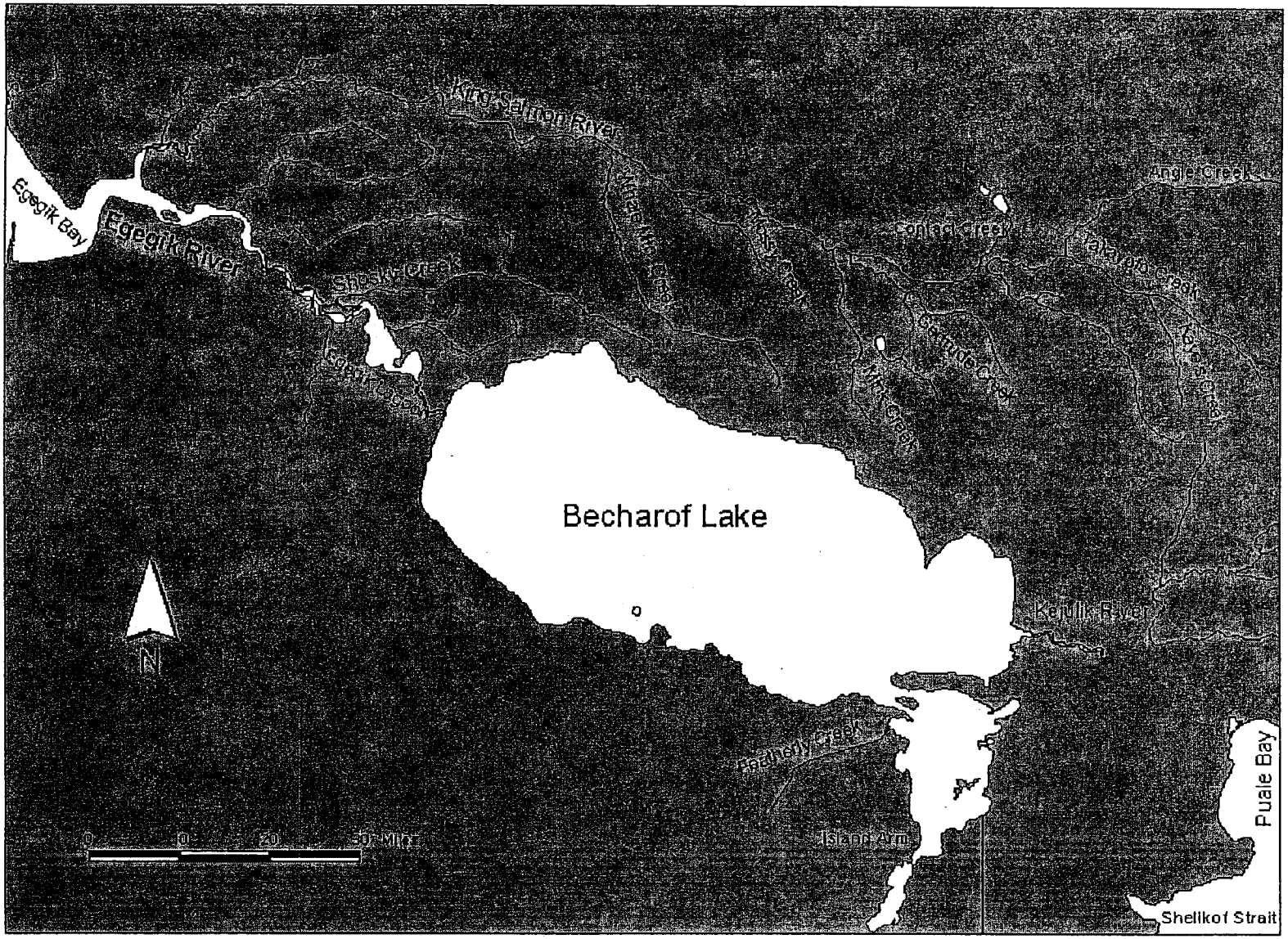

Figure 3. Egegik River drainage, Bristol Bay, Alaska

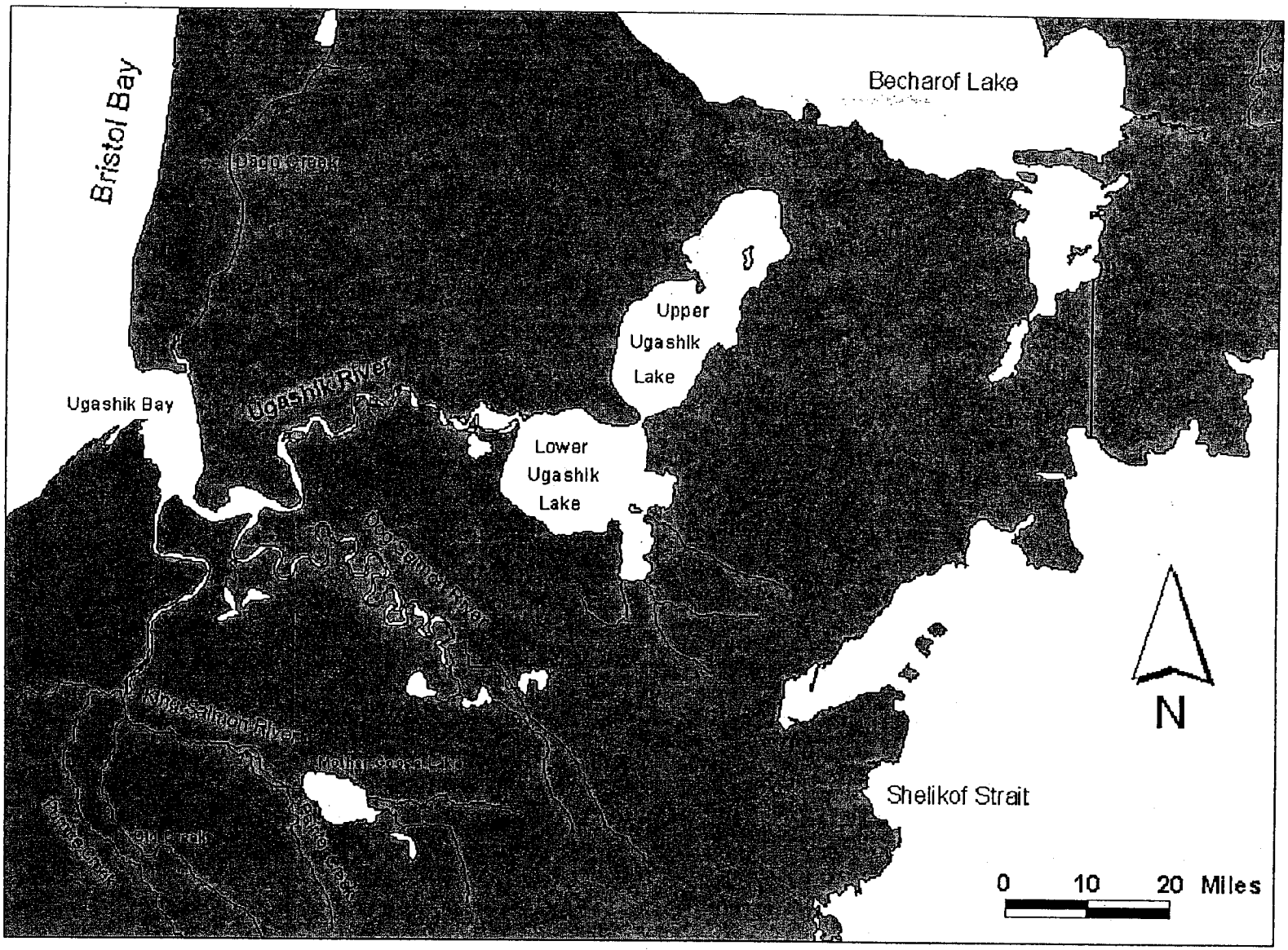

Figure 4. Ugashik River drainage, Bristol Bay, Alaska.

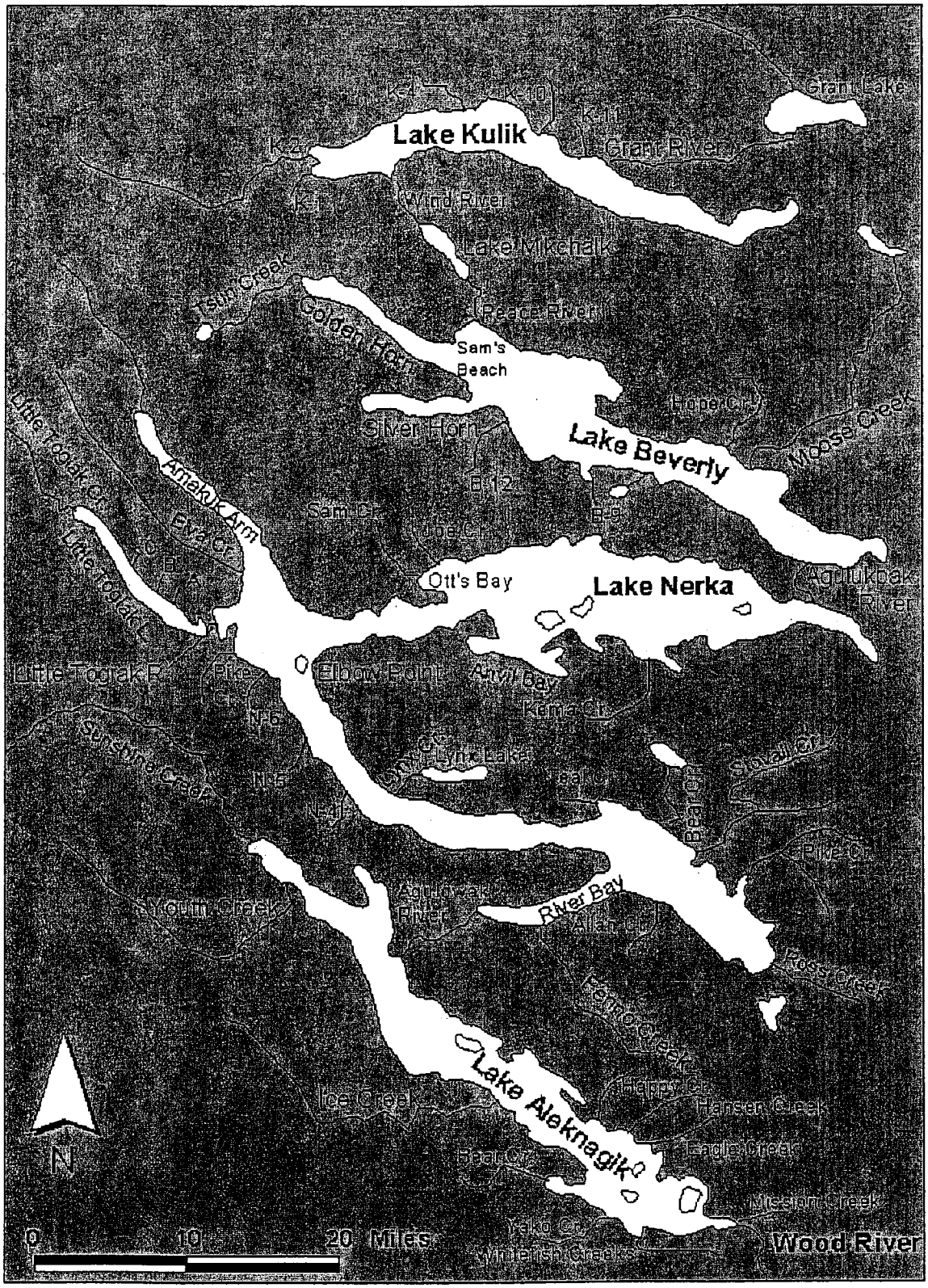

Figure 5. Wood River Lakes system, Bristol Bay, Alaska.

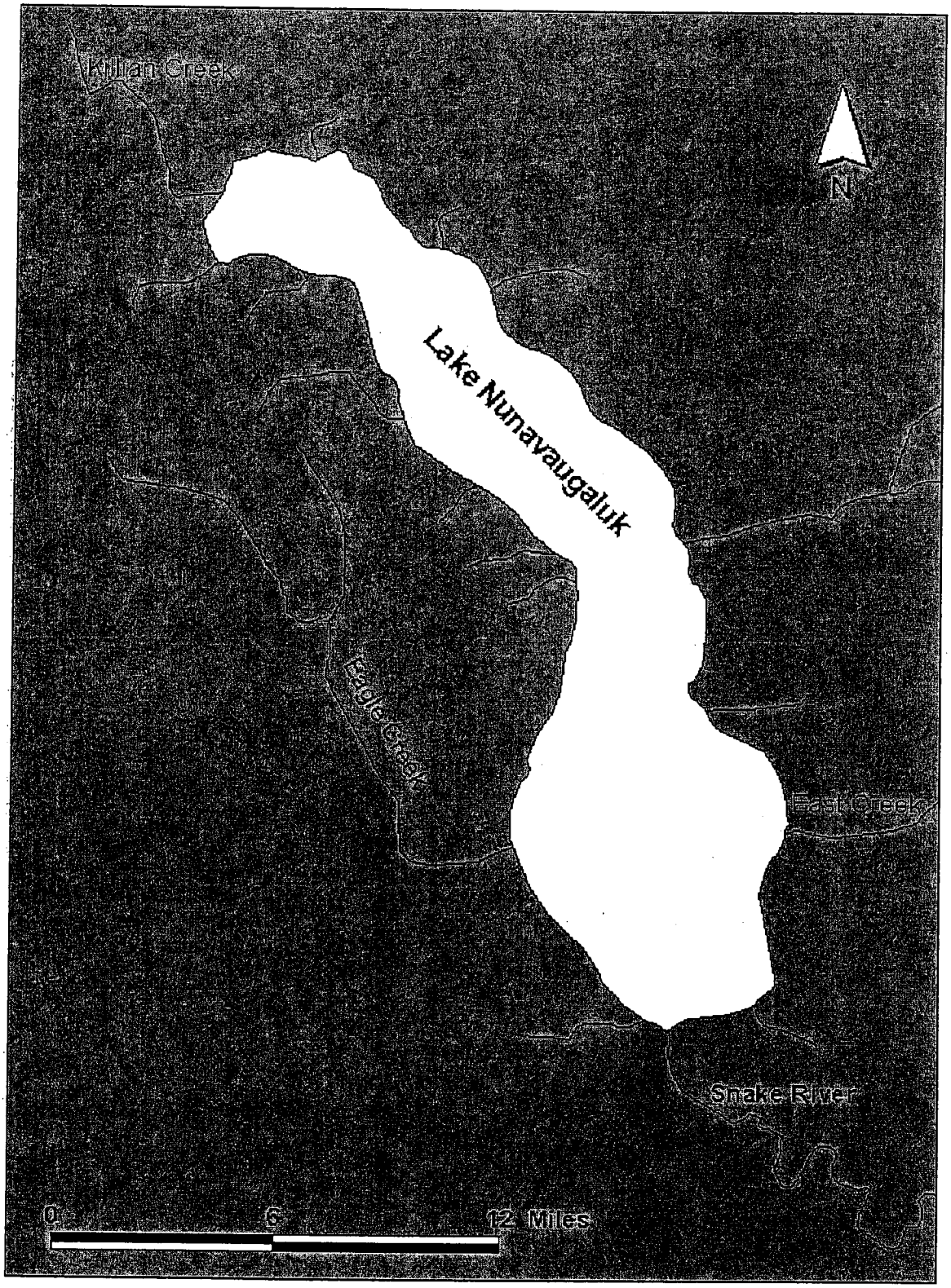

Figure 6. Lake Nunavaugaluk system, Bristol Bay, Alaska.

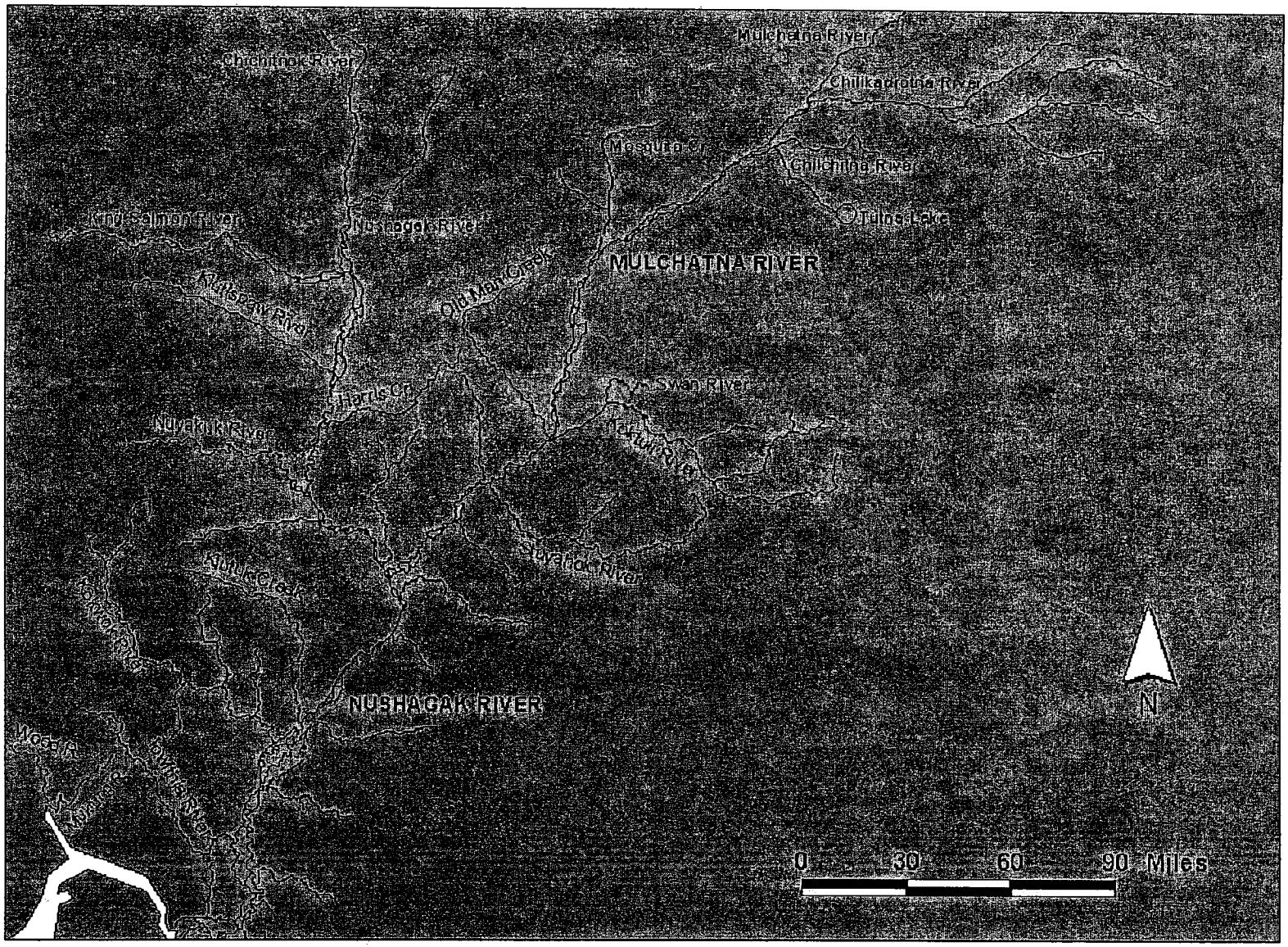

Figure 7. Nushagak-Mulchatna River system, Bristol Bay, Alaska.

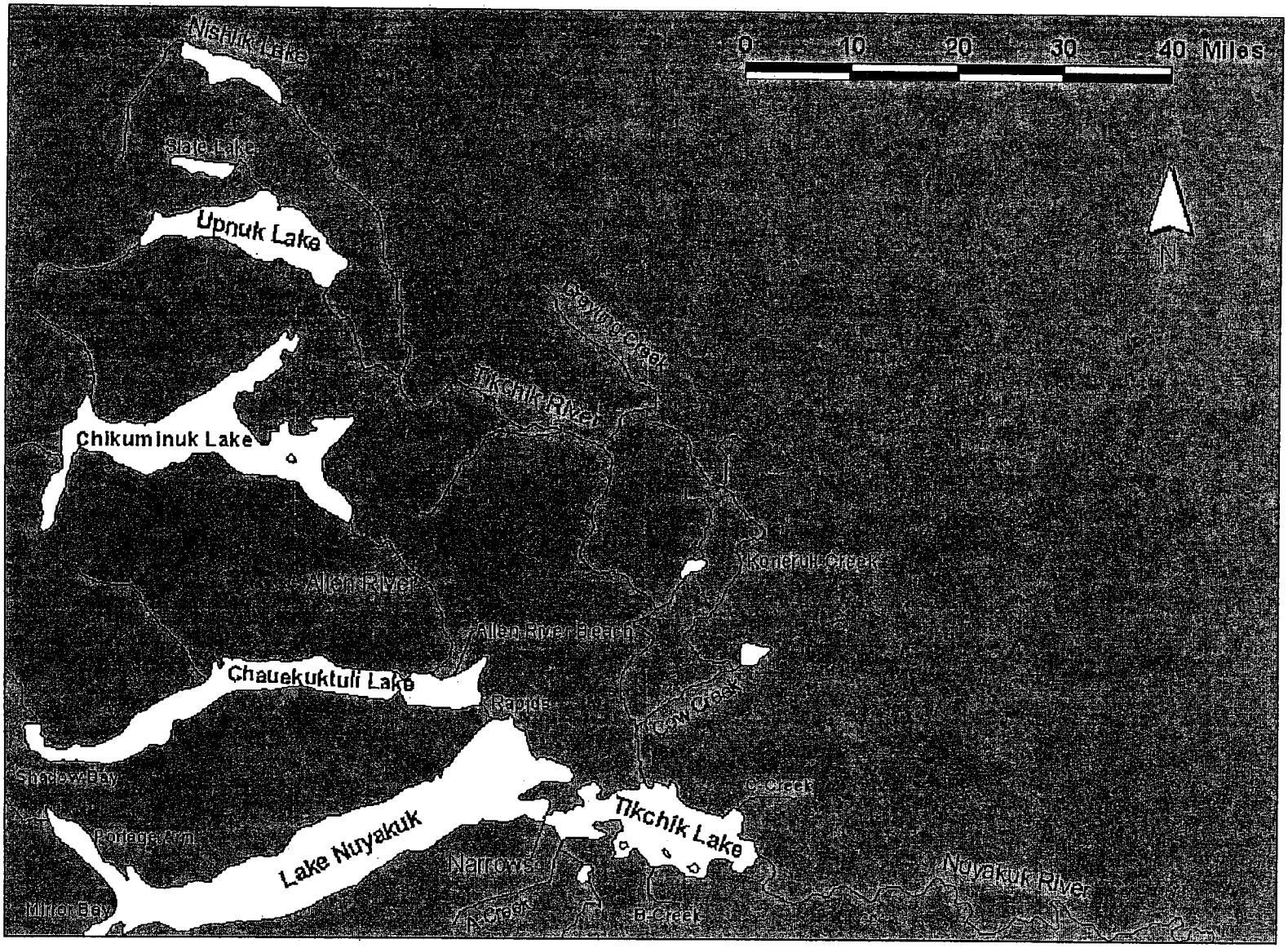

Figure 8. Tikchik Lakes system, Bristol Bay, Alaska.

Figure 9. Togiak River system, Bristol Bay, Alaska.

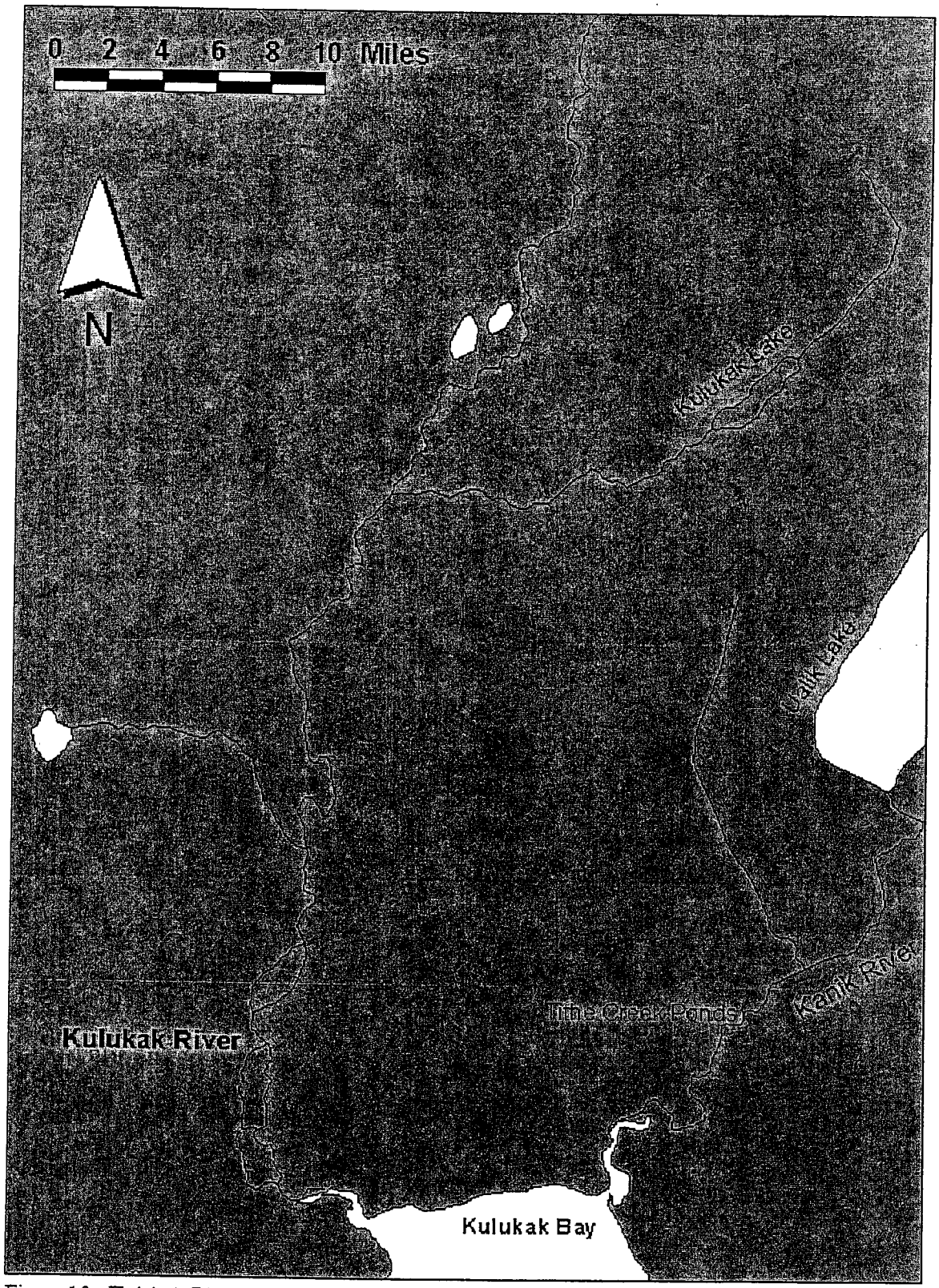

Figure 10. Kulukak River system, Bristol Bay, Alaska.

Appendix Table 1. Sockeye salmon total escapement estimates, Naknek-Kvichak District, 1983-2003. Estimates based on visual counts from towers unless otherwise noted.

Year	Kvichak	Naknek	Alagnak	Total	Alagnak Percent of Total
1983	3,569,982	888,294	96,220 [a]	4,554,496	2
1984	10,490,670	1,242,474	215,370 [a]	11,948,514	2
1985	7,211,046	1,849,938	118,030 [a]	9,179,014	1
1986	1,179,322	1,977,645	230,180 [a]	3,387,147	7
1987	6,065,880	1,061,806	154,210 [a]	7,281,896	2
1988	4,065,216	1,037,862	194,630 [a]	5,297,708	4
1989	8,317,500	1,161,984	196,760 [a]	9,676,244	2
1990	6,970,020	2,092,578	168,760 [a]	9,231,358	2
1991	4,222,788	3,578,508	277,589 [a]	8,078,885	3
1992	4,725,864	1,606,650	226,643 [a]	6,559,157	3
1993	4,025,166	1,535,658	347,975 [a]	5,908,799	6
1994	8,337,840	990,810	242,595 [a]	9,571,245	3
1995	10,038,720	1,111,140	215,713 [a]	11,365,573	2
1996	1,450,578	1,078,098	306,750 [a]	2,835,426	11
1997	1,503,732	1,025,664	218,115 [a]	2,747,511	8
1998	2,296,074	1,202,172	252,200 [a]	3,750,446	7
1999	6,196,914	1,625,364	463,600 [a]	8,285,878	6
2000	1,827,780	1,375,488	451,300 [a]	3,654,568	12
2001	1,095,348	1,830,360	267,000 [a]	3,192,708	8
2002	703,884	1,263,918	282,100 [a]	2,249,902	13
2003	1,686,804	1,831,170	2,110,000 [a]	5,627,974	37
Mean	4,570,530	1,493,694	335,035	6,399,259	7

[a] Aerial survey counts.
[b] Weir counts.
[c] Mean of counts from 1977 to present.

Appendix Table 2. Aerial survey counts of Chinook salmon escapements, Naknek River drainage, 1983-2003.

Year	Mainstem Naknek River	Paul's Creek	King Salmon Creek	Big Creek	Total
1983	2,860	290	460	4,220	7,830
1984	790	400	385	3,420	4,995
1985	590				590
1986	2,200	73	102	1,542	3,917
1987	2,800	7	290	1,353	4,450
1988	7,380	150	600	3,600	11,730
1989	1,700	50	100	860	2,710
1990	4,500	150	350	2,000	7,000
1991	1,655	121	275	2,340	4,391
1992	1,550	88	158	895	2,691
1993	5,520	86	700	1,710	8,016
1994	5,970	203	974	2,531	9,678
1995	2,790	26	239	1,905	4,960
1996	2,965	157	312	1,576	5,010
1997	7,520	248	902	1,783	10,453
1998	2,150	210	1,060	2,085	5,505
1999		223	847	2,250	3,320
2000	1,900	43	178	1,112	3,233
2001	3,800	118	413	2,009	6,340
2002	4,240	314	934	2,015	7,503
2003	4,150	583	1,348	[a]	6,081
Mean	3,352	177	531	2,063	5,733 [b]
Percent	58	3	9	36	107

[a] Counts unavailable.
[b] The sum of mean indices.

Appendix Table 3. Chinook salmon escapement survey history, mainstem Naknek River, 1983-2003.

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
1983	8/14	Bill		2,860	3,000	Pre-peak. Still fish holding in large groups.
1984	8/14	Bill		790	2,370	
1985	8/06	Bill			600	Pre-peak.
	8/27	Bill		590	700	
1986	8/18	Russell		1,990		Spawning pre-peak. Still many fish holding.
	8/19	Meyer		2,200		Peak of spawning drawing near.
1987	8/19	Meyer		2,800		Pre-peak. Fish still in large groups. Few redds.
	8/28	Bill		2,655	2,855	
1988	8/09	Minard		7,380	7,400	Approaching peak. Most fish on redds.
1989	8/14	Minard		1,700		Fish actively spawning. Few carcasses observed.
1990	8/06	Minard		4,500		
1991	8/20	Russell		1,655		Pre-peak. Still many fish schooled & waiting.
1992	8/21	Regnart		877		Water clarity poor in deeper pools.
	8/27	Regnart		1,550		At Peak...all fish on redds.
1993	8/23	Regnart		5,520		Near peak. Still some fish schooled.
1994	8/24	Regnart		5,970		Near peak. Most on redds.
1995	8/21	Regnart		2,790		Near peak. Most on redds.
1996	8/21	Regnart		2,965		At Peak...all fish on redds.
1997	8/16	Regnart		7,520		Near peak. Most on redds.
1998	8/18	Regnart		2,150		At Peak...all fish on redds.
1999	no survey					Survey flown September 8 no count available.

(Continued)

Appendix Table 3. (Page 2 of 2)

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
2000	8/07	Morstad		1,900		Early still fish schooled
2001	8/29	Morstad		3,800		Slightly after peak
2002	8/28	Morstad		4,240		Slightly after peak
2003	8/21	Morstad		4,150		Slightly after peak
Mean			3,124	3,154		

[a] Weir count did not account for estimated 15-20% of chinook that spawn downstream of weir site. Also does not account for fish that migrated upstream past the weir site before and after weir operation.

[b] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 4. Chinook salmon escapement survey history, Big Creek, Naknek River Drainage, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill		4,220	9,000	
1984	8/08	Bill		3,420	8,800	At peak of spawning.
1985	8/06	Bill			2,900	Survey conditions..high water & gusty winds.
1986	8/08	Meyer		1,542	6,000	Excellent conditions. Fish at spawning peak.
1987	8/21	Meyer		1,353	2,500	
1988	8/09	Minard		3,600		
1989	8/14	Minard		860		
1990	8/06	Minard		2,000		
1991	8/12	Regnart		2,340		At spawning peak..all fish on redds, only 20 dead.
1992	8/18	Regnart		895		Est. 5-6 days post-peak. Count includes 125 dead.
1993	8/17	Regnart		1,710		Estimated survey 3-4 days past peak.
1994	8/16	Regnart		2,531		Est. 2-3 days post-peak. Count includes 159 dead.
1995	8/15	Regnart		1,905		Estimate survey was several days past peak.
1996	8/12	Regnart		1,576		At spawning peak....38 dead observed
1997	8/7	Regnart		1,783		At spawning peak....48 dead observed
1998	8/18	Regnart		2,085		At spawning peak....no carcasses present
1999		Morstad		2,250		At spawning peak....no carcasses present
2000	8/07	Morstad		1,112		At spawning peak....4 dead observed
2001	8/08	Morstad		2,009		At spawning peak
2002	8/02	Morstad		2,015		At spawning peak
2003						NO survey completed
Mean			1,465	2,063		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 5. Chinook salmon escapement survey history, King Salmon Creek, Naknek River drainage, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill		460	1,400	Poor visibility. Muddy. 30% spawners dead already.
1984	8/08	Bill		385	1,155	
1988	8/08	Minard		600		At peak.
1989	8/14	Minard		100		Past peak.
1990	8/06	Minard		350		
1991	7/30	Russell		100		Pre-peak and water clarity only "Fair".
	8/05	Russell		275		Est. at spawning peak, most fish on redds, 2 dead.
1992	8/09	Russell		158		Post-peak as 47 dead counted & aband. redds numerous.
1993	7/31	Russell		700	900	Slightly pre-peak. Most fish on redds. Water clear.
1994	7/29	Russell		974		Slightly pre-peak. Most fish on redds. Only 6 carcasses.
1995	8/05	Russell		239		A little past peak. Several singles on redds. Vis. only
1996	8/05	Regnart		312		Slightly post peak. 26 dead counted.
1997	7/18	Regnart		902		Pre-peak and water clarity "Good".
1998	8/18	Regnart		1,060		Estimate is at peak of spawn.
1999	8/02	Morstad		847		Estimate near peak of spawn, fair to good conditions.
2000	8/01	Morstad		178		Estimate near peak, survey conditions fair
2001	8/02	Morstad		413		Estimate near peak, survey conditions fair
2002	31-Jul	Morstad		934		Estimate near peak, survey conditions excellent
2003	8/01	Morstad		1,348		Estimate near peak, survey conditions excellent
Mean				544		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for conditions, river areacounting at time of survey.

Appendix Table 6. Chinook salmon escapement survey history, Paul's Creek, Naknek River drainage, 1983-2003.

Year	Count Dates	Surveyors	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/14	Bill	290	800	Poor visibility.
1984	8/08	Bill	400	800	Fair visibility. About 25% dead already.
1985	8/06	Bill		170	Pre-peak.
1986	8/08	Meyer	73	236	Approximately 30% dead already.
1987	8/13	Russell	7		Poor survey conditions. Past peak.
	??	Meyer		400	Estimat 400 present based on jet boat surveys.
1988	8/08	Minard	150		At peak.
1989	8/14	Minard	50		Past peak. Excellent visibility.
1990	8/06	Minard	150		Excellent survey conditions.
1991	7/30	Russell	121		Slightly pre-peak.Only 1 carcass noted.
1992	8/01	Russell	88		Slightly pre-peak.Stream clarity only "Fair".
1993	7/31	Russell	86	140	Slightly pre-peak.Overflew approx 60% of stream.
1994	7/29	Russell	203	300	Pre-peak...but many fish on redds.
1995	8/05	Russell	26		Water clarity poor. 5 carcasses noted
1996	8/05	Regnart	157		Peak of spawning. 12 dead counted.
1997	7/18	Regnart	248		Pre-peak. Excellent visibility
1998	8/18	Regnart	210		
1999	8/02	Morstad	223		Pre spawning, 10% on redds and two carcasses
2000	8/01	Morstad	43		Pre spawning, 10% on redds no carcasses
2001	7/31	Morstad	118		Near spawning peak conditions fair
2002	7/31	Morstad	314		Near spawning peak conditions good
2003	8/01	Morstad	583		Near spawning peak conditions good
Mean			177		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 7. Chinook salmon escapement survey history, Alagnak River, 1983-2003.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/15	Bill		2,980	3,500	At peak of spawning.
1984	8/14	Bill		6,090	9,135	
1985	8/17	Bill		3,920	9,518	About peak for chinook spawning. 30% dead already.
1986	8/11	Bill		3,090	7,200	Peak of spawning.
1987	8/22	Bill		2,420		
1988	8/12	Bill		4,600		
1989	8/15	Bill		3,650		
1990	8/08	Bill		1,720		
1991	8/09	Regnart		2,023		Pre-peak. Most fish schooled yet. Few on redds.
	8/19	Regnart		2,531		Near peak. Most fish on redds.
1992	8/10	Regnart		3,042		Pre-peak. Most fish still schooled.
	8/21	Regnart		2,275		Near peak...but water clarity worse than earlier.
1993	8/09	Regnart		10,170		Near peak. Most on redds.
1994	8/08	Regnart		8,480		About half the fish on redds. Others schooled.
1995	8/10	Regnart		6,860		About 2/3 of chinook noted on redds.
1996	8/12	Regnart		9,885		Near peak. Most on redds.
1997	8/7	Regnart		15,210		Peak. Excellent visibility
1998	8/12	Anderson		4,148		About 1/3 of braids poor light; most on redds.
1999	8/10	Morstad		2,178		Peak of spawning, good survey conditions
2000	8/7	Morstad		2,220		Peak of spawning, good survey conditions
2001	8/8	Morstad		5,458		Near peak, high water survey conditions good
2002	8/2	Morstad		3,765		Near peak, survey conditions good
2003	8/13	Weiland		8,209		Near peak, survey conditions good
Mean			238	4,997		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 8. Chinook salmon escapement survey history, Kvichak River, 1932-2003.

Year	Count Dates	Surveyors	Weir Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1932	6/28-8/5		5,753			Peak count was on 7/05 (1,168 fish).
1976	8/16	Bill		35	45	Survey timed to count pink salmon.
1980[b]	8/08	Bill		900	1,000	Chinook actively spawning.
1984	8/14	Bill		200		
1988	8/13	Bill		190	570	Nearly all on redds.
1989	8/16	Bill		100	260	
1990	8/19	Bill		170	510	
1992	8/13	Regnart		264		All fish on redds in Kaskanak Flats.
1993	8/16	Regnart		115		All fish on redds in Kaskanak Flats.
1994	8/12	Regnart		306		
1995	8/14	Regnart		96		
1996	8/18	Regnart		132		
1997	8/15	Regnart		103		
1998	8/14	Anderson		187		All fish on redds in Kaskanak Flats
1999	8/10	Morstad		1,200		
2000	8/07	Morstad		6		
2001	8/08	Morstad		36		
2002	No survey					
2003	No survey					
Mean			5,753	222		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

[b] Pecks Creek, a Kvichak River tributary, was float surveyed 7/30-8/03, 1980 by R. Russell and 99 spawning chinook salmon were counted.

Appendix Table 9. Chinook salmon escapement data, Naknek-Kvichak District, 1983-2003.

Year	Non-expanded Escapement Indices by Drainage [a]			Total
	Naknek	Alagnak	Kvichak	
1983	7,830	2,980		10,810
1984	4,995	6,090	200	11,285
1985	590 [f]	3,920		4,510
1986	3,917	3,090		7,007
1987	4,450	2,420		6,870
1988	11,730	4,600	190	16,520
1989	2,710	3,650	100	6,460
1990	7,000	1,720	170	8,890
1991	4,391	2,531		6,922
1992	2,691	3,042	264	5,997
1993	8,016	10,170	115	18,301
1994	9,678	8,480	306	18,464
1995	4,960	6,860	96	11,916
1996	5,010	9,885	132	15,027
1997	10,453	15,210	103	25,766
1998	5,505	4,148	187	9,840
1999	3,320 [c]	2,178	1,200	6,698
2000	3,233	2,220	6	5,459
2001	6,340	5,458	36	11,834
2002	7,503	3,765		11,268
2003	6,081 [g]	8,209		14,290
Mean [h]	5,733	5,268	222	11,149

[a] Includes aerial indices from all streams surveyed in drainage.
[b] No index count for Paul's Creek.
[c] No index count for Naknek River.
[d] No non-expanded index counts exist for this year.
[e] Includes only index counts for mainstem Naknek River, Paul's Creek, & Big Creek.
[f] Naknek River mainstem only.
[g] No index count for Big Creek.
[h] Sum of mean indices.

Appendix Table 10. Chum salmon escapement survey history, Alagnak River, 1983-2003.

Year	Count Dates	Surveyors	Tower Counts	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1983	8/15	Bill		8,800		Pre-peak.
1984	8/14	Bill		48,000	87,500	
1990	8/08	Bill		8,500	30,000	Pre-peak.
	8/18	Bill		48,800		Close to peak of spawning.
1991	8/09	Regnart		43,000		Pre-peak.
	8/19	Regnart		64,300		Peak of spawning.
1992	8/10	Regnart		114,000		Near Peak.
1993	8/09	Regnart		4,600		Near Peak.
1994	8/08	Regnart		62,900		Near Peak.
1995	8/10	Regnart		132,000		Near Peak.
1996	8/12	Regnart		145,000		Near Peak
1997	8/07	Regnart		37,800		Near Peak
1998	8/12	Anderson		3,150		Poor survey conditions
1999	8/10	Morstad		11,800		Near Peak
2000	8/07	Morstad		10,120		Near Peak
2001	8/08	Morstad		70,800		At peak
2002	8/02	Morstad		157,800		At peak
2003	8/13	Morstad		78,000		At peak
Mean			3,575	58,298		

[a] Surveyor's subjective istimate of instantaneous population of chum salmon spawners in the river at time of aerial survey, based on survey conditions, coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for river area counting at time of survey.

Appendix Table 11. Pink salmon escapement survey history, Alagnak River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982	8/09	Bill	21,300	63,900	
	8/19	Bill	24,800	43,000	Pre-peak.
1984	8/14	Bill	296,500	567,100	Survey too early for peak. Most fish
1986	8/11	Bill	48,600	145,800	
1988	8/12	Bill	415,000	620,000	Pre-peak.
1990	8/08	Bill	45,100		
	8/18	Bill	240,500		Estimated to be about 1 week pre-peak.
1992	8/10	Regnart	15,000		Pre-peak.
1994	8/08	Regnart			No pinks noted.
1996	8/12	Regnart			No pinks noted.
1998	8/12	Anderson	3,200		High water poor light conditions
2000	8/7	Morstad	30,000		
2002	8/2	Morstad	127,500		Survey too early for peak. Most fish
Mean			115,227	205,686	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting a time of survey.

Appendix Table 12. Pink salmon escapement survey history, Kvichak River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982					No Survey.
1984	8/14	Bill	111,000	165,000	
1986					No survey.
1988	8/13	Bill	94,000		
1990	8/19	Bill	25,300	47,000	
1992					No survey.
1994					No survey.
1996					No Survey
1998					No Survey.
2000	8/07	Morstad	7,000		Still schooled.
2002					No survey
Mean			59,325	106,000	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 13. Pink salmon escapement survey history, Naknek River, 1982-2003.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982	8/19	Bill	33,600	34,000	Pre-peak.
1984	8/14	Bill	27,000	125,000	
1986	8/18	Russell	286,000	375,000	Most fish still schooled and holding. Pre-peak.
1988	8/24	Russell	187,000		
1990	8/18	Bill		65,000	
1992					No survey.
1994					No survey.
1996					No survey.
1998					No survey.
2000	8/07	Morstad	10,000		
2002	8/28	Morstad	20,000		Main stem only
Mean			15,000	65,000	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 14. Aerial survey counts of Chinook salmon escapement, Egegik District, 1983-2003.

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[f]	Contact Creek	King Salmon River	Total
1983						860		380		375		1,615
1984	40	300				600		350		110		1,400
1985	75	80	0	15	10	260	230	315		95		1,080
1986	65	150	48	0	0	150	46	40		18	15	532 [b]
1987	15	174	2	74	0	408	284	232	2	88		1,279
1988	50	151	0	12		248	120	177		110		868
1989	14	90	13	43	7	310	120	300		100		997
1990	24 [c]	85	7	35	2	260	175	175		205		968
1991	0 [c]	62	60	30	33	83	117	95		73		553
1992[d]	15	143	52	54	22	416	320	190		296		1,508
1993	80	58	6	38	6	350	170	200		235		1,143
1994[d]	66 [c]	48	32	118	77	840	214	230		705		2,330
1995[d]	60 [c]	32	10	53	103	456	248	130		275		1,367
1996	42 [c]	102	8	38	20	230	74	123	6	203	[g]	846
1997	30 [c]	39	2	18	10	260	173	374	[g]	740	[g]	1,646
1998	0 [c]	29	45	55	[g]	320	165	120	[g]	329	[g]	1,063
1999	6 [c]	75	10	51	[g]	165	6	115	[g]	145	[g]	573
2000	0 [c]	4	0	16	[g]	85	41	73	[g]	341	[g]	560
2001	0 [c]	32	0	35	[g]	116	120	153	[g]	299	[g]	755
2002	0 [c]	24	4	0	[g]	277	220	149	[g]	238	[g]	912
Mean	31	88	17	38	24	335	158	196	4	249	15	1,100
2003	0 [c]	35	0	20	10	297	180	313	[g]	197	[g]	1,052
Deviation [e]		-60%	-100%	-47%		-11%	14%	60%		-21%		-4%

[a] Peak aerial counts unless otherwise noted. Data not expanded.
[b] Survey 10-14 days later than normal.
[c] Tower count.
[d] Helicopter surveys.
[e] 2003 deviation from 1981-2002 average.
[f] Angle Creek is usually too turbid to survey.
[g] No Count.

Appendix Table 15. Aerial survey counts of chum salmon escapement, Egegik District, 1983-2003.

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[b]	Contact Creek	King Salmon River	Total
1983	6[c]					5,000		3,500		6,000		14,500
1984	800	200				13,000		2,400		10,000		26,400
1985	400	0	600	200	35	2,600	800	0		500	50	5,185
1986	0	0	6,025			140	3	5	0	15	25	6,213[d]
1987	150	0	19,000	16	1,000	3,770	2,780	0		2,850		29,566
1988	500	50	4,400	100	50	5,200	1,600	0		3,200		15,100
1989	0	10	3,200	25	100	1,100	0	0		200	14	4,649
1990	72[c]	0	2,000	0	150	1,675	80	0		750		4,727
1991	0[c]	0	1,500	70	100	990	280	0		480		3,420
1992[e]	50	0	680	15	25	4,500	400	0		3,630	200	9,500
1993	100	0	1,020	8	1	1,075	0	0		100		2,304
1994[e]	42[c]	0	1,700	5	7	760	175	30		260		2,979
1995[e]	144[c]	2	395	15	30	560	162	5		600		1,913
1996	12	[f]	438	4	20	530	[f]	24	[f]	633	[f]	1,661
1997	0[c]	[f]	220	8	10	495	290	60	[f]	640	[f]	1,723
1998	17[c]	8	1,480	4	[f]	920	4	4	[f]	140	[f]	2,577
1999	6[c]	[f]	1,040	4	[f]	243	[f]	4	[f]	140	[f]	1,437
2000	0[c]	[f]	492	4[f]	[f]	475	32	6	[f]	180	[f]	1,189
2001	0[c]	[f]	424	6	[f]	494	40	30	[f]	1,240	[f]	2,234
2002	0[c]	[f]	284	5	[f]	302	16		[f]	150	[f]	757
Mean	121	21	2,494	29	127	2,191	416	319	0	1,585	72	6,902
2003	0[c]	0	540	70	50	690	0	0	[f]	3,800	[f]	5,150

[a] Peak aerial counts unless otherwise noted. Data not expanded.
[b] Angle Creek is usually too turbid to survey.
[c] Tower count.
[d] Survey 10-14 days later than normal.
[e] Helicopter surveys.
[f] No Count.

Appendix Table 16. Aerial survey counts of pink salmon escapement, Egegik District, 1983-2003.[a]

Year	Egegik River	Whale Mountain Creek	Gertrude Creek	Contact Creek	Other	Total
1983			58 [c]			58
1984	17,000					17,000
1985						
1986	2,500					2,500
1987						
1988	23,000					23,000
1989	300					300
1990	17,000		40 [c]			17,040
1991		88 [d]	24 [d]	36 [d]		148
1992[e]	6 [b]	10			3	13
1993	50					50
1994	21,282 [b]					21,282
1995	24 [b]					24
1996	103,116 [b]					103,116
1997	0 [b]		1,290 [f]			1,290
1998	2 [b]		2,487 [f]			2,489
1999	6 [b]		1,125 [f]			1,131
2000 [g]	0 [b]					
2001 [g]	0 [b]					
2002 [g]	0 [b]					
Mean	13,161	49	837	36	3	12,629
2003 [g]	0 [b]					

[a] Non-expanded aerial peak counts unless otherwise noted.
[b] Tower counts.
[c] Float count.
[d] Foot survey (USFWS).
[e] Helicopter surveys.
[f] Gertrude Creek Weir count.
[g] No Counts.

Appendix Table 17. Aerial survey counts of coho salmon escapement, Egegik District, 1983-2003.

Year	Number of Surveys	Coho Salmon Count	Comments
1983	0	0	No surveys done.
1984	3	43,225	40,000 counted in Egegik Lagoon on August 15.
1985	3	5,260	Peak surveys on August 26.
1986	1	12,575	Surveyed August 19.
1987	6	6,930	Included King Salmon River & tributaries.
1988	6	13,715	Included King Salmon River & tributaries.
1989	9	4,485	Included Gertrude & Whale Mountain Creeks.
1990	7	13,400	Peak survey on August 17.
1991	0	220	Incidental observation made August 6.
1992 [b]	0	200	Incidental observation in Egegik River August 6.
1993	0	1,130	Incidental observation from Egegik River August 16.
1994 [b,c]	2	7,412	Included King Salmon River & tributaries.
1995 [d]	2	5,258	Included King Salmon River & tributaries.
1996 [e]	2	9,043	Included King Salmon River & tributaries.
1997	3	4,106	Gertrude Weir Count & selected Becharof Lake tributaries.
1998	1	6,075	Gertrude Weir Count & selected Becharof Lake tributaries.
1999	1	4,353	Gertrude Weir Count & selected Becharof Lake tributaries.
2000	1	4,870	Selected Becharof Lake tributariers
2001	1	5,100	Selected Becharof Lake tributariers
2002	1	7,050	Selected Becharof Lake tributariers
2003	1	5,280	Selected Becharof Lake tributariers

[a] Survey done by USFWS personnel.
[b] Helicopter surveys.
[c] The Egegik River Tower was maintained through September 11 and approximately 10,140 coho salmon were counted.
[d] The Egegik River Tower was maintained through August 30 and approximately 7,470 coho salmon were counted.
[e] The Egegik River Tower was maintained August 7 to September 11 and approximately 24,918 coho salmon were counted.

Appendix Table 18. Aerial survey counts of Chinook salmon escapement, Ugashik District, 1983-2003.

Year	Ugashik River	Dog Salmon River [g]	King Salmon	Painter Creed	Pumice Creek	Old Creek	Total
1983	50 [a]	1,635	525	635	1,800	660	5,305
1984	108 [a]	836	4,100	1,875	1,100	880	8,899
1985	150 [b]	560	4,600	410	930	410	7,060
1986	66 [b]	252	1,777	646	705	739	4,185
1987	54 [a]	751	981	1,051	1,602	1,155	5,594
1988	249 [c]	900	5,820	1,170	1,025	660	9,824
1989	226 [bc]	848	1,670	1,030	510	520	4,804
1990	67 [ac]	540	1,500	590	450	610	3,757
1991	131 [ac]	449	700	365	375	420	2,440
1992[d]	260 [ac]	821	1,260	855	750	815	4,761
1993	188 [ac]	579	1,970	865	450	635	4,687
1994[d]	233 [ac]	1,741	2,225	1,005	2,530	1,490	9,224
1995	149 [ac]	882	440	366	501	505	2,843
1996	76 [ac]	1,079	1,200	403	[f]	30 [f]	2,788
1997	839 [ac]	906	802	525	536	558	4,166
1998	458 [ac]	1,411	883	1,230	352	438	4,772
1999	237 [ac]	535	[f]	166	340	213	1,491
2000	26 [a]	425	[f]	314	339	246	1,350
2001	346 [abc]	929	828	563	646	530	3,842
2002	618 [abc]	1,121	430	472	586	408	3,635
Mean	227	860	1,762	727	817	596	4,771
2003	469 [abc]	1,053	334	490	596	351	3,293
Deviation [e]	107%	22%	-81%	-33%	-27%	-41%	-31%

[a] Tower counts
[b] Tower count plus later aerial survey counts of main river.
[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).
[d] Helicopter surveys.
[e] 2003 deviation from 1980-2002 average.
[f] No Count.
[g] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 19. Aerial survey counts of chum salmon escapement, Ugashik District, 1983-2003.

Year	Ugashik River	Dog Salmon River [i]	King Salmon River	Painter Creek	Pumice Creek	Old Creek	Other	Total
1983	0 [a]	1,650	2,700	4,000	20,000 [b]	3,300		31,650
1984	132 [a]	750	119,000	16,000	16,000	14,500	2,500	168,882
1985	42 [c]	350	20,000	1,925	6,000	670	300	29,287
1986	0 [c]	120	8,650	1,200	2,000	630	125	12,725
1987	130 [c]	340	9,750	2,290	10,340	2,090	40	24,980
1988	752 [c,d]	2,290	25,000	10,500	11,650	5,800	950	56,942
1989	600 [c,d]	1,005	7,500	3,700	2,200	2,010	625	17,640
1990	312 [c,d]	170	6,200	1,150	1,630	410	10	9,882
1991	315 [c,d]	240	7,400	750	2,550	2,525	130	13,910
1992[e]	510 [a,c,d]	1,210	8,525	4,000	14,000	15,000	0	43,245
1993	93 [c,d]	105	7,000	720	2,040	1,025	8	10,991
1994[e]	66 [a,c]	851	9,150	1,625	12,750	6,975	150	31,567
1995	6 [a,c]	160	3,900	1,370	2,600	1,800	0	9,836
1996	138 [a]	85	16,500	700	7,400	2,500	0	27,323
1997	100 [a,c]	450	10,500	4,200	5,300	9,480	115	30,145
1998	607 [a,c]	840	10,600	3,800	2,000	4,350	224	22,421
1999	278 [a,c]	400	[h]	650	1,660	2,020	50	5,058
2000	7 [a]	510	[h]	2,150	7,300	5,850		15,817
2001	78 [ac]	1,140	8,100	6,000	13,500	7,800	200	36,818
2002	0 [ac]	1,000	8,200	3,100	5,100	4,200	100	21,700
Mean	208	683	16,038	3,492	7,301	4,647	307	31,041 [f]
2003	142 [ac]	1,130	5,500	8,000	4,000	3,000	50	21,822
Deviation [g]	-32%	65%	-66%	129%	-45%	-35%	-84%	-30%

[a] State tower counts, (Federal tower count was 5,700 in 2001, 870 in 2002, and 630 in 2003.
[b] Float count done from a raft.
[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).
[d] Included tower count plus later aerial surver count.
[e] Helicopter surveys.
[f] Average of the sums of indices for all locations.
[g] 2003 deviation from 1980-2002 average.
[h] No Count.
[i] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 20. Aerial survey counts of pink salmon escapement, Ugashik District, 1983-2003.

Year	Number of Surveys [a]	Pink Salmon Count	Comments
1983	2	803	Survey of Dog Salmon River conducted by USFWS.
1984	3	656	650 counted in King Salmon River during September 21 float trip.
1985	3	0	
1986	1	350	Observed in King Salmon River on August 19.
1987	2	1	
1988	7	2,800	Peak count on August 23: 2,000 in King Salmon River.
1989	8	50	Observed in Ugashik River on August 9.
1990	5	2,000	Peak count on August 13.
1991	0	660	Ugashik River tower count.
1992 [b]	0	1,728	Ugashik River tower count.
1993	0	0	
1994 [b]	0	425	Observed near Ugashik Lake Outlet on August 11.
1995	0	36	Ugashik River tower count.
1996	0	550	Observed in King Salmon River on August 12.
1997	0	0	
1998	0	57	Ugashik River tower count.
1999	0	6	Ugashik River tower count.
2000	0	46	Ugashik River tower count.
2001 [c]	0	708	Ugashik River tower count.
2002 [d]	0	714	Ugashik River tower count.
2003 [e]	0	156	Ugashik River tower count.

[a] Zero indicates no surveys designated to look for pink salmon and any oberservations recorded would be incidental to surveying for other species.

[b] Helicopter survey.

[c] Includes 66 from State tower count and 642 from Federal tower count.

[d] Includes 24 from State tower count and 690 from Federal tower count.

[e] Includes 66 from State tower count and 90 from Federal tower count.

Appendix Table 21. Aerial survey counts of coho salmon escapement, Ugashik District, 1983-2003.

Year	Number of Surveys	Coho Salmon Counts	Comments
1983	0		
1984	1	6,100	Surveyed on August 31.
1985	2	18,880	16,500 in King Salmon River on September 12.
1986	2	8,455	Surveyed on August 19 and 25.
1987	2	17,000	16,700 in King Salmon River on August 23.
1988	7	28,280	12,900 in King Salmon River on September 7.
1989	4	11,515	7,615 observed on August 14.
1990	5	12,610	
1991	0	400	Incidental observation made August 12.
1992[a]	0	790	Incidental observation made August 11.
1993	0	705	Incidental observation made August 16.
1994[a]	0	760	Incidental observation made August 11.
1995	0		
1996[b]	1	8,275	Surveyed on September 27 and 28.
1997[b]	2	9,400	Surveyed on September 30 and October 17.
1998[b]	1	1,459	Surveyed on November 19.
1999[b]	1	10,210	Surveyed on October 14.
2000[b]	1	12,070	Surveyed on October 12.
2001[b]	1	4,540	Surveyed on September 27.
2002[b]	1	3,805	Surveyed on September 22.
2003[b]	1	19,670	Surveyed on September 21.

[a] Helicopter survey.

[b] Surveys are of selected areas in the Ugashik Lakes, King Salmon and Dog Salmon River drainages.

Appendix Table 22. Spawner distribution and total escapement estimates of sockeye salmon, Wood River system, 1983-2003.

	Spawner Distribution (%)			
Year	Creeks	Beaches	Rivers	Total Escapement[a]
1983	14.3	60.9	24.8	1,361,000
1984	11.4	27.6	61.0	1,002,800
1985	18.6	22.2	59.1	939,000
1986	16.1	23.3	60.6	819,000
1987	27.6	56.1	16.3	1,337,000
1988	31.0	44.4	24.6	866,800
1989	19.6	28.9	51.5	1,186,400
1990				1,069,400
1991			19.0	1,159,900
1992	24.9	56.7	18.4	1,286,300
1993	40.9	34.1	25.0	1,176,100
1994	25.5	36.4	38.1	1,471,900
1995	33.5	52.9	13.6	1,482,200
1996	25.8	39.3	34.9	1,649,600
1997	15.6	60.8	23.6	1,512,400
1998	20.0	66.2	13.8	1,755,800
1999				1,512,400
2000				1,300,000
2001				1,458,700
2002				1,283,700
Mean	23.2	43.6	32.3	1281520.0
2003				1,459,800

[a] Estimated from Wood River tower counts. Rounded to the nearest hundred.

Appendix Table 23. Total escapement estimates of pink salmon, Nushagak and Togiak District, 1982-2003.[a]

Year	Nushagak District[b]	Togiak District[c]
1982	1,656,660	44,300
1984	2,926,450	269,950
1986	72,190[e]	80,000[d]
1988	494,610[e]	142,500[d]
1990	801,730[e]	207,000
1992	[f]	235,000[d]
1994	192,780[e]	88,000[d]
1996	821,312[e]	[f]
1998	132,400[e]	134,780[d]
2000	135,285[e]	[f]
2002	317,659[e]	[f]
Mean	755,108	150,191

[a] Only those years of comprehensive aerial coverage are included: even years only; all counts rounded to the nearest 10 fish.

[b] Includes Wood, Igushik, Snake, Nushagak, and Nuyakuk Rivers, and Ice, Youth, and Sunshine Creeks, unless otherwise noted.

[c] Includes Togiak, Matogak and Osviak Rivers; 1982, 1990 and 1998 also Include Slug River.

[d] Togiak River estimate only.

[e] Sonar estimate of Nushagak-Mulchatna Rivers only.

[f] No escapement estimate.

Appendix Table 24. Aerial estimates of sockeye salmon escapements, Togiak District, 1983 - 2003.[a]

Year	Togiak River & Tributaries[b]	Kulukak Systems[c]
1983	13,200	27,000
1984	30,900	49,800
1985	8,800	36,600
1986	35,000	42,800
1987	28,600	37,800
1988	32,400	31,700
1989	19,800	10,800
1990	47,100	49,600
1991	23,700	23,900
1992	16,500	26,400
1993	15,900	31,800
1994	19,400	29,700
1995	25,500	14,600
1996	30,200	19,000
1997	20,600	8,000
1998	21,900	13,000
1999	40,200	12,300
2000	40,300	22,400
2001[d]	6,700	17,000
2002	16,175	8,500
1983-02 Mean (20-Year)	24,644	25,635
1983-92 Mean (10-Year)	25,600	34,444
1993-02 Mean (10-Year)	23,688	18,427
2003	[e]	8,000

[a] All counts are rounded to the nearest hundred.

[b] Estimates do not include fish spawning above the counting tower (Togiak Lake outlet); estimates for Ungalikthluk, Osviak,. Matogak and Slug Rivers are not included in the 1977-94 data as reported in Bristol Bay Data Reports 73 and 81.

[c] Includes Kulukak River, Kulukak Lake, and Tithe Creek Ponds.

[d] Togiak count includes only the Togiak mainstem and Ongivinuk Rivers.

[e] No aerial surveys performed due to weather

Appendix Table 25. Peak aerial counts of live sockeye salmon, Togiak River drainage, 1983 - 2003.

Year	Togiak Mainstem	Gechiak River	Pungokepuk River	Narogurum River	Kashaiak River	Ongivinuk River	Total
1983	4,800	1,100	700	0	0	1,200	7,800
1984	10,550	2,800	2,450	0	0	2,300	18,100
1985	1,800	400	500	0	0	1,700	4,400
1986	13,500						13,500
1987	5,200	3,600	600	0	0	4,900	14,300
1988	9,400	2,000	1,100	0	0	3,700	16,200
1989	7,600	1,500	630			150	9,880
1990	8,770	5,720	5,980	0	2,550	1,190	24,210
1991	7,990	1,640	1,220			1,010	11,860
1992	3,030	1,280	1,400			2,200	7,910
1993	2,300	1,270	540			2,950	7,060
1994	3,100	560	1,870			3,900	9,430
1995	3,260	1,745	1,000		4,200	2,330	12,535
1996	9,160	2,270	150	100	240	3,190	15,110
1997	8,200	1,600	450	50	650	2,800	13,750
1998	4,890	3,100	150	10	0	2,800	10,950
1999	5,400	11,275	1,475	100	75	6,700	25,025
2000	12,600	8,100	925	150	100	775	22,650
2001	3,260					100	3,360
2002	2,050	5,000	75	1,525	0	1,450	10,100
Mean	6,343	3,053	1,179	161	601	2,387	13,724 [a]
%	46.2%	22.2%	8.6%	1.2%	4.4%	17.4%	100.0%
2003	No surveys performed due to weather						

[a] Sum of means for all streams.

Appendix Table 26. Peak aerial counts of live sockeye salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Kulukak River [b]	Tithe Creek Ponds	Quigmy River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	7,800	8,430	2,720		80	20	2,000	230	940	22,220
1984	18,100	7,400	14,000		200	6,800		100	5,200	51,800
1985	4,400	6,700	11,600		0	200	2,300	260	1,310	26,770
1986	13,500	10,900	14,000							38,400
1987	14,300	10,500	8,400							33,200
1988	16,200	12,600	3,250	250	100	380	5,880	200	2,700	41,560
1989	9,880	2,920	2,500					5,000		20,300
1990	24,210	10,600	14,200	100	400	2,200	3,540	9,700	3,800	68,750
1991	11,860	8,650	3,320	35	860	2,530	560	3,400	2,650	33,865
1992	7,910	7,530	4,950	40	300	3,340	1,460	3,600	3,760	32,890
1993	7,060	9,600	6,300					3,100	5,680	31,740
1994	9,430	10,270	4,600	580	990	1,750	6,070	2,230	3,240	39,160
1995	12,535	3,000	4,310	200	610	1,470	2,820	390	1,720	27,055
1996	15,110	2,490	7,000		360	780	1,045	1,000		27,785 [d]
1997	13,750	2,300	3,000		360	780	1,045	1,000		22,235
1998	10,950	2,175	4,300	20	900	2,600	5,010	2,300	240	28,495
1999	25,025	3,250	3,200	1,100	2,400	750	1,400	1,625	625	39,375
2000	22,650	6,100	5,075	125	526	1,512	1,201	2,175	575	39,939
2001	3,360	5,140	3,500	160	370	210	4,620	740	2,340	20,440
2002	10,100	2,375	1,875	660	1,450	1,705	371	160	0	18,696 [f]
Mean	12,907	6,647	6,105	297	619	1,689	2,621	2,067	2,319	35,271 [e]
%	36.6%	18.8%	17.3%	0.8%	1.8%	4.8%	7.4%	5.9%	6.6%	100.0%
2003		900	4,136	110	500	2,180	2,330	1,500	2,580	14,236

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Includes surveys of Kulukak Lake. Counts prior to 1977 include Kulukak Lake only and are not included in the mean.

[c] Includes a combined count for the Negukthlik and Ungalikthluk of 4,500 fish.

[d] Complete count not available

[e] Sum of means for all streams.

[f] Togiak River count includes mainstem and Ongivinuk River only.

Appendix Table 27. Peak aerial counts of live Chinook salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
	A	B	C	D	E	F						
1983	120	220	370	290	360	850	820	240	340	430	350	4,390
1984	250	560	900	560	820	1,920	760	580	270	580	430	7,630
1985	270	320	640	340	470	970	470	250	290	310	460	4,790
1986	150	80	160	30	110	350						880
1987	20	70	170	120	200	480	610	180	100	120	320	2,390
1988	70	70	160	160	170	710	390	180	60	70	90	2,130
1989	10	30	370			940	190	80			40	1,660
1990	230	170	680	365	805	1,085	370	125	75	400	10	4,315
1991	505	165	475	225	520	455	460	105	90	100	150	3,250
1992	150	250	440	225	450	690	250	160	70	175	105	2,965
1993	170	120	220	160		1,810 [b]	595	240	130	65	440	3,950
1994				215	815	1,580	420	215	225	570	380	4,420
1995	120	220	750	255	800	800	715	140	425	520	295	5,040
1996	75	150	160	100	255	625	335	120	120	235	325	2,500
1997	100	350	1,300	600	820	1,000	275	180	150	275	100	5,150
1998	10	20	250	50	400	1,200	400	150	275	140	275	3,170
1999	150	210	540	510	225	480	365	90	240	305	270	3,385
2000	75	50	500	400	850	1,450	350	85	125	100	75	4,060
2001	610	500	500	200	300	950	700	270	550	1,050	160	5,790
2002	140	410	820	250	390	690	400	45	65	210	125	3,545
Mean	170	209	495	266	487	952 #	467	181	200	314	232	3,771 [c]
%	4.5%	5.5%	13.1%	7.1%	12.9%	25.2%	12.4%	4.8%	5.3%	8.3%	6.1%	100.0%
2003				180	265	495			115	100	135	1,290

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Nayorurun River
Section D; Nayorurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] Includes count for Section E.

[c] Sum of means for all streams.

Appendix Table 28. Peak aerial counts of live Chinook salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	4,390	40	2,460	190	120		1,080	260	8,540
1984	7,630	30	1,190	150	360		680	20	10,060
1985	4,790	0	540	100	50		80	90	5,650
1986	880								880
1987	2,390		300	30	40		660	80	3,500
1988	2,130	10	490	0	40	0	650	170	3,490
1989	1,660		740				560		2,960
1990	4,315	30	635	75	60	0	930	25	6,070
1991	3,250	25	285	75	100		1,175	55	4,965
1992	2,965	15	485	40	105	30	490	35	4,165
1993	3,950		1,140	80	110	100	830	70	6,280
1994	4,420	20	835	40	60	10	540	190	6,115
1995	5,040	35	430	65	135	50	740	80	6,575
1996	2,500	35	698	35	71	30	402		3,771
1997	5,150	10	310	50	65	33		10	5,628
1998	3,170	45	375	92	58	39	75	25	3,879
1999	3,385	10	240	105	40	150	345	130	4,405
2000	4,060	26	340	65	42	6	1,100	226	5,865
2001	5,790	24	330	58	84	2	201	74	6,563
2002	3,545	28	860	54	62	7	1,203	161	5,920
Mean	3,771	24	668	72	89	35	652	100	5,411 [b]
%	69.7%	0.4%	12.3%	1.3%	1.6%	0.6%	12.1%	1.8%	100.0%
2003	1290 [c]	17	360	28	99	66	466	40	1,076

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Partial aerial survey

Appendix Table 29. Peak aerial counts of live chum salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
	A	B	C	D	E	F						
1983	8,160	3,050	3,780	1,100	2,780	6,070	150	140	5,560	570	3,790	35,150
1984	3,900	6,300	800	0	2,600	6,400	3,700	2,000	4,200	700	3,500	34,100
1985	8,300	6,500	3,200	900	6,700	10,200	4,100	600	9,600	1,800	8,300	60,200
1986[b]												
1987	12,000	9,400	2,700	500	13,200	33,000	2,600	1,200	4,100	700	13,100	92,500
1988	10,000				4,900	3,800	3,700	5,000	3,500	200	3,800	34,900
1989		2,600	2,100		5,000	8,100	290	700			1,200	19,990
1990	2,200	1,275	1,350	400	650	4,200	3,150	1,150	3,400	250	125	18,150
1991	10,200	3,900	2,800	600	5,500	6,000	2,300	500	3,500	800	3,480	39,580
1992[c]	1,800	1,800	300	100	1,200	1,500	2,000	500	1,800	900	800	22,700 [d]
1993	6,500	3,500	2,300	60		4,400 [e]	1,950	450	4,380	620	3,500	27,660
1994				1,300	5,200	10,400	900	2,400	7,100	900	5,700	33,900
1995	15,700	7,100	4,700	1,800	6,800	5,900	4,800	1,900	9,700	2,700	8,200	69,300
1996	3,700	10,250	5,500	1,300	5,750	8,250	2,600	750	900	550	3,400	42,950
1997	3,900	3,100	3,800	2,750	7,100	4,550	3,200	800	4,750	1,800	3,900	39,650
1998	2,300	1,400	2,750	1,300	4,300	8,950	3,600	1,050	3,000	250	1,650	30,550
1999	3,975	1,950	2,375	1,300	1,725	2,200	1,840	440	4,230	480	2,540	23,055
2000[b]												
2001	9,400	6,500	5,250	1,000	3,500	9,850	7,800	2,850	200	21,450	6,000	73,800
2002	3,350	5,300	4,200	800	4,650	2,100	4,950	650	2,700	1,800	650	31,150
Mean	6,906	4,808	3,174	1,007	5,022	7,904	3,037	1,328	4,426	2,223	4,284	44,120 [f]
%	15.7%	10.9%	7.2%	2.3%	11.4%	17.9%	6.9%	3.0%	10.0%	5.0%	9.7%	100.0%
2003				25	675	1,000			175	1,125	1,125	4,125

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurum River
Section D; Narogurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] No aerial surveys conducted.

[c] Counts by section are not representative due to post-peak survey, and are not included in the mean.

[d] Preferred total estimate; management survey count conducted 7/15/92.

[e] Includes count for Section E.

[f] Sum of means for all streams.

Appendix Table 30. Peak aerial counts of live chum salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983	35,150	4,900	12,960	7,600	11,900	1,210	300	7,360	81,380
1984	34,100	6,300	8,500	10,200	18,400		2,100	3,000	82,600
1985	60,200	1,800	7,800	2,860	5,460	8,800	130	14,650	101,700
1986									
1987	92,500	1,500	22,000	2,300	2,160				120,460
1988	34,900	10,800	35,000	12,000	17,400	7,600	400	11,300	129,400
1989	19,990	2,820	5,580	7,450	4,900		560		41,300
1990	18,150	555	5,550	1,475	2,300	3,650	750	1,300	33,730
1991	39,580	4,420	9,540	4,730	8,700		120	3,020	70,110
1992	22,700 [c]	600	4,800 [c]	4,400	7,100	1,700	100	4,000	45,400
1993	27,660		6,950	1,970	1,360	3,060	20	4,020	45,040
1994	33,900	890	10,700	1,630	2,000	4,360	230	1,090	54,800
1995	138,600	2,200	7,600	5,200	13,920	6,440	1,000	7,200	182,160
1996	42,950	960	7,560	560	810	2,670	40		55,550
1997	39,650	1,700	4,550	3,000	2,500	1,890			53,290
1998	30,550	2,630	2,700	4,980	3,870	1,060	150	1,300	47,240
1999	23,055	1,340	3,430	5,700	3,650	4,750	410	11,360	53,695
2000		2,870	4,950	9,090	10,880	4,150	200	5,520	37,660
2001	75,600	2,590	22,300	2,840	2,220	5,570	220	5,480	116,820
2002	31,150	3,300	15,400	7,600	6,360	800	530	6,940	72,080
Mean	44,466	2,899	10,414	5,031	6,626	3,847	427	5,836	79,546 [b]
%	55.9%	3.6%	13.1%	6.3%	8.3%	4.8%	0.5%	7.3%	100.0%
2003	4,125[d]	720	3,425	1,340	3,480	1,030	30	4,970	14,995

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Preferred estimate from a management survey due to post-peak spawning ground survey.

[d] Partial aerial survey data

Appendix Table 31. Peak aerial counts of live coho salmon, Togiak River drainage, 1983-2003.

Year	Togiak River Section [a]						Mainstem Gechiak		Pungokepuk	Narogurum	Kashaiak	Ongivinuk	
	A	B	C	D	E	F	Total	River	River	River	River	River	Total
1983													
1984	1,440	1,190	200	120	620	1,480	5,050	4,750	2,240	990	1,110	6,140	20,280
1985	800 [c]	660 [c]	110 [c]	70 [c]	150	820	2,610	1,340	750	40	80	6,250	11,070
1986			60	400	100	400	960					2,560	3,520
1987	340	500	250	200	240	530	2,060	1,020	70			1,060	4,210
1988	950	370		140	210	360	2,030	1,530				4,100	7,660
1989													
1990	1,650	390	400	0	540	660	3,640	920	450	260	130	1,730	7,130
1991	4,900	400	700	600	1,680	140	8,020					100	140 [d]
1992	4,420	1,120	1,180	540	2,940	3,080	13,280	5,240	1,440	780	1,500	4,460	26,700
1993													
1994								1,290 [d]	220 [d]	120 [d]	95 [d]	1,930	3,655
1995								1,450			200	1,180	2,830
1996	2,550	1,090	150	250	1,600	5,020	10,910	2,080	1,170	575	725	6,450	21,910
1997	600	200	400	100	400	1,800	3,500	1,000	650	350	475	900	6,875
1998	460	625	100	100	310	1,075	2,670	2,550	575	400	500	1,750	8,445
1999	250	75	50	25	100	75	575	275	35	100	25	175	1,185
2000													
2001													
2002													
Mean	1,669	602	327	212	741 #	1,287	4,609	1,954	760	402	484	2,770	10,979 [b]
%	15.2%	5.5%	3.0%	1.9%	6.7%	11.7%	42.0%	17.8%	6.9%	3.7%	4.4%	25.2%	100.0%
2003													

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurum River
Section D; Narogurum River - Kashaiak River
Section E; Kashaiak River - Ongivinuck River

[b] Sum of means for all streams.

[c] Proportional estimates based on 1984 data.

[d] Timing of aerial surveys did not coincide with the period of peak spawning activity, and therefore, counts were not included in the mean or percent.

Appendix Table 32. Peak aerial counts of live coho salmon, Togiak District, 1983-2003.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1983									
1984	20,280		10,750	1,850	1,080	670			34,630
1985	9,430	200	7,790	610	420				18,450
1986	3,520								3,520
1987	4,210	30	910	440	120			130	5,840
1988	8,590	460	1,840	310	490	470	370	3,170	15,700
1989									
1990	7,130	1,029	5,195	2,675	1,491	810		4,153	22,483
1991[c]	140		4,200						4,340
1992	26,700		12,640						39,340
1993									
1994									
1995		855	1,185	1,392	1,080	1,149		5,196 [d]	10,857
1996	21,660	1,211	10,290	3,062	2,805	1,944	851	5,917	47,740
1997	6,875	325	1,675	150	1,046	1,397		1,690	13,158
1998	8,445	390	3,650	1,785	2,001	523		2,770	19,564
1999	1,185	169	500	220	213	117	95	450	2,949
2000									
2001		149		372	370	418			1,309
2002		421		597	539	62		1,027	2,646
Mean	9,847	476	5,052	1,122	971	756	439	2,723	16,168 [b]
%	60.9%	2.9%	31.2%	6.9%	6.0%	4.7%	2.7%	16.8%	100.0%
2003		680	1610	1620					3,910

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Timing of aerial surveys did not coincide with the period of peak spawning activity, and therefore, counts were not included in the mean or percent.

[d] Negukthlik and Ungalikthluk Rivers combined.