

Informational Leaflet

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RED SALMON SPAWNING GROUND SURVEYS IN THE
NUSHAGAK AND TOGIAK DISTRICTS - BRISTOL BAY,
1962

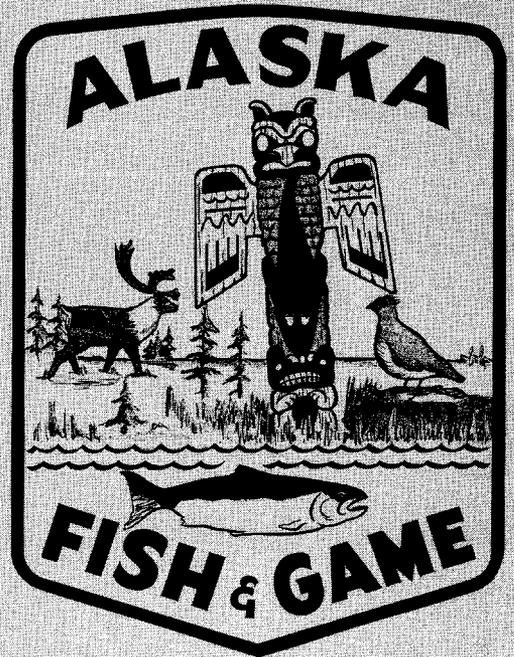
By:

Wilbur Church
and
Michael Nelson
Division of Commercial Fisheries
Dillingham, Alaska

July 31, 1963

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR

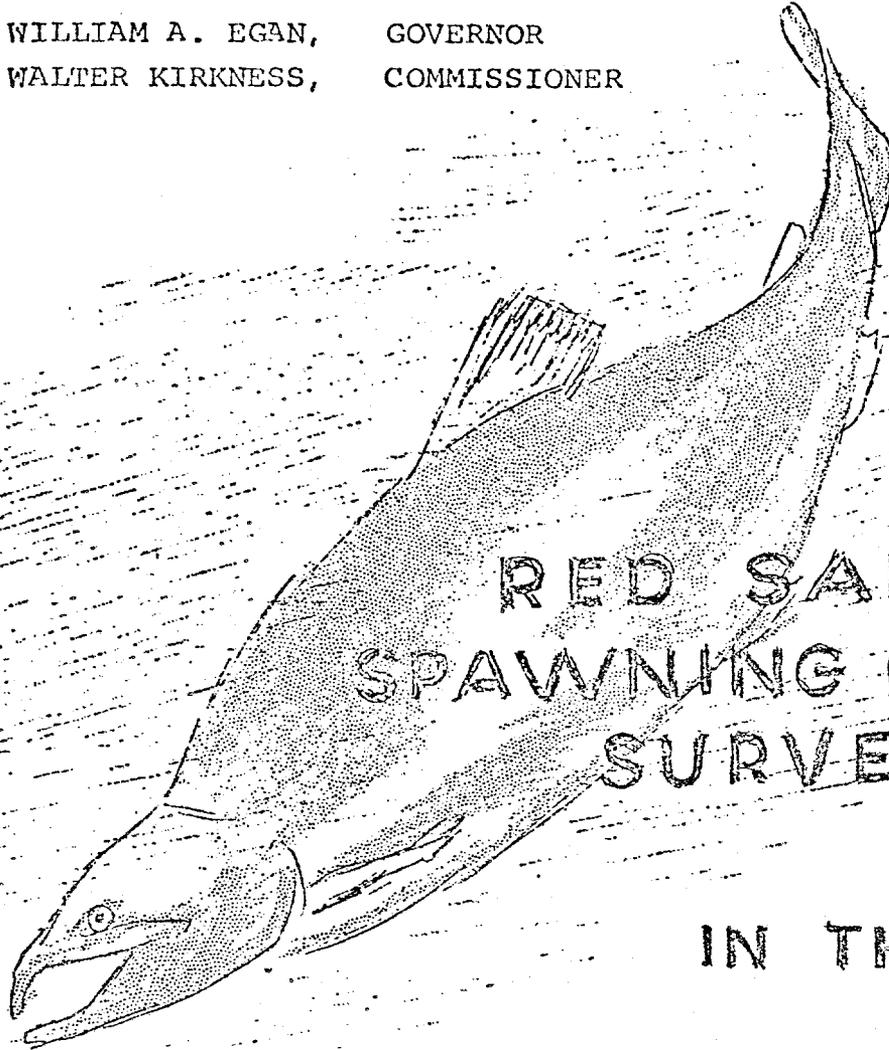
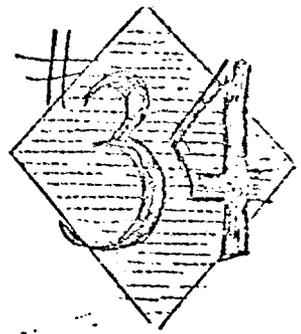
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Informational Leaflet

ALASKA DEPARTMENT OF FISH AND GAME

WILLIAM A. EGAN, GOVERNOR
WALTER KIRKNESS, COMMISSIONER



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WILBUR CHURCH
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BRISTOL BAY, 1962

INTRODUCTION

In 1962 the Alaska Department of Fish and Game conducted surveys of red salmon spawning grounds in the Nushagak and Togiak Districts. This is a continuation of many years of surveys in the area, and the third consecutive year in which the Department has been responsible for spawning distribution estimates.

The purpose of the surveys is to provide accurate estimates of abundance and distribution of fish in the various spawning areas. Such estimates are necessary to both research and management for optimum escapement studies and the attainment of escapement goals.

Systems included in the surveys were the Wood River, Igushik, Nunavaugluk, Tikchik, Nushagak-Mulchatna, Togiak, and Kulukak systems. These areas are shown in Figures 1-6.

METHODS

Survey Methods

Total escapement to the Wood River Lakes, Igushik Lakes, Lake Nunavaugluk, Tikchik Lakes, and Togiak Lakes were estimated by the tower counting method. Escapements to the Nushagak-Mulchatna, Kulukak, and tributaries of the Togiak River were estimated by aerial surveys only.

A Cessna 180 floatplane was used for all aerial surveys. Numbers and location of fish were entered on large scale maps (1 inch = 2 miles) of the spawning systems. Supplemental ground surveys of several creeks of the lower Wood River Lakes provided a comparison with aerial surveys.

Surveys were timed to cover the period of peak spawning in each area. Preliminary surveys were often made of late spawning areas while enroute to areas of earlier spawning.

Total Population Estimates

The chain-link method is used to derive total population estimates for each year by comparison with the estimates of the previous year.

In applying the method to 1962 data, peak spawning estimates from all areas within a given lake or river are added together. When compared with similar estimates made in 1961, the 1962-1960 ratio is obtained (Table 1-4). The 1961 total population estimates are then multiplied by the factor thus obtained to

arrive at preliminary population estimates for each lake and river within the systems (Tables 5-6). Preliminary population estimates are then corrected to agree with tower counts by distributing the difference among all areas.

Estimates of Spawning Ground Population in the Nushagak District

Wood River Lakes:

Peak estimates for 1961 and 1962, and peak estimate ratios for these two years are shown in Table 1. Preliminary population estimates and estimates adjusted to the tower count total are shown in Table 5.

The 1962 escapement of 873,900 red salmon to the Wood River Lakes was 1.9 times that of 1961 and constituted 93.19% of the known Nushagak escapement.

Most noteworthy was the very large return to Lake Beverley, which received over 40% of the escapement. Peace River, Wind River, and Lake Mikchalk also received large returns, with more spawners than have been recorded for these areas in recent years.

Returns to Wood River, Lake Aleknagik, and the Agulowak River were disappointing, with far fewer spawners than those areas are capable of supporting.

The return to Lake Nerka was noticeably spotty. Some usually good producing areas, notably Allah Creek Beach and Lynx Lake, produced small returns. Lake Nerka received about 30% of the escapement, approximately the same as in 1961, but a lower percentage than usual.

Little Togiak Lake and Grant River failed to show an increase over the 1961 populations, although the Wood River Lakes escapement was nearly twice as large this year.

The Agulukpak River received only a third as many spawners as in 1961 when it had an exceptionally large return. However, its 1962 return compares favorably with returns of other recent years.

Lake Kulik, after a poor return in 1961, received an escapement eight times as large in 1962. Its 1962 return also is excellent when judged by standards of recent years.

The distribution of spawners in the three major types of spawning areas showed a definite change from 1961 (Table 9). The very large return of Lake Beverley, largely beach spawners, and the small return to the Agulowak River were chiefly responsible for the increase in beach spawning and the decline in river spawning.

Igushik Lakes:

Peak estimates for 1961 and 1962, and peak estimate ratios for these two years

are shown in Table 2. Preliminary and adjusted estimates are shown in Table 5.

The 1962 escapement of 15,700 red salmon was 5.3% of that of 1961 and constituted only 1.6% of the known Nushagak escapement. This is one of the poorest escapements known for this system.

There was a little change in distribution within the system. The west shore of Lake Ualik had the largest population, followed by the Ongoke and Kathlene Rivers. Frances Creek and Longarm Creek, always good producers in the past had smaller populations than is usually contained in minor spawning areas of the system.

These areas continued to support the majority of the escapement at a greatly reduced level, while fish were almost non-existent in minor producing areas.

Lake Nunavaugaluk:

Peak estimates for 1961 and 1962, and peak estimate ratios for those two years are shown in Table 2. Preliminary and adjusted population estimates are shown in Table 5.

The 1962 escapement of 1,800 red salmon was 36.7% of that of 1961, and constituted only 0.19% of the known Nushagak escapement. Unlike the Igushik system, poor escapements are not unusual to Nunavaugaluk. Even so, this is also one of the lowest escapements known for this system.

On the few occasions that Nunavaugaluk has received a good escapement, the majority of the spawners have been along the Southwest and South Beaches and in Killian Creek. In 1962, however, these areas had populations no larger than those of minor producing areas where spawners are always thinly distributed even in good years.

Over half the fish spawned on the east side of the lake, showing no preference for any particular area there. This is only about 60 spawners per mile of shoreline. Fish were similarly dispersed on the west side of the lake along the beaches suitable for spawning.

Tikchik Lakes:

Peak estimates for 1961 and 1962, and peak estimates for those two years are shown in Table 3. Preliminary and adjusted population estimates are shown in Table 5.

The 1962 escapement of 37,900 red salmon was 47.5% of that of 1961, and constituted 4.04% of the known Nushagak escapement.

Lake Chauekuktuli received 60% of the spawning population, most of these concentrated on the Allen River Beach.

The river connecting Lake Chaukuktuli and Lake Nuyakuk, received a significant number of spawners for the first time in several years.

The Tikchik River, usually one of the better producing areas of the Tikchik system, received a very poor escapement. Most other areas had fewer spawners than in 1961, but did not decline so drastically. Since the Tikchik River accounts for most of the river spawning in the system, the percentage of river spawning decreased from 1961.

Nushagak-Mulchatna:

Peak estimates for 1961 and 1962, and peak estimate ratios for those two years are shown in Table 3. Preliminary and adjusted estimates are shown in Table 5.

The 1962 escapement estimate of 8,500 red salmon is based solely on aerial surveys. This constitutes 0.91% of the known Nushagak escapement.

Red salmon were observed in most of the tributaries of the Nushagak, but usually in small, widely scattered groups. The Mulchatna and Koktuli Rivers accounted for nearly 70% of the total.

The Nushagak-Mulchatna system has not been listed in Table 9, which shows the distribution of spawners in the three main types of spawning areas. All three types of areas are represented in this, but it is sometimes difficult to differentiate between creek and river spawning.

Most of the spawning in the Nushagak, King Salmon, Koktuli, and Iowthla Rivers takes place in the river themselves. In the Mulchatna River, there is little spawning in the main river. Most spawners there utilize small sloughs and tributaries, and probably should properly be classified as creek spawners. Beach spawning is represented in the Kokwok River, where most spawning takes place on the beaches of a few small lakes at the head of the river.

DISTRIBUTION OF PINK SALMON IN THE NUSHAGAK DISTRICT

Most of the pink salmon of the Nushagak District spawn in the Nuyakuk and Tikchik Rivers. Data given in Table 7 refer to these spawning populations.

493,000 pink salmon were enumerated past the tower located at the mouth of the Nuyakuk River. Nearly half of these spawned in the Tikchik River, with the rest remaining to spawn in the Nuyakuk River. In addition to those passing the tower, several thousand were observed spawning in the Nushagak River below the mouth of the Nuyakuk. None were seen in the Nushagak above its confluence with the Nuyakuk.

No attempt was made to estimate numbers of pink salmon elsewhere in the Nushagak District. However, good numbers of pinks were observed spawning in the Wood, Igushik, and Snake Rivers. They were also seen in the Agulowak River, Sunshine Creek, and Lynx Creek of the Wood River system.

ESTIMATES OF SPAWNING GROUND POPULATIONS IN THE TOGIK DISTRICT

Togiak Lakes

Peak estimates for 1961 and 1962, and peak estimate ratios for those two years are shown in Table 4. Preliminary and adjusted population estimates are shown in Table 6.

The 1962 escapement of 47,400 red salmon to the Togiak Lakes was 49.6% of that of 1961, and constituted 66.20% of the known Togiak escapement.

The Togiak Lake survey was made less reliable by the presence of glacial water. Due to its milky appearance, it was very difficult to detect the presence of fish. However, there was little discrepancy between the tower count total and the preliminary population estimate based on the surveys. Therefore, it is presumed that there actually were few fish in areas where few were observed.

Estimated populations of Zwischen River and Upper Togiak Lakes were actually higher than in 1961, although the escapement past the tower was only half as large. Beach spawning on the east shore of Togiak Lake was extremely sparse and scattered, although this has always been by far the greatest producing area of the Togiak system. It is possible that larger numbers of fish were present, but not seen along the east shore. However, fish could be seen in Upper Togiak Lake, in water of the same appearance.

With good numbers of fish in the Zwischen River, and a lack of them in the east shore area, the percentage of river spawning increased and beach spawning decreased in the Togiak Lakes.

Togiak Tributaries

Peak estimates for 1961 and 1962, and peak estimate ratios for those two years are shown in Table 4. Preliminary and adjusted population estimates are shown in Table 6. No tower counts are available to determine the percentage of fish accounted for by peak estimates, but for the purpose of population estimates it is presumed to be identical with that of the Togiak Lakes (Table 8).

The escapement of 14,600 red salmon estimated by aerial surveys was 54.5% of that of 1961, and constituted 20.39% of the known Togiak escapement.

Distribution was similar to that of 1961. Gechiak Lake was again by far the most important, with nearly 80% of the tributary total.

Of the Togiak tributaries, Gechiak Lake supports the greatest percentage of creek spawning. The very fine spawning creek at its head usually contributes at least half the Gechiak total. Minor numbers are supported in smaller creeks and at the head of Gechiak River, with the remainder spawning along the lake beaches.

Ongivinuk Lake is mainly beach spawning, but also supports river and creek spawning of minor importance. Pungokepek Lake populations consist almost entirely of beach spawners.

In the miscellaneous category are river spawners in the Narogurum, Kashaiak, and Gechiak Rivers and beach spawners in small unnamed lakes.

Kulukak Section

Peak estimates for 1961 and 1962, and peak estimate ratios for those two years are shown in Table 4. Preliminary and adjusted population estimates are shown in Table 6. As with the Togiak tributaries, the percentage of fish accounted for by peak estimates is presumed to be identical with that of the Togiak Lakes.

The escapement of 9,600 red salmon estimated by aerial surveys was 1.8 times that of 1961, and constituted 13.41% of the known Togiak escapement.

The escapement was almost evenly divided between the Kulukak River and Tithe Creek. This is a change in distribution from 1961, when more than 80% of the escapement was received in Tithe Creek.

Tithe Creek spawning takes place almost entirely in the numerous spring-fed ponds which drain into the creek. In both 1961 and 1962 a majority of the Nushagak River spawning took place in Kulukak Lake and the small creek which empties into it. In 1962 an increased amount of spawning was observed in the river itself. Undoubtedly, this river spawning can become of increased importance in years of larger escapements.

SUMMARY

1. The Alaska Department of Fish and Game conducted surveys of the red salmon spawning grounds of the Nushagak and Togiak Districts in 1962.
2. The Wood River Lakes received 93.2% of the known Nushagak escapement.
3. Escapement to the Wood River Lakes was unevenly distributed. Spawning populations of Lake Beverley, Peace River, Lake Mikchalk, and Wind River were far above average. Escapement was poor in Wood River, Lake Aleknagik, and Agulowak River.
4. The escapement to the Igushik Lakes was extremely poor. Spawning populations in all areas were far below average.
5. The escapement to Lake Nunavaugaluk was even less than the very poor escapement in 1961.
6. The Tikchik Lakes escapement declined from that of 1961. The Tikchik River, usually a good producer, had a very small spawning population.
7. The Nushagak-Mulchatna escapement showed a marked decrease from that of 1961.
8. The pink salmon escapement of 500,000 fish was almost equally divided between Nuyakuk and Tikchik River.

9. The Togiak Lakes escapement decreased from that of 1961. Although Zwischen River and Upper Togiak Lake had larger populations than in 1961, Togiak Lake east shore beach spawning was extremely poor.
10. The escapement to the Togiak tributaries was distributed essentially as in 1961, with most of the spawning population in the Gechiak Lake system.
11. Escapement to the Kulukak system increased from that of 1961. The increase was mainly in the Kulukak Lake population, while Tithe Creek remained about the same. Escapement was almost equally divided between the two spawning areas.

Table 1. Comparison of peak estimates - Wood River Lakes, 1961-1962.

Area	1961		1962		Ratio 1962-1961
	Date	No. Est.	Date	No. Est.	
Wood River:	8/29	4,000	8/30	1,5000	.38
Lake Aleknagik:					
Mission Creek	8/6	100	8/3	980	
Bear Creek	8/6	1,200	8/2	1,240	
Hansen Creek	8/6	700	8/4	3,860	
Happy Creek	8/6	800	8/4	650	
Ice Creek	8/6	2,500	8/9	2,200	
Yako Creek	8/6	100	8/5	1,360	
Sunshine Creek	8/6	3,000	8/9	1,100	
Whitefish Creek	8/6	300	8/6	880	
Northshore Creeks	8/6	100	8/9	1,400	
Northshore Beaches	8/29	600	8/30	490	
South Shore	8/29	860	8/9	230	
Yako Beach	8/29	<u>150</u>	8/9	<u>1,000</u>	
Aleknagik Total		10,410		15,390	1.48
Agulowak River & Lower River Bay:	8/29	100,000	8/30	17,180	.17
Lake Nerka:					
Fenno Creek	8/6	1,200	8/9	1,000	
Upper River Bay, N.W.	8/29	100	8/30	420	
Upper River Bay, S.E.	8/29	1,600	8/30	6,600	
Allah Creek Beach	8/29	7,600	8/30	5,400	
Ross Creek-Pike Creek	8/6	200	8/9	570	
Pike Creek	8/6	1,500	8/9	12,000	
Stovall Creek & Lake	8/6	2,000	8/9	2,000	
Bear Creek	8/6	100	8/9	1,700	
Teal Creek	8/6	100	8/9	1,700	
River Bay-N4 Beach	8/29	150	8/30	100	
N4-N6 Beach	8/29	7,800	8/30	10,150	
Pick Creek Beach	8/29	700	8/30	1,350	
Pick Creek	8/6	4,500	8/9	12,000	
Elva Creek Beach	8/29	1,200	8/30	1,110	
Elva Creek	8/6	200	8/9	330	
Anakuk Arm	8/29	950	8/30	510	
Lynx Creek	8/16	100	8/19	600	
Lynx Lake	8/29	2,940	8/30	4,600	
Anakuk Arm-Ott's Bay	8/28	250	8/30	1,330	
Ott's Bay	8/28	2,000	8/30	5,850	
Ott's Bay-Agulukpak R.	8/28	100	8/30	100	
Kema Creek	8/16	2,000	8/19	8,350	
Hidden Lake Creek	8/16	600	8/19	1,160	
Anvil Bay	8/28	10,100	8/30	21,570	
Anvil Bay-Elbow Pt.	8/28	440	8/30	1,610	

-Continued-

Table 1. Comparison of peak estimates - Wood River Lakes, 1961-62 (continued).

Area	1961		1962		Ratio 1962-1961
	Date	No. Est.	Date	No. Est.	
Elbow Pt.-Lynx Creek	8/29	730	8/30	2,900	
Little Togiak River	8/16	<u>3,300</u>	8/19	<u>3,000</u>	
Nerka Total		52,460		107,780	2.05
Little Togiak Lake:	8/23	7,770	8/30	7,660	.99
Agulukpak River	8/28	90,000	8/30	29,700	.33
Lake Beverley:					
Hardluck Bay	8/28	5,050	8/30	41,400	
Sam's Beach	8/28	500	8/30	1,300	
Golden Horn	8/28	450	8/30	3,040	
Silver Horn	8/28	3,350	8/30	79,000	
B-12 Beach	8/28	500	8/30	14,000	
B-9 Beach	8/28	100	8/30	10,000	
Anniversary Bay	8/28	50	8/30	600	
Moose Creek	8/16	2,000	8/19	11,000	
Hope Creek	8/16	50	8/19	7,000	
Misc.		<u>50</u>		<u>400</u>	
Beverley Total		12,100		167,740	13.86
Peace River:q		700		14,000	20.00
Lake Mikchalk:	8/28	2,200	8/30	26,500	12.05
Wind River:	8/28	1,300	8/30	5,300	4.08
Lake Kulik:					
North Shore	8/28	3,100	8/30	29,830	
West End	8/28	320	8/19	750	
South Shore	8/28	<u>610</u>	8/30	<u>2,130</u>	
Kulik Total		4,030		32,710	8.12
Grant River	8/16	8,000	8/19	8,700	1.09
<u>Wood River Lakes Total</u>		292,970		434,160	



Figure 1
WOOD RIVER LAKE SYSTEM
BRISTOL BAY, ALASKA

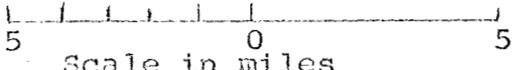


Table 2. Comparison of peak estimates - Igushik Lakes and Lake Nunavaugaluk, 1961-1962.

<u>Area</u>	<u>1961</u>		<u>1962</u>		<u>Ratio 1962-1961</u>
	<u>Date</u>	<u>No. Est.</u>	<u>Date</u>	<u>No. Est.</u>	
Igushik River	8/11	100	8/8	140	1.40
Lake Amanka:					
Longarm Creek	8/11	4,000	8/8	430	
Middle Creek	8/11	500	8/8	30	
South Creek	8/11	1,000	8/8	10	
Amanka Beaches	9/2	<u>800</u>		<u>60</u>	
Amanka Total		6,300		530	.08
Kathlene River:					
Lower River	8/11	100	8/8	1,100	
Upper River	8/11	30,000	8/8	640	
Ongoke River	8/11	<u>18,500</u>	8/8	<u>1,900</u>	
Kathlene River Total		48,600		3,640	.07
Lake Ualik:					
Frances Creek	8/11	20,000	8/8	700	
West Shore Creeks	8/11	1,000	8/8	150	
West Shore	9/2	36,500		2,210	
East Shore Creeks	8/11	400	8/8	80	
East Shore	9/2	<u>2,650</u>		<u>190</u>	
Ualik Total		60,550		3,330	.05
Igushik Lakes Total		115,450		7,640	
Lake Nunavaugaluk:					
Snake River	8/11	100	8/9	70	
Snake R.-Eagle Creek	9/2	950		130	
Eagle Creek	8/11	120	8/9	80	
West Shore	8/11	200		40	
Killian Creek	8/11	450	8/9	90	
East Shore	8/11	450		400	
East Creek	8/11	50	8/9	100	
South Shore	9/2	<u>250</u>		<u>10</u>	
Nunavaugaluk Total		2,570		920	.36



Figure 2

IGUSHIK AND NUNAVAUGALUK LAKE SYSTEMS
BRISTOL BAY, ALASKA

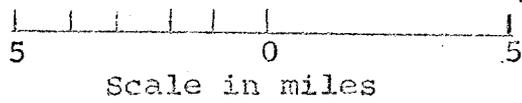
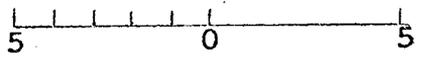
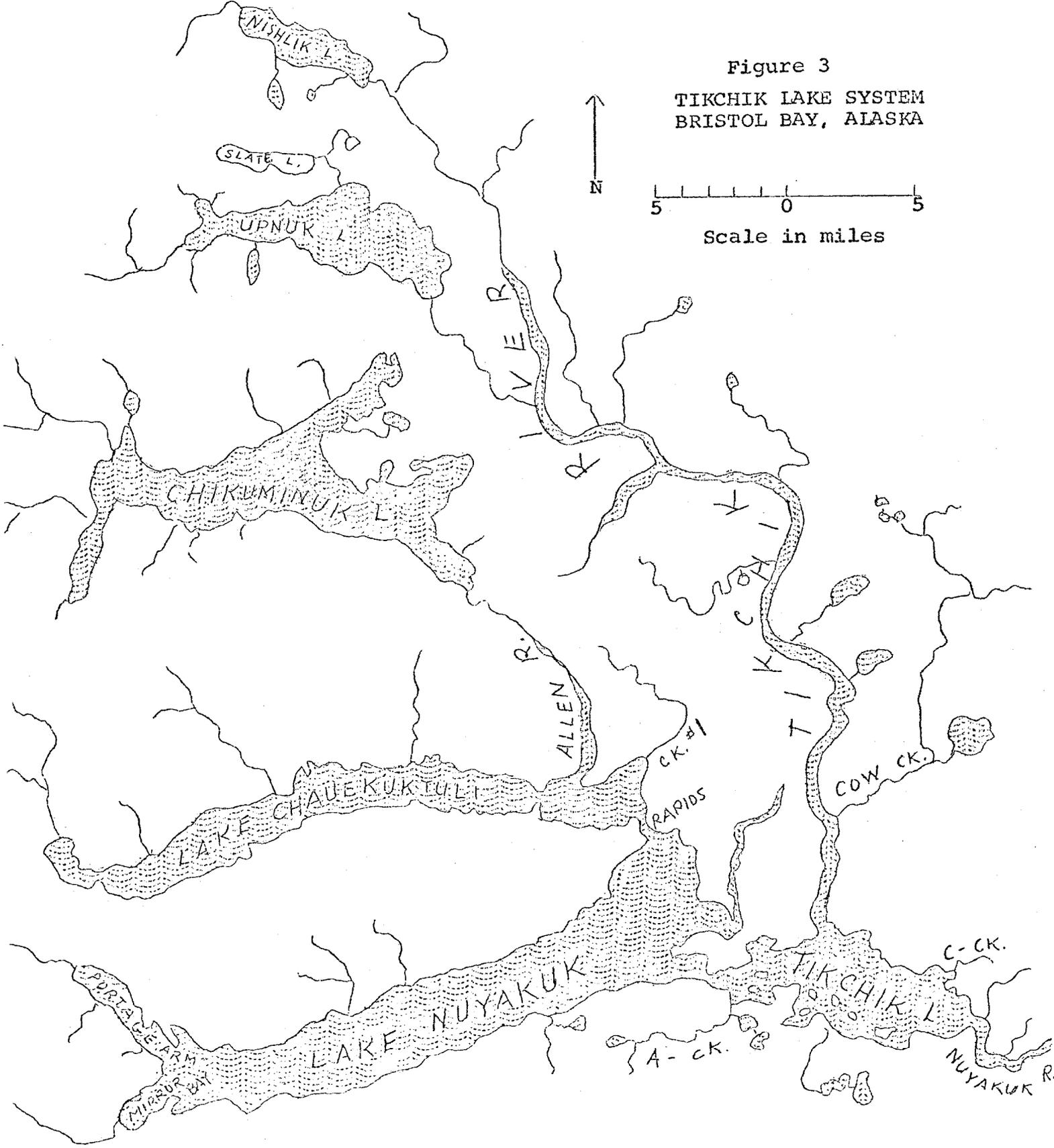


Table 3. Comparison of peak estimates - Tikchik Lakes and Nushagak - Mulchatna, 1961-1962.

Area	1961		1962		Ratio 1962-1961
	Date	No. Est.	Date	No. Est.	
Nuyakuk River:			8/10	(160)	
Tikchik Lake:					
Creek A	8/12	800	8/10	600	
Creek B	8/12	1,400	8/10	620	
Creek C	8/12	<u>50</u>	8/10	<u>10</u>	
Tikchik Total		2,250		1,230	.55
Tikchik River:	8/12	10,000	8/10	1,840	.18
Nuyakuk Lake:					
North Shore	8/22	1,070	8/31	420	
South Shore	8/22	970	8/31	600	
Mirror Bay	8/22	730	8/31	230	
Rapids	8/22	<u>50</u>	8/10	<u>1,750</u>	
Nuyakuk Total		2,820		3,000	1.06
Lake Chauekuktuli:					
Creek #1	8/12	10	8/10	30	
Allen River Beach	8/22	10,500	8/31	8,400	
Allen River	8/12	500	8/10	390	
North Shore	8/22	800	8/31	670	
South Shore	8/22	<u>500</u>	8/31	<u>170</u>	
Chauekuktuli Total		12,310		9,660	.78
Tikchik Lakes Total		27,380		15,730	
Mulchatna River	8/13	1,900	8/20	1,760	.93
Koktuli River	8/13	1,800	8/20	1,130	.63
Nushagak River	8/12	400	8/23	310	.78
King Salmon River	8/12	4,500	8/23	300	.07
Towithla River	8/13	1,500	8/23	210	.14
Kokwok River	--	--	8/23	<u>550</u>	--
Nushagak-Mulchatna Total		10,100		4,260	

Figure 3
TIKCHIK LAKE SYSTEM
BRISTOL BAY, ALASKA



Scale in miles

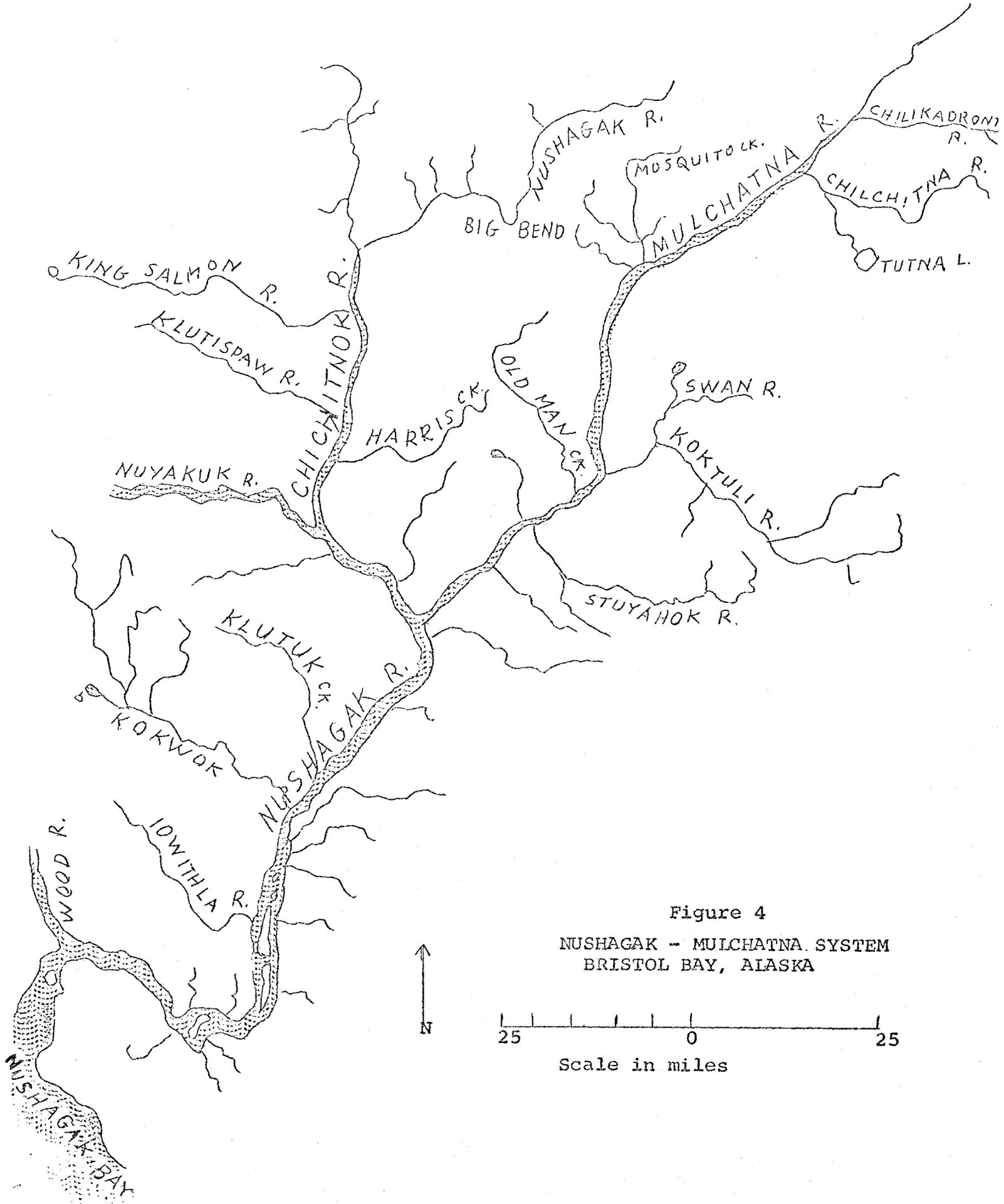


Figure 4
 NUSHAGAK - MULCHATNA SYSTEM
 BRISTOL BAY, ALASKA

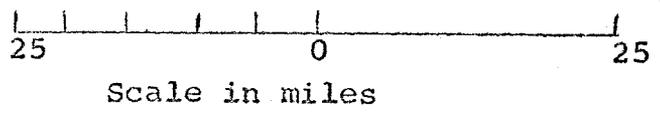


Table 4. Comparison of peak estimates - Togiak District, 1961-1962.

	1961		1962		Ratio 1962/1961
	Date	No. Est	Date	No. Est	
Togiak River	8/22	850	8/14	150	.18
Togiak Lake:					
Outlet-Jondik Cr.	9/ 8	730	9/ 4	250	
Jondik Creek	8/11	3,000	8/ 8	1,500	
Jondik Cr.-Bruin Cr.	9/ 8	1,800	9/ 4	1,070	
Bruin Cr.-Middle Pt.	9/ 8	1,020	9/ 4	910	
Middle Pt.-Sunday Cr.	9/ 8	20,730	9/ 4	1,860	
North Shore	9/ 8	2,100	9/ 4	860	
West Shore	9/ 8	2,010	9/ 4	350	
West Cr. & Lake	8/11	1,250	8/ 8	670	
Togiak Lake Total		32,640		7,470	.23
Zwischen River	8/22	5,150	9/ 4	6,950	1.35
Upper Togiak Lake:					
Zwischen R.-Budole Cr.	9/ 8	1,650	9/ 4	2,340	
Budole Cr.-Upper Togiak Cr.	9/ 8	1,360	9/ 4	2,630	
North Shore	9/ 8	150	9/ 4	970	
Makoo Creek	9/ 8	150	9/ 4	100	
Upper Togiak Creek	9/ 8	150	9/ 4	100	
West Shore	9/ 8	350	9/ 4	190	
Upper Togiak Total		3,810		6,330	1.66
Togiak Lakes Total		42,450		20,900	
Gechiak Lake	8/11	7,480	8/ 8	5,160	.69
Ongivinuk Lake	8/22	3,750	9/ 4	900	.24
Pungokepuk Lake	8/11	400	8/ 8	230	.58
Miscellaneous		300		150	.50
Togiak Tributaries Total		11,930		6,440	
Kulukak River	8/11	500	8/ 8	2,170	4.34
Tithe Creek	8/11	2,100	8/ 8	2,050	.98
Kulukak Total		2,600		4,220	

Table 5. Total population estimates of red salmon in the Nushagak District, 1961-1962.

<u>Area</u>	<u>Tot. Pop. Est. 1961</u>	<u>Ratio 1962-1961</u>	<u>1962 Preliminary</u>	<u>1962 Adj. Est.</u>	<u>Percent of Total</u>	<u>Percent of Nushagak Total</u>
Wood River	7,300	.38	2,774	2,600	.30	.28
Lake Aleknagik	19,000	1.48	28,120	26,200	3.00	2.79
Agulowak River	127,200	.17	21,624	20,200	2.31	2.15
Lake Nerka	139,200	2.05	285,360	266,100	30.45	28.38
Little Togiak Lake	10,500	.99	10,395	9,700	1.11	1.03
Agulukpak River	101,600	.33	33,528	31,300	3.58	3.34
Lake Beverley	29,100	13.86	403,326	376,000	43.02	40.09
Peace River	800	20.00	16,000	14,900	1.70	1.59
Lake Mikchik	3,200	12.05	38,560	35,900	4.11	3.83
Wind River	2,000	4.08	8,160	7,600	.87	.81
Lake Kulik	9,500	8.12	77,140	71,900	8.23	7.67
Grant River	11,300	1.09	12,317	11,500	1.32	1.23
Totals	460,700	2.03	937,304	873,900	100.00	93.19
Lake Nunavaugaluk	4,900	.36	1,764	1,800	100.00	.19
Igushik River	(200)	1.40	280	300	1.91	.03
Lake Amanka	16,100	.08	1,288	1,100	7.01	.12
Kathlene River	124,100	.07	8,687	7,600	48.41	.81
Lake Ualik	154,000	.05	7,700	6,700	42.67	.71
Totals	294,200	.06	17,955	15,700	100.00	1.67
Tikchik Lake	6,700	.55	3,685	3,100	8.18	.33
Tikchik River	29,700	.18	5,346	4,500	11.87	.48

-Continued-

Table 5. Total population estimates of red salmon in the Nushagak District, 1961-1962 (continued).

<u>Area</u>	<u>Tot. Pop. Est. 1961</u>	<u>Ratio 1962-1961</u>	<u>1962 Preliminary</u>	<u>1962 Adj. Est.</u>	<u>Percent of Total</u>	<u>Percent of Nushagak Total</u>
Lake Nuyakuk	8,500	1.06	9,010	7,500	19.79	.80
Lake Chauekuktuli	34,900	.78	27,222	22,800	60.16	2.43
Totals	79,800	.57	45,263	37,900	100.00	4.04
Mulchatna River	3,800	.93	3,534	3,500	41.18	.38
Koktuli River	3,600	.63	2,268	2,300	27.06	.25
Nushagak River	800	.78	624	600	7.06	.06
King Salmon River	9,000	.07	630	600	7.06	.06
Iowithla River	3,000	.14	420	400	4.70	.04
Kokwok River			1,100	1,100	12.94	.12
Totals	20,200	.21	8,576	8,500	100.00	.91
Nushagak District Totals	859,800	1.18	1,010,862	937,800		100.00

Figure 5
TOGIAK RIVER SYSTEM
BRISTOL BAY, ALASKA

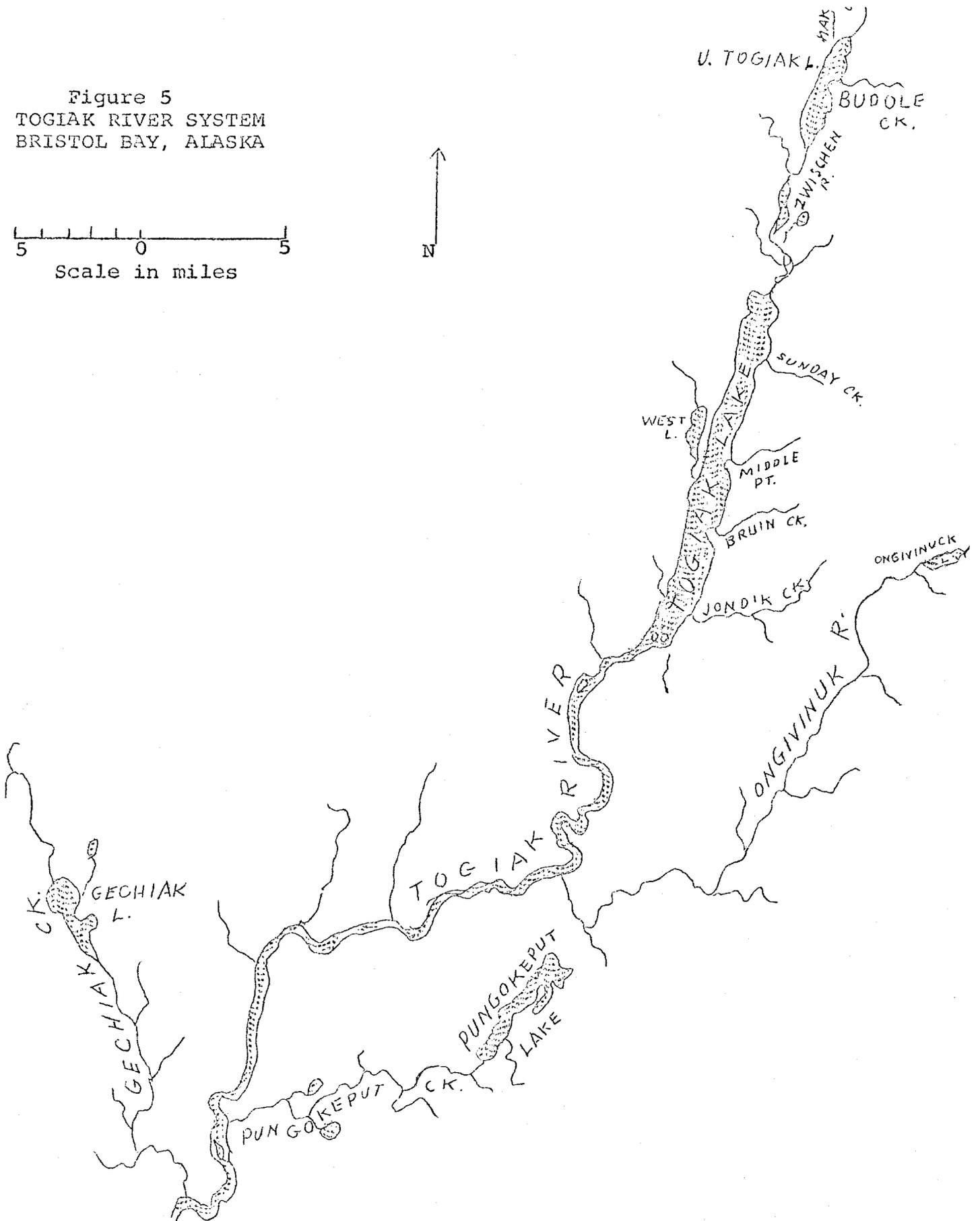
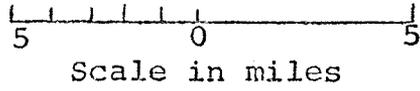


Table 6. Total population estimates of red salmon in the Togiak District, 1961 - 1962.

Area	Tot. Pop. Est. 1961	Ratio 1962-1961	1962 Preliminary	1962 Adj. Est.	Percent of Total	Percent of Togiak Total
Togiak River	1,900	.18	342	400	.84	.56
Togiak Lake	73,400	.23	16,882	17,000	35.87	23.74
Zwischen River	11,600	1.35	15,660	15,700	33.12	21.93
Upper Togiak Lake	8,600	1.66	14,276	14,300	30.17	19.97
Totals	95,500	.49	47,160	47,400	100.00	66.20
Gechiak Lake	16,800	.69	11,592	11,600	79.45	16.20
Ongivinuk Lake	8,400	.24	2,016	2,000	13.70	2.79
Pungokepuk Lake	900	.58	522	600	4.11	.84
Miscellaneous	700	.50	350	400	2.74	.56
Totals	26,800	.54	14,480	14,600	100.00	20.39
Kulukak River	1,000	4.34	4,340	4,900	51.04	6.84
Tithe Creek	4,200	.98	4,116	4,700	48.96	6.57
Totals	5,200	1.63	8,456	9,600	100.00	13.41
Togiak District Totals	127,500	.55	70,096	71,600		100.00

Figure 6
KULUKAK SYSTEM
BRISTOL BAY, ALASKA

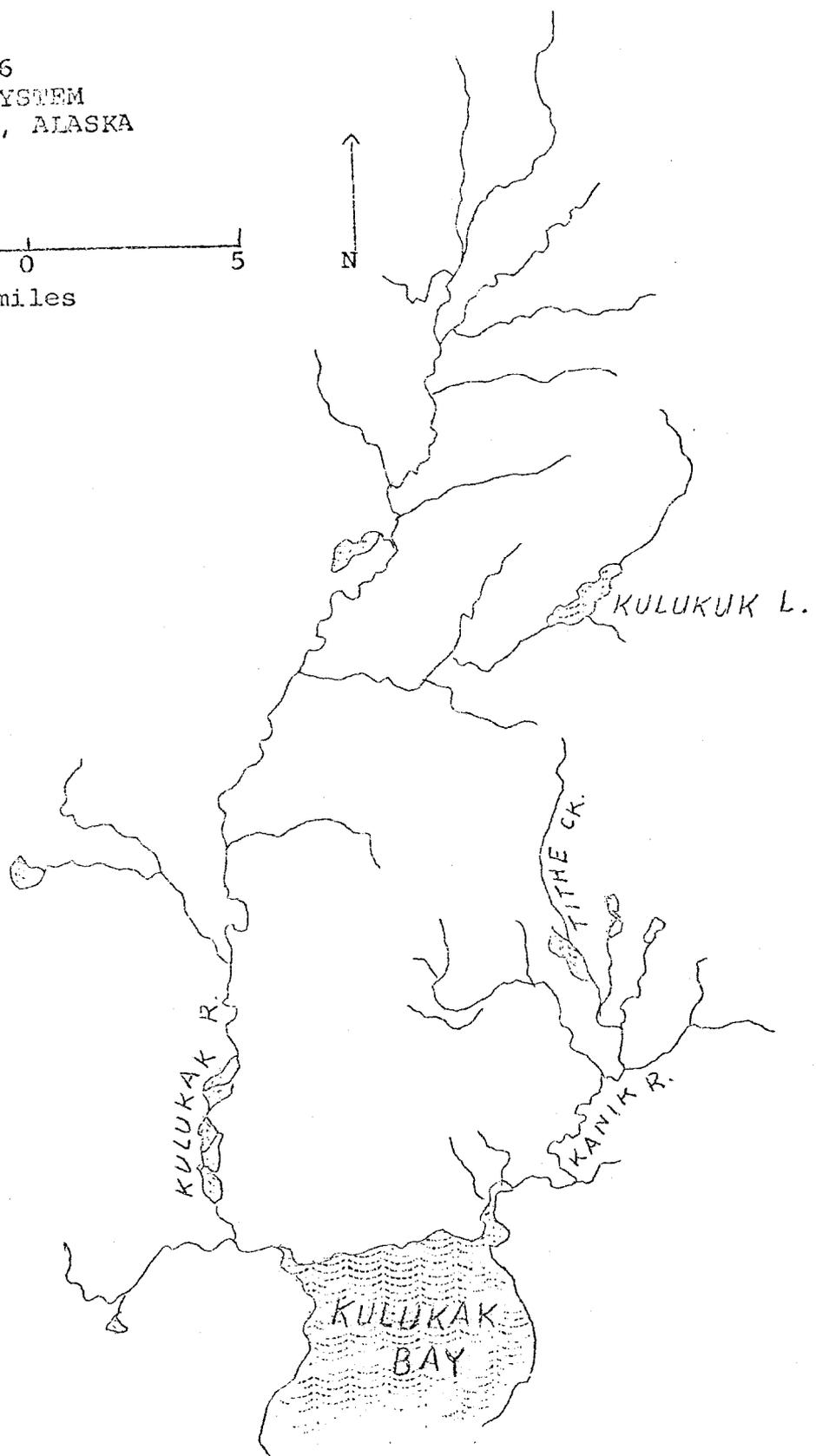
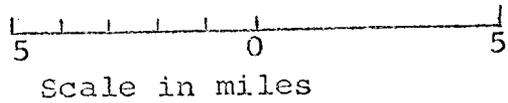


Table 7. Nuyakuk-Tikchik pink salmon data, 1960 - 1962.

<u>Area</u>	1960		1962		Ratio <u>1962-1960</u>
	<u>Date</u>	<u>No. Est.</u>	<u>Date</u>	<u>No. Est.</u>	
Nuyakuk River	8/29	39,000	8/10	140,000	3.59
Tikchik River	8/29	17,000	8/10	110,000	6.47
Nushagak River	- -	- -	8/10	3,100	- -
Totals		56,000		253,100	

TOTAL POPULATION ESTIMATES

<u>Area</u>	<u>Tot. Pop. Est. 1960</u>	<u>Ratio 1962-1960</u>	<u>1962 Preliminary</u>	<u>1962 Adjusted Est.</u>	<u>Percent of total</u>
Nuyakuk River	101,900	3.59	365,821	276,400	55.28
Tikchik River	44,500	6.47	287,915	217,500	43.50
Nushagak River	- -	- -	6,103	6,100	1.22
Totals	146,400	4.52	661,839	500,000	100.00

Table 8. Comparison of total population with sum of peak survey estimates in the Nushagak and Togiak systems, 1962.

<u>Area</u>	<u>Tot. Pop. Est. by Tower Counts</u>	<u>Sum of Peak Survey Estimates</u>	<u>Pct. Accounted for by Peak Est.</u>
Wood River Lakes	873,900	434,160	49.68
Lake Nunavaugaluk	1,800	920	51.11
Igushik Lakes	15,700	7,640	48.66
Tikchik Lakes	37,900	15,730	41.50
Togiak Lakes	47,400	20,900	44.09
Total	976,700	479,350	49.08

Table 9. Percentage distribution of spawners in three major types of spawning areas in the Nushagak and Togiak system, 1961-1962.

Area	1961			1962		
	<u>Creeks</u>	<u>Beaches</u>	<u>Rivers</u>	<u>Creeks</u>	<u>Beaches</u>	<u>Rivers</u>
Wood River Lakes	13.88	32.31	53.81	23.97	65.23	10.80
Lake Nunavaugaluk	24.12	71.99	3.89	29.35	63.04	7.61
Igushik Lakes	39.34	34.54	26.12	43.40	31.55	25.05
Tikchik Lakes	11.19	49.63	39.18	9.49	64.66	25.85
Togiak Lakes	15.89	73.07	11.04	11.39	54.64	33.97
Total	21.75	39.81	38.44	23.12	64.15	12.73

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