

Informational Leaflet 29

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NUSHAGAK AND TOGIAK DISTRICTS - BRISTOL BAY,
1960

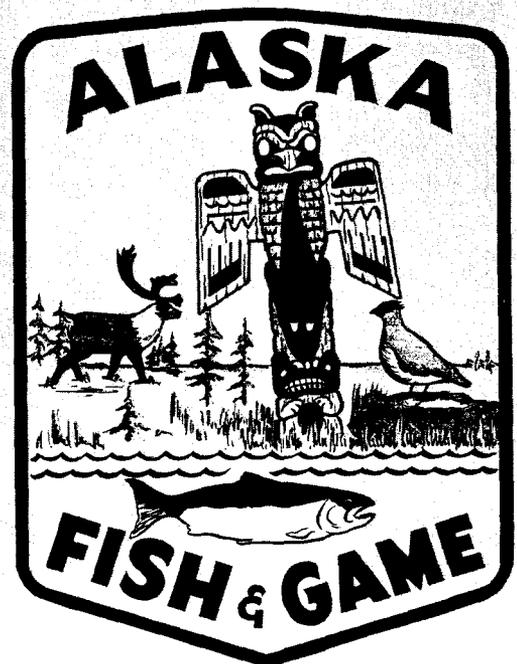
By:

Wilbur Church
Division of Commercial Fisheries
Dillingham, Alaska

June 18, 1963

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR

DEPARTMENT OF
FISH AND GAME
WALTER KIRKNESS - COMMISSIONER
SUPPORT BUILDING, JUNEAU



Informational Leaflet

ALASKA DEPARTMENT OF FISH AND GAME

WILLIAM A. EGAN, GOVERNOR

WALTER KIRKNESS, COMMISSIONER



RED SALMON

Spawning Ground Surveys

IN THE
NUSHAGAK AND TOGIK
DISTRICTS
BRISTOL BAY, 1960

BY WILBUR CHURCH

DIVISION OF COMMERCIAL FISHERIES

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RED SALMON SPAWNING GROUND SURVEYS IN THE NUSHAGAK AND TOGIAC DISTRICTS
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INTRODUCTION

In 1960, the Alaska Department of Fish and Game conducted surveys of red salmon spawning grounds in the Nushagak and Togiak Districts. This was a continuation of 14 years of surveys conducted by the Fisheries Research Institute. Figures given here for 1959 are taken from Fisheries Research Institute Circular No. 119.

Estimates of the total escapement to these systems are obtained at tower counting sites located on the main stem of the river. The purpose of the aerial and ground surveys described here are to obtain an accurate estimate of the abundance and distribution of fish in the various tributary spawning areas. Such estimates are necessary for studies to determine optimum escapement and to evaluate the results of fishing regulations.

Five major spawning systems were included in the surveys. These are the Wood River, Igushik, Nunavaugaluk, Tikchik, and Togiak systems. These areas are shown in Figures 1 - 4. Many of the streams shown are officially unnamed and some are known by various names. To avoid confusion, Fisheries Research Institute nomenclature has been used throughout.

METHODS

Survey Methods

Total escapement to each system was estimated by the tower counting method. The Wood River tower was operated by the Fisheries Research Institute; all others by the Department of Fish and Game.

A Cessna 170 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 while in flight.

Supplemental ground surveys were made in several creeks of the lower Wood River Lakes. These provided a valuable check on the accuracy of the aerial estimates.

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. This made it possible to survey many areas several times to determine very accurately the peak period of spawning in those areas.

Total Population Estimates

The method employed to derive total population estimates from estimates obtained at the peak of spawning was developed and used by the Fisheries Research Institute

in Bristol Bay. This is known as the chain-link method, in which the population estimates for each year are made by comparison with the estimates of the previous year.

In applying this method to 1960 data, peak spawning estimates from all areas within a given lake or river are added together. When compared with similar data gathered in 1959, the 1960-1959 ratio is obtained (Tables 1-4). 1959 total population estimates are then multiplied by the factor thus obtained to arrive at 1960 population estimates for each lake and river within the systems (Tables 5-6). Preliminary population estimates obtained in this way are corrected to agree with tower counts by distributing the difference among all areas.

Less than 50% of the known spawning population can be accounted for by peak spawning estimates (Table 7). This is because spawning is spread over a period of weeks and the entire population of an area is not present at any one time.

ESTIMATES OF SPAWNING GROUND POPULATIONS IN THE NUSHAGAK DISTRICT

Wood River Lakes

Peak estimates for 1960 and 1959, 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 1960 escapement of 1,016,000 red salmon to the Wood River Lakes was slightly less than half that of 1959 and constituted 60.74% of the known Nushagak escapement. The distribution in general did not differ markedly from that of the previous year and is considered to be very good although Lake Aleknagik once again received a relatively small proportion of the escapement.

A majority of the fish spawned in Lakes Nerka and Beverley. Lake Nerka received a little more than 50% of the escapement and Lake Beverley a little less than 20%. Lake Kulik also received a good share of the escapement with a little over 10% of the total.

Nearly all areas received about half the number of spawners that they did in 1959. Only four areas differed from this to any extent. The numbers of spawners in Peace River and Lake Mikchalk were nearly as great as in 1959, while Wind River and the Agulowak River received considerably less.

A larger proportion of the escapement were beach spawners than in 1959, with a corresponding decrease in the percentage of creek spawners (Table 8).

Igushik Lakes

Peak estimates for 1960 and 1959, and peak estimate ratios for these years are shown in Table 2. Preliminary population estimates and estimates adjusted to the tower count total are shown in Table 5.

The 1960 escapement of 494,800 red salmon was slightly more than three-fourths that of 1959 and constituted 29.59% of the known Nushagak escapement.

As in 1959, the majority of the escapement was contained in Lake Ualik and the Kathlene and Ongoke Rivers, while Lake Amanka supported a minor percentage of the escapement. The majority of the Lake Ualik population spawned on the west shore and in Frances Creek, and Longarm Creek continued as the chief contributor to Lake Amanka.

There was a slight decrease in the percentage of river spawning, while beach spawning showed a corresponding increase (Table 8).

Lake Nunavaugaluk

Peak estimates for 1960 and 1959, and peak estimate ratios for these two years are shown in Table 2. Preliminary population estimates and estimates adjusted to the tower count total are shown in Table 5.

The 1960 escapement of 16,000 red salmon was only a little over 10% of that of 1959, and constituted only 1% of the known Nushagak escapement.

Killian Creek and the southwest beach continued to be the major producers, although at a greatly reduced level. Spawning was extremely light and scattered in other areas.

There was a slight decrease in the percentage of creek spawning, while creek and river spawning showed a corresponding increase (Table 8).

Tikchik Lakes

Peak estimates for 1960 and 1959, and peak estimate ratios for these two years are shown on Table 1. Preliminary population estimates and estimates adjusted to the tower count total are shown in Table 5.

The 1960 escapement of 145,500 red salmon was slightly less than three times as great as that of 1959 and constituted 8.7% of the known Nushagak escapement.

Over half the population spawned in Lake Chauekuktuli, mostly along the Allen River Beach. Other important spawning areas in 1960 were the Tikchik River and B-Creek on Tikchik Lake. With these exceptions, spawning was very light in all areas.

Unlike the other systems of the Nushagak, the escapement was composed almost entirely of 2-ocean fish. There was also a much greater change in distribution from 1959 than in other systems. A much larger percentage of the fish were beach spawners than in the previous year (Table 8).

Nuyakuk-Tikchik Pink Salmon

Aerial survey counts for 1960 are shown in Table 3. Estimates adjusted to the tower counts are shown in Table 5.

The pink salmon survey was made too late to cover the period of peak spawning, so the percentage of fish accounted for by the survey was rather low. As in the parent year of 1958, the majority of the fish spawned in the Nuyakuk River. However, a much higher percentage (30%) spawned in the Tikchik River than in 1958.

Although exact figures of the 1958 escapement are not available, the 1960 spawning population was only a small fraction of that of the parent year. Significant numbers of pinks were observed only in the Nuyakuk and Tikchik Rivers.

ESTIMATES OF SPAWNING GROUND POPULATIONS IN THE TOGIAC DISTRICT

Togiak Lakes

Peak estimates for 1960 and 1959, and peak estimate ratios for those two years are shown in Table 4. Population estimates adjusted to the tower counts are shown in Table 6.

The 1960 escapement of 162,800 red salmon was a little over 90% of that of 1959 and constituted about 85% of the known Togiak escapement.

Over half of the total population spawned on the Sunday Creek and Bruin Creek beaches as was true in 1959. Although there was a smaller spawning population in 1960, there were over three times as many fish spawning in Zwischen River in 1960. This was the only major change in distribution from that of the previous year.

There was a slight increase in the percentage of river spawning, with a corresponding decrease in the percentage of beach spawning.

Togiak Tributaries

Of the Togiak tributaries, only Ongivinuk Lake has been surveyed in past years. Peak estimates for this lake for 1960 and 1959, and peak estimate ratios for these two years are shown in Table 4. Population estimates for the three major tributary lakes 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 to that of the Togiak Lakes (Table 7).

Of the three tributary lakes, Gechiak was by far the most important, containing nearly two-thirds of the total population of the tributaries. Ongivinuk Lake

was next in importance, with Pungokebuk Lake a very poor third.

SUMMARY

1. Surveys of the red salmon spawning grounds in the Nushagak and Togiak Districts were made by the Alaska Department of Fish and Game in 1960.
2. Aerial surveys served as the primary means of estimating the spawning populations.
3. The spawning population of the Wood River Lakes was distributed essentially as in 1959. The fish were well distributed in the upper lakes, but the Lake Aleknagik population was smaller than desirable.
4. There was little change in the Igushik Lakes distribution, with most of the spawning population in Lake Ualik and the Kathlene and Ongoke Rivers as usual.
5. The escapement to Lake Nunavaugaluk showed a marked decrease from that of 1959, but there was little change in spawning distribution.
6. The escapement to the Tikchik Lakes showed a marked increase over that of 1959. The majority of the population spawned in Lake Chaekuktuli. The percentage of beach spawning was a great deal larger than in 1959.
7. The Nuyakuk-Tikchik pink salmon escapement was greatly reduced from the parent escapement of 1958. Approximately 70% of the spawning took place in the Nuyakuk River, with the remainder in the Tikchik River. A larger percentage of the pinks spawned in the Tikchik River than in 1958.
8. A majority of the Togiak Lakes escapement spawned on the Sunday Creek and Bruin Creek beaches of Togiak Lake. The percentage of river spawning increased over that of 1959.
9. Aerial surveys of Togiak River tributaries indicated that approximately 15% of the Togiak system population spawned in three tributary lake systems. The lakes in order of importance are Gechiak Lake, Ongivinuk Lake, and Pungokebuk Lake.

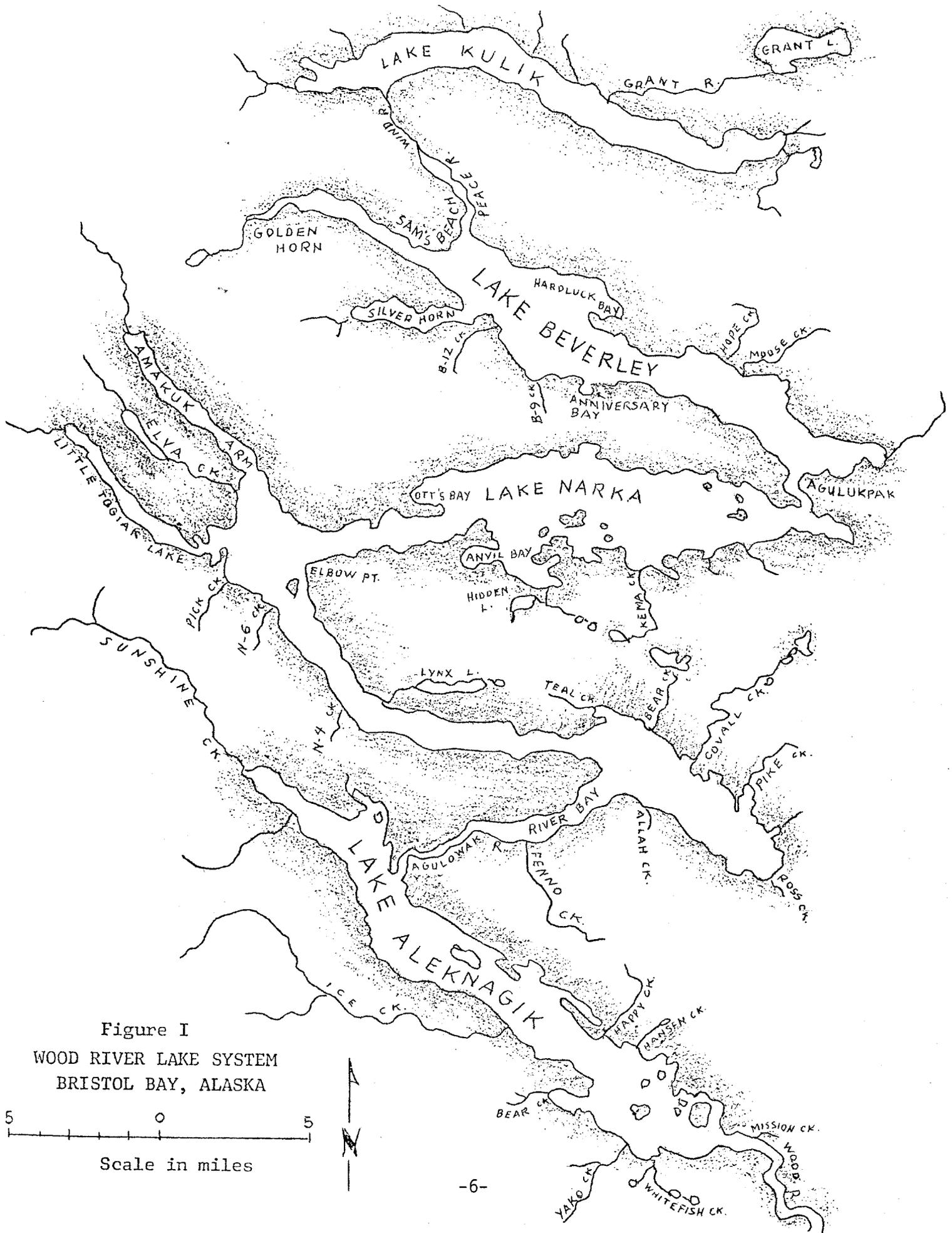
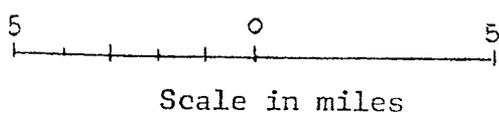


Figure I
WOOD RIVER LAKE SYSTEM
BRISTOL BAY, ALASKA



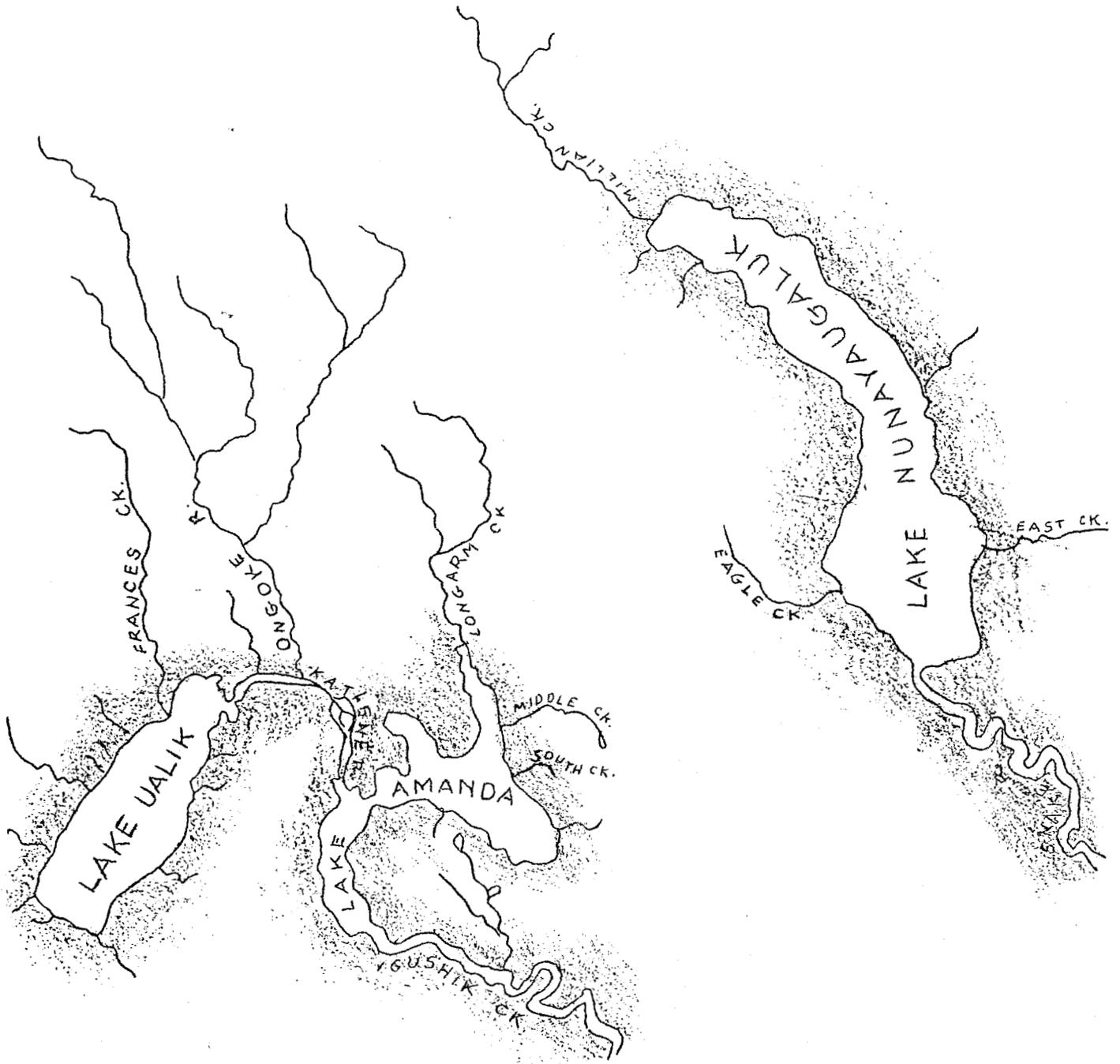


Figure 2

IGUSHIK AND NUNAVAUGALUK LAKE SYSTEMS
BRISTOL BAY, ALASKA

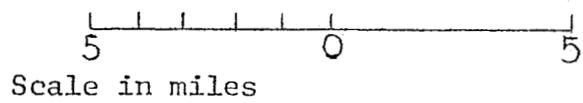


Figure 3
TIKCHIK LAKE SYSTEM
BRISTOL BAY, ALASKA

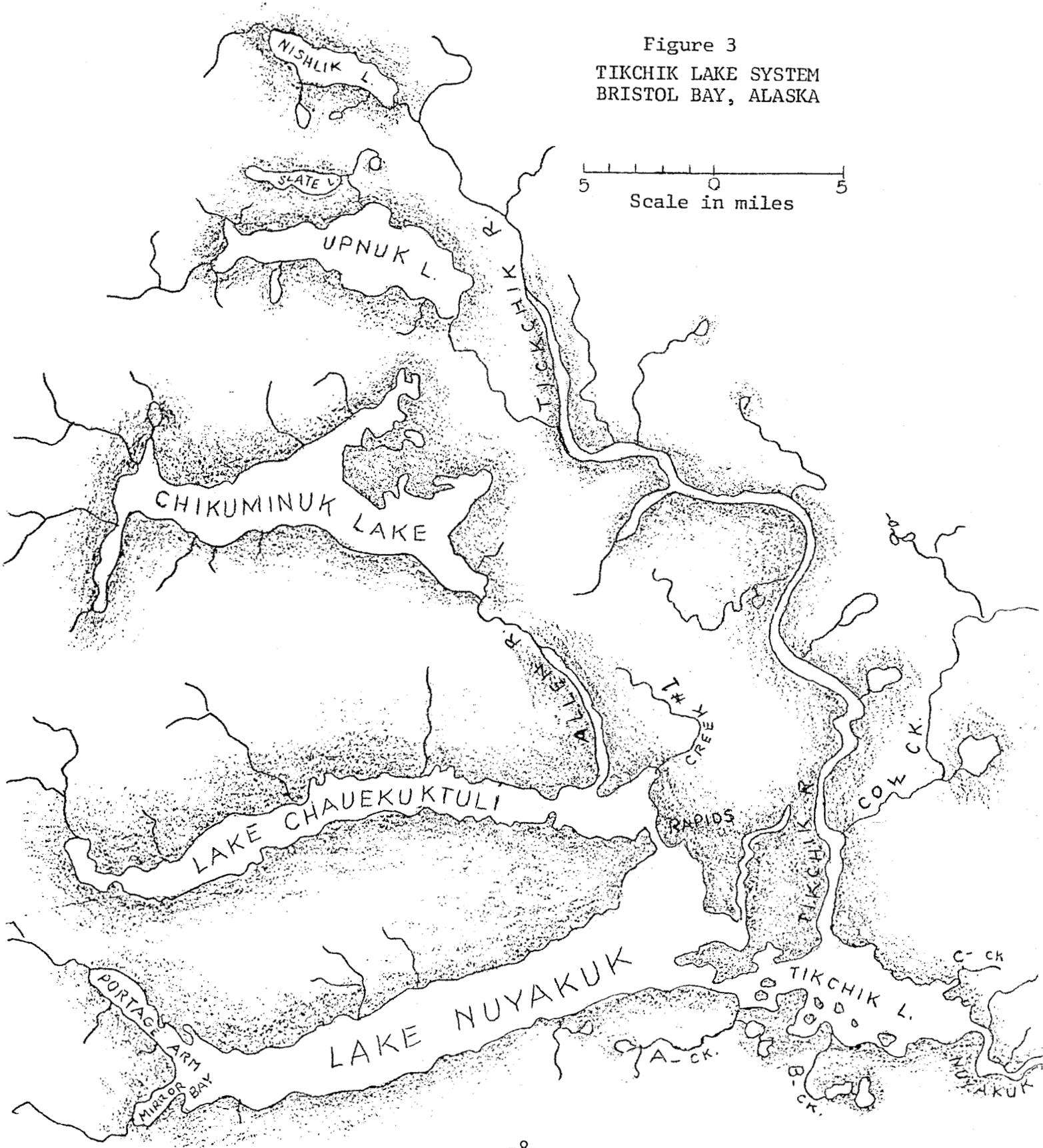


Table 1. Comparison of peak estimates - Wood River Lakes, 1959-1960.

Area	1959		1960		1960/1959
	Date	No. Est.	Date	No. Est.	
Wood River	8/27	4,000	8/28	1,800	.45
L. Aleknagik:					
Mission Creek	8/11	1,000	8/9	500	
Bear Creek	8/10	3,500	8/8	1,750	
Hansen Creek	8/11	10,000	8/9	2,900	
Happy Creek	8/3	2,600	8/11	650	
Ice Creek	8/10	2,500	8/9	7,000	
Yako Creek	8/10	1,500	8/10	700	
Sunshine Creek	8/10	2,000	8/9	2,000	
Jacknife Beach	8/27	100	8/28	200	
Northshore Creeks	8/10	6,700	8/9	400	
Whitefish Creek	8/11	2,200	8/9	2,000	
Yako Beach	8/27	5,000	8/9	1,300	
South Shore	8/27	350	8/28	800	
Aleknagik Total		37,450		20,200	.54
Agulowak River & Lower River Bay	9/2	100,000	8/28	37,000	.37
Lake Nerka:					
Fenno Creek	8/7	15,000	8/9	5,000	
Upper River Bay, NW	8/27	400	8/18	400	
Upper River Bay, SE	8/27	6,250	8/28	7,000	
Allah Cr. Beach	8/27	19,300	8/28	16,700	
Ross Cr.-Pike Cr.	8/10	10,000	8/9	3,000	
Pike Creek	8/10	5,000	8/9	10,000	
Stovall Cr. & Lake	8/10	75,000	8/9	5,000	
Bear Creek	8/10	3,000	8/9	3,000	
Teal Creek	8/10	30,000	8/9	7,000	
River Bay-N4 Beach	8/27	600	8/28	300	
N4-N6 Beach	8/27	18,300	8/28	10,300	
Pick Cr. Beach	9/2	800	8/28	1,000	
Pick Creek	8/12	85,000	8/9	25,000	
Elva Cr. Beach	9/2	3,300	8/28	1,100	
Elva Creek	8/12	1,500	8/18	1,000	
Amakuk Arm	8/27	750	8/28	3,100	
Lynx Creek	8/21	15,000	8/18	3,000	
Lynx Lake	8/27	41,000	8/28	25,900	
Amakuk Arm-Ott's Bay	8/27	1,300	8/28	500	
Ott's Bay	8/27	15,000	8/28	2,900	
Ott's Bay-Agulupak River	8/27	300	8/28	200	
Kema Creek	8/16	20,000	8/18	15,200	

-Continued-

Table 1. Comparison of peak estimates - Wood River Lakes, 1959-1960 (cont.).

Area	1959		1960		1960/1959
	Date	No. Est.	Date	No. Est.	
Hidden Lake Cr.	8/16	19,000	8/18	8,000	
Anvil Bay	8/27	51,050	8/28	31,500	
Anvil Bay-Elbow Pt.	8/27	5,250	8/28	1,700	
Elbow Pt.-Lynx Cr.	8/27	2,800	8/28	1,300	
Little Togiak R.	8/7	20,000	8/9	10,000	
Nerka Total		<u>433,400</u>		<u>199,100</u>	.46
Little Togiak L.	9/2	28,000	8/28	12,000	.43
Agulukpak River	8/27	100,000	8/28	51,000	.51
Lake Beverley:					
Hardluck Bay	8/27	55,500	8/28	27,800	
Sam's Beach	8/27	2,000	8/28	4,000	
Golden Horn	8/27	1,300	8/28	2,200	
Silver Horn	8/27	73,100	8/28	29,000	
B-12 Beach	8/27	12,000	8/28	9,000	
B-9 Beach	8/27	9,800	8/28	4,800	
Anniversary Bay	8/27	300	8/28	300	
Moose Creek	8/16	1,000	8/18	2,000	
Misc.		300		300	
Beverley Total		<u>154,300</u>		<u>79,400</u>	.51
Peace River	8/16	12,000	8/18	11,000	.92
Lake Mikchalk	8/27	22,200	8/28	15,300	.69
Wind River	8/27	2,150	8/28	540	.25
Lake Kulik:					
Grant River	8/16	40,000	8/18	20,000	
North Shore	8/27	55,200	8/28	32,400	
West End	8/27	3,800	8/28	300	
South Shore	8/27	3,100	8/28	1,400	
Kulik Total		<u>102,100</u>		<u>54,100</u>	.53
Wood River Lakes Total		1,028,100		481,540	

Table 2. Comparison of peak estimates - Igushik Lake and Lake Nunavaugaluk, 1959-1960.

Area	1959		1960		1960/1959
	Date	No. Est.	Date	No. Est.	
Lake Amanka:					
Longarm Creek	8/10	18,000	8/9	15,000	
Middle Creek	8/10	1,500	8/9	500	
South Creek	8/10	2,500	8/9	1,000	
East End Beaches	8/10	320	8/29	1,600	
Amanka Total		<u>22,320</u>		<u>18,100</u>	.81
Kathlene River:					
Lower River	8/10	32,000	8/29	20,000	
Upper River	8/10	15,000	8/9	5,000	
Ongoke River	8/10	40,000	8/9	35,000	
Kathlene R. Total		<u>87,000</u>		<u>60,000</u>	.69
Lake Ualik:					
Frances Creek	8/10	30,000	8/9	25,000	
West Shore	9/2	120,000	8/29	110,000	
East Shore	9/2	9,200	8/29	2,500	
Ualik Total		<u>159,200</u>		<u>137,500</u>	.95
Igushik Total		268,520		215,600	
Lake Nunavaugaluk:					
Snake R.-Eage Cr.	9/2	14,100	8/29	2,120	
Eagle Creek	---	-----	8/9	(50)	
Eagle Cr.-Killian Creek	9/2	6,470	8/29	890	
Killian Creek	8/10	25,000	8/9	2,500	
East Shore	9/2	9,400	8/29	1,100	
East Creek	---	-----	8/9	(1,000)	
South Shore	9/2	5,050	8/29	350	
Nunavaugaluk Total		<u>60,020</u>		<u>6,960</u>	.12

(Note: Figures in parentheses not included in totals used for computing 1960/1959 ratios.)

Table 3. Comparison of peak estimates - Tikchik Lakes, 1959-1960.

Area	1959		1960		1960/1959
	Date	No. Est.	Date	No. Est.	
Tikchik Lake:					
Creek A	8/16	774	8/10	2,000	
Creek B	8/16	2,607	8/10	5,650	
Creek C	---	---	8/10	(50)	
Tikchik Total		<u>3,381</u>		<u>7,650</u>	2.28
Tikchik River	8/16	5,400	8/10	12,000	2.22
Nuyakuk Lake:					
North Shore	8/16	307	8/10	820	
Mirror Bay	8/16	100	8/10	1,000	
Rapids	8/16	<u>50</u>	8/29	<u>300</u>	
Nuyakuk Total		457		<u>2,120</u>	4.64
Lake Chaekuktuli:					
Creek # 1	8/16	0	8/10	150	
Allen R. Beach	8/16	3,550	8/29	17,500	
Allen River	8/16	50	8/10	250	
North Shore	8/16	1,625	8/29	4,760	
South Shore	---	-----	8/29	(1,100)	
Chaekuktuli Total		<u>5,225</u>		<u>22,660</u>	4.34
Tikchik Total		14,463		44,430	
Pink Salmon:					
Nuyakuk River	---	-----	8/29	39,000	
Tikchik River	---	-----	8/29	17,000	
Tikchik Total				56,000	

(Note: Figures in parentheses not included in totals used for computing 1960/1959 ratios.)

Table 4. Comparison of peak estimates - Togiak system, 1959-1960.

Area	1959		1960		1960/1959
	Date	No. Est.	Date	No. Est.	
Togiak Lake:					
Outlet-Jondik Creek	9/7	2,600	8/29	3,500	
Jondik Creek	---	-----	8/8	(5,000)	
Jondik Cr.-Bruin Cr.	9/7	12,700	8/29	14,300	
Bruin Cr.-Middle Pt.	9/7	4,800	8/29	3,400	
Middle Pt.-Sunday Creek	9/7	23,000	8/29	18,950	
North Shore	9/7	8,000	8/29	3,800	
West Shore	9/7	500	8/29	1,200	
West Creek & Lake	---	-----	8/8	(100)	
Togiak Lake Total		<u>51,600</u>		<u>45,150</u>	.85
Togiak River	---	-----	8/29	(1,000)	.96
Zwischen River	9/7	2,300	8/29	7,650	3.33
Upper Togiak Lake:					
Zwischen R.-Budole Creek	9/7	3,900	8/29	3,800	
Budole Cr.-Upper Togiak Creek	9/7	2,850	8/29	2,000	
North Shore	9/7	2,150	8/29	1,000	
Makoo Cr. & Ponds	9/7	500	8/29	0	
Upper Togiak Creek	9/7	800	8/29	0	
East Shore	9/7	0	8/29	200	
Upper Togiak Total		<u>10,200</u>		<u>7,000</u>	.69
Togiak Lakes Total		64,100		59,800	
Ongivinuk Lake	9/7	3,400	8/29	3,200	
Gechiak Lake	---	-----	8/8	(7,650)	
Pungokebuk Lake	---	-----	8/8	(950)	
Togiak Tributary Total		<u>3,400</u>		<u>3,200</u>	.94
Togiak System Total		67,500		63,000	

(Note: Figures in parentheses not included in totals used for computing 1960/1959 ratios.)

Table 5. Total population estimates of red salmon in the Nushagak District, 1959-1960.

Area	Tot. Pop. Est. 1959	Ratio 1960-1959	1960 Preliminary	1960 Adj. Est.	Percent of Total	Percent of Nushagak Total
Wood River	7,264	.45	3,312	3,200	.32	.19
Lake Aleknagik	68,511	.54	37,496	35,800	3.52	2.14
Agulowak River	128,780	.37	48,293	46,100	4.54	2.76
Lake Nerka	1,176,726	.46	548,611	523,900	51.56	31.32
Little Togiak Lake	40,386	.43	17,600	16,800	1.65	1.00
Agulukpak River	114,359	.51	59,110	56,500	5.56	3.38
Lake Beverley	384,178	.51	198,579	189,600	18.66	11.33
Peace River	14,598	.92	13,612	13,000	1.28	.78
Lake Mikchalk	33,080	.69	23,127	22,100	2.18	1.32
Wind River	3,396	.25	862	800	.08	.05
Lake Kulik	237,985	.55	83,570	79,800	7.85	4.77
Grant River *		.50	29,701	28,400	2.80	1.70
Totals	2,209,264		1,063,873	1,016,000	100.00	60.74
-15- Lake Nunavaugaluk	139,950	.12	16,182	16,600	100.00	.99
Lake Amanka	53,516	.81	43,348	41,600	8.41	2.49
Kathlene River	208,593	.69	143,929	138,100	27.91	8.26
Lake Ualik	381,699	.95	328,261	315,100	63.68	18.84
Totals	643,808		515,538	494,800	100.00	29.59
Tikchik Lake	11,417	2.28	26,031	25,200	17.32	1.51
Tikchik River	18,234	2.22	40,479	39,200	26.94	2.34
Lake Nuyakuk	1,543	4.64	7,160	7,000	4.81	.42
Lake Chauekuktuli	17,643	4.34	76,571	74,100	50.93	4.43
Totals	48,837		150,241	145,500	100.00	8.70
Nushagak Totals	3,041,859		1,745,834	1,672,900		100.00
Nushagak Pink Salmon:						
Nuyakuk River	---	---	---	101,900	69.60	
Tikchik River	---	---	---	44,500	30.40	
Totals				146,400	100.00	

* Grant River was included with Lake Kulik in 1959.

Table 6. Total population estimates of red salmon in the Togiak District, 1959-1960.

Area	Tot. Pop. Est. 1959	Ratio 1960-1959	1960 Preliminary	1960 Adj. Est.	Percent of Total	Percent of Togiak Total
Togiak River	2,570	.96		2,500	1.53	1.30
Togiak Lake	145,250	.85		124,100	76.23	64.64
Zwischen River	5,670	3.33		18,900	11.61	9.84
Upper Togiak Lake	<u>25,250</u>	.69		<u>17,300</u>	<u>10.63</u>	<u>9.01</u>
Totals	178,740			162,800	100.00	84.79
Ongivinuk Lake	8,400	.94		7,900	27.05	4.11
Gechiak Lake	20,000	.94		18,900	64.73	9.85
Pungokepuk Lake	<u>2,500</u>	.94		<u>2,400</u>	<u>8.22</u>	<u>1.25</u>
Totals	30,900			29,200	100.00	15.21
Togiak Totals	209,640			192,000		100.00

Table 7. Comparison of total population with sum of peak survey estimates - Nushagak and Togiak systems.

Area	Total Pop. Est. by Tower Counts	Sum of Peak Survey Estimates	Percent Accounted for by Peak Est.
Wood River Lakes	1,016,000	481,540	47.4
Lake Nunavaugaluk	16,600	8,010	48.3
Igushik Lakes	494,800	215,600	43.6
Tikchik Lakes	145,500	45,580	31.3
Togiak Lakes	162,800	65,900	40.5
Nushagak Pink Salmon	146,400	56,000	38.3

Table 8. Percentage distribution of spawners in three major types of spawning areas in the Nushagak and Togiak systems, 1959-1960.

Area	1959 Type of Spawning Area			1960 Type of Spawning Area		
	Creek	Beaches	Rivers	Creeks	Beaches	Rivers
Wood River Lakes	37.6	50.3	12.1	32.9	55.5	11.6
Lake Nunavaugaluk	41.7	57.6	0.7	44.3	50.7	5.0
Igushik Lakes	34.3	48.2	17.5	35.5	52.9	11.6
Tikchik Lakes	24.1	37.9	38.0	19.4	53.1	27.5
Togiak Lakes	12.8	83.2	4.0	12.3	76.6	11.1

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