

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-9-3

Name: Sport Fish Investigations of Alaska.

Study No.: G-1

Study Title: Inventory and Cataloging.

Job No.: G-1-E

Job Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters of the Bristol Bay and Lower Kuskokwim Drainages.

Period Covered: July 1, 1970 to June 30, 1971.

ABSTRACT

The 1970 Naknek River king salmon, Oncorhynchus tshawytscha, recorded subsistence catch was 233. The estimated king salmon escapements derived from float and aerial observations were 260, 1,600 and 2,500 in King Salmon Creek, Big Creek, and Naknek River, respectively. An aerial estimate of king salmon in the Alagnak (Branch) River system was 4,600 to 5,300.

The preliminary estimate of the commercial king salmon harvest in the Naknek-Kvichak fishing district was 18,488. The Naknek River king salmon sport catch is discussed in Job No. G-IV-C.

Rainbow trout, Salmo gairdneri, were sampled and tagged in the Bay of Islands area of Naknek Lake during July.

Rainbow trout and Arctic grayling, Thymallus arcticus, were sampled in the major rivers and many creeks of the Wood River Lakes system. One hundred rainbow trout were sampled, with 88.0% of these collected in the Agulowak and Agulukpak rivers.

Wind River produced 36 of the 66 Arctic grayling sampled.

During this survey, Arctic char, Salvelinus alpinus, were observed spawning off all the major creeks and rivers but were not sampled.

Arctic grayling were sampled by hook and line at the outlet and narrows of the Ugashik Lake system. All fish sampled were tagged and released. A sample of 126 fish were caught at the outlet and 96 at the narrows.

Surveys were also conducted in tributary streams to Ugashik Lakes, with Arctic grayling observed only in Crooked Creek.

RECOMMENDATIONS

1. Naknek River Watershed:
 - a. Continue to refine fishery management techniques to regulate the sport fish harvest and to monitor the increasing sport fishing pressures.
 - b. Continue attempts to obtain an estimate of spawning rainbow trout in Naknek River, conduct aerial surveys of other rainbow trout spawning areas within the Katmai National Park on the Naknek River system, and obtain biological data from the Bay of Islands fishery.
 - c. Continue to obtain king salmon escapement estimates in Big, King Salmon, and Paul's creeks, as well as the Naknek River.
2. Alagnak (Branch) River Watershed:
 - a. Continue to monitor the Kulik River rainbow trout fishery.
 - b. Investigate the rainbow trout fisheries at the outlets of Kukaklek and Nonvianuk lakes, and continue to sample fish in Battle River, Funnel Creek, and Morraine Creek.
 - c. Determine the king salmon escapement in the Alagnak (Branch) River.
3. Nushagak River Watershed:
 - a. Conduct further fishery surveys with emphasis on early spring and fall months.
 - b. During early spring, survey all connecting rivers and streams entering the Wood River system to locate rainbow trout and Arctic grayling spawning areas.
 - c. Continue sampling and tagging rainbow trout and Arctic grayling populations in the Wood River system to determine age, growth, and basic population parameters.
4. Ugashik River Watershed:
 - a. Conduct sampling, tagging, and tag-recovery efforts on Arctic grayling at the narrows and outlets in the Ugashik Lake system in late July and early August to ascertain the extent of movement from the outlet area to other Ugashik Lakes areas, as well as sample streams with an electroshocker to determine adult spawning areas and distribution of juvenile Arctic grayling.

- b. Determine the effectiveness of existing bag limits and regulations in retaining the fishery quality.

OBJECTIVES

1. To determine the status of sport fish stocks within the job area.
2. To assess and record the environmental characteristics of the existing and potential recreational fishing waters of the job area.
3. To enumerate king salmon spawning stocks in the Naknek River, its tributaries, and in the Alagnak (Branch) River.
4. To determine the impact of other anadromous and freshwater fishery uses in relation to existing recreational anadromous and resident fish stocks, and to investigate, evaluate, and develop plans for the enhancement of other anadromous fish stocks.
5. To investigate multiple water-use projects (public and private) and to assess their effects upon the watersheds of the area.
6. To determine the need for and implementation of fishery restoration measures, including location of suitable sport fish egg sources.
7. To assist as necessary in the investigation of public access status of the sport fishing waters of the job area and to make recommendations for specific access sites.
8. To provide recommendations for the management of sport fishing resources in these waters and to direct the course of future studies.

TECHNIQUES USED

Species composition and distribution were determined by hook and line.

King salmon escapement in the Naknek River system was estimated by aerial and float surveys.

Standard fork lengths were recorded to the nearest millimeter by the use of rigid portable measuring boards.

Blue tube-type anchor tags were applied with Floy (Dennison) FD-67 tagging guns without the use of anesthetic.

FINDINGS

Naknek River Watershed

King Salmon Subsistence Catch:

Subsistence net catches in the Naknek River are regulated by permit. Fifty-four permits were issued in 1970 and 34 (62.0%) returned. The estimated king salmon, Oncorhynchus tshawytscha, subsistence harvest was 233, which was the lowest harvest since the permit system was initiated in 1963. The 1969 regulation reducing subsistence fishing time to one 24-hour period each week (from 9 AM Saturday until 9 AM Sunday) was continued. Continuous commercial fishing and limiting the subsistence fishing to one 24-hour period each week during the red salmon, O. nerka, fishery were two reasons for the reduction in the king salmon subsistence harvest.

King Salmon Commercial Catch:

The Naknek-Kvichak district preliminary estimated commercial king salmon catch of 18,488 is listed in Table 1. In 1971, the Naknek-Kvichak commercial fishing district was enlarged to allow for an increased red salmon harvest and a new general district was added. The general district encompasses all waters east of a line from Cape Menshikof to a point on the eastern side of Etolin Point. Fishing was allowed in this district until 6 AM, June 30, 1971. The reported preliminary general district catch was 431 king salmon. Some of the king salmon caught in this district were possibly bound for other river systems.

The 1971 commercial king salmon catch was the second largest since 1951. The largest harvest (19,016) occurred in 1969 (Table 2). Continuous fishing was allowed in the Naknek-Kvichak commercial fishing district throughout the 1971 season. The major king salmon catches during late July were caught in the upper Naknek-Kvichak commercial fishing district and appear to have been destined for the Alagnak (Branch) River.

King Salmon Escapement:

King salmon escapement estimates were made in the Naknek River drainage by float and aerial survey. An aerial survey was flown on King Salmon Creek on July 19, 1970, but due to high water and poor counting conditions, only 260 king salmon were observed.

Big Creek was floated between August 15 and 17, 1970. Counting conditions in the upper stream area were good, but steadily decreased due to high wind and muddy water. A total of 1,600 king salmon were observed in Big Creek.

TABLE 1 Preliminary Naknek-Kvichak District Commercial Catch of King Salmon, 1970.

<u>Fishing Period</u>	<u>Catch</u>	<u>Fishing Period</u>	<u>Catch</u>
5/25-5/31	9	7/ 5	865
6/ 1-6/ 7	1	7/ 6	201
6/ 8-6/14	66	7/ 7	1,147
6/15-6/20	2,147	7/ 8	747
6/21	488	7/ 9	474
6/22	181	7/10	629
6/23	275	7/11	463
6/24	265	7/12	394
6/25	707	7/13	188
6/26	691	7/14	160
6/27	926	7/15	69
6/28	811	7/16	172
6/29	399	7/17	256
6/30	1,028	7/18	491
7/ 1	711	7/19	450
7/ 2	469	7/20- 7/26	1,065
7/ 3	299	7/27- 8/ 2	758
7/ 4	419	8/ 3- 8/ 9	66
		8/10-12/31	1
		Total	18,488

TABLE 2 Summary of Commercial King Salmon Catches, Naknek-Kvichak Fishing District, 1959-1970.

<u>Year</u>	<u>King Salmon Catch</u>	<u>Year</u>	<u>King Salmon Catch</u>
1959	15,298	1965	8,047
1960	17,778	1966	5,497
1961	10,206	1967	3,705
1962	8,816	1968	6,398
1963	4,713	1969	19,016
1964	12,267	1970	18,488*

*Preliminary estimate which does not include the general district catch of 431 king salmon.

Numerous king salmon aerial surveys were flown on the main Naknek River to estimate the spawning population and distribution, and on one occasion, an estimated 2,500 king salmon were seen spawning within a four-mile section of this river. The spawning peak occurred shortly after August 25, but due to poor visibility, the peak spawning date was not determined. The 1970 return was larger than expected, and fish were still entering the main river after the July 12 sport fishing closure. It is believed that this season's escapement was comparable to the 1969 king salmon escapement.

The severe winter of 1970, which caused thick ice and low water conditions in the Bristol Bay area, may have contributed to egg and fry mortalities in marginal king salmon spawning areas.

Rainbow Trout Sampling:

Adult rainbow trout, Salmo gairdneri, were sampled and tagged in the Bay of Islands area of Naknek Lake during July. Apparently these fish migrate to this area after spawning, and stomach samples indicated they feed on stickleback, Gasterosteus sp. All fish sampled in this area were captured by trolling around the numerous islands. During the summer, this area is regularly fished by fishermen from the Wien Consolidated Airline Brooks Camp.

The mean fork length of 22 rainbow trout captured in this area was 712 mm and ranged from 587 - 818 mm.

Three age classes, V, VI, and VII, were represented in the sample. Average fork length for these classes were 649, 738, and 803 mm, respectively.

Alagnak (Branch) River Watershed

King salmon escapement estimates during the past three years have ranged from 4,600 - 10,000 in Branch River. Annual aerial survey estimates are as follows:

<u>Year</u>	<u>Range</u>
1968	7,000 - 10,000
1969	5,000 - 7,000
1970	4,600 - 5,300

The 1970 commercial king salmon catch in the Naknek-Kvichak district between July 14 and August 10 was less than the 1969 season, despite increased fishing effort. Because of the location of these late season king salmon catches, it is assumed that the majority of the fish were destined for the Alagnak (Branch) River system.

The rainbow trout sport fishery and data analysis are discussed in project report G-11-E.

Egegik River Watershed - Gertrude Creek

Rainbow Trout Sampling:

Rainbow trout samples were collected on October 16, 1970, from Gertrude Creek, a tributary of the King Salmon River which flows into the Egegik River. This sampling is the first documentation of rainbow trout in the Egegik watershed. The mean sample length was 468 mm, and the fish ranged in length from 414 - 556 mm. The predominate age classes were VI and VII.

The sample consisted of maturing rainbow trout which may spawn in this creek during spring. Six Arctic grayling, Thymallus arcticus, were also collected from Gertrude Creek.

Nushagak River Watershed - Wood River Lake System

A catalog and inventory survey was conducted from September 25 to October 7, 1970, by riverboat in the Wood River Lake system (Figure 1). Species distribution and composition were determined for key portions of this drainage. Rainbow trout and Arctic grayling were sampled by hook and line for standard fork length, and scale samples were taken for age determination. Fish were tagged and released, with small samples of each species retained to determine maturity. Arctic char, Salvelinus alpinus, were observed off all major creeks and river mouths.

Lake Aleknagik:

Lake Aleknagik tributaries surveyed during 1970 were Ice Creek, Youth Creek, and the Agulowak River (Figure 2).

Rainbow trout were collected in both the Agulowak River and Ice Creek. Only one rainbow trout was captured in Ice Creek. Agulowak River is a major rainbow trout stream and supports the greatest fishing pressure in this system. Local residents reach this area by boat from the town of Aleknagik, and a commercial sport fishing facility is located at the head of the river. Arctic grayling were sampled in the Agulowak River during all surveys.

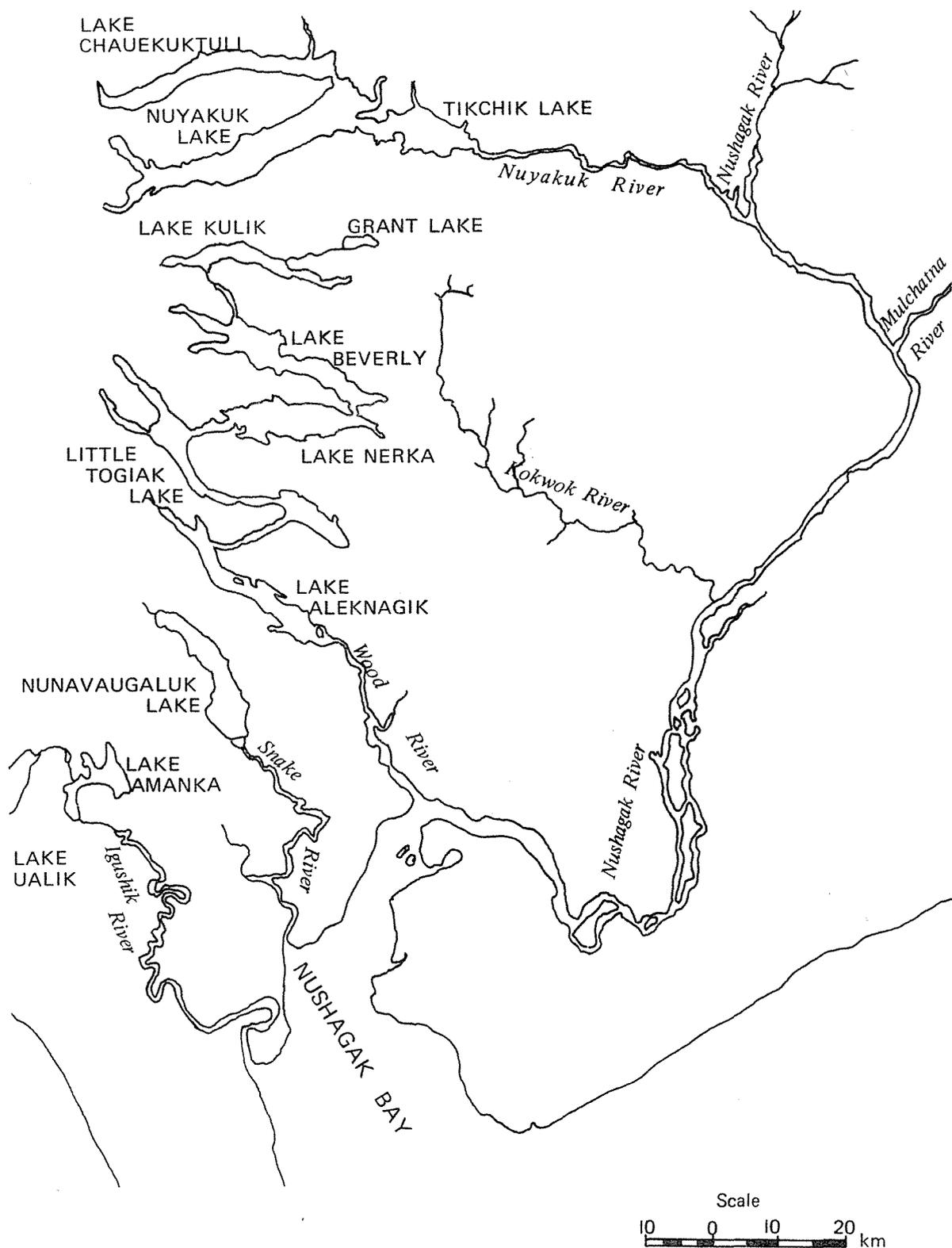
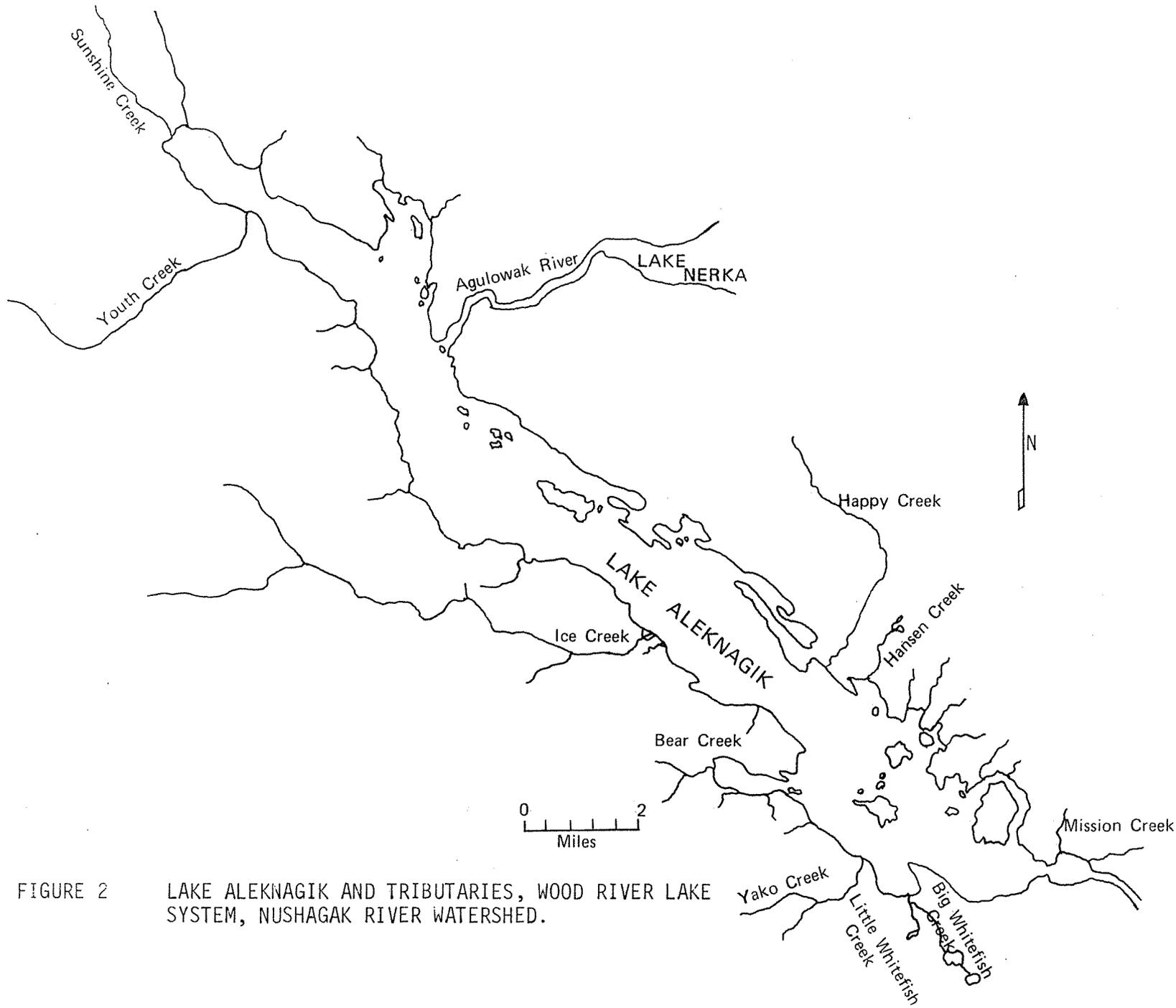


FIGURE 1 WOOD RIVER LAKE SYSTEM AND ADJOINING RIVER SYSTEMS IN THE NUSHAGAK RIVER WATERSHED.



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FIGURE 2 LAKE ALEKNAGIK AND TRIBUTARIES, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED.

Lake Nerka:

During 1970, the Agulukpak River, Little Togiak River, and Lynx Creek were surveyed (Figure 3). Rainbow trout were found in all of these streams. A small Arctic grayling and char population was present in the Agulukpak River. Sport fishing pressure occurs on this river from Golden Horn and Lake Beverly lodges.

Lake Beverly:

Tsun Creek was sampled for sport fish and observations were made in Peace River during 1970 (Figure 4). Arctic grayling were sampled in Tsun Creek and observed in Peace River. Arctic char fishing is excellent off the mouth of Peace River.

Lake Mikchalk:

Golden Horn Lodge, a sport fishing facility, is located on this lake. From this lodge, Kulik Lake and tributary streams are accessible, as well as Lake Beverly streams and the Agulukpak River (Figures 4 and 5). The major fishing pressure from this lodge is on the Wind and Agulukpak rivers, primarily for Arctic grayling, rainbow trout, and Arctic char. Rainbow trout and Arctic grayling were collected in Wind River, with Arctic grayling predominate in the catch. Lake Mikchalk is known to have a resident Arctic char population but was not sampled during 1970.

Lake Kulik:

In 1970, Grant River and K-II Creek were the only streams surveyed. Arctic grayling were sampled and tagged in the lower 300 yards of Grant River (Figure 5). This river was surveyed for approximately three miles. No fish were observed in K-II Creek.

Grant Lake:

Grant Lake was not surveyed. Local guides report Arctic char are present in this lake (Figure 5). Grant River, which is 5.8 miles long, drains this lake and has an impassable falls approximately 1.3 miles downstream from the lake. This lake will be surveyed in the future.

Results:

Rainbow Trout. Rainbow trout were found primarily in the main connecting rivers of this interconnecting Wood River Lakes system. The Agulowak and Agulukpak rivers are the two most productive rainbow streams in this system. Of the 100 samples collected, 88 were from these rivers. Rainbow trout were also collected from 6 of the remaining 12 streams surveyed during 1970.

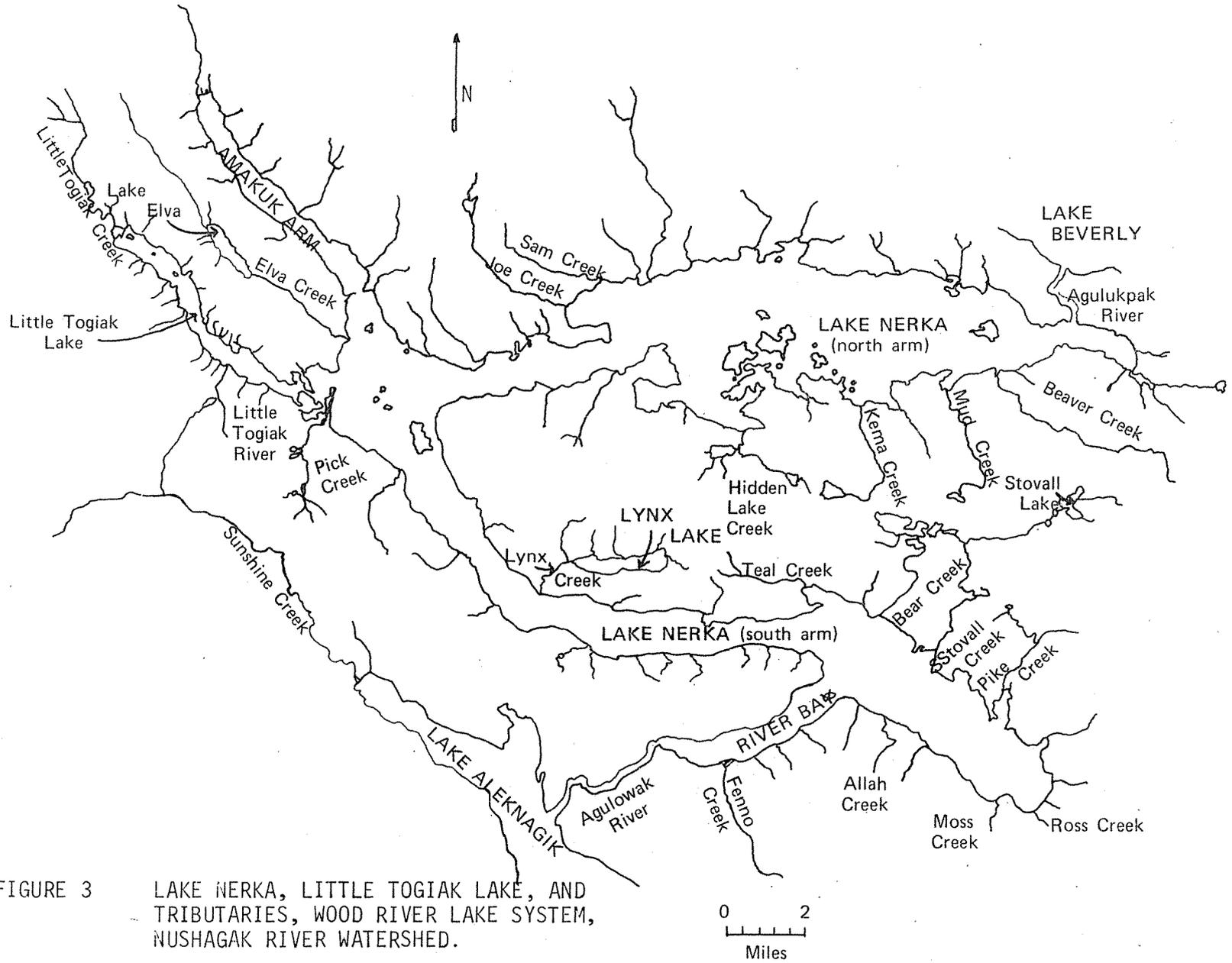


FIGURE 3 LAKE NERKA, LITTLE TOGIAK LAKE, AND TRIBUTARIES, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED.

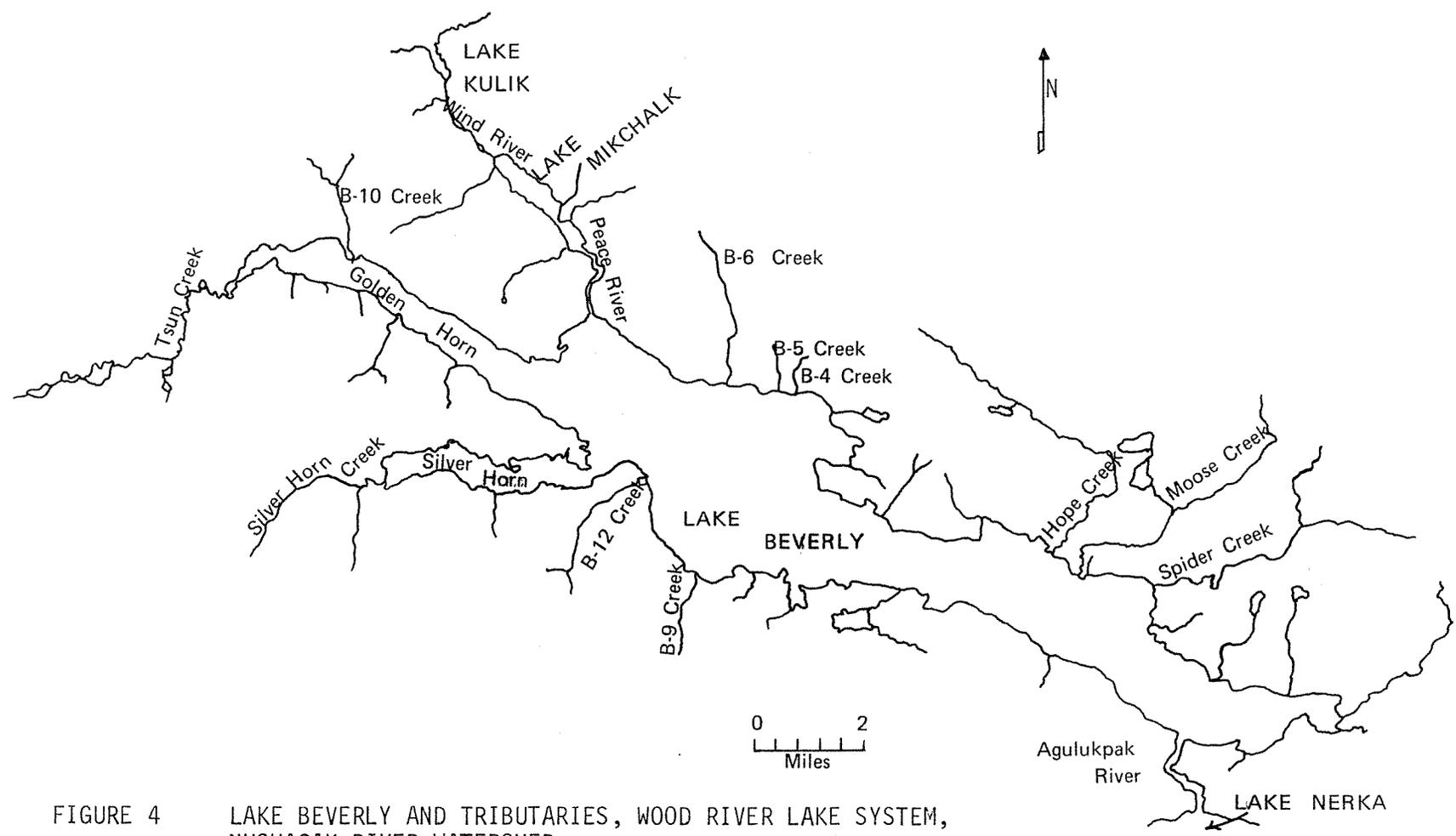
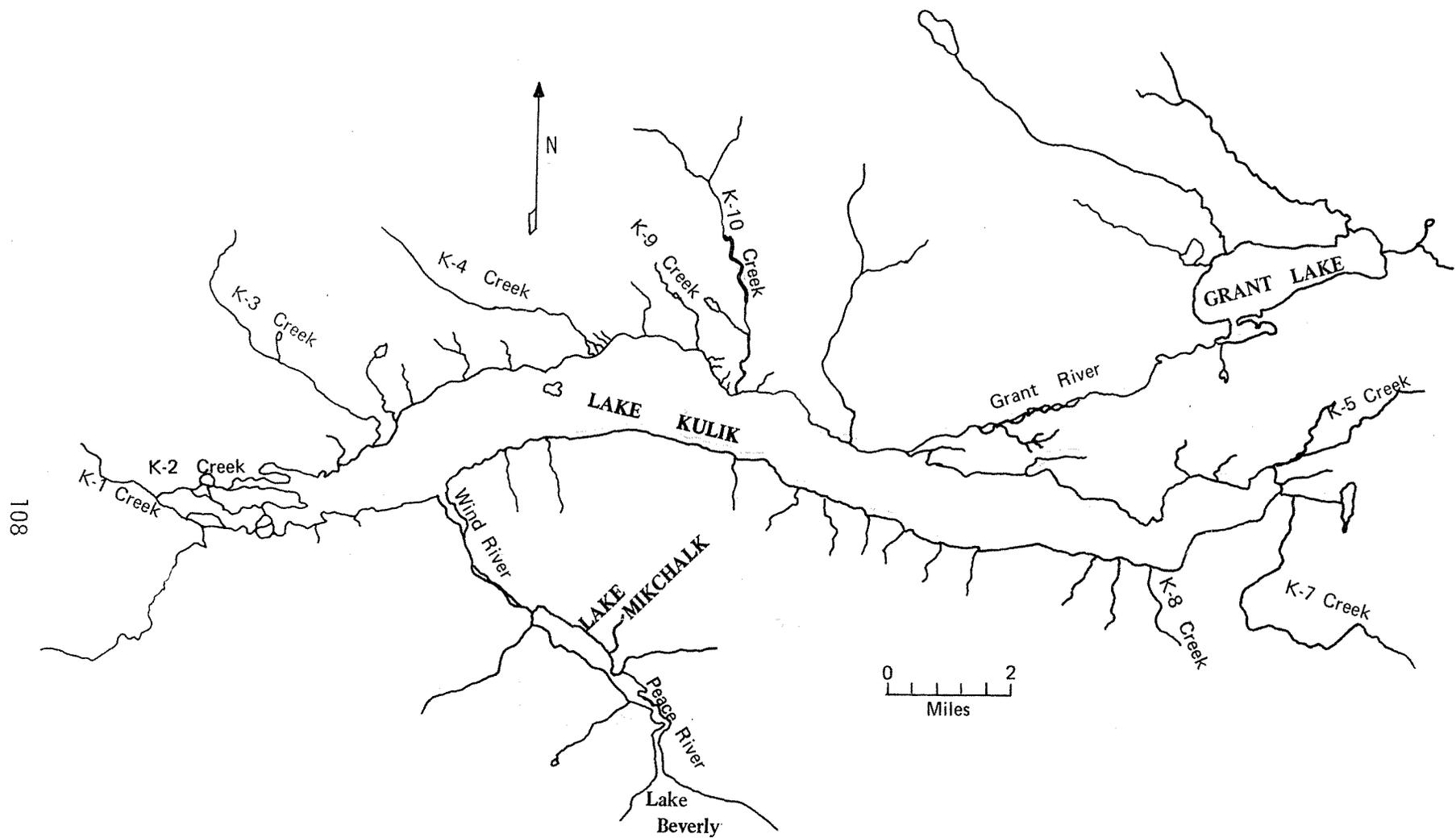


FIGURE 4 LAKE BEVERLY AND TRIBUTARIES, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED.



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FIGURE 5 LAKE KULIK, GRANT LAKE, AND TRIBUTARIES, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED.

Five rainbow trout age classes were present in the 74 scale samples analyzed for age, of which 75.1% were age III and IV. The average length and the sample length range is shown in Table 3. Of the scales collected, 63.2% from mature fish over 400 mm in length were regenerate.

The growth pattern for the Wood River system rainbow trout samples indicates reduced growth after age V (Table 3).

TABLE 3 Age-Length Frequency Comparison of Sport-Caught Rainbow Trout, Wood River Lakes System, Nushagak River Watershed, 1970.

Age	No. in Sample		Length (mm)	
			Range	Average
II	7	(9.5%)	171 - 285	217
III	34	(45.9%)	202 - 362	298
IV	22	(29.7%)	304 - 400	358
V	8	(10.8%)	352 - 436	410
VI	3	(4.1%)	382 - 436	413
Total	74	(100.0%)	171 - 436	325

These fish were collected during the late fall, thus indicating excellent growth for age II fish; while in actuality, these fish have completed almost three growing seasons.

The length-frequency for the 100 rainbow trout samples collected is shown in Figure 6. The length range was 169 - 536 mm, with a mean standard fork length of 346 mm. The sample's standard deviation was 73 mm.

Arctic Grayling. Arctic grayling were present in the connecting rivers throughout each lake system and in many major creeks. Wind River provides excellent Arctic grayling fishing and produced 36 of the 66 samples collected. The Agulupak River provided the second largest sample.

Age V and VI Arctic grayling dominated the hook-and-line sample with 53.3% and 21.7%, respectively (Table 4).

The length-frequency of the 66 Arctic grayling sampled is shown in Figure 7. The sample range was between 265 and 458 mm, with a mean standard fork length of 367 mm and a standard deviation of 43 mm.

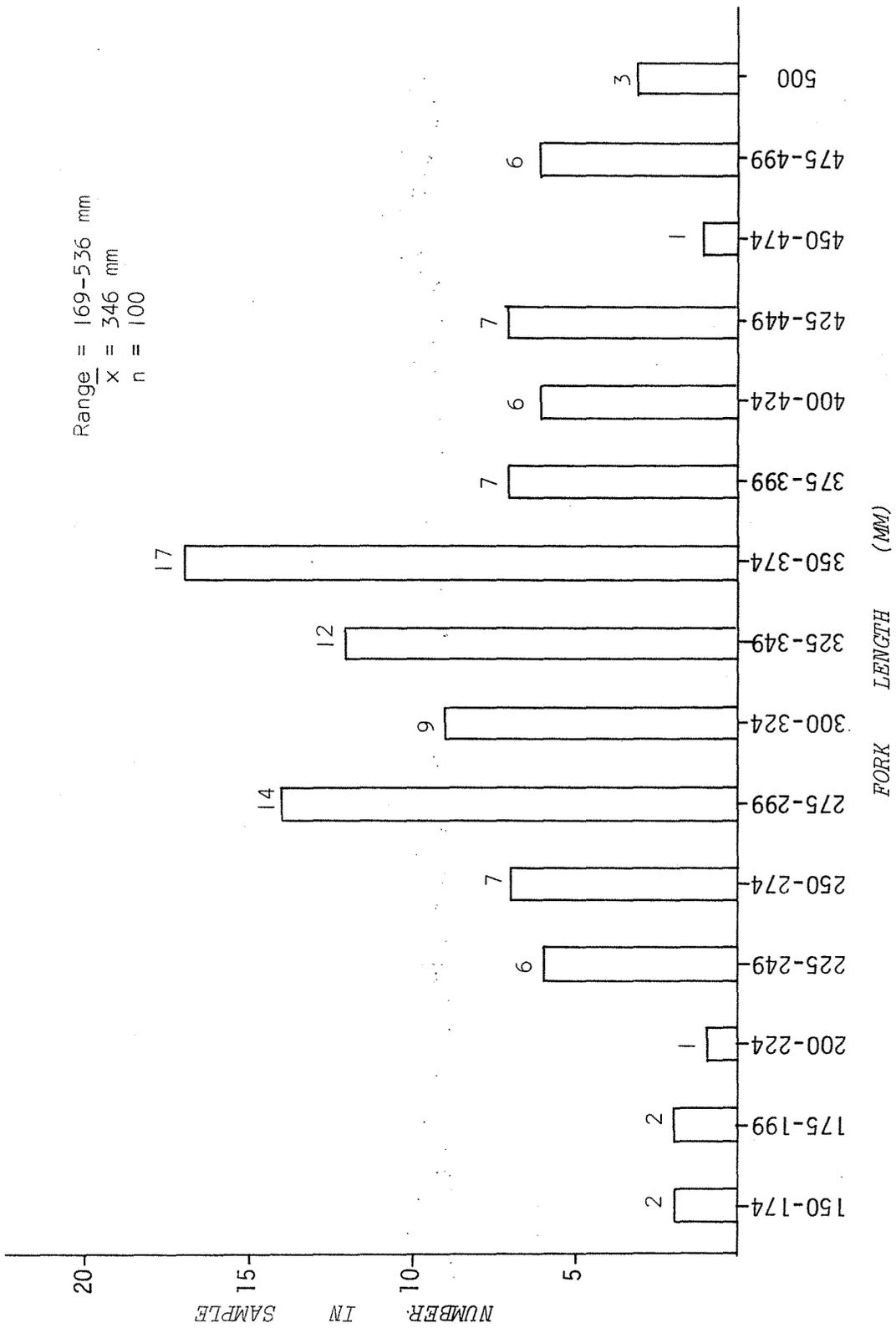


FIGURE 6 LENGTH-FREQUENCY OF SPORT-CAUGHT RAINBOW TROUT, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED, 1970.

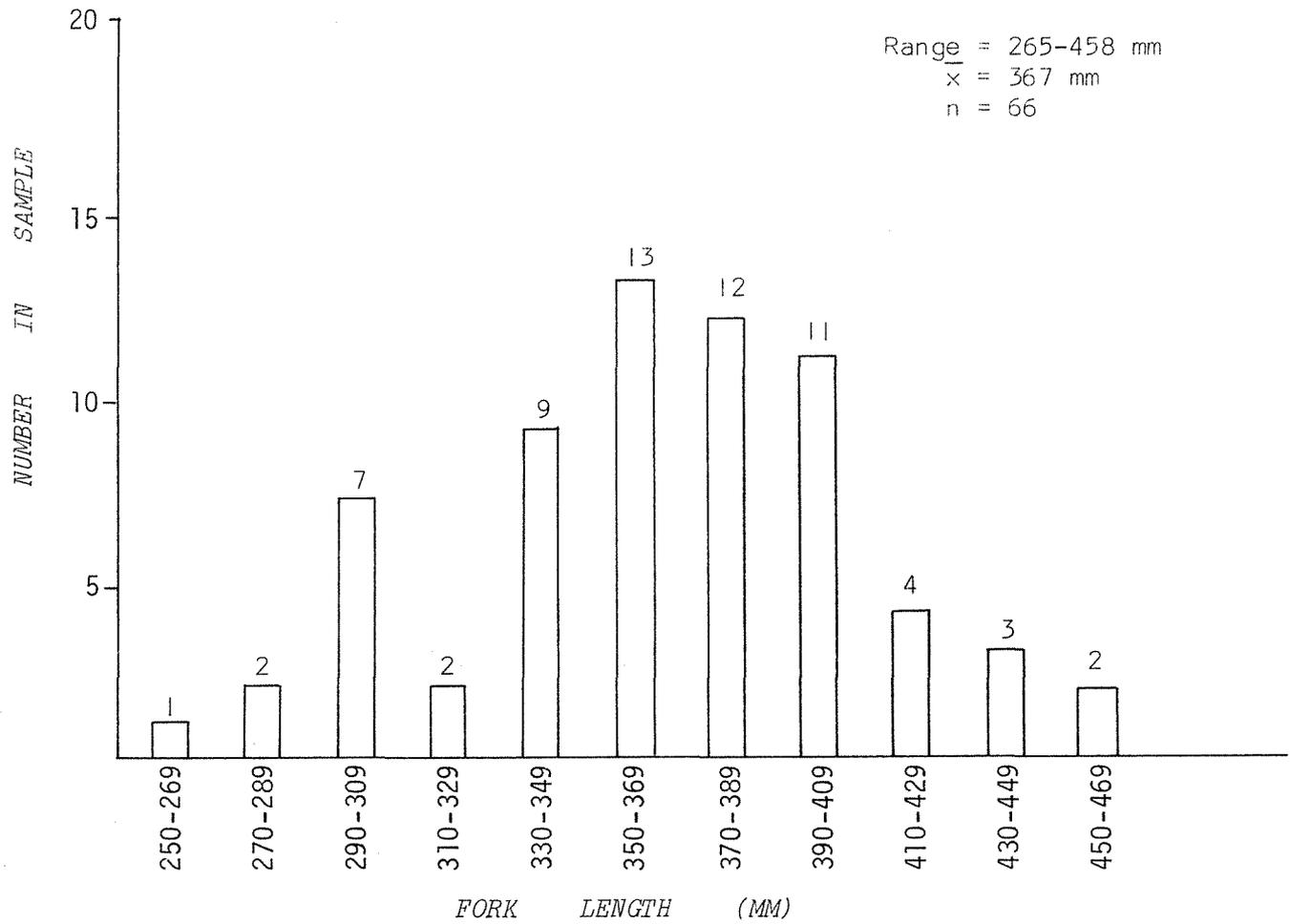


FIGURE 7 LENGTH-FREQUENCY OF SPORT-CAUGHT ARCTIC GRAYLING, WOOD RIVER LAKE SYSTEM, NUSHAGAK RIVER WATERSHED, 1970.

TABLE 4 Age-Length Frequency Comparison of Sport-Caught Arctic Grayling, Wood River Lakes System, Nushagak River Watershed, 1970.

Age	No. in Sample		Length (mm)	
			Range	Average
III	7	(11.7%)	265 - 305	290
IV	7	(11.7%)	293 - 352	332
V	32	(53.3%)	318 - 450	386
VI	13	(21.7%)	358 - 458	405
VII	1	(1.6%)	377	377
Total	60	(100.0%)	265 - 458	372

Ugashik River Watershed

Arctic Grayling Studies:

Outlet. During the period of August 6 - 8, 1970, Arctic grayling were collected by hook and line at the outlet of Lower Ugashik Lake (Figure 8). In the 126 fish sampled, one fish was previously tagged during 1968, and 17 were recovered from the fish tagged during 1969.

The mean standard fork length of this sample was 408 mm with a standard deviation of 42 mm. Figure 9 indicates the length-frequency. Analysis of age and length data is shown in Table 5.

Narrows. A sample of 96 Arctic grayling was collected at the Ugashik narrows from August 9 - 11, 1970 (Figure 8). There were three tag recoveries in this area from fish tagged at the Ugashik outlet in 1968, indicating interchange occurs between these two areas.

The mean standard fork length of this sample was 372 mm, with a standard deviation of 56 mm. Figure 9 illustrates the length-frequency. The age and length determinations from 64 fish is shown in Table 5.

When comparing the Ugashik outlet and narrows samples, a noted difference in the mean lengths and standard deviation is indicated. This difference could be due to the presence of small Arctic grayling in one sub-area at Ugashik narrows. The small fish were not observed previously in this sub-area. With these fish arbitrarily removed from the data, the mean sample length of 63 Arctic grayling is 407 mm, with a standard deviation of 40 mm, or very similar to the Ugashik outlet sample.

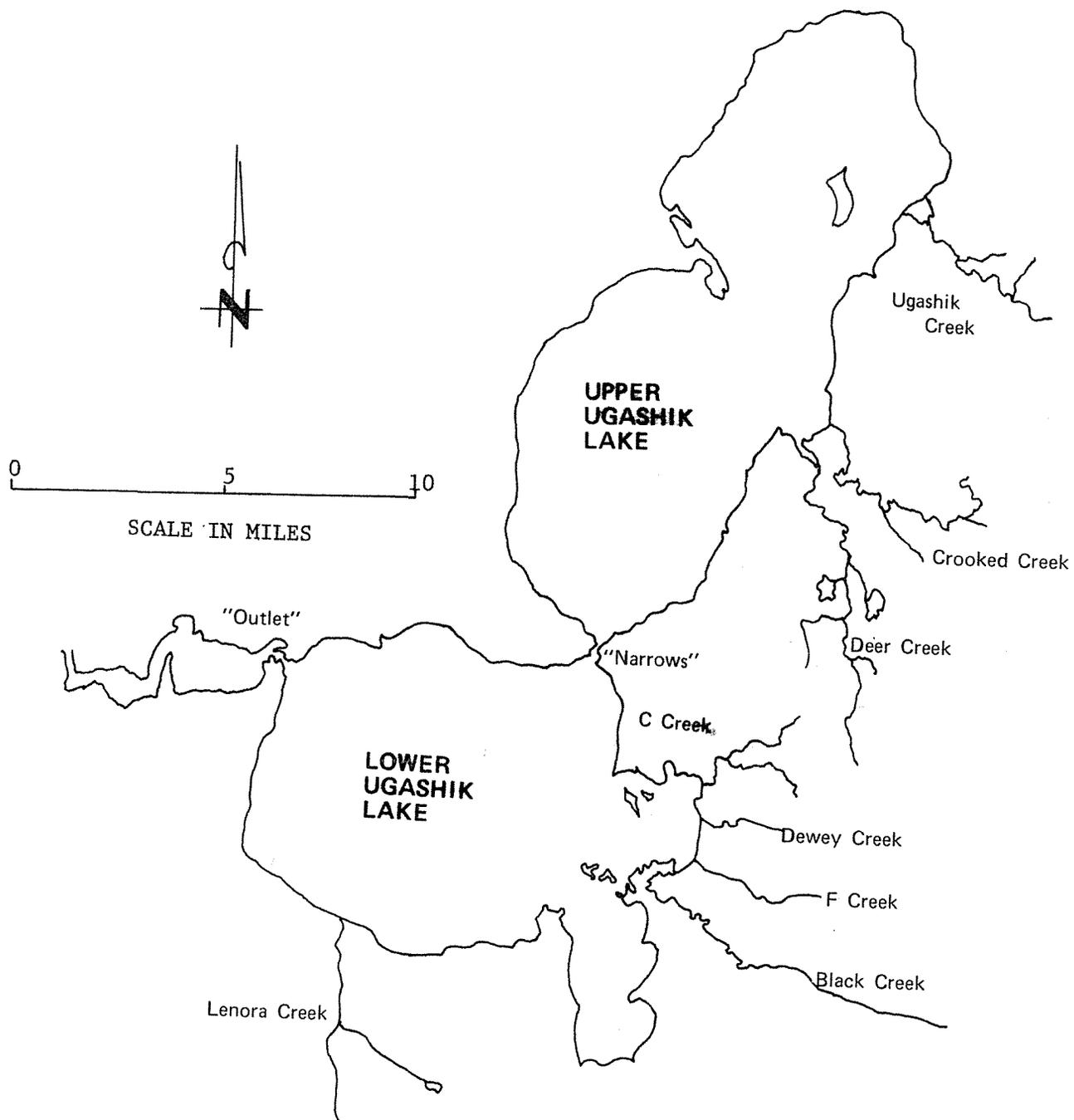


FIGURE 8 UPPER AND LOWER UGASHIK LAKES ARCTIC GRAYLING STUDY AND SAMPLING AREAS, 1970.

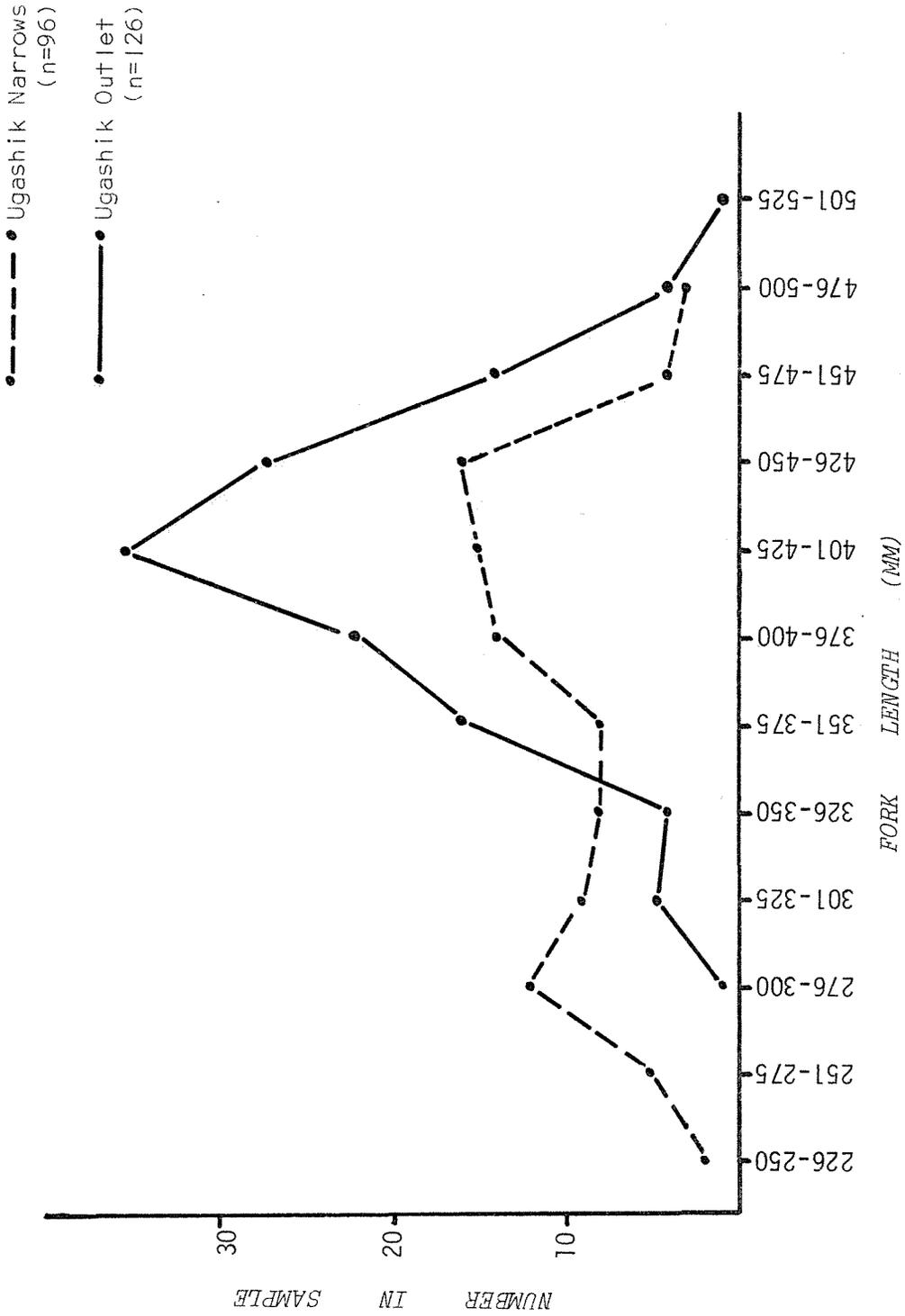


FIGURE 9 LENGTH-FREQUENCY OF SPORT-CAUGHT UGASHIK LAKES GRAYLING, 1970.

TABLE 5 Age-Length Frequency Comparison of Sport-Caught Arctic Grayling from Ugashik Lakes Outlet and Narrows, 1970.

	Age	No. in Sample		Length (mm)	
				Range	Average
Narrows:	III	21	(32.8%)	240 - 338	292
	IV	10	(15.6%)	290 - 374	349
	V	16	(25.0%)	345 - 436	399
	VI	14	(21.9%)	365 - 453	416
	VII	3	(4.7%)	428 - 451	437
	VIII	--	--	---	-
	Total	64	(100.0%)	240 - 451	361
	Outlet:	III	3	(3.0%)	298 - 324
IV		25	(25.3%)	328 - 395	363
V		30	(30.3%)	367 - 450	408
VI		29	(29.3%)	377 - 472	427
VII		11	(11.1%)	403 - 476	452
VIII		<u>1</u>	(<u>1.0%</u>)	495	495
Total		99	(100.0%)	298 - 495	405

Stream Surveys. Dewey, C & F creeks, Lower Ugashik Lake tributaries, were surveyed by boat and foot (Figure 8). These surveys were conducted to determine if Arctic grayling populations were present during the period that Arctic grayling were present at Ugashik outlet and narrows. No Arctic grayling were observed. Three tributaries to Upper Ugashik Lake, Deer, Crooked, and Ugashik creeks were also surveyed, with Arctic grayling observed in only Crooked Creek.

LITERATURE CITED

Paddock, A. Dean. 1970. Inventory and Cataloging of the Sport Fish and Sport Fish Waters of the Bristol Bay and Lower Kuskokwim Drainages. Alaska Department of Fish and Game. Federal Aid In Fish Restoration, Annual Report of Progress, 1969-1970, Project F-9-2, 11:213-227.

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