A FISHERIES INVENTORY OF WATERS

IN THE

LAKE CLARK NATIONAL MONUMENT AREA

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF SPORT FISH

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AND

UNITED STATES DEPARTMENT OF THE INTERIOR
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ABSTRACT

During the summers of 1978 and 1979 the Sport Fish Division, Alaska Department of Fish and Game, conducted a fisheries resource inventory in the Lake Clark area of southwestern Alaska.

This investigation was undertaken to provide baseline fisheries and human use data for State and Federal agencies involved in formulating land, water, and resource policies within the boundaries of the proposed Lake Clark National Park/Preserve. Funding and preliminary planning for the project were provided jointly by the U.S. National Park Service and the Alaska Department of Fish and Game.

Investigations were conducted on 27 lakes and portions of 13 rivers within the study area. Twenty-two fish species were captured. Information on distribution, age and growth, relative abundance, food habits, and spawning area (salmon species) is presented for most of the species captured.

Limited limnological investigations were conducted on lakes surveyed and the results are presented.

Human use observations indicate several waters directly support significant recreational, and subsistence fisheries. Other recreational uses (river floating, hunting, and backpacking) are documented.

Salmon escapement surveys indicate waters of the proposed Park/Preserve include important spawning and rearing areas and contribute to commercially important salmon runs in the Bristol Bay, Kuskokwim Bay and Cook Inlet areas.

The species data, human use information, and site specific characteristics cataloged should aid future resource managers in assessing proposed utilization, developments, and changes.

ACKNOWLEDGEMENTS

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BACKGROUND

Lake Clark, the sixth largest freshwater lake in Alaska, is located in the southwestern region of the State (Figure 1). It is a major component of the Kvichak River drainage. The lake has a surface area of 110 square miles (Bue, 1963), and occupies an active glacial basin bordered on the east by the Chigmit Mountains and on the north and west by foothills comprising the southern border of the Alaska Range. It drains, via the Newhalen River, into Iliamna Lake, approximately 20 miles to the south.

The Lake Clark area has been inhabited by native peoples (the Tanaina) from at least the late eighteenth or early nineteenth century (Vanstone, 1967) until the present. Non-native residents have been present in the area since approximately the beginning of the twentieth century (Van Horne, 1975). Principal settlements in the Lake Clark vicinity are Port Alsworth (a small community located near the mouth of the Tanalian River) and Nondalton, a larger, principally native village (population approximately 200-500) located on Sixmile Lake. Additionally, a few year-round residents live on patented parcels scattered around the lake shore.

Due perhaps to its wilderness character and distance from major population/transportation centers, not much attention from the outside world has been focused on the Lake Clark area until recent years. This began to change, however, with passage of the Alaska Native Claims Settlement Act (A.N.C.S.A.) by the U.S. Congress in 1971.

The vast majority of the study area has been designated Federal public lands since Alaska's purchase from Russia in 1867. Following the enactment of ANSCA in 1971, the U.S. Department of the Interior, acting on behalf of the Federal government under Section 17(d)2 of the Act, identified the Lake Clark area and considerable adjacent lands to the north, east and west as having potential for inclusion in the national park system. Lands identified included portions of the drainages of the Newhalen, Chilikadrotna, Mulchatna, Telaquana, Necons, Stony, Chakachatna, Big, Drift, Crescent, Tuxedni and Johnson Rivers (see Figure 2).

Following the collection of available historical, cultural and environmental data, an environmental impact statement and a draft conceptual master plan were completed in late 1973. The master plan considered the management, development and use of the proposed park. Public comment was then invited and received on these two documents. Additional historical and environmental data were summarized by Van Horne (1975).

The proposed park boundaries and the conceptual master plan were then greatly modified as a result of an agreement reached concerning the land selection rights of the State and the Cook Inlet Native Regional Corporation. The agreement resulted in a "land trade" occurring in late 1976 between the Federal government, the State of Alaska and the Cook Inlet Native Regional Corporation. Subsequently, the U.S. Department of the Interior recommended to the U.S. Congress in 1978 that a Lake Clark National Park/Preserve, with revised boundaries, be established to manage these public lands in the "national interest". (Mr. Ross Kavanagh, U.S. Na-

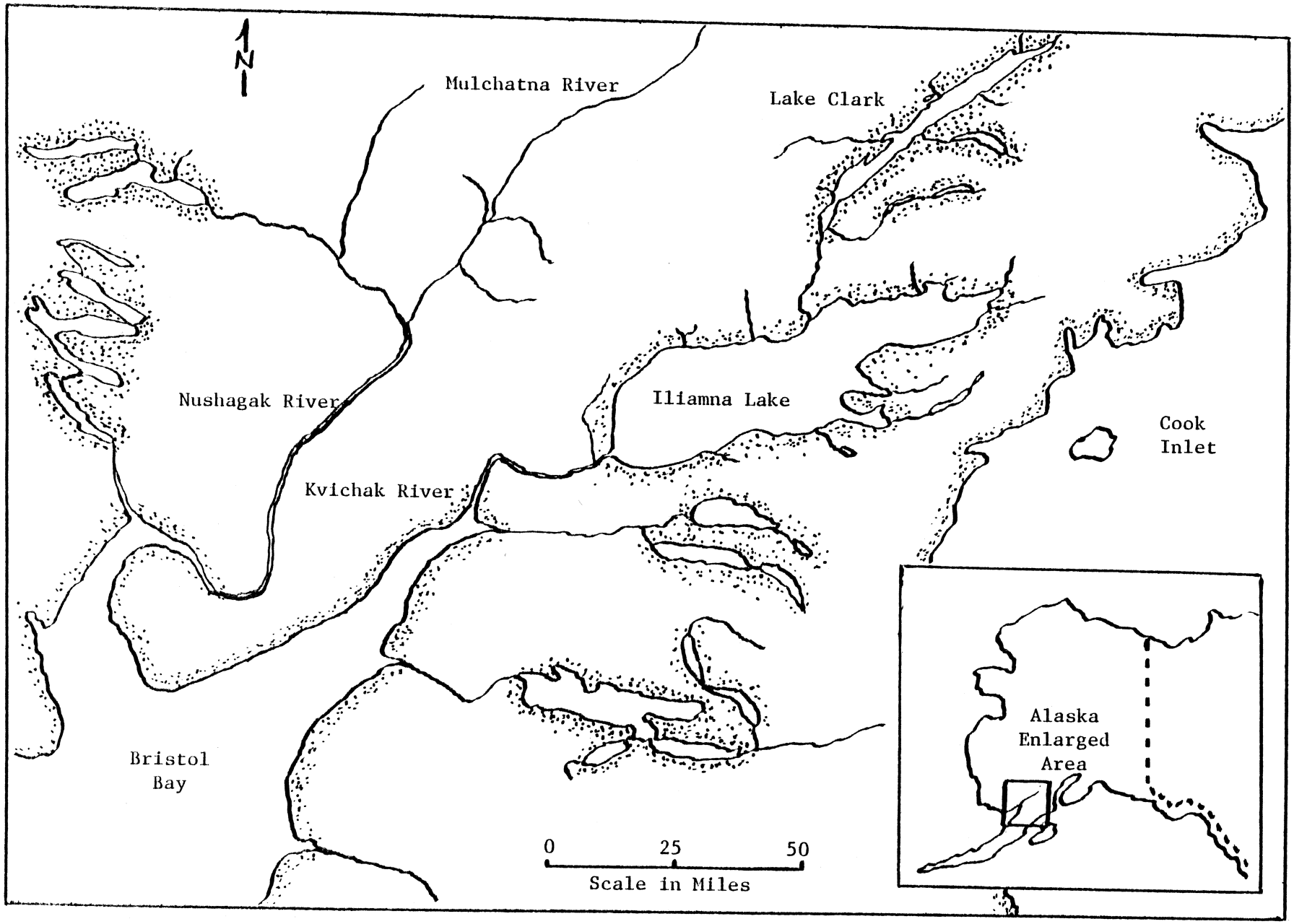

Figure 1. The Kvichak River System of Bristol Bay, Alaska

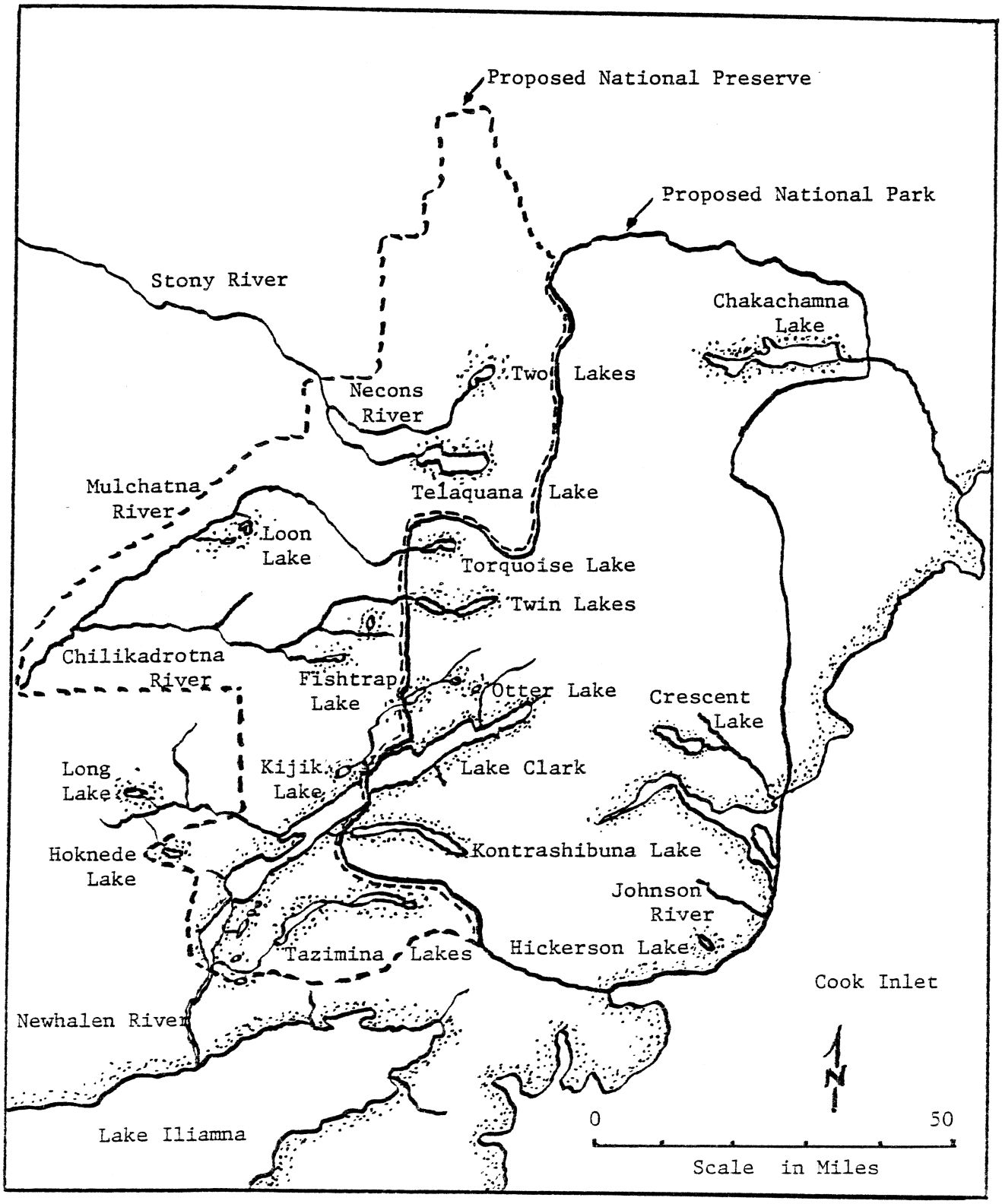

Figure 2. Proposed Lake Clark National Park and Preserve Showing Lakes and Rivers Surveyed in 1978-1979.

tional Park Service-Anchorage, provided the preceding information pertaining to the sequence of events leading up to identification of lands for consideration as Lake Clark National Park/Preserve). Congress failed to enact legislation necessary to accomplish this during the 1978 session, so in December of that year the President of the United States, utilizing the Antiquities Act, created a new national monument in the area from lands previously proposed for "park" status. This new monument was designated "Lake Clark National Monument". (The "Monument" occupies, with a few exceptions, the boundaries of the proposed "Park".)

Due to the character of the area, its relatively low human population, the high costs involved in reaching and working within it, and the recreational popularity of other areas nearby, fisheries inventories for many of the rivers, streams, and lakes in the proposed Park/Preserve were incomplete or lacking prior to the initiation of this project. A literature search indicated that some areas had been studied to varying degrees with most of the emphasis directed at salmon-producing waters. Areas previously studied included Lake Clark and its tributaries, the drainages emptying into the westside of Cook Inlet, and portions of the upper Mulchatna and Stony River watersheds. A brief description of the types of information gathered during these surveys follows.

Lake Clark and its sockeye salmon producing tributaries, Oncorhynchus nerka (Walbaum), have received the most attention. The U.S. Bureau of Fisheries conducted initial surveys around the lake in August 1920 looking for sockeye spawning areas and any concentrations of fish or birds that might inflict significant predation on salmon stocks. They documented the presence of Dolly Varden, Salvelinus malma (Walbaum) in Kijik Lake; northern pike, Esox lucius, Linnaeus, in Chulitna River; lake trout, Salvelinus namaycush (Walbaum) in Lake Clark; and sockeye salmon in Lake Clark, Tazimina River, Kijik River and Kijik Lake. Follow-up surveys were accomplished in 1921-22, 1924-28, 1931, 1933, 1937-38, 1940, and 1947-49. Accounts of these were published in Reports of the Commissioner of Fisheries to the Secretary of Commerce, Alaska Fishery and Fur Seal Industries, for the above years. For some years numerical estimates of sockeye escapements to particular spawning areas were determined, but for others only subjective statements describing apparent run strength appear (i.e. "not as numerous as in previous years" in 1924; "...observations at Lake Iliamna and Lake Clark indicated that the fish were well distributed" in 1933; etc.).

In 1950 the Fisheries Research Institute (F.R.I.) of the University of Washington began conducting salmon related investigations in the Kvichak River watershed, including the Lake Clark area (Demory, et al., 1964). Their efforts were directed primarily at obtaining information on factors affecting sockeye salmon production. During the course of their studies at Lake Clark (which continue to the present) they have made bathymetric measurements of the lake (Anderson, 1969); compiled a spawning catalog of sockeye spawning areas including bottom type descriptions and total spawning area (Demory, et al., 1964 and Anderson, 1968); studied juvenile sockeye distribution, abundance, age, and growth (Orrell, 1963 and Kerns, 1968); studied spawning timing, and age-length composition of the runs

(Mathisen and Poe, 1969); and compiled annual indices of sockeye escapement (Demory, et al., 1964, Anderson 1968, Anderson and Poe, 1969, Poe and associates, 1970, 1974, 1975, 1978). Bond and Becker (1963) prepared a key to the fishes of the Kvichak River drainage (including Lake Clark).

Alaska Department of Fish and Game studies at Lake Clark have been concerned with non-salmon species. During 1964 a commercial fishery for Dolly Varden, Arctic char, Salvelinus alpinus (Linnaeus), lake trout, humpback whitefish, Coregonus pidschian (Gmelin), northern pike, least cisco, Coregonus sardinella, Valenciennes, and burbot, Lota lota (Linnaeus) was initiated by Alaska Fish, Inc. in the Iliamna Lake - Lake Clark area. Participation in the fishery, gear types used, species caught, poundages harvested, fishing locations, and biological parameters of the catch (age, length, weight, maturity) were monitored (Metsker, 1967). The catch in the Lake Clark area (Sixmile Lake) was comprised mainly of whitefish and lake trout, plus a few pike and burbot. The fishery was discontinued in 1965.

Further studies included a brief survey of the Chulitna River and Long Lake in 1972 by Siedelman (unpublished) during which northern pike and Arctic grayling, Thymallus arcticus (Pallas) were captured. Tazimina River was surveyed during the spring of 1974 in an attempt to locate rainbow trout, Salmo gairdneri (Richardson) spawning areas. No spawners were located. Later in the season a sample of rainbow trout was captured and 25 were tagged and released (Gwartney, 1975).

Many of the drainages emptying into the westside of Cook Inlet from McArthur River on the north to Chinita Bay on the south are either in or partially within the proposed Park/Preserve. These areas have not been studied as extensively as Lake Clark. Baxter and Baxter (1961) conducted an inventory including most of these drainages yielding some information on species distribution, run timing, spawning areas, and human use (emphasis on salmon species). Sockeye escapement surveys have been conducted in the Crescent River drainage (Namtvedt, et al., 1977) and in Chinitna Bay (Gary Sanders, ADF&G, Soldotna, personal communication). Two fishwheels were operated near the mouth of Crescent River during 1975 to provide in-season salmon escapement indices (Namtvedt, et al., 1977). A catch of 1,302 sockeye, 220 chum salmon, Oncorhynchus keta (Walbaum), and 6 chinook salmon, Oncorhynchus tshawytscha (Walbaum) was made, yielding information on run timing and age composition.

The lakes and rivers comprising the Upper Mulchatna and Chilikadrotna River watersheds have been surveyed aerially by the Alaska Department of Fish and Game periodically to assess salmon escapements. These waters during years of high run-off are quite glacially discolored, sometimes rendering them unsuitable for surveying. The chinook salmon escapement into the Chilikadrotna River was surveyed first in 1964 (Nelson, 1965). Additional surveys were done in 1968, 1974, and 1976-1979 (Mike Nelson, Alaska Department of Fish and Game, Dillingham, personal communication). Sockeye and chum salmon spawners were also observed and enumerated during

the 1977-79 surveys by Nelson. Russell (1976) documented the presence of rainbow trout, Arctic grayling, northern pike, round whitefish, Prosopium cylindraceum (Pallas), chinook salmon, chum salmon, coho salmon, Oncorhynchus kisutch (Walbaum) and slimy sculpins, Cottus cognatus Richardson, in the upper Mulchatna River. Further inventory studies of the Mulchatna and its tributaries (including the Chilikadrotna River) during 1977 were reported by Gwartney and Russell in 1978. Additional species found inhabiting these waters included Dolly Varden, lake trout, and burbot.

The Two Lakes, Telaquana Lake, and upper Stony River drainages have been aerially surveyed during the mid-1960's by the Commercial Fisheries Division of the Alaska Department of Fish and Game to determine sockeye salmon spawning distribution (Rae Baxter, Alaska Department of Fish and Game, Bethel, personal communication). As these waters also are sometimes glacially discolored in mid-to-late summer, numerical estimates of spawning escapements must be considered conservative. Baxter in 1974 (unpublished surveys) did some test fishing using gill nets in Two Lakes and Telaquana Lake. His surveys documented the presence of northern pike, lake trout, Dolly Varden, sculpins, round whitefish, and longnose sucker, Catostomus catostomus (Forster) in Two Lakes and lake trout, least cisco, longnose sucker, northern pike, and Arctic grayling in Telaquana Lake.

Recognizing the limited data pertaining to resident fish species within portions of the proposed Park/Preserve, the U.S. National Park Service during February 1978 supplied the Alaska Department of Fish and Game with a list of waters for which they were interested in obtaining additional fisheries data. Waters named included:

Telaquana Lake	Lake Clark	Kijik Lake
Two Lakes	Snipe Lake	Otter Lake
Twin Lakes	Fishtrap Lake	Crescent Lake
Turquoise Lake	Lachbuna Lake	Hickerson Lake
Kontrashibuna Lake	Portage Lake	Chilikadrotna River
Upper Mulchatna River	Johnson River	

A cooperative study was subsequently initiated in June 1978.

OBJECTIVES

Within principal lakes and streams in the proposed Lake Clark National Park/Preserve:

1. Attempt to determine resident fish species composition and relative abundance at specific locations during the summer.

2. Attempt to determine adult anadromous species composition and relative abundance throughout the summer.

3. Provide information on age-growth relationships and age at sexual maturity for resident species.

4. Identify spawning areas for anadromous salmon and resident species when obvious.

5. Identify apparent patterns of migration and their timing.

6. Collect standard limnological data in study areas.

7. Provide a review and overview of existing knowledge relating to fishes, aquatic habitats, and fish harvest in the study area.

8. Include a description and analysis of fish stomach contents.

METHODS

Ground site surveys were conducted to collect fish and gather specific information from each of the waters visited. In most cases these surveys involved flying personnel and gear to a lake or river and then establishing a camp (or series of camps) from which daily sampling activities were conducted. These surveys included test fishing with various types of capture gear in differing types of fish habitat to provide fish species composition data; inspection of major inlet and outlet streams; collection of limnological data, depth sounding transects; and visits with any persons present at the location to document recreational use activities.

Aerial surveys (during 1978 in a Cessna 172 and in a Supercub during 1979) were flown to locate and enumerate spawning salmon, and to document recreational usage.

Fish were captured using gill nets, trap nets, dip nets, beach seines, hook and line, minnow traps, set lines, and backpack electroshocker. Gill nets were of three types:

A. 125 foot variable mesh monofilament diving net, 6 feet deep, comprised of five 25-foot panels bearing mesh sizes 1/2", 3/4", 1", 1-1/2", and 2", respectively (mesh size = square measure).

B. 125 foot variable mesh nylon floating net, 6 feet deep, comprised of five panels bearing mesh sizes above.

C. 75 foot monofilament floating net, 10 feet deep, 4 inch mesh.

The electroshocker was a Smith-Root, Type V, 12 volt, backpack electrofisher. Fish captured were identified to species in the field or preserved in 10% formalin solution for later identification in the lab. All fish were measured to the nearest millimeter (both standard fork length and total length), weighed to the closest ounce, and examined internally to determine sex and stage of maturity. Scales, otoliths, and/or opercular bones were removed, depending on the species sampled for use in age analysis. Stomachs were removed from selected individuals and preserved in 10% formalin. Contents were later analyzed under magnification in the lab.

Water samples were collected from a depth of four meters using a Nansen-type bottle. Samples were analyzed for alkalinity, dissolved oxygen, pH, and total hardness using a Hach Model AL-36B water chemistry kit. Lake depths were determined using a line and weight. Water transparencies were measured with a secchi disc.

Water temperatures for Lake Clark (Chulitna Bay) were determined using a Ryan submersible 90-day thermograph. A water gauge was installed in Chulitna Bay each year to monitor surface level fluctuations.

Salmon spawning areas were identified during the course of inventory activities on the ground and through use of aerial surveys.

Rivers were floated and lakes navigated using an Avon Redshank inflatable raft.

FINDINGS - WATERS

Portions of 27 lakes and 13 rivers within and adjacent to the proposed Park/Preserve were surveyed during the two-year study. A listing of these waters and the survey dates appears in Tables 1 and 2.

Limnological and physical data collected from the lakes surveyed is presented in Tables 3 and 4.

Waters within the proposed Park/Preserve can be separated into four major drainages as follows (refer to Figure 2):

Cook Inlet drainages	- waters tributary to Cook Inlet (eastern boundary of study area, Figure 3)
Lake Clark drainages	- waters tributary to Lake Clark and Six-mile Lake (central and southern portion of study area)
Mulchatna drainages	- waters tributary to the Mulchatna River (western portion of study area)
Stony River drainages	- waters tributary to Stony River (northwestern portion of study area)

Cook Inlet Drainages

Chakachamna Lake:

Chakachamna Lake is the second largest lake in the proposed Park/Preserve. Bue (1963) lists its surface area as 26 square miles. It is approximately 15 miles in length and averages about two miles in width and is situated in an east-west basin drained to the east by the Chakachatna River. Major inlet sources include Neacola River via Kenibuna Lake, Chilligan River,

Table 1. Waters Surveyed in the Proposed Lake Clark National Park/Preserve, 1978.

Waterbody	Watershed	Date Surveyed	Comments
Chilikadrotna River	Mulchatna River	Aug. 30	Aerial survey
Chilikadrotna River	Mulchatna River	Sept. 17-22	Float survey
Chokotonk River	Lake Clark	Sept. 16	Aerial survey
Chulitna River	Lake Clark	June 4	Riverboat (lower 7 mile)
Crescent River	Crescent River	June 10	Aerial survey
Crescent Lake	Crescent River	June 19-21	On site
Crescent River	Crescent River	June 21	On site (upper 1/2 mile)
Johnson River	Johnson River	June 10	Aerial survey
Johnson River	Johnson River	June 12-15	On site
Kijik Lake	Lake Clark	June 24-26	On site
Kijik Lake	Lake Clark	Sept. 16	Aerial survey
Kijik River	Lake Clark	June 26	On site
Kijik River	Lake Clark	Sept. 2	On site
Kijik River	Lake Clark	Sept. 16	Aerial survey
Kontrashibuna Lake	Lake Clark	June 10	Aerial survey
Kontrashibuna Lake	Lake Clark	Aug. 21-26	On site
Lachbuna Lake	Lake Clark	Sept. 2- 5	On site
Lake Clark	Kvichak River	June 5- 9	On site
Lake Clark	Kvichak River	June 18 and 28	Chulitna Bay
Lake Clark	Kvichak River	July 30	Chulitna Bay
Lake Clark	Kvichak River	Sept. 16	Aerial survey
Lake Clark	Kvichak River	Sept. 26-27	On site
Leon Lake 1/	Mulchatna River	Aug. 13-15	On site
Mulchatna River	Nushagak River	Aug. 10-13	Float survey
Mulchatna River	Nushagak River	Aug. 30	Aerial survey
Mulchatna River	Nushagak River	Sept. 22-23	Float survey
Necons River	Stony River	July 5	On site
Necons River	Stony River	Aug. 30	Aerial survey
Otter Lake	Lake Clark	June 28-29	On site
Portage Lake	Lake Clark	Aug. 31-Sept. 1	On site
Snipe Lake	Chilikadrotna R.	July 18-20	On site
Upper Tazimina Lake	Six Mile Lake	Sept. 7-11	On site
Lower Tazimina Lake	Six Mile Lake	Sept. 11-14	On site
Tazimina River	Six Mile Lake	Sept. 24	Partial aerial survey
Telaquana Lake	Stony River	July 10-16	On site
Telaquana Lake	Stony River	Aug. 30	Aerial survey
Telaquana River	Stony River	Aug. 30	Aerial survey
Tlikakila River	Lake Clark	June 29-30	Float survey
Tlikakila River	Lake Clark	Sept. 16	Aerial survey
Turquoise Lake	Mulchatna River	Aug. 6-9	On site
Turquoise Lake	Mulchatna River	Aug. 30	Aerial survey
Upper Twin Lake	Chilikadrotna R.	July 30-Aug. 1	On site
Upper Twin Lake	Chilikadrotna R.	Aug. 30	Aerial survey
Lower Twin Lake	Chilikadrotna R.	Aug. 1-Aug. 3	On site
Lower Twin Lake	Chilikadrotna R.	Aug. 30	Aerial survey
Lower Twin Lake	Chilikadrotna R.	Sept. 17	On site
Two Lakes	Stony River	July 3- 6	On site
Two Lakes	Stony River	Aug. 30	Aerial survey

1/ The author named this lake (located at 60° 37' N, 154° 18W)

Table 2. Waters Surveyed in the Proposed Lake Clark National Park/Preserve, 1979.

Waterbody	Watershed	Date(s) Surveyed		Comments
Caribou Lake	Koksetna River	July	27-29	On site
Chakachamna Lake	Chakachatna River	August	6 -11	On site
Chilikadrotna River	Mulchatna River	August	2	Aerial survey
Chokotonk River	Lake Clark	July	21	On site (lower 100 yards only)
Chulitna River	Lake Clark	June	5	On site
Chulitna River	Lake Clark	June	10-11	On site
Chulitna River	Lake Clark	June	20-21	On site
Chulitna River	Lake Clark	June	24-25	On site
Chulitna River	Lake Clark	June	30	On site
Chulitna River	Lake Clark	July	1	On site
Chulitna River	Lake Clark	August	3 - 4	On site
Fishtrap Lake	Chilikadrotna River	August	24-25	On site
Half-Cabin Lake	Mulchatna River	September	9	On site
Hickerson Lake	Hickerson Lake	July	2 - 4	On site
Hoknede Lake 1/	Chulitna River	August	27-29	On site
Hudson Lake	Tazimina River	July	15-17	On site
Kijik Lake	Lake Clark	June	6	On site
Kontrashibuna Lake	Lake Clark	September	5 - 7	On site
Lake Clark	Kvichak River	June	4 - 5	On site
Lake Clark	Kvichak River	June	27-29	On site
Lake Clark	Kvichak River	July	20-25	On site
Little Kijik River	Lake Clark	June	6 - 8	On site
Long Lake	Chulitna River	June	3	On site
Long Lake	Chulitna River	June	21-23	On site
Miller Creek	Lake Clark	July	25	On site
Mulchatna River	Nushagak River	September	9 -15	Float survey
Pickeral Lakes	Lake Clark	July	6 - 9	On site
Portage Creek	Lake Clark	July	24	On site
Tanalian River	Lake Clark	August	3	On site
Tazimina River	Lake Clark	July	16-17	On site
Tazimina River	Lake Clark	August	17-20	Float survey
Telaquana Lake	Stony River	July	18	Aerial survey
Turquoise Lake	Mulchatna River	July	18	Aerial survey

1/ Russell named this lake (located at 60° 06'N, 154° 55'W).

Table 3. Limnological Data, Selected Waters Within The Proposed Lake Clark National Park/Preserve, 1978.

Location	Sample Date	Surface Temp. °C	Dissolved Oxygen (ppm)	Alkalinity as $CaCO_3$ (ppm)	Total Hardness (ppm)	pH	Secchi Disc Transparency (m)	Maximum Known Depth (m)
Crescent L.	June 20	5.6	10	34	-	7.5	0.6	-
Kijik L.	June 24	9.4	10	34	-	7.5	17.8	99
Kontrashibuna L.	Aug. 24	12.8	10	17	34	8.0	2.3	108
Lachbuna L.	Sept. 2	11.1	10	34	34	7.5	1.0	37
Lake Clark	Sept. 26	8.9	11	34	34	7.5	2.3	262 3/
Loon L.	Aug. 14	13.9	-	-	-	-	-	-
Otter L.	June 28	16.1	13	102	-	10.0	2.3	3
Portage L.	Aug. 31	12.2	9	136	187	9.0	19.1	52
Snipe L.	July 19	12.2	9	51	-	8.5	6.7	16
Telaquana L.	July 13	8.9	11	51	-	8.0	3.8	130+
Turquoise L.	Aug. 6	13.9	10	34	34	8.0	0.8	103
Two L.	July 5	10.6	11	51	-	8.0	0.9	53+
Upper Tazimina L.	Sept. 9	9.4	10	17	34	7.5	5.0 1/	115
							13.0 2/	
Lower Tazimina L.	Sept. 12	12.2	10	17	34	8.0	12.0	62
Upper Twin L.	July 31	12.8	10	34	51	8.0	2.0	84
Lower Twin L.	Aug. 2	12.8	10	51	51	8.0	8.0	39
Chilikadrotna R.	Sept. 18	8.3	-	-	-	-	2.5	-
Johnson R.	June 12	5.6	-	-	-	-	0.4	-
Mulchatna R.	Aug. 9	14.4	-	-	-	-	0.9	-
Tlikakila R.	June 29	7.2	-	-	-	-	0.2	-

1/ East end

2/ West end

3/ Anderson, 1969

Table 4. Limnological Data, Selected Waters Within The Proposed Lake Clark National Park/Preserve, 1979.

Location	Sample Date	Surface Temp.° C	Dissolved Oxygen (ppm)	Alkalinity as C_aCO_3 (ppm)	Total Hardness	pH	Secchi Disc Transparency (m)	Maximum Known Depth (m)
Caribou L.	July 27	13.3	10 ppm	34	17	7.1	3.7	4
Chakachamna L.	Aug. 7	12.8	11 ppm	34	34	7.1	0.6	—
Fishtrap L.	Aug. 23	15.6	10 ppm	51	34	7.2	9.5	24
Hickerson L.	July 3	13.9	13 ppm	34	51	7.2	3.1	41
Hoknede L.	Aug. 27	15.0	10 ppm	51	34	7.1	3.7	8
Hudson L.	July 16	15.6	11 ppm	17	17	7.0	9.8	13
Kijik L.	June 6	7.2	13 ppm	34	34	7.2	4.9	99
Kontrashibuna L.	Sept. 6	11.7	12 ppm	17	17	7.1	2.2	108
Lake Clark-Sta.2	June 27	6.1	13 ppm	34	34	7.1	7.4	262
Lake Clark-Sta.3	Aug. 3	13.3	11 ppm	34	34	7.2	3.5	262
Lake Clark-Sta.4	July 20	14.4	13 ppm	34	34	7.1	0.3	262
Long Lake	June 21	13.9	12 ppm	26	34	7.5	3.1	3.1
Upper Pickeral L.	July 6	13.9	11 ppm	34	17	7.0	7.1	19
Middle Pickeral L.	July 7	15.0	11 ppm	34	17	7.2	2.2	2.2
Lower Pickeral L.	July 8	—	—	—	—	—	—	2.5

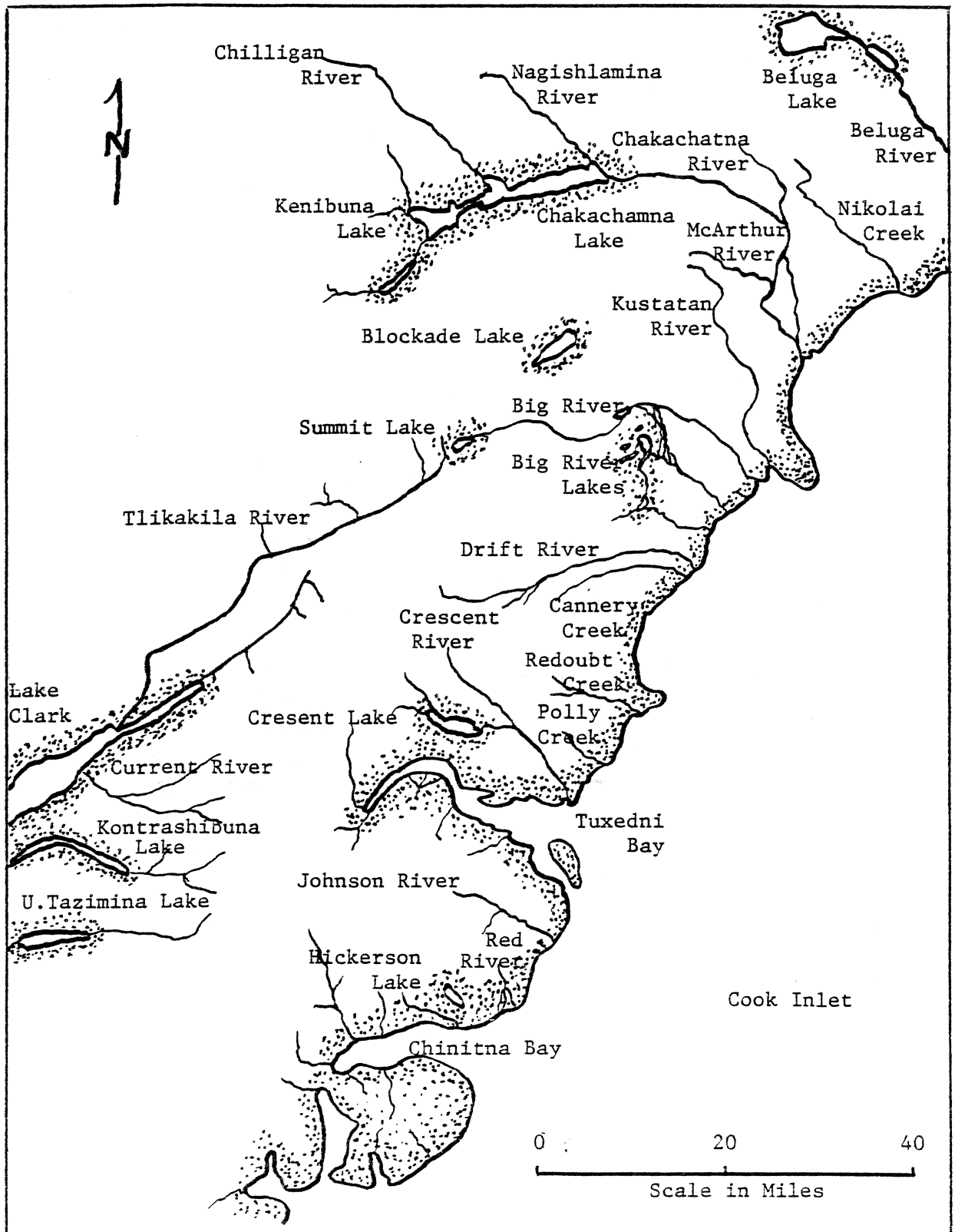

Figure 3. Westside Cook Inlet Drainages

and Nagishlamina River. Large active glaciers drain directly into the lake at several locations. Glacial icebergs were observed floating at the west end of the lake during the August 6-11, 1979 survey. Measured lake transparency (August 7) was 0.6 meters. Unfortunately, during this survey strong winds kept the lake surface so rough that raft travel was restricted to the immediate vicinity of camp in a sheltered area about a mile east of the Chilligan River outlet. Hence, no depth soundings were attempted and test fishing was limited to the same small area.

Test fishing produced catches of the following fishes: sockeye salmon (adults), lake trout, round whitefish, Dolly Varden, and slimy sculpins. Capture results by gear type and station are presented in Appendix A-1.

No other persons were observed at the lake during the survey. One previously used camp and a battered skiff were observed near our campsite, and a cabin at the east end of the lake was also noted. Due to the turbid, glacial nature of both the lake and its major tributaries recreational angling activity is probably slight in the area.

Crescent Lake - Crescent River:

Crescent Lake (60°23' N, 152°55' W) is a major source of Crescent River (tributary to Cook Inlet just north of Tuxedni Bay). The lake (see Figure 3) is approximately six miles long and two miles wide and lies in a glacially cut valley bordered on the north, west, and south by mountains and to the east by a forested valley. Run-off from glaciers and snow fields on the surrounding mountains enters the lake via small high-gradient tributaries. The only major inlet stream enters the lake from the northwest. Judging by the character of its surroundings the lake would appear to be quite deep (no soundings were made during the June 19-21, 1978 survey). The water is a milky green in color and measured transparency was 0.6 m (June 20, 1978).

Fish species inhabiting the lake include lake trout, Dolly Varden, chinook salmon, sockeye salmon, threespine stickleback, Gasterosteus aculeatus Linnaeus and coastrange sculpin, Cottus aleuticus Gilbert. Gill nets were fished at two locations in the lake yielding catch rates of 1.24 Dolly Varden and 0.88 lake trout per hour. Electrofishing in the major inlet stream yielded juvenile Dolly Varden and sculpins. Sockeye fry and stickleback were caught near the lake outlet. Fish capture results by gear type and sampling station are presented in Appendix A-2.

Recreational angling use of Crescent Lake appears to be significant. During the June 19-21 survey, 19 recreational anglers were observed fishing the lake outlet area. Two of these individuals also fished off the mouths of inlet creeks up the lake. One gentleman mentioned this was his fifth visit to the lake in recent years. During an aerial survey of the area on June 10, two float planes (presumably anglers) were observed parked at the lake outlet, and on July 29 a fishing guide and four of his clients returning from a fishing outing reported spending several days at the lake catching lake trout and Dolly Varden.

Based on test fishing results, the accessibility of Crescent Lake (suitable for the landing of large and small float planes), and the proximity of the area to major population centers along the Kenai Peninsula, the lake should be rated as having a high recreational angling potential.

Crescent River is floatable from Crescent Lake although there are several rapids with which to contend. Recreational angling occurs in at least the upper half mile of river below Crescent Lake.

Hickerson Lake:

Hickerson Lake (Figure 3) is located on the southeastern flank of Mount Iliamna. The lake, approximately 2.8 miles in length, sits at an elevation of 636 feet above sea level and is fed by run-off from snow fields and glaciers. A small tributary (Boulder Creek) enters from the north. The lake is unique in that it does not have a surface outlet. A large boulder pile extends across its southern end and any outflow is subterranean.

The lake was surveyed July 2-4, 1979. Depth soundings indicated a maximum depth of 41 meters. Measured transparency was 3.1 meters.

The only fish species captured in the lake was Dolly Varden. They were abundant (4.2/gill net hour), heavily parasitized (encysted nematodes and cestodes), and stunted. For catch per sample station see Appendix A-3.

Evidence of recent human visitation was observed at the north end of the lake. The nature of this use was not determined, and no one else was present at the lake during the survey. This scenic lake could support a recreational fishery for Dolly Varden.

Johnson River:

Johnson River (see Figure 3) is a tributary to Cook Inlet entering the Inlet at approximately 60°01' N, 152°37' W. It is a turbid river with the majority of its source originating from glaciers and snow fields on the southeast flanks of Mount Iliamna. Measured water transparency (June 12) was 0.4m. The river is multi-channeled in its lower reaches and judging by the number and condition of these channels the water levels must fluctuate quite significantly at various times during the year. Main channel width is approximately 35-40 m with an estimated stream velocity of four to five feet per second. River bottom is sand and fine gravel near the outlet, with small cobbles and gravel upstream. Bank vegetation is abundant above tidal influence.

Fish species captured in the river included Dolly Varden, coho salmon, chum salmon, pink salmon, Oncorhynchus gorbuscha (Walbum), chinook salmon, ninespine stickleback, Pungitius pungitius (Linnaeus), threespine stickleback and coastrange sculpin. Fish were captured using minnow traps, and dip nets (see Appendix A-4) in side channels approximately three miles upstream from the river outlet.

Recreational angling use is probably slight if present at all on this river. During peak run-off periods (mid-to-late summer) the river would not be wadeable due to depth and velocity.

Access to the river can be accomplished with wheel planes via nearby Cook Inlet beaches.

The river appears to be most significant as a salmon spawning and rearing stream.

Lake Clark Drainages (Figure 4)

Caribou Lake:

Caribou Lake is one of several small lakes in the headwaters of the Koksetna River (Figure 4). It is located at approximately 2,150 feet above sea level and is fed primarily by snow melt and springs from nearby alpine tundra hills. The lake is approximately 0.7 miles in length. It was surveyed July 27-29, 1979.

Depth soundings indicated a maximum depth of four meters. Measured transparency was 3.7 meters.

Fish species inhabiting the lake include Arctic char, Arctic grayling, and slimy sculpins. Several sets of very impressive rapids in the Koksetna River probably prevent upstream migration of Chulitna River fishes (pike, whitefishes, ciscos, salmon) into upriver areas including Caribou Lake. For catch per sample station see Appendix B-1.

No other persons were present at the lake during the survey. However, four old campsites were observed in the vicinity and air charter companies serving the local area reported dropping people off at the lake in previous years on combination hunting/fishing excursions. The lake is an excellent access point for hunting, fishing, and backpacking trips.

Chokotonk River:

Chokotonk River (see Figure 4) is a tributary to Little Lake Clark (that portion of Lake Clark separated from the rest of the lake by the Tlikakila River delta). The river is glacial, approximately 19 miles in length, and has a gradient of 41 feet per mile (Demory et. al., 1964). Its source is primarily glacial melt and surface run-off from the Chigmit Mountains located to the east.

The river flows through a forested (spruce, birch, cottonwood) valley and empties into the glacially discolored waters of Little Lake Clark.

The lower half-mile of river was foot surveyed July 21, 1979. Electrofishing yielded only ninespine sticklebacks, slimy sculpins, and coast-range sculpins.

Sockeye salmon spawn in the river but are difficult to count accurately due to glacial turbidity. An aerial survey of the entire river taken

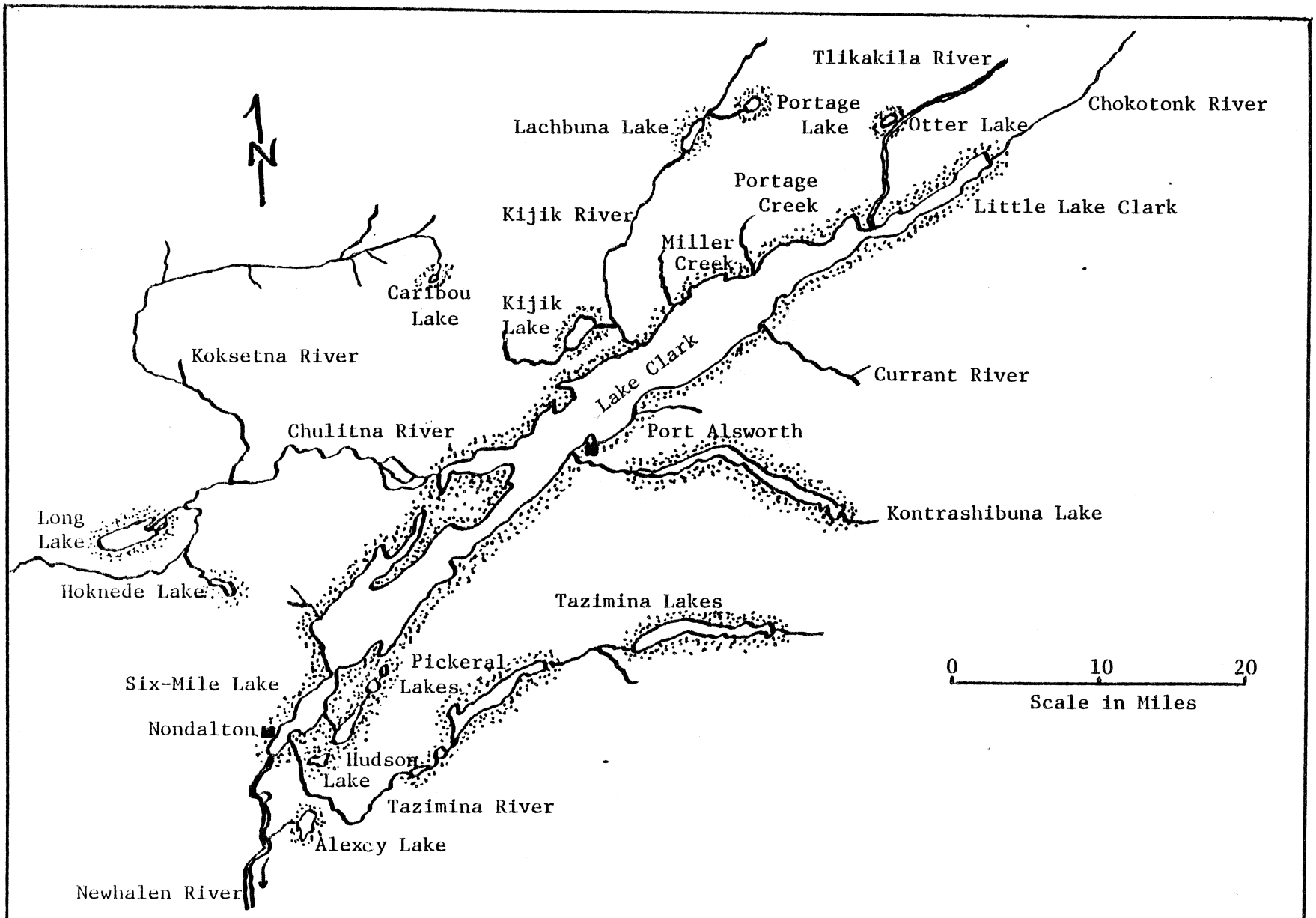

Figure 4. Lake Clark Drainage

September 16, 1978 yielded a count of at least 1,875 sockeye spawners. Most were observed spawning in side channels approximately four miles upstream from Little Lake Clark.

No recreational fishing, or floating of the Chokotonk has been observed by or reported to the author. Potential for either is slight at best. The river outlet is accessible by boat from Little Lake Clark, and to float planes. There are no float plane landing sites or wheel strips upstream. There are several sets of Class III - Class IV rapids in the upper river area. From a recreational standpoint the main use of this river is probably as a hiking route to the uplands and glaciers nearby.

Chulitna River:

Chulitna River is a major tributary to Lake Clark entering from the west (Figure 4). Over its length (approximately 90 miles) this river meanders through a broad forested lowland valley, with sources including a large number of tundra ponds, some large shallow lakes (Long Lake and Nikabuna Lakes), the Koksetna River, and a variety of small tributary creeks. The river is slow flowing (1.5-2.0 fps) and the water is brownish in color due to organic debris (transparency = 1m.).

Portions of the lower 15 miles were test fished during June, July, and August 1979. Fish species found inhabiting the river included northern pike, Arctic grayling, burbot, longnose suckers, humpback whitefish, round whitefish, least ciscos, sockeye salmon, ninespine stickleback, and slimy sculpins. It is probable that Arctic char and Dolly Varden are also present as Arctic char were caught in Caribou Lake. One sighting of a chinook salmon migrating up the river was made by the Hornbergers in August 1978. For catch results by gear type and station see Appendix B-2.

Recreational use of Chulitna River is primarily hunting and fishing oriented. During 1978, at least 30 anglers reported fishing the river for northern pike and Arctic grayling. Another 38 anglers were observed fishing the river during 1979. Most were guided parties. Potentially this activity can be expected to increase. The river is floatable from Nikabuna Lakes or Long Lake but the Koksetna River fork should not be floated by other than experts (and only after thorough inspection of its several sets of Class IV - V rapids).

Access to the river is often accomplished with shallow draft boats from Lake Clark. Landing float planes is also possible on Nikabuna Lakes and Long Lake.

Hoknede Lake:

This lake, located at 60° 06'N, 154° 55'W, is tributary to the Chulitna River (Figure 4). It was given the name Hoknede Lake by the author due to its proximity to Hoknede Mountain. The lake is approximately 1.5 miles in length and is located at an altitude of 423 feet above sea level. It is fed by run-off and several tiny creeks, and drains via a small outlet

stream into Chulitna River approximately 3.5 miles to the west. Terrain surrounding the lake is forested.

Hoknede Lake was surveyed August 27-29, 1979. Depth soundings yielded a maximum depth of eight meters. Measured transparency was 3.7 meters. Large portions of shallow shoreline areas supported emergent aquatic vegetation. The lake outlet was blocked by a beaver dam.

Fish species captured in the lake included northern pike, least ciscos, ninespine stickleback, and slimy sculpins. Catch results per sample station and gear type appear in Appendix B-3.

No other persons visited the lake during the survey. At least one guide reported fishing the lake during the summer of 1979.

Hudson Lake:

Hudson Lake is located at 59° 56' N, 154° 48'W and is a major access point for recreational anglers visiting the nearby Tazimina River (Figure 4). The lake is approximately 1.5 miles in length with no inlet or outlet streams. Portions of the shoreline are forested. Lake elevation is approximately 315 feet above sea level.

The lake was surveyed July 15-16, 1979. Depth soundings yielded a maximum depth of 13 meters and measured transparency was 9.8 meters.

Fish species captured included lake trout, round whitefish, ninespine stickleback, and slimy sculpins. Capture results by sample station and gear type appear in Appendix B-4.

No other persons visited the lake during the survey although recent campsites were noted near the west end of the lake and guides reported using the lake for access to Tazimina River during both 1978 and 1979. One semi-permanent tent camp was noted near the northwest corner of the lake, and the remains of a log cabin (purportedly started by Mr. Oren Hudson) are still standing where the foot trail from Hudson Lake reaches Tazimina River.

Kijik Lake:

Kijik Lake (60° 18' N, 154° 20' W) is a major source of Kijik River (tributary to Lake Clark). The lake (see Figure 4) is approximately two miles in length and three-quarters of a mile in width, and is fed directly by run-off from large mountains flanking its east and west sides. Additional source water is provided by a major inlet and springs located at the south end of the lake. Lake elevation is approximately 350 feet above sea level. Surrounding terrain is forested.

Surveys were conducted June 24-26, 1978 and again on June 6, 1979.

Depth soundings yielded a maximum depth of 99 meters. The lake bottom drops off sharply along both the east and west sides but major littoral areas occur at the north and south ends. Measured transparency readings were 17.8 meters (June 24, 1978) and 4.9 meters (June 6, 1979).

No sampling was conducted in the river itself. An aerial survey (September 16, 1978) yielded an estimate of 4,200-6,500 sockeye salmon in the river and its side sloughs below its confluence with Little Kijik River. A similar survey was conducted October 25, 1979 by Mr. Poe and 15,500 live salmon were observed (many dead were also noted but some may have washed down from Kijik Lake). Spawning was occurring in the side channels. Juvenile Arctic char and sculpins were observed (September 2, 1978) in the outlet that enters Kijik River from Portage Lake. Grayling and round whitefish were present June 26 at the confluence of Kijik River and Little Kijik River.

Recreational angling on the mainstem Kijik River is probably very limited due to river conditions. However, anglers frequently fish the mouth of the river (Lake Clark) according to local area residents. The river is not recommended for recreational floating due to treacherous rapids.

Access to the river mouth is possible by boat on Lake Clark. Float plane landings are possible on Lachbuna and Portage Lakes and small wheel planes are presently used on occasion to land on river bars in the upper river area (west of Portage Lake) mainly for hunting and backpacking access.

Kontrashibuna Lake:

Kontrashibuna Lake (elevation 459 feet) is the major source of Tanalian River, a tributary entering Lake Clark from the east (Figure 4). The lake is approximately 13 miles in length and one-half to one mile in width. It is glacial in origin and lies in a forested basin bordered by high jagged mountains. It is fed directly from snow fields by small high gradient tributaries and also by a major inlet stream at its east end. Depth soundings indicate a maximum known depth of 108 m. The U.S.G.S. has a water gauge in the lake outlet and has recorded flows of 500-800 cfs (Demory, et al., 1964). Measured water transparency was 2.3 meters (August 24, 1978) and 2.2 meters (September 6, 1979). Surveys were conducted August 21-26, 1978 and September 5-7, 1979.

Fish species inhabiting the lake include lake trout, Arctic char, pygmy whitefish, Prosopium coulteri (Eigenmann and Eigenmann) and slimy sculpins. A large waterfall located on Tanalian River approximately one mile downstream of the lake outlet is a total barrier to upstream fish migration. This barrier is probably responsible for the limited number of fish species present in the lake as opposed to Lake Clark (19 species) four miles downstream. See Appendix B-6 for capture results by gear type and sample station.

Recreational angling does occur at Kontrashibuna Lake. During the August 21-26, 1978 survey of the lake three skiffs were observed beached at various locations awaiting future use. No anglers were observed. One local resident of the Lake Clark area reported taking friends to the lake during early June for lake trout, and they experienced good success. Recreational angling on this lake can be expected to increase due to easy float plane access, close proximity to Port Alsworth, spectacular scenery in the area, and the availability of lake trout and Arctic char throughout the lake.

Fish species inhabiting Kijik Lake include lake trout, Arctic char, Arctic grayling, sockeye salmon, round whitefish, longnose sucker, slimy sculpin, and ninespine stickleback (see Appendix B-5 for catch results by capture gear and sampling station).

Recreational use of Kijik Lake is mainly angling oriented at present. The lake is well known for its excellent Arctic grayling, Arctic char, and sockeye fishing. During the three days (June 24-26) spent there in 1978, a total of 10 anglers were observed fishing the lake and its outlet. Two different guides brought people in. A third guide reported taking seven anglers to the lake on July 1. During subsequent over flights (August 6 and September 16, 1978) anglers were observed on each occasion. These sightings and reports are incomplete but they indicate the lake does support significant recreational angling effort. A voluntary creel census sent to local angling guides during 1975 (Gwartney, 1976) indicated a minimum of 26 guided anglers fished the lake and its outlet that summer (unguided trips were not reported).

The lake is accessible by float plane. Persons with access to a boat on Lake Clark can travel to the Kijik River outlet and reach the lake after a hike of approximately 2.5 miles.

The lake and its outlet are important in one other respect. They provide some of the most outstanding spawning conditions for sockeye salmon in the Kvichak River drainage. During an aerial survey of these areas September 16, 1978, the author estimated 65-70,000 live sockeye present in Kijik Lake littoral areas with another 3-5,000 already dead. Tributary streams at the south end of the lake had another 5-7,000 spawners and the outlet river (Little Kijik River) had another 26-30,000. These collectively total 99-112,000 sockeye spawners. A much more experienced sockeye surveyor, Mr. Pat Poe (F.R.I.) counting concurrently estimated 138,150 sockeye in the same overall area (Poe, 1978). His survey should be regarded with greater confidence. Mr. Poe surveyed the lake again in late October 1979 (after the spawning peak) and his index of abundance estimate was 291,200 (Poe personal correspondence). These surveys are only an index to the total run into these waters as a surveyor cannot possibly see all the fish using the area. This area contributes significantly to the sockeye production within the Kvichak River drainage.

Kijik River:

This tributary to Lake Clark (see Figure 4) originates in a glacial valley to the north of Portage Lake and is fed by Portage, Lachbuna, and Kijik Lakes as it descends(approximately 50 miles) to Lake Clark. The river is quite glacial in nature (estimated transparency less than one meter). In its upper reaches (upstream of Lachbuna Lake) it is braided, but below Lachbuna it becomes a single channel and flows through a canyon where it drops at a rate of approximately 45 feet per mile. This stretch of rapids is impassable to upstream migrating fish. Main channel width of the river in its lower reaches is approximately 30 meters.

Table 5. Summer Water Level Fluctuations, Chulitna Bay, Lake Clark, 1978-1979.

1978		1979	
Date	Water level gauge readings (mm)	Date	Water level gauge readings (mm)
June 3	0	June 2	0
June 11	22	June 4	25
June 18	311	June 8	64
June 22	431	June 11	114
June 27	711	June 20	343
July 1	775	June 25	431
July 10	959	June 29	527
July 16	1,118	July 5	673
July 20	1,206	July 14	838
July 30	1,289	July 19	889
August 5	1,423	July 29	983
August 19	1,511	August 3	889
August 30	1,556	August 6	838
September 6	1,080	August 12	958
September 17	896	August 22	1,108
September 24	661	August 26	914
		September 5	381
		September 8	203
		September 16	51

Lachbuna Lake:

Lachbuna Lake (Figure 4) is a major component of the Kijik River drainage. It is located approximately 18 river miles upstream of Kijik River's outlet into Lake Clark. The lake is approximately two and one-half miles in length with a maximum width of one mile. Major source streams include the upper section of Kijik River (entering from the northeast) and College Creek (entering from the northwest). The lake basin lies in a forested glacial valley just upstream of the Kijik River canyon. Depth soundings yielded a maximum depth of 37 m. Measured transparency was 1.0 meter. The lake was surveyed September 2-5, 1978.

Fish species inhabiting the lake include lake trout, Arctic char, and slimy sculpin. The rapids of Kijik River canyon have apparently prevented successful colonization of this lake by other species dwelling downstream in Kijik Lake and Lake Clark. Capture results by gear type and sample stations are presented in Appendix B-7.

Although none were observed during the survey, some recreational angling does occur at Lachbuna Lake (lost lures were found near the mouth of College Creek). There is one cabin located near the lake outlet. It appears to be recreational in nature (river boat, meat rack, etc.). There is also abundant evidence of previous camping activity around the shoreline of the lake (garbage, old lean-tos, meat racks) that are attributable to recreational hunting parties. One such party (caribou hunters) was present during our stay.

Access to Lachbuna Lake is accomplished using float planes. Also, small planes (wheeled) have been observed landing on river bars (Kijik River) upstream of the lake.

Lake Clark:

Lake Clark (Figure 4) is the second largest lake basin in the Kvichak River drainage and the sixth largest freshwater lake in Alaska. It is approximately 46 miles in length and varies from 1.5 to five miles in width. Major tributary sources include Tanalian River, Currant River, Chokotonk River, Tlikakila River, Kijik River and Chulitna River. The lake empties through a short narrows into Sixmile Lake which is subsequently drained by the Newhalen River. Total watershed drained by Lake Clark and Sixmile Lake combined is approximately 3,700 square miles (Demory, et. al, 1964). Bathymetric measurements of the lake (Anderson, 1969) indicate a total surface area of 266.8 km^2, a total volume of 27.3 km^3, a mean depth of 102.5 m, and a maximum depth of 262 m. The lake is glacial in nature. The shoreline is forested (spruce, birch and willow mainly).

Seasonal lake level fluctuations (1978, 1979) and surface temperature fluctuations (1978) over the summer were monitored at Chulitna Bay. Peak lake levels occurred August 30, 1978 and August 22, 1979 (see Table 5). Lake surface temperatures (see Table 6) measured one meter below the surface ranged from a low of 8.5°C (June 24) to a high of 19.1°C

(August 2-3). Chulitna Bay, due to its shallow nature, may be warmer than other areas of the lake.

At least 19 species of fish inhabit the lake including lake trout, Arctic char, Arctic grayling, burbot, northern pike, Dolly Varden, humpback whitefish, round whitefish, pygmy whitefish, least cisco, rainbow trout, sockeye salmon, chinook salmon, pink salmon, longnose sucker, slimy sculpin, coastrange sculpin, threespine stickleback, and ninespine stickleback. It is also probable that on occasion coho salmon and chum salmon may enter the system in small numbers similar to the chinook and pink salmon mentioned above. Least ciscos, humpback whitefish, longnose sucker, round whitefish, lake trout and Arctic grayling were the resident species captured most commonly in gill nets during 1978-1979 (see Appendix B-8 for capture results by gear type and sample station). Rainbow trout, Arctic char, and Dolly Varden are not abundant in the lake according to local residents. The lake is a major contributor to the sockeye salmon production of the Kvichak River drainage.

Recreational angling occurs at various locations in Lake Clark. During 1978 anglers were observed on three occasions (7 anglers total) fishing the lake. One party was trolling in the vicinity of Port Alsworth. The others were fishing at the mouths of tributary streams. During 1979, angling activity was observed in Chulitna Bay and off the mouths of the Tanalian and Kijik Rivers. Angling effort on the lake is much higher than that represented by these observations.

A fishery of major significance is the "subsistence" fishery conducted around the lake by local residents utilizing gill nets. Sockeye salmon (see Table 7) are the main species captured, although resident species are also utilized (especially in years of low salmon abundance). Gasbarro (1974) estimated the 1973 harvest of fish for personal use by Nondalton residents (based on a house-to-house survey in the village) to include: 18,822 sockeye salmon 1/, 940 whitefish, 281 pike, 1,782 grayling, 62 Arctic char/Dolly Varden, 157 rainbow trout and 730 lake trout. Subsistence fishing activities occur throughout the inshore Lake Clark and Sixmile Lake areas (generally near salmon spawning streams, in protected bays, or near human habitations).

Access to Lake Clark can be accomplished by plane (float or wheeled). A public wheel landing strip is located at Nondalton. There are several additional private strips elsewhere around the lake. There is also a road from Iliamna to the Newhalen River portage from which a person can reach the lake by boat.

Little Kijik River:

This short river (approximately one mile in length) drains Kijik Lake and

1/ Gasbarro's sockeye salmon catch totals are significantly greater than those compiled by A.D.F.&.G. for 1973 (Table 7). His survey method was probably more accurate than the voluntary return of subsistence permits utilized by A.D.F.&.G.

Table 6. Lake Water Temperatures, 1/ Chulitna Bay, Lake Clark, June 11 - September 8, 1978.

Date	High	Low	Date	High	Low	Date	High	Low
June 11	17.0	15.0	July 11	14.0	12.6	Aug. 10	16.4	15.5
12	15.5	13.6	12	13.3	11.5	11	16.7	15.7
13	14.0	12.0	13	13.1	11.6	12	16.2	15.1
14	12.6	9.8	14	13.0	11.6	13	15.0	13.5
15	12.5	10.5	15	11.5	10.9	14	13.4	12.0
16	10.6	8.8	16	12.8	11.0	15	12.3	11.6
17	10.0	9.0	17	12.6	11.7	16	12.4	12.2
18	10.4	8.8	18	12.8	12.0	17	12.8	12.0
19	12.0	9.0	19	12.3	11.7	18	13.7	12.6
20	14.0	9.4	20	11.8	11.1	19	13.6	12.6
21	15.0	12.0	21	11.4	10.0	20	12.6	11.7
22	14.1	12.0	22	12.1	10.8	21	12.4	11.6
23	12.0	9.5	23	12.9	11.0	22	13.6	12.2
24	11.9	8.5	24	12.6	12.0	23	13.2	12.5
25	11.0	9.3	25	13.7	11.9	24	14.0	12.5
26	11.0	9.0	26	14.1	12.7	25	14.5	13.3
27	11.3	9.3	27	14.8	13.3	26	14.5	13.5
28	13.4	9.9	28	16.0	13.5	27	14.6	13.4
29	12.7	10.9	29	16.7	14.8	28	14.2	13.2
30	11.4	9.7	30	16.8	15.3	29	13.1	11.9
July 1	11.5	10.0	31	17.5	15.4	30	12.0	11.4
2	11.0	9.7	Aug. 1	18.3	16.5	31	12.7	11.7
3	10.1	9.5	2	19.1	17.3	Sept. 1	12.7	11.8
4	12.0	9.6	3	19.1	17.9	2	13.0	11.7
5	11.5	10.5	4	18.8	17.8	3	12.5	11.5
6	11.4	10.5	5	18.7	17.4	4	11.5	10.9
7	12.0	10.4	6	18.8	17.7	5	11.0	10.6
8	13.2	10.7	7	18.6	18.0	6	10.7	10.1
9	13.0	12.2	8	18.0	17.0	7	10.5	9.8
10	14.0	11.6	9	17.0	15.9	8	10.0	9.5

1/ Temperatures = ^{0}C
Thermograph set 1 meter below lake surface.

flows into the mainstem Kijik River. It is a clear, gravel bottomed river flowing through a mixed spruce-birch-cottonwood forest. Several deep pools are present in the upper quarter-mile of river followed by a series of long runs and shallower riffles for the next half-mile. The lower quarter-mile of river is again characterized by deeper pools and several bedrock outcrops. Main channel width averages approximately 25 meters and stream velocity averages 2 f.p.s.

The river was foot surveyed June 26, 1978, and June 6-8, 1979. An aerial survey was conducted September 16, 1978.

Fish species inhabiting Little Kijik River include Arctic grayling, Arctic char, round whitefish, longnose suckers, sockeye salmon, ninespine sticklebacks, and slimy sculpins. For capture results by gear type see Appendix B-9.

The river is well known by local guides and anglers for its grayling and sockeye fishing. Anglers are usually dropped off at the Kijik Lake outlet and they fish the river below. The magnitude of angling use is substantial for a wilderness stream.

The river is very important as a sockeye salmon migration route and spawning area. During the September 16, 1978 aerial survey an estimated 26-30,000 sockeye were observed in the stream. Many of these were spawning at that time and others were waiting to join the 100,000 plus that had earlier passed through the river and were spawning in Kijik Lake. (Mr. Poe estimated 15,300 sockeye spawning in the river during his Oct. 25, 1979 survey). During the June 6-8, 1979 survey sockeye fry were tremendously abundant both along the Kijik Lake shoreline and in Little Kijik River. The easily recognizable remains of an old native village (or fish camp) approximately one-half mile downstream of the Kijik Lake outlet supports the view that the river has been an important salmon producer for some time.

Long Lake:

Long Lake is a major component of the Chulitna River drainage (refer to Figure 4). It is located approximately 15 river miles upstream of the Chulitna River outlet, at an elevation of 306 feet above sea level. The lake is approximately four miles in length and one mile in width. It is fed by several tiny tributaries and empties into the Chulitna River. The shoreline is forested (spruce, birch, willow) and the lake itself supports abundant submerged and emergent aquatic vegetation. Maximum depth is 3.1 meters. Measured transparency (June 21, 1979) was 3.1 meters.

The lake lies just outside the proposed Park/Preserve boundaries (Figure 2) but may be a significant producer of pike and other fish that reside in the Chulitna River. It was surveyed June 3 and June 21-23, 1979.

Fish species found present in the lake included northern pike, humpback whitefish, longnose suckers, and slimy sculpins. Fish capture results by gear type and sample stations appear in Appendix B-10.

Table 7. Subsistence Catch of Salmon by Villages in the Lake Clark Area, 1924 - 1978.

Year	Nondalton		Port Alsworth		Lake Total	
	Sockeye	Other	Sockeye	Other	Sockeye	Other
1924					50,000 1/	
1925					2,560 1/	
1926					33,920 1/	
1963	25,000 2/	-	-	-	25,000	-
1964	35,000	-	-	-	35,000	-
1965	-	-	-	-	-	-
1966	45,800	-	-	-	45,800	-
1967	29,600	-	-	-	29,600	-
1968	33,700	-	-	-	33,700	-
1969	44,000	-	-	-	44,000	-
1970	42,900	-	-	-	42,900	-
1971	22,100	9 chinook	-	-	22,100	9 chinook
1972	24,100	-	-	-	24,100	-
1973	8,500	-	-	-	8,500	-
1974	29,509	1 chinook	1,465	-	30,974 3/	1 chinook
1975	48,704	-	2,078	-	50,786 3/	-
1976	20,175	-	4,881	-	25,371 3/	-
1977	27,175	1 pink	4,897	-	32,072 3/	1 pink
1978	17,289	-	3,020	-	20,309 3/	-
1979	14,749	-	4,224	-	18,973 3/	

1/ Source - U.S. Bureau of Fisheries 1924, 1925, 1926

2/ Source - Schroeder, 1974

3/ Source - Donald Bill, Commercial Fisheries Division, ADF&G, King Salmon

Pickeral Lakes (Upper, Middle, Lower):

This string of small lakes empties into Sixmile Lake via a short outlet creek (refer to Figure 4). They were surveyed July 6-9, 1979.

The upper lake is approximately three-quarters of a mile in length and is fed by run-off and springs. It drains via a tiny outlet creek into Middle Pickeral Lake. The shoreline is forested and there are two small islands in midlake. Maximum depth located in this upper lake was 19 meters.

Middle Pickeral Lake is approximately 1.5 miles in length. It is shallow (maximum depth = 2.2 meters) and fed by several small tributary streams. The bottom is sandy and supports large areas of submerged and emergent aquatic vegetation. The lake drains through a marsh via a small outlet stream into Lower Pickeral Lake.

Lower Pickeral Lake is the largest of the three lakes (approximately 2.3 miles in length). It is also shallow (maximum depth = 2.5 meters) with a sandy bottom (some areas could be considered "quick sand") and is fed by several small tributaries.

Fish species inhabiting these lakes include northern pike, humpback whitefish, round whitefish, least ciscos, Arctic grayling, and slimy sculpins. Sockeye salmon in small numbers were observed in the lower lake and its outlet during an over flight in late August. Capture results by gear type and sample station appear in Appendix B-12.

No anglers were observed at the lakes during these surveys. One local fishing guide is known to have used the lakes over the past several years. Access to the lakes is via float plane.

Portage Creek:

Portage Creek enters Lake Clark from the north (see Figure 4). It is a small stream (average width approximately 2.5 meters) with a gravel/small cobble bottom and lots of bank cover. Stream velocity (July 24, 1979) was an estimated 2.5 f.p.s.

The lower quarter mile of stream was test fished with electrofishing equipment July 24, 1979. Fish species captured included Dolly Varden and slimy sculpins.

There is no known recreational angling in Portage Creek.

There has been an on-going hydraulic mining operation several miles upstream of the creek outlet for a number of years.

Access to the creek is mainly by boat on Lake Clark or by float plane.

Portage Lake:

Portage Lake (Figure 4) is one major source of Kijik River. The lake (elevation 1,470 feet) lies in a forested pass connecting the Kijik and Tlikakila River valleys. It is a deep, clear lake (maximum depth = 52 m,

Long Lake is locally regarded as a producer of large pike. Individual fish in excess of 20 pounds have been taken with hook and line. Local guides utilize the lake when they have clients who are pike fishing enthusiasts.

Anglers reach the lake either by float plane or by shallow draft boats via the Chulitna River. None were observed at the lake during the above surveys.

Miller Creek:

This small stream drains into Lake Clark to the north of Kijik River (see Figure 4). It is a clear stream with a gravel and rubble bottom. Stream width averages approximately four meters and current velocity (July 25, 1979) was an estimated two feet per second. Tree roots, debris, undercut banks, and pools on stream meanders all provide adequate cover for fish life.

The lower 400 meters of creek was surveyed July 25, 1979. Electrofishing was utilized to test fish this area. Fish species captured included Arctic grayling, Dolly Varden, burbot, and slimy sculpins. See Appendix B-8 (Station 23) for capture results by gear type.

Angling activitiy in Miller Creek is believed to be minimal.

Otter Lake:

Otter Lake (Figure 4) is located on the west side of the Tlikakila River approximately seven miles upstream of the river mouth. It was surveyed June 28-29, 1978. The lake is approximately three-quarters of a mile in length, shallow (maximum known depth = 2.3 m), and more alkaline in nature (see Table 3) than all but one of the other lakes sampled during the 1978-1979 surveys (the most alkaline was Portage Lake located within three miles of Otter Lake). Aquatic vegetation is abundant in the lake and the shoreline is forested (spruce, willow, alder). There are no inlet streams and a tiny outlet (blocked by a beaver dam during this survey) connects the lake to Tlikakila River. Aquatic invertebrates (amphipods, gastropods, ostracods, insects and leeches) were visibly abundant in the lake.

Fish species captured in the lake included longnose sucker and ninespine stickleback. One large fish thought to be a pike was observed but not captured. Capture results by gear type and sampling location are presented in Appendix B-11.

No evidence of recreational angling on this lake has been documented. Evidence of an old trapping camp on the lake was noted.

Access to the lake is accomplished utilizing small float planes and persons floating the Tlikakila River also make the short hike from the river to the lake without difficulty.

miles in length and averages about three-quarters of a mile in width. Maximum known depth is 115 m. Lower Tazimina Lake is approximately 7.3 miles in length with a maximum width of 1.8 miles. Maximum known depth is 62 meters. Water transparency ranges from five meters at the east end of Upper Tazimina to 12 meters at the west end of Lower Tazimina. The lakes lie in a forested glacial basin and are connected by approximately seven miles of river. A number of small creeks feed the lakes but major tributaries consist of a large stream entering Upper Tazimina Lake at its east end and another large stream entering the interconnecting river from the south. Tazimina River which drains the lakes has a large waterfall nine miles upstream from its confluence with Sixmile Lake, thus the Tazimina Lakes are inaccessible to fish species inhabiting the lower river. These lakes were surveyed September 7-14, 1978.

Fish species inhabiting the lakes include Arctic char, Dolly Varden, Arctic grayling, slimy sculpin, and threespine stickleback (see Appendices B-14, B-15) for capture results by gear type and sample station). Conspicuously absent are lake trout. The abundance of Arctic char in these two lakes was far greater than in any other lakes sampled during the project.

Recreational angling occurs at both lakes. During surveys in the area two guided anglers were observed September 11 fishing near the outlet of Upper Tazimina Lake. Several pieces of fishing tackle were found in the river that interconnects the two lakes. There was a make-shift pole raft and a well used campsite at the outlet of the upper lake. One camp site with a boat stashed nearby was observed on the lower lake. The river connecting the two lakes is locally known as a pleasant one-day float trip.

Access to these lakes is by float plane only.

Tazimina River:

Tazimina River drains from Tazimina Lakes into Sixmile Lake, a distance of approximately 17 river miles. Over this distance the river drops 401 feet in elevation with most of the drop occurring over a short stretch of water approximately eight miles downstream of Lower Tazimina Lake. There the river cuts through a northern flank of Road House Mountain and drops about 250 feet in little over a mile. Below this point the lower river meanders through a wooded valley to Sixmile Lake. The river is clear throughout.

On-site surveys were conducted on the river July 16-17 and August 17-20, 1979. Additionally, portions of the river were observed during over-flights to other areas on other days.

Fish species inhabiting the river below the falls include: rainbow trout, Arctic char, sockeye salmon, round whitefish, Arctic grayling, threespine stickleback, longnose sucker, and slimy sculpin. For capture results by gear type see Appendix B-16.

Large escapements of sockeye salmon spawned in the river during 1978 and 1979. Mr. Pat Poe (F.R.I.) aerially surveyed the stream near the peak of sockeye spawning each year. His point estimate of spawners observed

measured transparency = 19.1m) approximately a mile and a quarter in length and a half-mile in width. It is the most alkaline of the lakes sampled in the Lake Clark area (total alkalinity as C_aCO_3 = 136 ppm). There are no major inlet creeks. Its outlet feeds Kijik River approximately two miles to the west. It was surveyed August 31 - September 1, 1978.

Fish species inhabiting the lake include lake trout, Arctic char, and slimy sculpin. These are the same species found in Lachbuna Lake farther downstream in the drainage. Capture results by gear type and location are presented in Appendix B-13.

Recreational angling occurs at Portage Lake (often referred to locally as Teardrop Lake). The lake shoreline at the east and west ends shows ample evidence of previous camping activity. Some are obviously hunting related (meat racks, broken hunting arrows, etc.). One local air charter company reported having dropped off 20 backpackers on this lake during July, 1978.

Access to the lake is by float plane.

Tanalian River:

This is a major tributary river originating at Kontrashibuna Lake and entering Lake Clark near Port Alsworth (Figure 4). A major waterfall approximately one-half mile downstream of Kontrashibuna Lake presents a total barrier to upstream migration. The river below the falls is rocky and fairly rapid with an average main channel width of approximately 30 meters. The river is clear in summer and apparently fluctuates in volume considerably as a number of side channels and abandoned channels are present in the lower mile. There is a U.S.G.S. water gauge in the outlet of Kontrashibuna Lake and the river is described as having a flow range (USGS) year unknown) of 500-800 cfs (Demory et.al. 1964).

The lower river was surveyed August 3, 1979. Electrofishing yielded round whitefish, burbot, Arctic grayling, Dolly Varden, and slimy sculpins. Adult sockeye salmon were observed but not captured. Capture results are presented in Appendix B-8 (Station 24).

One angler was observed fishing for lake trout and grayling near the river outlet during the above survey. The outlet is known to be a popular recreational angling area--especially for Port Alsworth residents and visitors.

Access to Tanalian River is possible utilizing float planes or boats on Lake Clark. There is a private wheel plane landing strip at Port Alsworth where for a fee one can land and then reach the river after a short hike.

Tazimina Lakes (Upper and Lower):

These two lakes (Figure 4) are the major source of the Tazimina River (tributary to Sixmile Lake). They are catch-basins for a watershed of approximately 350 square miles. Upper Tazimina Lake is approximately 8.5

Access to the river is accomplished using small aircraft (either wheeled or on floats) and boats. Some of the upriver bars are utilized by wheeled planes. Float planes are landed at Summit Lake (60°48' N, 152°44' W), at Otter Lake, and at the river outlet. Shallow draft jet-powered boats could be used to reach upriver areas from Lake Clark.

Mulchatna River Drainages (Figure 5)

Chilikadrotna River:

The Chilikadrotna River (see Figure 5) originates at Twin Lakes (elevation 1,979 ft.) and flows in a southwesterly direction approximately 60 miles before joining the Mulchatna River (elevation 825 ft.).

At its origin the river is clear, 25-30 m. in width, single channeled, with mid-channel depths ranging from 1.0 to 2.5 meters. River velocity in the upper four to five miles averages approximately one meter per second. The river cuts through a terminal moraine in the upper area and is somewhat rocky in nature. Large pools are present on several of the bends and intermittent gravel areas provide suitable spawning areas for salmonids (especially chinook salmon). After leaving the moraine the river widens, slows for about three miles, and flows through a marshy upland area. It then narrows, gathers speed, and begins its cut through the Bonanza Hills. For the next 18-20 miles it is best described (using the international white water rating system) as mostly Class II white water with a few Class III areas (for white water rating scale, see Norman, 1976). The river elevation over this stretch drops 600-700 feet, or approximately 35 feet per mile. Erosive processes cause the water clarity to diminish (transparency 2-3m). Two tributaries of significant size and volume enter the river during this stretch, Snipe Lake Creek (the author's name for this creek) and the Little Mulchatna River.

Below the Bonanza Hills the river gradient decreases, the velocity slows, and the river takes on a more multi-channelled nature. Long runs and gravel bars are common. Gravel areas suitable for salmonid spawning are extensive. One major tributary, Ptarmigan Creek, enters below the Bonanza Hills.

At its confluence with the Mulchatna, the Chilikadrotna is approximately 35-40 m in width.

Over most of its course the Chilikadrotna flows through a spruce, birch, willow, balsam poplar forest. Over-hanging trees, submerged logs, root structures, and piles of log debris in and along the river provide abundant cover for juvenile and adult fishes.

The river was float-surveyed September 17-22, 1978. It was aerially surveyed August 30, 1978 and August 2, 1979.

Fish species present in the river during the summer period include rainbow trout, lake trout, Dolly Varden, Arctic grayling, round whitefish, burbot, chinook salmon, coho salmon, sockeye salmon, chum salmon, and

August 23, 1978 was 146,900 (Poe, 1978). His 1979 survey (September 7) yielded a point estimate of 495,750 spawners (Poe, 1980 personal communication). It is one of the major spawning streams in the Kvichak River drainage.

The river is locally well known for its rainbow trout, grayling and sockeye salmon angling. Most of this occurs in the lower nine miles of river below the falls.

During a voluntary creel census of angling guides in 1975 (Gwartney, 1975), the river was mentioned as a fishing location by some respondents. During over flights of the area, anglers have been observed on several occasions fishing the river from Alexcy Lake downstream.

Anglers reach the river either by float plane or boat. Float planes are landed on Hudson's Lake (59°56' N, 154°48' W) or Alexcy Lake (59°53' N, 154°48' W) and anglers walk the remaining distance to the river. Shallow draft jet-powered boats are run up the river to the vicinity of the falls and are used at times to ferry river visitors. Day floats from the above mentioned lakes also occur.

Tlikakila River:

This river, known locally as "Big River", is the largest tributary to Lake Clark (see Figure 4). It is a glacial river fed primarily by melt water and run-off from the Lake Clark Pass area. It is approximately 50 miles in length and drains a watershed of approximately 650 square miles (Demory et. al, 1964). Measured water transparency (June 29, 1978) was 0.2m. Bottom and banks along the lower seven miles of river consist of fine sand and silt. Areas of "quick sand" in this lower river area have been reported by knowledgeable local residents. The river is multi-channelled over much of its length. Major bank vegetation is spruce, poplar, willow and alder.

The lower seven miles of river were floated June 29-30, 1978 and an aerial survey was conducted September 16, 1978.

The only fish species known present in the river is sockeye salmon. An estimated 1,015-1,200 were observed spawning in the river September 16, 1978 approximately 12-18 miles upstream of Lake Clark. Mr. Poe surveyed the river October 25, 1979 and observed an estimated 10,945 sockeye spawners. Other species including longnose sucker, northern pike, ninespine stickleback, slimy sculpin, Arctic char, and Dolly Varden may be present but have not been documented. The suckers and stickleback (and possibly pike) inhabiting Otter Lake presumably migrated up the Tlikakila River to that locality.

There is no recreational angling in Tlikakila River at present and, unless the river clears significantly, there is no reason to expect any in the future. The river is floatable and has been surveyed by the Bureau of Outdoor Recreation in July 1975 (Bureau of Outdoor Recreation, 1976).

slimy sculpin. See Appendix C-1 for capture results by gear type.

The above species vary in abundance throughout the river. Lake trout are found commonly within the upper mile of river below Lower Twin Lake but are uncommon further downriver. Arctic grayling are found distributed throughout the river inhabiting pools, runs, and side sloughs. Rainbow trout are most common throughout the lower river (below the Bonanza Hills) although specimens have been caught as far upriver as due north of Snipe Lake. They are often found associated with submerged log debris and/or near spawning salmon. Sockeye, chinook, chum, and coho salmon all spawn in the river (see Table 8) during the July-October period. Chinook spawn throughout the river and in both major and minor tributaries. They have been observed spawning as far upstream as the outlet of Lower Twin Lake. Sockeye utilize sloughs and backwaters throughout the river, major tributaries (Ptarmigan Creek, Little Mulchatna River), Twin Lakes, and Fishtrap Lake for spawning. Coho were observed spawning throughout the main river. Dolly Varden were found in small numbers, mostly below Bonanza Hills. Individuals captured on September 19 and September 21 had partially spawned. Sculpins were present throughout the river and its tributaries. Insufficient numbers of burbot and round whitefish were captured to indicate their distribution within the drainage.

Recreational use of the Chilikadrotna at the present is mainly from "float" enthusiasts. During 1978 at least 34 persons floated this river during the July 29 - September 15 period. In addition, some individuals camp on Lower Twin Lake and hunt and fish in the upper river area. Three such individuals were observed during the September float-survey. They had camped at Snipe Lake and walked over to hunt and fish that section of the river to the north.

The Chilikadrotna is accessible in summer mainly from two staging areas: Twin Lakes and Snipe Lake. These lakes are suitable for float plane landings depending on wind and lake surface conditions (one fatality was recorded from Lower Twin Lake during 1978 when a pilot tried to land on the lake during a wind storm and waves flipped his aircraft). Those who choose Snipe Lake as a "put-in" point face a two mile portage to the river. Pickup for float parties generally occurs at locations on the Mulchatna River. One of the commonly used sites is located approximately one-half mile downstream of the Chilchitna River-Mulchatna River confluence. It is suitable for small float planes (Cessna 206 and smaller).

Recreational potential of the Chilikadrotna River should be considered high. Float characteristics of the river are such that float enthusiasts, if they use reasonable caution and sturdy equipment, can safely enjoy a trip down the river. Recreational fishing, is average to good for resident species and can be excellent for salmon (chinook primarily) depending on trip timing, and water conditions. Based on observations of this river during 1978 (and also 1977) float use can be expected to increase rather substantially over the next few years. Concurrently, recreational angling can also be expected to increase as more people use and become familiar with the river.

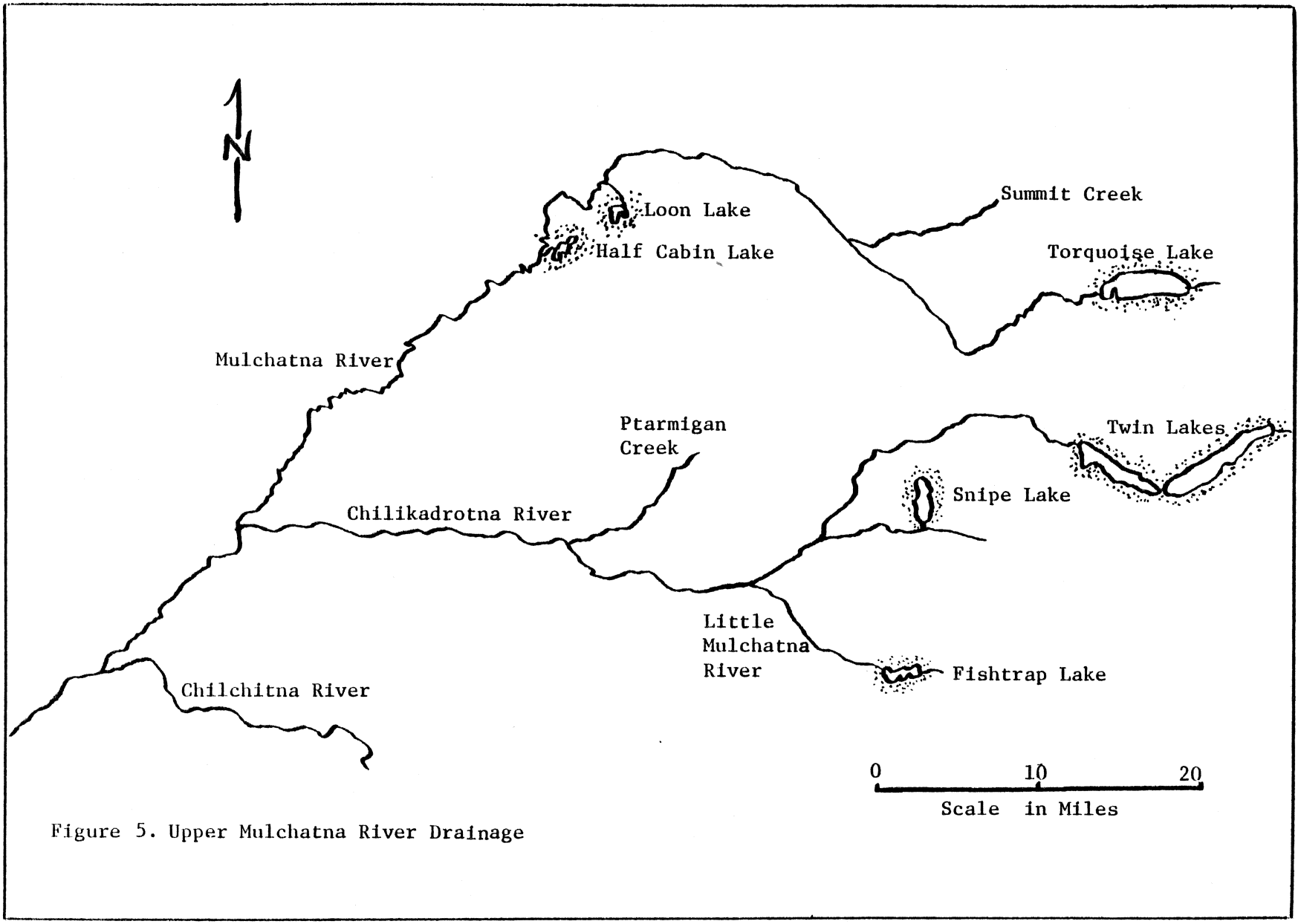

Figure 5. Upper Mulchatna River Drainage

Fishtrap Lake:

Fishtrap Lake (see Figure 5) is the major source of the Little Mulchatna River (a tributary of the Chilikadrotna River). The lake is 2.2 miles in length and has a maximum depth of 24 meters. Measured transparency August 23, 1979 was 9.5 meters. Lake elevation is approximately 1,700 feet above sea level. Several small tributary streams enter the lake along its eastern end. The shoreline is forested (spruce, balsam poplar, willow).

The lake was surveyed August 23-25, 1979. It has been surveyed once previously by A.D.F.&.G. personnel July 27-28, 1977.

Fish species inhabiting Fishtrap Lake include lake trout, Arctic char, round whitefish, burbot, Arctic grayling, sockeye salmon, coho salmon, and slimy sculpin. Capture results by gear type and sample station appear in Appendix C-2.

It is probable that chinook salmon and chum salmon also enter the lake on occasion although none were observed during the surveys.

The 1977 survey indicated sockeye spawners arrive at the lake during mid-July. An estimated 4,500-5,500 were observed (August 24, 1979) beach-spawning off the mouth of a small tributary at the east end of the lake.

There is a sport fishing lodge located at the outlet of the lake. The extent of angling usage of the lake however is not known.

Access to the lake is by float plane.

Half Cabin Lake: .

Half Cabin Lake (Figure 5) is tributary to the upper Mulchatna River. It was used September 9, 1979 as a "put-in" point for a float-survey of the Mulchatna. No survey activities other than making visual observations were performed as the objective of the day was to descend the outlet creek and reach the Mulchatna River.

Fish species observed in Half Cabin Lake during pre-departure activities included northern pike, Arctic grayling, sockeye salmon, and sculpins. These same species plus round whitefish were observed in the outlet creek.

The outlet creek is narrow, shallow and considerable labor was required to descend it to the Mulchatna, although the descent took only one hour. Evidence of previous users was observed enroute.

Three camps of moose hunters were present at Half Cabin Lake on September 9.

Loon Lake:

This lake, located at approximately 60°37' N, 154°18' W is also tributary to the Mulchatna River (Figure 5). It is an "S" shaped lake, approxi-

Table 8. Summary of Chilikadrotna River Salmon Escapement Surveys, 1964-1979.

Year	Date	Chinook	Sockeye	Chum	Coho	Source
1964	8/14	200	100	-	-	Nelson, 1965
1968	8/7	410 4/	-	-	-	Nelson, 1972
1972	8/4	- 2/	-	-	-	Nelson, 1972
1973	-	-	-	-	-	Nelson, 1979 3/
1974	8/2	450	-	-	-	Nelson, 1979 3/
1975	-	-	-	-	-	Nelson, 1979 3/
1976	8/2	780	-	-	-	Nelson, 1979 3/
1977	7/31	430	800	1100	-	Nelson, 1979 3/
	8/1-7	240 5/	200-300	300+	-	Russell,1977 4/
1978	8/2	570	300	-	-	Nelson, 1979 3/
	8/30	38	-	-	-	Russell
	9/17-23	-	-	-	58 5/	Russell
1979	8/2	290	-	-	-	Nelson, 1980
	8/2	782 6/	400-600	-	-	Russell
	8/24	-	4500-5500 7/	-	-	Russell

1/ Partial survey

2/ Too murky to survey

3/ Mike Nelson, ADF&G, Dillingham, personal communication

4/ Richard Russell, ADF&G, King Salmon, Float trip survey report, on file

5/ Float surveys (all others aerial)

6/ Estimate total 1979 Chilikadrotna run at 1200-1400 chinook based on this survey

7/ East end of Fishtrap Lake

floated September 22-23, 1978 and an aerial survey of the entire upper river was flown August 30, 1978.

At least 20 species of fish are known to inhabit the Mulchatna River drainage. Included are the following: longnose sucker, humpback whitefish, least cisco, slimy sculpin, northern pike, Arctic lamprey, Lampetra japonica (Martens), burbot, pink salmon, chum salmon, coho salmon, sockeye salmon, chinook salmon, round whitefish, pygmy whitefish, ninespine stickleback, rainbow trout, Dolly Varden, lake trout, Arctic grayling and Arctic char. Sampling during 1978 and 1979 was limited to electroshocking and hook and line angling producing catches of grayling, rainbow trout, coho salmon, burbot, Dolly Varden, sculpins, and chinook salmon. Carcasses of postspawn chum salmon were observed. No salmon were caught or observed upstream of the Bonanza Hills escarpment--the rapids upstream may present a velocity barrier to upmigrating fish during the summer high water period. Capture results by gear type are presented in Appendix C-4.

A summary of salmon escapement surveys of the upper Mulchatna area (1974-1979) appears in Table 9. This area is often too turbid to aerially survey accurately but it does support spawning stocks of chinook, chum, and coho salmon and it is used by sockeye salmon in their migration to the Chilikadrotna River.

Recreational angling occurs at various locations along the Mulchatna River. Anglers were observed during 1978 surveys fishing just below the Mulchatna - Chilchitna River confluence. Four were observed further upriver during the 1979 float. Mills (1979) estimated the total 1977 angler effort in the Mulchatna River system (entire Mulchatna drainage) at 1,296 man-days. Chinook salmon was the major species sought (521 harvested). Other species taken included sockeye salmon (280), rainbow trout (116), Dolly Varden/Arctic char (102), coho salmon (90), grayling (59), chum salmon (46) and pike (25). Unfortunately there is no way to determine what percentage of the above usage occurred within the proposed Park/Preserve.

The Mulchatna River is accessible by float plane from a variety of locations. The river channel itself is suitable for the landing of small float planes at locations as far upstream as the Mulchatna - Chilchitna River confluence. Small lakes adjacent to the river (Half Cabin Lake, Loon Lake) are important access points. Twin Lakes, Snipe Lake and Turquoise Lake also provide access (either directly or indirectly) for those who desire to float the river. Shallow draft motorized boats are utilized routinely by local residents and guides for travel on the lower river. On occasion boats have been used as far upstream as the Chilikadrotna - Mulchatna confluence. A few river bars are also utilized by the pilots of small, wheeled aircraft for access.

Snipe Lake:

Snipe Lake (63°37' N, 154°17' W) feeds a tributary to the Chilikadrotna River (Figure 5). The lake (elevation 1,850 ft.) is approximately two miles in length with widths to 0.8 miles. Maximum known depth is 16 meters

mately two miles in length. Although no soundings were made, the lake appears to be shallow (probably not exceeding six meters in depth). The water is clear and the bottom is mud. Aquatic vegetation is abundant in sheltered shallows (horse-tails, grasses, sedges). The lake shore has been burned by a forest fire sometime within the last ten years and much of the larger surrounding vegetation (spruce) was killed. The lake outlet creek flows into the Mulchatna River approximately three miles downstream.

Loon Lake was surveyed August 13-15, 1978. Fish species captured included northern pike, Arctic grayling, sockeye salmon and slimy sculpins. See Appendix C-3 for capture results by sample station and gear type. Pike appear to be widespread throughout the lake while grayling were observed only in inlet and outlet creeks. One adult male sockeye was caught, the only one seen in the lake. A few deteriorated salmon carcasses (either chinook or chums) were observed along the outlet creek.

Recreational angling occurs at the lake although the magnitude of use is unknown. There are two permanent tent camps located at the lake and angling gear was observed present at both. These camps appear to be mainly hunting and trapping oriented.

Access to the lake is limited to float planes, or float craft via the Mulchatna River. The lake was used on this survey as a "take-out" point after a float of the upper Mulchatna River. It has been used in the past as a "put-in" point for initiation of float trips down the remainder of the upper Mulchatna River (Pourchot, 1976).

Mulchatna River:

The Mulchatna River (Figure 5) originates at Turquoise Lake and flows in generally a south-westerly direction for approximately 217 miles to its confluence with the Nushagak River. Over this distance it drops approximately 2,325 feet in elevation from alpine tundra to forested lowland tundra and drains an estimated 3,600 square miles.

At its source the river is approximately 50 meters in width, single channel, with a transparency of 0.8 meters. It meanders, with a velocity of approximately one meter per second through a moraine deposit for about three miles and then picks up speed and begins its descent through the Bonanza Hills. Over the next 19 miles the river gradient is approximately 47 feet per mile (the upper 10 miles of this is continuous class II-III white water). The river then leaves the Bonanza Hills and for the remainder of its course is relatively "smooth-flowing" (average gradient 5.7 feet per mile).

As it descends through the upper Mulchatna Valley the river is fed by a number of small tributaries and the Chilikadrotna and Chilchitna Rivers.

The upper Mulchatna River (Turquoise Lake to Loon Lake) was float surveyed August 10-13, 1978. The section from Half Cabin Lake to just below the Chilchitna River was floated September 9-15, 1979. Additionally the portion between the Chilikadrotna outlet and the Chilchitna outlet was

and measured water transparency (July 19, 1978) was 6.7 meters. Shoreline vegetation is mainly alpine tundra with scattered willows and occassional spruce. There are no major inlet creeks. The outlet creek drops approximately 20 meters in elevation over the course of three-quarters of a mile and then enters a larger creek the author named Snipe Lake Creek. The lake was surveyed July 18-20, 1978.

Fish species captured included: Arctic grayling, lake trout, Dolly Varden, Arctic char, round whitefish, chinook salmon, coho salmon, burbot, and slimy sculpin. Capture results by gear type and location are presented in Appendix C-5. Visual observations indicate Snipe Lake Creek is inhabited by spawning chinook salmon, grayling, and char species.

Some recreational angling occurs in Snipe Lake. Two camps were noted during a September 17 over flight but these were probably hunters. One trapping cabin is located adjacent to the lake.

Access to Snipe Lake is accomplished by float plane. The lake is also important as an access point to the upper Chilikadrotna River area.

Turquoise Lake:

Turquoise Lake is the initial source of the Mulchatna River (Figure 5). The lake is approximately five miles in length with widths to 1.5 miles. Maximum known depth is 103 m. Measured water transparency (August 6, 1978) was 0.8 m. Glacial melt, surface run-off, and springs all feed the lake. The main inlet stream originates at a glacier approximately four miles east of the lake. Lake elevation is 2,504 feet above sea level (the most alpine of lakes sampled during 1978-1979) and surrounding vegetation is mostly alpine tundra, with willow and alder on lower slopes. The lake was surveyed August 6-9, 1978.

Fish species inhabiting the lake include lake trout, Arctic grayling, Dolly Varden, round whitefish, burbot, slimy sculpin, and Arctic lamprey. No salmon species were observed. The Bonanza Hills rapids may be a barrier to their upstream migration. Capture results by gear type and sample station are presented in Appendix C-6.

Recreational angling occurs at Turquoise Lake. A U.S.G.S. survey party, camped on the lake from early July until August 11, 1978, reported to the author they had seen anglers utilizing the lake on two occasions over that period. One group was comprised of a Sierra Club hiking party. The other was a fly-in fishing party. The Sierra Club party reportedly caught lake trout to eight pounds in weight. No anglers were observed during the lake survey, but several old campsites (perhaps hunting camps) and one wrecked amphibious aircraft were noted in the vicinity.

Access to the lake is by float plane. Small plane landings (wheels) may be possible on some gravel bars just east of the lake. This lake is the "put-in" point for float trips down the upper Mulchatna River.

Table 9. Summary of Mulchatna River 1/ Salmon Escapement Surveys, 1974-1979.

Year	Date	Chinook	Sockeye	Chum	Coho	Source
1974	8/2	170 2/	-	-	-	Nelson, 1979
1975	-	-	-	-	-	Nelson, 1979
1976	8/4	720 2/	-	-	-	Nelson, 1979
1977	7/31	270	0 2/	2000 2/	-	Nelson, 1979
1978	8/2	890	900 2/	0 2/	-	Nelson, 1979
1979	8/2	0 2/	0 2/	0 2/	-	Nelson, 1979
	9/9-15	-	-	-	65 3/	Russell

1/ Section of river from Chilchitna River mouth to Turquoise Lake

2/ Coverage incomplete due to poor survey conditions

3/ Coverage incomplete - float survey

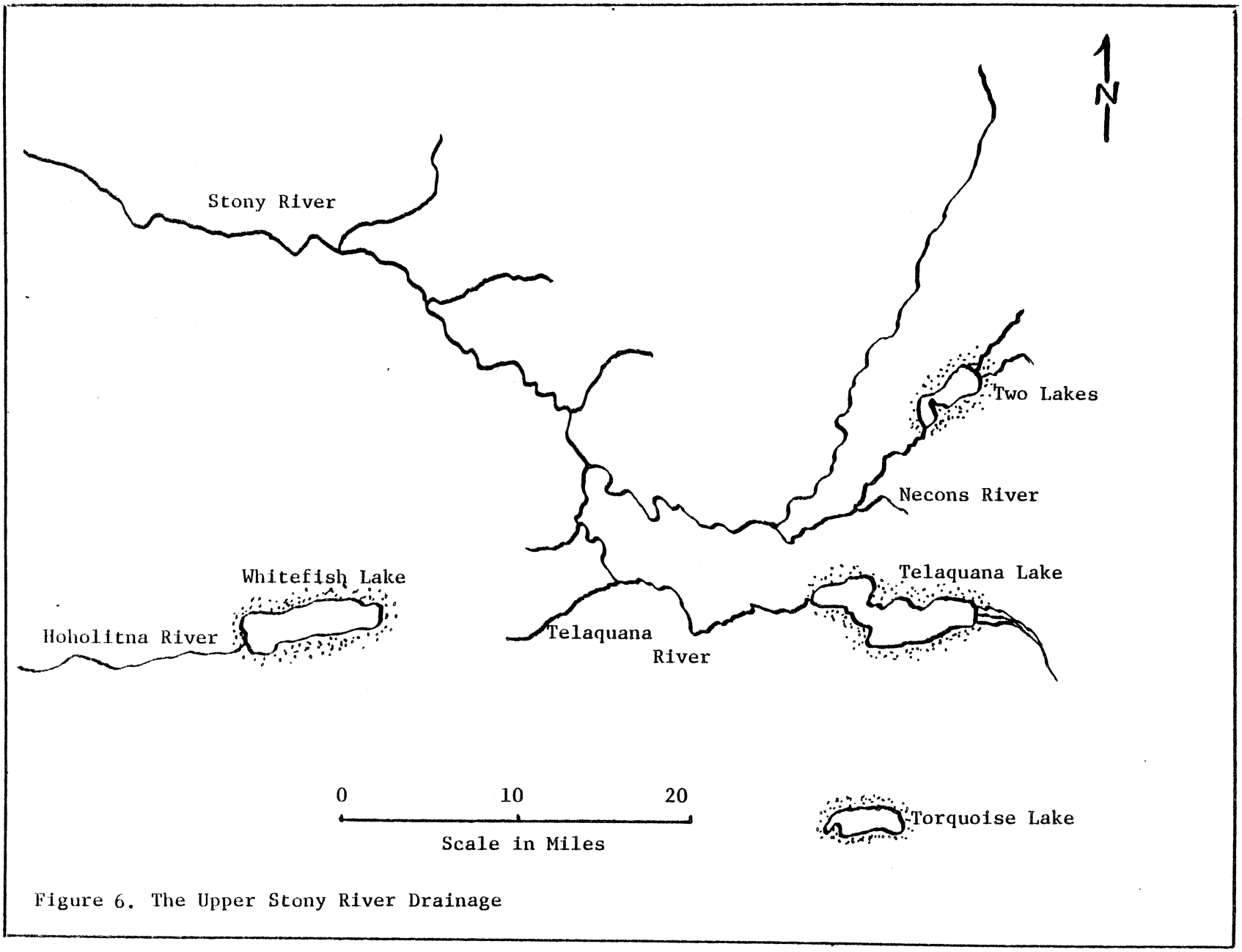

Figure 6. The Upper Stony River Drainage

Twin Lakes (Upper and Lower):

Twin Lakes are the source of the Chilikadrotna River (Figure 5). These two lakes occupy a glacial basin and are connected by approximately 0.3 miles of river. Upper Twin Lake is seven miles in length and averages approximately three-quarters of a mile in width. Maximum known depth is 84 m. Lower Twin Lake is approximately five miles in length with an average width of approximately one-half mile. Maximum known depth is 39 m. These lakes appear to have been one in the historic past. Outwash alluvium from two streams have created the narrows separating them. The lakes lie at an elevation of 1,982 feet above sea level, and are fed by glacial melt, springs and surface run-off. The shorelines are forested (although not too heavily in some areas). The lakes were surveyed July 30-August 3, 1978. Water transparency in the eastern end of Upper Twin Lake (July 31, 1978) was two meters. Transparency near the west end of Lower Twin Lake (August 2, 1978) was eight meters.

Fish species inhabiting the lakes include Arctic grayling, lake trout, Dolly Varden, Arctic char, round whitefish, pygmy whitefish, sockeye salmon, burbot, longnose sucker and slimy sculpin. Capture results by gear type and sample location are presented in Appendices C-7 and C-8.

Recreational angling occurs at Twin Lakes. Keith (1973) in his book on Richard Proenneke's experiences at the lakes documents angling by Proenneke on at least 16 occasions over the 16-month period covered. Two anglers were observed at the outlet of the interconnecting river on July 30, 1978. A broken spinning rod was found there August 1. Tent camps (possibly hunters) were observed on the lower lake during over flights August 30 and September 17, 1978. There are 10 cabins around the shoreline of the upper lake plus two on the lower lake. Another cabin is located on the Chilikadrotna River about one-quarter mile below the lower lake. Some angling by cabin owners (in addition to Proenneke) probably occurs.

Access to Twin Lakes is by airplane. Small planes (wheeled) are sometimes landed on a short strip at the east end of the upper lake. Float planes are landed on both lakes. The lower lake is the main "put-in" point for Chilikadrotna River float parties.

Stony River Drainages (Figure 6)

Necons River:

The Necons River, flowing out of Two Lakes (Figure 6), is a major tributary to the Stony River (Kuskokwim River drainage). The river at the Two Lakes outlet was sampled on July 5, 1978. At that point it was glacial green in color (transparency = one meter) and approximately 30 meters wide. Large boulders and shoals were noted in mid-channel.

Sockeye salmon were the only species noted present. A school of these had apparently just arrived and they were jumping periodically (still silvery). On August 30, 1978 the river was too murky to survey aerially.

One guide from the Lake Clark area reported taking clients occasionally to the river to fish. No other information pertaining to recreational angling

lake can be expected to visit the upper river seasonally.

Recreational angling occurs in the river (extent unknown). In addition the river attracts at least some "float" enthusiasts. The Heritage Conservation and Recreation Service (formerly Bureau of Outdoor Recreation) conducted a float evaluation of the river during July 1978 (Kevin Apgar, H.C.R.S. personal communication). Additionally the author is aware of five other individuals who floated the river during 1978. During an aerial survey of the river August 30, 1978 one kayak was observed speared on a rock in a section of rapids.

Access to the river is mainly by aircraft via Telaquana Lake.

Two Lakes:

Two lakes (elevation 1,132 ft.) is actually one lake nearly bisected by a spit. It is a major source of the Necons River. The lake (Figure 6) is four miles long and averages approximately one mile in width. Maximum known depth is in excess of 53 meters (length of the sounding line used during the survey). Measured water transparency (July 5, 1978) was 0.9 meters. The lake is fed by the Upper Necons River and a stream known as Tlikakila River (not to be confused with the other Tlikakila River, a tributary to Lake Clark). These inlet streams carry glacial run-off from surrounding mountains and Merrill Pass. The lake shoreline is forested (spruce, willow, poplar, alder, birch). An on-site survey of the lake was conducted July 3-6, 1978 and an aerial survey was flown August 30, 1978.

Fish species inhabiting the lake include lake trout, Dolly Varden, round whitefish, pygmy whitefish, sockeye salmon, northern pike, longnose sucker, slimy sculpin and ninespine stickleback. All net sampling was done in shallow waters at the south end of the lake, due to high winds and wave problems on the north side of the spit. Fish capture results by gear type and sampling station are presented in Appendix D-2.

No anglers were observed at the lake during these surveys. One guide operating out of the Lake Clark area reported taking parties to Two Lakes on occasion to fish the lake outlet. There is a private cabin and one lodge located on the lake and some angling may be done by the people associated with them. The lake outlet is also the "put-in" point for persons floating the Necons and Stony Rivers.

Access to the lake is by float plane. One might also find a place to land a wheeled plane north of the lake on a river bar.

FINDINGS - FISH SPECIES

Fish were found present in all waters sampled within the proposed Park/Preserve during the study. Twenty-two species were captured or observed. Distribution of these species by major drainage is presented in Table 10.

Gill-netting (in a comparable manner) was conducted in 25 of the lakes surveyed. Catch rates per gill net hour from these lakes are presented in

was obtained.

The river is floatable (Kevin Apgar - Heritage Conservation and Recreation Service, personal communication).

Telaquana Lake:

Telaquana Lake, surface area 16 square miles (Bue, 1963), is the principal source of the Telaquana River (Stony River drainage). The lake (Figure 6) is approximately 9.3 miles in length and ranges from 1.0 to 2.9 miles in width. Maximum known depth is in excess of 130 m (the length of the sounding line used during the survey). Littoral area is most abundant in the western third of the lake although a small but significant area (used by spawning sockeye salmon) exists at the extreme east (inlet) end. Water transparency (July 13, 1978) was 3.9 meters. The lake (elevation 1,219 feet) is fed primarily by glacial run-off from the Telaquana Pass area to the east. This reaches the lake via the very braided upper section of Telaquana River. The lake shoreline is forested (spruce, birch, poplar, willow). On-site surveys were conducted July 10-16, 1978 and aerial surveys August 30, 1978 and July 18, 1979.

Fish species inhabiting the lake include: lake trout, Arctic grayling, Dolly Varden, round whitefish, northern pike, least ciscos, longnose sucker, sockeye salmon, chum salmon, slimy sculpin and ninespine stickleback. Capture results by gear type and sample station are presented in Appendix D-1.

Recreational angling occurs at Telaquana Lake. Two anglers were observed during the on-site survey (they fished the outlet July 12). During a previous visit (July 21-23, 1977) by Lou Gwartney (ADF&G, King Salmon) a total of five anglers were observed fishing near the lake outlet. There are five cabins located on the lake and boats were observed beached or stored near each. During the August 30 aerial survey two boat parties were observed on the lake.

Access to Telaquana Lake is mainly by float plane. In addition some of the gravel bars along the inlet river at the east end of the lake bore tire tracks made by wheeled aircraft (small planes).

Telaquana River:

This river drains from Telaquana Lake into Stony River. The upper quarter-mile was visited July 13, 1978 during the lake survey. No other on-site work was performed. At the lake outlet the river is approximately 30 meters in width, clear and single channel. There are a few large boulders in mid-channel and a couple of deep pools (in which there were large schools of adult sockeye). River velocity was one meter per second. The river was wadeable in hip boots at one spot approximately 150 meters below the lake. Bottom composition was mainly small gravel.

Fish noted in the river were sockeye salmon, sculpins and grayling. Other resident species (lake trout, Dolly Varden, suckers, and pike) from the

Table 10. Fish Species Distribution, Proposed Lake Clark National Park/Preserve, 1978-1979.

Species	Scientific Name	Drainages			
		Cook Inlet	Lake Clark	Mulchatna	Stony River
Arctic char	Salvelinus alpinus (Linnaeus)	-	X	X	-
Arctic grayling	Thymallus arcticus (Pallas)	-	X	X	X
Arctic lamprey	Lampetra japonica (Martens)	-	-	X	-
Burbot	Lota lota (Linnaeus)	-	X	X	-
Chinook salmon	Oncorhynchus tshawytscha (Walbaum)	X	X	X	-
Chum salmon	Oncorhynchus keta (Walbaum)	X	-	X	X
Coastrange sculpin	Cottus aleuticus Gilbert	X	X	-	-
Coho salmon	Oncorhynchus Kisutch (Walbaum)	X	-	X	-
Dolly Varden	Salvelinus malma (Walbaum)	X	X	X	X
Humpback whitefish	Coregonus pidschian (Gmelin)	-	X	X	-
Lake trout	Salvelinus namaycush (Walbaum)	X	X	X	X
Least cisco	Coregonus sardinella Valenciennes	-	X	X 1/	X
Longnose sucker	Catostomus catostomus (Forster)	-	X	X	X
Ninespine stickleback	Pungitius pungitius (Linnaeus)	X	X	X	X
Northern pike	Esox lucius Linnaeus	-	X	X	X
Pink salmon	Oncorhynchus gorbuscha (Walbaum)	X	X	X	-
Pygmy whitefish	Prosopium coulteri (Eigenmann and Eigenmann)	-	X	X	X
Rainbow trout	Salmo gairdneri (Richardson)	-	X	X	-
Round whitefish	Prosopium cylindraceum (Pallas)	X	X	X	X
Slimy sculpin	Cottus cognatus Richardson	X	X	X	X
Sockeye salmon	Oncorhynchus nerka (Walbaum)	X	X	X	X
Threespine stickleback	Gasterosteus aculeatus Linnaeus	X	X	-	-

1/ Gwartney and Russell, 1978

Table 11. These catch rates are the best indicator of relative species abundance presently available for most of the waters surveyed.

Biological information for each species captured during 1978-1979 is presented as follows:

Arctic Char:

Arctic char were found commonly in lakes within the proposed Park/Preserve. They were identified based on counts of gill rakers (lower first gill arch) and pyloric caeca (only gill raker counts were used on specimens less than 100 mm in length). These criteria were suitable for separating the species from Dolly Varden which in some cases inhabited the same waters. Seventy-eight Arctic char were examined to determine gill raker counts. Counts ranged from 13 to 19 with a mean of 15.6 (see Table 12). Dolly Varden counts ranged from eight to 15 with a mean of 11.4. Some overlap exists between counts of the two species. Pyloric caeca counts (Table 13) for 61 Arctic char ranged from 41 to 70 with a mean of 54.9. Dolly Varden counts (64 fish) ranged from 17 to 48 pyloric caeca with a mean of 27.3. Using the two characteristics together the species were nearly 100% separable.

Arctic char (n=511) ranging in fork length from 32 to 580 mm were captured during the surveys (Table 14). Maximum weight recorded for an individual was 2,380 grams (5 lbs. 4 oz.) from Kijik Lake.

Gill-netting yielded the greatest catch rates of Arctic char (Table 11) in Tazimina Lakes, Lower Twin Lake, and Kijik Lake. This species was notably absent in the lakes feeding the upper Stony River, Cook Inlet drainages, and the upper Mulchatna River, and scarce in Lake Clark proper.

Fork length versus age (otolith readings) of Arctic char is presented in Table 15. In general, growth appears to be slow for these fish. Maximum age observed was 15 years (from Caribou Lake).

A total of 99 Arctic char captured were obviously mature. The age distribution of these fish appears in Table 16. It appears the onset of sexual maturity occurs at six years of age for this species in the study area. Six fish had retained eggs from previous spawnings. No spawning activity was observed during late summer sampling although several ripe individuals were captured September 13, 1978 near the outlet of Lower Tazimina Lake.

Based on age and physical indications it appears that a race of "dwarf" Arctic char co-exists with the larger more common variety in the Tazimina Lakes. Sexually mature individuals less than 200 mm in fork length with ages to 13 years were captured among the larger fish (whose age and growth appeared similar to other populations from adjacent waters).

Stomachs from 155 Arctic char (see Table 17) were examined to determine food items utilized. The results indicate these fish are opportunistic feeders utilizing food organisms throughout the water column. Gastropods (*Lymnaea sp.*, *Valvata sp.*, and *Physa sp.*), Pelecypods (*Pisidium sp.*), and Trichoptera (caddis fly) larvae were the benthic organisms found commonly

Table 11. Relative Abundance of Resident Species in Selected Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Lake	No.Gillnet Hours	Catch/Gillnet Hour									
		Arctic Char	Arctic Grayling	Burbot	Dolly Varden	Humpback Whitefish	Lake Trout	Least Cisco	Longnose Sucker	Northern Pike	Round Whitefish
Caribou L.	36.7	0.44	0.19	-	-	-	-	-	-	-	-
Chakachamna L.	33.8	-	-	-	-	-	0.30	-	-	-	0.27
Crescent L.	33.0	-	-	-	1.24	-	0.88	-	-	-	-
Fishtrap L.	29.3	0.72	0.03	-	-	-	0.24	-	-	-	1.09
Hickerson L.	24.8	-	-	-	4.20	-	-	-	-	-	-
Hoknede L.	71.5	-	-	-	-	-	-	0.15	-	0.17	-
Hudson L.	12.0	-	-	-	-	-	0.58	-	-	-	6.33
Kijik L.	29.5	0.92	-	-	-	-	0.17	-	2.58	-	1.76
Kontrashibuna L.	140.4	0.46	-	-	-	-	0.48	-	-	-	-
Lachbuna L.	73.1	0.55	-	-	-	-	0.33	-	-	-	-
Lake Clark 1/	190.8	-	0.25	0.06	0.01	0.44	0.24	0.62	0.28	0.03	0.23
Loon Lake	35.5	-	-	-	-	-	-	-	-	0.76	-
Otter Lake	14.0	-	-	-	-	-	-	-	1.93	-	-
Upper Pickeral L.	15.0	-	-	-	-	0.40	-	-	-	0.13	0.20
Middle Pickeral L.	16.3	-	-	-	-	0.18	-	-	-	0.49	-
Lower Pickeral L.	17.8	-	-	-	-	0.28	-	0.11	-	0.11	-
Portage L.	37.8	0.64	-	-	-	-	0.77	-	-	-	-
Snipe L.	42.5	0.07	1.41	-	-	-	0.14	-	-	-	0.47
Upper Tazimina L.	69.0	2.86	0.99	-	0.04	-	-	-	-	-	-
Lower Tazimina L.	14.7	5.85	0.48	-	-	-	-	-	-	-	-
Telaquana L.	83.3	-	-	-	-	-	0.24	0.06	0.32	0.19	0.08
Turquoise L.	116.3	-	0.09	0.04	-	-	0.34	-	-	-	0.09
Upper Twin L.	41.8	0.07	-	0.05	-	-	0.41	-	-	-	0.07
Lower Twin L.	30.8	1.01	0.23	0.03	-	-	0.84	-	0.03	-	0.13
Two Lakes	71.3	-	-	-	-	-	0.04	-	0.06	0.24	0.07

1/ Includes Little Lake Clark

Table 12. Comparison of Gill Raker Count 1/ Frequencies for Arctic Char and Dolly Varden from Waters 2/ Within the Proposed Lake Clark National Park/Preserve, 1978.

No. Gill Rakers	Arctic Char (n)	Arctic Char (%)	Dolly Varden (n)	Dolly Varden (%)
8	-	-	4	4.4
9	-	-	7	7.8
10	-	-	10	11.1
11	-	-	22	24.4
12	-	-	22	24.4
13	1	1.3	23	25.6
14	11	14.1	1	1.1
15	33	42.3	1	1.1
16	17	21.8	-	-
17	9	11.5	-	-
18	5	6.4	-	-
19	2	2.6	-	-
Totals	78	100	90	100

1/ Lower first gill arch

2/ Samples taken from the following waters:

Chilikadrotna River
Crescent Lake
Kijik Lake
Kontrashibuna Lake
Lachbuna Lake
Mulchatna River
Portage Lake
Snipe Lake
Tazimina Lake
Telaquana Lake
Turquoise Lake
Twin Lakes
Two Lakes

Table 13. Comparison of Pyloric Caeca Counts for Arctic Char and Dolly Varden from Waters 1/ Within the Proposed Lake Clark National Park/Preserve, 1978.

No Pyloric Caeca	Arctic Char (n)	Arctic Char (%)	Dolly Varden (n)	Dolly Varden (%)
17-18	-	-	2	3.1
19-20	-	-	-	-
21-22	-	-	7	10.8
23-23	-	-	6	9.4
25-26	-	-	15	23.4
27-28	-	-	13	20.3
29-30	-	-	11	17.2
31-32	-	-	1	1.6
33-34	-	-	6	9.4
35-36	-	-	1	1.6
37-38	-	-	1	1.6
39-40	-	-	-	-
41-42	1	1.6	-	-
43-44	-	-	-	-
45-46	2	3.3	-	-
47-48	5	8.2	1	1.6
49-50	9	14.8	-	-
51-52	4	6.6	-	-
53-54	8	13.1	-	-
55-56	12	19.7	-	-
57-58	6	9.8	-	-
59-60	3	4.9	-	-
61-62	4	6.6	-	-
63-64	3	4.9	-	-
65-66	1	1.6	-	-
67-68	1	1.6	-	-
69-70	2	3.3	-	-
Totals	61	100	64	100

1/ Samples taken from the following waters:

Chilikadrotna R.
Crescent Lake
Kijik Lake
Kontrashibuna Lake
Lachbuna Lake
Mulchatna River
Portage Lake
Snipe Lake
Tazimina Lake
Telaquana Lake
Turquoise Lake
Twin Lakes
Two Lakes

Table 14. Length Distribution of Arctic Char Sampled 1/ From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Caribou Lake	Fishtrap Lake	Kijik Lake	Kontrashibuna Lake	Lachbuna Lake	Portage Lake	Tazimina Lakes	Twin Lakes	Total
25-49	-	-	1	-	-	-	-	-	1
50-74	-	13	-	2	-	15	-	-	30
75-99	-	-	-	-	-	4	-	-	4
100-124	-	-	-	2	1	5	-	-	8
125-149	-	1	3	4	-	6	16	1	31
150-174	-	-	-	8	-	-	4	1	13
175-199	-	-	-	12	1	4	52	-	69
200-224	-	-	3	7	6	5	14	-	35
225-249	1	2	-	5	1	1	29	1	40
250-274	-	-	2	8	3	1	42	-	56
275-299	-	2	1	2	3	-	39	2	49
300-324	3	2	2	2	5	-	12	2	28
325-349	-	-	-	2	6	-	10	4	22
350-374	1	-	-	-	10	-	9	2	22
375-399	3	-	1	3	3	-	4	3	17
400-424	1	5	1	6	-	-	5	5	23
425-449	-	4	2	1	2	1	2	7	19
450-474	1	-	2	1	-	-	-	2	6
475-499	4	4	3	2	-	1	-	3	17
500-524	-	2	4	-	-	1	1	1	9
525-549	2	-	-	-	-	-	-	1	3
550-574	-	-	4	-	-	-	-	-	4
575-599	-	-	1	-	-	-	-	-	1
Total	16	35	30	67	41	44	239	35	507

1/ All capture methods

Note: Arctic char were also caught in Lake Clark (1) and Snipe Lake (3).

Table 15. Arctic Char Length 1/ - Age Frequency From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

	Fishtrap Lake		Kijik Lake		Kontrashibuna Lake		Lachbuna Lake		Portage Lake		Twin Lakes	
Age Group	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)
0	-	(-)	31	(1)	-	(-)	-	(-)	-	(-)	-	(-)
1	-	(-)	-	(-)	64	(1)	-	(-)	-	(-)	86	(1)
2	-	(-)	-	(-)	127	(6)	121	(1)	119	(9)	170	(1)
3	-	(-)	135	(3)	177	(17)	223	(1)	158	(7)	217	(2)
4	267	(2)	-	(-)	215	(18)	217	(7)	220	(7)	301	(6)
5	289	(4)	224	(3)	236	(8)	276	(6)	-	(-)	341	(3)
6	420	(1)	292	(6)	237	(1)	320	(4)	440	(1)	406	(4)
7	426	(1)	469	(2)	375	(7)	343	(4)	496	(2)	423	(1)
8	437	(5)	-	(-)	401	(5)	358	(8)	-	(-)	425	(7)
9	443	(4)	526	(3)	-	(-)	353	(7)	-	(-)	429	(4)
10	494	(3)	463	(3)	-	(-)	-	(-)	-	(-)	479	(2)
11	-	(-)	520	(3)	430	(1)	401	(2)	-	(-)	442	(1)
12	-	(-)	526	(3)	476	(2)	391	(1)	-	(-)	489	(3)
13	515	(1)	542	(2)	484	(1)	-	(-)	-	(-)	-	(-)
14	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	497	(1)
Total		21		29		67		41		26		36

1/ Mean Fork Length (mm)

Table 16. Age Distribution of Mature Arctic Char Sampled from Waters 1/ Within the Proposed Lake Clark National Park/Preserve, 1978 - 1979.

Age (Yrs.)	No.	Percentage
3	1	1.0
4	1	1.0
5	3	3.0
6	12	12.0
7	19	19.0
8	19	19.0
9	13	13.0
10	15	15.0
11	9	9.0
12	3	3.0
13	2	2.0
14	1	1.0
15	1	1.0
	99	99.0

1/ Samples taken from the following waters:

Kijik Lake
Kontrashibuna Lake
Lachbuna Lake
Portage Lake
Tazimina Lake
Twin Lakes
Caribou Lake
Fishtrap Lake

Table 17. Food Items Found Most Commonly In Arctic Char Stomachs From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Kijik Lake June		Twin Lakes August		Fishtrap Lake August	
	Item	%	Item	%	Item	%
1	Gastropoda	(92)	Hymenoptera	(44)	Cyclopoid Copepods	(100)
2	Trichoptera larvae	(48)	Coleoptera adults	(36)	_	(-)
3	Pelecypoda	(44)	Gastropoda	(36)	_	(-)
4	Amphipoda	(7)	Hemiptera	(33)	_	(-)
5	Chironomid larvae	(7)	Chironomid pupae	(33)	_	(-)
6	Chironomid pupae	(7)	Chironomid adults	(30)	_	(-)
7	Culicid pupae	(7)	Misc. Diptera adults	(27)	_	(-)
8	Plecoptera nymphs	(3)	Trichoptera adults	(25)	_	(-)
9	Coleoptera larvae	(3)	Plecoptera nymphs	(13)	_	(-)
10	_	(-)	Trichoptera larvae	(13)	_	(-)
No. Stomachs Examined	27		36		4	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Table 17. (cont.) Food Items Found Most Commonly In Arctic Char Stomachs From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Kontrashibuna Lake August		Portage Lake August		Tazimina Lakes September	
	Item	%	Item	(%)	Item	(%)
1	Trichoptera larvae	(76)	Cladocera	(80)	Trichoptera larvae	(34)
2	Gastropoda	(71)	Trichoptera larvae	(26)	Trichoptera adults	(34)
3	Pelecypoda	(18)	Gastropoda	(20)	Gastropoda	(20)
4	Hymenoptera	(13)	Grichoptera adults	(20)	Chironomid pupae	(20)
5	Chironomid adults	(7)	Culicid pupae	(13)	Pelecypoda	(17)
6	Chironomid pupae	(5)	Neuroptera adults	(6)	Cladocera	(17)
7	Simulid adults	(5)	_	(-)	Hymenoptera	(11)
8	Misc. Diptera adults	(5)	_	(-)	Hemiptera	(11)
9	Coleoptera adults	(5)	_	(-)	Unident fish	(8)
10	Culicid adults	(5)	_	(-)	Chironomid larvae	(8)
No. Stomachs Examined	38		15		35	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

in stomachs. Hymenoptera (ants and small wasps), Trichoptera adults, and Chironomid (midges) pupae and adults were surface dwellers ingested. Cladocerans, adult Coleoptera (aquatic beetles), Amphipods, and Copepods may have been captured by these fish throughout the water column.

It is interesting to note the presence of Cladocerans (Tazimina Lakes and Portage Lake) and Cyclopoid copepods (Fishtrap Lake) among the food items ingested by Arctic char. Large numbers of these organisms were present in several of the stomachs sampled indicating that gill rakers of these fish are certainly adequate for zooplankton filtration from lake waters.

Arctic Grayling:

Grayling were found in lakes, rivers, and streams throughout most of the study area (none were captured in the Cook Inlet drainages surveyed). A total of 548 ranging in fork length from 21 to 464 mm (Table 18) were captured. Capture rates using gill nets were greatest in Snipe Lake and the Tazimina Lakes (Table 11). Hook and line capture rates were highest from Little Kijik River (2.53/ang. hr.), Chulitna River (2.43/ang. hr.), Tazimina River (1.32/ang. hr.), and Mulchatna River (1.00/ang. hr.).

The heaviest grayling sampled weighed 850 grams (1 lb. 14 oz.).

Age-length data for 472 grayling is presented in Table 19. Both scales and otoliths were used in aging these. Ages ranged from 0 (young-of-the-year) to 11 years. It appears maximum growth rate occurs during the first year of life.

Ninety-seven grayling sacrificed during the study proved to be mature. The age distribution of these fish at spawning is presented in Table 20. Most grayling appear to enter the spawning population at age five.

Grayling spawning areas were not identified during this study as field operations each year began after spawning had ceased (grayling usually spawn during May in the Bristol Bay area). Spawners had moved to feeding areas prior to the surveys. Young-of-the-year grayling were captured as early as June 5, 1979 (Chulitna River).

Grayling stomachs (n=117) were examined to determine food items utilized (see Table 21). Contents identified indicate grayling prey on benthic, mid-water, and surface organisms. Trichoptera larvae, Plecoptera (stone fly) nymphs, Chironomid larvae, and gastropods were benthic organisms found in many stomachs. Cyclopoid copepods, Cladocerans, Nematomorpha (horsehair worms), adult Coleoptera, Hydracarina (water mites), and Hemiptera are organisms ingested from throughout the water column. Trichoptera adults, Hymenoptera, adult Chironomids, other adult Diptera, and adult Plecoptera were surface dwelling organisms found in the stomachs. The ability to utilize a wide range of food items may be one factor contributing to the wide range of habitats occupied in the study area by grayling.

Table 18. Length Distribution of Arctic Grayling Sampled 1/ in the Proposed Lake Clark National Park/ Preserve, 1978-1979.

Fork Length Range (mm)	Caribou Lake	Chilikadrotna River	Chulitna River	Fishtrap Lake	Lake Clark	Little Kijik River	Mulchatna River
0-24	-	-	5	-	-	-	-
25-49	-	-	5	-	-	-	-
50-74	-	-	-	-	-	-	-
75-99	-	-	-	-	-	-	-
100-124	1	-	4	-	3	-	-
125-149	-	-	4	-	5	-	-
150-174	-	-	4	-	3	-	-
175-199	1	-	4	-	5	-	-
200-224	-	-	7	-	5	-	-
225-249	2	-	3	-	1	-	1
250-274	-	1	3	1	1	-	-
275-299	2	3	-	-	2	7	10
300-324	-	-	6	-	7	12	5
325-349	1	6	12	-	7	26	23
350-374	-	10	24	-	6	12	9
375-399	-	3	21	-	8	12	1
400-424	-	2	10	-	1	4	2
425-449	-	-	4	-	1	2	-
450-474	-	-	-	-	-	1	-
Total	7	25	116	1	55	76	51

1/ All capture methods

Table 18. (cont.) Length Distribution of Arctic Grayling Sampled 1/ in the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Lower Pickeral Lake	Snipe Lake	Tanalian River	Tazimina Lakes	Tazimina River	Turquoise Lake	Twin Lakes	Total
0-24	-	-	-	-	-	-	-	5
25-49	9	4	-	-	-	-	-	18
50-74	-	-	3	-	1	-	-	4
75-99	-	-	-	-	-	-	-	-
100-124	-	-	-	6	-	-	-	14
125-149	-	-	-	15	-	1	-	25
150-174	-	7	-	-	-	-	-	14
175-199	-	6	-	6	-	1	1	24
200-224	-	6	-	9	2	-	2	31
225-249	-	5	-	13	1	-	-	26
250-274	-	16	-	9	2	-	1	34
275-299	-	11	-	7	3	1	-	46
300-324	-	7	-	4	6	2	-	49
325-349	-	1	-	-	4	1	-	81
350-374	-	2	-	-	12	2	-	77
375-399	-	-	-	2	14	2	3	66
400-424	-	-	-	1	5	-	1	26
425-449	-	-	-	-	-	-	-	7
450-474	-	-	-	-	-	-	-	1
Total	9	65	3	72	50	10	8	548

1/ All capture methods

Table 19. Arctic Grayling Length 1/ Age Frequency from Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age Group	Chulitna River		Lake Clark		Little Kijik River		Mulchatna River		Snipe Lake		Tazimina Lakes		Tazimina River		Area Average	
	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)
0	24	(10)	-	(-)	-	(-)	-	(-)	36	(4)	-	(-)	62	(1)	30	(15)
1	131	(9)	128	(7)	-	(-)	-	(-)	-	(-)	131	(21)	-	(-)	130	(37)
2	189	(9)	189	(7)	-	(-)	-	(-)	175	(13)	193	(8)	-	(-)	185	(37)
3	232	(8)	202	(6)	-	(-)	243	(1)	228	(9)	227	(17)	234	(3)	226	(44)
4	310	(1)	274	(4)	310	(7)	295	(8)	270	(18)	259	(14)	275	(2)	277	(54)
5	320	(11)	330	(7)	328	(24)	315	(5)	275	(11)	292	(9)	334	(17)	317	(84)
6	350	(11)	344	(9)	355	(27)	330	(14)	306	(8)	-	(-)	367	(9)	345	(78)
7	373	(13)	340	(3)	373	(9)	343	(15)	316	(1)	-	(-)	383	(12)	349	(53)
8	380	(19)	392	(8)	373	(2)	363	(6)	-	(-)	-	(-)	391	(4)	381	(39)
9	385	(14)	376	(2)	431	(1)	406	(1)	350	(1)	379	(1)	409	(1)	387	(21)
10	415	(5)	-	(-)	464	(1)	406	(1)	-	(-)	402	(1)	-	(-)	418	(8)
11	419	(1)	-	(-)	-	(-)	-	(-)	-	(-)	393	(1)	-	(-)	406	(2)
Total		111		53		71		51		65		72		49		472

1/ Mean Fork Length (mm)

Table 20. Age Distribution of Mature Arctic Grayling Sampled from Waters 1/ Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age (Yrs.)	No.	Percentage
3	1	1.0
4	4	4.1
5	13	13.4
6	20	20.6
7	16	16.5
8	17	17.6
9	12	12.4
10	8	8.2
11	6	6.2
Total	97	100.0

1/ Samples taken from the following waters:

Chilikadrotna River	Tazimina Lake	Chulitna River
Lake Clark	Turquoise Lake	Caribou Lake
Mulchatna River	Twin Lakes	Fishtrap Lake
Snipe Lake	Little Kijik River	

Table 21. Food Items Found Most Commonly In Arctic Grayling Stomachs, From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Lake Clark June		Snipe Lake July		Caribou Lake July	
	Item	%	Item	%	Item	%
1	Trichoptera larvae	(62)	Cyclopoid copepods	(77)	Trichoptera adults	(57)
2	Hymenoptera	(43)	Chironomid pupae	(48)	Cladocera	(42)
3	Plecoptera nymphs	(37)	Hymenoptera	(48)	Chironomid larvae	(28)
4	Chironomid adults	(37)	Trichoptera adults	(29)	Plecoptera nymphs	(28)
5	Chironomid larvae	(37)	Culicid adults	(19)	Hemipera	(28)
6	Hydracarina	(37)	Nematomorpha	(19)	Trichoptera larvae	(14)
7	Coleoptera adult	(31)	Coleoptera adults	(9)	Plecoptera adults	(14)
8	Misc. Diptera adults	(25)	Culicid pupae	(9)	Chironomid adults	(14)
9	Trichoptera adults	(18)	Chironomid adults	(6)	Gastropoda	(14)
10	Gastropoda	(18)	Chironomid larvae	(6)	_	(-)
No. Stomachs Examined	16		30		7	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Table 21. (cont.) Food Items Found Most Commonly In Arctic Grayling Stomachs, From Waters Within The Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Twin Lakes August		Tazimina Lakes September		Chilikadrotna River September	
	Item	%	Item	%	Item	%
1	Coleoptera adult	(100)	Trichoptera adults	(78)	Trichoptera larvae	(100)
2	Hymenoptera	(100)	Trichoptera larvae	(51)	Plecoptera adult	(34)
3	Hemiptera	(87)	Chironomid adults	(39)	Ephemeroptera nymph	(34)
4	Trichoptera adults	(87)	Hymenoptera	(39)	Trichoptera adults	(26)
5	Chironomid adults	(87)	Misc. Diptera adults	(39)	Misc. Diptera adults	(21)
6	Misc. Diptera adults	(87)	Hemiptera	(15)	Hemiptera	(17)
7	Trichoptera larvae	(50)	Plecoptera adults	(12)	Hymenoptera	(17)
8	Chironomid Pupae	(50)	Hydracarina	(9)	Tipulid adults	(17)
9	Plecoptera nymph	(25)	Chironomid pupae	(9)	Chironomid larvae	(13)
10	Gastropda	(25)	Coleoptera adults	(9)	Plecoptera adult	(8)
No. Stomachs Examined	8		33		23	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Arctic Lamprey:

No Arctic lampreys were actually captured during the study. However, one Turquoise Lake lake trout bearing a fresh lamprey scar was caught. During surveys lower in the Mulchatna River drainage (1977) an Arctic lamprey was captured from Chilchitna River (Gwartney and Russell, 1978) further indicating they are present in the system.

Arctic lampreys are commonly observed in Lake Iliamna and its tributaries. Although none were captured in Lake Clark they may also occur there.

Burbot:

Burbot were found in lakes, rivers, and streams of the Mulchatna and Lake Clark drainages (Table 10). They were captured with gill nets and set lines in lakes, and with use of the electroshocker in streams. The length distribution of those caught is presented in Table 22. The largest burbot sampled measured 597 mm (total length) and weighed 1,360 grams.

The length-age (based on otolith readings) of 24 burbot from the Lake Clark drainage (including Miller Creek and Tanalian River) is presented in Table 23. The data while incomplete indicate these fish grow slowly in the Lake Clark area. Maximum age found was 11 years.

Thirty-five burbot stomachs were examined (see Table 24). Contents identified indicate this species feeds at or near the benthos. Bottom dwelling insects and fish species were the food items most commonly ingested.

Burbot spawn in late winter (McPhail and Lindsey, 1970). Thirteen caught during the study proved to be mature. These fish ranged in age from five through eleven years. Eleven were age seven or older. All mature fish were caught in lakes. Juvenile burbot were captured in both lakes and rivers.

Burbot ("ling cod" is the name used locally) are sought by Lake Clark area residents for personal use, especially during the winter months. The liver is considered a delicacy by local native people.

Chinook Salmon:

Chinook salmon were captured in Mulchatna River drainages, Crescent Lake and Johnson River and one individual was observed in Chulitna River (a tributary of Lake Clark). Only juveniles were captured.

Adults of this species enter Bristol Bay river drainages from approximately May 25 to the end of July on their spawning migrations. Spawning timing varies considerably between areas. Peak of spawning in the Chilikadrotna - Mulchatna area is thought to occur about August 1. A summary of chinook escapement surveys for the Chilikadrotna River is included in Table 8. Escapement figures presented should be considered minimums. Figures are available also for the mainstem Mulchatna River 1974-1979 and are included in Table 9.

Spawning occurs to Bonanza Hills on the Mulchatna River and to Lower Twin

Table 22. Length Distribution of Burbot Sampled 1/ in the Proposed Lake Clark National Park/Preserve, 1978-1979.

Total Length Range (mm)	Fishtrap Lake	Lake Clark	Miller Creek	Mulchatna River	Snipe Lake Outlet	Tanalian River	Turquoise Lake	Twin Lakes	Total
75 - 99	-	-	-	2	-	-	-	-	2
100-124	-	-	-	3	-	-	-	-	3
125-149	-	-	-	-	1	-	-	-	1
150-174	-	-	-	-	-	-	-	-	-
175-199	1	-	1	-	-	-	-	-	2
200-224	-	-	-	-	-	1	-	-	1
225-249	-	-	-	-	-	-	1	-	1
250-274	-	-	-	-	-	-	-	-	-
275-299	-	-	-	-	-	-	1	-	1
300-324	-	-	-	-	-	-	2	-	2
325-349	-	-	-	-	1	-	-	1	2
350-374	-	-	-	-	-	-	-	-	-
375-399	-	-	-	-	-	-	1	1	2
400-424	-	1	-	-	-	-	-	1	2
425-449	-	5	-	-	-	-	-	-	5
450-474	-	6	-	-	-	-	-	-	6
475-499	-	2	-	-	-	-	-	-	2
500-524	-	2	-	-	-	-	-	1	3
525-549	-	2	-	-	-	-	-	-	2
550-574	-	3	-	-	-	-	-	-	3
575-599	-	1	-	-	-	-	-	-	1
Total	1	22	1	5	2	1	5	4	41

1/ All capture methods

Table 23. Burbot Length 1/ Age Frequency From Lake Clark Drainages, 1978-1979.

Age Group	Mean Length	(n)
0	-	(-)
1	-	(-)
2	-	(-)
3	198	(2)
4	-	(-)
5	-	(-)
6	435	(2)
7	469	(10)
8	495	(5)
9	521	(1)
10	568	(1)
11	543	(3)
Total		24

1/ Mean Total Length (mm)

Table 24. Burbot Stomach Contents, From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Lake Clark June-Sept. Item	%	Twin Lakes July Item	%	Turquoise Lake August Item	%	Mulchatna River August Item	%
1	Least cisco fry	(13)	Unident. fish	(75)	Unident. fish	(40)	Ephemeroptera nymph	(50)
2	Tipulid larvae	(13)	Lake trout	(25)	Hydracarina	(20)	Plecoptera nymph	(25)
3	Plecoptera nymphs	(13)	Plecoptera adult	(25)	Plecoptera nymph	(20)	_	(-)
4	Unident. fish	(13)	Tipulid larvae	(25)	Lake trout	(20)	_	(-)
5	Chironomid larvae	(8)	Round whitefish	(25)	Sculpin	(20)	_	(-)
6	Unident. fish egg	(4)	Misc.Diptera larvae	(25)	_	(-)	_	(-)
7	Simulid larvae	(4)	_	(-)	_	(-)	_	(-)
8	Misc.Diptera larvae	(4)	_	(-)	_	(-)	_	(-)
9	_	(-)	_	(-)	_	(-)	_	(-)
10	_	(-)	_	(-)	_	(-)	_	(-)
No. Stomachs Examined	23		4		5		4	

1/ Ranking based on ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Lake on the Chilikadrotna.

None of the juvenile chinooks captured were aged, as other investigators (Nelson, 1972) have aged Nushagak River drainage chinooks and found the vast majority spend only one year in freshwater. The 42 captured during 1978 in the Mulchatna - Chilikadrotna Rivers ranged in fork length from 54 to 83 mm with a mean length of 69 m and were probably all young-of-the-year. The two caught in Crescent Lake (fork lengths 121 and 125 mm) June 20, 1978 appeared to be smolt.

No chinook stomachs were examined.

Chum Salmon:

Only two chum salmon were caught during the study (a fry from Johnson River, and an adult in Telaquana Lake). Carcasses of postspawners were observed on gravel bars along the upper Mulchatna River August 12, 1978. Aerial escapement surveys of the upper Mulchatna River (Table 9) and the Chilikadrotna River (Table 8) further document the presence of this species in these waters.

Gary Sanders (ADF&G, Soldotna) provided escapement data (from aerial surveys) for Clearwater Creek, a major chum salmon spawning stream located at the west end of Chinitna Bay (just inside the southwest boundary of the proposed Park/Preserve). These data indicate minimum chum escapements between 1971 and 1978 as follows:

Year	1971	1973	1974	1975	1976	1977	1978
Date	8/15	8/18	8/22	8/17	8/11	8/21	8/12
Survey Estimate	5,000	8,450	1,800	4,400	12,500	12,700	6-7,000

Baxter and Baxter, 1961 documented the presence of chums in the following Cook Inlet drainages:

McArthur River (Swank Slough)
Polly Creek
Crescent River
Bear Creek
Dog Creek
Johnson River
Silver Salmon Creek

A few chum salmon are observed annually spawning in Iliamna Lake tributaries and stragglers may occasionally enter Lake Clark.

Chum fry migrate seaward soon after hatching, not requiring a period of freshwater residency.

Coastrange Sculpin:

This species was found in Johnson River, Crescent Lake, and Lake Clark. Four individuals total were collected during the study.

Roger (1971) documented the presence of coastrange sculpin in Lake Iliamna and several of its tributaries. His work did not include waters within the Lake Clark area. His studies of feeding habits, age and growth, migration, and other aspects of the ecology of both Cottus aleuticus and Cottus cognatus are probably very applicable to the adjacent populations of both these species.

Coho Salmon:

Cohos were captured in the Mulchatna, Chilikadrotna, and Johnson River drainages. A total of 69 juveniles ranging in fork length from 34 to 112 mm were sampled. All but three of these were less than 65 mm in length and were probably young-of-the-year fish. Nushagak River drainage cohos (based on age analysis by Nelson, 1972) generally spend one year in freshwater prior to migrating seaward.

Fifty-eight coho spawners were observed during the course of a float trip down the Chilikadrotna River September 17-22, 1978. Some were actively spawning at that time. Numbers were probably much greater than what was seen from the raft. Another 65 spawners were observed in side channels of the Mulchatna River during the September 9-15, 1979 float survey. Most of these were still migrating upriver to spawning areas.

Baxter and Baxter (1961) documented the presence of spawning runs into numerous Cook Inlet drainages including the following:

McArthur River drainage
Kustatan River
Severson Slough
Katnu (Big) River drainage
Drift River
Cannery Slough
Whiskey Jack Slough
Redoubt River
Polly Creek
Crescent River
Bear Creek
Johnson River
Silver Salmon Creek

No other biological data was collected for this species.

Dolly Varden:

Dolly Varden were found in each of the major drainages (Cook Inlet, Lake Clark, Mulchatna, and Stony River) sampled. They were captured in greatest abundance from Hickerson Lake (4.2/gill net hr.), and Crescent Lake (1.24/gill net hr.). Most of the remainder were found in small streams tributary to lakes throughout the above drainages.

Length distribution of 226 Dolly Varden captured is presented in Table 25. The largest individual measured 548 mm in fork length, weighed 2,350 grams (5 lb. 3 oz.), and was 11 years old. The length-age of 144 Dolly Varden (based on otolith readings) is presented in Table 26. Growth rates appear to be very slow.

Six mature Dolly Varden were captured in Crescent Lake. Youngest of these was seven years old. One nine-year-old had retained eggs from a previous

Table 25. Length Distribution of Dolly Varden Sampled 1/ in the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chakachamna Lake	Chilikadrotna River	Crescent Lake	Hickerson Lake	Mulchatna River	Tazimina Lakes	Twin Lakes Tribs.	Other 2/	Total
25- 49	5	-	2	-	3	3	7	1	21
50- 74	3	-	1	-	11	-	-	11	26
75- 99	3	-	1	-	3	-	2	11	20
100-124	1	-	8	7	3	1	4	2	26
125-149	2	1	15	7	-	2	-	2	29
150-174	-	2	2	3	-	-	2	1	10
175-199	-	-	5	16	-	1	1	-	23
200-224	-	-	1	9	-	-	-	-	10
225-249	-	-	1	14	-	-	-	-	15
250-274	-	-	-	16	-	-	-	-	16
275-299	-	-	1	12	-	-	-	1	14
300-324	-	-	1	3	-	-	-	-	4
325-349	-	-	-	1	-	-	-	-	1
350-374	-	-	-	-	-	-	-	-	-
375-399	-	-	2	-	-	-	-	-	2
400-424	-	-	2	-	-	-	-	1	3
425-449	-	-	1	-	-	-	-	1	2
450-474	-	1	1	-	-	-	-	-	2
475-499	-	-	-	-	-	-	-	-	-
500-524	-	1	-	-	-	-	-	-	-
525-549	-	-	1	-	-	-	-	-	1
Total	14	5	45	88	20	7	16	31	225

1/ All capture methods

2/ Includes Johnson River (6), Snipe Lake Outlet (4), Telaquana Lake tribs. (4), Turquoise Lake tribs.(3), Two Lakes tribs.(5), Lake Clark (2), and Lake Clark tribs.(7).

Table 26. Dolly Varden Length 1/ - Age, Frequency From Waters Within Proposed Lake Clark National Park/Preserve, 1978-1979.

Age Group	Chakachamna Lake Mean Length	(n)	Crescent Lake Mean Length	(n)	Hickerson Lake Mean Length	(n)
0	42	(5)	-	(-)	-	(-)
1	75	(2)	47	(2)	-	(-)
2	83	(3)	76	(2)	111	(1)
3	115	(1)	130	(18)	138	(13)
4	139	(2)	143	(6)	178	(18)
5	-	(-)	191	(5)	230	(18)
6	-	(-)	278	(1)	262	(17)
7	-	(-)	294	(3)	263	(18)
8	-	(-)	-	(-)	303	(3)
9	-	(-)	409	(3)	-	(-)
10	-	(-)	-	(-)	-	(-)
11	-	(-)	548	(1)	-	(-)
12	-	(-)	470	(1)	-	(-)
13	-	(-)	417	(1)	-	(-)
Total		13		43		88

1/ Mean Fork Length (mm)

spawning. Three mature individuals were captured from a landlocked population near Twin Lakes (residents of an intermittent stream), the youngest of which was a two-year-old male. Two of three mature individuals caught in Upper Tazimina Lake were three years old. Sixty-nine mature Hickerson Lake fish were captured ranging in age from three to eight years, 91 percent of which were ages four through seven. Age four appears to mark the onset of sexual maturity for most of that population.

Spawning Dolly Varden were captured in the Chilikadrotna River September 19-21, 1978.

Forty-seven Dolly Varden stomachs were examined during the study (see Table 27). Chironomids (larvae, pupae, and adults), Trichoptera larvae, and other Diptera larvae and adults were the food items appearing in most stomachs. These fish apparently fed throughout the water column also. They were observed taking surface organisms at Hickerson Lake and the presence of snails (Gastropoda), freshwater clams, (Pelecypoda), and Trichoptera larvae indicate benthic feeding also.

Humpback Whitefish:

This species was captured from Lake Clark, Pickeral Lakes, Long Lake and Chulitna River. A total of 119 were sampled ranging in fork length from 24 to 519 mm (Table 28). The heaviest weighed 1,500 grams (3 lbs. 5 oz.). Nearly all were captured in gill nets.

The author attempted ageing 94 humpback whitefish captured during the study but did not attain sufficiently consistent readings to present. Metsker (1967) aged 290 humpback whitefish captured during the 1964 Lake Clark commercial freshwater fishery. A summary of his age-length data appears in Table 29.

Adults in spawning condition were captured September 26-27 near shoal areas in Chulitna Bay (Lake Clark) and near some small islands in midlake approximately seven miles southwest of Port Alsworth. One "spent" individual was captured on that date.

Fry were captured June 20, 1978 in the shallows of Chulitna Bay near the Chulitna River outlet and June 23, 1979 at the outlet of Long Lake.

Fifty-six stomachs were examined during the study (Table 30). Thirty-one were collected during June, and 25 in September. Benthic organisms were most common among the food items identified. Gastropods (Lymnaea sp. and Valvata sp.) were the single most important food item numerically in the stomachs examined. Many stomachs were full of Gastropods, some to the point of distention. Humpback whitefish stomachs are characterized by very muscular walls, which can completely crush Gastropod shells and the protective cases of other food items (Pelecypods and Trichoptera larvae). Although the percentage occurrences varied, it is interesting to note that the five organisms found most commonly in June stomach samples also were the five most commonly found organisms in September stomachs.

Table 27. Dolly Varden Stomach Contents, From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Crescent Lake June		Hickerson Lake July		Twin Lakes August	
	Item	%	Item	%	Item	%
1	Trichoptera larvae	(55)	Chironomid adult	(90)	Chironomid larvae	(55)
2	Chironomid pupae	(38)	Hymenoptera	(50)	Chironomid adult	(44)
3	Baby birds	(27)	Simulid adults	(45)	Chironomid pupae	(44)
4	Gastropoda	(22)	Chironomid pupae	(40)	Trichoptera larvae	(33)
5	Pelecypoda	(16)	Trichoptera adults	(35)	Coleoptera larvae	(33)
6	Salmon eggs 2/	(11)	Coleoptera adults	(25)	Coleoptera adult	(33)
7	Chironomid larvae	(11)	Tipulid adults	(25)	Culicid pupae	(33)
8	Misc. Diptera larvae	(11)	Misc. Diptera adults	(15)	Culicid adult	(22)
9	Hydracarina	(5)	Dolly Varden	(5)	Misc. Diptera larvae	(22)
10	Chironomid adults	(5)	Gastropoda	(5)	Misc. Diptera adults	(22)
No. Stomachs Examined	18		20		9	

1/ Ranking based on ratio of stomachs containing a particular item to the number of stomachs examined for that location.

2/ Overwintered salmon eggs (dead).

Table 28. Length Distribution of Humpback Whitefish Sampled 1/ From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chulitna River	Lake Clark	Long Lake	Pickeral Lakes	Total
0- 24	-	1	-	-	1
25- 49	-	2	5	-	7
50- 74	-	-	-	-	-
75- 99	1	-	-	-	1
100-124	-	-	-	-	-
125-149	2	1	-		3
150-174	1	2	-	-	3
175-199	1	4	-	-	5
200-224	-	11	-	-	11
225-249	-	20	-	-	20
250-274	1	11	-	-	12
275-299	-	3	-	1	4
300-324	1	7	-	-	8
325-349	-	2	-	-	2
350-374	-	4	-	1	5
375-399	-	5	-	2	7
400-424	1	3	-	-	4
425-449	-	8	-	4	12
450-474	-	7	-	1	8
475-499	-	-	-	5	5
500-524	-	1	-	-	1
Total	8	92	5	14	119

1/ All capture methods

Table 29. Humpback Whitefish Length 1/ Age Frequency From Lake Clark Drainage, 1964. 2/

Age Group	Mean Length	(n)
5	370	(5)
6	383	(24)
7	401	(47)
8	413	(50)
9	423	(42)
10	428	(45)
11	433	(35)
12	441	(22)
13	449	(20)
Total		290

1/ Mean Fork Length (mm)

2/ From Metsker (1967)

Table 30. Humpback Whitefish Stomach Contents From Lake Clark, 1978-1979.

Food Item	Percentage Occurrence 1/ June	September
Gastropoda	80	80
Chironomid larvae	51	16
Pelecypoda	38	20
Hydracarina	35	12
Trichoptera larvae	32	20
Chironomid pupae	22	-
Misc. Diptera larvae	12	4
Culicid pupae	9	-
Unident. fish	6	-
Unident. fish eggs	6	-
Cladocera	3	-
Chironomid adults	3	8
Amphipoda	3	4
Sculpins	3	-
Hymenoptera	3	-
Trichoptera adults	3	-
Hemiptera	3	-
No. stomachs examined	31	25

1/ Percentage Occurrence = $\frac{\text{No. stomachs containing item}}{\text{No. stomachs examined}}$

Lake Trout:

Lake trout are widely distributed throughout the proposed Park/Preserve (Table 10) and were captured in 15 of the 26 lakes test fished. Greatest capture rates were attained at Crescent Lake (0.88/gill net hr.), Lower Twin Lake (0.84/gill net hr.), and Portage Lake (0.77/gill net hr.).

A total of 396 individuals were captured (Table 31), ranging in fork length from 41 to 781 mm. The smallest individuals (41, 44 and 45 mm in length respectively) were caught in a slow-flowing rocky inlet tributary to Turquoise Lake. The largest individual (781 mm, 5,750 gram prespawn female) was captured off a creek delta in the Little Lake Clark arm of Lake Clark.

The length-age frequency of 334 lake trout is presented in Table 32. Growth is characteristically slow. The oldest fish examined was 29 years of age.

A total of 228 mature lake trout were captured during the study. The age distribution of these is presented in Table 33. Ages 11 through 16 constitute 74% of the spawning population. The youngest spawners were age six. Lake trout in spawning condition were captured September 26-27, 1978 near shoals around islands in Lake Clark. Although no actual spawning was observed, two "spent" individuals were captured on that date.

Stomach samples from 264 lake trout were examined (see Tables 34 and 35). These fish appear to have fed throughout the water column taking surface organisms (Chironomid pupae, Trichoptera adults, Culicid adults and pupae, and Chironomid adults), benthic organisms (Trichoptera larvae, Gastropods, Pelecypods, Plecoptera nymphs, and Chironomid larvae), and mid-water organisms (other fishes, Cladocera, Amphipods, and Hirudinea).

Main food items utilized appear to be other fishes, Chironomid pupae and adults, Gastropods, and Trichoptera larvae and adults.

Least Cisco:

Least ciscos were captured in four lakes (Hoknede Lake, Lake Clark, Lower Pickeral Lake, and Telaquana Lake) and in Chulitna River. Greatest capture rate (0.62/gill net hr.) was achieved from Lake Clark. A total of 223 fish ranging in fork length from 119 to 276 mm, were caught (see Table 36).

Length-age data for Chulitna River and Lake Clark individuals appears in Table 37. The oldest examined was age nine. Growth rate appears to be quite slow after age three.

Ages were determined for 107 mature least ciscos, the oldest of which were age nine (Table 38). It appears that age three marks the onset of sexual maturity for the majority of least ciscos in the area. This species spawns in the fall (McPhail and Lindsey, 1970). No spawning activity was noted during either field season. Local residents have reported schools of juvenile ciscos migrating out of Chulitna River during late June.

Table 31. Length Distribution of Lake Trout Sampled 1/ in the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chakachamna Lake	Crescent Lake	Kontrashibuna Lake	Lachbuna Lake	Lake Clark	Portage Lake	Telaquana Lake	Turquoise Lake	Twin Lakes	Other 2/	Total
25- 49	-	-	-	-	-	-	-	3	-	-	3
50- 74	-	-	-	-	-	-	-	2	-	-	2
75- 99	-	-	-	-	-	-	-	1	-	-	1
100-124	-	-	-	-	-	-	-	-	-	-	-
125-149	1	-	2	-	-	-	-	-	-	-	3
150-174	-	-	-	-	-	1	-	-	-	-	1
175-199	1	1	1	-	-	-	-	-	-	-	3
200-224	1	-	-	2	-	-	-	-	-	1	4
225-249	2	-	-	2	-	1	-	4	2	-	11
250-274	-	-	1	1	2	-	-	-	3	-	7
275-299	1	1	-	1	1	-	-	1	1	-	6
300-324	2	-	1	4	1	-	-	3	-	-	11
325-349	6	3	9	2	2	2	-	8	3	1	36
350-374	5	1	20	4	-	-	-	7	7	1	45
375-399	7	2	18	3	1	3	-	8	5	1	48
400-424	-	6	9	1	3	7	5	4	23	8	66
425-449	2	2	5	1	1	6	2	3	13	7	42
450-474	2	1	2	1	8	5	4	2	5	5	35
475-499	1	6	1	1	8	-	5	-	-	2	24
500-524	2	-	1	-	7	2	3	-	-	1	16
525-549	-	3	1	-	8	1	1	-	-	1	15
550-574	-	3	-	-	5	1	-	-	-	-	9
575-599	-	-	-	-	2	-	-	-	-	-	2
600-624	-	-	-	-	1	-	-	-	-	-	1
625-649	-	-	-	-	2	-	-	-	-	-	2
650-674	-	-	-	1	-	-	-	-	-	-	1
675-699	-	-	-	1	-	-	-	-	-	-	1
700-724	-	-	-	-	-	-	-	-	-	-	-
725-749	-	-	-	-	-	-	-	-	-	-	-
750-774	-	-	-	-	1	-	-	-	-	-	1
Total	33	29	71	25	53	29	20	46	62	28	396

1/ All capture methods

2/ Includes Fishtrap Lake (7), Hudson Lake (7), Kijik Lake (5), Snipe Lake (6), and Two Lakes (3).

Table 32. Mean Fork Length [1/] Age, Lake Trout from Waters within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age Group	Location																	
	Crescent Lake		Kontrashibuna Lake		Lachbuna Lake		Lake Clark		Portage Lake		Telaquana Lake		Turquoise Lake		Twin Lakes		Area Average	
	Mean Length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)	Mean length	(n)
1	-	-	-	-	-	-	-	-	-	-	-	-	51	(2)	-	-	51	(2)
2	-	-	-	-	-	-	-	-	-	-	-	-	76	(1)	-	-	76	(1)
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(-)
4	-	-	-	-	-	-	270	(1)	-	-	-	-	-	-	-	-	270	(1)
5	-	-	182	(4)	224	(3)	258	(1)	168	(1)	-	-	-	-	241	(1)	207	(10)
6	-	-	-	-	-	-	-	-	-	-	-	-	239	(4)	265	(2)	248	(6)
7	-	-	343	(1)	249	(2)	276	(1)	248	(1)	-	-	314	(4)	268	(2)	287	(11)
8	233	(2)	322	(3)	318	(1)	371	(3)	327	(1)	-	-	338	(1)	371	(5)	336	(16)
9	-	-	336	(2)	319	(2)	411	(4)	396	(2)	408	(1)	346	(6)	359	(4)	365	(21)
10	327	(1)	362	(13)	308	(10)	-	-	395	(3)	-	-	357	(5)	376	(3)	349	(35)
11	346	(1)	385	(11)	326	(3)	474	(4)	-	-	483	(1)	372	(6)	396	(5)	392	(31)
12	421	(6)	377	(10)	374	(1)	480	(5)	426	(4)	476	(6)	402	(5)	410	(11)	420	(48)
13	381	(3)	393	(12)	395	(5)	487	(9)	452	(4)	470	(5)	400	(2)	414	(10)	426	(50)
14	483	(1)	400	(5)	-	-	534	(6)	470	(2)	437	(2)	423	(2)	427	(8)	452	(26)
15	525	(1)	423	(5)	362	(2)	526	(5)	-	-	536	(1)	393	(2)	432	(3)	453	(19)
16	465	(5)	482	(1)	-	-	-	-	448	(2)	423	(1)	419	(2)	381	(1)	445	(12)
17	424	(1)	485	(2)	400	(1)	513	(2)	-	-	452	(2)	-	-	461	(2)	465	(10)
18	555	(1)	428	(1)	485	(1)	515	(4)	442	(1)	447	(1)	-	-	-	-	491	(9)
19	473	(3)	-	-	-	-	565	(2)	468	(3)	-	-	-	-	445	(2)	484	(10)
20	565	(1)	-	-	-	-	640	(3)	413	(1)	-	-	-	-	-	-	580	(5)
21	495	(2)	-	-	-	-	635	(1)	-	-	-	-	430	(1)	428	(1)	497	(5)
22	539	(1)	-	-	-	-	-	-	542	(1)	-	-	-	-	-	-	541	(2)
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(-)
24	-	-	-	-	679	(1)	-	-	443	(1)	-	-	-	-	-	-	561	(2)
25 and older	-	-	-	-	663	(1) [2/]	-	-	542	(1) [3/]	-	-	-	-	-	-	-	(2)
Total		29		70		33		51		28		20		43		60		334

1/ Length in mm
2/ Age Group 29
3/ Age Group 26

Table 33. Age Distribution of Mature Lake Trout Sampled from Waters [1/] Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age	No.	Percentage
6	2	0.8
7	3	1.3
8	5	2.1
9	8	3.5
10	12	5.3
11	20	8.8
12	40	17.6
13	42	18.5
14	23	10.1
15	17	7.5
16	14	6.2
17	9	4.0
18	9	4.0
19	9	4.0
20	5	2.1
21	5	2.1
22	1	0.4
23	-	-
24	2	0.9
25	-	-
26	1	0.4
27	-	-
28	-	-
29	1	0.4
Total	228	100.0

1/ Samples taken from the following waters:

Crescent Lake
Kijik Lake
Kontrashibuna Lake
Lachbuna Lake
Lake Clark
Portage Lake
Telaquana Lake
Turquoise Lake
Twin Lakes
Two Lakes
Hudson Lake
Chakachamna Lake
Fishtrap Lake

Table 34. Food Items Found Most Commonly In Lake Trout Stomachs, From Waters Within the Proposed Lake Clark National Park/ Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Crescent Lake June		Kijik Lake June		Hudson Lake July		Twin Lakes August	
	Item	%	Item	%	Item	%	Item	%
1	Chironomid pupae	(75)	Chironomid pupae	(60)	Ninespine Stickleback	(57)	Chironomid Pupae	(37)
2	Unident. fish	(31)	Sockeye fry	(40)	Sculpins	(42)	Unident. fish	(22)
3	Dolly Varden	(13)	Round whitefish	(20)	Culicid adults	(14)	Trichoptera larvae	(22)
4	Chironomid larvae	(13)	Suckers	(20)	Gastropoda	(14)	Culicid pupae	(20)
5	Plecoptera nymphs	(10)	Unident. fish	(20)	Hirudinea	(14)	Gastropoda	(14)
6	Sculpins	(6)	_	(-)	Pelecypoda	(14)	Chironomid adults	(9)
7	Salmon eggs	(6)	_	(-)	_	(-)	Hymenoptera	(9)
8	Gastropods	(6)	_	(-)	_	(-)	Trichoptera adults	(9)
9	Ephemeroptera nymphs	(6)	_	(-)	_	(-)	Chironomid larvae	(6)
10	Chironomid adults	(6)	_	(-)	_	(-)	Sculpins	(6)
No. Stomachs Examined	29		5		7		62	

1/ Based on the ratio of stomachs containing a particular item to the total number of stomachs examined for that location.

Table 34. Food Items Found Most Commonly In Lake Trout Stomachs, From Waters within the Proposed Lake (cont.) Clark National Park/Preserve, 1978-1979

Percentage Abundance Ranking 1/	Chakachamna Lake August		Kontrashibuna Lake August		Fishtrap Lake August		Portage Lake August	
	Item	%	Item	%	Item	%	Item	%
1	Sculpins	(21)	Trichoptera larvae	(39)	Sculpins	(25)	Cladocera	(34)
2	Lake Trout	(15)	Unident. fish	(39)	Unident. fish	(25)	Culicid pupae	(30)
3	Unident. fish	(9)	Gastropoda	(34)	Cladocera	(25)	Chironomid pupae	(30)
4	Round whitefish	(6)	Sculpins	(21)	Gastropoda	(25)	Unident. fish	(26)
5	Trichoptera larvae	(6)	Pygmy whitefish	(21)	Pelecypoda	(12)	Sculpins	(26)
6	Hymenoptera	(6)	Culicid pupae	(21)	Chironomid pupae	(12)	Trichoptera adults	(21)
7	Voles	(3)	Chironomid pupae	(19)	_	(-)	Trichoptera larvae	(13)
8	_	(-)	Trichoptera adults	(15)	_	(-)	Amphipoda	(13)
9	_	(-)	Coleoptera larvae	(6)	_	(-)	Gastropoda	(13)
10	_	(-)	Chironomid adults	(4)	_	(-)	Lake trout	(4)
No. Stomachs Examined	33		46		8		23	

1/ Based on the ratio of stomachs containing a particular item to the total number of stomachs examined for that location.

Table 35.. Lake Trout Stomach Contents, Lake Clark, 1978-1979.

Food Item	Percentage Occurrence 1/ June	July	August 2/	September
Chironomid pupae	44	-	-	-
Plecoptera nymphs	27	-	-	-
Gastropoda	22	-	-	-
Unident. fish	22	20	-	11
Trichopera larvae	16	-	-	-
Coleoptera adults	11	-	-	5
Chironomid adults	5	-	-	-
Culid adults	5	-	-	-
Ephemeroptera nymphs	5	-	-	-
Trichoptera adults	5	6	-	-
Least cisco	5	6	-	-
Ninespine stickleback	5	-	-	-
Sculpins	5	6	-	5
Simulid larvae	-	6	-	-
Hymenoptera	-	13	-	-
Lake trout	-	6	-	-
Salmon eggs	--	-	-	5
Voles	-	6	-	-
No Stomachs Examined	18	15	-	18

1/ Percentage Occurrence = $\frac{\text{No. stomachs containing item}}{\text{No. stomachs examined}}$

2/ No lake trout sampled were collected from the lake during August

Table 36. Length Distribution of Least Ciscos Sampled 1/ From Selected Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chulitna River	Hoknede Lake	Lake Clark	Lower Pickeral Lake	Telaquana Lake	Total
100-124	-	-	1	-	-	1
125-149	32	-	3	1	-	36
150-174	61	2	-	-	1	64
175-199	1	3	15	1	-	20
200-224	-	3	77	-	-	80
225-249	-	2	15	-	-	17
250-274	-	-	1	-	3	4
275-299	-	-	-	-	1	1
Total	94	10	112	2	5	223

1/ All capture methods

Table 37. Least Cisco Length 1/ - Age Frequency From Lake Clark Drainage, 1979.

Age Group	Chulitna River Mean Length	Chulitna River (n)	Lake Clark 2/ Mean Length	Lake Clark 2/ (n)
0	-	-	-	-
1	-	-	-	-
2	137	(3)	126	(1)
3	145	(27)	-	-
4	156	(48)	188	(3)
5	158	(3)	205	(7)
6	-	-	215	(12)
7	-	-	223	(2)
8	-	-	240	(4)
9	-	-	233	(1)
Total		81		30

1/ Mean Fork Length (mm)

2/ All Caught in the Little Lake Clark arm of Lake Clark

Table 38. Age Distribution of Mature Least Ciscos Sampled From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age Group	Chulitna River	Hoknede Lake	Lake Clark	Lower Pickeral Lake	Telaquana Lake	Total
2	-	1	-	1	-	2
3	22	1	-	-	-	23
4	48	-	6	1	-	55
5	3	3	3	-	4	13
6	-	-	8	-	-	8
7	-	-	2	-	-	2
8	-	-	3	-	-	3
9	-	-	1	-	-	1
Total	73	5	23	2	4	107

Twenty-five stomachs taken June 5, 1979 from Chulitna River least ciscos were examined and the contents analysis is presented in Table 39. These fish were observed prior to capture rising for surface organisms. The majority of food items identified were surface dwellers (even the Plecoptera nymphs may have been taken at the surface as adult stoneflies had begun appearing by this time).

Least ciscos at times travel in "schools". These were observed in both the Chulitna River, and in the stream connecting Middle and Lower Pickeral Lakes.

This species has been reported previously from Lake Clark by the Fisheries Research Institute and some information on seasonal distribution was published (Kerns, 1968).

Longnose Sucker:

Longnose suckers were captured in the Lake Clark, Mulchatna and Stony River drainages, but not from any Cook Inlet drainages. Maximum capture rates were attained from Kijik Lake (2.58/gill net hr.), and Otter Lake (1.93/gill net hr.). A total of 265 individuals ranging in fork length from 13 to 533 mm were captured (Table 40). The heaviest of these weighed 1,960 grams (4 lbs. 5 oz.). Ages were determined (scale analysis) for 190 individuals (Table 41). The oldest examined was age 14.

Suckers spawn in streams in the Bristol Bay area during late May over gravel bottoms in slow-flowing waters. No spawning was observed as field surveys began in June.

Age at maturity was not determined for this species.

Sucker fry were first observed in the shallows of Chulitna Bay (Lake Clark) on June 20, 1978.

No food habits data were observed.

Ninespine Stickleback:

Ninespine sticklebacks were observed and captured in shallow weedy areas of Chulitna River, Hoknede Lake, Hudson Lake, Johnson River, Lake Clark, Otter Lake, Pickeral Lakes, Telaquana Lake, and Two Lakes. A total of 42 were measured, ranging in total length from 19-81 mm. No other biological data were collected from this species.

Northern Pike:

Northern pike were captured from the Lake Clark, Mulchatna, and Stony River drainages but not from waters tributary to Cook Inlet. Greatest capture rates using nets were achieved at Loon Lake (0.76/gill net hr.), and Long Lake (0.71/trap net hr.). Additionally, pike were caught on hook and line from Long Lake (3.65/ang. hr.) and Chulitna River (0.68/ang. hr.).

Table 39. Least Cisco Stomach Contents, Chulitna River, June 5, 1979.

Food Item	Percentage Occurrence 1/
Plecoptera nymphs	88
Chironomid pupae	84
Chironomid adults	72
Trichoptera adults	68
Ephemeroptera nymphs	32
Simulid adults	28
Hymenoptera	28
Coleoptera adults	24
Culicid adults	24
Collembola	12
Arachnids	12
Hemiptera	8
Misc. adult diptera	8
Coleoptera larvae	4
Misc. terrestrial insects	4
No. stomachs examined	25

1/ Percentage Occurrence = $\frac{\text{No. stomachs containing item}}{\text{No. stomachs examined}}$

Table 40. Length Distribution of Longnose Suckers Sampled 1/ in the Proposed Lake Clark National Park/ Preserve, 1978-1979.

Fork Length Range (mm)	Chulitna River	Kijik Lake	Lake Clark	Otter Lake	Telaquana Lake	Twin Lakes	Two Lakes	Total
0 - 24	-	-	47	-	-	-	-	47
25 - 49	3	-	27	-	-	-	-	30
50 - 74	-	-	-	-	-	-	-	-
75 - 99	-	-	1	-	-	-	-	1
100-124	-	24	1	-	-	-	-	25
125-149	-	6	1	-	-	-	-	7
150-174	-	28	3	3	-	-	-	34
175-199	-	11	2	11	-	-	-	24
200-224	-	4	5	6	-	-	-	15
225-249	-	3	3		-	-	-	10
250-274	-	-	-	1	-	-	-	1
275-299	-	-	-	-	-	-	-	-
300-324	-	-	3	1	-	-	-	4
325-349	-	1	8	-	-	-	1	10
350-374	-	-	1	-	-	1	-	2
375-399	-	-	3	-	-	-	-	3
400-424	-	-	7	1	4	-	-	12
425-449	-	-	6	-	8	-	2	16
450-474	1	-	3	-	4	-	-	8
475-499	-	-	1	-	8	-	-	9
500-524	-	-	3	-	3	-	1	7
Total	4	77	125	27	27	1	4	265

1/ All capture methods

Table 41. Longnose Sucker Length-Age Frequency 1/ From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Location	Age Group														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Kijik Lake	-	119 (n=1)	128 (n=7)	182 (n=10)	212 (n=7)	-	-	-	-	-	-	-	-	-	-
Lake Clark	23 (n=24)	-	-	141 (n=2)	206 (n=2)	225 (n=1)	325 (n=2)	348 (n=3)	353 (n=5)	407 (n=6)	419 (n=6)	409 (n=2)	464 (n=5)	513 (n=2)	521 (n=1)
Otter Lake	-	-	-	196 (n=8)	206 (n=18)	-	-	-	-	-	-	-	-	-	-
Telaquana Lake	-	-	-	-	-	-	-	-	464 (n=3)	441 (n=6)	443 (n=7)	459 (n=7)	-	493 (n-1)	-
Twin Lakes	-	-	-	-	-	-	-	368 (n=1)	-	-	-	-	-	-	-
Two Lakes	-	-	-	-	-	-	-	329 (n=1)	-	443 (n=1)	-	-	-	513 (n=1)	-
Area Average	23 (n=74)	119 (n=1)	128 (n=7)	184 (n=20)	208 (n=27)	225 (n=1)	325 (n=2)	348 (n=5)	395 (n=8)	425 (n=13)	432 (n=13)	448 (n=9)	464 (n=5)	508 (n=4)	521 (n=1)

1/ Mean fork length (mm)

The length distribution of 282 pike captured during the study appears in Table 42. The largest individual caught measured 908 mm (fork length) and weighed 6,890 grams (15 lbs. 3 oz.). Larger fish have been caught in Chulitna Bay by a local resident during June 1978 but they were butchered prior to inspection by the author.

Ages were determined (using opercular bones) for 108 Chulitna River drainage pike (see Table 43). Ages to 18 years were attained.

Pike in spawning condition were caught in Two Lakes July 5, 1978. Others in a "spent" condition were captured July 13, 1978 from Telaquana Lake. In both cases they were caught in shallow weedy areas. Ages were determined for 98 mature individuals (see Table 44 and ranged from four through 18 years. The majority were age six or older.

Pike fry were captured June 21, 1979 in weedy shoreline areas of Long Lake.

A total of 166 pike stomachs were examined to determine food habits (Table 45). Other fishes, Amphipods, Hirudinea (leeches), and Coleoptera larvae were the main food items utilized.

Chulitna Bay in Lake Clark is an important pike concentration area. Subsistence nets fished during the period June 2- June 21, 1978 in Turner Bay (a sheltered side bay) took an estimated 350-500 pike. This harvest from a probable spawning and recreational use area needs evaluation to ensure that adequate population levels are maintained. Some spectacularly large pike were taken in the subsistence fishery.

Pink Salmon:

No pink salmon were captured during the 1978-1979 surveys. However, Baxter and Baxter (1961) documented their presence in the following Cook Inlet drainages adjacent or within the proposed Park/Preserve:

McArthur River drainage
Katnu (Big) River
Cannery Slough
Polly Creek
Crescent River
Johnson River
Silver Salmon Creek

The author observed pink salmon in the Mulchatna River drainage during 1977 (Gwartney and Russell, 1978). A few individuals are captured in Iliamna Lake tributaries during sockeye subsistence fisheries and one was reported captured at Nondalton in 1977 (Table 7).

Pygmy Whitefish:

Pygmy whitefish were captured in Lake Clark, and Kontrashibuna Lake. Individuals were also found in stomachs of predatory fish from Twin Lakes and Two Lakes. A total of thirty-one individuals were captured during the study ranging in fork length from 29 to 122 mm.

The age distribution of 26 Kontrashibuna Lake individuals appears in Table

Table 42. Length Distribution of Northern Pike Sampled 1/ From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chulitna River	Hoknede Lake	Lake Clark	Long Lake	Loon Lake	Pickeral Lakes	Telaquana Lake	Two Lakes	Total
25 - 49	-	-	-	12	-	-	-	-	12
50 - 74	-	-	-	1	-	-	2	-	3
75 - 99	-	-	-	-	-	-	1	-	1
100-124	-	-	-	-	-	-	-	-	-
125-149	-	-	-	5	-	-	-	-	5
150-174	-	-	-	7	-	-	-	-	7
175-199	-	-	2	3	-	-	-	-	5
200-224	-	-	-	3	-	-	-	-	3
225-249	1	-	-	10	1	-	-	-	12
250-274	-	-	-	12	-	-	-	-	12
275-299	1	-	-	1	-	1	-	-	3
300-324	-	-	-	3	-	-	-	-	3
325-349	-	-	-	5	-	-	-	-	5
350-374	-	-	-	5	-	-	1	-	6
375-399	-	-	-	8	-	-	-	-	8
400-424	1	-	1	9	-	-	-	-	11
425-449	-	-	-	7	-	-	-	-	7
450-474	1	-	-	5	-	1	-	-	7
475-499	1	1	2	24	2	-	2	-	32
500-524	3	2	1	14	4	2	1	1	28
525-549	1	2	1	8	4	2	3	3	24
550-574	1	1	1	3	7	2	1	4	20
575-599	4	3	4	2	3	-	2	1	19
600-624	4	1	-	-	3	-	4	-	12
625-649	1	2	1	1	2	1	-	1	9
650-674	-	-	-	1	-	1	-	2	4
675-699	-	-	1	1	-	1	-	-	3
700-724	3	-	-	1	-	1	-	1	6
725-749	-	-	1	1	-	-	1	1	4
750-774	1	-	-	-	-	-	-	2	3
775-799	1	-	-	-	-	-	-	-	1
800-824	1	-	-	-	-	1	-	-	2
825-849	-	-	-	1	-	-	-	1	2
850-874	-	-	-	1	-	-	-	-	1
875-899	1	-	-	-	-	-	-	-	1
900-924	-	-	-	-	-	-	1	-	1
Total	26	12	15	154	26	13	19	17	282

1/ All capture methods

Table 43. Northern Pike Length 1/ - Age Frequency, Chulitna River Drainage, 1979.

Age Group	Chulitna River		Hoknede Lake		Long Lake		Drainage Total	
	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)	Mean Length	(n)
0	-	(-)	-	(-)	43	(13)	43	(13)
1	-	(-)	-	(-)	152	(9)	152	(9)
2	-	(-)	-	(-)	212	(10)	212	(10)
3	259	(2)	-	(-)	288	(14)	284	(16)
4	401	(1)	-	(-)	328	(5)	340	(6)
5	484	(1)	-	(-)	413	(2)	436	(3)
6	-	(1)	498	(2)	474	(3)	484	(5)
7	577	(1)	647	(1)	483	(5)	520	(7)
8	585	(3)	524	(2)	508	(3)	545	(7)
9	596	(3)	539	(1)	542	(3)	565	(7)
10	603	(1)	590	(2)	543	(3)	569	(6)
11	704	(2)	584	(3)	604	(2)	624	(7)
12	709	(3)	-	(-)	710	(1)	709	(4)
13	-	(-)	640	(1)	708	(2)	685	(3)
14	777	(1)	-	(-)	847	(2)	823	(3)
15	-	(-)	-	(-)	-	(-)	-	(-)
16	807	(1)	-	(-)	-	(-)	807	(1)
17	-	(-)	-	(-)	-	(-)	-	(-)
18	875	(1)	-	(-)	-	(-)	875	(1)
Total		20		12		76		108

1/ Mean Fork Length (mm)

Table 44. Age Distribution of Mature Northern Pike Sampled from Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age	Chulitna River	Hoknede Lake	Lake Clark	Long Lake	Loon Lake	Pickeral Lakes	Telaquana Lake	Two Lakes	Total
4	-	-	-	-	-	2	-	-	2
5	-	-	-	-	-	1	2	1	4
6	-	2	-	-	2	1	1	2	8
7	-	1	-	2	2	2	1	2	10
8	-	2	3	2	2	-	1	4	14
9	2	1	1	1	5	2	-	-	12
10	1	2	1	3	5	-	-	3	15
11	2	3	-	2	1	1	2	2	13
12	2	-	-	1	3	-	-	1	7
13	-	1	-	2	-	2	-	-	5
14	1	-	-	2	1	-	-	-	4
15	-	-	-	-	-	-	-	-	-
16	1	-	-	-	-	-	-	-	1
17	-	-	-	-	1	-	-	-	1
18	1	-	1	-	-	-	-	-	2
Total	10	12	6	15	22	11	7	15	98

Table 45. Food Items Found Most Commonly In Northern Pike Stomachs From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Lake Clark June		Long Lake June		Chulitna River June	
	Item	%	Item	%	Item	%
1	Round whitefish	(33)	Amphipoda	(57)	Coleoptera larvae	(21)
2	Least cisco	(16)	Gastropoda	(19)	Unident. fish	(14)
3	Humpback whitefish	(16)	Pike	(16)	Round whitefish	(7)
4	Unident. fish	(16)	Coleoptera larvae	(11)	Pike	(7)
5	_	(-)	Ephemeroptera nymphs	(9)	Ephemeroptera nymphs	(7)
6	_	(-)	Hirudinea	(8)	Trichoptera larvae	(7)
7	_	(-)	Pelecypoda	(6)	_	(-)
8	_	(-)	Trichoptera larvae	(4)	_	(-)
9	_	(-)	Odonata nymphs	(3)	_	(-)
10	_	(-)	Humpback whitefish	(1)	_	(-)
No. Stomachs Examined	6		61		14	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Table 45. Food Items Found Most Commonly In Northern Pike Stomachs From Waters Within the (cont.) Proposed Lake Clark National Park/Preserve, 1978-1979

Percentage Abundance Ranking 1/	Pickeral Lakes July Item	%	Two Lakes July Item	%	Telaquana Lake July Item	%
1	Unident. fish	(45)	Unident. fish	(47)	Unident. fish	(36)
2	Ninespine stickleback	(18)	Sockeye fingerlings	(23)	Ninespine stickleback	(31)
3	Amphipoda	(18)	Round whitefish	(11)	Sockeye fingerling	(26)
4	Trichoptera larvae	(18)	Pygmy whitefish	(11)	Amphipoda	(10)
5	Coleoptera larvae	(18)	Trichoptera larvae	(5)	Ephemeroptera nymphs	(10)
6	Round whitefish	(9)	Sculpins	(5)	Hirudinea	(5)
7	Least cisco	(9)	Suckers	(5)	Sculpins	(5)
8	_	(-)	Lake trout	(5)	Plecoptera nymphs	(5)
9	_	(-)	Diptera larvae	(5)	_	(-)
10	_	(-)	_	(-)	_	(-)
No. Stomachs Examined	11		17		19	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

Table 45. Food Items Found Most commonly In Northern Pike Stomachs From Waters Within the (cont.) Proposed Lake Clark National Park/Preserve, 1978-1979

Percentage Abundance Ranking 1/	Loon Lake August		Hoknede Lake August	
	Item	%	Item	%
1	Amphipoda	(50)	Ninespine Stickleback	(41)
2	Hirudinea	(26)	Sculpins	(16)
3	Gastropoda	(23)	Amphipoda	(8)
4	Trichoptera larve	(3)	Hirudinea	(8)
5	Pelecypoda	(3)	Shrews	(8)
6	Sculpins	(3)	_	(-)
7	_	(-)	_	(-)
8	_	(-)	_	(-)
9	_	(-)	_	(-)
10	_	(-)	_	(-)
No. Stomachs Examined	26		12	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

46. The oldest captured were age three.

Twenty individuals were sexually mature (15 were age two and five were age three). The smallest mature specimen was 60 mm in length. They apparently spawn in late fall or winter.

Nineteen stomach samples collected at Kontrashibuna Lake August 21-26, 1978, were examined (see Table 47). Surface dwelling organisms comprised the bulk of food items utilized. Chironomid life stages were the predominate food organism ingested.

During the Kontrashibuna Lake survey (August 21-26, 1978) schools of pygmy whitefish were observed near shore at several locations surface feeding. Dip nets and the electroshocker were used to capture them.

This species is an important forage fish for lake trout in Kontrashibuna Lake.

Rainbow Trout:

Rainbow trout were captured in the Chilikadrotna River (0.85/ang. hr.), Mulchatna River (1.00/ang. hr.), and Tazimina River (0.70/ang. hr.). A total of 110 were measured (see Table 48) ranging in fork length from 43 to 550 mm. The largest individual weighed 2,320 grams (5 lbs. 2 oz.). Rainbow trout are occasionally caught in Lake Clark, but are more frequently caught in Sixmile Lake and Tazimina River.

Ages were determined for 103 individuals captured during the study (Table 49). An 11-year-old from the Chilikadrotna River was the oldest examined. Growth appears to be similar between the three populations sampled through age six.

Rainbow trout spawn from late April to early June in the Bristol Bay area. No spawning activities were observed as surveys of the above rivers occurred later in the summer. Fourteen rainbows examined from these waters were sexually mature and ranged in age from five to ten years. A study of rainbow trout at Lower Talarik Creek (a tributary of Lake Iliamna) indicated most individuals in that drainage enter the spawning population at age six (Russell, 1977).

Rainbow trout fry were captured August 19, 1979 in side channels of Tazimina River. They have also been captured by the author during early August in the Chilikadrotna River (Gwartney and Russell, 1978).

Thirty-eight rainbow trout stomachs were collected from the study area and examined (see Table 50). Major food items identified included Trichoptera larvae (caddis larvae), small rodents, salmon eggs and decaying carcasses, and other fishes. One Chilikadrotna rainbow stomach contained a total of five shrews. Another contained two shrews, one red backed vole, one meadow jumping mouse, and a sculpin. Several others contained more than one rodent. One fish had also ingested a cigarette filter.

Table 46. Fork Length Versus Age, Pygmy Whitefish, Kontrashibuna Lake August 22-24, 1978.

	Age Group				
Fork Length mm	0	1	2	3	Total
25 - 49	1	-	-		1
50 - 74	-	-	6	-	6
75 - 99	-	-	13	6	19
100-124	-	-	-	-	-
Total	1	0	19	6	26
Length Range mm	29	-	60-90	84-95	29-95
Mean Length mm	-	-	78	89	-
Standard Deviation	-	-	9	4	-

Table 47. Pygmy Whitefish Stomach Contents, Kontrashibuna Lake, August 22-24, 1978.

Food Item	Percentage Occurrence 1/
Chironomid adults	68
Hymenoptera	63
Misc. adult diptera	31
Chironomid larvae	26
Chironomid pupae	21
Trichoptera adults	10
Culicid adults	10
Coleoptera larvae	5
Coleoptera adults	5
Hemiptera	5
Misc. diptera larvae	5
No. stomachs examined	19

1/ Percentage Occurrence = $\frac{\text{No. stomachs containing item}}{\text{No. stomachs examined}}$

Table 48. Length Distribution of Rainbow Trout [1/] Sampled Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chilikadrotna River	Mulchatna River	Tazimina River	Total
25- 49	-	-	2	2
50- 74	-	-	1	1
75- 99	-	-	2	2
100-124	-	-	-	-
125-149	-	-	1	1
150-174	-	1	-	1
175-199	-	-	-	-
200-224	-	-	4	4
225-249	1	-	2	3
250-274	-	-	2	2
275-299	-	4	3	7
300-324	1	2	7	10
325-349	2	4	3	9
350-374	5	5	-	10
375-399	8	5	2	15
400-424	8	7	1	16
425-449	2	3	-	5
450-474	5	5	-	10
475-499	-	6	1	7
500-524	-	1	-	1
525-549	2	-	1	3
550-574	1	-	-	1
Total	35	43	32	110

1/ All capture methods

Table 49. Rainbow Trout Length 1/ - Age Frequency From Waters Within Proposed Lake Clark National Park/Preserve 1978-1979.

Age Group	Chilikadrotna River Mean Length	(n)	Mulchatna River Mean Length	(n)	Tazimina River Mean Length	(n)
0	-	(-)	-	(-)	47	(3)
1	-	(-)	-	(-)	84	(2)
2	-	(-)	-	(-)	126	(1)
3	302	(1)	242	(3)	211	(1)
4	311	(2)	331	(6)	278	(16)
5	356	(6)	375	(13)	354	(5)
6	405	(7)	405	(6)	433	(2)
7	401	(5)	463	(4)	544	(1)
8	417	(4)	483	(5)	-	(-)
9	441	(3)	481	(1)	-	(-)
10	492	(3)	459	(2)	-	(-)
11	542	(1)	-	(-)	-	(-)
Total		32		40		31

1/ Mean Fork Length (mm)

Table 50. Rainbow Trout Stomach Contents From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Food Item	Percentage Occurrence 1/ Tazimina River July - August	Mulchatna River September	Chilikadrotna River September
Trichoptera larvae	67	71	39
Salmon eggs	33	-	3
Shrews and voles	-	14	46
Unident. fish	-	-	17
Sculpin	-	14	10
Plecoptera nymphs	-	-	7
Chinook fry	-	-	3
Salmon remains	-	42	3
Tipulid adult	-	-	3
Terrestrial insect	-	-	3
Cigarette filter	-	-	3
No. stomachs examined	3	7	28

1/ Percentage Occurrence = $\frac{\text{No. stomachs containing item}}{\text{No. stomachs examined}}$

Round Whitefish:

Round whitefish are widespread throughout the proposed Park/Preserve (Table 10). A total of 273 were captured, with greatest catch rates occurring at Hudson Lake (6.33/gill net hr.), Kijik Lake (1.76/gill net hr.), and Fishtrap Lake (1.09/gill net hr.). They were found inhabiting both streams and lakes.

The length distribution of individuals captured appears in Table 51. The largest specimen caught measured 420 mm in length and weighed 880 grams (1 lb. 15oz.).

Age-length data for 196 round whitefish appears in Table 52. Individuals to 14 years of age were caught. Growth rate appears to slow after age four.

Round whitefish spawn in the fall and although several prespawn individuals were captured no spawning activities were observed during the survey program.

The age distribution of mature fish sampled appears in Table 53. Age four appears to mark the onset of sexual maturity. Several mature fish examined had retained eggs from a previous spawning. Consecutive years spawning may occur.

Sixty-seven round whitefish stomachs were examined (Table 54). Gastropods, Trichoptera larvae, and Chironomid larvae were the major food items found. Apparently this species utilizes primarily benthic food items.

This species is not commonly caught on hook and line during the summer, but they are caught through the ice by fishermen using bait in winter. Historically (according to local residents) they have also been taken with hand held snares through the ice in the Lake Clark area. Local residents often refer to them as "candlefish".

Slimy Sculpin:

These were found in more of the study waters than any other species. Other than collecting, identifying and measuring 222 individuals (total lengths 20 to 117 m) no other emphasis was directed toward this species. They are an important food item for most of the predaceous fish species inhabiting the study area (lake trout, rainbow trout, and burbot especially).

Again, Roger (1971) is a major source of information regarding this species in the general area (Lake Iliamna and tributaries).

Sockeye Salmon:

Sockeye salmon were found in all four major drainage areas (Table 10), and were the second most widespread species captured.

Sampling activities were purposely structured to avoid capturing adult

Table 51. Length Distribution of Round Whitefish Sampled [1/] Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Fork Length Range (mm)	Chakachamna Lake	Fishtrap Lake	Hudson Lake	Kijik Lake	Lake Clark	Snipe Lake	Telaquana Lake	Turquoise Lake	Twin Lakes	Other [2/]	Total
50- 74	-	-	-	-	1	-	-	-	-	-	1
75- 99	-	-	-	-	-	-	-	-	-	-	-
100-124	2	-	-	-	-	-	-	-	-	3	5
125-149	-	1	1	-	2	-	-	-	-	3	7
150-174	-	-	-	1	-	1	-	-	-	2	4
175-199	2	1	1	-	2	-	-	-	-	2	8
200-224	2	3	24	-	9	1	-	-	-	2	41
225-249	1	2	19	5	3	3	-	-	-	1	34
250-274	-	2	11	9	9	3	-	-	-	-	34
275-299	2	14	12	16	6	5	1	-	-	2	58
300-324	2	1	2	11	2	2	4	-	1	-	25
325-349	-	3	-	3	4	4	-	-	-	1	15
350-374	-	3	-	3	6	1	-	-	2	-	15
375-399	-	1	-	2	-	-	2	5	2	2	14
400-424	-	-	1	2	1	-	-	6	2	-	12
Total	11	31	71	52	45	20	7	11	7	18	273

1/ All capture methods

2/ Includes individuals captured at Chilikadrotna River (1), Chulitna River (4), Pickeral Lakes (3), Tanalian River (5), and Two Lakes (5).

Table 52. Round Whitefish Length [1/] - Age Frequency From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

	Fishtrap Lake		Hudson Lake		Kijik Lake		Lake Clark		Snipe Lake	
Age Group	$\bar{X}$	(n)	$\bar{X}$	(n)	$\bar{X}$	(n)	$\bar{X}$	(n)	$\bar{X}$	(n)
0	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
1	-	(-)	132	(1)	-	(-)	-	(-)	-	(-)
2	144	(1)	-	(-)	153	(1)	137	(2)	-	(-)
3	202	(3)	210	(15)	-	(-)	186	(2)	166	(1)
4	232	(4)	247	(16)	256	(4)	223	(6)	-	(-)
5	284	(7)	271	(16)	285	(23)	240	(8)	228	(2)
6	287	(8)	303	(2)	289	(14)	255	(6)	267	(4)
7	327	(2)	-	(-)	279	(1)	285	(4)	281	(4)
8	353	(4)	-	(-)	349	(4)	294	(3)	296	(4)
9	373	(2)	-	(-)	365	(3)	339	(7)	340	(2)
10	-	(-)	-	(-)	-	(-)	376	(3)	342	(1)
11	-	(-)	411	(1)	410	(2)	-	(-)	334	(2)
12	-	(-)	-	(-)	-	(-)	360	(1)	-	(-)
Total		31		51		52		42		20

1/ Mean Fork Length (mm)

Note: Individuals to 13 years of age were caught in Twin Lakes and one 14 year old was caught in Turquoise Lake.

Table 53. Age Distribution of Mature Round Whitefish Sampled From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Age	Fishtrap Lake	Hudson Lake	Kijik Lake	Lake Clark	Snipe Lake	Turquoise Lake	Other 1/	Total
3	-	2	-	-	-	-	-	2
4	1	13	-	-	-	-	-	14
5	6	15	4	-	-	-	-	25
6	8	2	1	1	2	-	-	14
7	2	-	-	1	1	-	5	9
8	4	-	4	3	3	-	2	16
9	2	-	3	6	1	2	2	16
10	-	-	-	4	1	4	2	11
11	-	1	2	-	2	4	1	10
12	-	-	-	1	-	-	1	2
13	-	-	-	-	-	-	1	1
14	-	-	-	-	-	1	-	1
Total	23	33	14	16	10	11	14	121

1/ Includes individuals from Chakachamna Lake (3), Chilikadrotna River (1), Pickeral Lakes (2), Telaquana Lake (2), Twin Lakes (5), and Two Lakes (1).

Table 54. Food Items Found Most Commonly In Round Whitefish Stomachs From Waters Within the Proposed Lake Clark National Park/Preserve, 1978-1979.

Percentage Abundance Ranking 1/	Lake Clark June		Kijik Lake June		Snipe Lake July		Torquoise Lake August	
	Item	%	Item	%	Item	%	Item	%
1	Chironomid larvae	(33)	Gastropoda	(53)	Gastropoda	(100)	Gastropoda	(72)
2	Trichoptera larvae	(28)	Chironomid larvae	(40	Trichoptera larvae	(45)	Trichoptera larvae	(72)
3	Gastropoda	(28)	Trichoptera larvae	(26)	Chironomid pupae	(40)	Chironomid larvae	(9)
4	Misc. Diptera larvae	(14)	Cladocera	(13)	Chironomid larvae	(20)	Pelecypoda	(9)
5	Hydracarina	(9)	Coleoptera larvae	(6)	Trichoptera adults	(15)	_	(-)
6	Culicid pupae	(9)	Chironomid pupae	(6)	Pelecypoda	(10)	_	(-)
7	Chironomid pupae	(9)	Culicid pupae	(6)	Cladocera	(10)	_	(-)
8	Annelida	(9)	_	(-)	Unident. fish	(10)	_	(-)
9	Unident. fish	(4)	_	(-)	Sculpins	(5)	_	(-)
10	Pelecypoda	(4)	_	(-)	Plecoptera adults	(5)	_	(-)
No. Stomachs Examined	21		15		20		11	

1/ Based on the ratio of stomachs containing a particular item to the number of stomachs examined for that location.

sockeye. Observing their presence at various locations was adequate for the purposes of this report (they are easily distinguishable from other species after entering fresh water). Fry however, were captured to confirm their identity.

Adult sockeye on spawning migrations enter Bristol Bay drainages beginning in late June, and continue into mid-July. Fish arrive at the spawning areas from late June to August. During 1978, sockeye were present at Lake Clark by June 22, at Two Lakes by July 5, at Telaquana Lake by July 12 and at Upper Twin Lake by July 31. Some individuals spawn soon after reaching spawning areas. Others have been observed spawning under the ice as much later as early January.

Sockeye were observed spawning during 1978 as summarized in Table 55. During 1979, additional spawning populations were located in Chakachamna Lake and Fishtrap Lake. Mr. Pat Poe (Fisheries Research Institute, University of Washington) flew index surveys of Lake Clark spawning areas during 1979. His preliminary findings (Poe, personal communication) indicate general run strength to Lake Clark during 1979 was greater than during 1978. An estimated 4-6,000,000 sockeye spawners returned to the Lake Clark drainages during 1980. Kijik Lake and Tazimina River received very large numbers of spawners. Aerial counts of the Chilikadrotna and upper Mulchatna River escapements are presented in Tables 8 and 9.

Sockeye fry were captured from Crescent Lake, Kijik Lake, Two Lakes, Telaquana Lake, Tazimina River, Upper Twin Lake, Fishtrap Lake, and Lake Clark during the study. They normally rear in freshwater two years before migrating to the sea.

Baxter and Baxter, 1961, documented the presence of sockeye in the following Cook Inlet drainages:

McArthur River drainage
Kustatan River
Katna (Big) River drainage
Cannery Slough
Whiskey Jack Slough
Crescent River
Island Creek
Silver Salmon Creek
Harriet Creek

This is the most economically significant species inhabiting waters within the proposed Park/Preserve. Production from these waters contributes to important commercial sockeye fisheries in the Kuskokwim, Bristol Bay and Cook Inlet areas. Subsistence (Table 7) and recreational fisheries throughout the above areas additionally utilize these sockeye. Mills, 1979 reports a 1977 recreational harvest of 420 sockeye from the "Lake Clark Area". There is no estimate of the number of Lake Clark bound sockeye taken in subsistence and recreational fisheries farther down the Kvichak drainage (at Levelock, Igiugig, Newhalen, etc.) as these fish are mixed with those returning to other downstream natal areas. The same is true with Mulchatna River and Stony River stocks.

Table 55. Summary of Sockeye Spawning Observations from Waters Within Proposed Lake Clark National Park/Preserve, 1978.

Spawning Location	Major Drainage	Date	Estimated No. 4/	Type of Survey	Observer
Two Lakes Inlet	Kuskokwim R.	Aug. 30	120-165	Aerial	Russell
Telaquana Lake	Kuskokwim R.	Aug. 30	900-1100	Aerial	Russell
Upper Twin Lake	Nushagak R.	July 31	- 1/	-	Russell
Chilikadrotna R.	Nushagak R.	Aug. 2	300	Aerial	Nelson 2/
Tazimina R.	Kvichak R.	Sept.16	146,900	Aerial	Poe 3/
Kijik R. Drainage	Kvichak R.	Sept.16	146,435 3/	Aerial	Poe & Russell
Tlikakila R.	Kvichak R.	Sept.16	1160 3/	Aerial	Poe & Russell
Chokotonk R.	Kvichak R.	Sept.16	1875 3/	Aerial	Poe & Russell
Sucker Bay Lake	Kvichak R.	Sept.16	5825 3/	Aerial	Poe & Russell
Priest Rock Creek	Kvichak R.	Sept.16	3650 3/	Aerial	Poe & Russell
Lake Clark Beaches	Kvichak R.	Sept.16	50 3/	Aerial	Poe & Russell

1/ Caught five prespawn adults in a gill net.

2/ Mike Nelson, ADF&G, Dillingham, personal communication.

3/ Poe, 1978. Mr. Poe's estimates are used rather than Mr. Russell's as Mr Poe is a much more experienced observer.

4/ All these estimates should be considered minimums if used to describe the total run to each area. They are index counts suitable mainly for yearly comparisons of run strength.

Threespine Stickleback:

Threespine sticklebacks were found at Crescent Lake, Johnson River, Tazimina Lakes, and Tazimina River. They have been reported from Lake Clark (Mathisen and Poe, 1969). Other than measuring 18 of these (total lengths 18 to 81 mm) no other information was collected pertaining to this species.

Threespine stickleback have been studied extensively in nearby Lake Iliamna by Dunn, 1962 and Kerns 1965, 1966, 1968.

DISCUSSION

The summers of 1978 and 1979 were spent gathering fisheries data from waters of the area proposed for inclusion in Lake Clark National Park/Preserve. All waters originally identified for study by the National Park Service were surveyed. Additional waters were surveyed as time permitted. Information was gathered from 40 bodies of water. The published objectives of the project were met through the survey program.

Resident fish species composition was determined at each of the waters surveyed. It is possible that a few species may have been missed in some of the waters although efforts were made to sample a cross section of habitat types at each locale. Twenty-two different species were found inhabiting the study area.

The relative abundance of resident species for any location is difficult to determine with one or two surveys unless tagging experiments are used to estimate populations. This was not done. The only measures of relative species abundance generated through the survey program were the various catch per unit effort rates achieved with the test fishing gear employed. By identifying sampling stations, gear type, date of sampling, and catch for each body of water surveyed (see Appendices) future resource managers could selectively re-sample specific areas to derive comparative relative abundance data when need. Any comparisons of C.P.U.E. rates between areas should be tempered by the recognition that many factors influence the "catchability" of a species from site to site (sampling timing, water temperature, food availability, etc.). Depending on the type of comparison desired these factors may need to be considered.

The anadromous species inhabiting the study area include five species of Pacific salmon and possibly Dolly Varden from Cook Inlet drainages (there may also be some species of smelt that enter Cook Inlet drainages to spawn during late winter and early spring). Spawning areas and migration routes of salmon were identified whenever located.

Age and growth relationships and age at maturity data were gathered and presented for important resident species. Comparisons with populations from other Alaska waters were not included due to the already lengthy nature of this report. Age data were not collected from salmon adults as there is ample information available in the literature pertaining to Alaskan salmon age structures.

Very few resident fish species spawn during the summer in Alaskan waters,

hence little information pertaining to important spawning areas (for other than salmon) was gathered. Fry of rainbow trout, Dolly Varden, northern pike, Arctic grayling, humpback whitefish, and longnose sucker were captured and in some cases the timing of their presence at particular sites indicated spawning had occurred nearby. Additional spring and fall surveys will be necessary to locate and document important spawning areas for resident species within the proposed Park/Preserve.

The only migration data of consequence identified during the study apply to sockeye, chinook, and coho salmon. These fish were observed making spawning migrations and the timing of those migrations was identified. Tagging experiments or periodic test fishing would have to be employed to identify movement patterns of resident lake and river dwelling species.

Limited limnological data were gathered from most of the lake sampled. Logistics and time constraints precluded more indepth investigations of limnological characteristics. No thermal profiles or plankton sampling were attempted. Otter Lake, Long Lake, and Hoknede Lake were the most productive lakes sampled. Chakachamna Lake was probably the least productive. The other lakes sampled exhibited low productivity characteristics.

Stomachs from the important resident species were preserved and examined in the lab. Some interesting food habits information was discovered. The stomachs were collected during one-time surveys in most cases and stomach contents reflect only the feeding habits for that short survey period. Other important food items utilized during the remainder of the summer period may not have appeared in the stomachs. Systematic sampling from a particular population over the course of a feeding season would be necessary to adequately describe a species feeding habits. The analyses conducted did serve a useful purpose however. In several cases fish species were found in stomachs of predatory fish from a particular lake, but were not found in that lake during test fishing operations. They were then added to the species list for that lake.

Recreational angling was observed (or known to occur) at most of the waters surveyed. During surveys of these waters the author encountered anglers, guides, and air charter services on several occasions and information exchanged during these contacts has been presented earlier in the report.

The author also conducted (as part of another project) a voluntary angler use survey by contacting a number of angling guides and air charter services thought to utilize the proposed Park/Preserve area in their angling oriented activities. Twenty-three operators responded to the survey with 20 indicating they use at least some of the waters within the study area. They were asked how many anglers they hauled to waters within the proposed Park/Preserve during 1979 and their responses collectively are summarized in Table 56. These reports indicate substantial angler use occurs on several of the lakes and rivers within the proposed Park/Preserve. Chilikadrotna River, Chulitna River, Kijik Lake, Kontrashibuna Lake, Lake Clark, Little Kijik River, Mulchatna River, Tazimina River, Tazimina Lakes,

Table 56. Results of a Voluntary Use Census Conducted Among Angling Guides and Air Charter Services 1/ Utilizing Waters Proposed for Inclusion in Lake Clark National Park/Preserve, 1979.

Waterbody	Reported Angler Days				
	June	July	August	September	Total
Chakachamna Lake	-	2	2	-	4
Chilikadrotna River	14	64	26	18	122
Chulitna River	41	72	44	30	187
Crescent Lake	23	6	-	3	32
Fishtrap Lake	-	2	-	-	2
Hickerson Lake	-	-	2	-	2
Kijik Lake - Little Kijik River	137	218	214	141	710
Kontrashibuna Lake	47	83	52	42	224
Lachbuna Lake	2	-	-	-	2
Lake Clark	83	181	133	92	489
Mulchatna River 2/	333	868	436	250	1,887
Portage Lake	6	19	23	3	51
Snipe Lake	-	-	11	-	11
Tazimina Lakes	46	55	57	39	197
Tazimina River	93	172	145	95	505
Telaquana Lake	43	54	33	42	172
Turquoise Lake	4	8	8	4	24
Twin lakes	8	18	10	-	36
Two Lakes	-	6	4	-	10
Other	-	-	-	-	-
Total	880	1,828	1,200	759	4,667

1/ 23 respondents

2/ Entire Mulchatna River

and Telaquana Lake all received 100 or more man-days of commercially transported angler use. These figures under estimate total angler use as private plane operators and local nonguided anglers were not included in the survey, and a few commercial operators known to use the area did not respond. Twin Lakes, Portage Lake, and Fishtrap Lake probably also exceed 100 man-days of angling use annually.

Commercial operators known to transport anglers to waters within the proposed Park/Preserve include the following:

Alaska Air Guides
Alaska North Flying Service
Alaska Safari, Inc.
Alaska Travel Air
Alaska Trophy Safaris
Chulitna Lodge
Fishing Unlimited
Hayes River Lodge
Hedlund Guide Service
Homer Air Service
Iliamna Air Taxi, Inc.
Iliamna River Outfitters
Iliamna Safaris
Iliaska Lodge
Kachemak Air Service
Kenai Air Alaska, Inc.
Kenai Guide Service
Ketchums Air Service
Kokhanok Lodge
Koksetna Camp
Little Mulchatna Lodge
Newhalen Lodge
Rainbow King Lodge
Rusts Flying Service
Samsal's Guide and Flying Service
Talarik Creek Lodge
Van Valin's Island Lodge

This listing may not be complete.

Fish species sought primarily by anglers within the proposed Park/Preserve area include Arctic grayling, Arctic char, Dolly Varden, lake trout, northern pike, rainbow trout, sockeye salmon, coho salmon, and chinook salmon. Burbot and whitefish species are also sought by local anglers during winter through-the-ice fisheries. Additionally, razor clams are sought during low spring tides along the western Cook Inlet shoreline (especially in the vicinity of Polly Creek).

The primary angling related attributes of the proposed Park/Preserve are the variety of fish species available to the angler, relatively high catch rates, and the scenic wilderness settings in which fishing occurs. The stocks of recreationally utilized species (with the exception of northern pike) don't really produce the uniquely large individuals which attract "Trophy" fishermen to adjacent areas (the Iliamna and Naknek watersheds). Thus angling effort in the study area is fairly widely dispersed (probably a beneficial situation which should be encouraged in the future). With this dispersed angling effort there do not appear to be any obvious biological problems in the area at present.

The recreationally used fish species plus suckers, least ciscos, chum salmon, and pink salmon are utilized to varying degrees for subsistence either by people residing within the study area (Port Alsworth, Nondalton, etc.) or in some cases by those who live outside the proposed Park/Preserve but near waters that originate within the proposed boundaries (i.e. residents of Newhalen, Igiugig, New Stuyahok, Ekwok, Lime Village, etc.).

The five species of salmon inhabiting waters in the study area are also important to commercial fisheries and local economies that in some cases are located hundreds of miles distant from the actual Park/Preserve area (i.e. Bristol Bay and Kuskokwim commercial salmon fisheries and associated fishing communities). Salmon stocks receive the most intensive harvest pressures and the most management attention both within and outside the study area. Salmon runs in recent years have responded to conservative management philosophies and favorable climatic conditions and appear to be in good shape going into the 1980's.

Northern pike in the Chulitna Bay area receive both recreational (hook and line) and subsistence (gill net) use. In recent years, both subsistence and recreational cropping of larger individuals have probably contributed to a reported scarcity of "trophy size" pike in the recreational fishery. It appears from length-age data that 30-inch pike from that area are 14 years of age or older. If a management philosophy emphasizing maintenance of the recreational fishery for large individuals is adopted some manipulation of the subsistence gill net fishery will be necessary to protect larger pike. It may also be advisable to promote hook and release attitudes among recreational users.

Methods of access and important landing and staging areas were noted on a water-by-water basis in this report. Float planes are the method of transport used most commonly to travel to waters within the study area. Wheel planes are used to a lesser extent (landing primarily on river bars) and motor boats are employed for travel on the larger lakes and rivers. Inflatable rafts are an important mode of travel for river trips in the area (Mulchatna, Chilikadrotna, Tlikakila, Tazimina, and Chulitna Rivers) and are also used on some of the smaller lakes. Collectively, the present lack of access restrictions contributes to the dispersal of recreational anglers and other users.

No data on winter use of the study area was collected. Most of the waters are ice-covered from late October to mid-May.

Management of lands, waters, and users within the proposed Park/Preserve will potentially affect fish species and fisheries both within and outside that management unit. Consideration of potential impacts on this important resource should be emphasized during the planning of any future developments in the area.

RECOMMENDATIONS

Observations during the course of this study resulted in the following recommendations:

1. Initiate an annual Arctic grayling spawning survey program at Little Kijik River to assess brood stock recruitment at existing exploitation levels.

2. Initiate a northern pike migration and population study (utilizing tag and recovery techniques) in the Chulitna River - Chulitna Bay

area.

3. Conduct periodic rainbow trout abundance and harvest surveys at Tazimina River.

4. Encourage the continuation of annual salmon escapement surveys of spawning streams within the proposed Park/Preserve.

5. Re-survey each of the major lakes and rivers at least once each five years.

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APPENDICES

Appendix A-1. Sampling Results, Chakachamna Lake, August 6-11, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	August 7	Diving Gill Net	0 - 5.2	16.8 hrs.	3 lake trout, 6 round whitefish, 9 adult sockeye.
2	August 7	Diving Gill Net	0 - 3.7	17.0 hrs.	7 lake trout, 3 round whitefish, 33 adult sockeye
3	August 8-9	Set Line (20 hooks)	0 -15.4	846 hook hours	9 lake trout
4	August 8-9	Set Line (17 hooks)	0 - 3.1	660 hook hours	10 lake trout
5	August 10	Set Line (20 hooks)	0 -17.3	446 hook hours	1 lake trout
6	August 10	Set Line (17 hooks)	0 -12	378 hook hours	1 lake trout
7	August 10	Electroshock	0 - 1.0	700 sec.	2 round whitefish, 14 Dolly Varden, 6 sculpins.
8	August 7	Limnology	4.0	-	-

1/ See Figure 7.

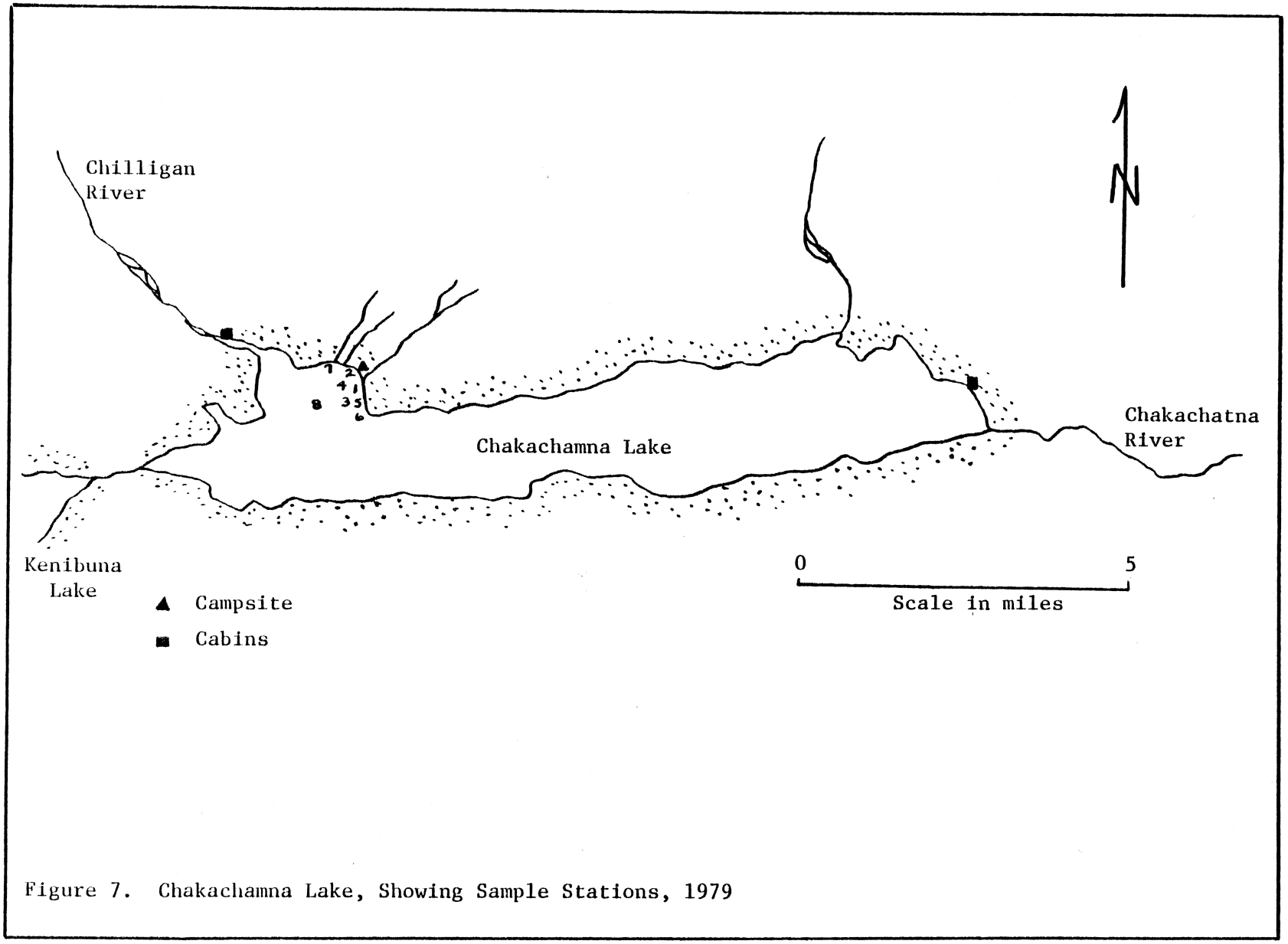

Figure 7. Chakachamna Lake, Showing Sample Stations, 1979

Appendix A-2. Sampling Results, Crescent Lake, June 19-22, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 19	Minnow trap	0.3	19.0 hrs.	None
2	June 19	Diving Gill Net	0-14.5	18.2 hrs.	4 Dolly Varden, 9 lake trout
3	June 19	Diving Gill Net	0-14.6	14.8 hrs.	37 Dolly Varden, 20 lake trout, 2 chinook
4	June 20	Electroshock	0- 1.5	91 sec.	4 Dolly Varden, 2 sculpins
5	June 21	Dip Net	0- 0.5	-	20 Sockeye fry, 1 ninespine stickleback
6	June 20	Limnology	4.0	-	-

1/ See Figure 8

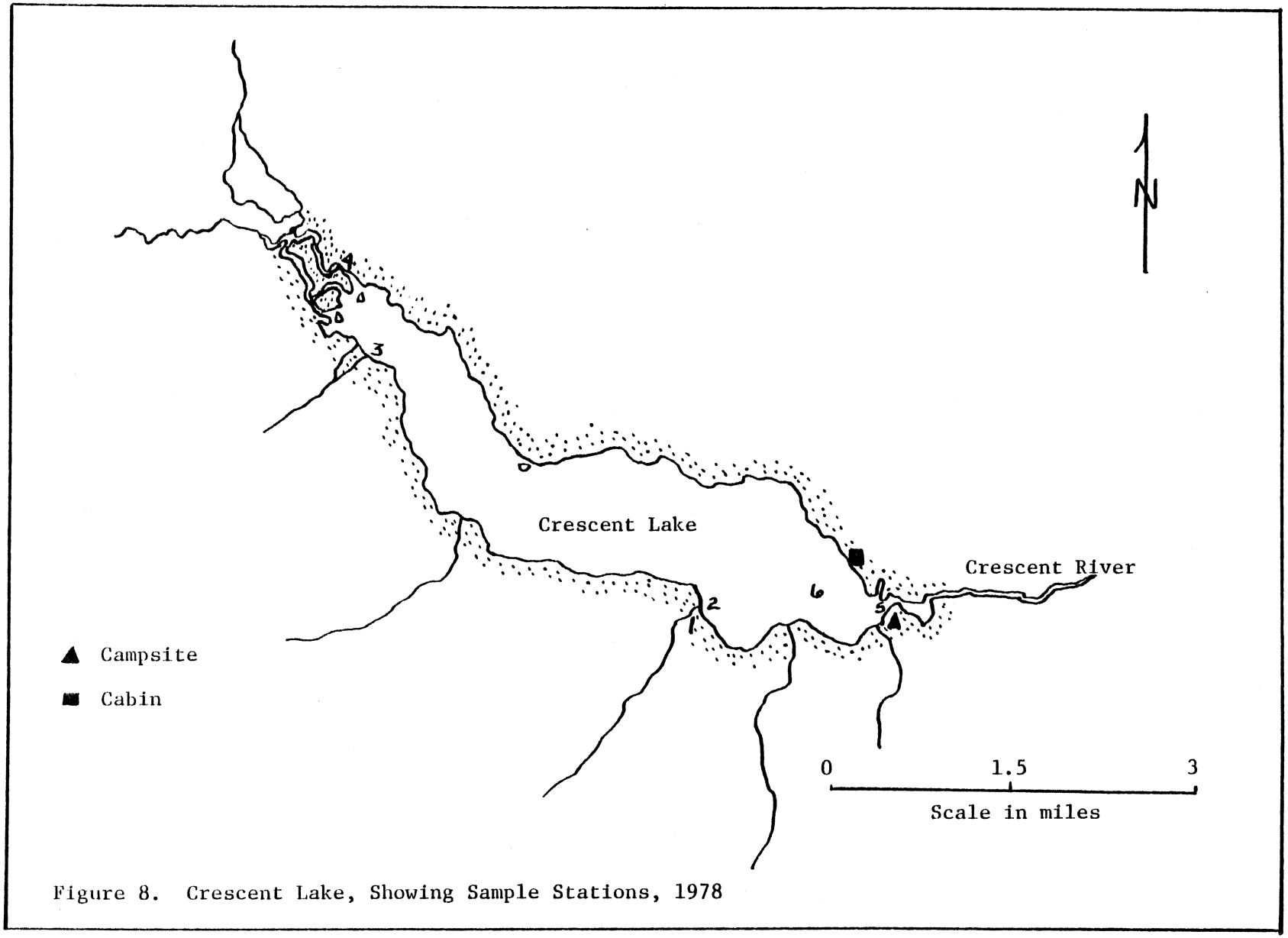

Figure 8. Crescent Lake, Showing Sample Stations, 1978

Appendix A-3. Sampling Results, Hickerson Lake, July 2-4, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 3	Diving Gill Net	0-9.2	12.3 hrs.	43 Dolly Varden
2	July 3	Diving Gill Net	0-2.8	12.5 hrs.	61 Dolly Varden
3	July 3	Limnology	4.0	-	-
-	July 3	Depth soundings 2/	-	-	-

1/ See Figure 9

2/ See Figure 10

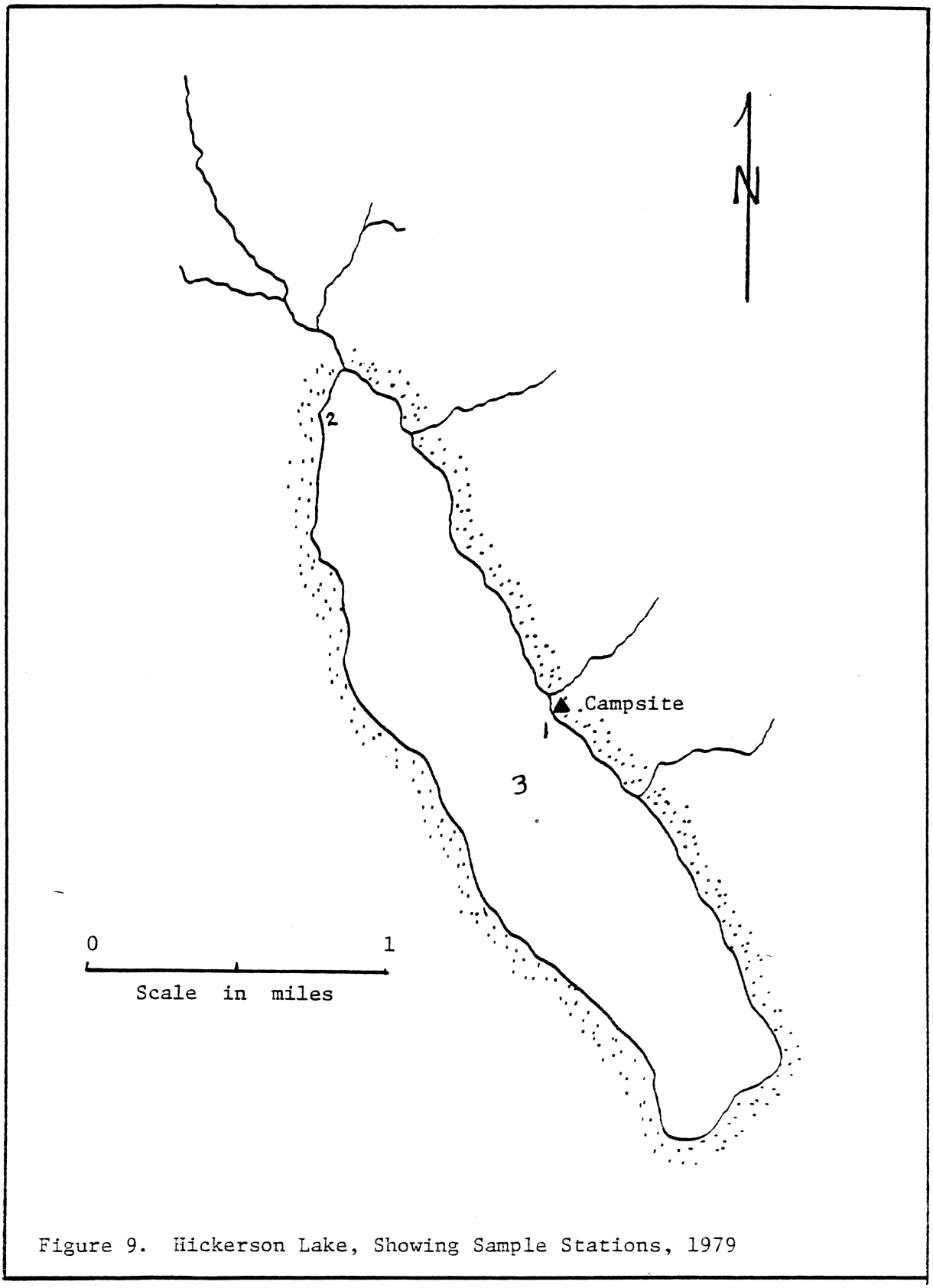

Figure 9. Hickerson Lake, Showing Sample Stations, 1979

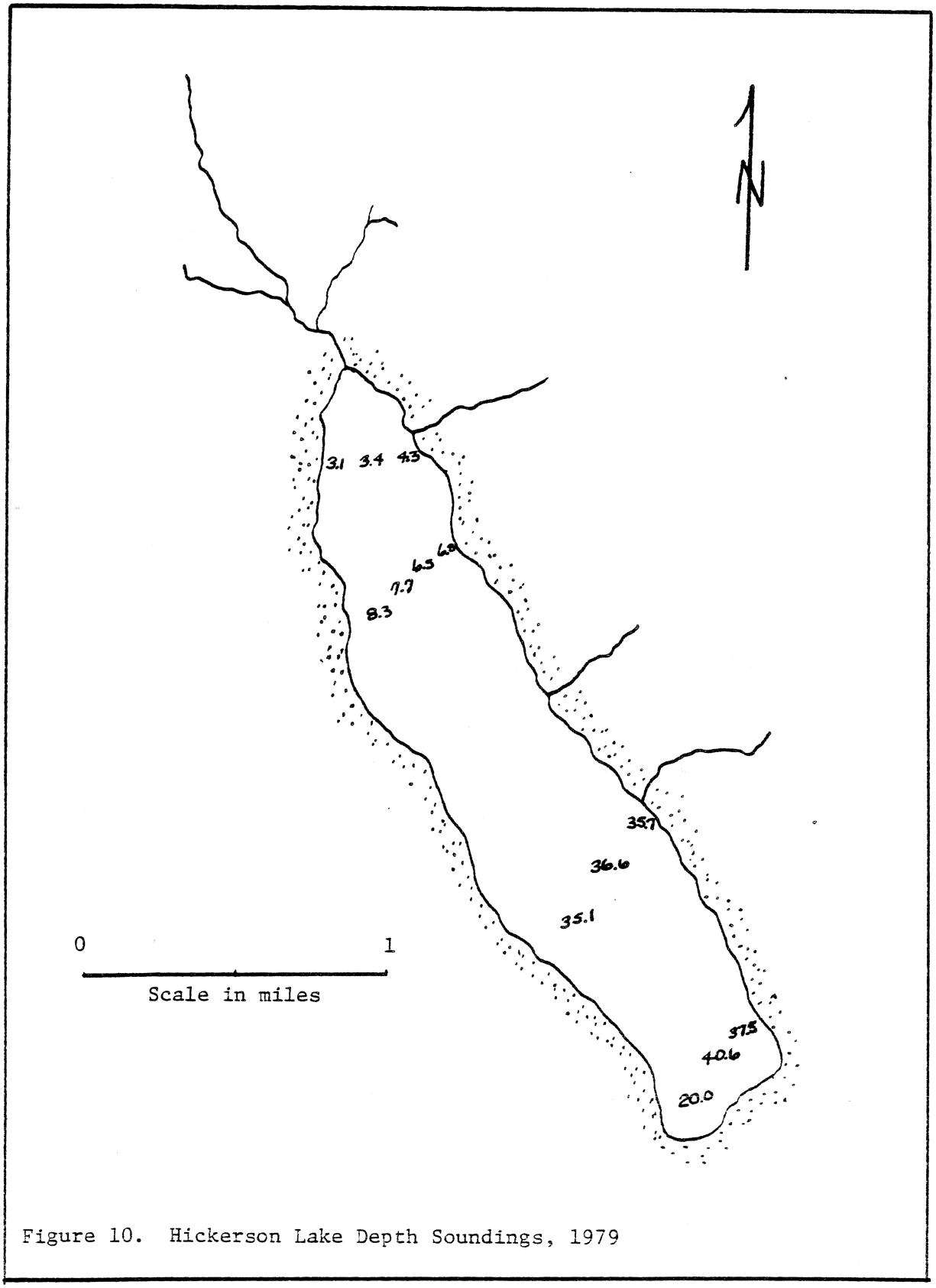

Figure 10. Hickerson Lake Depth Soundings, 1979

Appendix A-4. Sampling Results, Johnson River, June 12-15, 1978

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 12	Minnow Trap	0.6	12.5 hrs.	6 Dolly Varden, 9 coho fingerlings, 1 chinook fingerling.
2	June 12	Minnow Trap	0.3	12.5 hrs.	None
3	June 13	Dip Net	Surface	-	26 coho fry, 1 ninespine stickleback
4	June 13	Dip Net	Surface	-	1 chum fry, 1 ninespine stickleback 1 threespine stickleback
5	June 13	Hook and Line	0.25	-	None

1/ See Figure 11

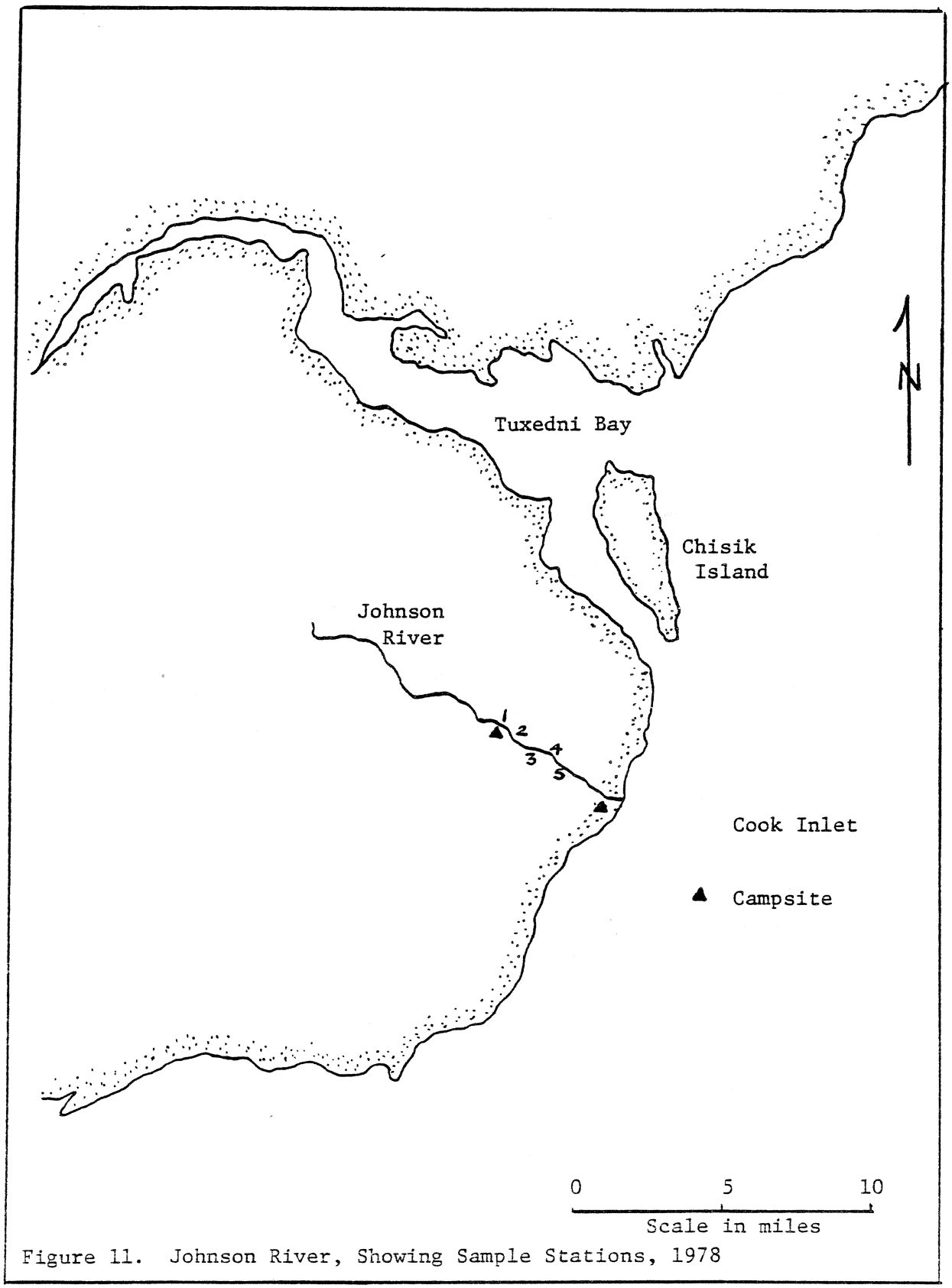

Figure 11. Johnson River, Showing Sample Stations, 1978

Appendix B-1. Sampling Results, Caribou Lake, July 27-29, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 28	Diving Gill Net	0-1.5	19.0 hrs.	10 Arctic char, 3 Arctic grayling
2	July 29	Diving Gill Net	0-2.5	17.7 hrs.	6 Arctic char, 4 Arctic grayling
3	July 28	Dip Net	0-0.6	-	10 sculpins
4	July 27	Limnology	3.0	-	-
-	July 27	Depth soundings 2/	-	-	-

1/ See Figure 12.

2/ See Figure 13.

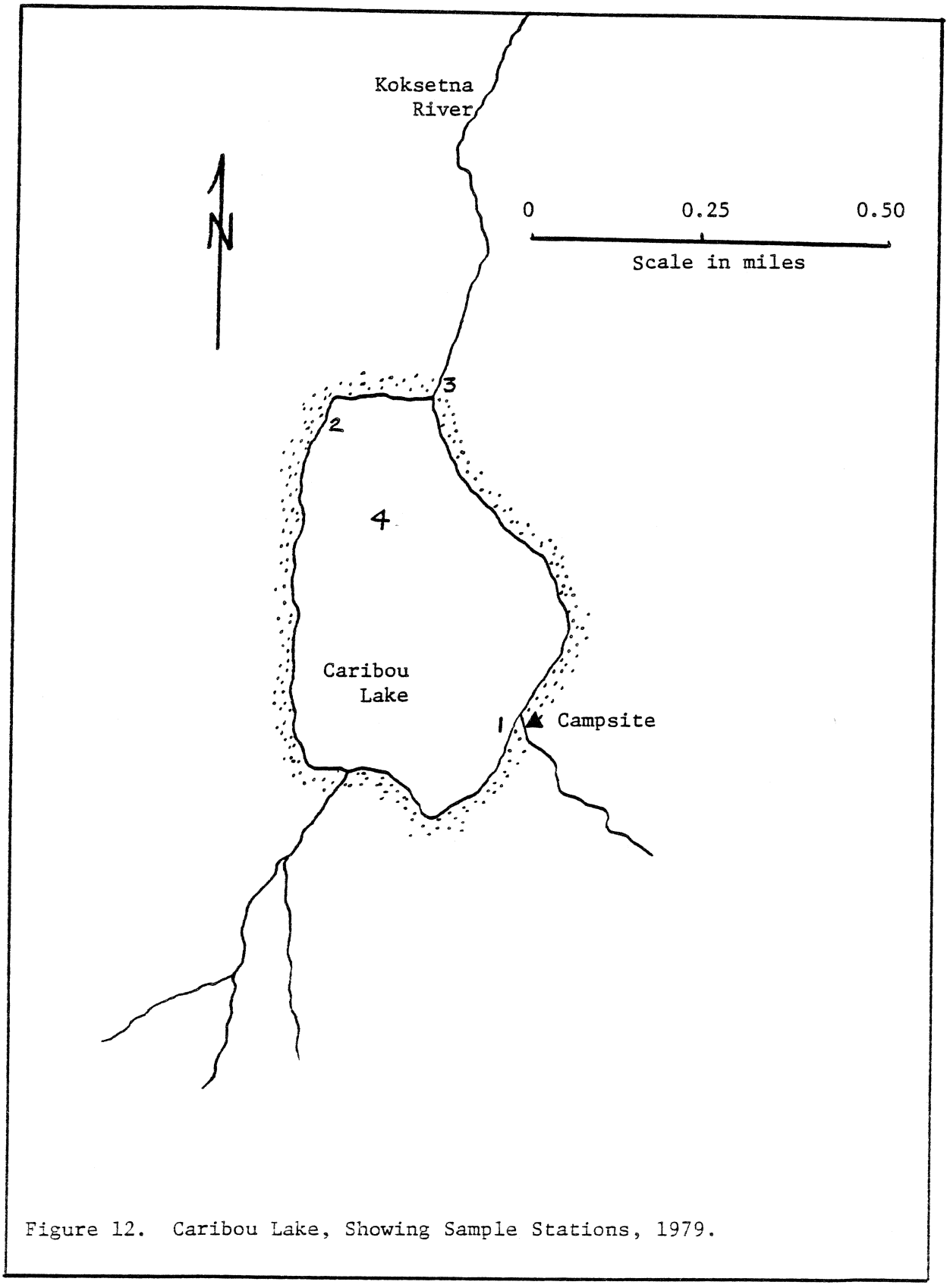

Figure 12. Caribou Lake, Showing Sample Stations, 1979.

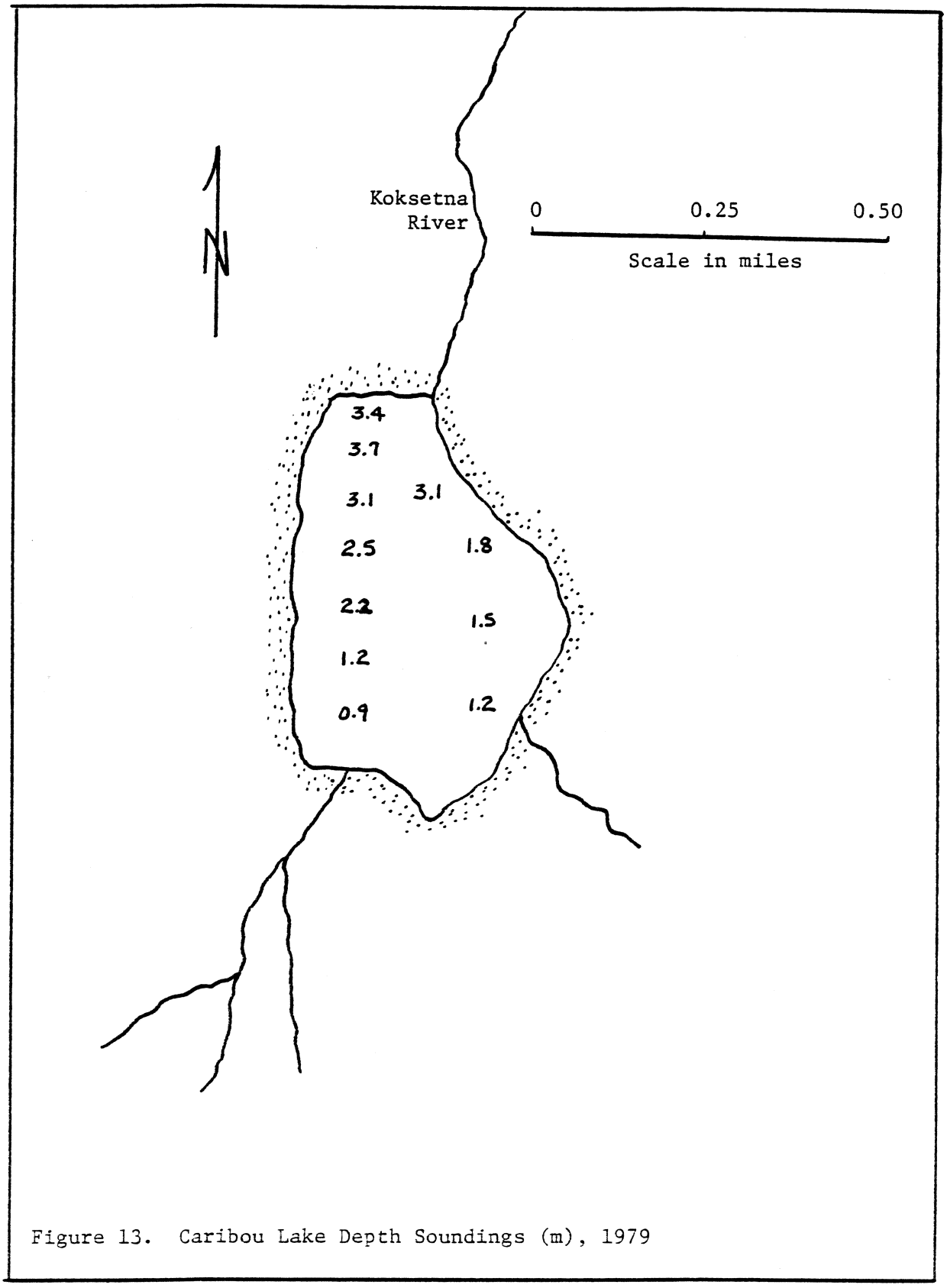

Figure 13. Caribou Lake Depth Soundings (m), 1979

Appendix B-2. Sampling Results, Chulitna River, June 5- August 4, 1979.

Sample Station 1/	Date	Gear Type	Depth Sample(m)	Duration	Catch
1	June 5	Beach seine	0-2.0	8 hauls	2 northern pike, 71 least ciscos, 6 humpback whitefish, 7 Arctic grayling, 3 longnose suckers, 7 ninespine sticklebacks, 21 sculpins.
1	June 20	Beach seine	0-2.0	5 hauls	21 least ciscos, several humpback whitefish fry, several longnose sucker fry.
2	June 10	Trap net	0-1.5	22.5 hrs.	2 humpback whitefish, 1 northern pike.
2	June 20	Trap net	0-1.5	22.3 hrs.	1 northern pike
3	June 3	Electroshock	0-1.0	77 sec.	4 sculpins
4	June 30	Beach seine	0-1.5	6 hauls	13 Arctic grayling, 4 round whitefish, 1 longnose sucker, 2 least ciscos.
-	June 10	Hook and line	-	13 ang. hrs.	17 Arctic grayling, 1 northern pike.
-	June 24	Hook and line	-	7 ang. hrs.	24 northern pike, 1 Arctic grayling
-	June 30	Hook and line	-	2 ang. hrs.	4 Arctic grayling
-	August 3	Hook and line	-	5 ang. hrs.	20 Arctic grayling
-	August 4	Hook and line	-	10 ang. hrs.	48 Arctic grayling (observed 4 adult sockeye in river).

1/ See Figure 14.

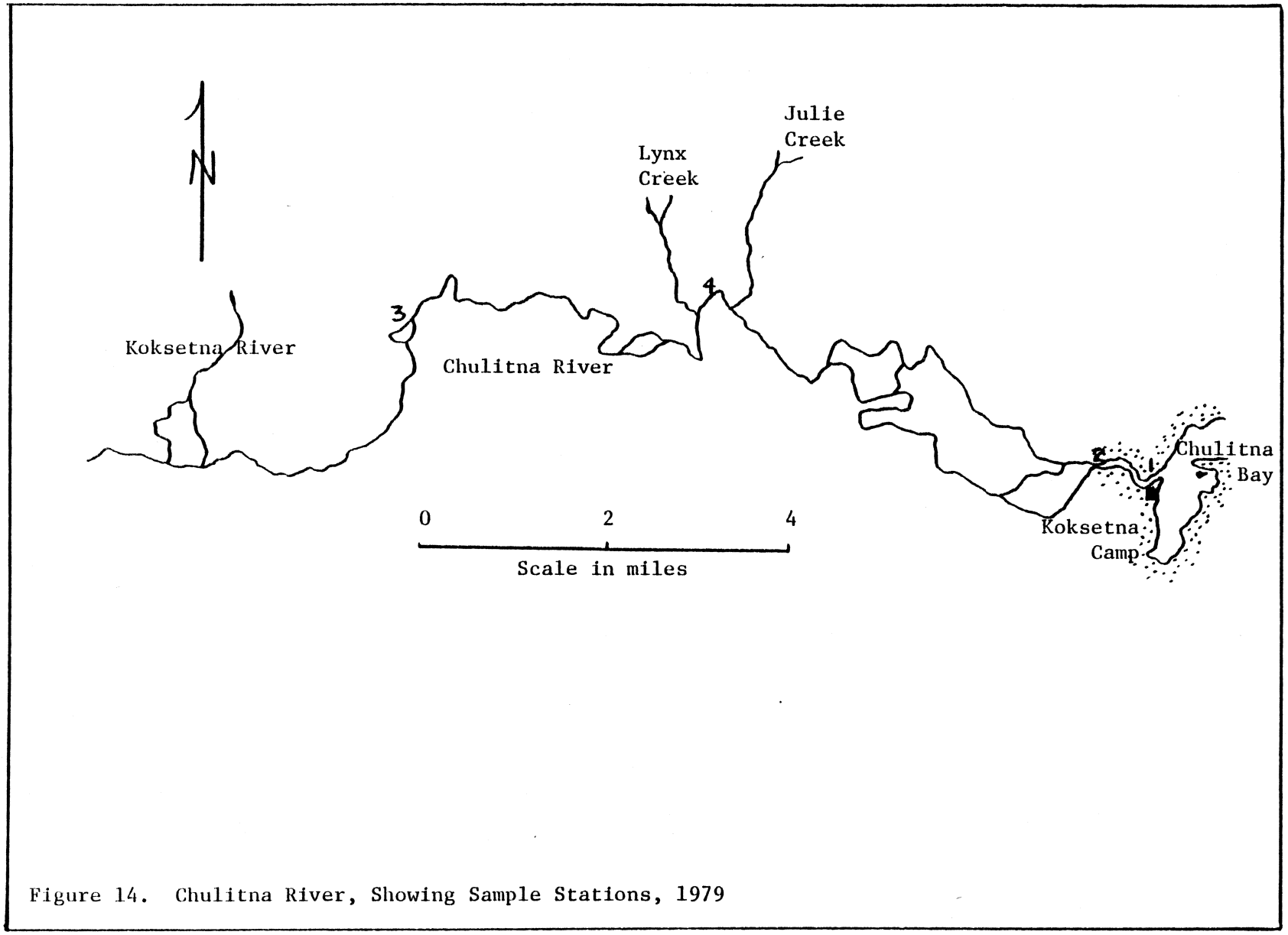

Figure 14. Chulitna River, Showing Sample Stations, 1979

Appendix B-3. Sampling Results, Hoknede Lake, August 27-29, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	August 28	Diving Gill Net	0-1.8	17.0 hrs.	2 northern pike, 1 least cisco.
2	August 28	Diving Gill Net	0-3.1	17.0 hrs.	4 northern pike, 1 least cisco
3	August 29	Diving Gill Net	0-1.8	19.0 hrs.	2 northern pike, 3 least cisco
4	August 29	Diving Gill Net	0-2.2	18.5 hrs.	4 northern pike, 6 least ciscos
5	August 27	Electroshock	0-1.0	170 sec.	1 ninespine stickleback, several sculpins
6	August 27	Limnology	4.0	-	-
-	August 27	Depth soundings 2/	-	-	-

1/ See Figure 15

2/ See Figure 16

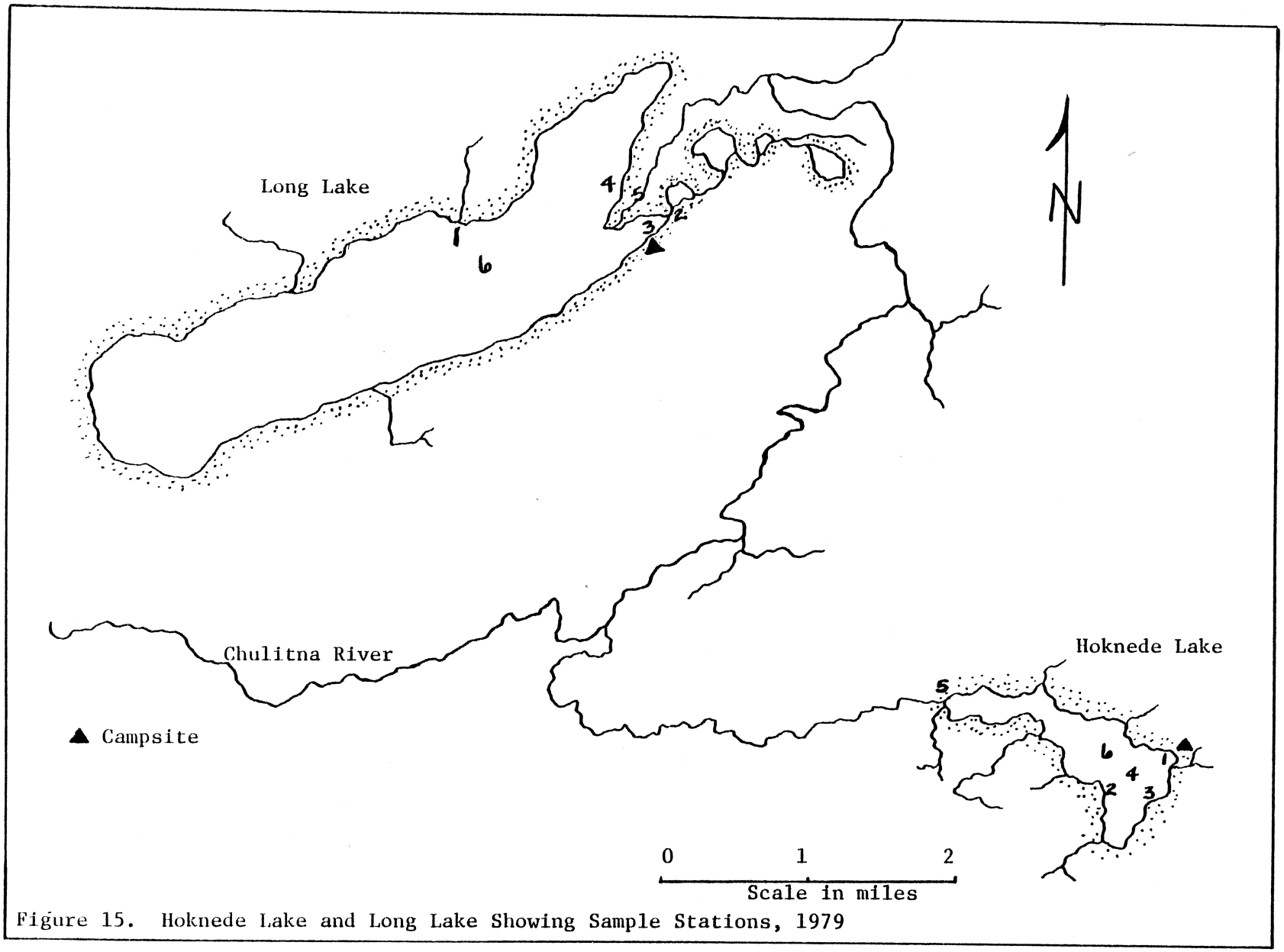

Figure 15. Hoknede Lake and Long Lake Showing Sample Stations, 1979

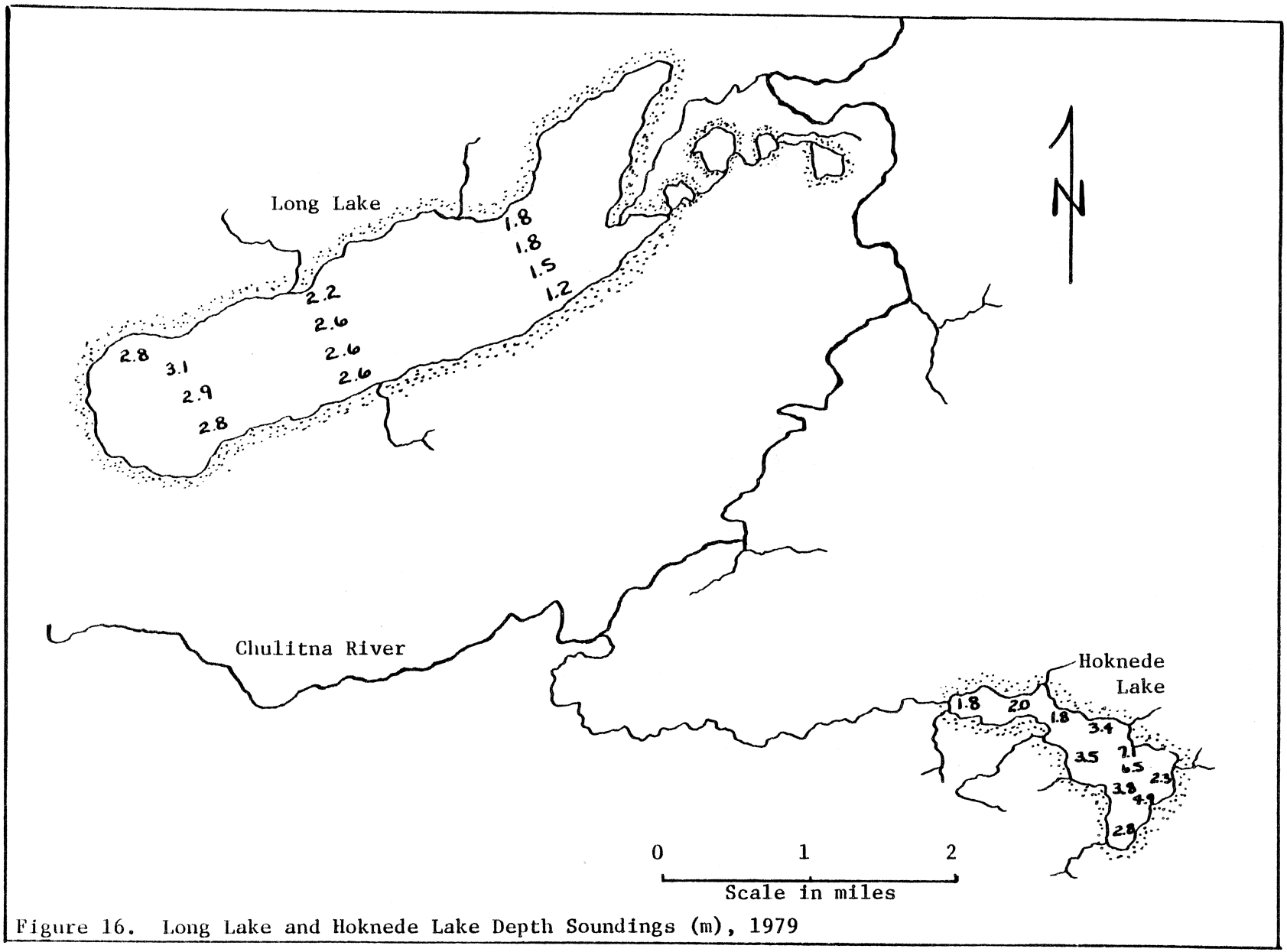

Figure 16. Long Lake and Hoknede Lake Depth Soundings (m), 1979

Appendix B-4. Sampling Results, Hudson Lake, July 15-17, 1979.

Sample Station 1/	Date	Gear Type	Depth Sample(m)	Duration	Catch
1	July 16	Diving Gill Net	0-5.2	12.0 hrs.	7 lake trout, 76 round whitefish
2	July 16	Limnology	4.0	-	-
-	July 16	Depth soundings 2/	-	-	-

1/ See Figure 17

2/ See Figure 18

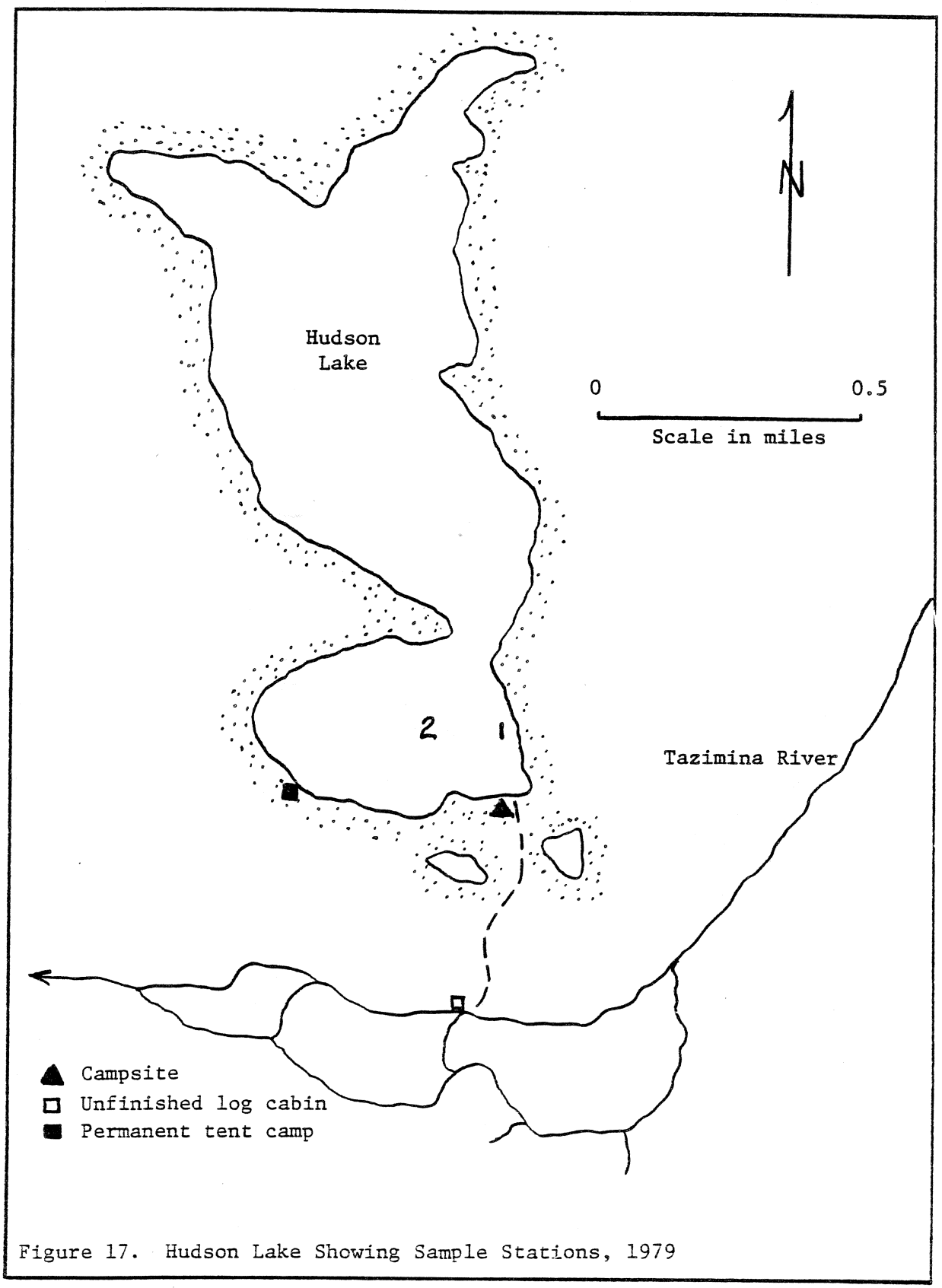

Figure 17. Hudson Lake Showing Sample Stations, 1979

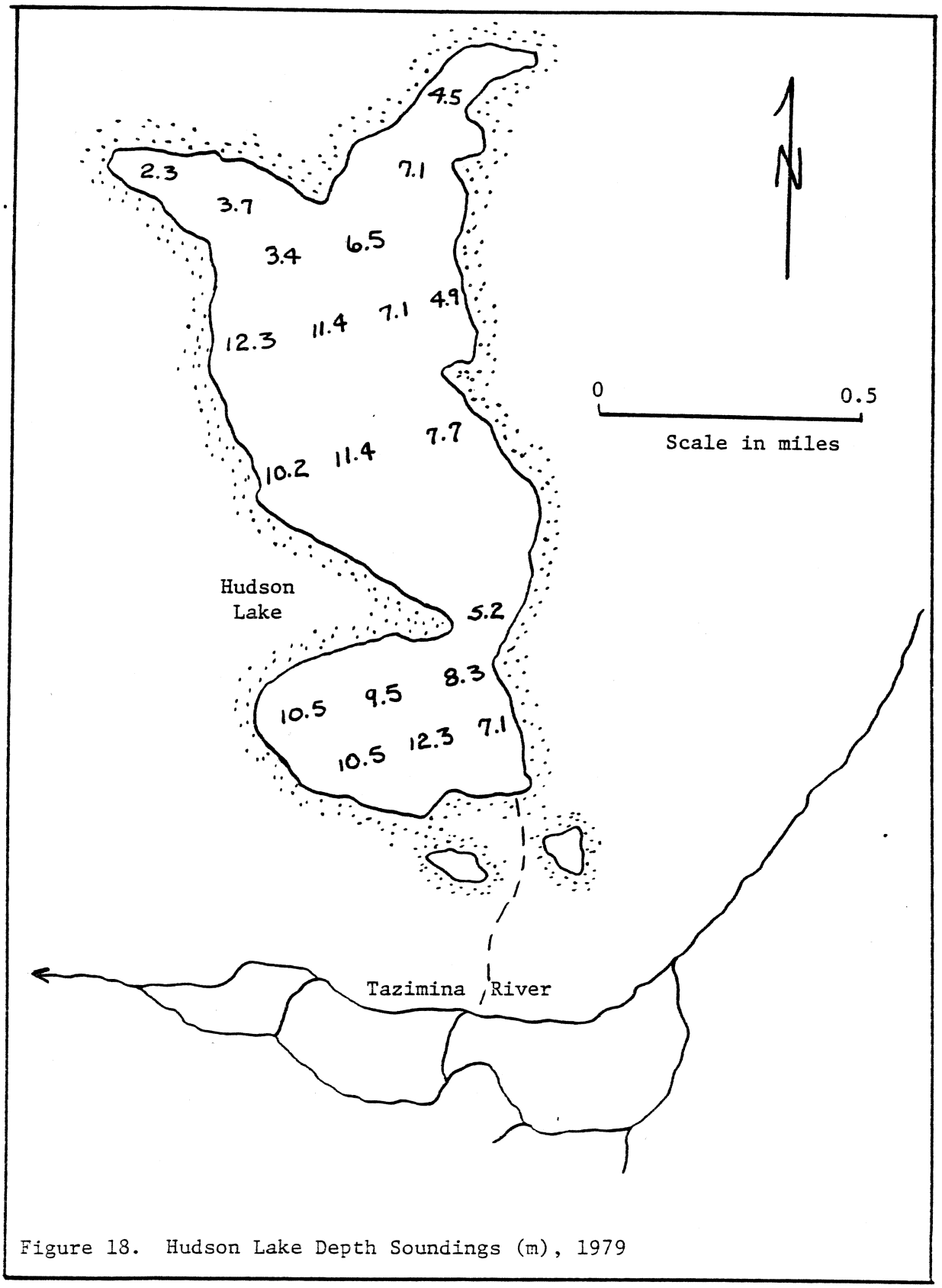

Figure 18. Hudson Lake Depth Soundings (m), 1979

Appendix B-5. Sampling Results, Kijik Lake, June 24-26, 1978 and June 6, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 24	Electroshock	0-1.0	303 sec.	1 Arctic char fry, 2 sockeye fry, several sculpins.
2	June 6	Hook and line	-	1 ang. hr.	2 Arctic char
3	June 24	Floating Gill Net	0-3.0	14.3 hrs.	4 lake trout, 13 Arctic char, 39 round whitefish, 74 longnose suckers.
4	June 24	Diving Gill Net	0-16.1	15.2 hrs.	1 lake trout, 14 Arctic char, 13 round whitefish, 2 longnose suckers.
5	June 24	Minnow Trap	1.0	36.0 hrs.	None
6	June 24	Dip Net	Surface	-	7 sockeye fry
7	June 6	Limnology	4.0	-	-
7	June 24	Limnology	4.0	-	-
-	June 6	Depth soundings 2/	-	-	-

1/ See Figure 19

2/ See Figure 20

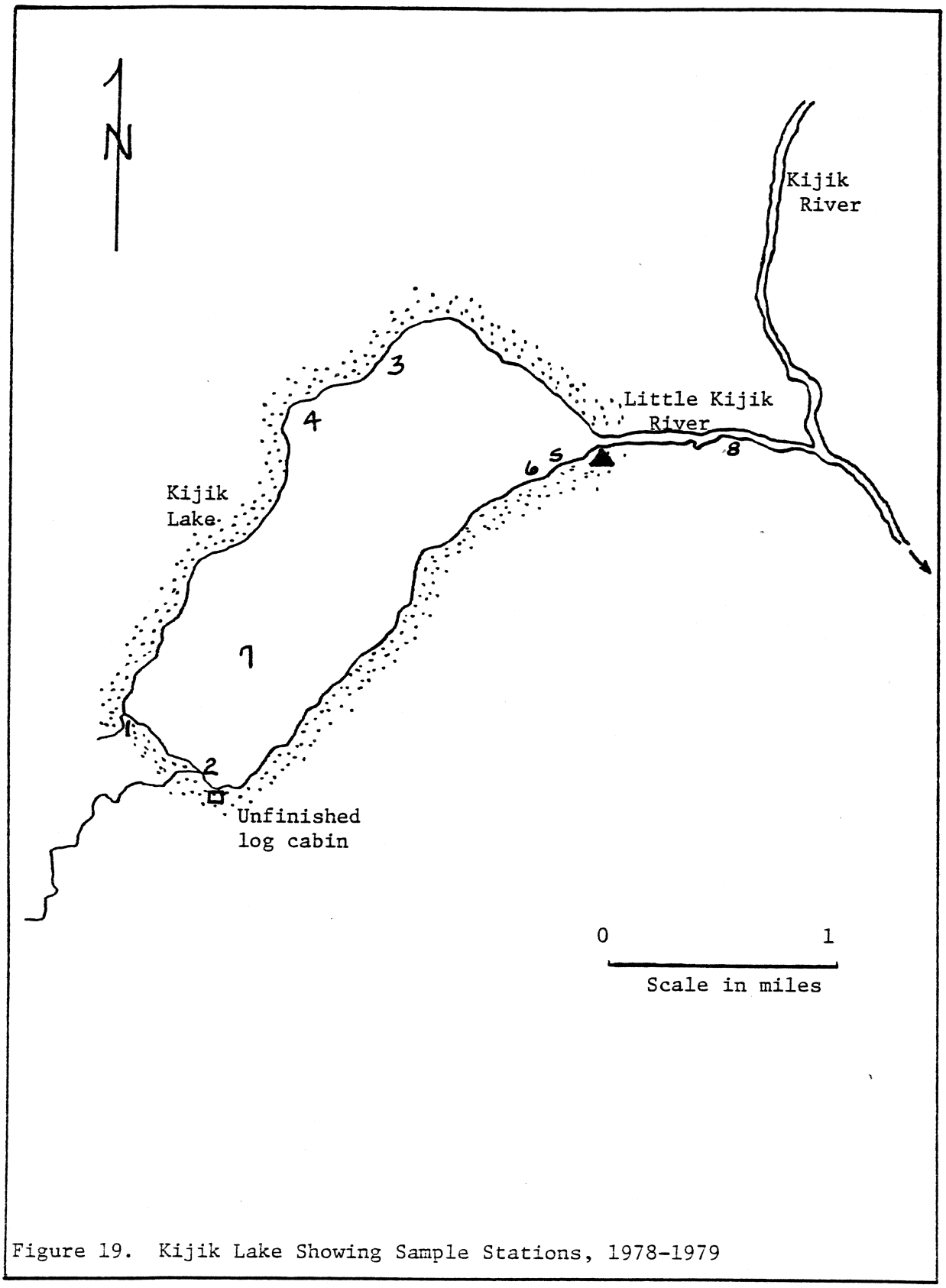

Figure 19. Kijik Lake Showing Sample Stations, 1978-1979

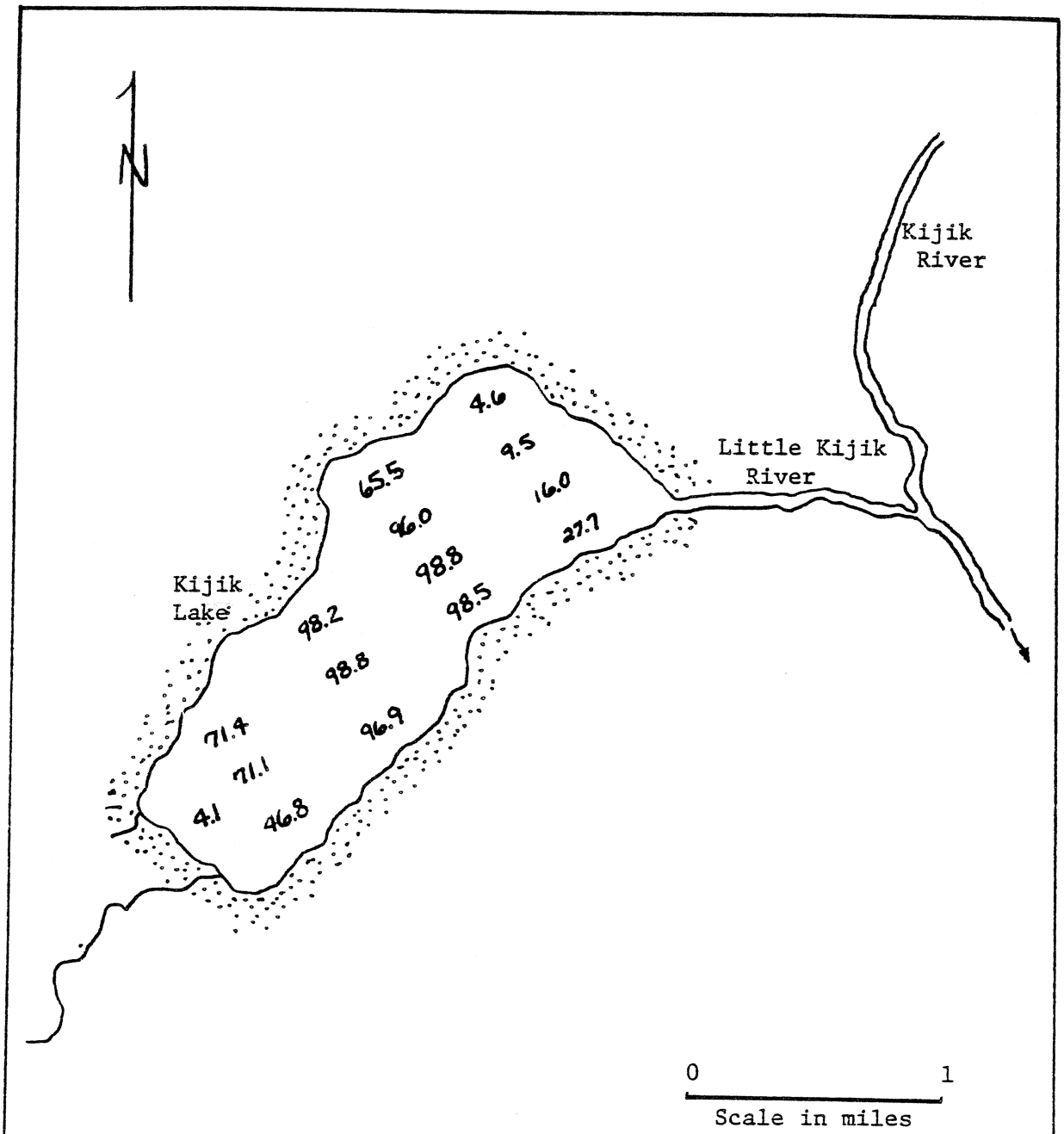

Figure 20. Kijik Lake Depth Soundings (m), 1979

Appendix B-6. Sampling Results, Kontrashibuna Lake, August 21-26, 1978 and September 5-7, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 21	Floating Gill Net	0-1.5	13.8 hrs.	6 lake trout, 1 Arctic char
2	Aug. 21	Diving Gill Net	0-13.0	13.7 hrs.	12 lake trout, 7 Arctic char
3	Aug. 22	Electroshock	0-1.0	218 sec.	19 pygmy whitefish, several sculpins
4	Aug. 22	Electroshock	0-1.0	92 sec.	6 pygmy whitefish, several sculpins
5	Aug. 22	Floating Gill Net	0-3.6	25.5 hrs.	3 lake trout, 5 Arctic char
6	Aug. 22	Diving Gill Net	0-22.1	25.8 hrs.	8 lake trout, 6 Arctic char
7	Sept. 6	Hook and line	-	8 ang. hr.	4 lake trout
8	Sept. 7	Set line (17 hooks)	3.1-20.0	314 hook hrs.	None
8	Sept. 6	Limnology	4.0	-	-
9	Sept. 7	Set line (20 hooks)	15.4-53.5	370 hook hrs.	None
10	Aug. 23	Floating Gill Net	0-1.5	15.1 hrs.	6 lake trout, 11 Arctic char
11	Aug. 23	Diving Gill Net	0-2.7	15.8 hrs.	9 lake trout, 2 Arctic char
12	Aug. 24	Dip Net	Surface	-	3 pygmy whitefish, 2 Arctic char
13	Aug. 24	Electroshock	0-1.0	124 sec.	Several sculpins
14	Aug. 24	Floating Gill Net	0-1.8	15.8 hrs.	7 lake trout, 12 Arctic char
15	Aug. 24	Diving Gill Net	0-2.1	15.0 hrs.	16 lake trout, 21 Arctic char
16	Aug. 24	Limnology	4.0	-	-
-	Aug. 22-26	Depth soundings 2/	-	-	-

1/ See Figure 21

2/ See Figure 22

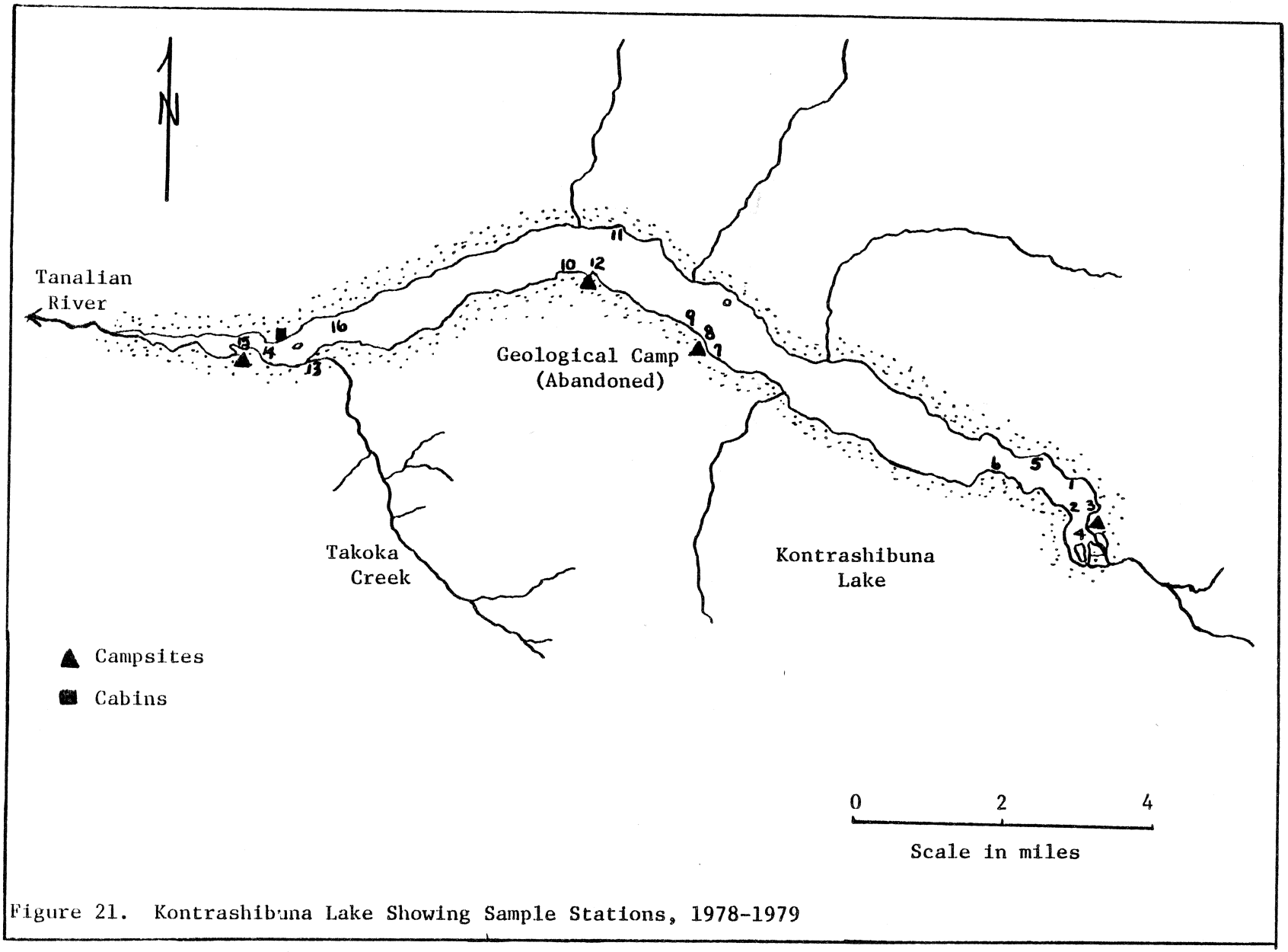

Figure 21. Kontrashibuna Lake Showing Sample Stations, 1978-1979

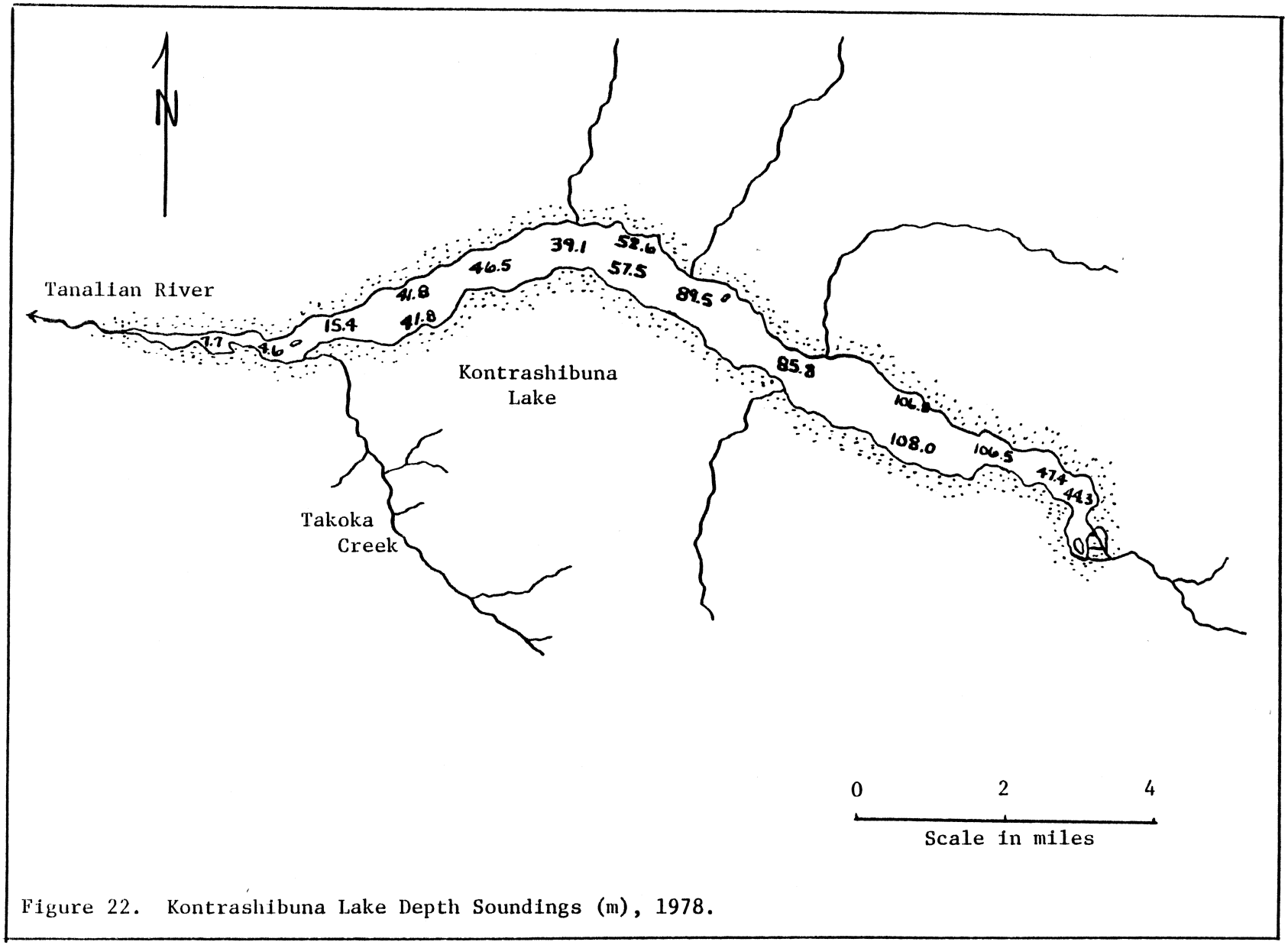

Figure 22. Kontrashibuna Lake Depth Soundings (m), 1978.

Appendix B-7. Sampling Results, Lachbuna Lake, September 2-5, 1978.

Sample Station 1/	Date	Gear Type	Depth Sample(m)	Duration	Catch
1	Sept. 2	Diving Gill Net	0-9.7	18.8 hrs	2 lake trout, 10 Arctic char
2	Sept. 2	Floating Gill Net	0.2.7	18.8 hrs.	9 lake trout, 5 Arctic char
3	Sept. 3	Diving Gill Net	0.6.7	17.8 hrs.	9 lake trout, 18 Arctic char
4	Sept. 3	Floating Gill Net	0.1.8	17.8 hrs.	4 lake trout, 7 Arctic char
5	Sept. 3	Electroshock	0.1.5	492 sec.	Several sculpins
6	Sept. 2	Limnology	4.0	-	-
-	Sept. 2	Depth soundings 2/	-	-	-

1/ See Figure 23

2/ See Figure 24

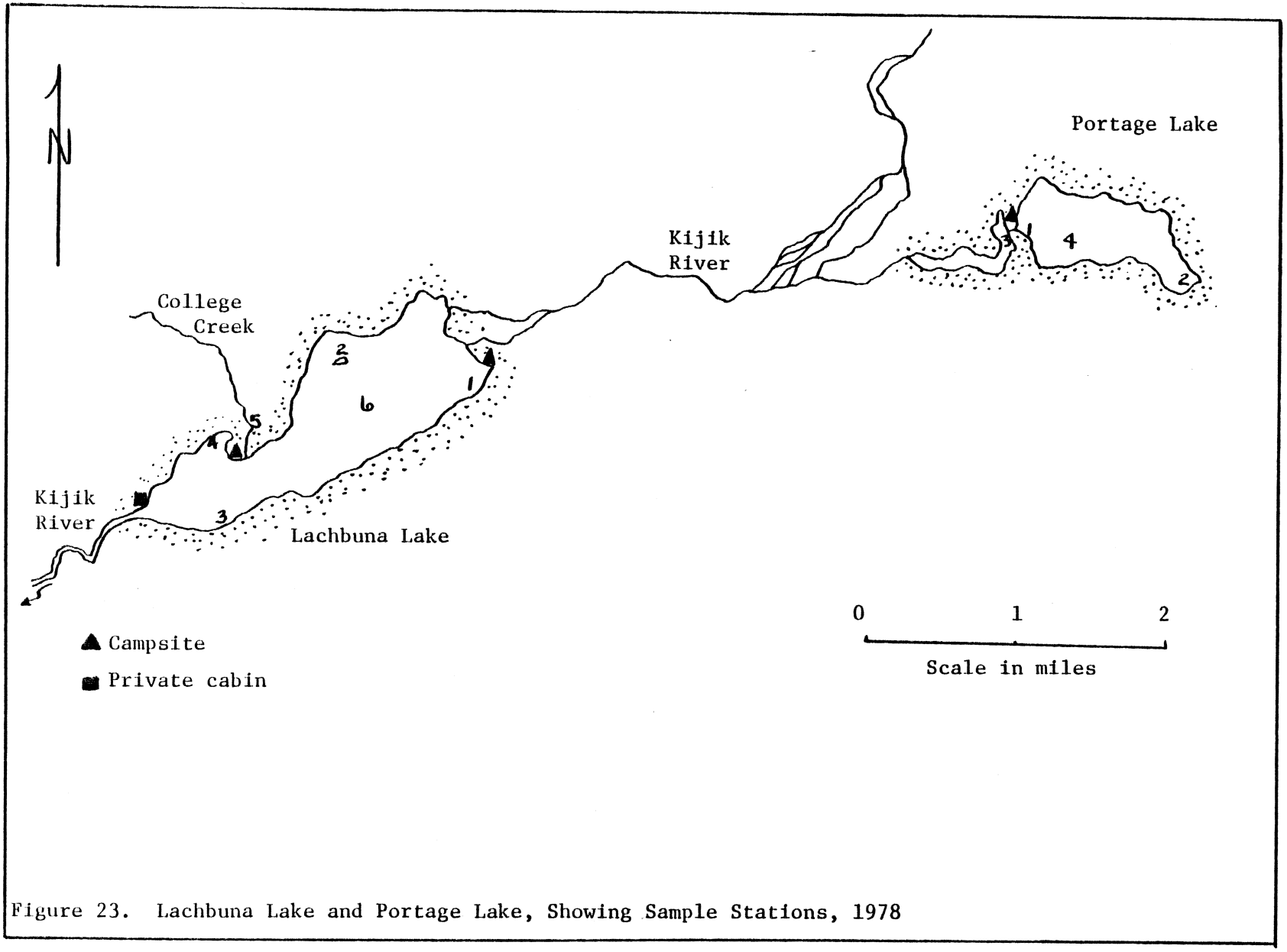

Figure 23. Lachbuna Lake and Portage Lake, Showing Sample Stations, 1978

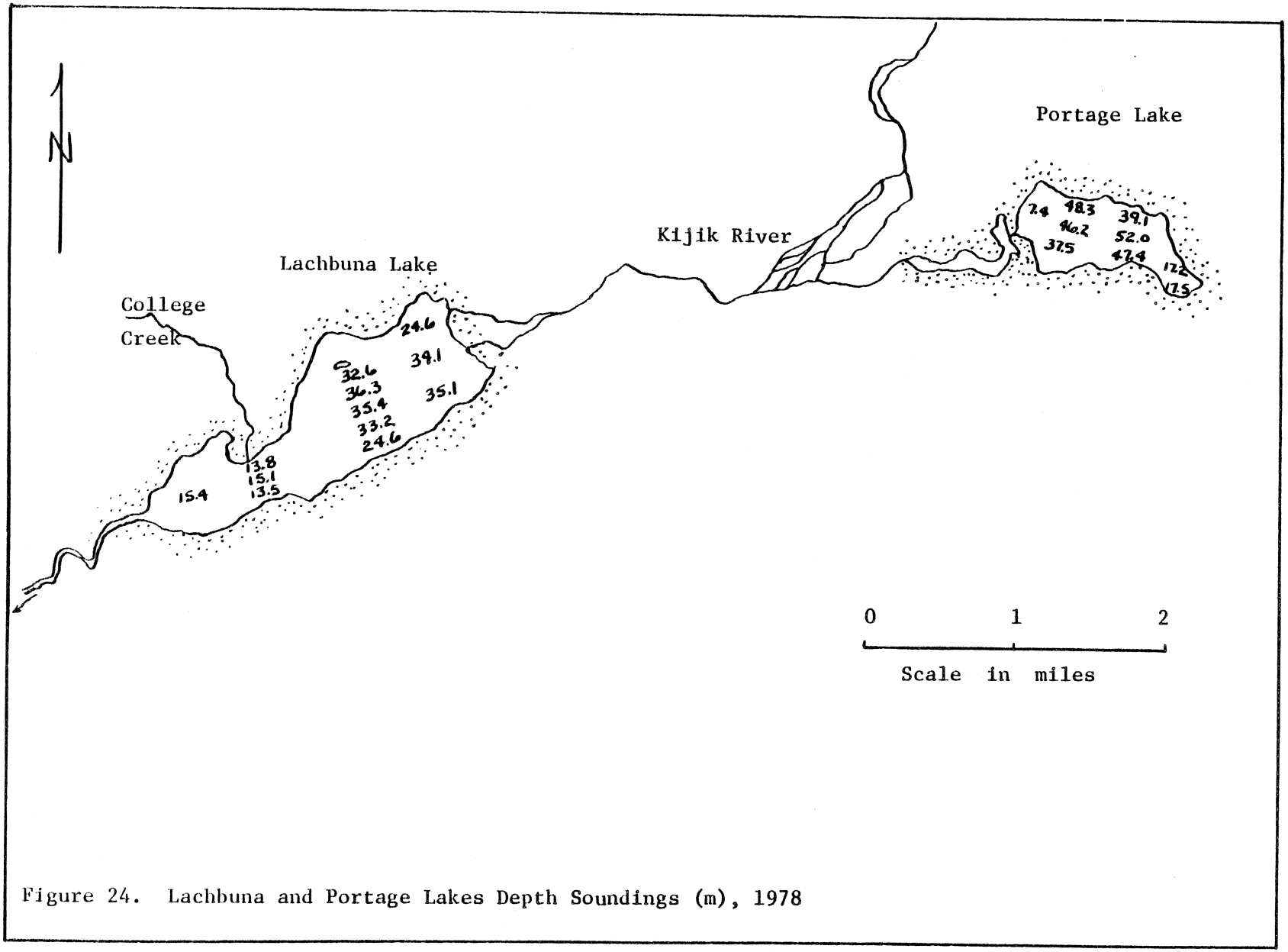

Figure 24. Lachbuna and Portage Lakes Depth Soundings (m), 1978

Appendix B-8. Sampling Results, Lake Clark, 1978-1979.

Sample Station [1]	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 5	Diving Gill Net	0-10.9	4.0 hrs.	1 lake trout, 4 humpback whitefish, 2 round whitefish.
2	June 5	Floating Gill Net	0- 2.9	12.0 hrs.	2 lake trout, 12 humpback whitefish 5 round whitefish, 2 pike, 2 grayling, 1 Arctic char, 4 suckers.
3	June 6	Diving Gill Net	0-11.9	16.3 hrs.	3 lake trout, 8 humpback whitefish, 6 round whitefish, 3 pike, 1 burbot, 5 least ciscos, 10 suckers.
4	June 6	Diving Gill Net	0-11.9	14.0 hrs.	5 lake trout, 1 humpback whitefish, 9 round whitefish, 6 grayling, 1 least cisco, 5 suckers.
5	June 8	Floating Gill Net	0- 1.8	5.2 hrs.	5 grayling, 2 round whitefish
6	June 18	Electroshock	0- 1.0	-	1 juvenile pike
6	June 28	Electroshock	0 - 1.0	-	11 sucker fry, 3 humpback whitefish fry.
6	July 30	Dip Net	0- 1.0	-	63 sucker fry, 2 sockeye fry, 1 fingerling round whitefish.
7	Sept.26	Diving Gill Net	0- 1.8	19.3 hrs.	5 lake trout, 6 humpback whitefish, 5 suckers, 1 pike, 3 sockeye spawners, 1 burbot.
7	June 20	Set Line	1- 2.5	468 hook hrs.	None
8	Sept.26	Floating Gill Net [2]	0- 3.0	18.8 hrs.	3 lake trout, 3 humpback whitefish, 4 suckers.
9	Sept.26	Diving Gill Net	0- 5.5	19.2 hrs.	10 lake trout, 16 humpback whitefish, 5 round whitefish, 4 grayling, 9 suckers, 1 least cisco, 1 burbot

Appendix B-8 (cont.) Sampling Results, Lake Clark, 1978-1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
10	June 5	Trap Net	0-1.5	18.8 hrs.	9 northern pike, 1 humpback whitefish
11	June 28	Electroshock	0-1.0	100 sec.	None
12	June 28	Diving Gill Net	0-5.5	15.3 hrs.	5 longnose suckers, 2 Arctic grayling, 3 lake trout, 2 round whitefish, 3 humpback whitefish.
13	June 27	Beach Seine	0-2.0	3 hauls	2 round whitefish, 1 Arctic grayling
13	June 28	Electroshock	0-1.0	234 sec.	Several sculpins
13	June 29	Set Line	2.0-5.5	828 hook hrs.	2 burbot, 1 lake trout
14	June 28	Electroshock	0-1.0	110 sec.	1 Arctic grayling, several sculpins.
15	June 28	Surface Gill Net	0-2.5	13.8 hrs.	3 longnose suckers, 27 Arctic grayling, 2 lake trout, 4 round whitefish.
16	June 29	Electroshock	0-1.5	125 sec.	Several sculpins
17	July 21	Electroshock	0-1.5	377 sec.	Several sculpins, several ninespine stickleback.
18	July 21	Diving Gill Net	0-12.0	20.8 hrs.	3 lake trout, 5 humpback whitefish, 21 least ciscos, 1 round whitefish, 1 pygmy whitefish.
19	July 21	Diving Gill Net	0-11.1	20.0 hrs.	9 humpback whitefish, 10 longnose suckers, 20 least ciscos, 2 round whitefish, 2 burbot.
20	July 22	Diving Gill Net	0-5.5	16.0 hrs.	10 lake trout, 16 humpback whitefish, 7 round whitefish, 68 least ciscos, 2 Arctic grayling, 4 longnose suckers, 7 burbot, 2 Dolly Varden.

Appendix B-8 (cont.) Sampling Results, Lake Clark, 1978-1979.

Sample Station [1]	Date	Gear Type	Depth Sampled(m)	Duration	Catch
20	July 22	Set Line (21 hooks)	1.0-9.2	320 hook hrs.	9 burbot
21	July 25	Diving Gill Net	0-5.2	15.0 hrs.	2 lake trout, 5 humpback whitefish, 4 least ciscos, 1 adult sockeye
22	July 24	Electroshock	0-1.5	475 sec.	2 Dolly Varden, several sculpins
23	July 25	Electroshock	0-1.5	558 sec.	1 Arctic grayling, 1 burbot, 4 Dolly Varden, several sculpins
24	Aug. 3	Electroshock	0-1.5	719 sec.	5 round whitefish, 3 Arctic grayling, 1 burbot, 1 Dolly Varden, several sculpins.
Limnol. [2] No. 1	Sept.26	Limnology	4.0	-	-
Limnol. No. 2	June 27	Limnology	4.0	-	-
Limnol. No. 3	July 20	Limnology	4.0	-	-
Limnol. No. 4	Aug. 3	Limnology	4.0	-	-

1/ See Figure 25

2/ See Figure 26

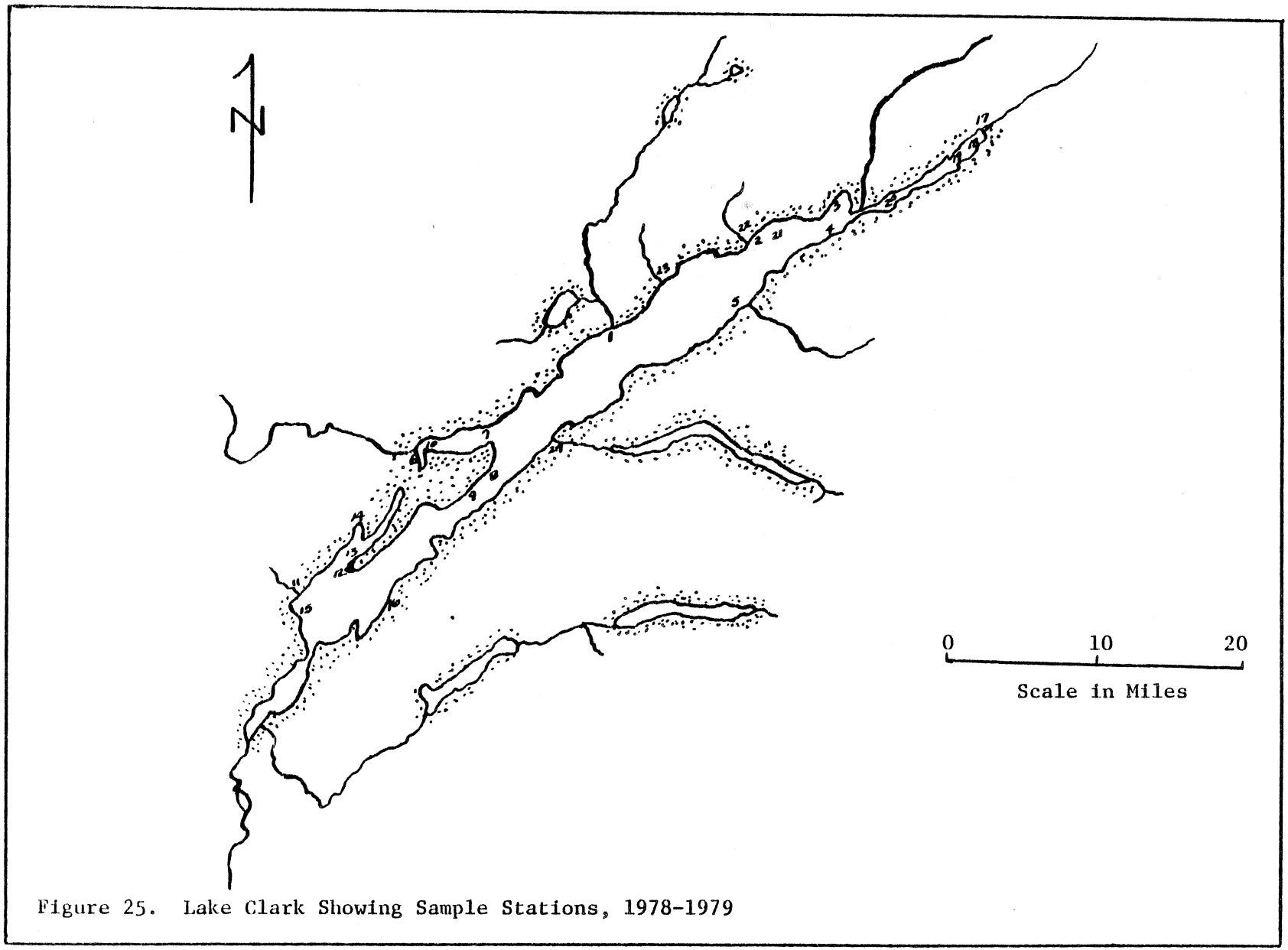

Figure 25. Lake Clark Showing Sample Stations, 1978-1979

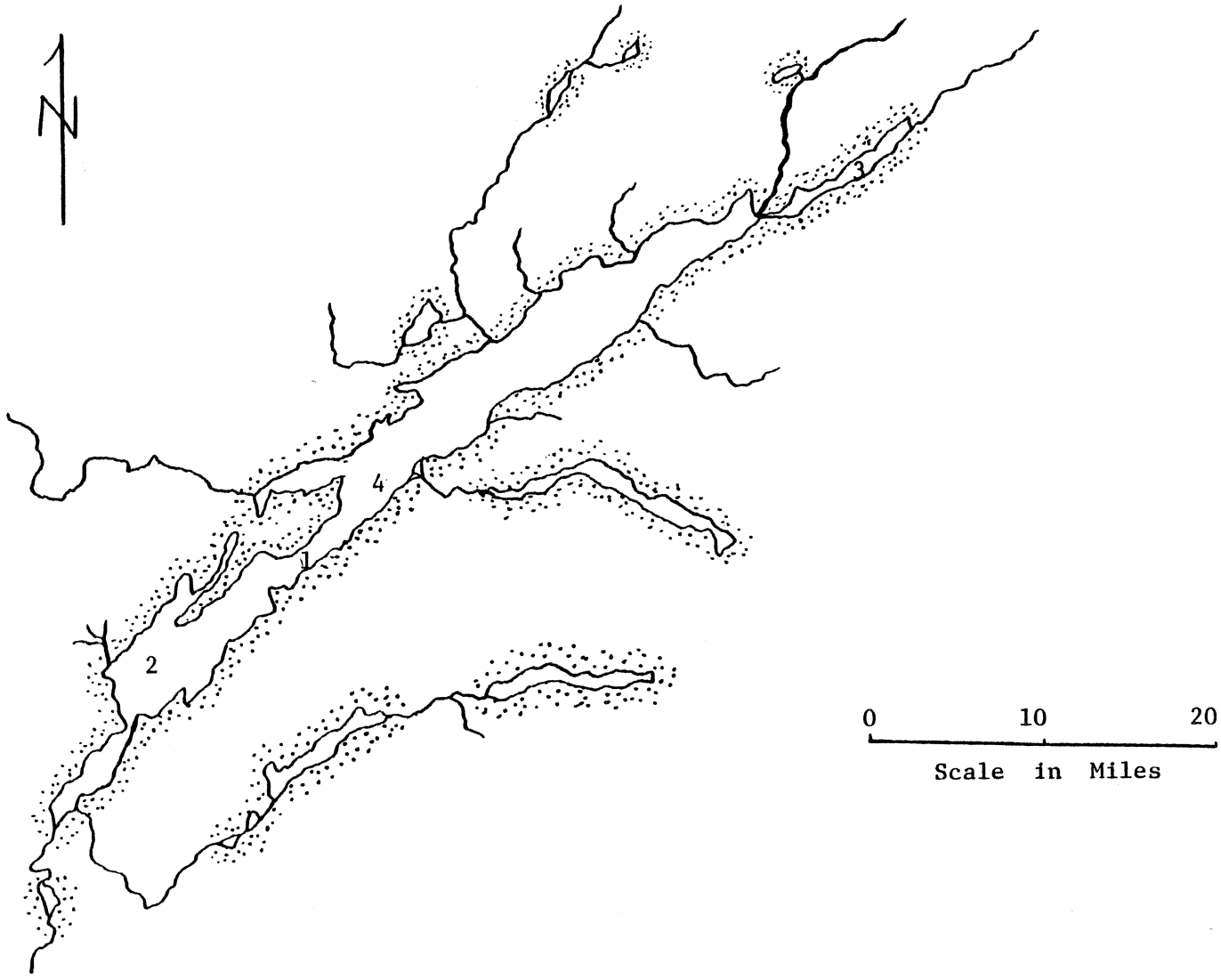

Figure 26. Lake Clark Showing Limnological Sampling Stations, 1978-1979.

Appendix B-9. Sampling Results, Little Kijik River, June 26, 1978 and June 6-8, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
8	June 24	Minnow Trap	0.3	36.5 hrs.	None
-	June 26	Hook and Line	0-3.0	2.0 ang. hrs.	13 Arctic grayling
-	June 6-8	Hook and Line	0-3.0	28 ang. hrs.	63 Arctic grayling

1/ See Figure 19.

Appendix B-10. Sampling Results, Long Lake, June 3 and June 21-23, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 3	Electroshock	0-1.5	103 sec.	Several sculpins
2	June 3	Electroshock	0-1.5	1,135 sec.	4 northern pike
-	June 3	Hook and Line	0-2.0	4 ang. hrs.	10 northern pike
-	June 21-23	Hook and Line	0-3.0	19 ang. hrs.	74 northern pike
2	June 22	Trap Net	0-1.0	18 hrs.	8 northern pike
2	June 22	Beach Seine	0-1.5	7 hauls	28 northern pike
3	June 22	Dip Net	Surface	-	13 northern pike fry, many longnose sucker fry
4	June 23	Trap Net	0-1.0	15.8 hrs	16 northern pike
5	June 23	Dip Net	Surface	-	5 humpback whitefish fry
6	June 21	Limnology	1.5	-	-
-	June 21	Depth soundings 2/	-	-	-

1/ See Figure 15

2/ See Figure 16

Appendix B-11. Sampling Results, Otter Lake, June 28-29, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	June 28	Diving Gill Net	0-1.8	14.0 hrs.	27 longnose suckers
2	June 28	Electroshock	0-1.0	40 sec.	16 ninespine sticklebacks
3	June 28	Limnology	2.1	-	-
-	June 28	Depth soundings 2/	-	-	-

1/ See Figure 27

2/ See Figure 28

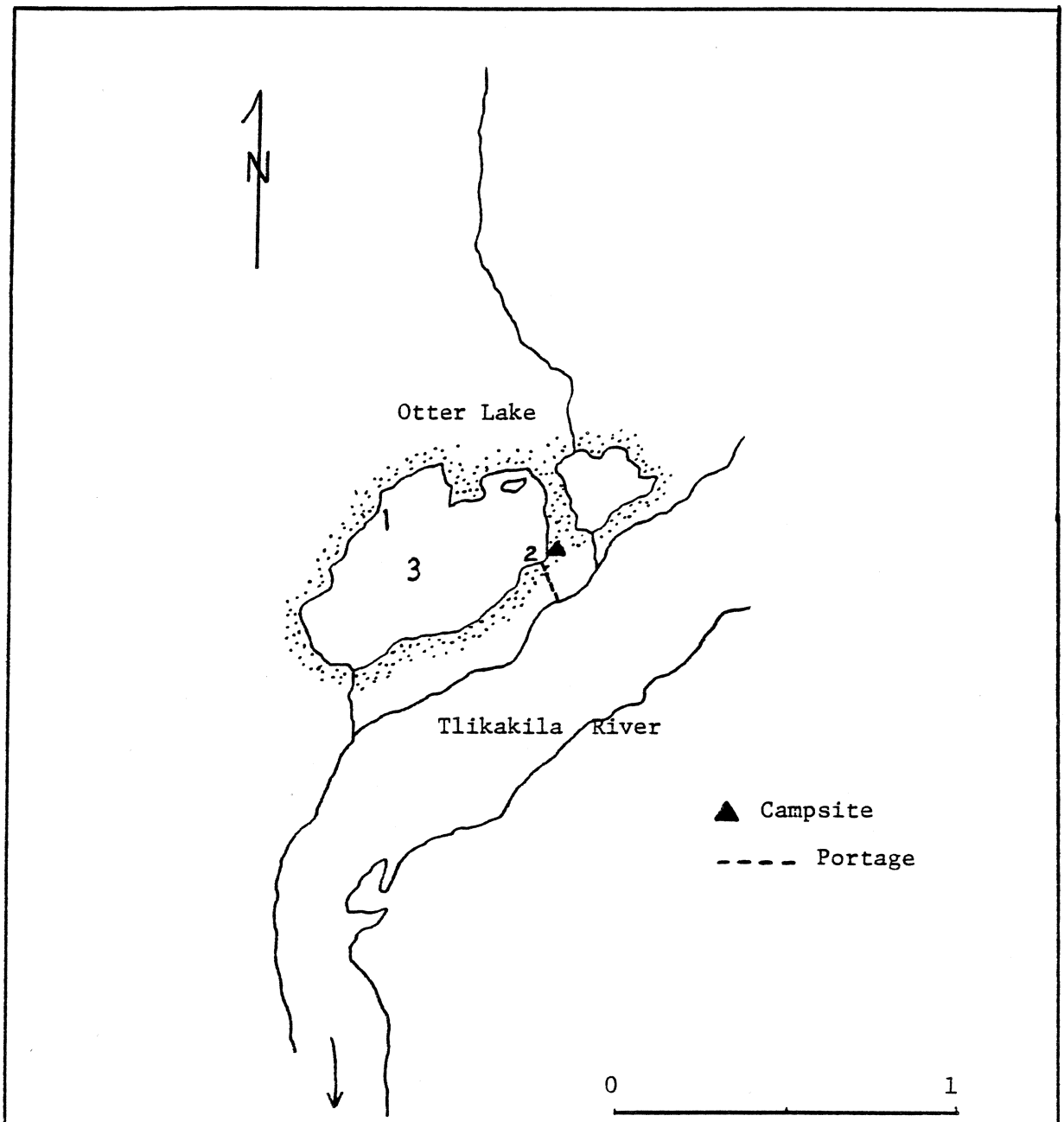

Figure 27. Otter Lake, Showing Sample Stations, 1978

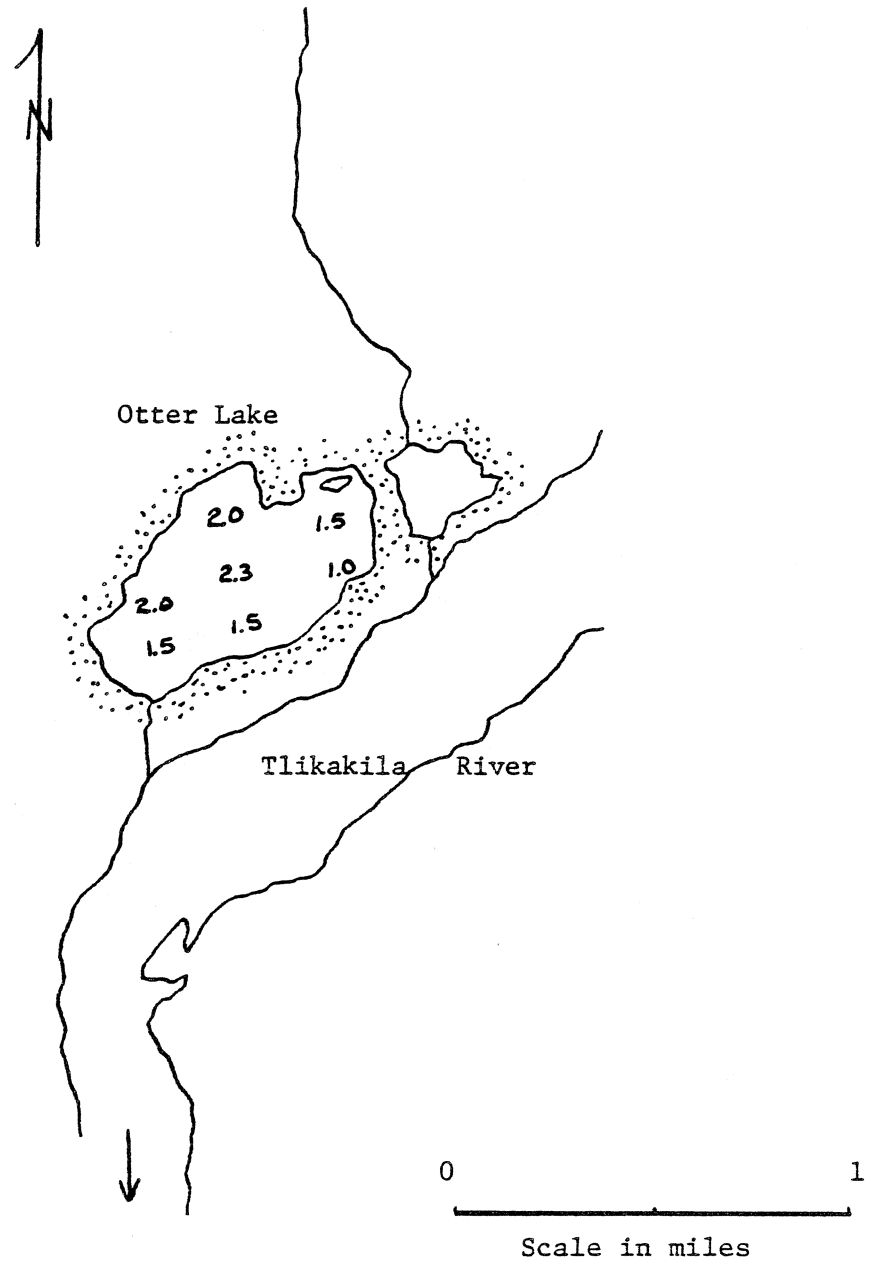

Figure 28. Otter Lake Depth Soundings (m), 1978

Appendix B-12. Sampling Results, Pickeral Lakes, July 6-9, 1979.

Sample Station [1]	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 7	Floating Gill Net	0-2.5	15.0 hrs.	2 northern pike, 6 humpback whitefish, 3 round whitefish.
2	July 6	Limnology	4.0	-	-
-	July 6	Depth soundings [2]	-	-	-
-	July 6	Hook and Line	-	1 ang. hr.	None
-	July 6	Visual	Shoreline	-	Several ninespine sticklebacks, several Arctic grayling
3	July 7	Floating Gill Net	0-1.3	16.3 hrs.	8 northern pike, 3 humpback whitefish
-	July 7	Hook and Line	-	1 ang. hr.	1 northern pike
4	July 7	Limnology	2.0	-	-
-	July 7	Depth soundings [2]	-	-	-
5	July 8	Dip Net	Surface	-	9 Arctic grayling fry, several sculpins
6	July 9	Floating Gill Net	0-1.3	17.8	2 northern pike, 5 humpback whitefish, 2 least ciscos

1/ See Figure 29

2/ See Figure 30

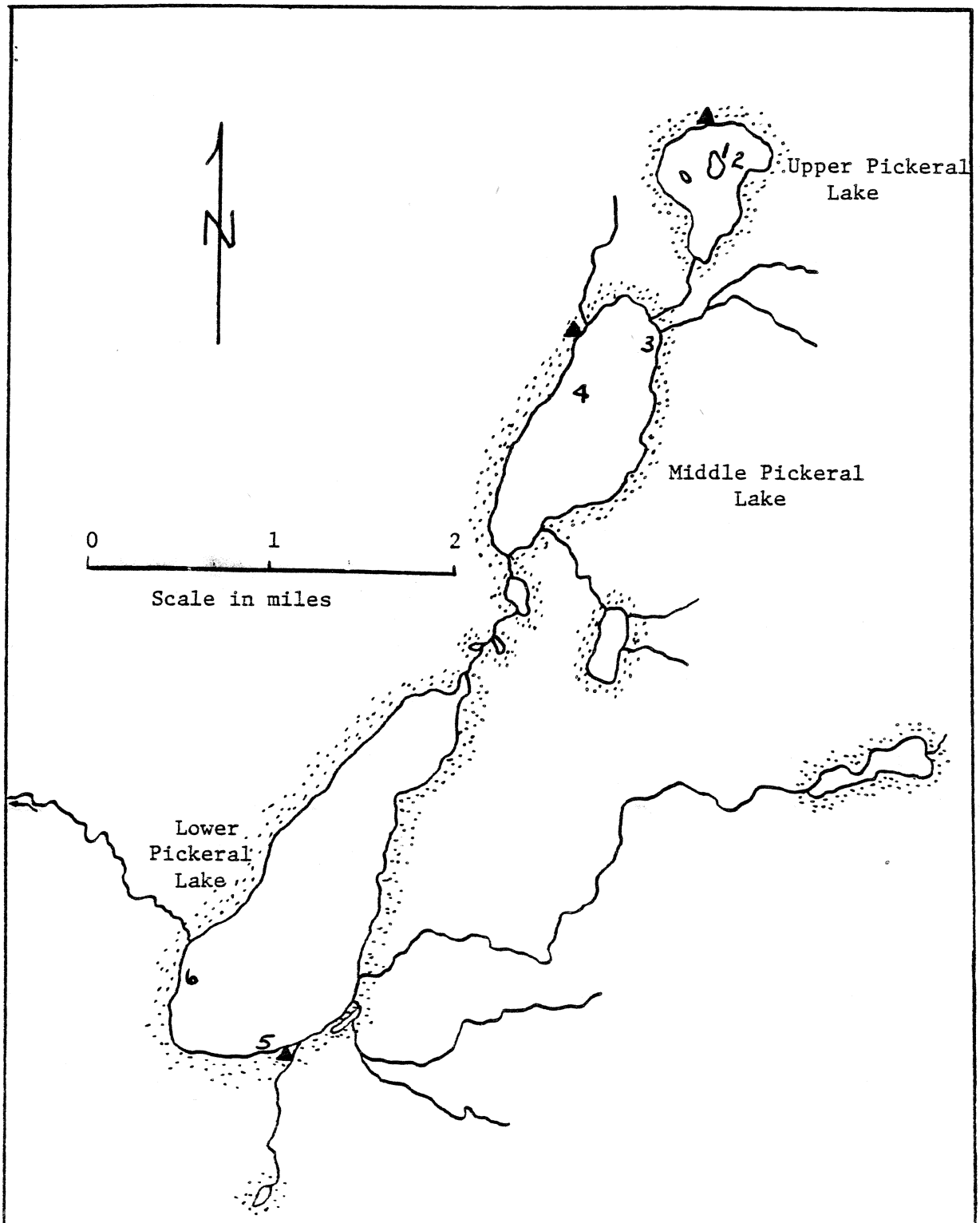

Figure 29. Pickeral Lakes, Showing Sample Stations, 1979

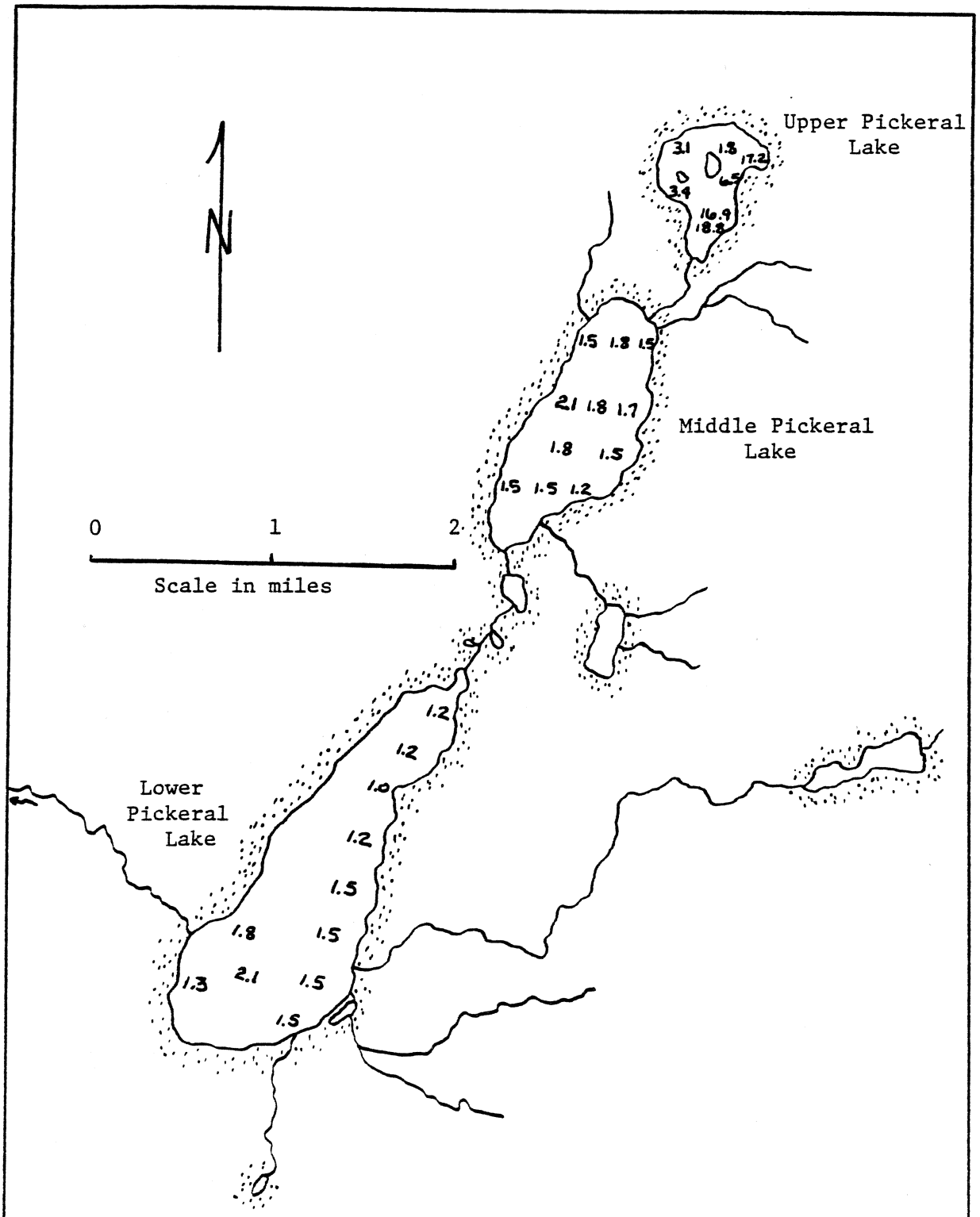

Figure 30. Pickeral Lakes Depth Soundings (m), 1979.

Appendix B-13. Sampling Results, Portage Lake, August 31 - September 1, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 31	Floating Gill Net	0-4.9	19.5 hrs.	10 lake trout, 4 Arctic char
2	Aug. 31	Diving Gill Net	0-6.5	18.3 hrs.	19 lake trout, 20 Arctic char
3	Aug. 31	Electroshock	0-1.0	415 sec.	20 juvenile Arctic char, several sculpins
4	Aug. 31	Limnology	4.0	-	-
-	Aug. 31	Depth soundings 2/	-	-	-

1/ See Figure 23

2/ See Figure 24

Appendix B-14. Sampling Results, Upper Tazimina Lake, September 7-11, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Sept. 7	Floating Gill Net	0- 4.6	15.3 hrs.	30 Arctic char, 6 grayling
2	Sept. 7	Diving Gill Net	0-11.4	14.7 hrs.	57 Arctic char, 17 grayling
3	Sept. 8	Hook and Line	0- 3.0	1.0 hrs.	7 Arctic grayling
4	Sept. 9	Electroshock	0- 1.0	241 sec.	1 grayling, 4 Dolly Varden, 14 sculpins, 15 threespine stickleback
5	Sept. 9	Diving Gill Net	0- 3.7	19.3 hrs.	66 Arctic char, 35 grayling
6	Sept. 9	Floating Gill Net	0- 2.5	19.7 hrs.	47 Arctic char, 18 grayling
7	Sept. 9	Limnology	4.0	-	-
8	Sept.10	Hook and Line	0- 2.0	1.0 hrs.	3 Arctic grayling
-	Sept.8-9	Depth soundings 2/	-	-	-

1/ See Figure 31

2/ See Figure 32

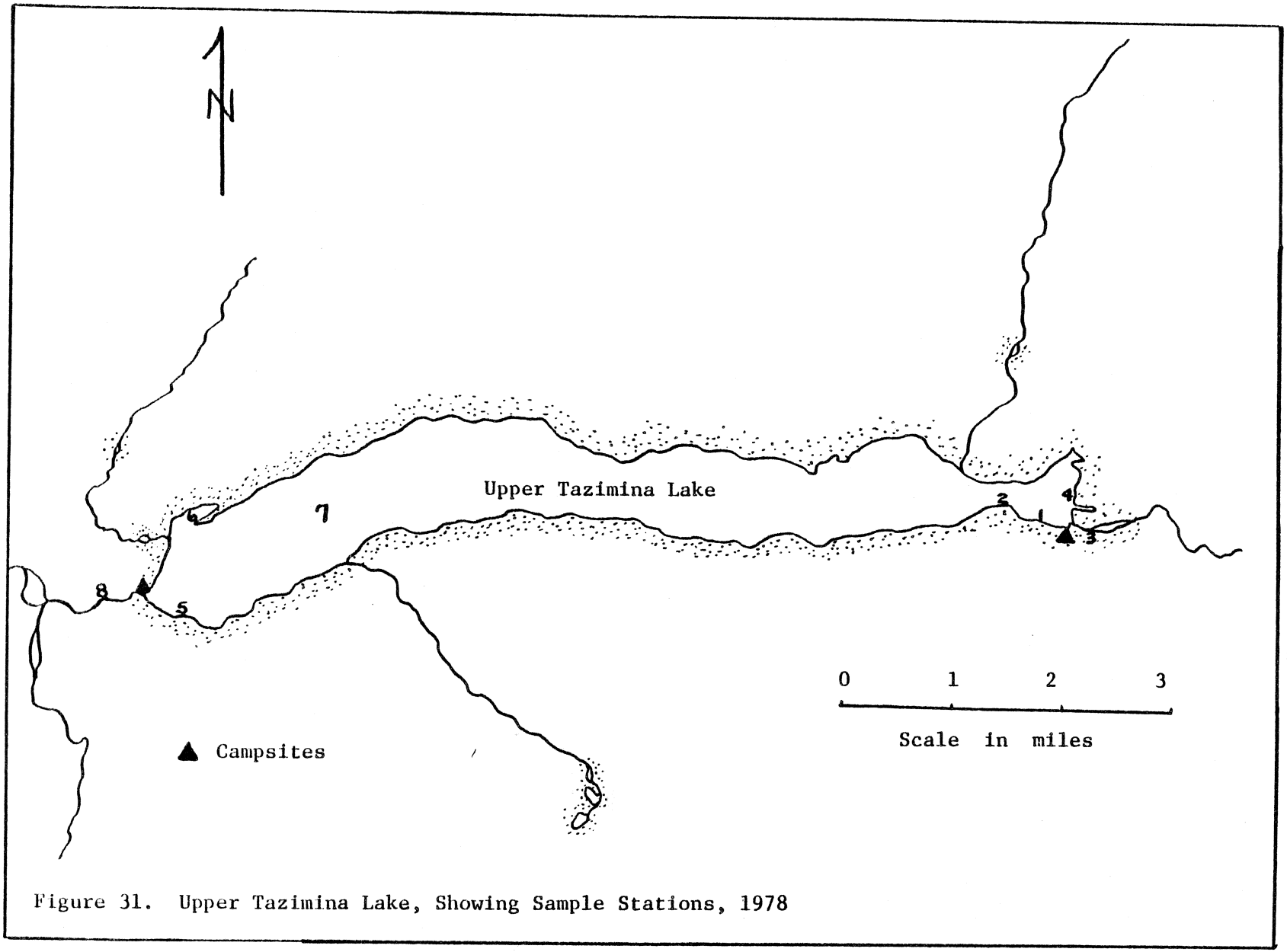

Figure 31. Upper Tazimina Lake, Showing Sample Stations, 1978

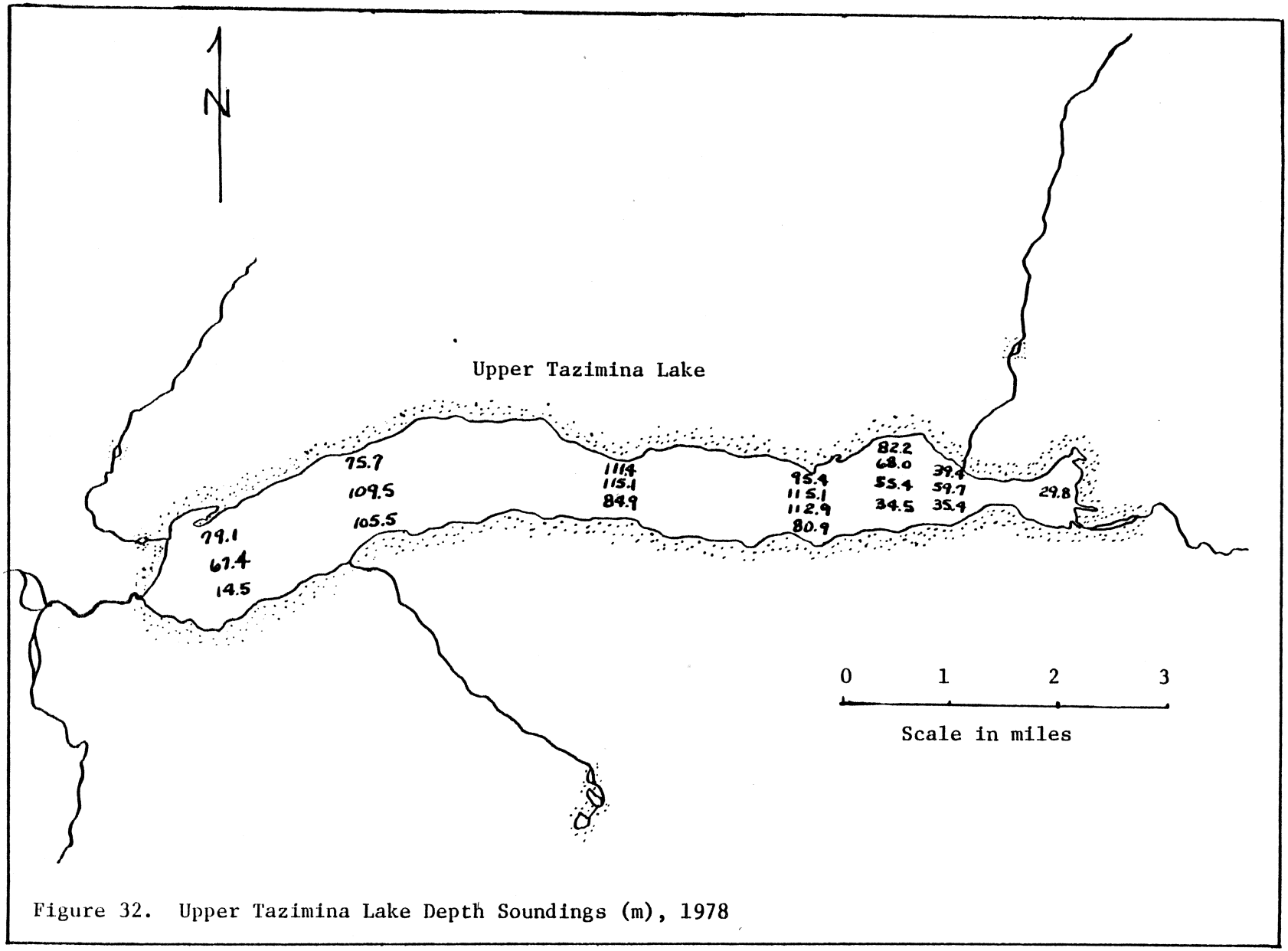

Figure 32. Upper Tazimina Lake Depth Soundings (m), 1978

Appendix B-15. Sampling Results, Lower Tazimina Lake, September 11-14, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Sept. 12	Diving Gill Net	0-3.4	14.7 hrs.	86 Arctic char, 7 grayling
2	Sept. 12	Limnology	4.0	-	-
-	Sept. 12	Depth soundings 2/	-	-	-

1/ See Figure 33

2/ See Figure 34

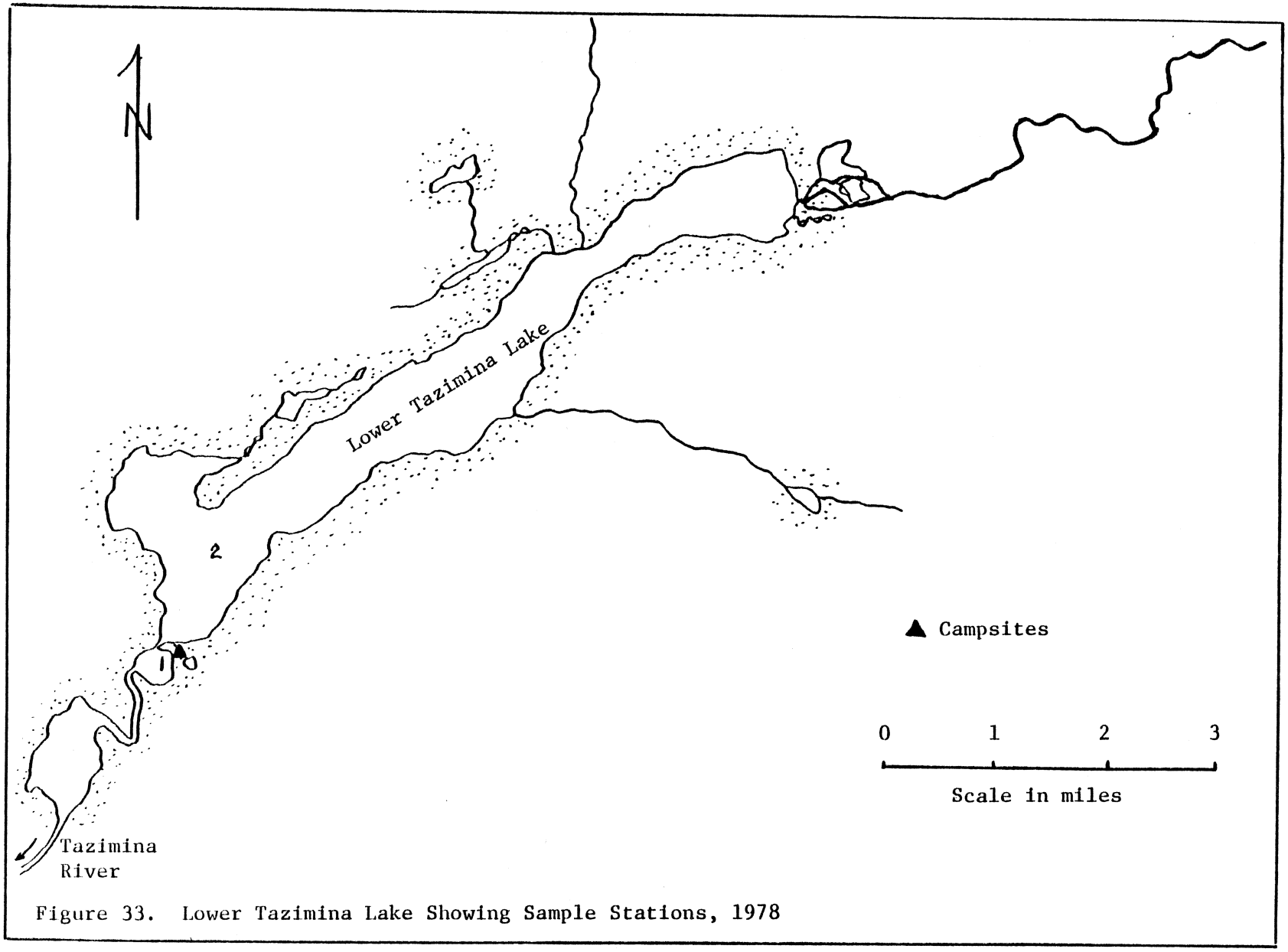

Figure 33. Lower Tazimina Lake Showing Sample Stations, 1978

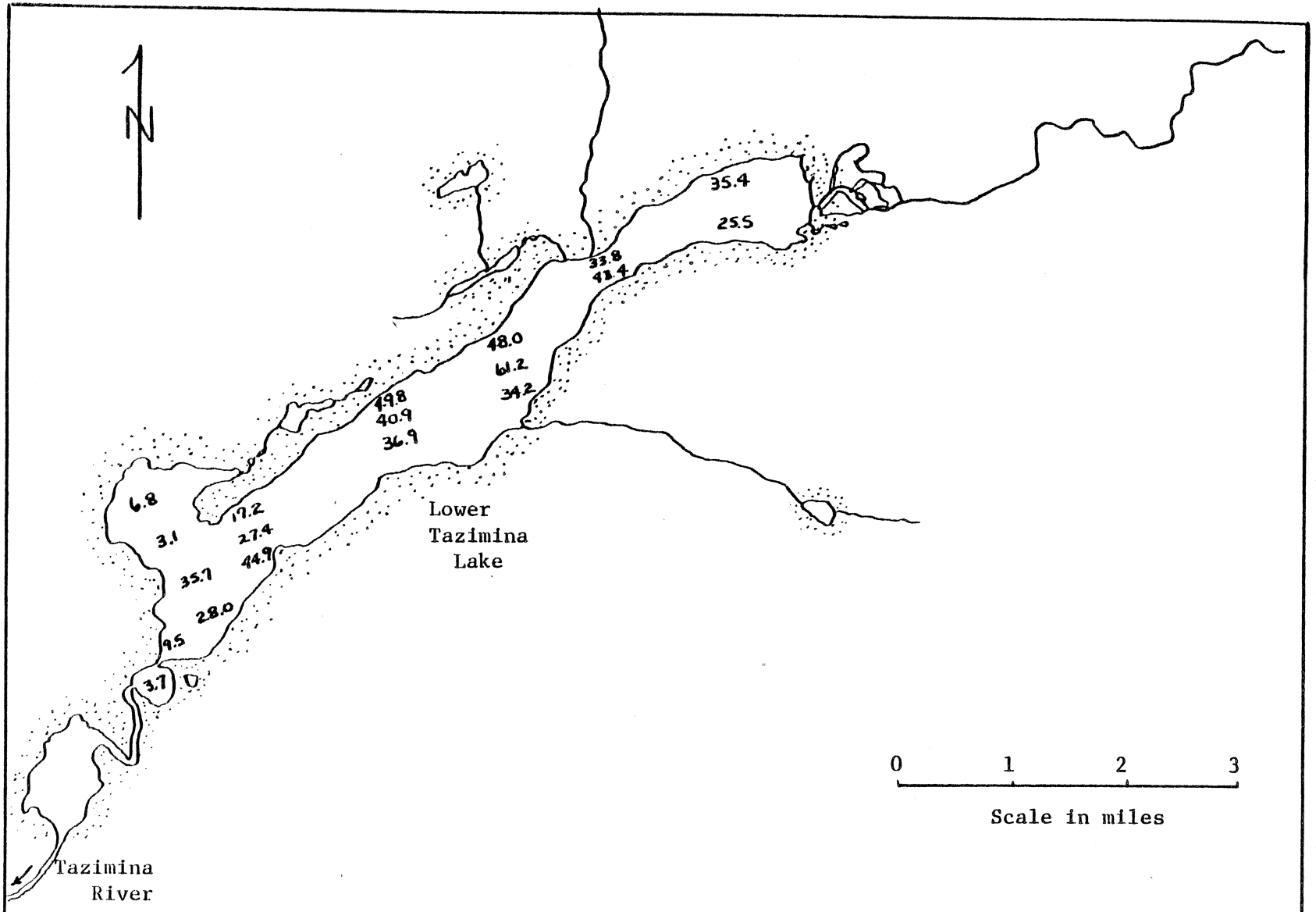

Figure 34. Lower Tazimina Lake Depth Soundings (m), 1978

Appendix B-16. Sampling Results, Tazimina River, July 16-17 and August 17-20, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 19	Electroshock	0-1.5	643 sec.	6 rainbow trout, 7 sockeye fry, 1 three-spine stickleback, several sculpins
-	July 16-17	Hook and Line	-	21 ang. hrs.	36 Arctic grayling, 12 rainbow trout
-	July 17	Visual	-	-	Observed round whitefish, longnose suckers, many adult sockeye
-	Aug. 18-20	Hook and Line	-	16 ang. hrs.	14 rainbow trout, 14 Arctic grayling

1/ See Figure 35

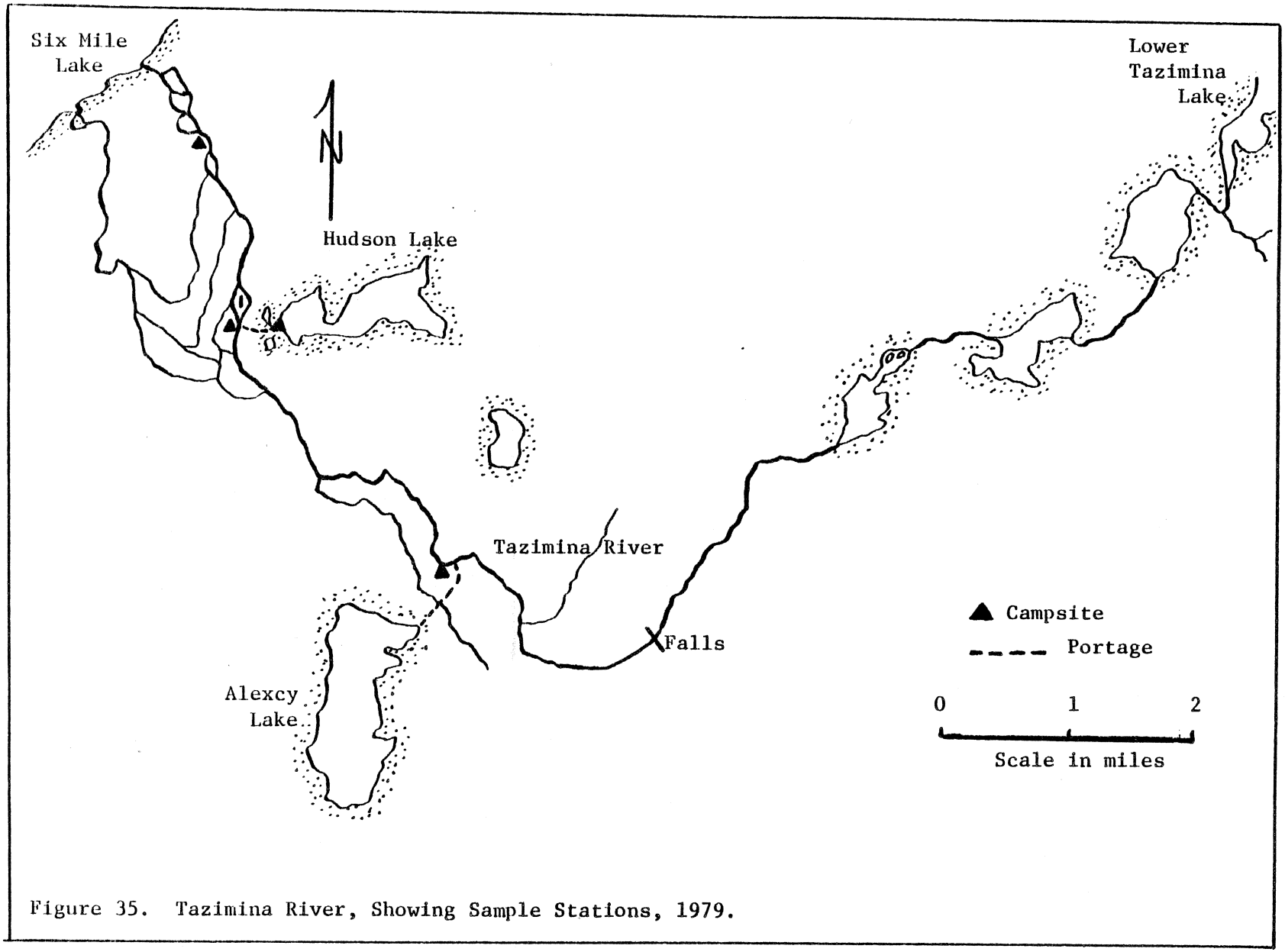

Figure 35. Tazimina River, Showing Sample Stations, 1979.

Appendix C-1. Sampling Results, Chilikadrotna River, September 17-22, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
-	Sept. 17-22	Hook and Line	-	41 ang. hrs.	35 rainbow trout, 25 Arctic grayling, 6 coho adults, 2 Dolly Varden, 1 round whitefish
Outlet of Snipe Lake Creek	Sept. 18	Electroshock	0-1.5	270 sec.	6 chinook fingerlings, 1 coho fingerling, several sculpins
3 miles below Ptarmigan Creek	Sept. 21	Minnow Trap	1.0	14.5 hrs.	3 Dolly Varden, 1 coho fingerling, 25 chinook fingerlings

Appendix C-2. Sampling Results, Fishtrap Lake, August 23-25, 1979.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 24	Diving Gill Net	0-4.3	14.5 hrs.	6 adult sockeye, 5 Arctic char, 5 lake trout, 25 round whitefish, 2 sockeye smolt
2	Aug. 24	Diving Gill Net	6.0-8.6	14.8 hrs.	16 Arctic char, 2 lake trout, 7 round whitefish, 1 Arctic grayling
3	Aug. 24	Electroshock	0-1.0	331 sec.	1 burbot, 14 Arctic char, 1 coho juvenile, several sculpins
4	Aug. 25	Set Line (37 hooks)	0-19.4	500 hook hrs.	1 lake trout
5	Aug. 24	Visual	-	-	Observed 4,500-5,000 sockeye spawning at east end of lake near small inlet creek
6	Aug. 23	Limnology	4.0	-	-
-	Aug. 23	Depth soundings 2/	-	-	-

1/ See Figure 36

2/ See Figure 37

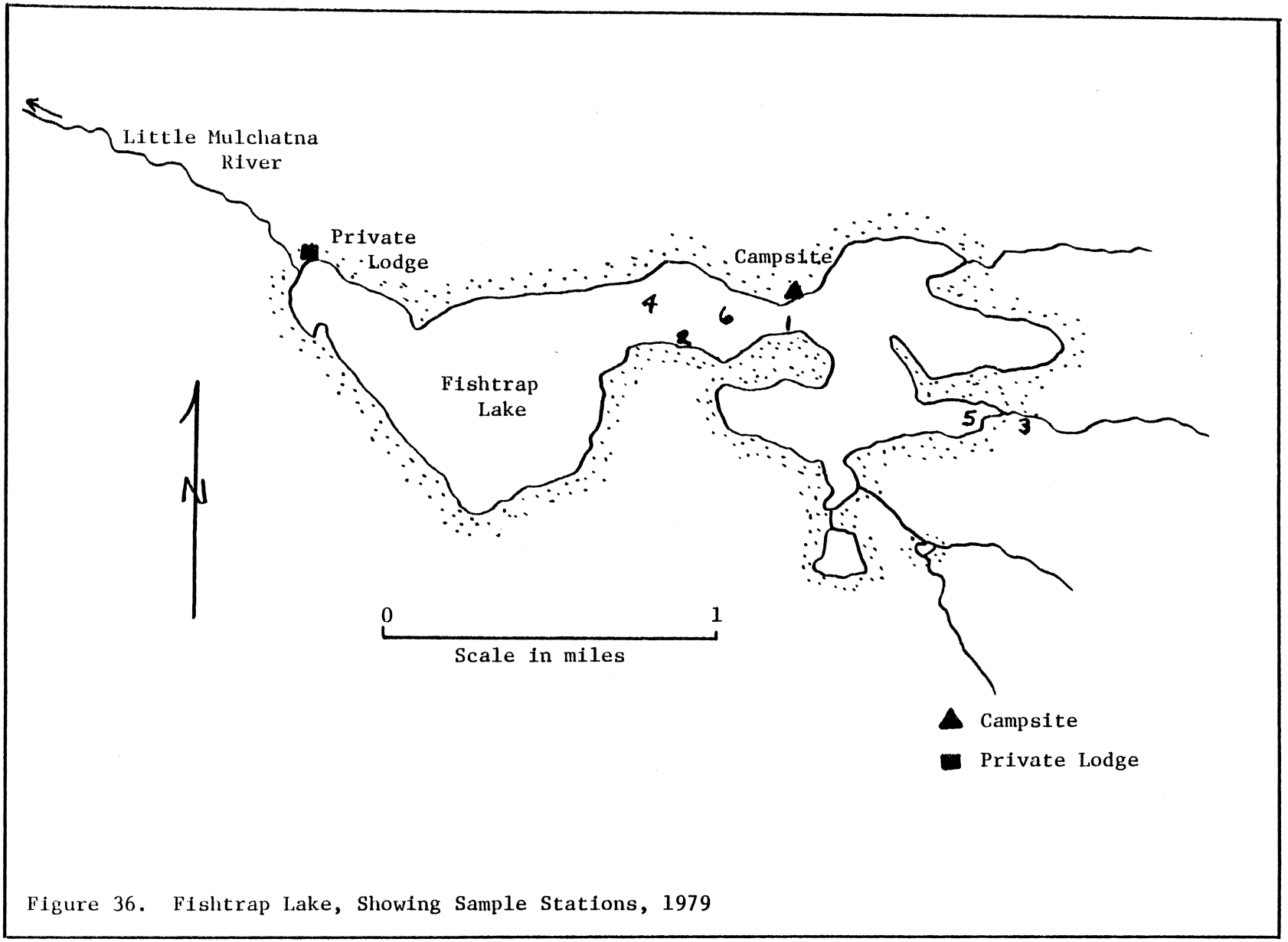

Figure 36. Fishtrap Lake, Showing Sample Stations, 1979

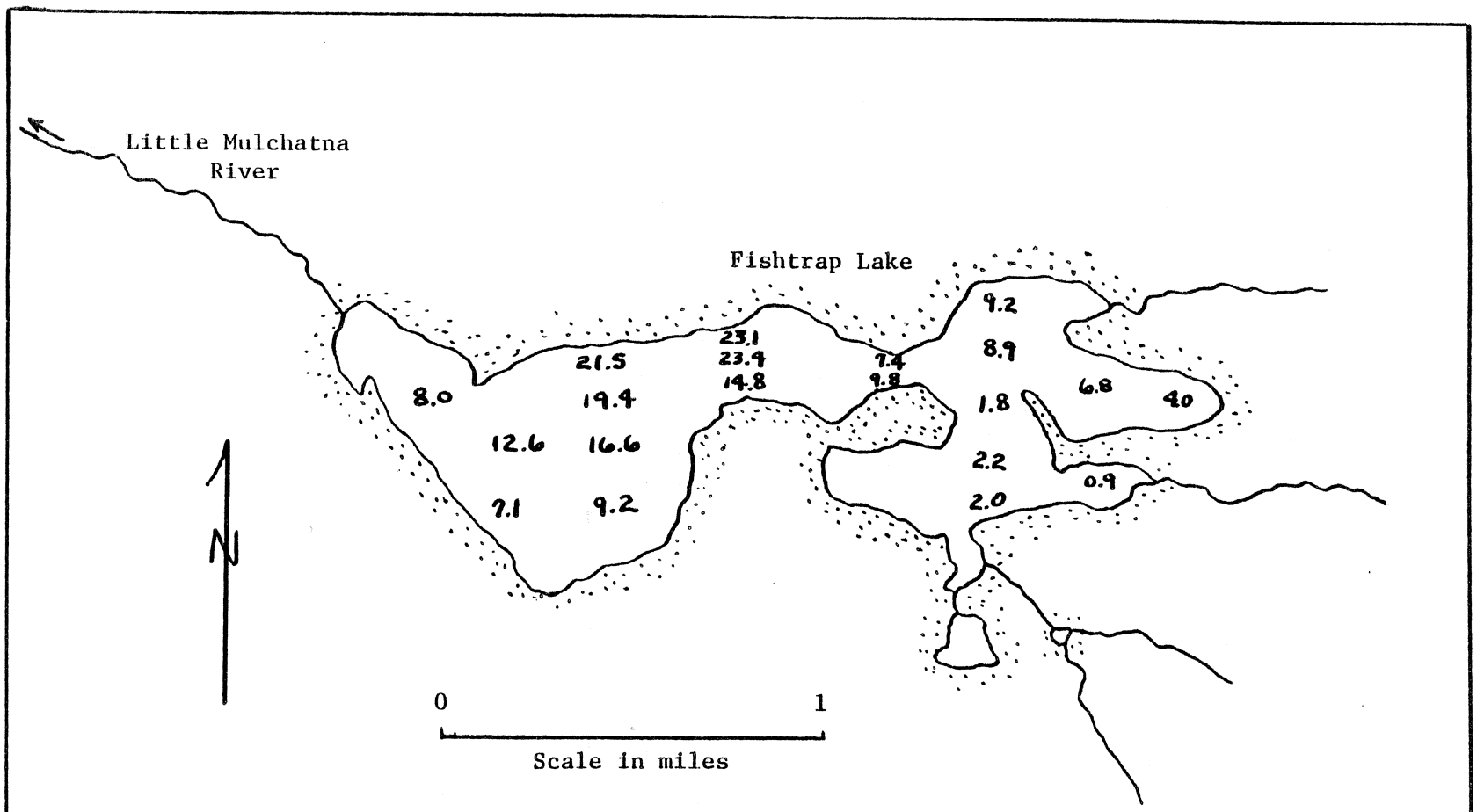

Figure 37. Fishtrap Lake Depth Soundings (m), 1979

Appendix C-3. Sampling Results, Loon Lake, August 13-15, 1978

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 13	Floating Gill Net	0-2.1	17.0 hrs.	17 pike, 1 adult sockeye
2	Aug. 14	Floating Gill Net	0-1.8	18.5 hrs.	10 pike

1/ See Figure 38

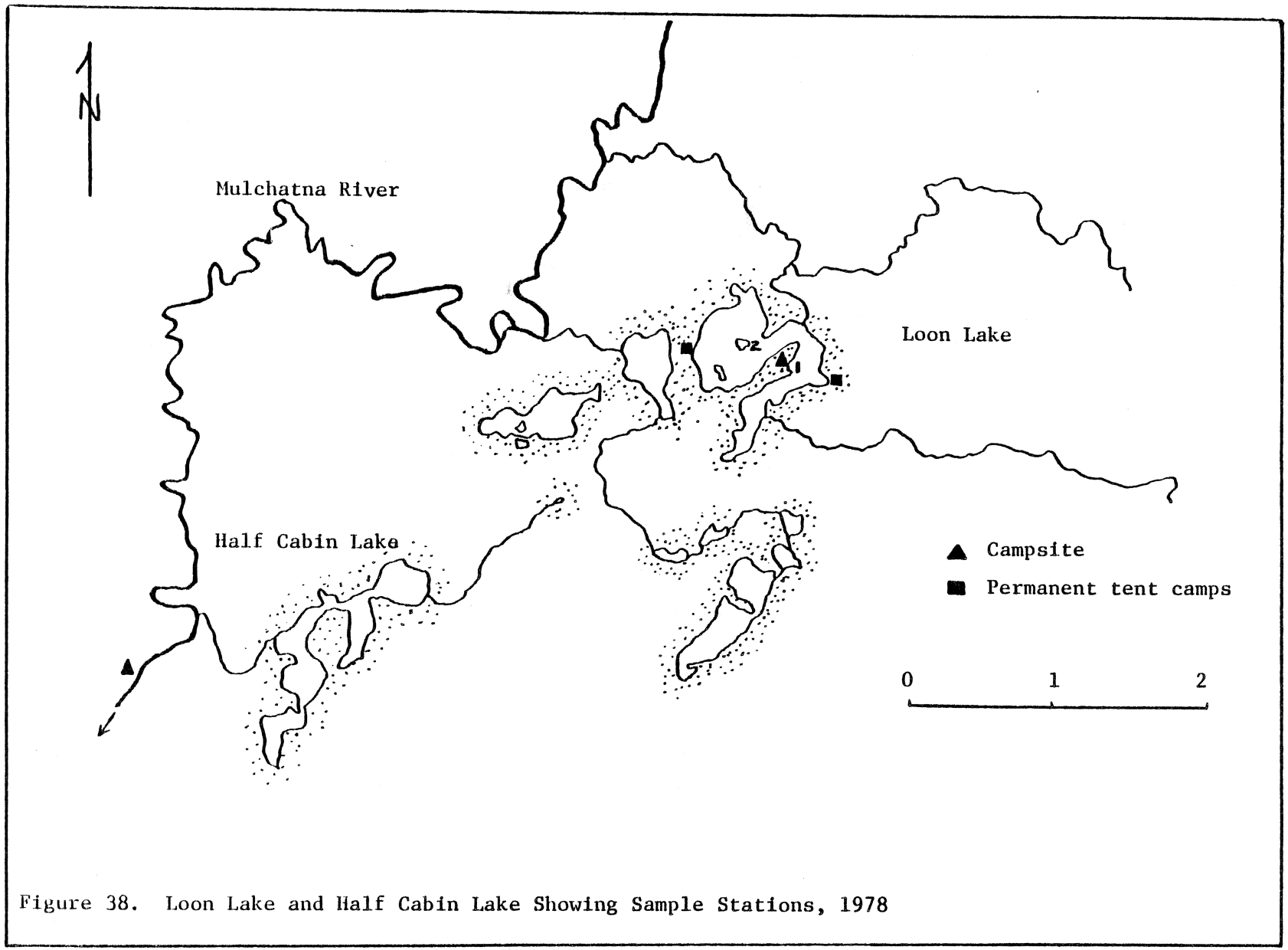

Figure 38. Loon Lake and Half Cabin Lake Showing Sample Stations, 1978

Appendix C-4. Sampling Results, Mulchatna River, 1978-1979.

Sample Station	Date	Gear Type	Depth Sampled(m)	Duration	Catch
First mile below Turquoise Lake	Aug. 10	Hook and Line	-	1.5 ang. hrs.	None
1.5 miles below Turquoise Lake	Aug. 10	Electroshock	0-1.0	282 sec.	6 Dolly Varden, 10 sculpins. Observed 1 burbot
Summit Creek Outlet	Aug. 11	Electroshock	0-1.5	369 sec.	10 Dolly Varden, 3 burbot, several sculpins
4 miles below Summit Creek	Aug. 12	Electroshock	0-1.5	215 sec.	8 chinook fingerlings, 2 Dolly Varden, 1 burbot, several sculpins
10 miles below Summit Creek	Aug. 12	Electroshock	0-1.0	174 sec.	12 coho fry, 2 Dolly Varden, several sculpins
-	Aug. 12	Hook and Line	-	2 ang. hrs.	4 Arctic grayling
-	Aug. 13	Hook and Line	-	5 ang. hrs.	2 Arctic grayling
7 miles below Chilikadrotna River	Sept.22	Hook and Line	-	1 ang. hr.	5 rainbow trout, 5 Arctic grayling, 1 coho adult
-	Sept.9-15	Hook and Line	-	43 ang. hrs.	43 rainbow trout, 44 Arctic grayling, 4 coho adults

Appendix C-5. Sampling Results, Snipe Lake, July 18-20, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 18	Diving Gill Net	0-2.2	20.0 hrs.	4 lake trout, 3 Arctic char, 13 grayling, 9 round whitefish
2	July 18	Floating Gill Net 2/	0-1.5	19.0 hrs.	None
3	July 19	Floating Gill Net	0-2.0	5.8 hrs.	None
4	July 19	Diving Gill Net	0-3.7	16.7 hrs.	2 lake trout, 11 round whitefish, 47 grayling
5	July 18	Electroshock	0-1.0	398 sec.	Juvenile cohos (measured 20), grayling fry and juveniles (measured 5), 4 Dolly Varden, 3 juvenile chinook, 2 burbot, several sculpins
6	July 19	Electroshock	0-1.0	95 sec.	None
7	July 19	Limnology	4.0	-	-
-	July 19	Depth soundings 3/	-	-	-

1/ See Figure 39

2/ Four inch mesh

3/ See Figure 40

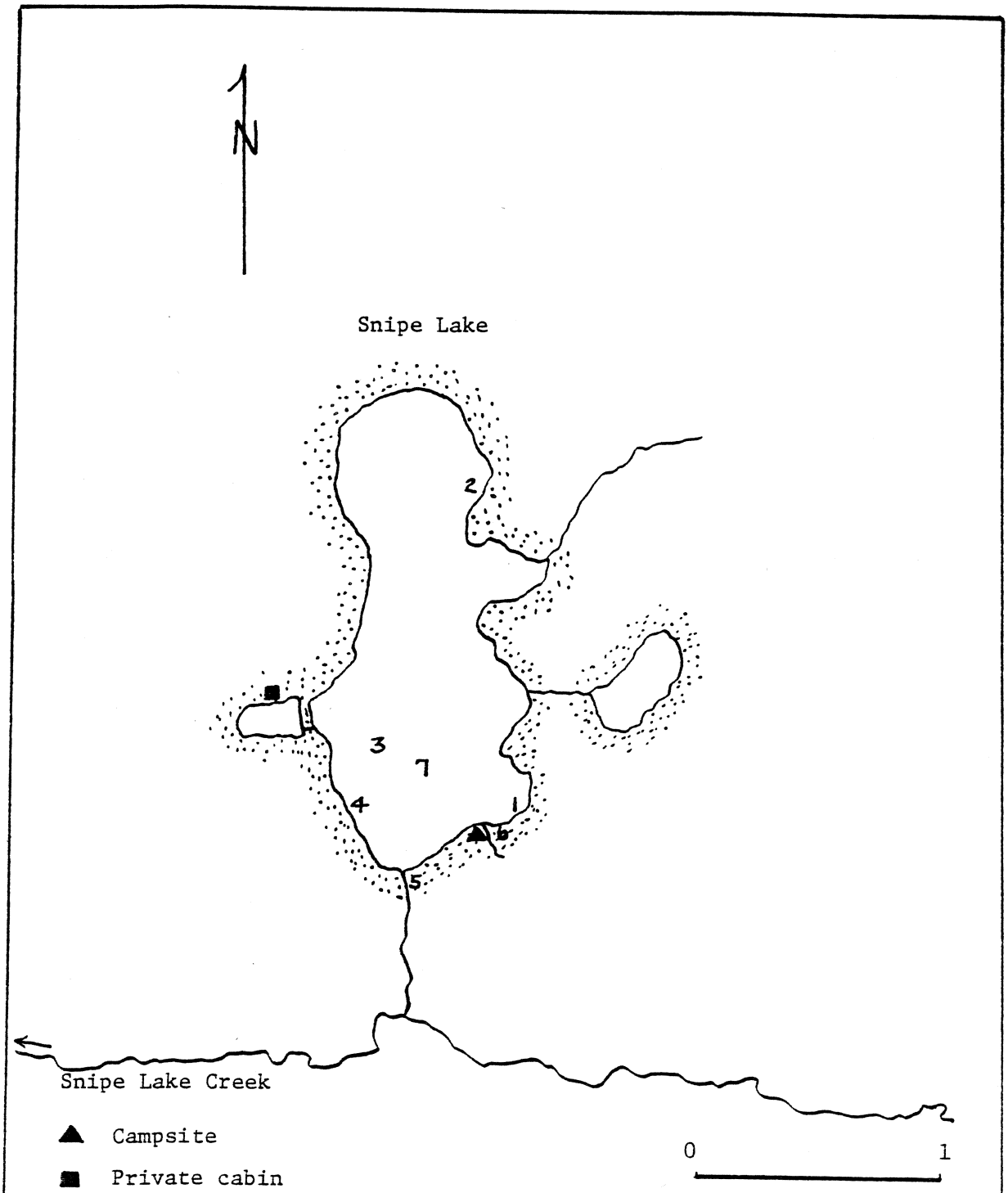

Figure 39. Snipe Lake, Showing Sample Stations, 1978.

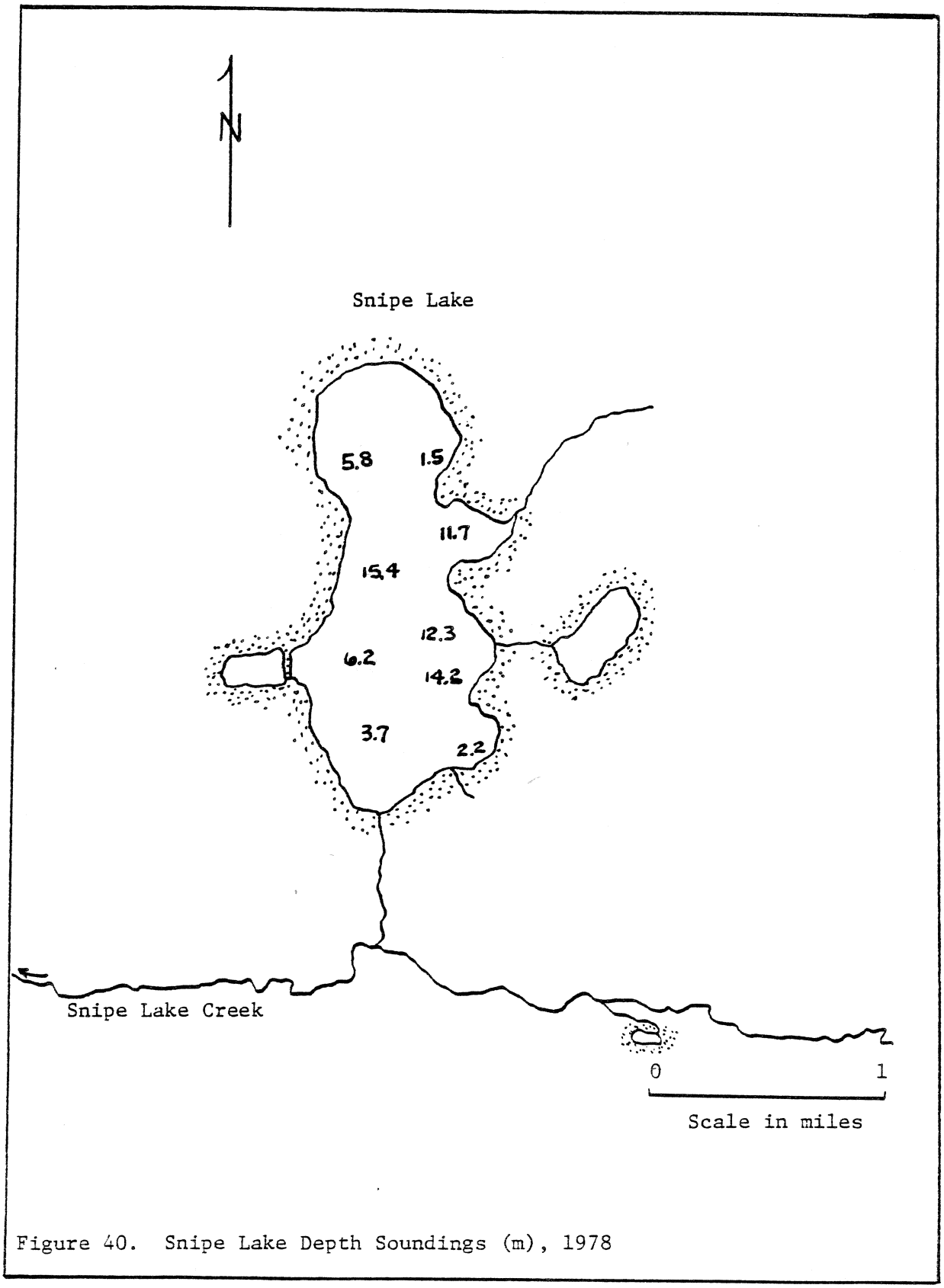

Figure 40. Snipe Lake Depth Soundings (m), 1978

Appendix C-6. Sampling Results, Turquoise Lake, August 6-9, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 6	Diving Gill Net	0-16.6	20.0 hrs.	1 lake trout, 1 burbot
2	Aug. 6	Floating Gill Net	0- 8.9	20.0 hrs.	12 lake trout, 7 grayling, 1 round whitefish
3	Aug. 6	Electroshock	0- 1.0	Approx. 1000 sec.	2 juvenile Dolly Varden, 4 lake trout fingerlings, 10 sculpins
4	Aug. 6	Limnology	4.0	-	-
5	Aug. 7	Floating Gill Net	0- 3.1	20.0 hrs.	12 lake trout, 1 grayling, 1 burbot
6	Aug. 7	Diving Gill Net	0-12.9	20.3 hrs.	5 lake trout, 2 burbot
7	Aug. 8	Floating Gill Net	0- 1.8	17.5 hrs.	6 lake trout, 6 round whitefish, 1 grayling
8	Aug. 8	Diving Gill Net	0- 1.8	18.3 hrs.	4 lake trout, 4 round whitefish, 1 grayling, 1 burbot
9	Aug. 9	Electroshock	0- 1.0	462 sec.	1 juvenile Dolly Varden, 1 juvenile lake trout, 11 sculpins
10	Aug. 9	Electroshock	0- 1.0	69 sec.	Several sculpins
-	Aug.6-8	Depth soundings 2/	-	-	-

1/ See Figure 41

2/ See Figure 42

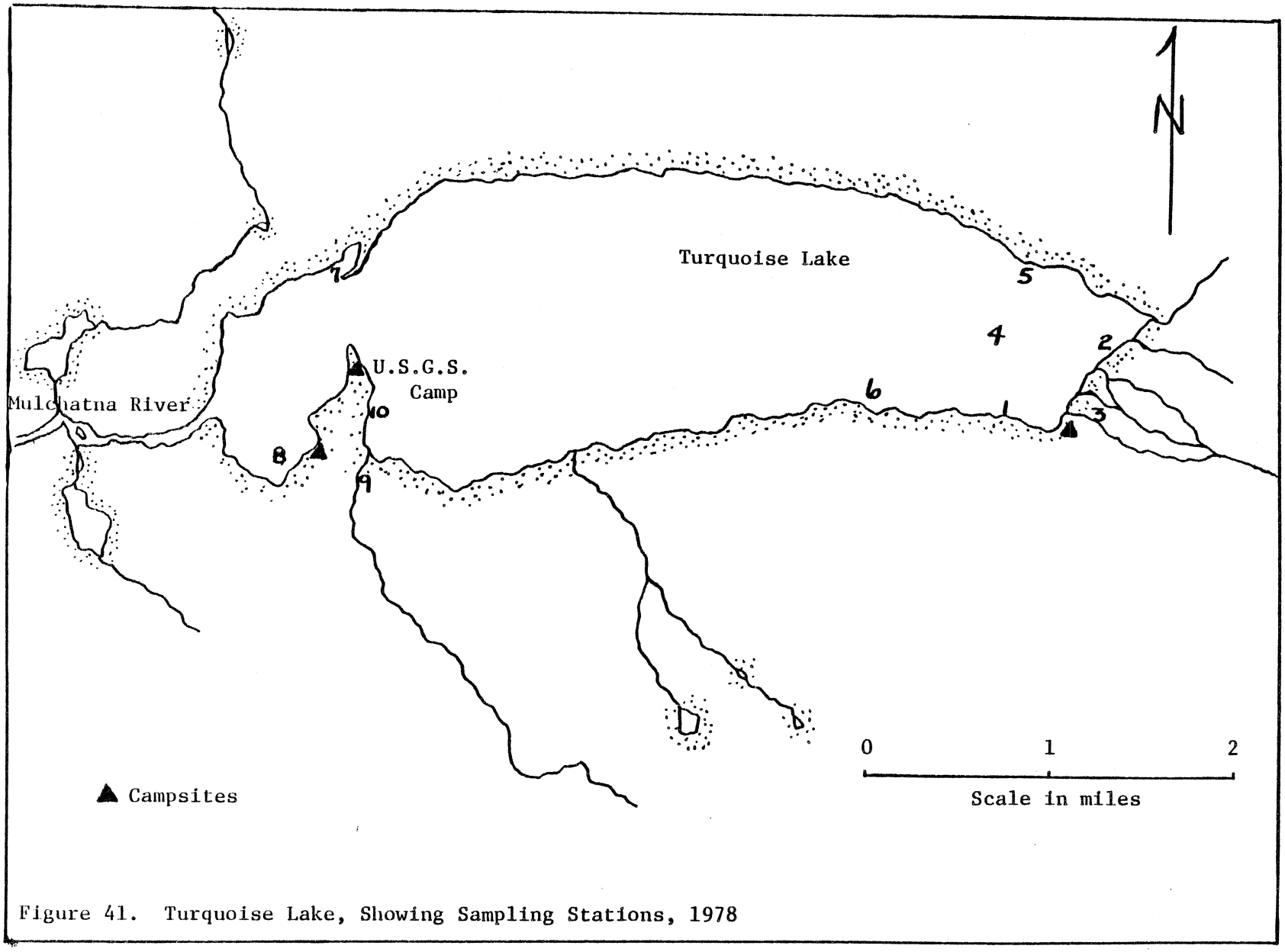

Figure 41. Turquoise Lake, Showing Sampling Stations, 1978

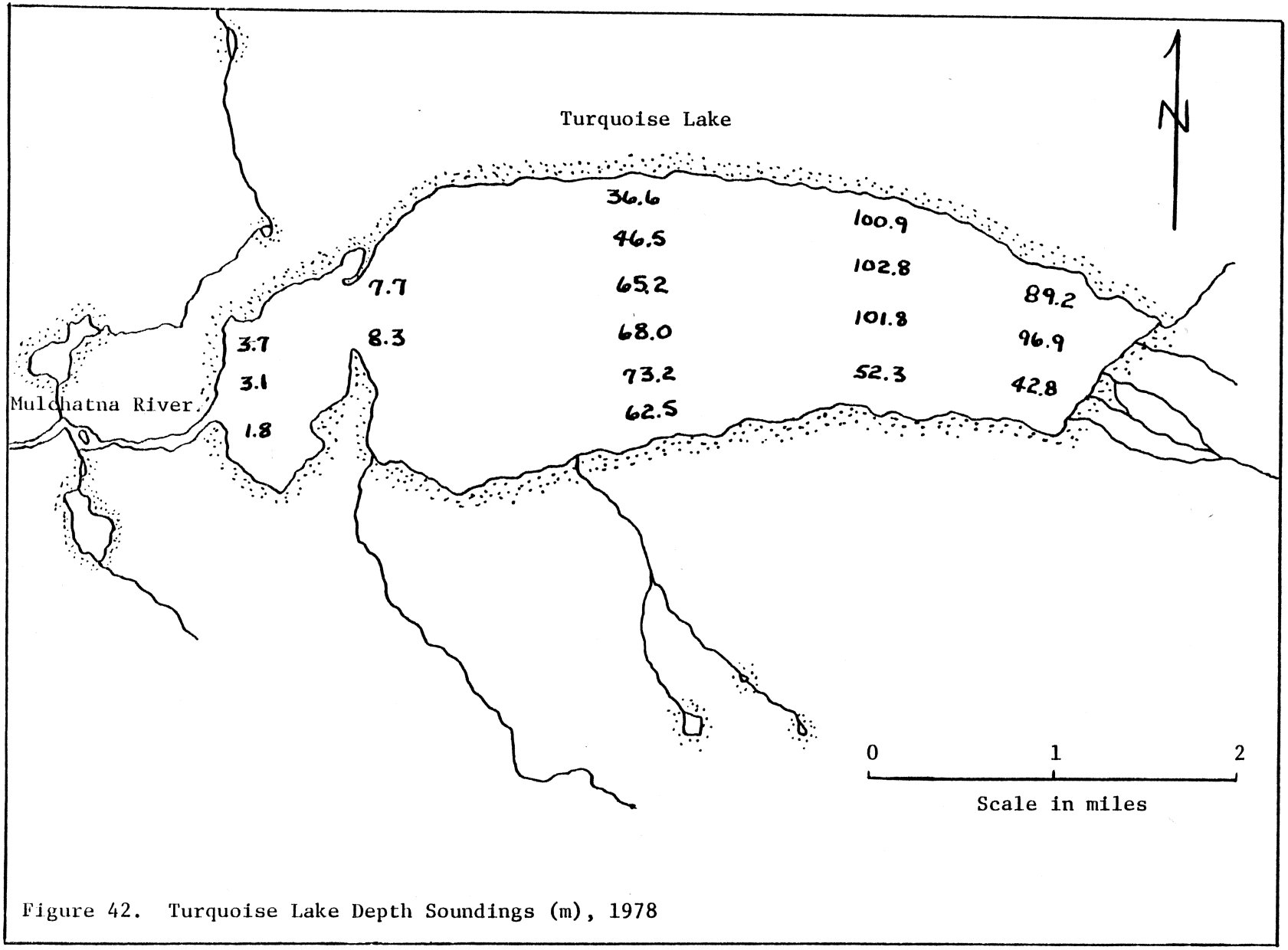

Figure 42. Turquoise Lake Depth Soundings (m), 1978

Appendix C-7. Sampling Results, Upper Twin Lake, July 30 - August 1, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 30	Diving Gill Net	0-17.2	12.3 hrs.	2 lake trout, 1 Arctic char, 1 round whitefish.
2	July 30	Floating Gill Net	0-2.2	12.6 hrs.	11 lake trout, 5 adult sockeye, 2 round whitefish, 2 burbot
3	July 31	Electroshock	0-1.0	508 sec.	1 Arctic char, 4 Dolly Varden, 10 sculpins
4	July 31	Diving Gill Net	0-11.7	16.9 hrs.	4 lake trout, 2 Arctic char
5	Aug. 1	Dip Net	Surface	-	7 fingerling Dolly Varden, 4 sockeye fry
6	July 31	Limnology	4.0	-	-
-	July 31	Depth soundings 2/	-	-	-

1/ See Figure 43

2/ See Figure 44

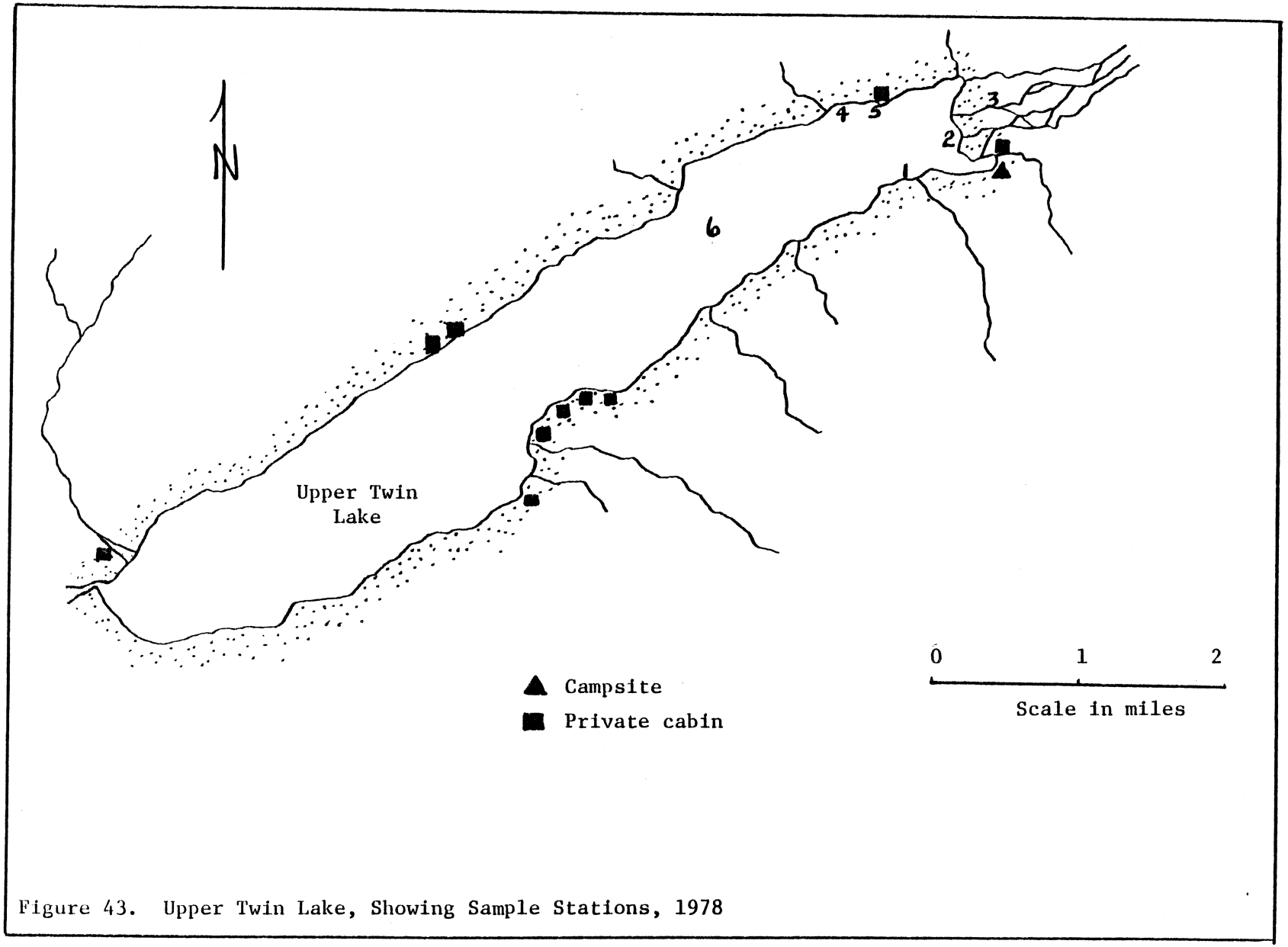

Figure 43. Upper Twin Lake, Showing Sample Stations, 1978

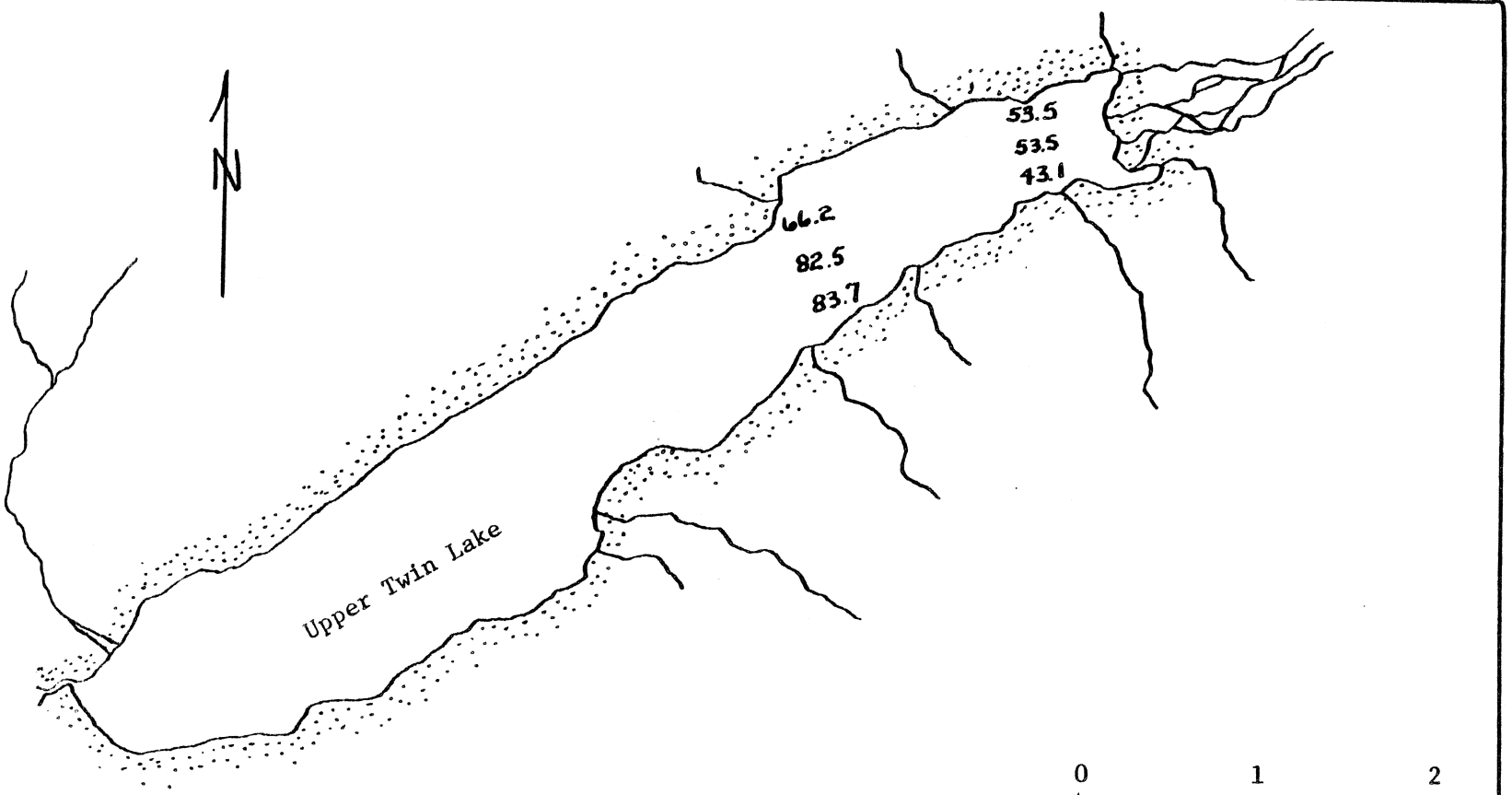

Figure 44. Upper Twin Lake Depth Soundings (m), 1978

Appendix C-8. Sampling Results, Lower Twin Lake, August 1-3, 1978.

Sampe Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	Aug. 1	Floating Gill Net	0-3.7	15.2 hrs.	19 lake trout, 26 Arctic char, 6 Arctic grayling, 3 round whitefish
2	Aug. 1	Diving Gill Net	0-11.7	15.6 hrs.	7 lake trout, 5 Arctic char, 1 Arctic grayling, 1 burbot, 1 round whitefish, 1 longnose sucker
3	Aug. 1	Hook and Line	0-100	1.3 ang. hrs.	15 lake trout
4	Aug. 1	Hook and Line	0-2.0	0.7 ang. hrs.	None
5	Aug. 2	Electroshock	0-1.0	128 sec.	6 Dolly Varden
6	Aug. 2	Limnology	4.0	-	-
7	Aug. 2	Hook and Line	0-4.0	0.1 ang. hr.	1 Arctic grayling
8	Aug. 3	Set Line (4 hooks)	4.0	46 hook hrs.	1 burbot, 1 lake trout
9	Aug. 3	Set Line (4 hooks)	3.0	46 hooks hrs.	3 lake trout
-	Aug. 2	Depth soundings 2/	-	-	-

1/ See Figure 45

2/ See Figure 46

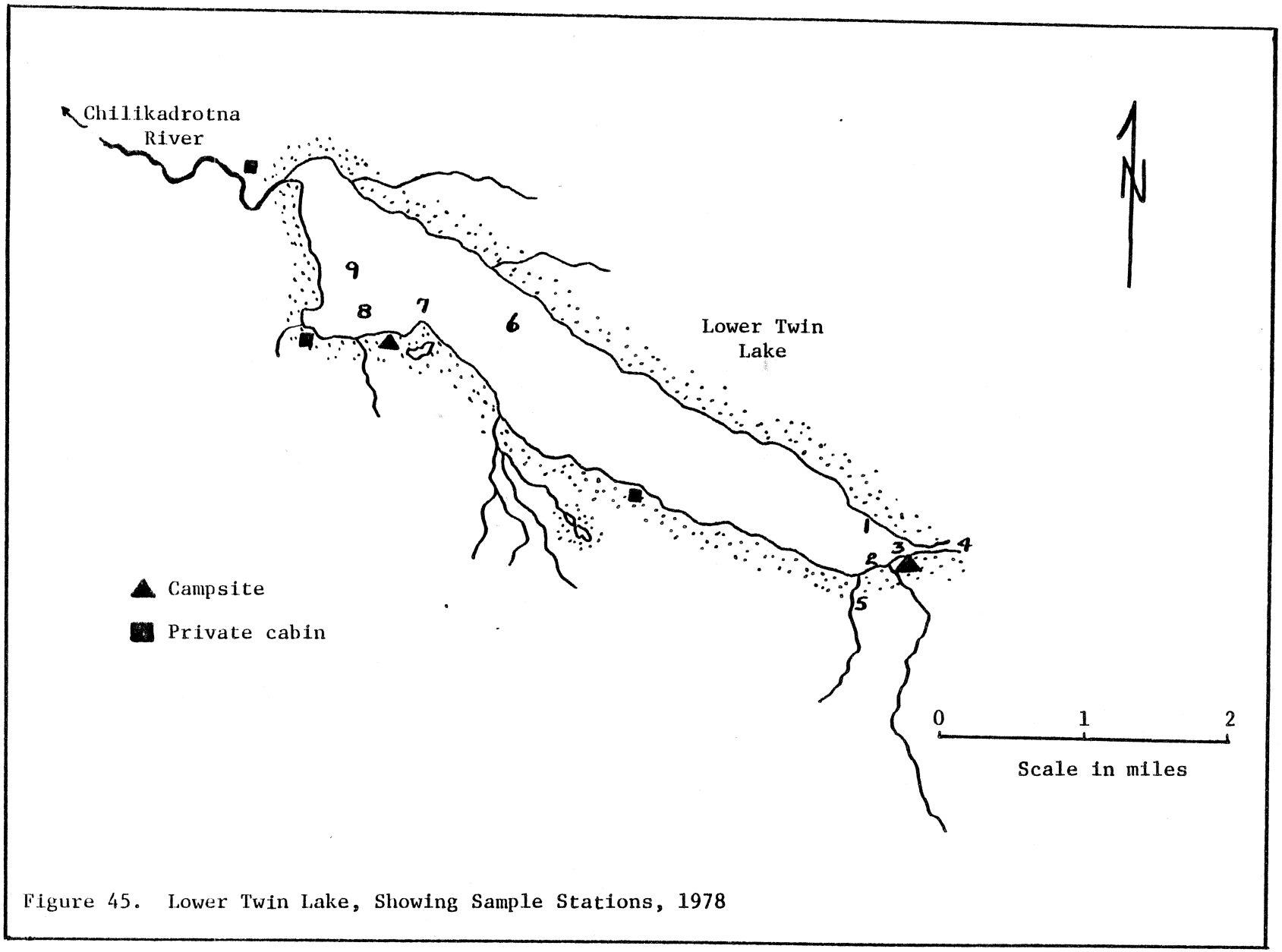

Figure 45. Lower Twin Lake, Showing Sample Stations, 1978

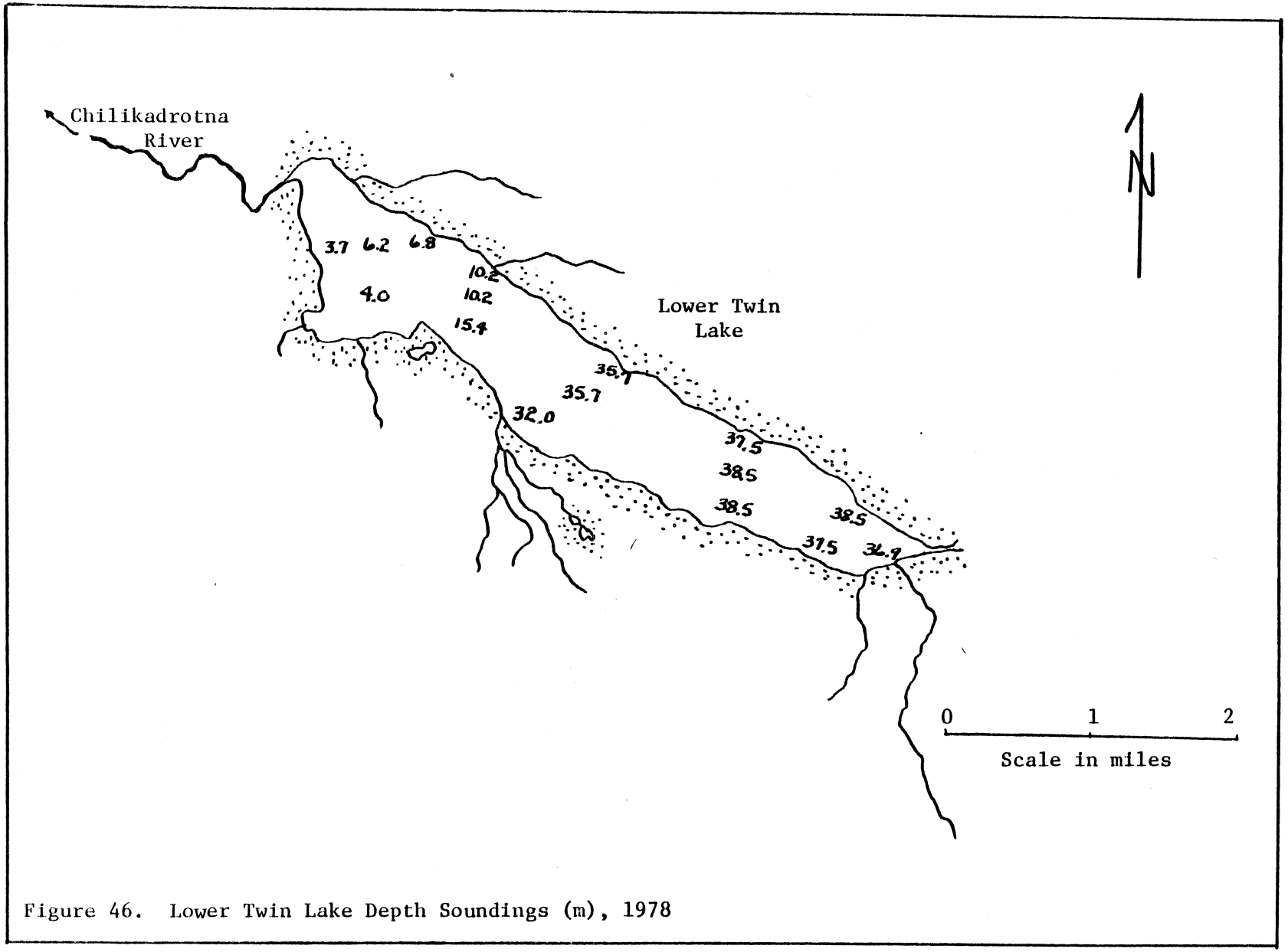

Figure 46. Lower Twin Lake Depth Soundings (m), 1978

Appendix D-1. Sampling Results, Telaquana Lake, July 10-16, 1978.

Sample Station 1/	Date	Gear Type	Depth Sampled(m)	Duration	Catch
1	July 10	Diving Gill Net	0-11.7	13.8 hrs.	7 lake trout, 3 round whitefish, 7 longnose suckers
2	July 10	Floating Gill Net	0- 1.8	11.7 hrs.	11 lake trout, 5 longnose suckers
3	July 11	Electroshock	0- 1.0	992 sec.	4 Dolly Varden, many sockeye fry (measured 15), many sculpins (measured 8), a few ninespine stickleback
4	July 12	Floating Gill Net	0- 2.2	19.8 hrs.	14 pike, 1 chum salmon adult, 6 longnose suckers
5	July 12	Diving Gill Net	0.14.2	20.0 hrs.	2 lake trout, 2 least ciscos
6	July 13	Hook and Line	0- 3.0	1.5 hrs.	None. Grayling were observed
7	July 13	Floating Gill Net	0- 2.2	12.7 hrs.	2 pike, 3 adult sockeye, 3 least ciscos, 3 round whitefish, 5 longnose suckers
8	July 14	Diving Gill Net	0- 2.8	5.3 hrs.	4 longnose suckers, 1 round whitefish
9	July 14	Electroshock	0- 1.0	545 sec.	3 juvenile pike, 4 sculpins, several ninespine stickleback (measured 11)
10	July 13	Limnology	4.0	-	-
-	July 12	Depth sounding 2/	-	-	-

1/ See Figure 47

2/ See Figure 48

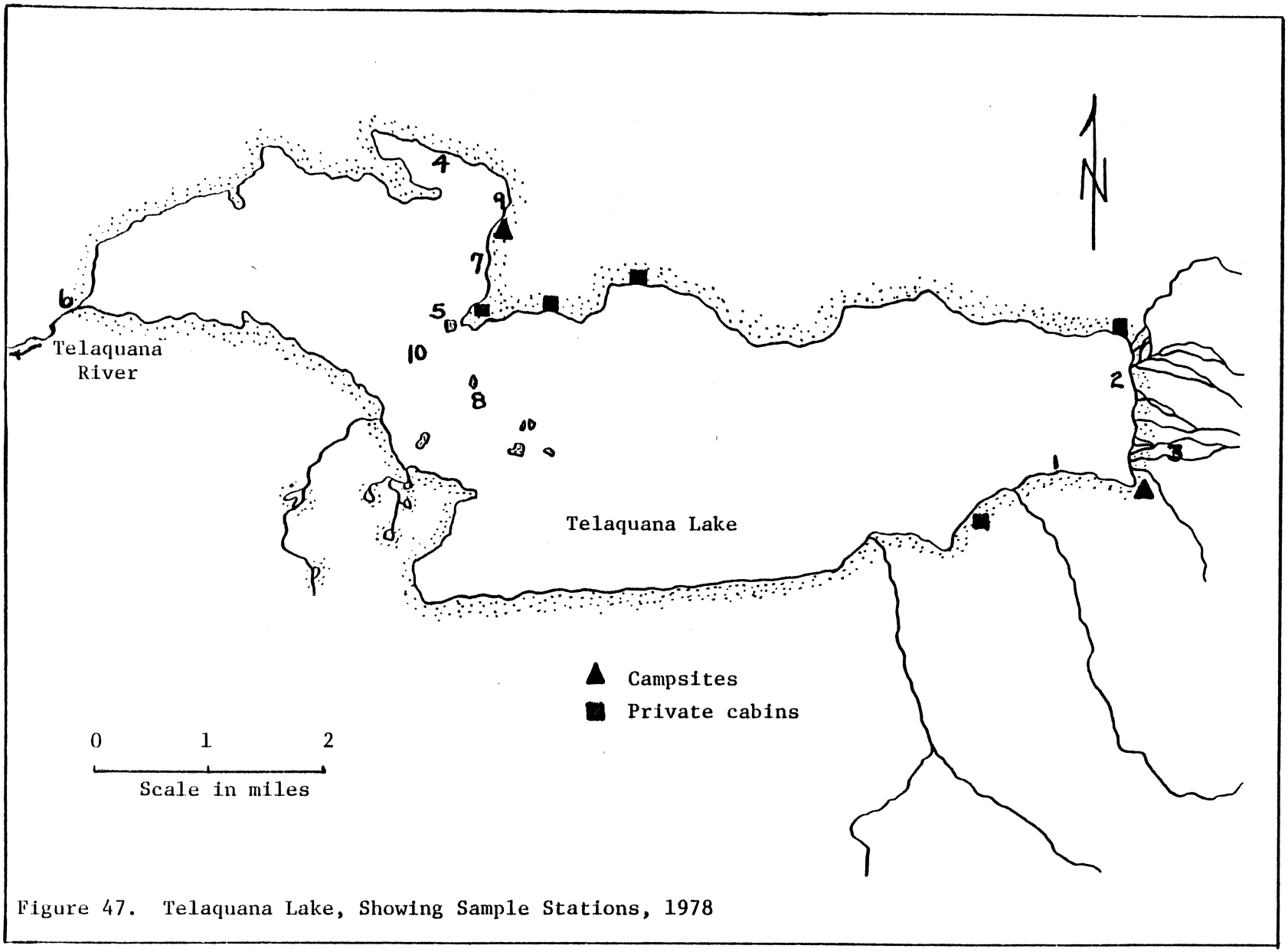

Figure 47. Telaquana Lake, Showing Sample Stations, 1978

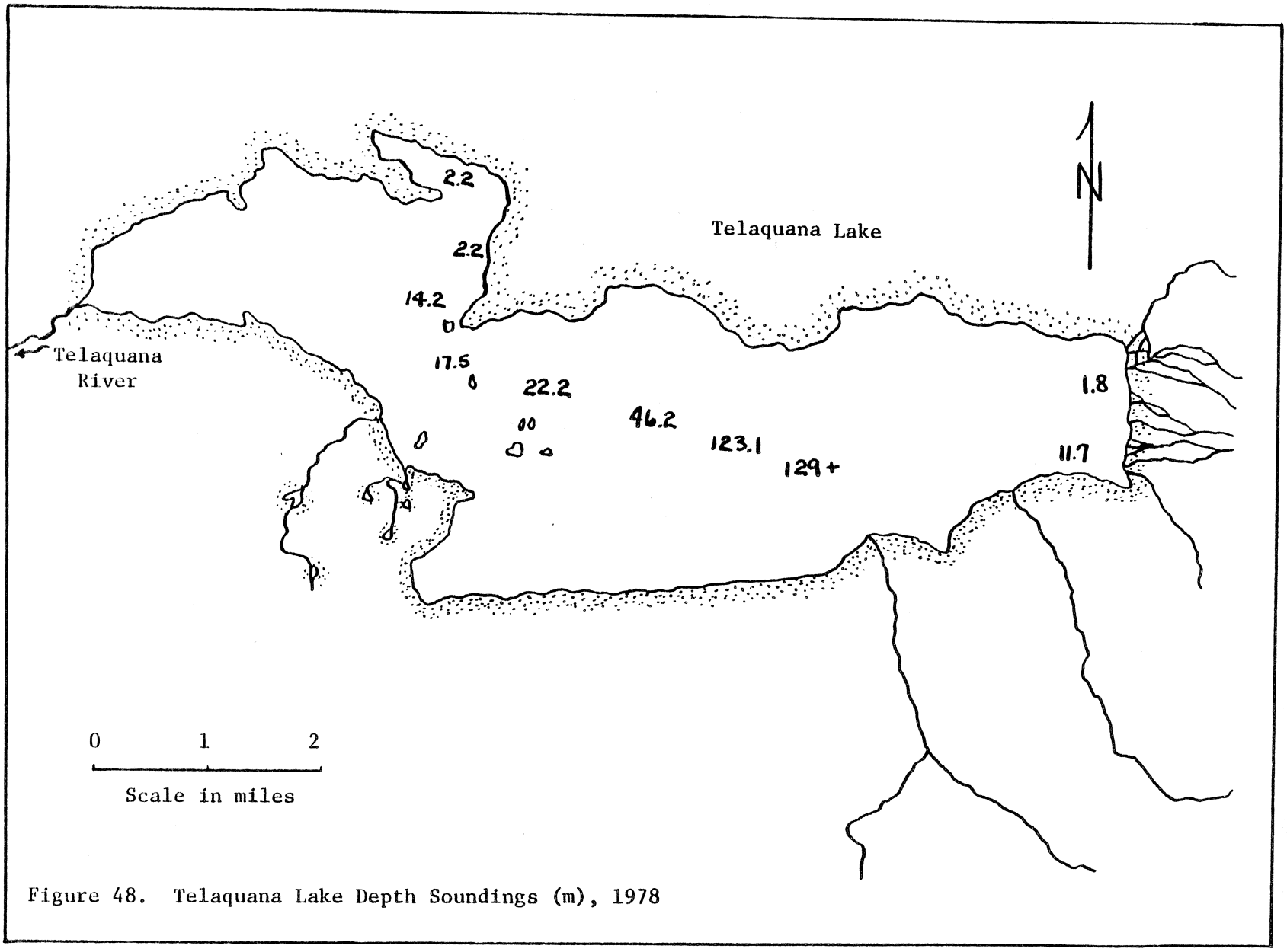

Figure 48. Telaquana Lake Depth Soundings (m), 1978

Appendix D-2. Sampling Results, Two Lakes, July 3-6, 1978.

Sample Station 1/	Date	Gear Type	Sampled(m)	Duration	Catch
1	July 3	Floating Gill Net	0-1.8	19.5 hrs.	1 lake trout, 3 round whitefish, 1 pike
2	July 3	Diving Gill Net	0-1.8	19.8 hrs.	2 round whitefish
3	July 3	Electroshock	0-1.0	204 sec.	8 sculpins, 1 ninespine stickleback
4	July 3	Dip Net	Surface	-	9 sockeye fry
5	July 4	Floating Gill Net	0-1.8	20.2 hrs.	11 pike, 1 adult sockeye, 1 longnose sucker
6	July 4	Diving Gill Net	0-2.2	11.8 hrs.	5 pike, 2 lake trout, 1 adult sockeye, 3 longnose suckers
7	July 5	Electroshock	0-1.0	393 sec.	5 juvenile Dolly Varden, numerous sockeye fry (measured 12), sculpins
8	July 5	Limnology	4.0	-	-
9	July 5	Hook and LIne	0-3.0	1.0 hr.	None
-	July 5	Depth soundings 2/	-	-	-

1/ See Figure 49

2/ See Figure 50

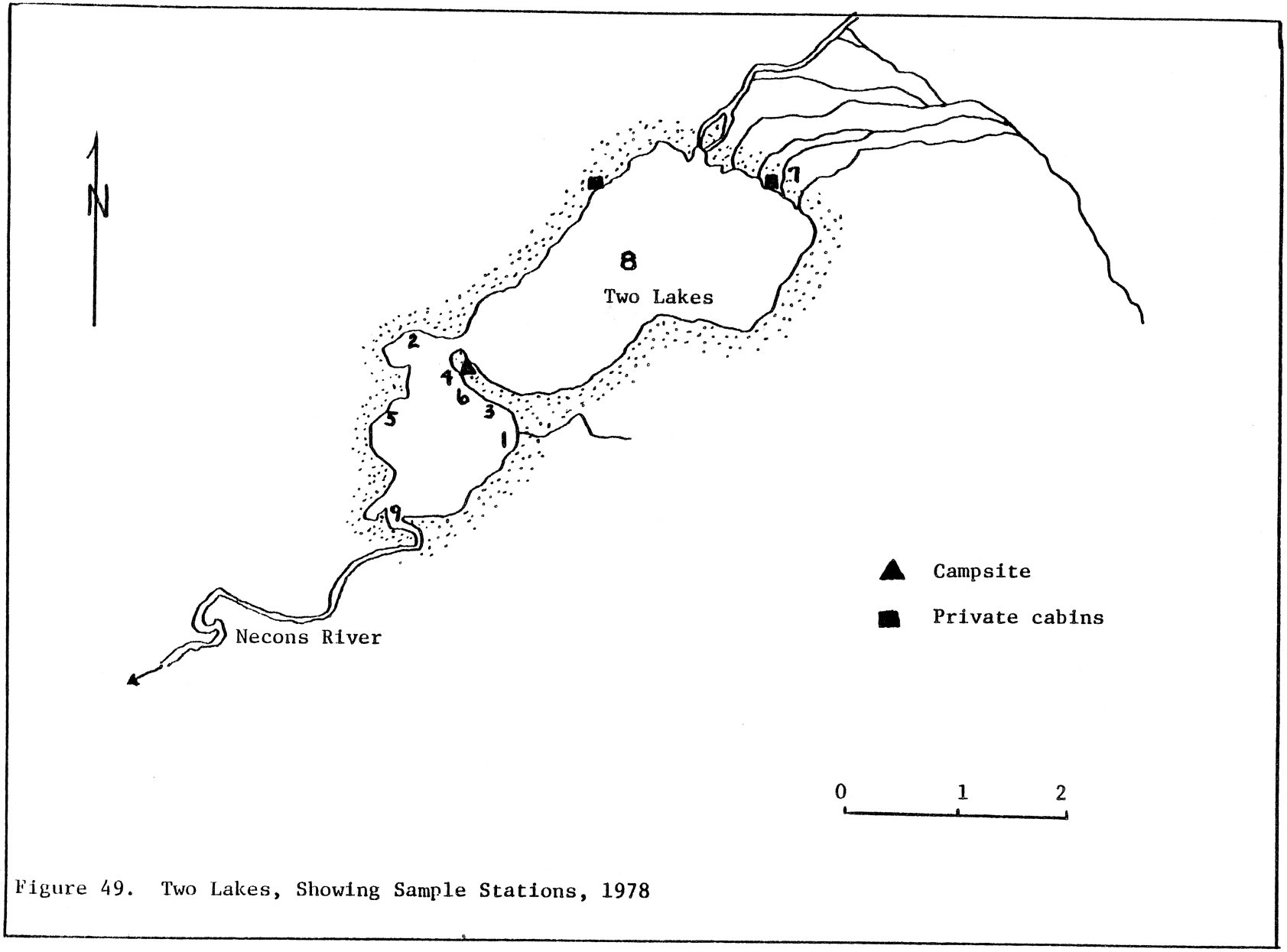

Figure 49. Two Lakes, Showing Sample Stations, 1978

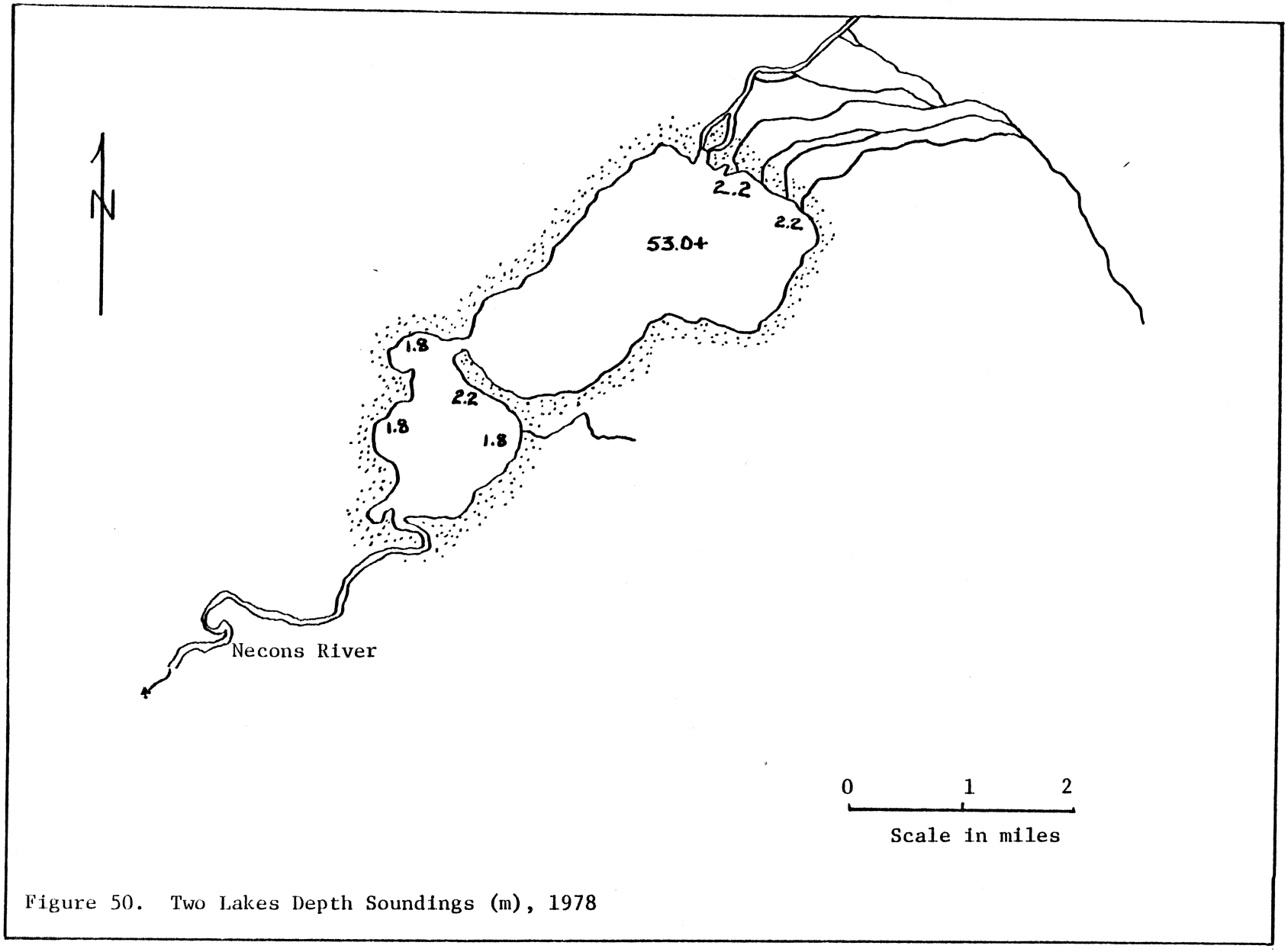

Figure 50. Two Lakes Depth Soundings (m), 1978