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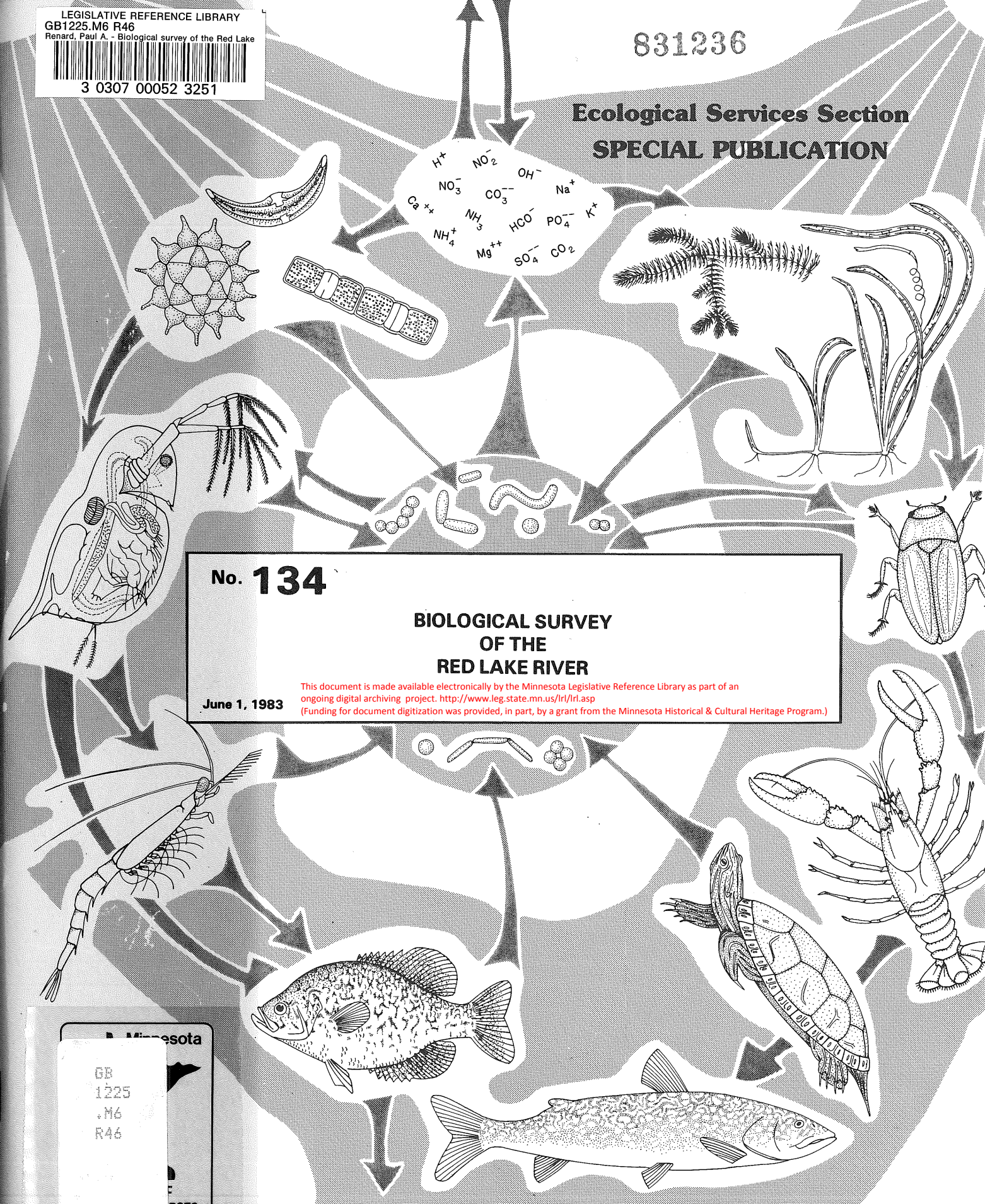

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BIOLOGICAL SURVEY OF THE RED LAKE RIVER

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Division of Fish and Wildlife

BIOLOGICAL SURVEY OF THE RED LAKE RIVER [a]

By

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ABSTRACT

A stream survey was conducted on the Red Lake River during the autumns of 1976 and 1977. Stream characteristics and various fish and wildlife habitat parameters were delineated. A total of 23.1 mi of river were electrofished in the 8 study sectors. The catch was comprised of 38 fish species representing 13 families. Game fish comprised 6% of the overall large fish catch which is somewhat below the statewide average (14%) for electrofishing samples on larger streams. Fish distribution was predictably responsive to physical stream parameters. Two related characteristics, gradient and substrate, exhibited the greatest influence; however, water clarity and depth were also important. Problems associated with the Red Lake River are intensive land use within the watershed and low flows resulting from extreme low discharge rates at the Red Lake dam and from winter hydropower peaking operations at Thief River Falls.

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INTRODUCTION

The Red Lake River was surveyed during September and October 1976 and September 1977 to document the physical and biological parameters of the stream. The study area extended from the boundary of the Red Lake Indian Reservation to the mouth of the river at East Grand Forks. The survey consisted of two phases. The initial phase was done by canoe at which time the physical and wildlife characteristics of the river were noted. This facilitated dividing the study area into eight sectors based on changing stream characteristics. The second part of the survey included electrofishing portions of each sector to determine the fish species present, their relative size and abundance and the general status of the populations. The Red Lake River maps (Plates 1-17) show the location of the 8 sectors and the 24 electrofishing runs. Other pertinent information such as topography, river mile, dams and access points is shown on these maps.

The Red Lake River is located in the northwest portion of Minnesota and flows west and south 193 mi before entering the Red River of the North at East Grand Forks. It originates from the west end of Lower Red Lake at an elevation of 1,175 ft and drops 384 ft as it meanders through Clearwater, Pennington, Red Lake and Polk Counties. From Lower Red Lake, the river flows west through the Red Lake Indian Reservation which is predominantly bog with scattered woodlands.

Much of the upper 35 mi of river from Red Lake to High Landing has been channelized. At mile 175.2, where the survey began, it enters Pennington County and continues west for 48 mi to Thief River Falls. This stretch is generally a flat agricultural area with fields and pastures often extending to the river bank.

At Thief River Falls, the Red Lake River turns south at the confluence with the Thief River. From Thief River Falls to Crookston, the river's character changes. The gradient rises sharply, resulting in many riffle and rapids areas. There is a distinct river valley with bank heights of 30 ft being common.

At Red Lake Falls, where the Clearwater River enters, the river turns westward and flows southwesterly towards Crookston. Upstream of Crookston, the river again flows westward for 30 mi to Fisher and from this point it flows northwesterly the final 30 mi to East Grand Forks. From Crookston to East Grand Forks, agriculture is the predominant riparian land use. River banks are higher and there is a decrease in stream gradient.

PHYSICAL CHARACTERISTICS

Topography and Geology

The Red Lake River watershed is part of the Red River basin and drains an area of approximately 5,990 mi^2. The Red Lake River flows through an area that was once the bottom and shoreline of glacial Lake Agassiz. This enormous lake encompassed the northwest part of Minnesota, most of the province of Manitoba and part of Saskatchewan and Ontario.

Twelve thousand years ago almost all of the area drained by the Red Lake River system was covered by glacial Lake Agassiz. The exception is the portion south of Red Lake and the land that the Clearwater River system drains. This land is made up of moraines, numerous small lakes and is well drained. On the east, west and north sides of Upper and Lower Red Lake the land is mainly poorly drained bogland. This bog extends along the banks of the Red Lake River as far as the Pennington-Clearwater line where sector 1 begins.

From the beginning of sector 1 to Huot, which is 20 mi west of Red Lake Falls, the land surface is flat to gently rolling and consists of lake-washed till laid down by glacial Lake Agassiz. The western part of the Red Lake River basin, from Huot to East Grand Forks, is glacial lake plain characterized by extreme flatness and poor drainage.

From Thief River Falls west to Crookston, there are a series of elevated ancient beach ridges that run in north-south directions. These were created by wave action on recessional shorelines of glacial Lake Agassiz. The river is diverted southward at Thief River Falls by this higher land and it is not until Huot that the river flows through a low spot in the Campbell Beach ridge to resume its westward course to the Red River.

Variations in physical features include stream widths ranging from 67 ft near High Landing to 300 ft above the impoundment at Thief River Falls. Stream widths in the high gradient area between Thief River Falls and Crookston ranged from 80-250 ft. Maximum stream depths ranged from 1.0-22.0 ft with the greater depths nearer the Red River. More detailed physical characteristics are listed in Appendix Table 2.

Sand is the most abundant stream substrate above Thief River Falls with some gravel and silt present. From Thief River Falls to Huot, the gradient increases and substantial amounts of gravel, rubble and boulder are present. The majority of the riffles and rapids are also found in this stretch. The remainder of the river has a lower gradient with a sand bottom mixed with some silt, gravel and rubble.

Source of Water

Upper and Lower Red Lakes form the headwaters of the Red Lake River. Flows in the Red Lake River are affected by the Army Corps of Engineers dam at the west end of Lower Red Lake. Upper Red Lake and Lower Red Lake

are connected at the narrows. About one-half the average flow from the upper three quarters of the watershed is from regulated storage in Red Lake. Normal pool elevation of Lower Red Lake is 1,174.0 with the level reduced during the winter to 1,173.5 to accommodate spring runoff. The winter discharge rate to the Red Lake River is set on 15 November and no change is made after the gates freeze. In April, flows are reduced to alleviate downstream flooding.

The Red Lake River watershed upstream of Crookston has an average annual precipitation of 22.0 inches (1890-1966) with 19.4 inches lost through evapotranspiration. This leaves an average annual outflow from the watershed of 2.6 inches. In spring and early summer, during a normal year, rainfall is adequate for plant growth but in August and September a moisture deficiency results in less than optimum growth.

Prolonged periods of higher flow generally occur during spring snow melt. Precipitation in the form of rain also occurs during this period which contributes to the magnitude and duration of the spring flow when soils are saturated. During late summer and fall, runoff decreases. Low flow in late summer comes at a time when natural river temperatures are at their maximum.

Stream gauging stations (USGS) are located at the outlet of Lower Red Lake, High Landing and Crookston. The average flow for 76 yrs of record at Crookston is 1,110 ft^3/sec. The average flow for each of the water years 1974-1976 was above 1,110 ft^3/sec but in water year 1977 it was reduced to 279 ft^3/sec (Table 1). Average monthly flows at Lower Red Lake, Highlanding and Crookston (1974-1981) are shown in Table 2.

Extremely low releases from Lower Red Lake as in 1977, 1980 and 1981, stress aquatic communities in the river. The deleterious effects on fish and other organisms are increased by hydropower peaking opera-

tions at Thief River Falls. These problems are discussed further in the Fisheries Section.

The Red Lake River's principal tributaries are the Thief and Clearwater Rivers draining areas of 959 and 1,370 mi^2, respectively. In addition, there are 58 smaller tributaries, of which 42 are ditches. The names, locations and flow characteristics of the tributaries may be found in Appendix Table 3. The Clearwater River is the largest tributary and has the most consistent flows throughout the year. Along with its tributaries, it flows through a moraine area and receives ground water all year. The Thief River flows through flat, poorly drained land and its flow is closely related to rainfall. Flow flucuation of the Red Lake River at Crookston is determined by the combined flow of the tributaries and the regulated discharge from Lower Red Lake.

Dams and Other Obstructions

There are three functional dams on the surveyed portion of the Red Lake River. These are located in Thief River Falls, Crookston and East Grand Forks. Two nonfunctional dam sites are located at Red Lake Falls and near Crookston. There are two other dams in the Red Lake Indian Reservation. One of these controls the outflow from Lower Red Lake and the other is 12 mi downstream and is used for flood control.

Table 1. Average flows at the U.S.G.S. gauging stations on the Red Lake River and two tributaries for the years of record and for water years 1974-77.[a]

Location	Ave. flow (cfs) for years of record	1974	1975	1976	1977
Red Lake R. near Red Lake	486.0 (1933-77)	902.0	968.0	929.0	114.0
Red Lake R. near Highlanding	536.0 (1929-77)	1,171.0	1,284.0	1,083.0	129.0
Thief R. near Thief R. Falls	157.0 (1917-77)	370.0	441.0	73.8	6.9
Clearwater R. at Red Lake R.	314.0 (1926-77)	555.0	563.0	182.0	88.8
Red Lake R. at Crookston	1,110.0 (1901-77)	2,337.0	2,544.0	1,441.0	279.0

[a] A water year runs from 1 October of previous year to 30 September of the year indicated.

Table 2. Average monthly flow (cubic feet/second) at Red Lake, High Landing and Crookston for 1974-81.

Location	Water year[a]	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
Red Lake	1974	776	1,026	807	810	846	766	379	849	957	1,282	1,061	1,255
	1975	1,327	1,053	855	768	713	639	392	764	1,354	803	1,464	1,475
	1976	1,463	1,100	683	1,033	1,012	804	821	1,030	940	854	857	552
	1977	178	163	126	121	122	124	105	75	82	108	83	79
	1978	220	284	450	490	498	502	256	520	821	859	506	322
	1979	354	393	400	397	392	391	293	922	1,126	1,033	1,051	1,039
	1980	887	663	847	833	828	810	567	529	574	218	111	94
	1981	71	68	58	54	57	71	55	63	100	376	428	405
Ave. for Period (1933-1981)		**507**	**481**	**463**	**476**	**471**	**450**	**359**	**521**	**607**	**558**	**471**	**476**
High Landing	1974	989	1,072	859	874	905	814	1,346	1,813	1,363	1,428	1,283	1,290
	1975	1,387	1,147	914	789	728	693	1,229	1,397	1,545	2,474	1,478	1,578
	1976	1,791	1,377	817	1,127	1,040	966	1,115	1,119	1,062	856	971	674
	1977	231	172	126	119	127	136	113	123	91	106	95	111
	1978	244	304	440	510	526	545	1,085	657	976	1,005	607	371
	1979	386	433	410	410	415	426	1,335	1,345	1,261	1,224	1,117	1,031
	1980	965	748	821	821	845	847	784	674	628	247	161	104
	1981	81	78	60	60	71	103	82	76	123	361	458	457
Crookston	1974	2,301	1,319	986	928	1,008	1,003	6,856	5,755	2,755	1,621	2,024	1,456
	1975	1,580	1,429	915	994	907	934	6,064	4,697	2,509	6,851	1,788	1,747
	1976	1,966	1,604	1,092	1,337	1,238	1,602	3,409	1,340	1,149	915	991	669
	1977	280	184	195	177	181	277	429	366	225	384	191	451
	1978	629	670	732	624	622	693	7,509	1,798	1,289	1,360	832	610
	1979	613	520	504	490	506	557	7,678	4,489	2,613	2,322	1,571	1,166
	1980	1,138	936	1,201	1,085	1,038	1,070	2,658	809	643	385	415	381
	1981	186	180	138	126	150	237	232	237	888	1,349	873	1,356

[a] A water year runs from 1 October of previous year to 30 September of the year indicated.

The Thief River Falls dam is 140 ft wide, 18 ft high and is a barrier to fish migration. The city-owned dam is operated for hydro-electric power generation utilizing run-of-the-river flows, except during the winter when some peaking is done. The impoundment, which extends approximately two miles upstream through town and east of the city limits is used for fishing, boating, swimming and various winter sports.

The Red Lake Falls dam, built in 1890, collapsed many years ago leaving crumbled dam material just below the water surface. In times of low river levels, it can be a hazard to boaters and canoeists.

Seven river miles east of Crookston there is another abandoned dam that has a 2 ft head at times of normal water levels. It is a barrier to navigation and fish migration at normal and low flows.

The Crookston dam is 120 ft wide, 12 ft high and is also a fish barrier. This dam serves to moderate flows and insure an adequate public water supply for the city.

The dam in East Grand Forks is 100 ft wide and has a gradual drop of 5 ft. It was built for water appropriation by the city and for recreation along the banks. This dam, located at the mouth of the stream, is a deterrent to fish movement most of the year.

WATER QUALITY

The Red Lake River begins as a relatively clear river at its source and gradually increases in turbidity, total solids and fertility towards the mouth. It is classified by the MPCA as a 1C, 2B, 3B intrastate stream which indicates suitability for the propagation of cool and warm water fish; aquatic recreation of all kinds; and use for public water supply with treatment. The river generally conforms to the classifi-

cation; however, fecal coliform counts and turbidity levels sometimes exceed the standards of 200 organisms/100 ml and 25 FTU, respectively. These violations generally occur at times of high runoff.

Water quality monitoring is done by the MPCA at East Grand Forks. The MPCA data shows the Red Lake River to be a hard-water stream with chemical parameters suitable for healthy aquatic communities(Appendix, Table 4). Total alkalinity and conductivity ranged from 120-290 mg/l and 240-590 micromhos/cm, respectively with the lower values generally being associated with periods of high runoff. Total nitrogen and total phosphorus ranged from 0.62 to 3.77 mg/l and 0.04 to 1.88 mg/l, respectively. Fecal coliform counts ranged from 20 to 2,800 organisms/100 ml. Dissolved oxygen ranged from 4.9 to 15.2 mg/l.

Pollution sources are of agricultural, industrial and municipal origin. Treated sewage enters the river at five sites and beet processing waste, municipal water treatment waste and urban runoff are also contributed (see Water Uses Section).

The Minnesota Department of Health, Section of Water Pollution Control collected data from four stations along the Red Lake River (1958-59). The data showed considerable increases in total solids, turbidity and phosphorus from the source of the stream to the mouth.

Secchi disc transparencies were recorded during the 1976-77 MDNR survey. From the beginning of the survey downstream to Thief River Falls, the readings were consistent (range 4.5-5.0 ft). In the middle third of the river, from Thief River Falls to Crookston, the transparencies ranged from 2.2-7.0 ft. The higher values were found in the areas with frequent riffles which presumably provided the substrate for organisms that removed suspended particulates. On the lower third of the

river, transparency was lowest ranging from 1.1-2.2 ft. Finer stream substrates, agricultural runoff and waste discharge were contributing factors.

WATER USES

Waste Discharges

The 1981 Industrial and Municipal Waste Inventory (MPCA) lists Crookston, Fisher, Red Lake Falls, St. Hilaire and Thief River Falls as cities which seasonally discharge effluent from sewage stabilization ponds at rates ranging from 0.00675 to 1.4 million gallons day (mgd). Crookston and Thief River Falls discharge waste water from municipal water treatment facilities. The American Crystal Sugar plant at Crookston discharges waste water from lagoons 2-3 months of the year during the beet processing operation. Peak discharges approach 10.0 mgd.

Water Appropriation

Water is appropriated from the Red Lake River by six major users. American Crystal Sugar plants in Crookston and East Grand Forks each appropriate 3,715 acre-ft/yr. The four public water users and the amounts appropriated by each are: Thief River Falls - 615 gallons per minute (g/m); Crookston - 4,200 g/m; East Grand Forks - 5,600 g/m and Grand Forks; North Dakota - 6,800 g/m. Numerous permits have been issued for small-scale appropriation for irrigation purposes.

Recreational Uses

The Red Lake River is the only river in northwestern Minnesota designated by the Department of Natural Resources as a state canoe and boating river. It is considered navigable with few obstructions and mild rapids and thereby rated as a class 1 canoeing river. Two abandoned

dams, one above Crookston and one at Red Lake Falls may obstruct navigability during low water. Dams requiring portaging are present at Thief River Falls, Crookston and East Grand Forks. Two dams within the Red Lake Indian Reservation also obstruct canoe passage. Small motor boats can navigate most of the river but are not recommended between Thief River Falls and Huot. From Thief River Falls to East Grand Forks, few access points exist. Access and campsites are indicated in A Gathering of Waters (MDNR 1977).

Walleye and northern pike are the most widely distributed game fish in the Red Lake River. Channel catfish are common below Thief River Falls and are a popular sport species. The majority of the fishing pressure seems to be concentrated in the tailwaters of the dams where fishermen can be seen almost daily on the river banks near the spillways. Popular fishing areas are located below dams at Thief River Falls and Crookston and near the junctions of the Red Lake River and the Thief, Clearwater and Black Rivers. The river below Crookston has the greatest concentrations of channel catfish where they are usually found in the deep pools and runs.

AQUATIC VEGETATION

Sixteen species of emergent and 19 species of aquatic floating or submerged vegetation were noted during the survey (Table 3). Above Thief River Falls, the Red Lake River has a variety of aquatic plants with dense growths in some areas. Wild rice is the most abundant emergent often forming heavy stands approximately 6 ft wide on both sides of the river. Cattail and softstem bulrush are less common emergents. River pondweed is the most abundant submerged vegetation with sago pondweed and wild celery commonly occurring.

Table 3. The common and scientific names of aquatic vascular plants noted during the Red Lake River survey by sector.

Scientific Name - Common Name	Sector 1	2	3	4	5	6	7	8
Submerged								
Ceratophyllum demersum - Coontail	X		X	X			X	
Drepano cladus - Water moss						X		
Elodea canadensis - Canada waterweed			X	X	X	X	X	X
Hippuris vulgaris - Marestail		X		X	X			
Lemna minor - Lesser duckweed	X	X	X					
Lemna trisulca - Star duckweed							X	
Myriophyllum exalbescens - Water milfoil	X					X		
Potamogeton natans - Floatingleaf pondweed			X	X				
Potamogeton nodosus - River pondweed	X	X	X	X	X	X	X	X
Potamogeton pectinatus - Sago pondweed	X	X	X	X	X	X	X	X
Potamogeton Richardsonii - Claspingleaf pondweed	X	X	X	X	X			
Potamogeton spp. - Narrowleaf pondweed							X	X
Potamogeton vaginatus - Largesheath pondweed	X							
Potamogeton zosteriformis - Flatstem pondweed	X		X		X	X		
Vallisneria americana - Wild celery	X		X	X	X	X	X	
Emergent								
Acorus calamus - Sweet flag	X	X	X					
Alisma triviale - Water plantain	X							
Carex spp. - Sedge			X	X	X	X		
Equisetum spp. - Horsetail				X				
Glyceria grandis - Reed-meadow grass	X							
Phalaris arundinacea - Reed canary grass	X		X	X	X	X	X	X
Phragmites communis - Cane	X	X	X		X			
Polygonum amphibium - Water smartweed			X		X			
Polygonum spp. - Smartweed	X						X	X
Sagittaria spp. - Arrowhead	X						X	X
Scirpus fluviatilis - River bulrush	X						X	
Scirpus validus - Softstem bulrush	X		X		X	X		X
Spartina pectinata - Cord grass				X				
Typha latifolia - Common cattail		X	X	X	X	X		
Zizania aquatica - Wild rice	X	X	X	X				

In sector 5, below Thief River Falls, aquatic plants are only occasionally found due to the increased water velocity and coarser substrate associated with an increased gradient. Below Red Lake Falls the river slows down considerably and there is a corresponding increase in aquatic plants but not to the extent found above Thief River Falls. From Crookston downstream, turbidity increases and becomes a factor in limiting instream vegetation.

TERRESTRIAL VEGETATION

The Red Lake River, beginning at Lower Red Lake, flows for 17 miles through the Red Lake Indian Reservation which contains a mixture of woodlands and bogs. As the river progresses westward from this area, the woodlands are reduced to a 20-75 ft wide discontinuous corridor along the river banks. Beyond this fringe of woods, the land is used intensively for crops and grazing. Occasionally, the woodlands are a few acres or more in size and are usually on steep slopes or other lands unsuitable for agriculture.

Approximately 60% of the immediate river banks are forested. Species composition of the bottom woodlands consisted primarily of willows, cottonwood, American elm and green ash (Table 4). Less common species were box elder and black ash. The common species on slightly higher ground were green ash, American elm, quaking aspen, white birch and basswood. These trees also grow on the uplands along with bur and red oak, white pine and balsam fir.

Table 4. Common and scientific names of the trees noted during the Red Lake River survey.

Scientific name	Common name
Abies balsamea	Balsam fir
Acer negundo	Box elder
Acer saccharinum	Silver maple
Betula papyrifera	White birch
Carpinus caroliniana	Ironwood
Fraxinus nigra	Black ash
Fraxinus pennsylvanica	Green ash
Pinus strobus	White pine
Pinus sylvestris	Scotch pine [a]
Populus balsamfera	Balsam poplar
Populus deltoides	Cottonwood
Populus grandidentata	Bigtooth aspen
Populus nigra	Lombardy poplar [a]
Populus tremuloides	Quaking aspen
Quercus alba	White oak
Quercus macrocarpa	Bur oak
Quercus velutina	Red oak
Salix babylonica	Weeping willow [a]
Salix spp.	Willow
Tilia americana	Basswood
Ulmus americana	American elm
Ulmus rubra	Slippery elm

[a] Introduced species.

Most of the non-forested regions along the river banks (approximately 40%) are cropland and pastured grasslands. Wetlands and residential districts make up the remainder of the non-woodland areas with the majority of the wetlands in the upper reach and the residential areas in Thief River Falls, Red Lake Falls, Crookston and East Grand Forks. Only remnants of the once expansive prairie grasslands can be found growing along the river banks.

On non-grazed land, vegetation provides forage and cover for a variety of wildlife species. The vegetation layers contain mature and immature trees, shrubs and herbaceous plants. Common understory species are red-osier dogwood, hazelnut, speckled alder, raspberry, choke cherry and wild plum (Table 5). The upper river is grazed quite heavily but this decreases as you approach Thief River Falls. Pastured land is minimal from Thief River Falls to the mouth of the river at East Grand Forks. Sweet clover, milkweed, bluegrass and tansy are the more common herbaceous plants found along the river (Table 6).

Table 5. Common and scientific names of the shrubs noted during the Red Lake River survey.

Scientific name	Common name
Alnus rugosa	Speckled alder
Amelanchier spp.	Juneberry
Cornus stolonifera	Red-osier dogwood
Corylus cornuta	Beaked hazelnut
Crataegus spp.	Hawthorn
Parthenocissus spp.	Virginia creeper
Prunus americana	American plum
Prunus virginiana	Choke cherry
Rhus radicans	Poison Ivy
Rhus spp.	Summac
Ribes cynosbati	Gooseberry
Rubus idaeus	Red raspberry
Vitis spp.	Grape
Xanthoxylum americanum	Prickly ash

Table 6. Common and scientific names of the herbaceous plants noted during the Red Lake River survey.

Scientific name	Common name
Ambrosia artemisiifolia	Ragweed
Ambrosia trifida	Giant ragweed
Amphicarpa bracteata	Hog peanut
Asarum canadense	Wild ginger
Asclepias spp.	Milkweed
Asperigus officinallis	Asperagus
Aster spp.	Asters
Bidens frondosa	Beggar-ticks
Bromus brizaeformis	Quackgrass
Bromus spp.	Smooth brome
Chrysanthemum leucanthemum	Daisy
Cirsium arvense	Canada thistle
Cirsium spp.	Common thistle
Echinocystis lobata	Wild cucumber
Fragaria virginiana	Strawberry
Geranium maculatum	Wild geranium
Helianthus spp.	Sunflower
Laportea canadensis	Wood nettle
Melilotus alba	White sweet clover
Melilotus officinals	Yellow sweet clover
Menispermum canadense	Moonseed
Plantago rugelii	Plantain
Poa spp.	Bluegrass
Rosa carolina	Wild rose
Rumex orbiculatus	Water dock
Solidago spp.	Goldenrod
Sonchus arvensis	Sow thistle
Streptopus roseus	Twisted stalk
Tanacetum vulgare	Tansy
Thalictrum dasycarpum	Meadow rue
Urtica urens	Stinging nettle
Xanthium chinense	Cocklebur

The upper river wooded areas were typically lowland hardwood communities composed of green ash, basswood and cottonwood. Also present were quaking aspen, bur oak, American elm and white birch. Before mile 110, a few miles upstream from Red Lake Falls, there is no distinct river valley. Up until this point, the topography next to the river is generally flat and the land does not rise more than 10-15 ft above the river level. In this upper reach, the land is frequently cultivated to the banks of the stream.

The middle reach, which runs from mile 110 to Crookston (mile 52), is more extensively forested than the upper river. It is characterized by steep banks (40 ft high) and is predominantly upland woods. Bur oak, American elm and white birch were the most abundant tree species. Also found were basswood, quaking aspen, cottonwood and green ash. Understory vegetation consisted of gooseberry, red-osier dogwood and hazelnut.

The lower river extends from Crookston (mile 52) to the mouth of the Red Lake River at East Grand Forks. In this section, the stream gradient decreases because of the gradual leveling off of the land which slopes downward towards the Red River. The wooded areas are confined to the narrow river valley through which the river meanders. Adjacent to the valley, the land is flat and is almost totally utilized for agriculture. The more common trees in this section were cottonwood, green ash and American elm with occasional basswood, bur oak and large willows lining the river banks.

WILDLIFE CHARACTERISTICS

Along the Red Lake River, the land adjacent to the river corridor is dominated by cropland and pasture. Some wildlife species prosper in this type of environment but most species do best where there is an interspersion of cover types which produce an edge effect. Despite the fact that habitat has been reduced, there remains a diverse wildlife resource. In an area which is so intensively utilized for agricultural purposes, this resource is dependent upon the available habitats afforded by the river corridor. The water environment and its riparian vegetation attract many species that otherwise would not exist in monoculture farmland. During the survey, 79 species of birds, 8 species of mammals and 4 species of amphibians and reptiles were observed. The Canadian toad, northern leopard frog and western painted turtle are among the reptiles and amphibians that are present along the Red Lake River (Table 7).

Most of the Red Lake River's main channel provides only marginal waterfowl habitat, particularly the high gradient area. From the upper end of the survey area to Thief River Falls, there are stretches of good wild rice and wild celery production along the river. Of the few oxbows present in the upper river, only two or three have open water and there are virtually no wetlands near the river. Wood ducks, mallards and blue-wing teal were the most common ducks seen during the survey.

Table 7. The common and scientific names of the reptiles and amphibians present along the Red Lake River. [a]

Species	Scientific Name	Common Name
	REPTILES	
Turtles:		
	Chelydra serpentina	Common snapping turtle
*	Chrysemys picta belli	Western painted turtle [b]
Lizards:		
	Eumeces septentrionalis septentrionalis	Northern prairie skink
Snakes:		
	Storeria occipitomaculata	Red-bellied snake
*	Thamnophis sirtalis sirtalis	Eastern garter snake
	Thamnophis sirtalis parietalis	Red-sided garter snake
	Thamnophis radix haydeni	Western plains garter snake
	Heterodon nasicus	Western hognose snake
	Opheodrys vernalis blanchardi	Western smooth green snake
	Opheodrys vernalis vernalis	Eastern smooth green snake
	Pituophis melanoleucus sayi	Bullsnake
	AMPHIBIANS	
Salamanders:		
	Necturus maculosus	Mudpuppy
	Notophthalmus viridescens louisianensis	Central newt
	Ambystoma laterale	Blue-spotted salamander
	Ambystoma tigrinum tigrinum	Eastern tiger salamander
Toads:		
	Bufo americanus	American toad
*	Bufo hemiophrys hemiophrys	Canadian toad
	Bufo cognatus	Great plains toad
Frogs:		
	Hyla crucifer crucifer	Northern spring peeper
	Hyla versicolor and H. chrysoscelis	Gray treefrog
	Pseudacris triseriata maculata	Boreal chorus frog
	Rana septentrionalis	Mink frog
	Rana sylvatica	Wood frog
*	Rana pipiens	Northern leopard frog

[a] From the Occurrence, Distribution, Legal Status and Utilization of Reptiles and Amphibians in Minnesota. 1980. MDNR.

[b] (*) Species sighted during the survey.

Furbearers of primary importance are beaver, muskrat, raccoon, fox and mink. Beaver lodges and cuttings, both old and new, were found in every sector. Muskrats and signs of their activities were found downstream as far as Red Lake Falls where decreased amounts of aquatic vegetation limits their numbers. Six mink were observed upstream of Red Lake Falls but none were seen below this point. Since muskrats are an important part of the mink's diet, this probably contributes to the decrease. Woodlands throughout the river corridor are habitat for the many raccoons that inhabit the area. Frogs, crayfish and clams in the river are their food source.

Game birds occurring along the river corridor include ruffed grouse, woodcock and gray partridge. The stands of upland hardwoods containing aspen and other species provide food and cover for both ruffed grouse and woodcock. Suitable habitat for gray partridge occurs in the cropland and pastured grasslands.

Game mammals found in the area are gray and fox squirrels, cottontail rabbit and white-tail deer (Table 8). Areas in which oaks are an important component of the woodland provide habitat for both species of squirrels. White-tail deer and cottontail rabbits are found throughout the river corridor in areas where fields co-exist with woodlands that have an understory. Moose are occasional visitors to the region from more favorable habitat to the north. Bobcats frequent the river and Canada lynx and timber wolves occasionally wander down into the area from northern boreal regions.

Table 8. The common and scientific names of the mammals present along the Red Lake River.[a]

Scientific Name	Common Name
Sorex cinereus	Masked shrew
Sorex palustris	Northern water shrew
Sorex arcticus	Arctic shrew
Microsorex hoyi	Pygmy shrew
Blarina brevicauda	Shorttail shrew
Condylura cristata	Starnose mole
Myotis lucifugus	Little brown bat
Myotis keeni	Keen myotis
Lasionycteris noctivagans	silver-haired bat
Eptesicus fuscus	Big brown bat
Lasiurus borealis	Red bat
Lasiurus cinereus	Hoary bat
Ursus americanus	Black bear
Procyon lotor	Raccoon
Martes pennanti	Fisher
Mustela erminea	Shorttail weasel
Mustela nivalis	Least weasel
Mustela frenata	Longtail weasel
* Mustela vison	Mink [b]
Lutra canadensis	River otter
Taxidea taxus	Badger
Mephitis mephitis	Striped skunk
Vulpes vulpes	Red fox
Canis latrans	Coyote
Canis lupus	Gray wolf
Lynx canadensis	Lynx
Lynx rufus	Bobcat
* Marmota monax	Woodchuck
* Spermophilus tridecemlineatus	Thirteen-lined ground squirrel
Spermophilus franklini	Franklin ground squirrel
* Tamias striatus	Eastern chipmunk
Eutamias minimus	Least chipmunk
* Tamiasciurus hudsonicus	Red squirrel
* Sciurus carolinensis	Eastern gray squirrel
* Sciurus niger	Eastern fox squirrel
Glaucomys sabrinus	Northern flying squirrel
* Geomys bursarius	Plains pocket gopher
* Castor canadensis	Beaver
Peromyscus maniculatus	Deer mouse
Peromyscus leucopus	White-footed mouse
Clethrionomys gapperi	Boreal redback vole
Microtus pennsylvanicus	Meadow vole
* Ondatra zibethica	Muskrat
Rattus norvegicus	Norway rat
Mus musculus	House mouse
Zapus hudsonius	Meadow jumping mouse

Table 8. Continued.

Scientific name	Common Name
Erethizon dorsatum	Porcupine
Lepus townsendi	White-tailed jack rabbit
Lepus americanus	Snowshoe hare
* Sylvilagus floridanus	Eastern cottontail
* Odocoileus virginianus	White-tail deer
Alces americana	Moose

[a] From A Field Guide to the Mammals, W.H. Burt and R.B. Grossenheider. 1964.
[b] (*) This species was sighted during the survey.

A wide variety of nongame wildlife species are present along the length of the Red Lake River due to the diversity of vegetative cover. Seventy-three passerine and 43 non-passerine bird species were determined to be present (Table 9).

Table 9. Common and scientific names of the birds of the Red Lake River region. [a]

Scientific Name	Common Name
* Podiceps auritus	Horned grebe [b]
Podiceps nigricollis	Eared grebe
* Podilymbus podiceps	Pied-billed grebe
Podiceps grisegena	Red-necked grebe
Aechmophorus occidentalis	Western grebe
* Branta canadensis	Canada goose
* Anas platyrhynchos	Mallard
Anas rubripes	Black duck
* Aix sponsa	Wood duck
* Anas discors	Blue-winged teal
* Anas crecca	Green-winged teal
* Aythya valisineria	Canvasback
* Aythya affinis	Lesser scaup
* Fulica americana	American coot
Larus argentatus	Herring gull
* Larus delawarensis	Ring-billed gull
* Larus pipixcan	Franklin's gull

Table 9. Continued.

	Scientific name	Common name
	Sterna forsteri	Forster's tern
	Chilidonias niger	Black tern
*	Ardea herodias	Great blue heron
	Nycticorax nycticorax	Black-crowned night heron
*	Butorides striatus	Green heron
*	Botaurus lentiginosus	American bittern
*	Grus canadensis	Sandhill crane
	Rallus limicola	Virginia rail
*	Porzana carolina	Sora
*	Charadrius vociferus	Killdeer
*	Philohela minor	American woodcock
*	Capella gallinago	Common snipe
	Tringa melanoleuca	Greater yellowlegs
	Tringa flavipes	Lesser yellowlegs
*	Actitus macularia	Spotted sandpiper
	Calidris minutilla	Least sandpiper
*	Bonasa umbellus	Ruffed grouse
	Phasianus colchicus	Ring-necked pheasant
	Perdix perdix	Gray partridge
	Accipiter gentilis	Northern goshawk
*	Circus cyaneus	Northern harrier
*	Accipiter striatus	Sharp-shinned hawk
*	Accipiter cooperii	Cooper's hawk
*	Buteo jamaicensis	Red-tailed hawk
*	Buteo lagopus	Rough-legged hawk
*	Buteo platypterus	Broad-winged hawk
*	Pandion haliaetus	Osprey
*	Cathartes aura	Turkey vulture
*	Falco sparverius	Kestrel
*	Falco sparverius	Great horned owl
*	Strix varia	Barred owl
*	Zenaidura macroura	Mourning dove
*	Columba livia	Rock dove
*	Chordeiles minor	Common nighthawk
	Caprimulgus vociferus	Whip-poor-will
	Archilochus colubris	Ruby-throated hummingbird
*	Megaceryle alcyon	Belted kingfisher
*	Melanerpes erythrocephalus	Red-headed woodpecker
*	Dryocopus pileatus	Pileated woodpecker
*	Colaptes auratus	Common flicker
	Sphyrapicus varius	Yellow-bellied sapsucker
	Picoides pubescens	Downy woodpecker
*	Picoides villosus	Hairy woodpecker
	Tyrannus tyrannus	Eastern kingbird
	Tyrannus tyrannus	Western kingbird
	Myiarchus crinitus	Great crested flycatcher
	Sayornis phoebe	Eastern phoebe
*	Contopus virens	Eastern pewee
	Empidonax minimus	Least flycatcher

Table 9. Continued.

	Scientific name	Common name
	Anthus spinoletta	Water pipit
*	Petrochelidon pyrrhonota	Cliff swallow
*	Hirundo rustica	Barn swallow
*	Iridoprocne bicolor	Tree swallow
*	Riparia riparia	Bank swallow
	Chaetura pelagica	Chimney swift
*	Corvus brachyrhynchos	American crow
*	Cyanocitta cristata	Bluejay
*	Pica pica	Black-billed magpie
*	Parus atricapillus	Black-capped chickadee
*	Sitta carolinensis	White-breasted nuthatch
*	Sitta candensis	Red-breasted nuthatch
	Troglodytes aedon	House wren
*	Cistothorus platensis	Marsh wren
*	Regulus calendula	Ruby-crowned kinglet
	Regulus satrapa	Golden-crowned kinglet
*	Toxostoma rufum	Brown thrasher
*	Dumetella carolinensis	Gray catbird
	Sialia sialis	Eastern bluebird
*	Turdus migratorius	Robin
	Catharus ustulatus	Swainson's thrush
*	Hylocichla mustelina	Wood thrush
	Catharus fuscescens	Veery
*	Bombycilla cedrorum	Cedar waxwing
	Vireo olivaceus	Red-eyed vireo
	Vireo gilvus	Warbling vireo
	Mniotilta varia	Black-and-white warbler
*	Dendroica coronata	Yellow-rumped warbler
	Dendroica pensylvanica	Chestnut-sided warbler
	Setophaga ruticilla	American redstart
*	Dendroica palmarum	Palm warbler
	Dendroica petechia	Yellow warbler
	Vermivora peregrina	Tennessee warbler
	Vermivora ruficapilla	Nashville warbler
	Wilsonia pusilla	Wilson's warbler
	Dendroica striata	Blackpoll warbler
	Geothlypis trichas	Yellowthroat
*	Seiurus noveboracensis	Northern waterthrush
	Seiurus aurocapillus	Ovenbird
*	Agelaius phoeniceus	Red-winged blackbird
	Xanthocephalus xanthocephalus	Yellow-headed blackbird
*	Molothrus ater	Brown-headed cowbird
*	Euphagus carolinus	Rusty blackbird
	Euphagus cyanocephalus	Brewer's blackbird
*	Quiscalus quiscalus	Common grackle
	Dolichonyx oxyzivorus	Bobolink
	Sturnella magna	Eastern meadowlark
	Sturnella neglecta	Western meadowlark

Table 9. Continued.

	Scientific name	Common name
	Icterus galbula	Northern oriole
	Piranga olivacea	Scarlet tanager
	Passer domesticus	House sparrow
*	Calcarius lapponicus	Lapland longspur
	Junco hyemalis	Northern junco
*	Carduelis flammea	Common redpoll
*	Carpodacus pupureus	Purple finch
*	Carduelis tristis	American goldfinch
	Pheucticus ludovicianus	Rose-breasted grosbeak
	Pipilo erythrophthalmus	Rufus-sided towhee
	Zonotrichia albicollis	White-throated sparrow
	Zonotrichia querula	Harris' sparrow
	Zonotrichia leucophrys	White-crowned sparrow
	Spizella passerina	Chipping sparrow
*	Spizella pusilla	Field sparrow
	Spizella arborea	American tree sparrow
*	Melospiza melodia	Song sparrow
	Pooecetes gramineus	Vesper sparrow
*	Passerculus sandwichensis	Savannah sparrow

[a] From the Agassiz National Wildlife Refuge bird list.

[b] (*) Species sighted during the survey.

During the 1976-77 MDNR survey, eight species of freshwater mussels were recorded. Specimens were hand picked and consisted of live organisms and recently dead shells. Most species were observed in the lower 70 mi of river because of more suitable substrates and the necessary fish host species. Data collections by Dawley (1947) established a list of 10 species for the Red Lake River, 4 of which - Fusconia flava, Anodonta grandis, Strophitus rugosus (undulatus), Lampsilis siliquoidia, - were unique to that collection. Two species - Quadrula quadrula and Actinonaias carinata - were unique to the 1976-77 MDNR survey. Overall, there was close agreement between the two surveys indicating that over a span of 30 yr the integrity of the aquatic environment has remained relatively stable. This comment applies, most particularly, to those sections of the lower river not impacted by industrial and municipal waste sources at Crookston or agriculturally induced shifting substrates. Mussel species and notes on the fish host species of the mussel glochidia stage are found in Table 10.

Table 10. The common and scientific names of the mussels and host species found in the Red Lake River in 1976 and 1977.

Species	Host Species
Actinonaias carinata (Mucket)	Sunfish (Lepomis spp.) Bass (Micropterus spp.) White bass (Morone chrysops) Yellow perch (Perca flavescens)
Amblema plicata (Three-ridge)	Largemouth bass (Micropterus salmoides) Black crappie (Pomoxis nigromaculatus) Sauger (Stizostedion canadense)
Lampsilis ventricosa (Pocketbook)	Bluegill (Lepomis macrochirus) possibly bass (Micropterus spp.) Yellow perch (Perca flavescens) Sauger (Stizostedion canadense)
Lasmigona complanata (White heel-splitter)	Unknown
Lasmigona costata (Fluted shell)	Unknown
Ligumia recta (Black sand shell)	Bluegill (Lepomis macrochirus)
Proptera alata (Pink heel-splitter)	Unknown
Quadrula quadrula (Maple-leaf)	Catfish (Ictalurus spp.)

FISHERIES

Fisheries survey work was conducted on the Red Lake River during September and October 1976 and September 1977. Electrofishing stations were established from the border of the Red Lake Indian Reservation to East Grand Forks. The upper 20 mi of river within the Red Lake Indian Reservation were not surveyed. Previous fishery survey work was limited to that done by Huber (1971) which extended from St. Hilaire to near Huot. The purpose of the survey was to document fish populations and habitat prior to a proposed Corps of Engineers dam and reservoir project for flood control near Huot.

During the reconnaissance phase of the 1976 MDNR survey, comprehensive mapping of the stream's physical characteristics was done. The study area was canoed and stream widths, depths, bank height, vegetation and substrate were recorded. Also noted was differentiation in stream habitat (pools, riffles, runs). Sector subdivisions were made on the basis of changing stream characteristics along the 175 mi stretch from the boundary of the Red Lake Indian Reservation to the mouth at East Grand Forks.

Electrofishing sampling stations were located to include representative stream habitats within the various study sectors. One to five timed runs were completed/sector depending on the length of the sector and habitat variation. A total of 24 electrofishing runs were made in the 8 designated sectors for a total electrofishing distance of 23.1 mi. Typical electrofishing parameters were 180 VDC, 5 amps, 30 pulses/sec and 40% pulse width. Electrofishing runs are shown on the map series and a legal description of the location of each run is given in Appendix Table 1.

Although stream flow was low, there were many deep holes from Thief River Falls to the mouth. The range of the electric field was less than 8 ft which limited the effectiveness of electrofishing in these areas. Water temperatures ranged from 50 F to 62 F. At the low end of this range, fish response (electrotaxis) to the electric field was somewhat reduced.

Catch

The total catch of fish from the 8 sectors of the study area contained 38 species representing 13 families of which 16 species were minnows and other small fishes (Table 11). Although minnows and other small fish species are an integral part of the ichthyofauna of the Red

Lake River, and comprised approximately one-third of the total catch, they are excluded from the percent composition analysis of the catch. Electrofishing gear is frequently less efficient for the small fish species and a percent analysis of the numbers of large fish caught would be greatly influenced by extremely high or low catches of the small fishes.

Table 11. Fish species taken by electrofishing in the Red Lake River, 1976.

Scientific name	Family	Common name
	Petromyzontidae	
Ichthyomyzon castaneus		Chestnut lamprey
	Hiodontidae	
Hiodon tergisus		Mooneye
	Umbridae	
Umbra limi		Central mudminnow
	Esocidae	
Esox lucius		Northern pike
	Cyprinidae	
Cyprinus carpio		Common carp
Hybopsis storeriana		Silver chub
Nocomis biguttatus		Hornyhead chub
Notemigonus crysoleucas		Golden shiner
Notropis atherinoides		Emerald shiner
Notropis cornutus		Common shiner
Notropis dorsalis		Bigmouth shiner
Notropis heterodon		Blackchin shiner
Notropis stramineus		Sand shiner
Pimephales promelas		Fathead minnow
Rhinichthys cataractae		Longnose dace

Table 11. Continued.

Scientific name	Family	Common name
	Catostomidae	
Carpiodes cyprinus		Quillback
Catostomus commersoni		White sucker
Moxostoma anisurum		Silver redhorse
Moxostoma erythrurum		Golden redhorse
Moxostoma macrolepidotum		Shorthead redhorse
	Ictaluridae	
Ictalurus melas		Black bullhead
Ictalurus nebulosus		Brown bullhead
Ictalurus punctatus		Channel catfish
Noturus gyrinus		Tadpole madtom
	Percopsidae	
Percopsis omiscomaycus		Trout-perch
	Gadidae	
Lota lota		Burbot
	Gasterosteidae	
Culaea inconstans		Brook stickleback
	Centrarchidae	
Ambloplites rupestris		Rock bass
Micropterus salmoides		Largemouth bass
Pomoxis nigromaculatus		Black crappie
	Percidae	
Etheostoma nigrum		Johnny darter
Perca flavescens		Yellow perch
Percina caprodes		Logperch
Percina maculata		Blackside darter
Percina shumardi		River darter
Stizostedion canadense		Sauger
Stizostedion vitreum vitreum		Walleye
	Sciaenidae	
Aplodinotus grunniens		Freshwater drum

Peterson (1975) examined electrofishing catches from various Minnesota streams and compiled some average statistics describing fish composition. In an electrofishing catch from a large river ($\bar{x}$ flow greater than 100 cfs), game fish (walleye, sauger, white bass, smallmouth bass, largemough bass, catfish, northern pike and muskellunge) were 14% of the large fish catch by number and 9% by weight [1]. Carp and catostomids were 71% by number and 90% by weight. Red Lake River survey results, in comparison, showed game fish to be 6.0% of the overall large fish catch by number and 5.1% by weight. Carp and catostomids were 67.5% by number and 74.3% by weight (Table 12).

Table 12. Percent of catch for two groups of fishes (game fish, carp and catostomids) in four northwestern Minnesota streams.

	Game fish		Carp and catostomids	
	% (No.)	% (Wt.)	% (No.)	% (Wt.)
Red Lake River (1976, 77)	6.0	6.1	67.5	74.3
Wild Rice River (1976)	3.8	5.0	83.7	89.0
Roseau River (1976)	39.0	25.0	48.8	72.1
Otter Tail River (1979, 80)	7.1	4.1	65.1	89.0

[1] Small fish species were not included in Peterson's catch composition analysis for the larger rivers.

Appendix Tables 6 and 7 give total numbers and percent composition by number for the eight study sectors. Walleye were the most evenly distributed game fish as well as most abundant at 4.3% of the overall large fish catch. Sector 6 showed the highest percent composition for walleye at 13.4%. Northern pike totaled 1.3% overall with sector 1 the highest at 4.4%. Northern pike tended to be more common in the upper reaches of the study area due to the presence of marsh habitat in the Red Lake Reservation and along the Thief River drainage.

The remainder of the game fish, channel catfish, sauger and large-mouth bass, were less than 1.0% by number overall. It was noted that some channel catfish were stunned in waters too deep for the netters to reach and consequently were not collected.

White sucker, shorthead redhorse and golden redhorse were the three most abundant species in the catch. White suckers (29.3% of the total) dominated the catch. No golden redhorse were taken in sectors 1-4; however, in sectors 6 and 7 they were 47% and 62% of the catch, respectively. Freshwater drum were distributed throughout the study area and at 14.4% were the fourth most abundant fish.

Appendix Tables 8 and 9 provide the weight and percent composition of the catch by weight for the study area. Channel catfish were the most abundant game fish by weight (2.3%) and were most abundant (9.9%) in sector 6. Walleye were 2.2% by weight overall and were also highest (5%) in sector 6. White sucker, golden redhorse, shorthead redhorse and freshwater drum together comprised 81.1% of the total catch by weight.

A total of 2,909 fish were sampled in 16.6 hrs of electrofishing on the Red Lake River. The average catch per unit of effort (CPUE), for the 8 study sectors, was 166 fish/hr (range 100-250 fish/hr) (Appendix Table 10). The average CPUE, for the large fish species, was 118 fish/hr (range 92-150 fish/hr). Although sector 6 had the lowest CPUE for the large fish species (68 fish/hr), it had the second highest game fish catch at 11.1 fish/hr. An above average catch of walleye (9.1 fish/hr) accounted for the high game fish catch in sector 6. Sector 3 had the highest CPUE for the large fish species (150 fish/hr) of which white suckers accounted for 80.8 fish/hr.

In the combined large fish catch, for the eight sectors, white sucker and shorthead redhorse were the most frequently taken fish at 34.8 and 21.6 fish/hr, respectively. Walleye were the most frequently taken game fish at 5.1 fish/hr. Carp had an overall catch rate of 1.5 fish/hr and were taken only in sectors 5 and 8.

A representation of the three categories of sexual maturity for 10 selected species is given in Figure 1. Less than 2% of the walleye catch were young-of-the-year fish. All collected channel catfish were adults and 82% of the collected catostomids were adults. Length frequencies for the overall catch and for the individual sectors are given in Appendix Tables 13 and 14-21, respectively.

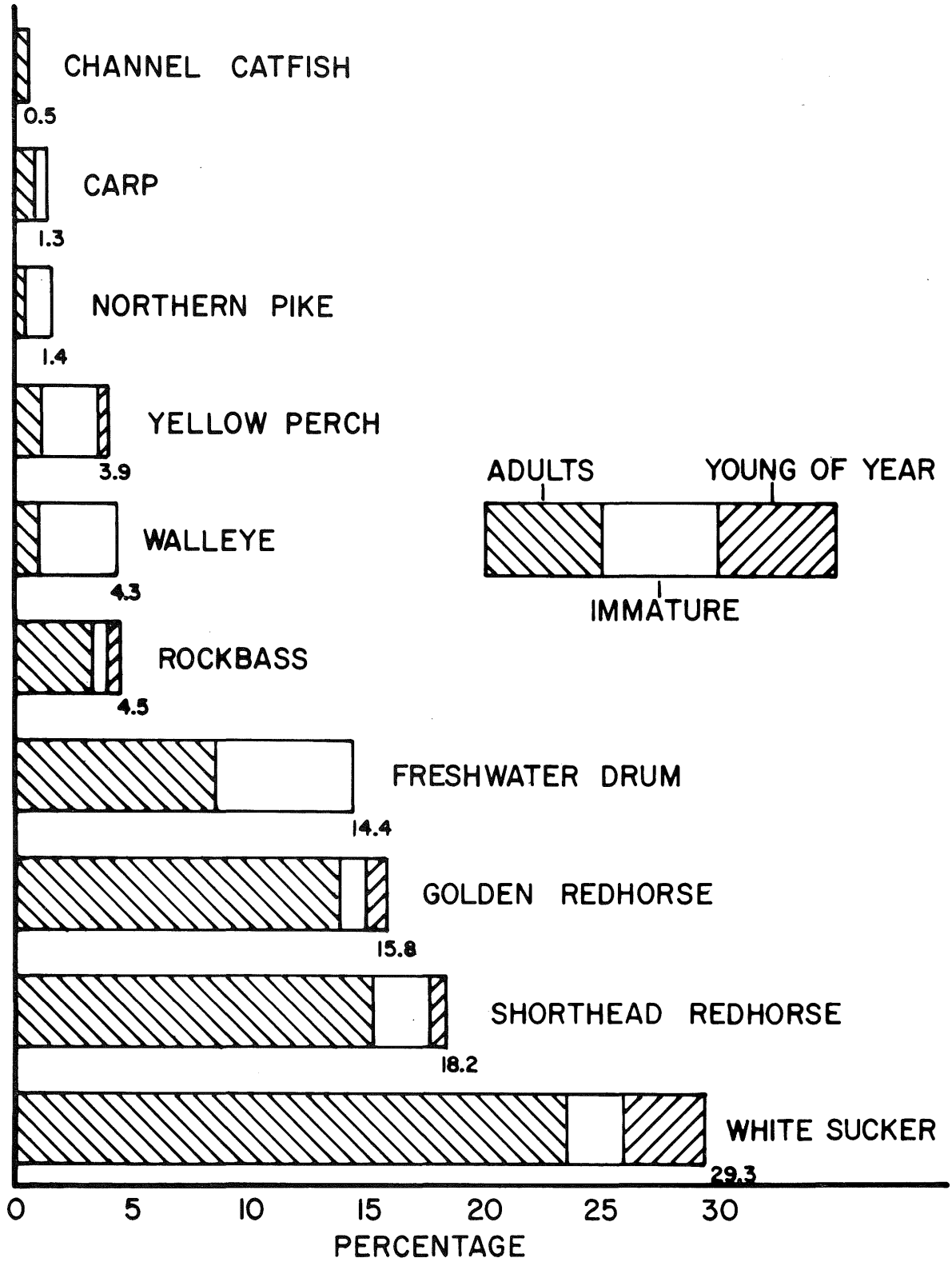


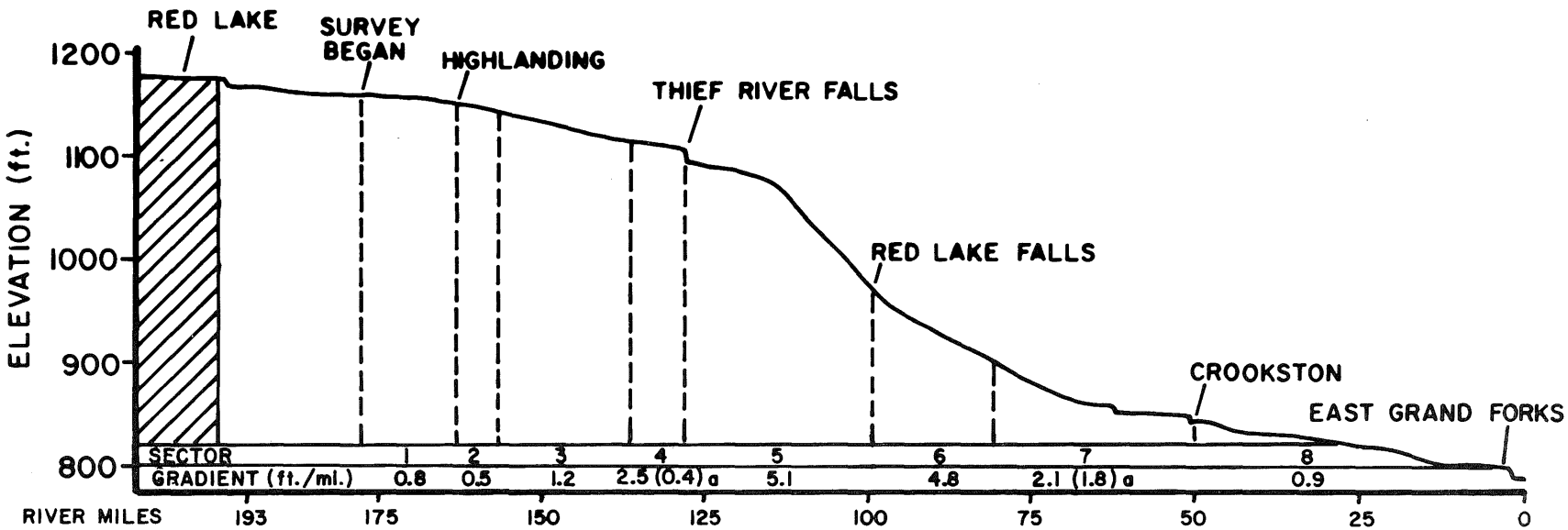
Figure 1. Comparative abundance of the primary fish species and levels of sexual maturity for the catch of the Red Lake River, September and October, 1976 and September 1977.

A statistical expression, diversity index ($\bar{d}$) can be used as an indicator of the quality of the aquatic environment. Environmental stress on fish populations may be reflected by the $\bar{d}$ of the catch but the index more accurately shows the dominance of the most abundant species. Peterson (1975, 1977) compiled information from 21 different stream reaches and found that the usual range of $\bar{d}$ for Minnesota's warmwater streams is from 1.8 to 2.6 with a median of 2.2 for the large fish species. In Peterson's analysis, the genus Moxostoma was not separated. In situations where numbers of more than one redhorse species are present, this method underestimates the actual diversity.

Diversity index values for the Red Lake River were calculated with all fish as distinct species. Appendix Table 12 gives values, by sector, for the large fish species (excluding minnows and other small fishes) and for all species combined. For the large fish, the median value was 2.2 with a range of 1.6 to 3.1.

Peterson (1975) stated that a large fish $\bar{d}$ below 1.8 may be the result of some environmental stress. In sector 2, the $\bar{d}$ was 1.6. Observation of aquatic parameters here did not indicate significant stress to the fish populations but there was some feeling that an atypical gear bias and fish movement contributed to the low diversity and unusually high catch rate for drum.

Fish distribution was predictably responsive to physical stream parameters along the Red Lake River. Two related characteristics, gradient and substrate, exhibited the greatest influence; however, water clarity and depth were also important (Appendix Table 12). The stream profile and percent of catch by number for the predominant species in the Red Lake River are expressed in Figure 2. Fish are listed in order of their overall abundance in the stream but the considerable variation in



	Total %								
White sucker	29.3	32.8	26.3	53.9	62.4	16.8	6.7	4.9	1.5
Sh. redhorse	18.2	14.7	5.4	18.8	15.1	25.9	20.2	14.8	19.6
Gold. redhorse	15.8					12.3	47.2	61.7	28.7
Fresh. drum	14.4	29.4	59.2	7.2	7.8	18.0	1.2	4.9	11.1
Rock bass	4.4	5.1		8.6	7.2	1.5	0.6	0.4	5.0
Walleye	4.3	3.4		2.9	3.0	3.9	13.4	6.3	3.5
Yellow perch	3.9	7.1	6.5	6.6	1.8	3.6	0.6		
Quillback	1.6	0.3				3.3	0.6	0.9	8.5
Mooneye	1.5						0.6	1.8	13.1
Silver redhorse	1.3					3.6	4.2	3.1	
Northern pike	1.3	4.4	2.1	0.9	1.2	0.3	1.8		0.5
Carp	1.3					4.8			5.0
Channel catfish	0.4					0.6	1.2		2.5

Figure 2. Red Lake River stream profile and percent of catch by sector for the primary species, September and October 1976 and September 1977.

[a] Dams have reduced the gradient to the figure in parentheses.

percent composition between sectors is a result of changing gradient and related factors.

The upper four sectors of the study area, above the Thief River Falls dam, are characterized by low stream gradient and fine substrate types. At the time of survey, secchi disc readings approximated the average thalweg depth and aquatic vegetation was common. Numbers of white sucker, drum, rock bass, yellow perch and northern pike were generally higher in this reach than the overall stream average. Walleye numbers were somewhat less than average. Golden redhorse, mooneye, silver redhorse, carp and channel catfish were not found during the survey. The two latter species are apparently restricted to the downstream reaches of river by the dam at Thief River Falls and the habitat requirements of the former three species are apparently not met here.

The three sectors between Thief River Falls and Crookston are characterized by high stream gradient, coarse substrates and habitat differentiation (numerous riffles and pools). Species discussed as being above the overall stream average upstream of Thief River Falls are generally well below average here. Golden redhorse became the dominant fish species below Thief River Falls. The percent composition for walleye was above the overall stream average. Channel catfish appear in this reach and carp are present for the first time but constitute a small part of the fish population.

The last sector of the study area, from Crookston to the mouth at East Grand Forks, is characterized by low gradient, fine substrate types and reduced water clarity. Species typical to large, turbid rivers become more abundant here - channel catfish, quillback and mooneye. Drum

again increased as compared to the previous high gradient reach. Walleye were slightly below the overall stream average and a single sauger was collected.

Appendix Table 12 is a list of fish stocked in the Red Lake River from 1958-1982. Varying numbers of walleye fry have been stocked in Pennington, Red Lake and Polk Counties.

A serious problem affecting the fisheries of the Red Lake River is low instream flows. Although this river has comparatively stable flows throughout most years, irregularly occurring periods of drought cause unsatisfactory conditions for the maintenance of aquatic life. Flow releases from Lower Red Lake at these times have on occasion been excessively low. The years 1977, 1980 and 1981 are exemplary in showing periods with inadequate monthly flows (Table 2).

From August 1980 through June 1981, average monthly flows ranged from 54-111 cfs at the Lower Red Lake dam. This translates to a range of 11-23% of the average annual flow, 11-24% of the monthly average flow for years of record and 11-27% of the monthly fiftieth percentile (median) flow for years of record. Examination of literature regarding instream flows, particularly that of Tennant (1976), suggests that these flows are poor to marginal for maintaining aquatic communities. Tennant's recommendation for "optimum" flow ranges from 60-100% of average annual discharge. For the Red Lake River at Lower Red Lake this translates to a flow of 292-486 cfs.

Hydroelectric peaking is done at the city owned dam at Thief River Falls [1]. At times of low flow releases from Lower Red Lake, this practice can seriously compound instream flow problems and cause severe degradation of aquatic communities downstream from Thief River Falls.

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[1] The utility is under contract with the city to utilize a hydroelectric peaking mode only during the period from 20 November to 20 March At other times, operation is run-of-the-river. Full power output is achieved with a flow of 750 cfs and 200 cfs is the minimum flow for generation.

CONCLUSIONS AND RECOMMENDATIONS

1. Local conservation efforts should be directed at improvements in land use practices including the protection of streamside vegetation. Restoration of tree and other natural riparian cover types would enhance fish and wildlife values, water quality and recreational opportunity.

2. Further instream flow investigations should be done on the Red Lake River. In the interim, stream discharge from the Army Corps of Engineers dam at Lower Red Lake should be in the range of 292 to 486 cfs for normal water years. The discharge could be higher in above average water years. In low water years (drought conditions) the discharge from Lower Red Lake should be no less than 98 cfs from Oct.-March and 196 cfs from April-Sept.

3. The surface area of the Red Lakes is 288,800 acres. Based on gross calculations, a supplemental release of 200 cfs for a period of 8 months will result in an additional drawdown of Red Lake of 0.3 ft.

4. For the stretch of river below the dam at Lower Red Lake, median and average monthly flows for the years of record are lowest during April. The April average (359 cfs) is considerably less than the average annual flow (486 cfs) for the years of record. This is the result of flood water retention in Red Lake. Typical flushing flows which would cleanse and provide access to desirable fish spawning substrates are infrequent at this time. Species most directly affected are northern pike and walleye. When flooding is not an imminent concern, normal flows should be resumed as soon as possible.

5. Consideration should be given to installing a bubbler or similar de-icing system at the discharge gates of the Army Corps of Engineers dam at Lower Red Lake. This would allow for flow adjustment during the winter months which has not been possible in the past when the gates were frozen.

6. Fishery problems have resulted from winter peaking operation (20 November - 20 March) at the city owned dam in Thief River Falls. Further analysis of the operation of this facility is needed. In the interim, minimum flow release during winter hydroelectric peaking operations should be no less than 108 cfs. This value is derived by applying Tennants 20% recommendation to the average annual flow (period of record) at the gauging station at High Landing. No flow for the Thief River was factored in because of historically very low discharge during this period. During normal water years a high minimum release would benefit the fishery.

7. Serious consideration should be given, by MDNR fishery managers, to a substantial introductory stocking of smallmouth bass. Survey results indicate that stream parameters, between Thief River Falls and Huot, are good to excellent for this species and their establishment could enhance the sport fishery. Fish stocks should be derived from a Minnesota stream where a strong native population is present and stream physical and chemical parameters are closely matched.

8. Comprehensive and coordinated water appropriation management must be done on the Red Lake River and tributaries in order to maintain desirable instream flow regimes.

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A P P E N D I X

Table 1. Location and lengths of electrofishing runs during the 1976 and 1977 Red Lake River survey.

Electrofishing run	Legal Description	Length (mi)
1a	T. 152, R. 39, S. 10 & 11	0.5
1b	T. 152, R. 40, S. 1	1.2
1c	T. 153, R. 40, S. 27 & 28	1.9
2a	T. 153, R. 40, S. 19 & 30	1.1
3a	T. 153, R. 41, S. 26	0.8
3b	T. 153, R. 41, S. 21 & 22	1.3
3c	T. 153, R. 41, S. 18	1.6
3d	T. 153, R. 42, S. 14 & 15	1.7
4a	T. 153, R. 43, S. 1, 6, 7 & 8	2.1
4b	T. 154 & 153, R. 43, S, 35, 36, 2 & 1	1.3
5a	T. 154, R. 43, S. 33	
5b	T. 154 & 153, R. 43, S. 33 & 4	0.5
5c	T. 153, R. 43, S. 29	0.5
5d	T. 152, R. 43, S. 5 & 6	0.7
5e	T. 152, R. 43, S. 20 & 29	0.6
6a	T. 151, R. 44, S. 13 & 14	0.6
6b	T. 151, R. 44, S. 15	0.3
6c	T. 151, R. 45, S. 22, 26 & 27	0.8
7a	T. 151, R. 45, S. 27	1.2
7b	T. 151, R. 45, S. 33	0.5
7c	T. 150, R. 46, S. 32	1.0
8a	T. 150, R. 46, S. 25, 30, 36	0.8
8b	T. 150, R. 48, S. 16 & 21	0.9
8c	T. 151, R. 50, S. 1 & 12	1.2

Table 2. Stream physical characteristics.

Sectors	1	2	3	4
Date	Sept. 21,22,23, 1976	Sept. 23, 1976	Sept. 23,27,28, 1976	Sept. 28,29, 1976
T.R.S. to T.R.S.	T. 152, R. 39, S. 13 T. 153, R. 40, S. 28	T. 153, R. 40, S. 28 T. 153, R. 41, S. 25	T. 153, R. 41, S. 25 T. 153, R. 42, S. 8	T. 153, R. 42, S. 8 T. 154, R. 43, S. 33
Upstream end of sector (miles from mouth)	175.2	160.7	155.2	134.7
Length of sector (miles)	14.5	5.5	20.5	9.0
Sinuosity value	1.3	1.8	2.2	1.7
Width - average (ft)	90	79	132	184
Width - range (ft)	67-122	68-100	105-175	145-300
Depth - Thalweg average (ft)	4.0	5.8	3.6	3.6
Depth - maximum (ft)	6.0	8.0	7.5	8.0
Average bank height (ft)	4.8	7.3	4.0	4.0
Bank height range	1.5-10.0	2.0-20.0	1.0-15.0	0.5-8.0
Number of riffles	0	0	0	0
Flow (cfs)	471	522	-	-
Gradient (ft/mi)[a]	0.8	0.5	1.2	2.5 (0.4)
Stream stage	Low	Low	Low	Low
Secchi disc transparency (ft)	5.0+	-	4.5	5.4
Dams (by river mile)	-	-	-	-
Substrate types[d]	Sand-gravel	Sand-gravel-clay	Sand-gravel	Gravel-sand-rubble

[a] Dams have reduced gradient to figure in parentheses.

[b] Collapsed dam.

[c] Out of service hydro power dam.

[d] In order of abundance - excluding reservoirs.

Table 2. Continued.

Sectors	5	6	7	8
Date	Sept. 29, 30 & Oct. 1,4, 1976	Oct. 5,6, 1976 Sept. 7, 1977	Sept. 7,8,9, 1977	Sept. 9,10,11, 1977
T.R.S. to T.R.S.	T. 154, R. 43, S. 33 T. 151, R. 44, S. 13	T. 151, R. 44, S. 13 T. 151, R. 45, S. 27	T. 151, R. 45, S. 27 T. 150, R. 47, S. 36	T. 150, R. 47, S.36 T. 151, R. 50, S. 2
Upstream end of sector (miles from mouth)	125.7	97.6	80.2	52.3
Length of sector (miles)	28.1	17.4	27.9	52.3
Sinuosity value	1.7	2.1	2.2	2.3
Width - average (ft)	209	151	-	-
Width - range (ft)	85-300	60-250	-	-
Depth - Thalweg average (ft)	2.4	2.4	3.6	2.5
Depth - maximum (ft)	8.0	7.0	22.0	16.0
Average bank height (ft)	14.8	18.4	12.5	-
Bank height range (ft)	2.5-50.0	2.0-80.0	10.0-15.0	-
Number of riffles	121	64	20	5
Flow (cfs)	-	-	284	328
Gradient (ft/mi)[a]	5.1	4.8	2.1 (1.8)	0.9
Stream stage	Low	Low	Low	Low
Secchi disc transparency	4.5	7.0+	2.2	1.4
Dams (by river mile)	125.7	94.5[b]	61.7[c]	52.3, 0.2
Substrate types[d]	rubble-gravel-sand-boulder	Gravel-rubble-sand	Sand-gravel-rubble	Sand-gravel-rubble River Mile 52.3-30.0 Sand-silt-gravel River Mile 30.0-0

[a] Dams have reduced gradient to figure in parentheses.

[b] Collapsed dam.

[c] Out of service hydro power dam.

[d] In order of abundance - excluding reservoirs.

Table 3. Streams tributary to the Red Lake River.

Station name	Tributary no.	Location of mouth (T.,R.,S.)	County	Source	Flow
Unnamed	H-26-30-1	151,49,7	Polk	Runoff	Intermittent
Unnamed	H-26-30-2	151,49,27	Polk	Runoff	Intermittent
Ditch	H-26-30-3	150,48,16	Polk	Marsh	Intermittent
Ditch	H-26-30-4	150,48,16	Polk	Runoff	Intermittent
Unnamed	H-26-30-5	150,48,27	Polk	Runoff	Intermittent
Burnham Cr.	H-26-30-6	150,48,27	Polk	Runoff	No flow
Ditch	H-26-30-7	150,47,28	Polk	Runoff	Intermittent
Ditch	H-26-30-8	150,47,26	Polk	Runoff	Intermittent
Ditch	H-26-30-9	150,46,32	Polk	Runoff	Intermittent
Ditch	H-26-30-10	150,46,33	Polk	Marsh	Intermittent
Unnamed	H-26-30-11	150,46,35	Polk	Marsh	Intermittent
Ditch	H-26-30-12	150,46,25	Polk	Runoff	Intermittent
Unnamed	H-26-30-13	150,46,25	Polk	Marsh	Intermittent
Gentilly R.	H-26-30-14	150,45,19	Polk	Runoff	No flow
Unnamed	H-26-30-15	150,45,5	Polk	Marsh	Intermittent
Black R.	H-26-30-16	151,45,28	Red Lake	Marsh	No flow
Cyr Cr.	H-26-30-17	151,45,25	Red Lake	Marsh	-
Unnamed	H-26-30-18	151,44,19	Red Lake	Runoff	Intermittent
Clearwater R.	H-26-30-19	151,44,15	Red Lake	Runoff	13 cfs
Ditch	H-26-30-20	151,44,14	Red Lake	Runoff	Intermittent
Ditch	H-26-30-21	151,43,5	Red Lake	Runoff	Intermittent
Ditch	H-26-30-22	152,43,32	Red Lake	Runoff	Intermittent
Unnamed	H-26-30-23	152,43,29	Red Lake	Marsh	Intermittent
Ditch	H-26-30-24	152,43,20	Red Lake	Runoff	Intermittent
Ditch	H-26-30-25	152,43,20	Pennington	Runoff	Intermittent
Ditch	H-26-30-26	152,43,20	Pennington	Runoff	Intermittent
Unnamed	H-26-30-27	152,43,17	Pennington	Runoff	Intermittent
Ditch	H-26-30-28	152,43,7	Pennington	Runoff	Intermittent
Unnamed	H-26-30-29	152,43,7	Pennington	Runoff	Intermittent
Ditch	H-26-30-30	153,43,29	Pennington	Runoff	Intermittent
Ditch	H-26-30-31	153,43,21	Pennington	Runoff	Intermittent
Ditch	H-26-30-32	153,43,17	Pennington	Runoff	Intermittent
Thief R.	H-26-30-33	154,43,27	Pennington	Thief Lake	2.1 cfs
Ditch	H-26-30-34	154,43,34	Pennington	Runoff	Intermittent
Ditch	H-26-30-35	154,43,35	Pennington	Runoff	Intermittent
Ditch	H-26-30-36	153,43,1	Pennington	Runoff	Intermittent
Ditch	H-26-30-37	153,42,10	Pennington	Runoff	Intermittent
Ditch	H-26-30-38	153,42,10	Pennington	Runoff	Intermittent
Ditch	H-26-30-39	153,42,14	Pennington	Runoff	Intermittent
Ditch	H-26-30-40	153,42,24	Pennington	Runoff	Intermittent
Ditch	H-26-30-41	153,41,18	Pennington	Runoff	Intermittent
Ditch	H-26-30-42	153,41,17	Pennington	Runoff	Intermittent
Ditch	H-26-30-43	153,41,21	Pennington	Runoff	Intermittent
Ditch	H-26-30-44	153,41,22	Pennington	Runoff	Intermittent
Ditch	H-26-30-45	153,41,22	Pennington	Runoff	Intermittent
Ditch	H-26-40-46	153,41,22	Pennington	Runoff	Intermittent
Ditch	H-26-30-47	153,41,24	Pennington	Runoff	Intermittent

Table 3. Continued.

Station name	Tributary no.	Location of mouth (T.,R.,S.)	County	Source	Flow
Ditch	H-26-30-48	153,41,25	Pennington	Runoff	Intermittent
Ditch	H-26-30-49	153,40,19	Pennington	Runoff	Intermittent
Ditch	H-26-30-50	153,40.19	Pennington	Runoff	Intermittent
Ditch	H-26-30-51	153,40,27	Pennington	Runoff	Intermittent
Ditch	H-26-30-52	153,40,34	Pennington	Runoff	Intermittent
Ditch	H-26-30-53	152,40,3	Pennington	Runoff	Intermittent
Ditch	H-26-30-54	152,40,2	Pennington	Runoff	Intermittent
Ditch	H-26-30-55	152,39,6	Pennington	Runoff	Intermittent
Ditch	H-26-30-56	152,39,5	Pennington	Runoff	Intermittent
Ditch	H-26-30-57	152,39,9	Pennington	Runoff	Intermittent
Ditch	H-26-30-58	152,39,10	Pennington	Runoff	Intermittent
Ditch	H-26-30-59	152,39,12	Pennington	Runoff	Intermittent
Unnamed	H-26-30-60	152,38,15	Clearwater	Marsh	Intermittent
Ditch	H-26-30-61	152,38,14	Clearwater	Runoff	1 cfs
Unnamed	H-26-30-62	152,37,21	Clearwater	Marsh	2 cfs

Table 4. Summary of MPCA water quality data for the Red Lake River at East Grand Forks, 1974-77.

Item	1974 No.	1974 Median	1974 Range	1975 No.	1975 Median	1975 Range	1976 No.	1976 Median	1976 Range	1977 No.	1977 Median	1977 Range
pH	12	8.2	7.4-8.4	12	8.2	7.9-8.4	12	8.2	7.8-8.6	9	8.1	7.3-8.4
Fecal Coliform (mpn/100 ml)	12	110	20-1100	12	410	20-2400	11	130	50-2800	9	330	50-1700
Turbidity-(FTU)	12	14.0	2.0-74.0	12	21	3.5-74.0	12	10.0	3.3-39.0	9	19.0	2.9-36.0
Conductivity (micromhos/cm)	12	325	240-360	12	320	250-410	12	350	300-590	9	480	340-530
Total alkalinity (mg/l)	12	165	120-290	12	175	150-220	8	155	140-170	3	180	120-250
Total nitrogen (mg/l)	12	1.62	1.14-3.77	12	1.34	0.63-2.22	12	1.24	0.62-1.69	9	1.51	0.99-2.38
Total phosphorous (mg/l)	12	0.11	0.05-0.57	12	0.13	0.05-0.50	12	0.07	0.04-0.35	9	0.18	0.04-1.88
Chloride-(mg/l)	12	5	1-8	12	4	3-13	12	3.7	2.4-9.4	9	9.0	5.5-13.0
Sulfate-(mg/l)	12	29	14-77	12	19	10-62	8	15	9-37	3	40	18-65
Dissolved oxygen	12	10.2	4.9-15.2	12	10.2	6.1-13.1	12	10.2	5.3-12.5	9	7.4	6.3-11.2
B.O.D.-(mg/l)	12	1.7	0.5-11.0	12	1.9	0.6-3.0	12	2.2	1.0-2.9	9	3.1	0.4-23.0

Table 5. Summary of Minnesota Department of Health water quality data for the Red Lake River at four locations, 1958-59.

	E. Grand Forks			Fisher			Gentilly			Lower Red Lake		
	No.	Median	Range	No.	Median	Range	No.	Median	Range	No.	Median	Range
pH	12	7.8	6.9-8.4	12	7.8	6.9-8.5	12	7.8	6.8-8.8	9	7.9	6.7-8.2
Total solids	9	350	270-710	9	350	240-510	9	330	240-460	9	250	210-300
Turbidity-(JTU)	11	23	10-180	12	17	2-150	12	14	2-100	9	9	2-40
Total nitrogen (mg/l)	6	1.3	0.8-3.9	7	1.2	0.8-4.5	7	1.5	0.8-3.1	5	1.2	1.1-2.4
Total phosphorous (mg/l)	6	0.13	0.10-0.51	7	0.18	0.10-0.38	7	0.10	0.06-0.32	5	0.06	0.01-0.17
Dissolved oxygen (mg/l)	11	5.6	3.6-11.0	12	7.1	3.4-12.0	12	8.0	3.2-13.0	9	7.5	4.0-12.0
B.O.D.-(mg/l)	12	2.9	0.5-6.5	12	3.5	1.0-4.4	12	2.9	1.0-3.5	9	2.5	1.0-4.4

Table 6. Total numbers of fish for the eight sectors of the Red Lake River, 1976.

Species	1	2	3	4	5	6	7	8	Total
Mooneye	–	–	–	–	–	1	4	26	31
Northern pike	13	2	5	2	1	3	–	1	27
Carp	–	–	–	–	16	–	–	10	26
Quillback	1	–	–	–	11	1	2	17	32
White sucker	96	24	275	103	56	11	11	3	579
Silver redhorse	–	–	–	–	12	7	7	–	26
Golden redhorse	–	–	–	–	41	77	137	57	312
Shorthead redhorse	43	5	96	25	86	33	33	39	360
Black bullhead	4	–	1	–	–	–	–	–	5
Brown bullhead	2	–	–	1	2	–	–	–	5
Channel catfish	–	–	–	–	2	2	–	5	9
Burbot	1	–	1	1	14	2	2	–	21
Rock bass	15	–	44	12	5	1	1	10	88
Largemouth bass	–	–	1	–	–	–	–	–	1
Black crappie	–	–	1	–	1	–	–	–	2
Yellow perch	21	6	34	3	12	1	–	–	77
Sauger	–	–	–	–	–	–	–	1	1
Walleye	10	–	15	5	13	22	14	7	86
Freshwater drum	86	54	37	13	60	2	11	22	285
Subtotal	**292**	**91**	**510**	**165**	**332**	**163**	**222**	**198**	**1973**
Chestnut lamprey	–	–	–	–	4	2	3	1	10
Central mudminnow	–	–	2	–	–	–	–	–	2
Silver chub	–	–	–	–	–	–	1	7	8
Hornyhead chub	1	–	10	17	4	4	8	–	44
Golden shiner	1	–	–	–	–	–	–	–	1
Emerald shiner	–	3	–	–	–	–	3	1	7
Common shiner	47	–	101	9	11	9	19	1	196
Bigmouth shiner	–	–	–	–	–	–	–	1	1
Blackchin shiner	1	–	–	–	–	–	–	–	1
Sand shiner	–	–	–	–	–	–	–	1	1
Fathead minnow	12	1	18	–	–	–	–	–	31
Longnose dace	–	–	–	–	25	156	6	1	188
Tadpole madtom	–	–	3	–	–	–	–	–	3
Trout-perch	–	–	–	–	–	–	3	–	3
Brook stickleback	3	–	–	–	–	–	–	–	3
Johnny darter	2	1	15	–	3	6	–	1	28
Logperch	–	–	–	–	–	1	–	1	1
Blackside darter	50	–	190	34	76	24	27	2	403
River darter	–	–	–	–	–	–	5	–	5
Subtotal	**117**	**5**	**339**	**60**	**123**	**201**	**75**	**16**	**936**
TOTAL	**409**	**96**	**849**	**225**	**455**	**364**	**297**	**214**	**2909**
Effort (hrs)	2.00	.70	3.40	1.75	2.35	2.40	1.85	2.15	15.60

Table 7. Percent composition (numbers) by fish species for the eight sectors of the Red Lake River, 1976.

Sectors	1	2	3	4	5	6	7	8	Total
Mooneye	–	–	–	–	–	0.6	1.8	13.1	1.5
Northern pike	4.4	2.1	0.9	1.2	0.3	1.8	–	0.5	1.3
Carp	–	–	–	–	4.8	–	–	5.0	1.3
Quillback	0.3	–	–	–	3.3	0.6	0.9	8.5	1.6
White sucker	32.8	26.3	53.9	62.4	16.8	6.7	4.9	1.5	29.3
Silver redhorse	–	–	–	–	3.6	4.2	3.1	–	1.3
Golden redhorse	–	–	–	–	12.3	47.2	61.7	28.7	15.8
Shorthead redhorse	14.7	5.49	18.8	15.1	25.9	20.2	14.8	19.6	18.2
Black bullhead	1.3	–	0.1	–	–	–	–	–	0.2
Brown bullhead	0.6	–	–	0.6	0.6	–	–	–	0.2
Channel catfish	–	–	–	–	0.6	1.2	–	2.5	0.4
Burbot	0.3	–	0.1	0.6	4.2	1.2	0.9	–	1.0
Rock bass	5.1	–	8.6	7.2	1.5	0.6	0.4	5.0	4.4
Largemouth bass	–	–	0.1	–	–	–	–	–	0.1
Black crappie	–	–	0.1	–	0.3	–	–	–	0.1
Yellow perch	7.1	6.5	6.6	1.8	3.6	0.6	–	–	3.9
Sauger	–	–	–	–	–	–	–	0.5	0.1
Walleye	3.4	–	2.9	3.0	3.9	13.4	6.3	3.5	4.3
Freshwater drum	29.4	59.3	7.2	7.8	18.0	1.2	4.9	11.1	14.4
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 8. Total weight (lbs) of fish for the eight sectors of the Red Lake River, 1976.

	Sector								
	1	2	3	4	5	6	7	8	Total
Mooneye	-	-	-	-	-	1.2	1.9	11.6	14.7
Northern pike	9.9	0.8	3.1	1.1	0.3	2.5	-	0.1	17.8
Carp	-	-	-	-	126.5	-	-	26.2	152.7
Quillback	5.5	-	-	-	29.5	1.7	2.4	33.4	72.5
White sucker	76.4	46.8	393.8	149.3	61.7	6.1	16.7	2.0	752.8
Silver redhorse	-	-	-	-	53.4	13.6	9.1	-	76.1
Golden redhorse	-	-	-	-	120.5	127.3	211.3	84.1	543.2
Shorthead redhorse	67.9	7.6	142.5	29.8	125.9	42.2	45.2	37.2	498.3
Black bullhead	0.9	-	0.4	-	-	-	-	-	1.3
Brown bullhead	1.9	-	-	0.8	2.4	-	-	-	5.1
Channel catfish	-	-	-	-	20.5	23.3	-	22.6	66.4
Burbot	0.1	-	0.5	0.2	13.4	1.8	1.6	-	17.6
Rock bass	6.6	-	10.8	5.8	1.3	-	0.4	4.5	29.4
Largemouth bass	-	-	0.1	-	-	-	-	-	0.1
Black crappie	-	-	-	-	-	-	-	-	-
Yellow perch	5.9	1.9	1.5	0.1	0.3	-	-	-	9.7
Sauger	-	-	-	-	-	-	-	0.5	0.5
Walleye	2.6	-	5.6	4.9	26.1	11.8	6.8	5.4	63.2
Freshwater drum	164.1	120.1	57.0	37.0	64.3	2.9	26.9	16.9	489.2
TOTAL	**341.8**	**177.2**	**615.3**	**229.0**	**646.1**	**234.4**	**322.3**	**244.5**	**2810.6**

Table 9. Percent composition (weight) of fish for the eight sectors of the Red Lake River, 1976.

Sector	1	2	3	4	5	6	7	8	Total
Mooneye	–	–	–	–	–	0.5	0.5	4.7	0.5
Northern pike	2.8	0.4	0.5	0.4	0.1	1.0	–	<0.1	0.6
Carp	–	–	–	–	19.5	–	–	10.7	5.4
Quillback	1.6	–	–	–	4.5	0.7	0.7	13.6	2.5
White sucker	22.3	26.4	64.0	65.1	9.5	2.6	5.1	0.8	26.7
Silver redhorse	–	–	–	–	8.2	5.8	2.8	–	2.7
Golden redhorse	–	–	–	–	18.6	54.3	65.5	34.3	19.3
Shorthead redhorse	19.8	4.2	23.1	13.0	19.4	18.0	14.0	15.2	17.7
Black bullhead	0.2	–	–	–	–	–	–	–	<0.1
Brown bullhead	0.5	–	–	0.3	0.3	–	–	–	0.1
Channel catfish	–	–	–	–	3.1	9.9	–	9.2	2.3
Burbot	–	–	–	0.1	2.0	0.7	0.4	–	0.6
Rock bass	1.9	–	1.7	2.5	0.2	–	0.1	1.8	1.0
Largemouth bass	–	–	<0.1	–	–	–	–	–	<0.1
Black crappie	–	–	–	–	–	–	–	–	–
Yellow perch	1.7	1.0	0.2	<0.1	0.1	–	–	–	0.3
Sauger	–	–	–	–	–	–	–	0.2	–
Walleye	0.7	–	0.9	2.1	4.0	5.0	2.1	2.2	2.2
Freshwater drum	48.0	67.7	9.2	16.1	9.9	1.2	8.3	6.9	17.4
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 10. Catch per unit of effort (fish/hr) for the eight sectors of the Red Lake River, 1976.

	Sector								
	1	2	3	4	5	6	7	8	Total
Mooneye	–	–	–	–	–	0.4	2.1	12.0	1.8
Northern pike	6.5	2.8	1.4	1.1	0.4	1.2	–	0.4	1.6
Carp	–	–	–	–	6.8	–	–	4.6	1.5
Quillback	0.5	–	–	–	4.6	0.4	1.0	7.9	1.9
White sucker	48.0	34.2	80.8	58.8	23.8	4.5	5.9	1.3	34.8
Silver redhorse	–	–	–	–	5.1	2.9	3.7	–	1.5
Golden redhorse	–	–	–	–	17.4	32.0	74.0	25.5	18.7
Shorthead redhorse	21.5	7.1	28.2	14.2	36.6	13.7	17.8	18.1	21.6
Black bullhead	2.0	–	0.2	–	–	–	–	–	0.3
Brown bullhead	1.0	–	–	0.5	0.8	–	–	–	0.3
Channel catfish	–	–	–	–	0.8	0.8	–	2.3	0.5
Burbot	0.5	–	0.2	0.5	5.9	0.8	1.0	–	1.2
Rock bass	7.5	–	12.9	6.8	2.1	0.4	0.5	4.6	5.3
Largemouth bass	–	–	0.2	–	–	–	–	–	–
Black crappie	–	–	0.2	–	0.4	–	–	–	0.1
Yellow perch	10.5	8.5	10.0	1.7	5.1	0.4	–	–	4.6
Sauger	–	–	–	–	–	–	–	0.4	–
Walleye	5.0	–	4.4	2.8	5.5	9.1	7.5	3.2	5.1
Freshwater drum	43.0	77.1	10.8	7.4	25.5	0.8	5.9	10.2	17.1
Subtotal	**146.0**	**130.0**	**150.0**	**94.2**	**141.2**	**67.9**	**120.0**	**92.0**	**118.8**
Chestnut lamprey	–	–	–	–	1.7	0.8	1.6	0.4	0.6
Central mudminnow	–	0	0.5	–	–	–	–	–	0.1
Silver chub	–	–	–	–	–	–	0.5	3.2	0.4
Hornyhead chub	0.5	–	2.9	9.7	1.7	1.6	4.3	–	2.6
Golden shiner	0.5	–	–	–	–	–	–	–	–
Emerald shiner	–	4.2	–	–	–	–	1.6	0.4	0.4
Common shiner	23.5	–	29.7	5.1	4.6	3.3	10.2	0.4	11.8
Bigmouth shiner	–	–	–	–	–	–	–	0.4	–
Blackchin shiner	0.5	–	–	–	–	–	–	–	–
Sand shiner	–	–	–	–	–	–	–	0.4	–
Fathead minnow	6.0	1.4	5.2	–	–	–	–	–	1.8
Longnose dace	–	–	–	–	10.6	65.0	3.2	0.4	11.3
Tadpole madtom	–	–	0.8	–	–	–	–	–	0.1
Trout-perch	–	–	–	–	–	–	1.6	–	0.1
Brook stickleback	1.5	–	–	–	–	–	–	–	0.1
Johnny darter	1.0	1.4	4.4	–	1.2	2.5	–	0.4	1.6
Logperch	–	–	–	–	–	0.4	–	–	–
Blackside darter	25.0	–	55.8	19.4	32.3	10.0	14.5	0.9	24.2
River darter	–	–	–	–	–	–	2.7	–	–
Subtotal	**58.5**	**7.1**	**99.7**	**34.2**	**52.3**	**83.7**	**40.5**	**7.4**	**56.3**
TOTAL	**204.5**	**137.1**	**249.7**	**128.5**	**193.6**	**151.6**	**160.5**	**99.5**	**175.2**
Effort (hrs)	2.00	.70	3.40	1.75	2.35	2.40	1.85	2.15	16.60

Table 11. Diversity index for the eight sectors of the Red Lake River, 1976.

Sector	1	2	3	4	5	6	7	8
Large fish	2.50	1.56	2.05	1.82	3.08	2.33	1.87	2.93
All fish	3.16	1.85	2.87	2.54	3.54	2.70	2.84	3.23

Table 12. Walleye fry stocking activities on the Red Lake River from 1958-81.

Year	Number	Location (County)
1958	300,000	Polk
1958	300,000	Red Lake
1958	300,000	Pennington
1963	300,000	Polk
1967	300,000	Red Lake
1976	40,000	Red Lake
1976	40,000	Pennington
1978	100,000	Red Lake
1978	100,000	Pennington
1979	100,000	Pennington
1979	100,000	Red Lake
1981	100,000	Pennington
1982	100,000	Pennington

Table 13. Length frequency distributions in the Red Lake River for all sectors, 1976.

Total length (in)	Species and numbers of fish by length groups					
	Walleye	Sauger	Northern pike	Largemouth bass	Channel catfish	Black crappie
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	2
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	-	-	1	-	-
4.0 - 4.9	1	-	-	-	-	-
5.0 - 5.9	1	-	-	-	-	-
6.0 - 6.9	21	-	1	-	-	-
7.0 - 7.9	23	-	-	-	-	-
8.0 - 8.9	6	-	1	-	-	-
9.0 - 9.9	1	-	-	-	-	-
10.0 - 10.9	9	-	-	-	-	-
11.0 - 11.9	4	-	4	-	-	-
12.0 - 12.9	2	1	2	-	-	-
13.0 - 13.9	5	-	2	-	-	-
14.0 - 14.9	1	-	6	-	-	-
15.0 - 15.9	3	-	4	-	1	-
16.0 - 16.9	1	-	1	-	-	-
17.0 - 17.9	-	-	2	-	-	-
18.0 - 18.9	2	-	1	-	-	-
19.0 - 19.9	-	-	1	-	1	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	2	-	1	-	-	-
23.0 - 23.9	1	-	-	-	1	-
24.0 - 24.9	2	-	-	-	1	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	1	-	-	-	1	-
27.0 - 27.9	-	-	-	-	1	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	1	-
30.0 - 30.9	-	-	-	-	2	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	86	1	27	1	9	2

Table 13. Continued.

Total length (in)	Species and numbers of fish by length groups					
	Rock bass	White sucker	Short-head red-horse	Silver red-horse	Golden red-horse	Quill-back
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	12	-	2	-	-	-
2.0 - 2.9	8	17	3	-	-	-
3.0 - 3.9	1	32	5	-	19	-
4.0 - 4.9	2	15	-	-	1	-
5.0 - 5.9	3	3	1	-	-	4
6.0 - 6.9	8	-	20	-	5	-
7.0 - 7.9	32	5	13	1	-	-
8.0 - 8.9	15	3	1	-	3	1
9.0 - 9.9	4	2	-	-	6	-
10.0 - 10.9	2	7	5	1	1	-
11.0 - 11.9	1	33	11	1	6	-
12.0 - 12.9	-	91	28	-	12	-
13.0 - 13.9	-	87	45	3	19	-
14.0 - 14.9	-	56	33	1	54	1
15.0 - 15.9	-	62	54	1	80	4
16.0 - 16.9	-	87	76	2	62	10
17.0 - 17.9	-	52	43	1	23	10
18.0 - 18.9	-	26	16	2	23	1
19.0 - 19.9	-	1	4	3	13	-
20.0 - 20.9	-	-	-	4	2	-
21.0 - 21.9	-	-	-	3	3	-
22.0 - 22.9	-	-	-	2	-	1
23.0 - 23.9	-	-	-	1	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	88	579	360	26	312	32

Table 13. Continued

Total length(in)	Species and numbers of fish by length groups						
	Carp	Drum	Yellow perch	Mooneye	Burbot	Bullhead Bl.	Bullhead Br
	-	-	-	-	-		-
0.0 - 0.9	-	-	-	-	-		-
1.0 - 1.9	-	-	-	-	-		-
2.0 - 2.9	-	-	5	-	-		-
3.0 - 3.9	-	-	41	-	-		-
4.0 - 4.9	-	-	3	1	-		-
5.0 - 5.9	-	-	3	3	-		-
6.0 - 6.9	-	-	3	1	-		-
7.0 - 7.9	-	-	1	-	-	3	-
8.0 - 8.9	-	-	9	6	3	2	-
9.0 - 9.9	-	34	10	2	2	-	-
10.0 - 10.9	-	59	2	2	2	-	2
11.0 - 11.9	-	20	-	12	-	-	1
12.0 - 12.9	-	4	-	2	1	-	1
13.0 - 13.9	-	1	-	1	1	-	-
14.0 - 14.9	-	3	-	-	1	-	1
15.0 - 15.9	-	8	-	1	4	-	-
16.0 - 16.9	-	25	-	-	1	-	-
17.0 - 17.9	4	58	-	-	3	-	-
18.0 - 18.9	5	45	-	-	-	-	-
19.0 - 19.9	-	16	-	-	-	-	-
20.0 - 20.9	3	6	-	-	-	-	-
21.0 - 21.9	2	3	-	-	-	-	-
22.0 - 22.9	-	2	-	-	-	-	-
23.0 - 23.9	2	-	-	-	3	-	-
24.0 - 24.9	2	1	-	-	-		-
25.0 - 25.9	2	-	-	-	-		-
26.0 - 26.9	3	-	-	-	-		-
27.0 - 27.9	2	-	-	-	-		-
28.0 - 28.9	1	-	-	-	-		-
29.0 - 29.9	-	-	-	-	-		-
30.0 - 30.9	-	-	-	-	-		-
31.0 - 31.9	-	-	-	-	-		-
32.0 - 32.9	-	-	-	-	-		-
33.0 - 33.9	-	-	-	-	-		-
34.0 - 34.9	-	-	-	-	-		-
35.0 - 35.9	-	-	-	-	-		-
36.0 - 36.9	-	-	-	-	-		-
	-	-	-	-	-		-
Totals	26	285	77	31	21	5	5

Table 14. Length frequency distributions in the Red Lake River for Sector 1, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Northern pike	Rock bass	White sucker	Shorthead redhorse	Quillback
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	2	-
2.0 - 2.9	-	-	-	6	2	-
3.0 - 3.9	-	-	-	1	-	-
4.0 - 4.9	-	-	-	1	-	-
5.0 - 5.9	-	-	1	-	-	-
6.0 - 6.9	4	-	2	-	-	-
7.0 - 7.9	1	-	4	2	-	-
8.0 - 8.9	-	-	7	-	-	-
9.0 - 9.9	1	-	1	-	-	-
10.0 - 10.9	2	-	-	1	-	-
11.0 - 11.9	-	3	-	4	-	-
12.0 - 12.9	-	1	-	12	2	-
13.0 - 13.9	2	-	-	17	4	-
14.0 - 14.9	-	4	-	5	2	-
15.0 - 15.9	-	2	-	11	3	-
16.0 - 16.9	-	-	-	18	13	-
17.0 - 17.9	-	-	-	12	11	-
18.0 - 18.9	-	1	-	6	2	-
19.0 - 19.9	-	1	-	-	2	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	1	-	-	-	1
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	10	13	15	96	43	1

Table 14. Continued.

Total length (in)	Species and numbers of fish by length groups					
	Drum	Yellow Perch	Burbot	Black bullhead	Brown bullhead	
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	1	-	-	-	-
3.0 - 3.9	-	2	-	-	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	-	2	-	-	-	-
7.0 - 7.9	-	1	-	3	-	-
8.0 - 8.9	-	6	1	1	-	-
9.0 - 9.9	7	7	-	-	-	-
10.0 - 10.9	8	2	-	-	1	-
11.0 - 11.9	1	-	-	-	-	-
12.0 - 12.9	1	-	-	-	-	-
13.0 - 13.9	-	-	-	-	1	-
14.0 - 14.9	2	-	-	-	-	-
15.0 - 15.9	5	-	-	-	-	-
16.0 - 16.9	15	-	-	-	-	-
17.0 - 17.9	25	-	-	-	-	-
18.0 - 18.9	15	-	-	-	-	-
19.0 - 19.9	6	-	-	-	-	-
20.0 - 20.9	1	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	86	21	1	4 -	2	-

Table 15. Length frequency distributions in the Red Lake River for Sector 2, 1976.

Total length (in)	Species and numbers of fish by length groups					
	Northern pike	White sucker	Shorthead redhorse	Drum	Yellow perch	
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	2	-	-	1	-
3.0 - 3.9	-	-	-	-	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	-	-	-	-	-	-
7.0 - 7.9	-	-	-	-	-	-
8.0 - 8.9	-	-	-	-	3	-
9.0 - 9.9	-	-	-	1	2	-
10.0 - 10.9	-	-	-	1	-	-
11.0 - 11.9	-	2	1	3	-	-
12.0 - 12.9	1	2	-	-	-	-
13.0 - 13.9	-	-	-	-	-	-
14.0 - 14.9	1	1	-	-	-	-
15.0 - 15.9	-	3	-	-	-	-
16.0 - 16.9	-	3	4	6	-	-
17.0 - 17.9	-	5	-	21	-	-
18.0 - 18.9	-	5	-	16	-	-
19.0 - 19.9	-	1	-	3	-	-
20.0 - 20.9	-	-	-	2	-	-
21.0 - 21.9	-	-	-	1	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	2	24	5	54	6	-

Table 16. Length frequency distributions in the Red Lake River for Sector 3, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Northern pike	Largemouth bass	Black crappie	Rock bass	White sucker
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	1	13	-
2.0 - 2.9	-	-	-	-	4	8
3.0 - 3.9	-	-	1	-	1	18
4.0 - 4.9	-	-	-	-	-	4
5.0 - 5.9	-	-	-	-	2	-
6.0 - 6.9	4	-	-	-	4	-
7.0 - 7.9	5	-	-	-	16	-
8.0 - 8.9	-	1	-	-	2	-
9.0 - 9.9	-	-	-	-	-	1
10.0 - 10.9	3	-	-	-	2	4
11.0 - 11.9	1	-	-	-	-	20
12.0 - 12.9	-	-	-	-	-	47
13.0 - 13.9	1	1	-	-	-	48
14.0 - 14.9	1	1	-	-	-	19
15.0 - 15.9	-	1	-	-	-	22
16.0 - 16.9	-	1	-	-	-	54
17.0 - 17.9	-	-	-	-	-	18
18.0 - 18.9	-	-	-	-	-	12
19.0 - 19.9	-	-	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	15	5	1	1	44	275

Table 16. Continued.

Total length(in)	Species and numbers of fish by length groups					
	Burbot	Shorthead redhorse	Drum	Yellow perch	Black bullhead	
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	3	-	-
3.0 - 3.9	-	5	-	28	-	-
4.0 - 4.9	-	-	-	1	-	-
5.0 - 5.9	-	1	-	-	-	-
6.0 - 6.9	-	11	-	1	-	-
7.0 - 7.9	-	6	-	-	-	-
8.0 - 8.9	-	1	-	-	1	-
9.0 - 9.9	-	-	4	1	-	-
10.0 - 10.9	-	1	12	-	-	-
11.0 - 11.9	-	-	3	-	-	-
12.0 - 12.9	-	4	2	-	-	-
13.0 - 13.9	1	5	-	-	-	-
14.0 - 14.9	-	3	-	-	-	-
15.0 - 15.9	-	7	2	-	-	-
16.0 - 16.9	-	20	3	-	-	-
17.0 - 17.9	-	20	3	-	-	-
18.0 - 18.9	-	10	5	-	-	-
19.0 - 19.9	-	2	1	-	-	-
20.0 - 20.9	-	-	1	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	1	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	1	96	37	34	1	-

Table 17. Length frequency distributions in the Red Lake River for Sector 4, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Northern Pike	Rock bass	White sucker	Shorthead redhorse	Drum
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	1	-	-
3.0 - 3.9	-	-	-	-	-	-
4.0 - 4.9	-	-	-	1	-	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	3	-	2	-	7	-
7.0 - 7.9	1	-	6	1	2	-
8.0 - 8.9	-	-	1	1	-	-
9.0 - 9.9	-	-	3	-	-	-
10.0 - 10.9	-	-	-	2	-	1
11.0 - 11.9	-	-	-	6	-	-
12.0 - 12.9	-	-	-	25	2	-
13.0 - 13.9	-	1	-	15	1	-
14.0 - 14.9	-	-	-	15	2	-
15.0 - 15.9	-	1	-	15	1	-
16.0 - 16.9	-	-	-	8	6	1
17.0 - 17.9	-	-	-	10	1	4
18.0 - 18.9	-	-	-	3	3	4
19.0 - 19.9	-	-	-	-	-	1
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	1
23.0 - 23.9	1	-	-	-	-	1
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	5	2	12	103	25	13

Table 17. Continued.

Total length(in)	Species and numbers of fish by length groups					
	Yellow perch	Burbot	Brown bull-head			
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	1	-	-	-	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	2	-	-	-	-	-
6.0 - 6.9	-	-	-	-	-	-
7.0 - 7.9	-	-	-	-	-	-
8.0 - 8.9	-	-	-	-	-	-
9.0 - 9.9	-	1	-	-	-	-
10.0 - 10.9	-	-	1	-	-	-
11.0 - 11.9	-	-	-	-	-	-
12.0 - 12.9	-	-	-	-	-	-
13.0 - 13.9	-	-	-	-	-	-
14.0 - 14.9	-	-	-	-	-	-
15.0 - 15.9	-	-	-	-	-	-
16.0 - 16.9	-	-	-	-	-	-
17.0 - 17.9	-	-	-	-	-	-
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	-	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	3	1	1	-	-	-

Table 18. Length frequency distributions in the Red Lake River for Sector 5, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Northern pike	Channel catfish	Black crappie	Rock bass	White sucker
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	1	-	-
2.0 - 2.9	-	-	-	-	1	2
3.0 - 3.9	-	-	-	1	-	-
4.0 - 4.9	-	-	-	-	1	8
5.0 - 5.9	-	-	-	-	-	3
6.0 - 6.9	1	-	-	-	-	-
7.0 - 7.9	2	-	-	-	2	2
8.0 - 8.9	3	-	-	-	1	2
9.0 - 9.9	-	-	-	-	-	-
10.0 - 10.9	2	-	-	-	-	-
11.0 - 11.9	-	1	-	-	-	1
12.0 - 12.9	1	-	-	-	-	4
13.0 - 13.9	-	-	-	-	-	6
14.0 - 14.9	-	-	-	-	-	11
15.0 - 15.9	1	-	-	-	-	8
16.0 - 16.9	-	-	-	-	-	3
17.0 - 17.9	-	-	-	-	-	6
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	-	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	3	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	1	-	-	-
29.0 - 29.9	-	-	1	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	13	1	2	1	5	56

Table 18. Continued.

Total length (in)	Species and numbers of fish by length groups					
	Short-head red-horse	Silver red-horse	Golden red-horse	Quill-back	Carp	Drum
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	1	-	-	-	-	-
3.0 - 3.9	-	-	-	-	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	2	-	-	-	-	-
7.0 - 7.9	5	-	-	-	-	-
8.0 - 8.9	-	-	-	-	-	-
9.0 - 9.9	-	-	-	-	-	20
10.0 - 10.9	-	-	-	-	-	24
11.0 - 11.9	-	-	-	-	-	2
12.0 - 12.9	6	-	1	-	-	-
13.0 - 13.9	17	-	-	-	-	-
14.0 - 14.9	5	-	-	-	-	-
15.0 - 15.9	18	-	3	6	-	1
16.0 - 16.9	21	-	7	4	-	-
17.0 - 17.9	10	-	7	1	1	4
18.0 - 18.9	1	-	15	-	2	4
19.0 - 19.9	-	3	8	-	-	3
20.0 - 20.9	-	4	-	-	1	2
21.0 - 21.9	-	2	-	-	1	-
22.0 - 22.9	-	2	-	-	-	-
23.0 - 23.9	-	1	-	-	1	-
24.0 - 24.9	-	-	-	-	2	-
25.0 - 25.9	-	-	-	-	3	-
26.0 - 26.9	-	-	-	-	4	-
27.0 - 27.9	-	-	-	-	1	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	86	12	41	11	16	60

Table 18. Continued.

Total length(in)	Species and numbers of fish by length groups					
	Yellow perch	Burbot	Brown bull-head			
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	9	-	-	-	-	-
4.0 - 4.9	2	-	-	-	-	-
5.0 - 5.9	1	-	-	-	-	-
6.0 - 6.9	-	-	-	-	-	-
7.0 - 7.9	-	-	-	-	-	-
8.0 - 8.9	-	2	-	-	-	-
9.0 - 9.9	-	1	-	-	-	-
10.0 - 10.9	-	1	-	-	-	-
11.0 - 11.9	-	-	1	-	-	-
12.0 - 12.9	-	1	-	-	-	-
13.0 - 13.9	-	1	-	-	-	-
14.0 - 14.9	-	1	1	-	-	-
15.0 - 15.9	-	2	-	-	-	-
16.0 - 16.9	-	-	-	-	-	-
17.0 - 17.9	-	2	-	-	-	-
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	-	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	3	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	12	14	2	-	-	-

Table 19. Length frequency distributions in the Red Lake River for Sector 6, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Northern pike	Channel catfish	Rock bass	White sucker	Shorthead redhorse
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	1	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	-	-	6	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	4	-	-	-	-	-
7.0 - 7.9	8	-	-	-	-	-
8.0 - 8.9	1	-	-	-	-	-
9.0 - 9.9	-	1	-	-	-	-
10.0 - 10.9	2	-	-	-	1	1
11.0 - 11.9	2	-	-	-	-	-
12.0 - 12.9	1	-	-	-	1	4
13.0 - 13.9	-	-	-	-	1	5
14.0 - 14.9	-	-	-	-	1	9
15.0 - 15.9	2	-	-	-	-	9
16.0 - 16.9	1	-	-	-	1	4
17.0 - 17.9	-	2	-	-	-	1
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	-	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	1	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	2	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	22	3	2	1	11	33

Table 19. Continued.

Total length(in)	Species and numbers of fish by length groups						
	Red-horse		Quill-back	Drum	Yellow perch	Mooneye	Burbot
	Sil	*Gld					
		-	-	-	-	-	-
0.0 - 0.9		-	-	-	-	-	-
1.0 - 1.9		-	-	-	-	-	-
2.0 - 2.9		-	-	-	-	-	-
3.0 - 3.9		4	-	-	1	-	-
4.0 - 4.9		-	-	-	-	-	-
5.0 - 5.9		-	-	-	-	-	-
6.0 - 6.9		1	-	-	-	-	-
7.0 - 7.9	1	-	-	-	-	-	-
8.0 - 8.9		1	-	-	-	-	-
9.0 - 9.9		3	-	1	-	-	-
10.0 - 10.9		-	-	-	-	-	-
11.0 - 11.9		-	-	-	-	-	-
12.0 - 12.9		-	-	-	-	-	-
13.0 - 13.9	2	4	-	-	-	1	-
14.0 - 14.9		12	1	-	-	-	-
15.0 - 15.9		25	-	-	-	-	1
16.0 - 16.9	1	15	-	-	-	-	-
17.0 - 17.9	1	9	-	-	-	-	1
18.0 - 18.9	1	1	-	1	-	-	-
19.0 - 19.9		1	-	-	-	-	-
20.0 - 20.9		1	-	-	-	-	-
21.0 - 21.9	1	-	-	-	-	-	-
22.0 - 22.9		-	-	-	-	-	-
23.0 - 23.9		-	-	-	-	-	-
24.0 - 24.9		-	-	-	-	-	-
25.0 - 25.9		-	-	-	-	-	-
26.0 - 26.9		-	-	-	-	-	-
27.0 - 27.9		-	-	-	-	-	-
28.0 - 28.9		-	-	-	-	-	-
29.0 - 29.9		-	-	-	-	-	-
30.0 - 30.9		-	-	-	-	-	-
31.0 - 31.9		-	-	-	-	-	-
32.0 - 32.9		-	-	-	-	-	-
33.0 - 33.9		-	-	-	-	-	-
34.0 - 34.9		-	-	-	-	-	-
35.0 - 35.9		-	-	-	-	-	-
36.0 - 36.9		-	-	-	-	-	-
		-	-	-	-	-	-
Totals	7	77	1	2	1	1	2

Table 20. Length frequency distributions in the Red Lake River for Sector 7, 1976.

Total length (in)	Species and numbers of fish by length groups					
	Walleye	Rock bass	White sucker	Shorthead redhorse	Silver redhorse	Golden redhorse
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	-	4	-	-	8
4.0 - 4.9	-	-	1	-	-	-
5.0 - 5.9	1	-	-	-	-	-
6.0 - 6.9	3	-	-	-	-	-
7.0 - 7.9	4	1	-	-	-	-
8.0 - 8.9	1	-	-	-	-	2
9.0 - 9.9	-	-	-	-	-	3
10.0 - 10.9	-	-	-	-	1	1
11.0 - 11.9	1	-	-	1	1	4
12.0 - 12.9	-	-	-	3	-	9
13.0 - 13.9	2	-	-	5	1	11
14.0 - 14.9	-	-	3	8	1	25
15.0 - 15.9	-	-	1	10	1	39
16.0 - 16.9	-	-	1	6	1	26
17.0 - 17.9	-	-	1	-	-	2
18.0 - 18.9	2	-	-	-	1	3
19.0 - 19.9	-	-	-	-	-	1
20.0 - 20.9	-	-	-	-	-	3
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	14	1	11	33	7	137

Table 20. Continued.

Total length(in)	Species and numbers of fish by length groups					
	Quillback	Drum	Mooneye	Burbot		
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	-	-	-	-	-
4.0 - 4.9	-	-	-	-	-	-
5.0 - 5.9	-	-	2	-	-	-
6.0 - 6.9	-	-	1	-	-	-
7.0 - 7.9	-	-	-	-	-	-
8.0 - 8.9	1	-	-	-	-	-
9.0 - 9.9	-	-	-	-	-	-
10.0 - 10.9	-	2	-	-	-	-
11.0 - 11.9	-	5	-	-	-	-
12.0 - 12.9	-	-	-	-	-	-
13.0 - 13.9	-	-	-	-	-	-
14.0 - 14.9	-	-	-	1	-	-
15.0 - 15.9	1	-	1	-	-	-
16.0 - 16.9	-	-	-	1	-	-
17.0 - 17.9	-	-	-	-	-	-
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	2	-	-	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	2	-	-	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	2	11	4	2	-	-

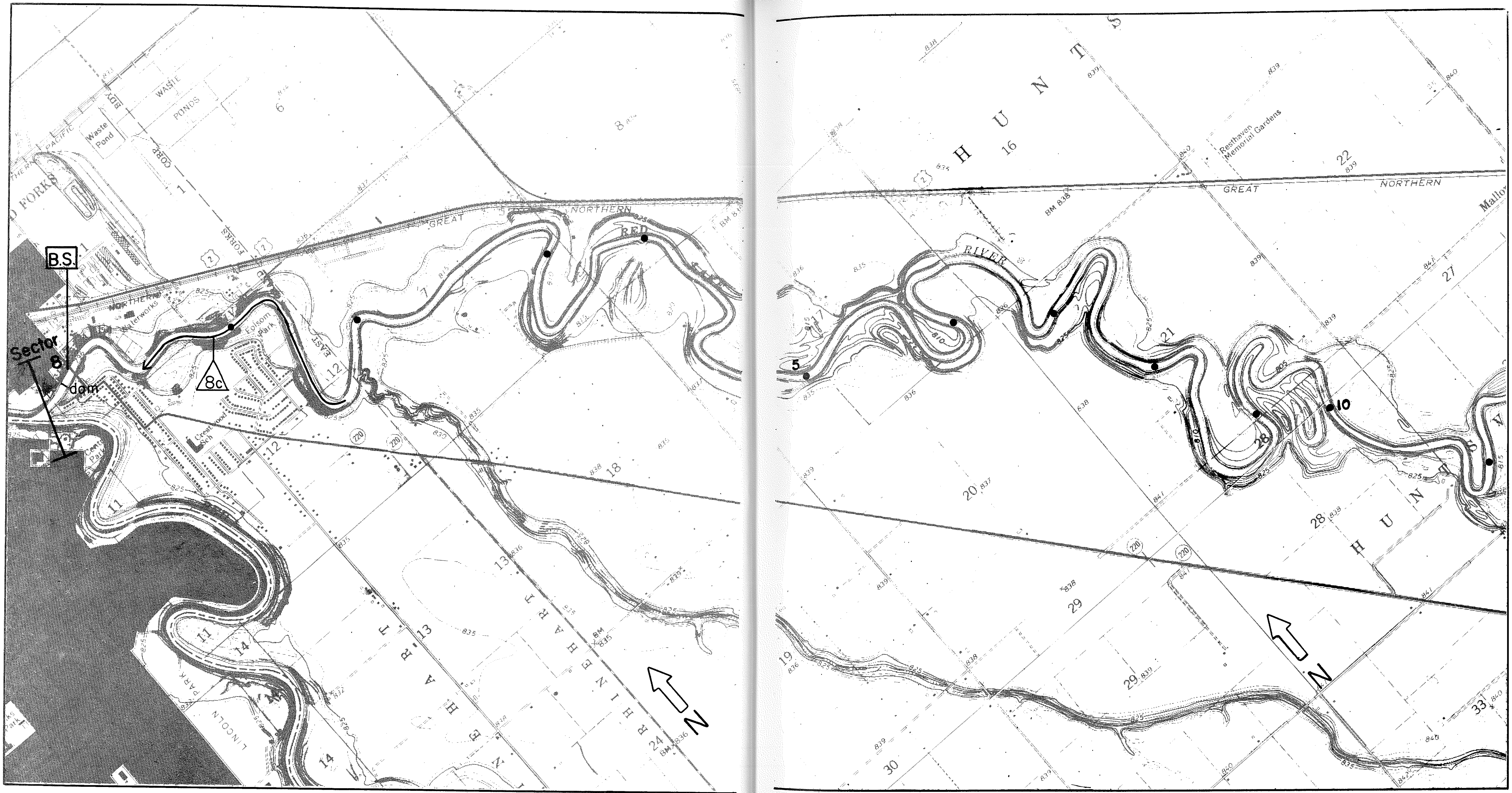
Table 21. Length frequency distributions in the Red Lake River for Sector 8, 1976.

Total length(in)	Species and numbers of fish by length groups					
	Walleye	Sauger	Northern pike	Channel catfish	Rock bass	White sucker
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	1	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	-	-	-	-	1
4.0 - 4.9	1	-	-	-	1	-
5.0 - 5.9	-	-	-	-	-	-
6.0 - 6.9	2	-	1	-	-	-
7.0 - 7.9	2	-	-	-	3	-
8.0 - 8.9	1	-	-	-	4	-
9.0 - 9.9	-	-	-	-	-	1
10.0 - 10.9	-	-	-	-	-	-
11.0 - 11.9	-	-	-	-	1	-
12.0 - 12.9	-	1	-	-	-	-
13.0 - 13.9	-	-	-	-	-	-
14.0 - 14.9	-	-	-	-	-	-
15.0 - 15.9	-	-	-	1	-	1
16.0 - 16.9	-	-	-	-	-	-
17.0 - 17.9	-	-	-	-	-	-
18.0 - 18.9	-	-	-	-	-	-
19.0 - 19.9	-	-	-	1	-	-
20.0 - 20.9	-	-	-	-	-	-
21.0 - 21.9	-	-	-	-	-	-
22.0 - 22.9	1	-	-	1	-	-
23.0 - 23.9	-	-	-	-	-	-
24.0 - 24.9	-	-	-	1	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	1	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	7	1	1	5	10	3

Table 21. Continued.

Total length(in)	Species and numbers of fish by length groups					
	Short-head red-horse	Golden red-horse	Quill-back	Carp	Drum	Mooneye
	-	-	-	-	-	-
0.0 - 0.9	-	-	-	-	-	-
1.0 - 1.9	-	-	-	-	-	-
2.0 - 2.9	-	-	-	-	-	-
3.0 - 3.9	-	7	-	-	-	-
4.0 - 4.9	-	1	-	-	-	1
5.0 - 5.9	-	-	4	-	-	1
6.0 - 6.9	-	4	-	-	-	-
7.0 - 7.9	-	-	-	-	-	-
8.0 - 8.9	-	-	-	-	-	6
9.0 - 9.9	-	-	-	-	1	2
10.0 - 10.9	3	-	-	-	11	2
11.0 - 11.9	9	2	-	-	6	12
12.0 - 12.9	7	2	-	-	1	2
13.0 - 13.9	8	4	-	-	1	-
14.0 - 14.9	3	7	-	-	1	-
15.0 - 15.9	6	13	2	-	-	-
16.0 - 16.9	3	4	3	-	-	-
17.0 - 17.9	-	5	8	3	1	-
18.0 - 18.9	-	4	-	3	-	-
19.0 - 19.9	-	3	-	-	-	-
20.0 - 20.9	-	1	-	2	-	-
21.0 - 21.9	-	-	-	1	-	-
22.0 - 22.9	-	-	-	-	-	-
23.0 - 23.9	-	-	-	1	-	-
24.0 - 24.9	-	-	-	-	-	-
25.0 - 25.9	-	-	-	-	-	-
26.0 - 26.9	-	-	-	-	-	-
27.0 - 27.9	-	-	-	-	-	-
28.0 - 28.9	-	-	-	-	-	-
29.0 - 29.9	-	-	-	-	-	-
30.0 - 30.9	-	-	-	-	-	-
31.0 - 31.9	-	-	-	-	-	-
32.0 - 32.9	-	-	-	-	-	-
33.0 - 33.9	-	-	-	-	-	-
34.0 - 34.9	-	-	-	-	-	-
35.0 - 35.9	-	-	-	-	-	-
36.0 - 36.9	-	-	-	-	-	-
	-	-	-	-	-	-
Totals	39	57	17	10	22	26

Plates 1-17. Red Lake River by section from the mouth to Lower Red Lake.

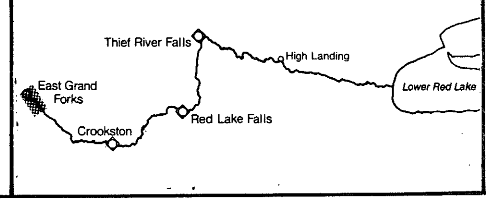


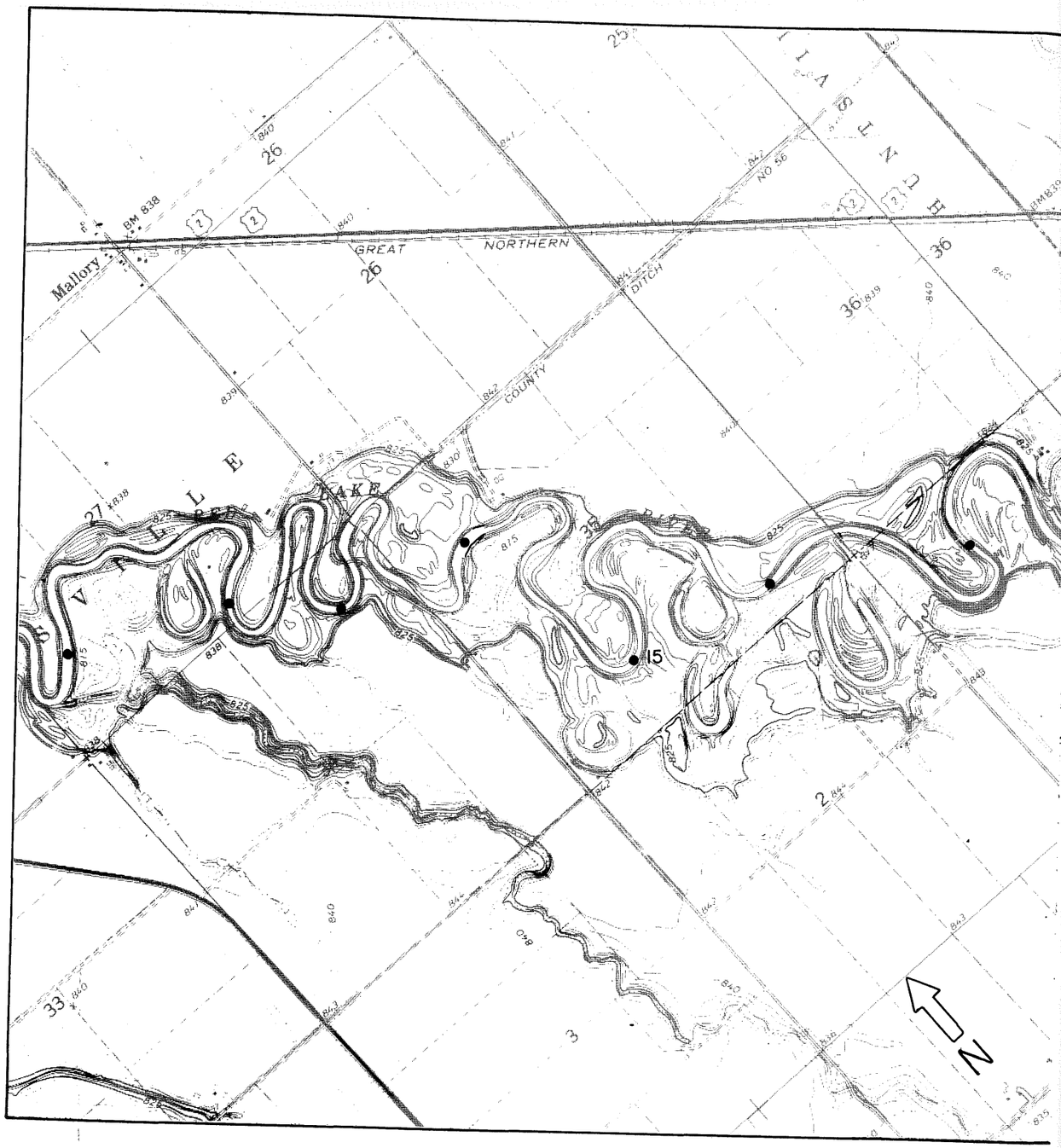
LEGEND

SECTOR 1 2	SECTOR START AND/OR END	B.S.	BOOMSHOCKER ACCESS
1a	ELECTROFISHING RUN	C	CANOE ACCESS
	SCALE 1:24,000	X	CITY PARK

PLATE 1

scale 1":2000'





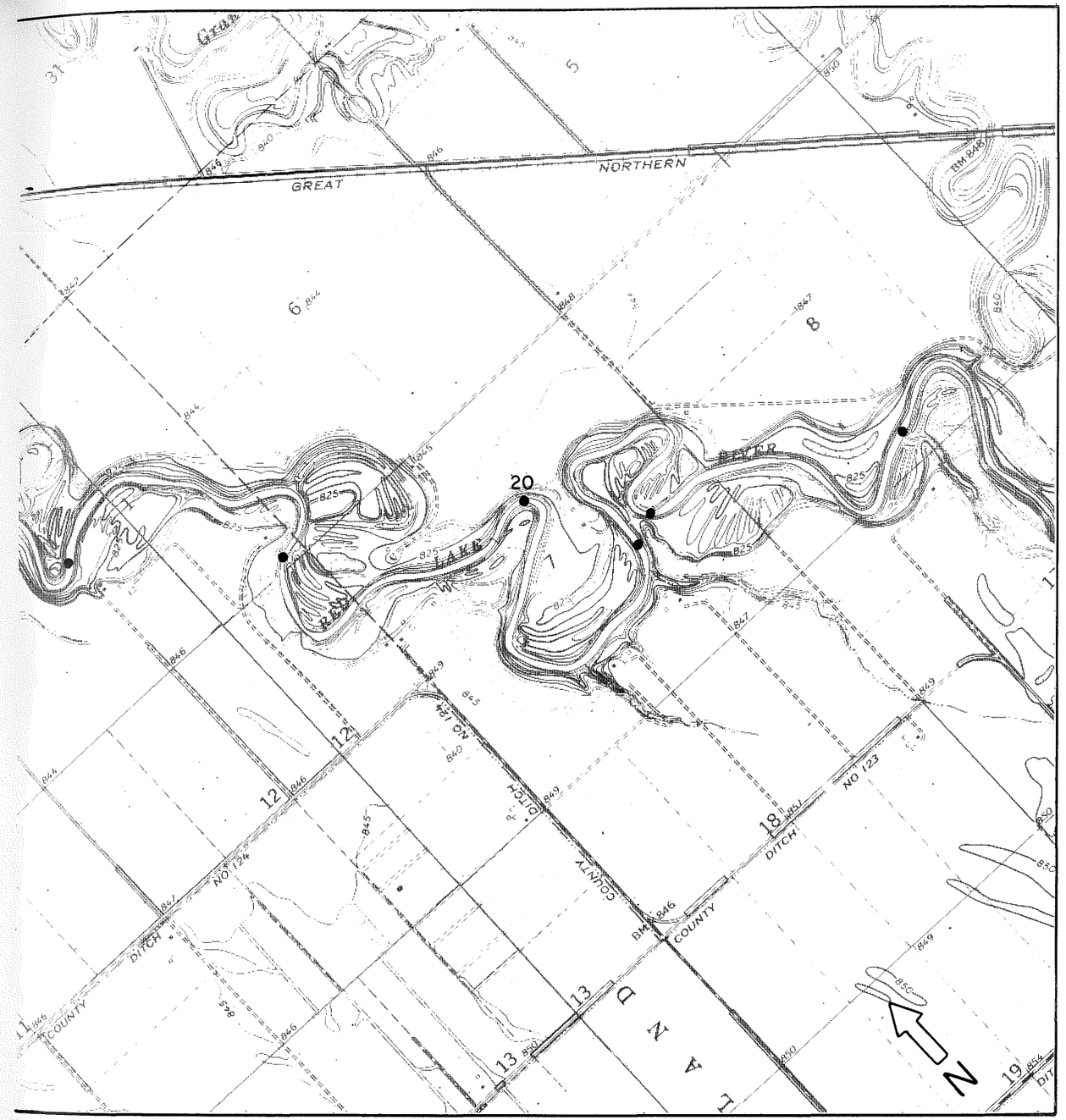


PLATE 2

scale
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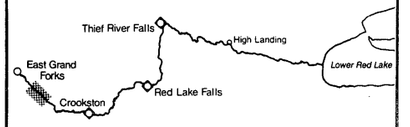

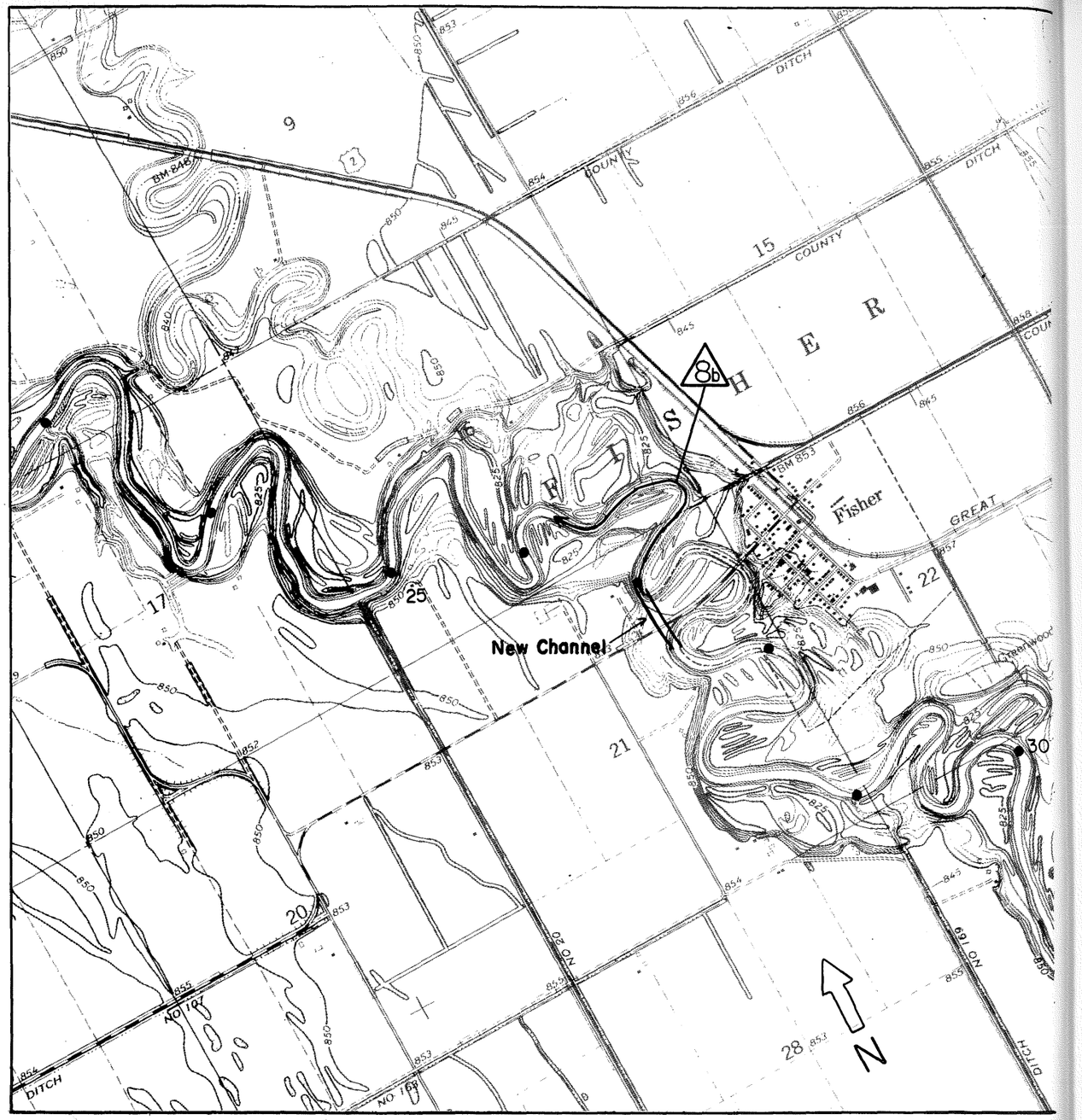

PLATE 3

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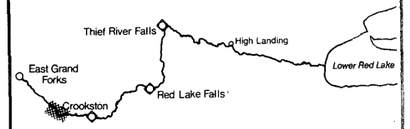

PLATE 4

scale
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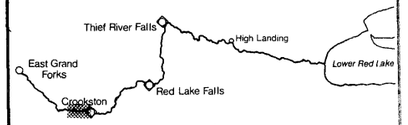

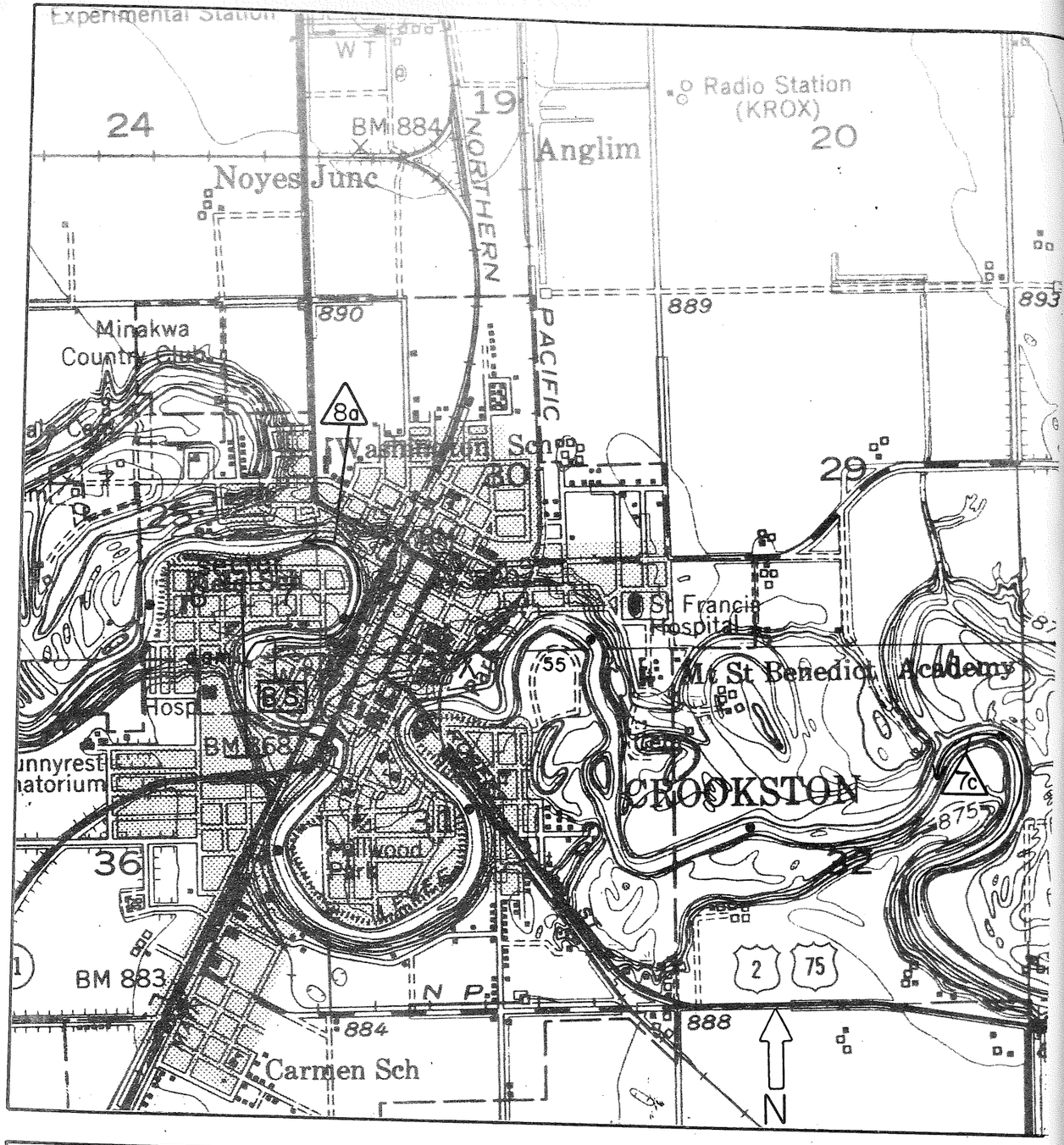

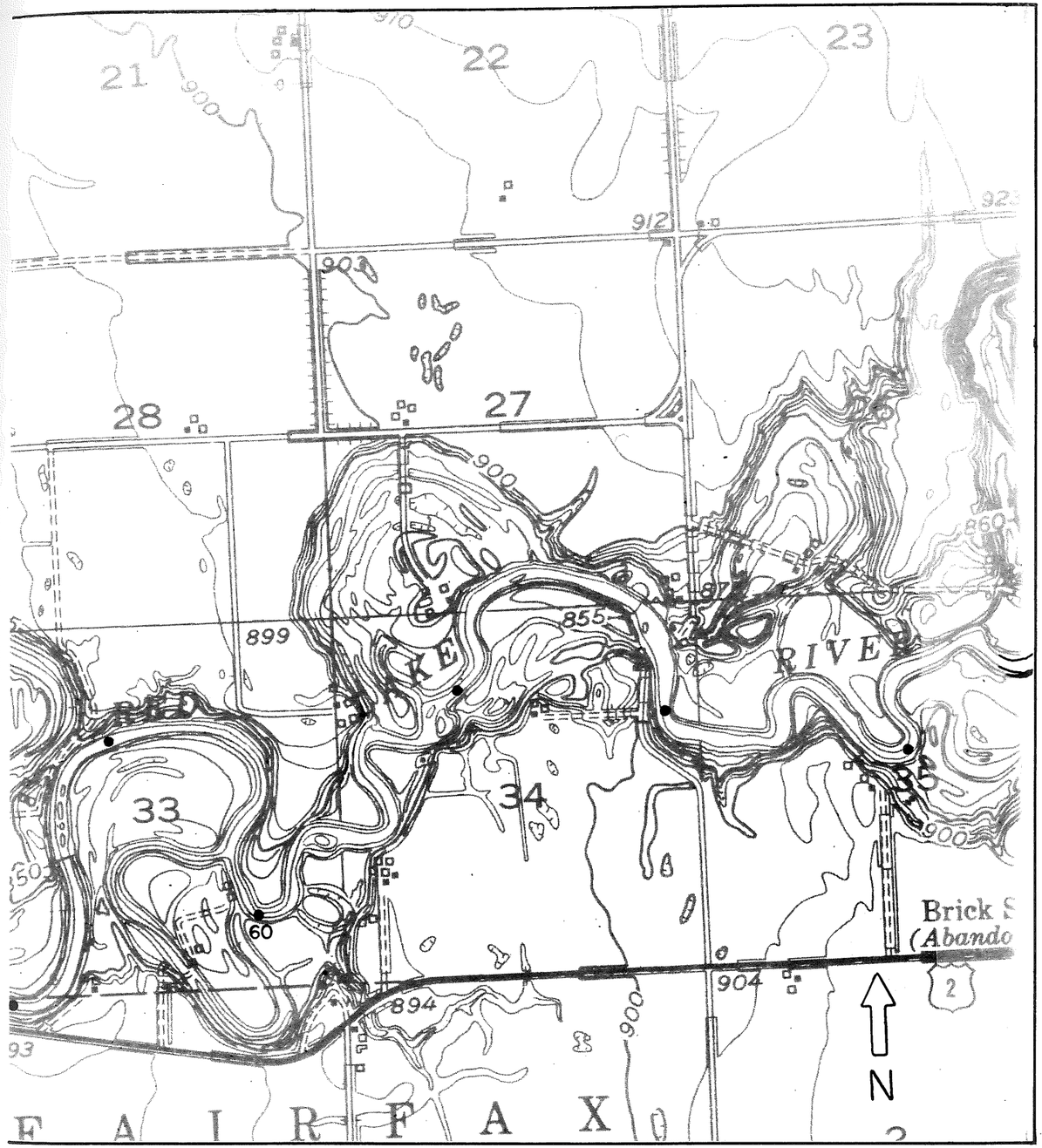

PLATE 5

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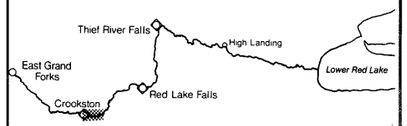

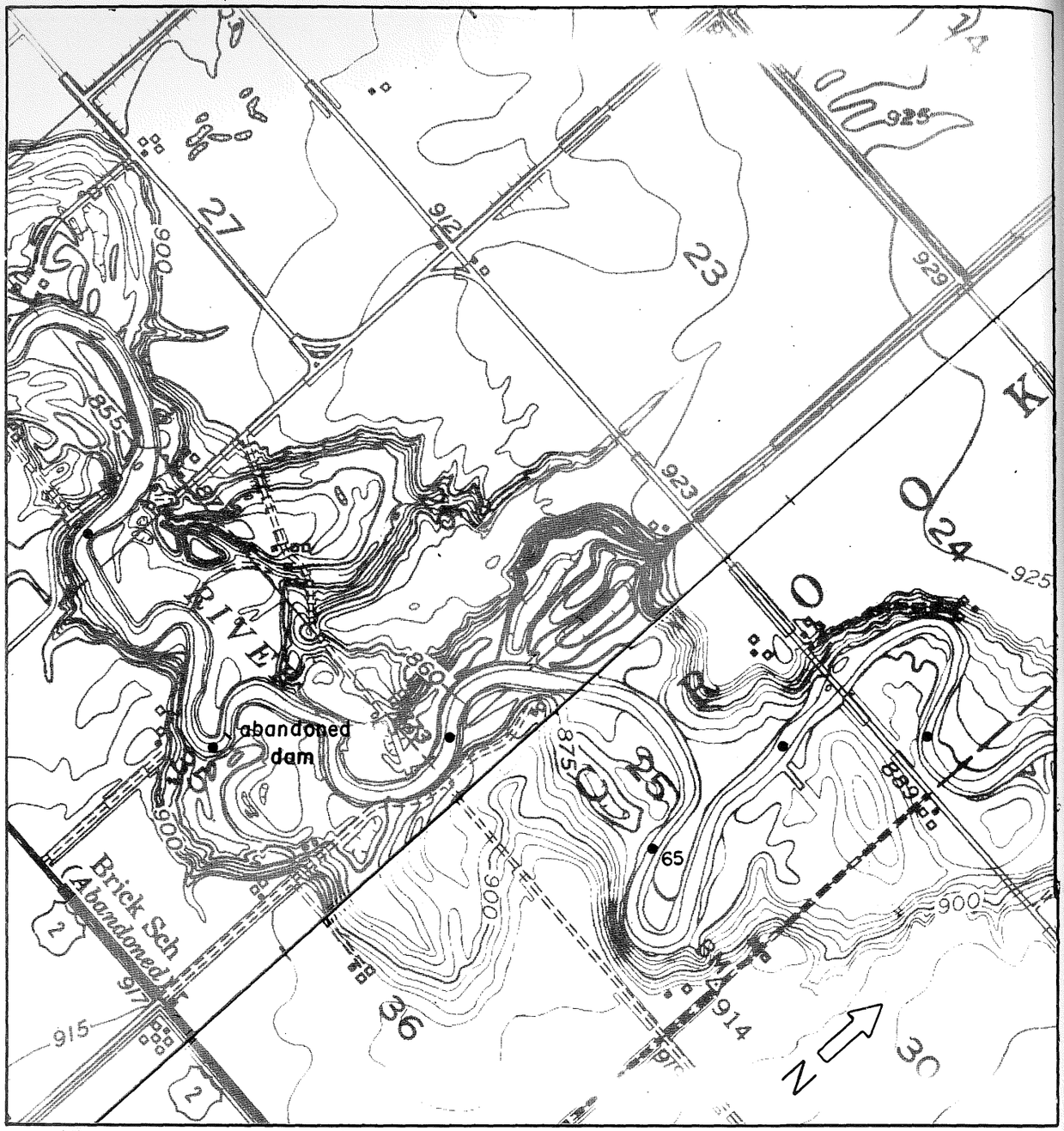

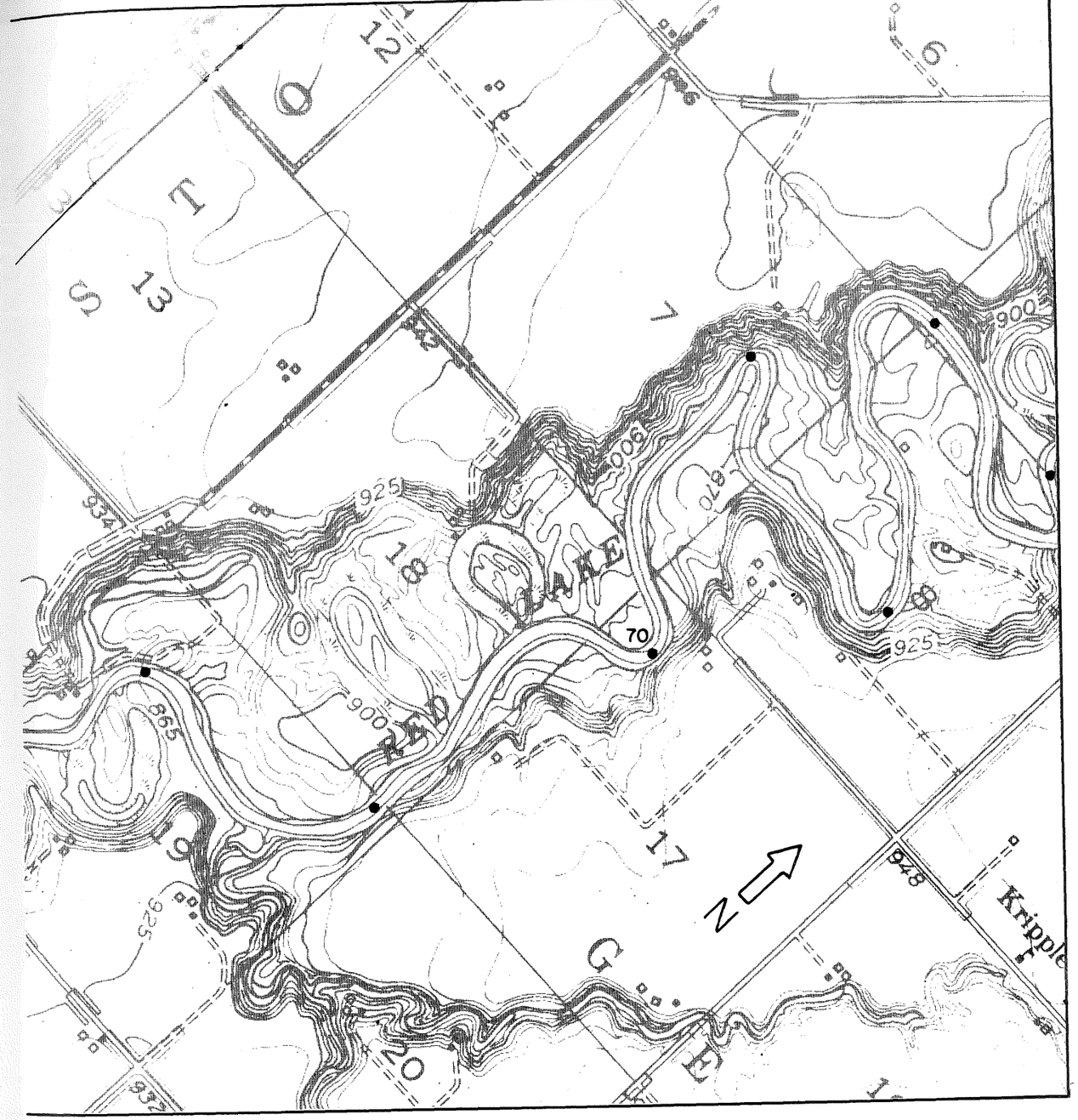

PLATE 6

Scale 1":2000'

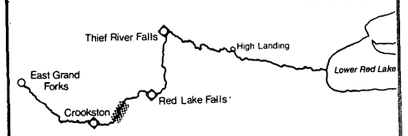

PLATE 7

scale
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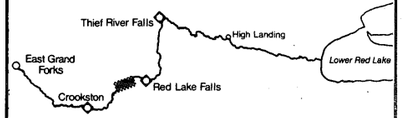

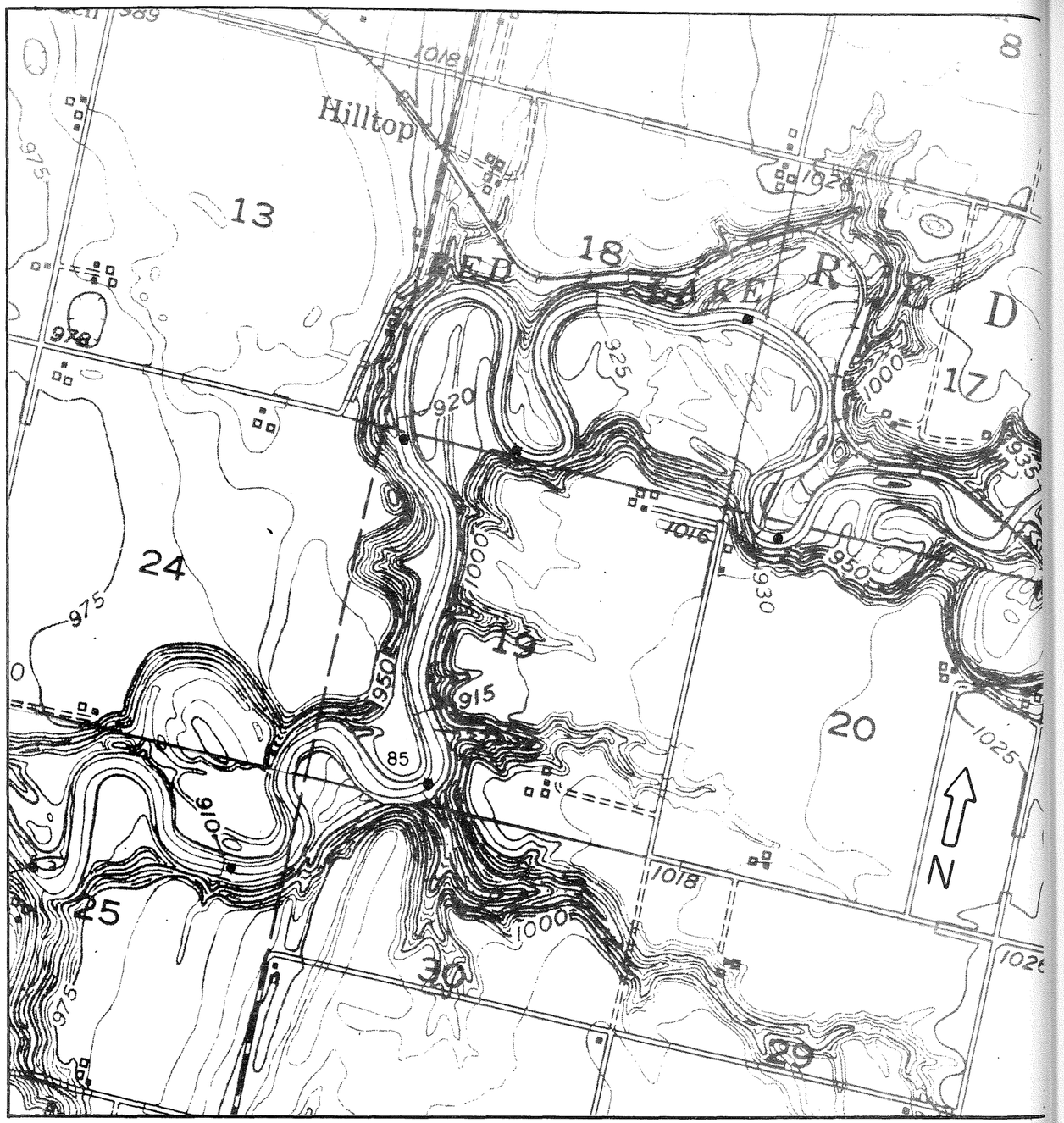

PLATE 8

scale 1" : 2000'

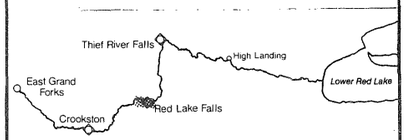

PLATE 9

scale
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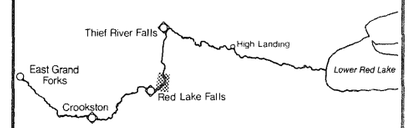

PLATE 10

scale
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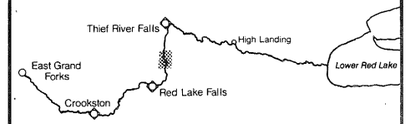

PLATE 11

scale
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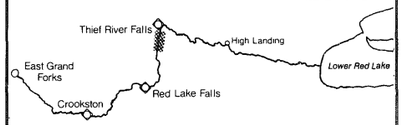

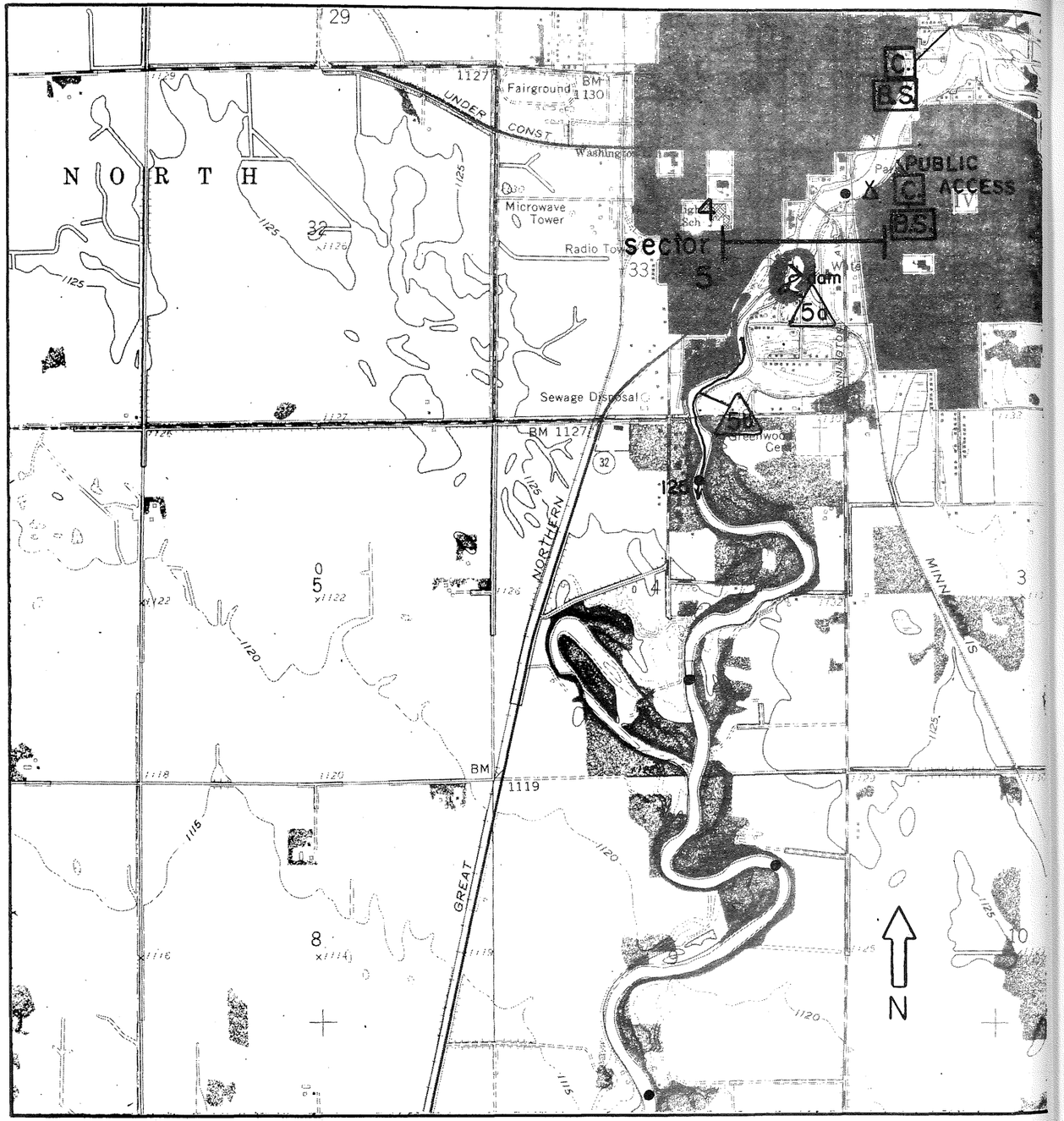

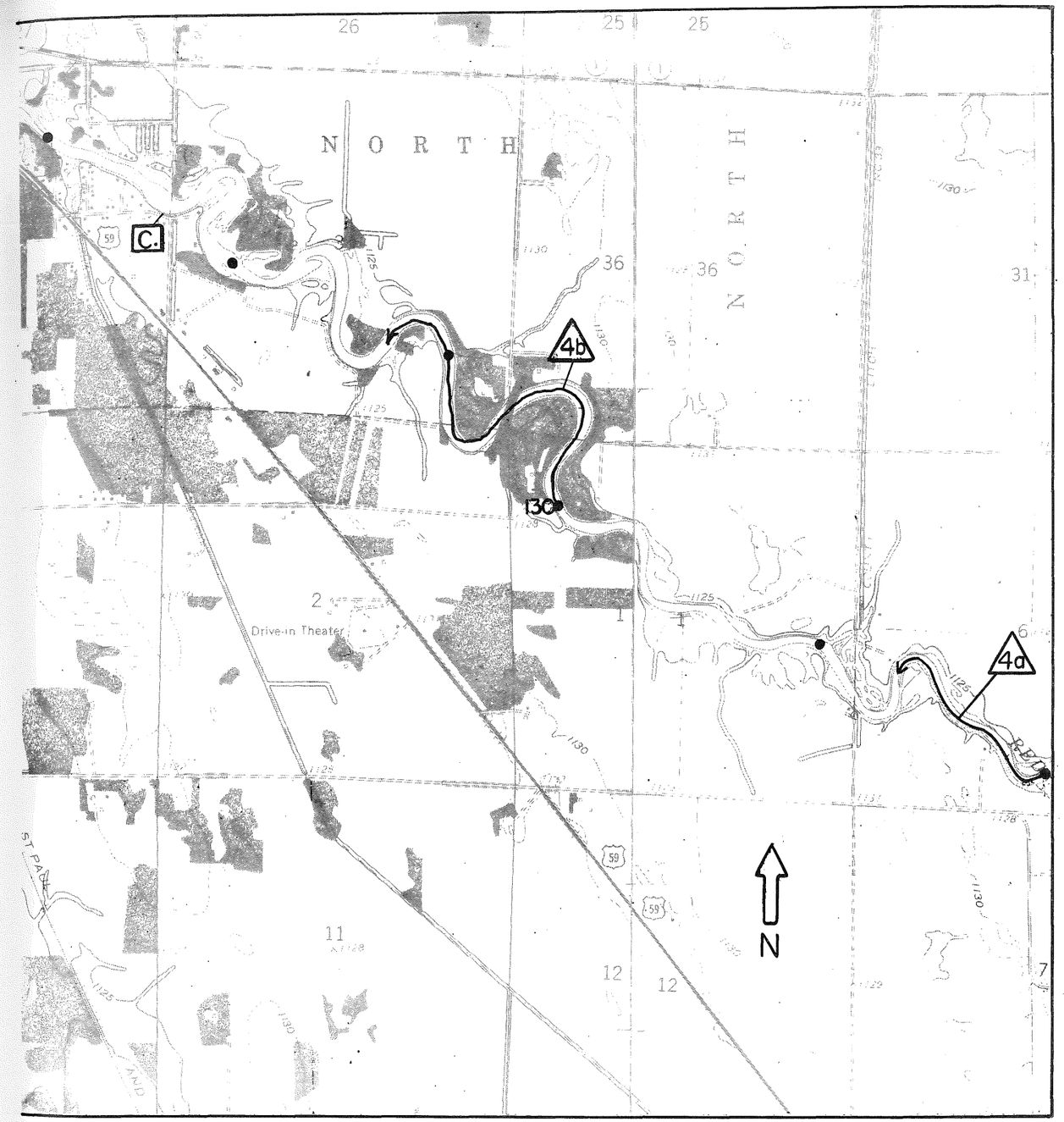

PLATE 12

scale
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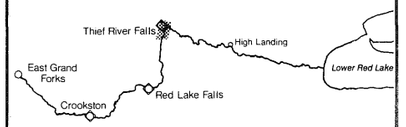

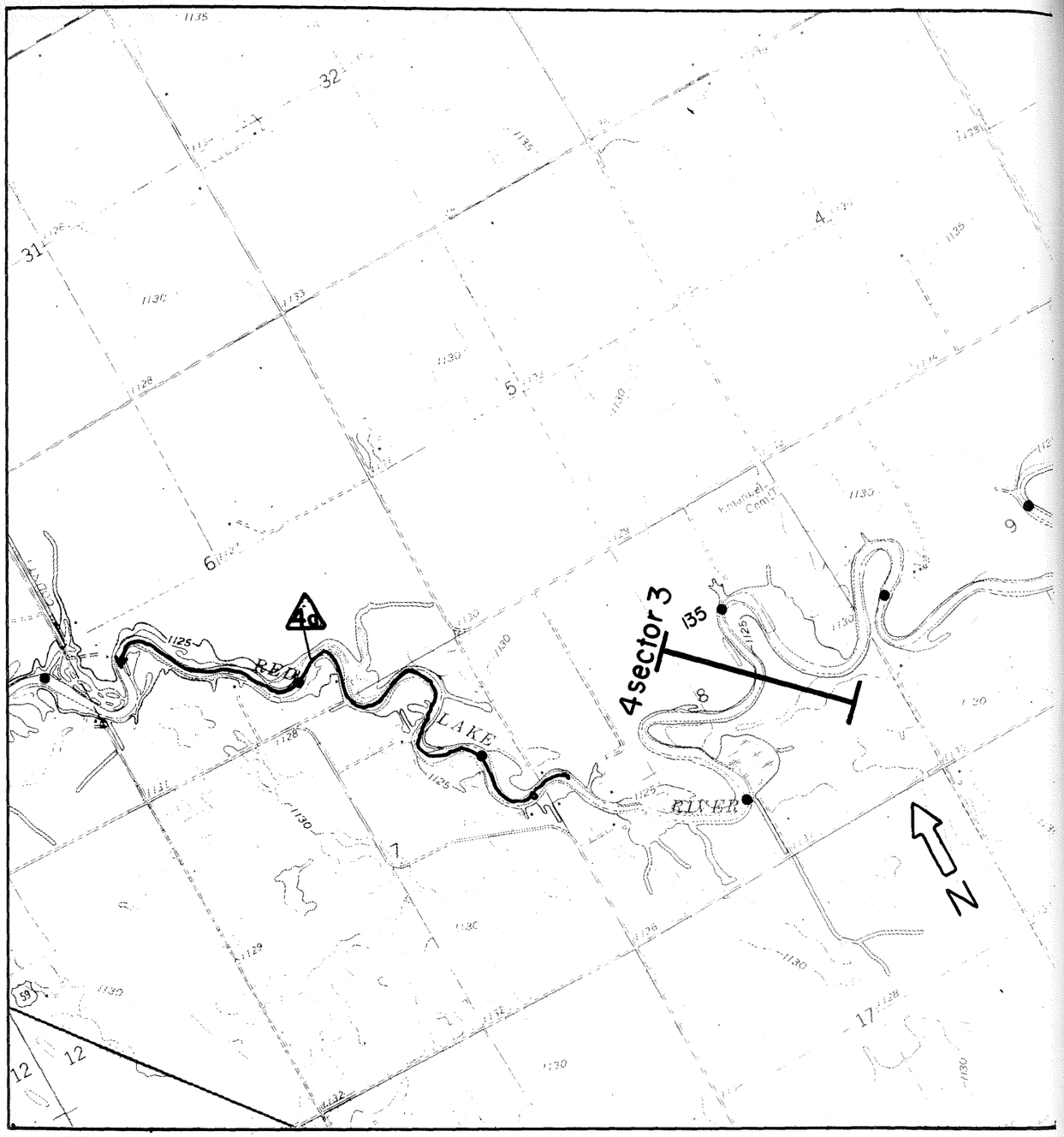

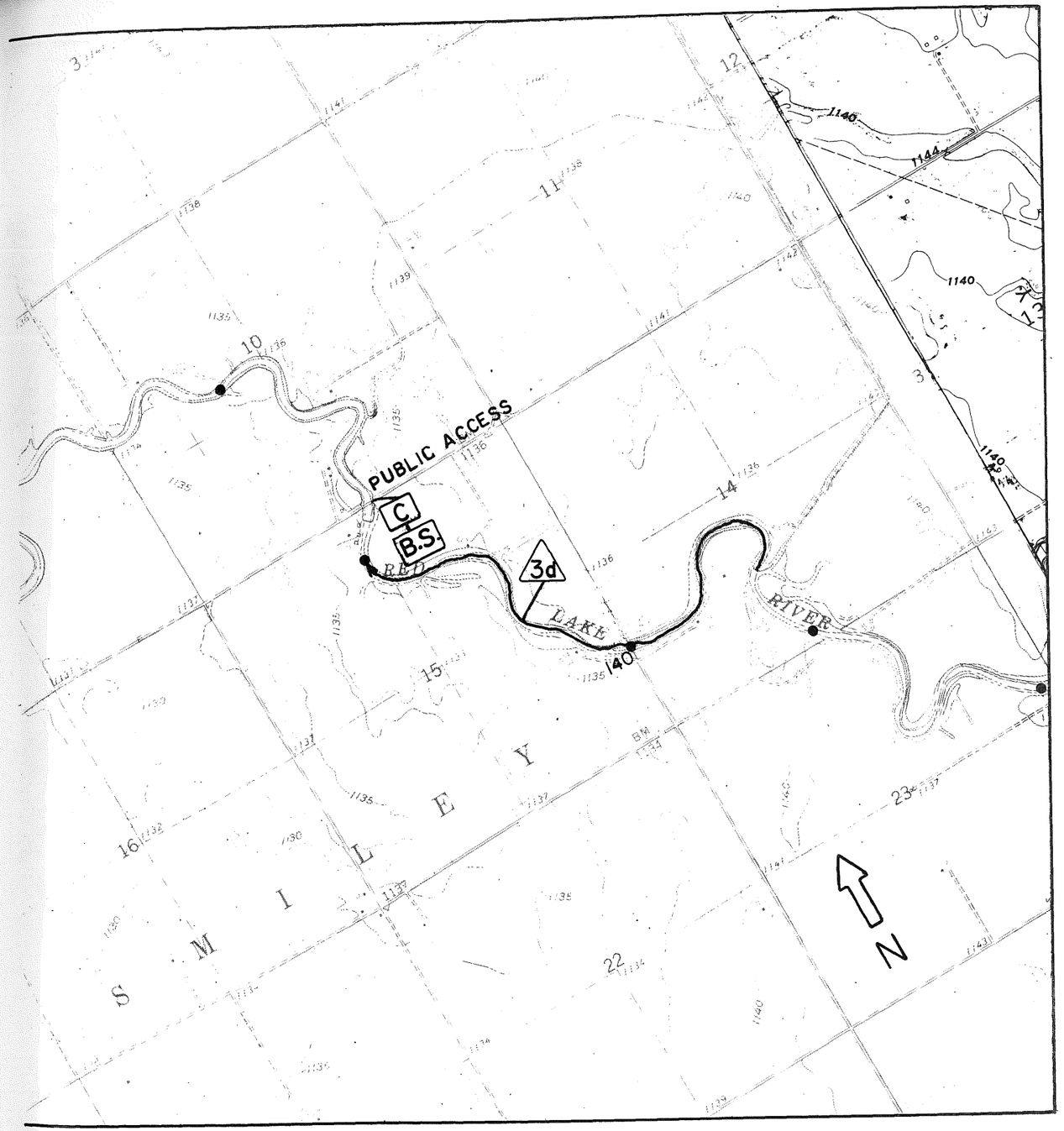

PLATE 13

scale
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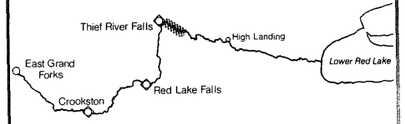

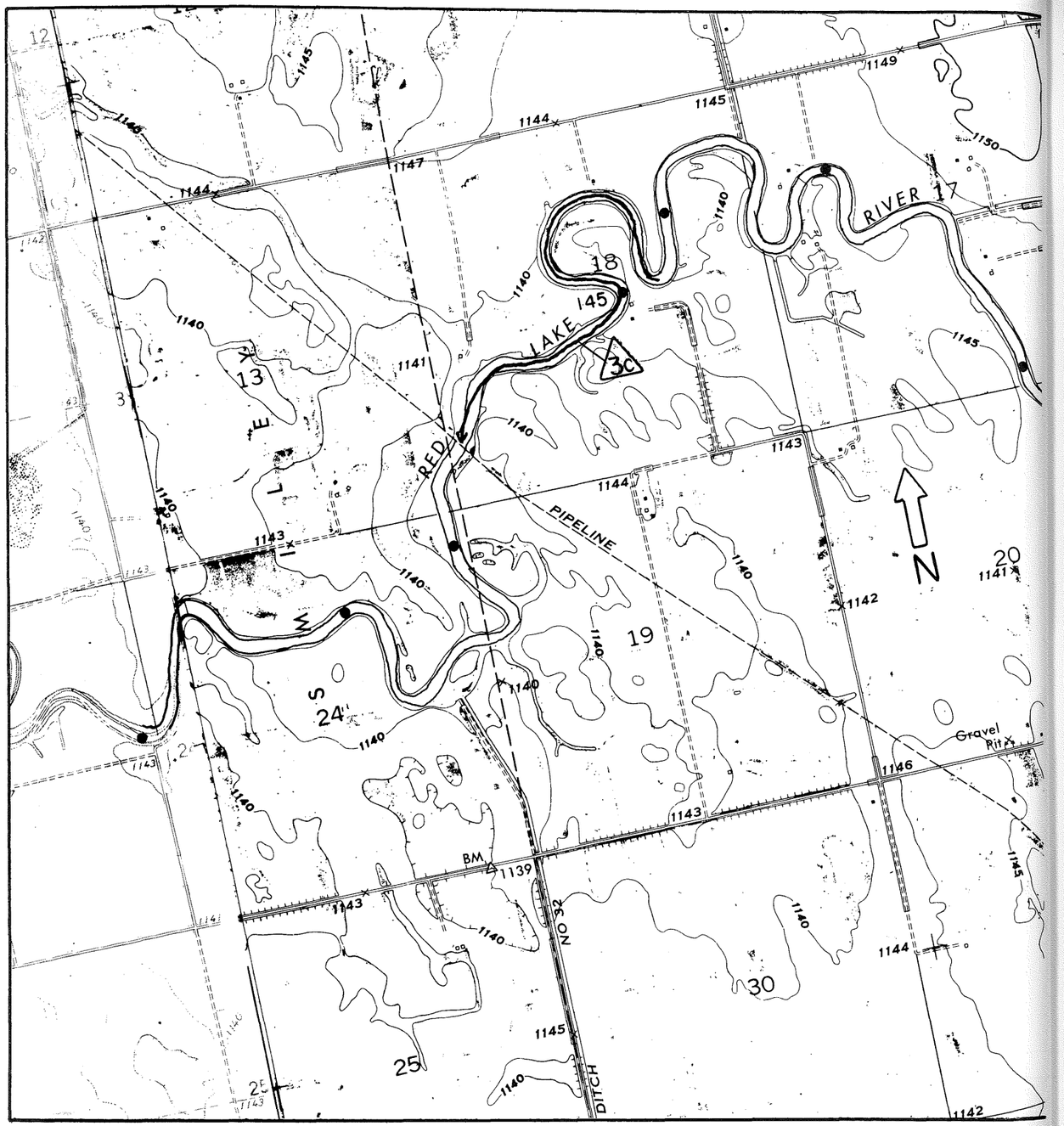

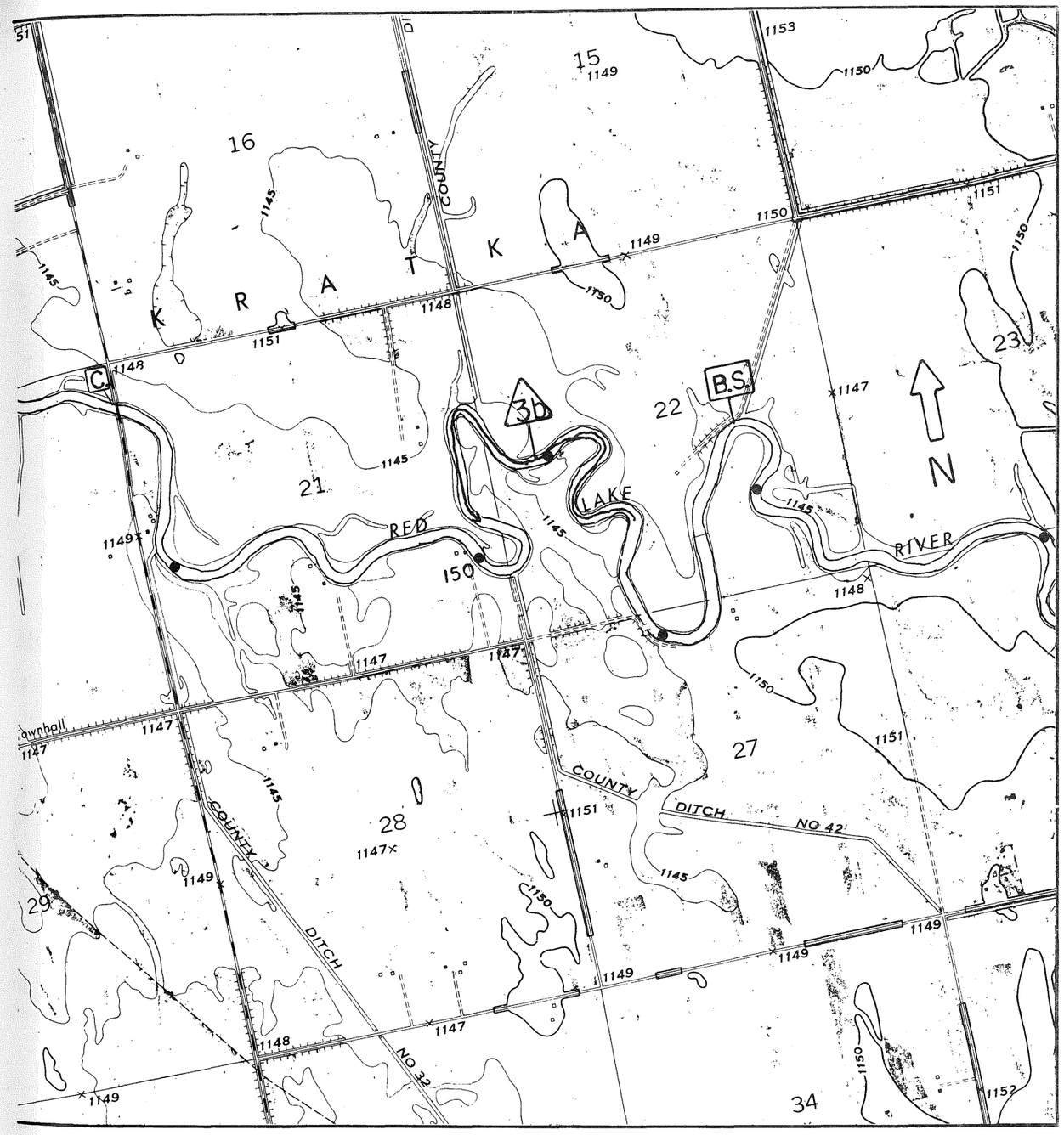

PLATE 14

scale
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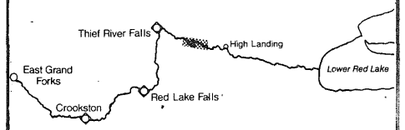

PLATE 15

scale
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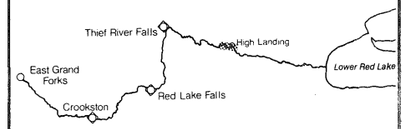
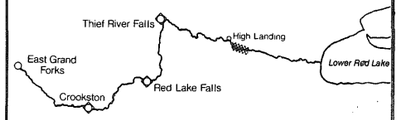


PLATE 16

scale
1":2000'



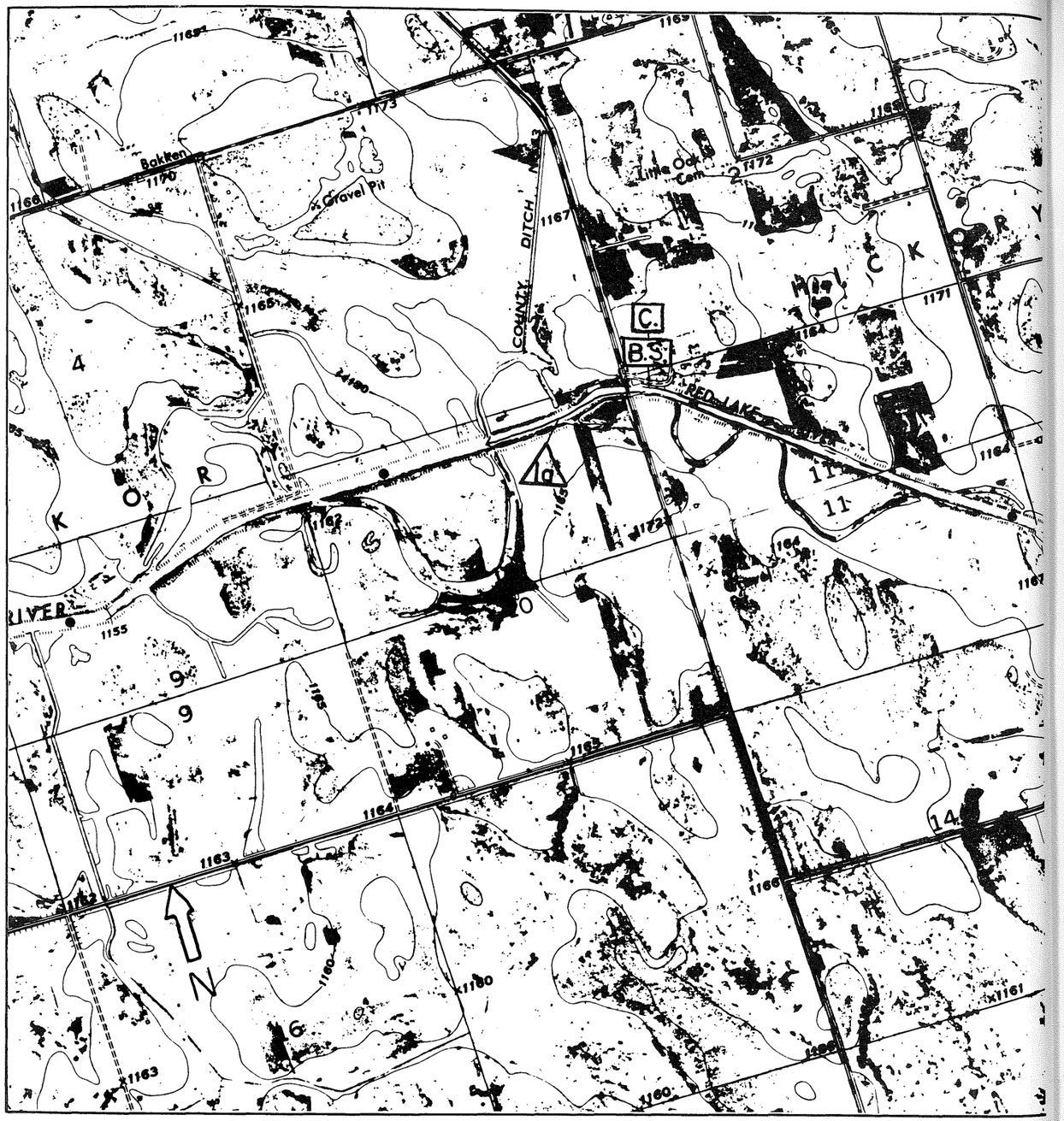


PLATE 17

scale
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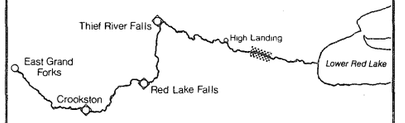

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