SURVEY OF THE MINNESOTA RIVER

BIOLOGICAL SURVEY OF THE MINNESOTA RIVER
MANKATO TO MOUTH

ABSTRACT

A fisheries survey begun in 1958 and concluded in 1959 examined 107 miles of the lower portion of the Minnesota River. In this segment, the river is characterized as being a moderately slow, turbid stream which meanders throughout a valley varying in width from 1 to 5 miles. Because there are no major tributaries in this portion, the general character of the river is quite similar throughout.

The meandering nature of the river is due to the low gradient (average about 1 foot per mile) throughout most of this portion. The resulting stream basin is a relatively wide, shallow channel which has collected large amounts of sand brought into the stream from tributaries lying in eroded watersheds. The only remaining pools exist in the outside of each of the sharper bends, and most of the fish and the fish food production occurs here.

The fact that the Minnesota River is subject to such extreme flows during floods and mid-summer is no doubt one limiting factor. The shifting sand bottom, turbid waters, pollution, and warm temperatures are no doubt also limiting the fish production to the capacity of the pools.

Although over 500 springs occur near the banks of the river channel, most are so minute that their cool temperatures affect only a small area of the river.

Fish were sampled using both electro-fishing gear and trapnets. A list of the fish taken by electro-fishing and the approximate percent of the total catch which they make up are shown below:

Species	Sector I Mouth-Shakopee	Sector II Shakopee-Henderson	Sector III Henderson-Mankato
Carp	43	60	67
Gizzard shad	37	X	1
Quillback	1	6	6
Sheepshead	6	2	3
Northern redhorse	2	8	5
Silver redhorse	X	1	2
Smallmouth bass		X	X
White bass	3	5	4
Carpsucker (highfin and/or river)	1	4	1
Sauger	1	3	2
Northern pike	1	1	X
Walleye	X	3	1
Black crappie	X	X	X
White crappie	1	X	X
Channel catfish	X	4	5
Flathead catfish	X	1	1
Common sucker	X	1	X
Shortnose gar	1	X	1
Dogfish	X		
Bigmouth buffalofish	1	1	X
Smallmouth buffalofish		X	X
Hog sucker		X	X
Rock bass			X
Largemouth bass	X		

X = present in low numbers

Any improvement involving habitat alteration would be impractical unless applied on a very large scale capable of withstanding the flooding and erosion now present. Fishing is provided on a limited scale to anglers who can utilize the species present. Efforts to curb the existing domestic and industrial pollution should improve the quality of the existing sport fishes present. With future increase of angling pressure on other waters the more complete management of such a large river may become more necessary than it appears to be now.

Some Notes on Minnesota River Survey from Mouth of Blue Earth River at Mankato to Mouth of Minnesota River at Mendota (St. Paul)

Dates of Field Work and Survey Personnel

June 17 through September 8, 1958	July 27 through August 7, 1959
Philip A. Gilderhus, Aquatic Biologist I	Earl H. Huber, Aquatic Biologist I
James R. Lloyd, Aquatic Biologist Aide	Jay P. Johnson, Laborer I
Thomas A. McConnell, Aquatic Biologist Aide	

Length of river surveyed - 107 miles

Nine counties border on this portion of river surveyed --
Blue Earth, Nicollet, LeSueur, Sibley, Scott, Carver, Hennepin, Dakota and Ramsey

Surveyed portion of river divided into following 3 sectors:
I - from highway bridges at Mendota to Shakopee
II - from highway bridges at Shakopee to Henderson
III - from Henderson highway bridge to mouth of Blue Earth River

Following are some of the river's watershed, physical, chemical, and biological characteristics.

SECTOR I

From Highway Bridges at Mendota to Shakopee

A. Watershed Characteristics
1. Length of river - 24.2 miles
2. Width of river - average of about 225 feet with an average of about 300 feet from Savage downstream
3. River depth - maximum between 30 to 35 feet, average between 4 to 5 feet with an average of about 9 feet from Savage downstream
4. Flow - estimated at 500 c.f.s. at Mendota bridge on August 6-7, 1959
5. Gradient - nearly level
6. Bottom soil type - mostly sand with some silt
7. Pool type - mostly one vast shallow pool with unproductive bottom and no shelter
8. Tributaries - 35 were observed on August 6-7, 1959, ranging in flow from less than 0.05 c.f.s. at one of the tributaries to a maximum of 12.42 c.f.s at Eagle Creek (Tributary M-55-23); water temperatures ranged from 51½ °F. at one of the tributaries to a maximum of 81½ °F. at tributary M-55-25 out of Fisher Lake in Scott County
9. Nature and use of valley - 75% wild land, 20% farmland, and 5% dwellings and industry; valley width varies from about one mile at the river's mouth to near 4½ miles at Shakopee.

B. Physical Characteristics of Water
1. Color and turbidity - moderately brown and very turbid even during periods of little rainfall; Secchi disk readings - 6 to 7 inches
2. Temperatures - ranged from lowest reading of 76 °F. three-fourths mile below Lyndale Avenue bridge to highest reading of 95½ °F. at side channel to Northern States Power Black Dog plant. Air temperature was 65 °F. with a 100% cloud cover when recordings were made between 10:30 - 11:05 a.m. on August 7, 1959.

C. Chemical Characteristics of Water

1. Water quality - analysis of 1 surface water sample taken downstream near Shakopee:

	P.P.M.
Total phosphorus	0.116
Chloride ion	10.8
Total nitrogen	1.225
Total alkalinity	266.0
Dissolved oxygen	12.8

2. Pollution - 5 sewage outlets were observed from Shakopee downstream to the Mississippi River plus the discharge of warm water from the Northern States Power Black Dog plant.

D. Biological Characteristics of River

1. Aquatic plants - none were observed to be present in this sector of the river
2. Fishes - 25 species present (electro-fishing, seining and trapnetting).

Four runs (a total of 8¼ hours) were made along the entire length of this sector with a 230-volt A.C. shocker. A total of 607 fish were captured representing 20 species. Percent composition of total catch in the four runs:

Species	Total Number	Percent Composition
Carp	259	42.7
Gizzard shad	226	37.2
Sheepshead	39	6.4
White bass	18	3.0
Northern redhorse	13	2.1
Carpsucker	7	1.2
Sauger	6	1.0
Northern pike	5	0.8
Bigmouth buffalofish	5	0.8
Quillback	5	0.8
Shortnose gar	5	0.8
White crappie	4	0.7
Flathead catfish	3	0.5
Silver redhorse	3	0.5
Black crappie	2	0.3
Common sucker	2	0.3
Logfish	2	0.3
Walleye	1	0.2
Largemouth bass	1	0.2
Channel catfish	1	0.2
Totals 20	607	100.0

SECTOR II

From Highway Bridges at Shakopee to Henderson

A. Watershed Characteristics
1. Length of river - 44.5 miles
2. Width of river - between 150 to 200 feet or an average near 180 feet
3. River depth - average near 3 feet
4. Flow - 415 c.f.s. on July 27, 1959, and 395 c.f.s. on August 14, 1959, at U.S. Corps of Engineers gaging station 2½ miles south of Carver
5. Gradient - approximately 20 feet in this sector (about 0.1 inch per 100 feet) or about 0.5 feet per mile.
6. Bottom soil type - mostly shifting sand with some silt in sheltered areas; there are a few areas of gravel and boulder
7. Pool type - mostly deep pools in the wider portions of the stream having little or no shelter and unprotected bottom. There are some A-2 and D-2 types, however. See stream survey manual for description. This sector appears to be approximately 60% bars and 40% pools.
8. Tributaries - 21 were observed ranging in flow from 0.05 c.f.s. at one of the tributaries to a maximum of 2.0 c.f.s at 3 of the tributaries one of which is Carver Creek (Tributary M-55-42) which had a silty flow, water temperatures ranged from 59½ °F. at one of the tributaries to a maximum of 95½ °F. at Tributary M-55-56 which is located between Blakeley and Henderson.
9. Springs - 9 spring areas were located with over a total of 300 springs; flows ranged from "minute" at one of the areas to a maximum flow of 2.0 c.f.s. at the largest spring area. Temperatures ranged generally from 48 °F. to the low 50's.
10. Nature and use of valley - bottom lands are about 65% farmland, 30% wild land, and 5% homesites; valley width varies from about 7/8 mile to approximately 4 miles.

B. Physical Characteristics of Water
1. Color and turbidity - moderately brown with Secchi disk readings of 6 to 7 inches during both years of the survey.
2. Temperatures - ranged from lowest reading of 77½ °F at Henderson bridge to highest reading of 82½ °F. at the Jordan bridge. With a clear sky air temperature was 83 °F. at 11:45 a.m. on August 4, 1959, at the Henderson bridge. With 15% cloud cover air temperature was 88 °F. at 2:30 p.m. on August 5, 1959, at the Jordan bridge.

C. Chemical Characteristics of Water
1. water quality - analyses of 4 surface water samples taken above and below sewer outlets at Chaska and Belle Plaine:

	range in p.p.m.
Total phosphorus	0.19 - 0.81
Chloride ion	21.3 - 55.5
Total nitrogen	0.65 - 2.73
Carbon dioxide	5.0 - 8.8
Total alkalinity	258.0 - 290.0

Dissolved oxygen ranged from 7.4 p.p.m. at station 8 (Jordan bridge) to 8.8 p.p.m. at station 7 (Belle Plaine). Stations 6 (Blakeley) and 9 (Chaska) recorded 8.7 p.p.m. dissolved oxygen.

2. Pollution - 4 sewage outlets were observed from Belle Plaine downstream to Chaska. These were in conjunction with a creamery and sugarbeet factory.

D. Biological Characteristics of River

1. Aquatic plants - nonexistent or possibly very limited.
2. Fishes - 35 species present (electro-fishing, seining, and trapnetting). Nine runs (a total of 19.92 hours) were made along the entire length of this sector except for the rapids below Jordan.

A total of 1,417 fish were captured representing 22 species. Percent composition of total catch in the 9 runs:

Species	Total Number	Percent Composition
Carp	855	60.3
Northern redhorse	115	8.1
Quillback	80	5.6
White bass	70	4.9
Channel catfish	55	3.9
Carpsucker (Highfin and River)	51	3.6
Walleye	42	3.0
Sauger	35	2.5
Sheepshead	25	1.8
Bigmouth buffalofish	16	1.1
Flathead catfish	15	1.1
Silver redhorse	14	1.0
Northern pike	12	0.8
Common sucker	8	0.6
White crappie	5	0.4
Smallmouth buffalofish	4	0.3
Gizzard shad	4	0.3
Shortnose gar	4	0.3
Black crappie	3	0.2
Smallmouth bass	2	0.1
Hog sucker	2	0.1
Totals 22	1,417	100.0

SECTOR III

From Henderson bridge to mouth of Blue Earth River

A. Watershed Characteristics

1. Length of river - 38.3 miles
2. Width of river - between 125 to 175 feet or an average near 150 feet.
3. River depth - maximum 20 to 25 feet with an average of 2 to 3 feet.
4. Flow - estimated at 150 c.f.s. at Henderson on August 4, 1959; 257 c.f.s. (July 21, 1959) and 119 c.f.s. (August 10, 1959) at U.S. Corps of Engineers gaging station at the main street bridge in Mankato 1.8 miles below mouth of Blue Earth River.
5. Gradient - approximately 47 feet in this sector (about 0.3 inch per 100 feet) or about 1.2 feet per mile.
6. Bottom soil type - 95% sand, 3% boulder, and 2% rubble.
7. Pool type - mostly deep pools which occur at each bend and in the wider portions of the river with little or no shelter and unprotected bottom. There are some A-2, B-2, and D-2 types also. This sector is composed of about 45% pools and 55% bars.

8. Tributaries - 19 were observed ranging in flow from 0.05 c.f.s. (3 tributaries) to a maximum of 2.88 c.f.s. (Rush River Tributary M-55-57); water temperatures ranged from 58 °F. at one of the tributaries to a maximum of 95½ °F. at Tributary M-55-64 which is upriver from Cherry Creek in LeSueur County.
9. Springs - 24 spring areas were located with over a total of 200 springs; flows ranged from "minute" at 3 of the areas to a maximum flow of 0.6 c.f.s. in the spring area near the St. Peter State Hospital. Temperatures ranged from a low generally of 48 °F. at most springs to a maximum of 62 °F. in the springs near the St. Peter State Hospital.
10. Nature and use of valley - bottom lands are 80% agricultural, 15% wild land, and 5% homesites; valley width varies from about 3/4 mile to a maximum of 3½ miles.

B. Physical Characteristics of Water
1. Color and turbidity - moderately brown with Secchi disk readings of 5 to 8 inches during 1958 survey.
2. Temperatures - ranged from lowest reading of 76 °F. at the old LeSueur bridge to highest reading of 86 °F. midway between LeSueur and St. Peter. With a clear sky air temperature was 79 °F. at 9:00 am. on August 4, 1959. With 30% cloudcover air temperature was 87 °F. at 5:30 p.m. on July 28, 1959.

C. Chemical Characteristics of Water
1. Water quality - analyses of 7 surface water samples taken above and below sewer outlets at LeSueur, St. Peter and Mankato:

	range in p.p.m.
Total phosphorus	0.099 - 0.299
Chloride ion	10.8 - 15.0
Total nitrogen	1.225 - 2.185
Total alkalinity	231.0 - 266.0

Dissolved oxygen ranged from 9.5 p.p.m. at station 2 (Kasota) to 10.9 p.p.m. at station 3 (between St. Peter and Le Sueur). Readings at the other 3 stations - Mankato, LeSueur, and Henderson - fell into this range.

2. Pollution - 12 sewage outlets were observed from Mankato downstream to Henderson which includes the Green Giant Canning Company operations.

D. Biological Characteristics of River
1. Aquatic plants - evidence of aquatic vegetation is totally lacking
2. Fishes - 36 species present (electro-fishing, seining, and trapnetting)

Eleven runs (a total of 25.17 hours) were made along the entire length of this sector. A total of 2,614 fish were captured representing 22 species. Percent composition of total catch in the eleven runs:

	Species	Total Number	Percent Composition
	Carp	1,742	66.6
	Quillback	163	6.2
	Northern redhorse	128	4.9
	Channel catfish	125	4.8
	White bass	104	4.0
	Sheepshead	74	2.9
	Silver redhorse	58	2.2
	Sauger	47	1.8
	Shortnose gar	33	1.3
	Gizzard shad	27	1.0
	Carpsucker	26	1.0
	Flathead catfish	21	0.8
	Walleye	17	0.7
	Smallmouth bass	11	0.4
	Hog sucker	9	0.3
	Common sucker	8	0.3
	Smallmouth buffalofish	6	0.2
	Northern pike	4	0.2
	White crappie	4	0.2
	Black crappie	3	0.1
	Bigmouth buffalofish	3	0.1
	Rock bass	1	trace
Totals	22	2,614	100.0

River Survey Data Summary

Minnesota River (Part)
M-55
Blue Earth, Nicollet, LeSueur, Sibley,
Scott, Carver, Hennepin, Dakota, and
Ramsey Counties

Dates of Field Work
June 17 thru September 8, 1958
July 27 thru August 7, 1959

Summary of Survey Data

From its junction with the Blue Earth River at Mankato (T. 108, R. 27, S. 14) the Minnesota River flows north-northeasterly for about 107 miles until the Mississippi River is reached at the Mendota Bridge (T. 28, R. 23, S. 28). Over this lengthy course the river forms the boundaries for 9 counties and many loops, bends, and oxbows are in evidence. Average width of the river thru this predominantly agricultural area is about 200 feet or less.

Hills which form the rim of the valley are moderately high to high (75-250 feet), steep, and lightly to moderately wooded. Valley width varies from 1 to 5 miles. Bottom lands for the most part have scattered, moderate-sized woodlots or fringes of trees bordering on the river not over ½ mile wide. Soils of the riverbed are dominated by sand. Pollution (sewage mainly) and erosion are predominant thruout.

Most river improvement measures on such a large system would be very difficult if not impractical. However, conditions could be improved if pollution controls were more strictly enforced, and if proper farming practices and watershed improvements were increased.

Fishing pressure as observed thru the river reconnaissance of 1959 appears to range from light to moderate.

MINNESOTA DIVISION OF GAME AND FISH
SECTION OF RESEARCH AND PLANNING

River Survey Report

Minnesota River (Part)
M-55
Blue Earth, Nicollet, LeSueur, Sibley,
Scott, Carver, Hennepin, Dakota,
and Ramsey Counties

I. Introduction

A. River Name, Tributary Number, Location, and Length

1. Name - Minnesota River
2. Tributary number - M-55
3. Beginning of survey - mouth of Blue Earth River, Blue Earth and Nicollet Counties (T. 108, R. 27, S. 14) - Mankato, Minnesota.
4. End of survey - mouth of Minnesota River, Dakota and Ramsey Counties (T. 28, R. 23, S. 28) - St. Paul, Minnesota.
5. Length surveyed - 107.0 miles from mouth of Blue Earth River at Mankato to Mississippi River junction at St. Paul (Mendota).

B. Dates of Field Work

June 17 thru September 8, 1958
July 27 thru August 7, 1959

C. Management Problem

Survey of warm water stream resources of Minnesota.

D. Survey Request

Fisheries Research Unit project

E. Previous Surveys and Investigations

1. Report of the Investigation of the Pollution of the Minnesota River from above New Ulm to the Junction with the Mississippi River at Mendota - Minnesota State Board of Health in collaboration with the Minnesota State Conservation Department, 1934.

2. Investigation of Reported Fish Loss in the Minnesota River near Blakeley, Minnesota - T. A. Olson, 1939.

3. Report on Investigation of Prospective Sand and Gravel Removal Operations from the Bed of the Minnesota River at Mankato by the North Star Concrete Company - J. B. Moyle, 1942.

4. Proposed Sewage Treatment Plant for the Village of Richfield, Hennepin County (memorandum) - J. B. Moyle, 1949.

5. Dissolved Oxygen Reports - 1949, 1950, 1951, 1955, 1956, 1957, and 1959.

6. Memorandum on Pollution of the Minnesota River from above Mankato to the Junction with the Mississippi River at Mendota.

7. Hydrologic Atlas of Minnesota - Bulletin No. 10, Division of Waters, Department of Conservation, April 1959.

F. Geology and Topography

The geology along the Minnesota River from Mendota to Mankato is quite varied. Cambrian and Ordovician sedimentary rocks have been cut deeply to form the Minnesota River valley which was created by the Glacial River Warren. From Fort Snelling to Shakopee the rock formations are of the Lower and Middle Ordovician strata. A short distance above Shakopee there are exposures of Jordan sandstone. West of Jordan the river valley possesses the St. Lawrence formation (dolomite). At Henderson the floor of the river exhibits the Franconia formation (green silts and sandstones). From St. Peter to Mankato dolomite of the Oneota formation is prominent.

Walls of the Minnesota River valley vary from 1 to 4 miles apart and from 75 to 250 feet high. Within the valley a number of lengthy high terraces have been formed. Soils are of alluvium, glacial drift and till. The land bordering the valley in the area from Mendota to Mankato varies from flat to gently undulating to morainic. Banks of the river are generally steeply cut and exhibit a sandy loam to clay loam profile underlain with sand and gravel.

II. Physical, Chemical, and Biological Characteristics

SECTOR I - From Mississippi River junction in Dakota and Ramsey Counties (T. 28, R. 23, S. 28) upstream for 24.2 miles to U.S. Highway #169 at Shakopee (T. 115, R. 23, S. 1)

A. Watershed Characteristics

1. Length and Width

Length - 24.2 miles
Width - average of about 225 feet with an average of about 300 feet from Savage and downstream.

2. Water Depth, Flow and Gradient

Depth - maximum between 30 and 35 feet, average between 4 and 5 feet with an average of about 9 feet from Savage and downstream.

Flow - near 500 c.f.s. (estimate) at Mendota Bridge (August 6 and 7, 1959); 415 c.f.s. (July 27, 1959) and 395 c.f.s. (August 14, 1959) at Corps of Engineers gaging station 2½ miles south of Carver.

Gradient - no gradient in 24.2 miles (Report of Water Resources Investigation of Minnesota, 1909-1912)

3. Bottom Types and Pool Types

Soils of the river bottom appear to be to a large extent sand. Water depth was prohibitive in judging composition. However, the shallow borders of the river had some silt altho, in the main, sand was abundant.

The major pool type is D-2. Some C-2 type pools appear but they like other pool types are scarce. This portion of the river appears to be one vast pool. See manual of stream survey procedures for description of pool types.

4. Dams and Other Permanent Obstructions

No dams are present. The only obstacles that serve as permanent obstructions are the highway bridges.

5. Beaver Dams - Age and Felling Activity

No beaver activity was noted except for a few old cuttings on the river bank.

6. Tributaries - Width, Location, Flow, and Temperature

No tributary lengths are available except in specific instances where a tributary has been subjected to a stream survey. River water and air temperatures, time of day, and cloud cover were noted at certain locations during the course of a day's trip down the river, and this data will be used so that comparisons of these temperatures with the tributary water temperatures may be drawn. No specific air temperature or time was taken at each individual tributary. If further information is desired reference may be made to the section on temperatures (II B 2) or to the map.

Friday, August 7, 1959

M-55-1:
Width - mouth forms 25-foot wide, rubble delta and falls
Location - enters right bank of river in T. 28, R. 23, S. 28-NW¼
Flow - 0.50 c.f.s.
Temperature - mouth is 71°F.; see stations a to c of section II B 2.

M-55-2:
Width - 25 feet at mouth
Location - enters from left river bank in T. 28, R. 23, S. 32-NE¼
Flow - 0.5-0.75 c.f.s.
Temperature - mouth is 60°F.; see stations a to c of section II B 2.

M-55-3:
Width - 8 inches at small falls formed on river bank
Location - left river bank in T. 28, R. 23, S. 32 (NE¼) shortly above M-55-2
Flow - 0.05 c.f.s.
Temperature - 62°F. at mouth; see stations a to c of section II B 2.

M-55-4:
Width - 10 feet at mouth which forms a 30-foot wide, sand delta
Location - right bank of river in T. 28, R. 23, S. 32--SW¼
Flow - 1.0 c.f.s.
Temperature - mouth is 54°F.; see stations a to c of section II B 2.

M-55-5:
Width - mouth forms 12-foot wide, sand delta
Location - enters right river bank in T. 28, R. 23, S. 32 (SW¼)-shortly above M-55-4.
Flow - 0.30 c.f.s.
Temperature - 52°F. at mouth; see stations a to c of section II B 2.

M-55-6:
Width - 15 feet at mouth
Location - right bank of river in T. 27, R. 23, S. 5 - NW¼ and SW¼ line
Flow - 0.75 c.f.s.
Temperature - mouth is 67°F.; see stations a to c of section II B 2.

M-55-7:
Width - 8 inches at mouth
Location - enters left river bank in T. 27, R. 23, S. 7 - NE¼ and SE¼ line
Flow - less than 0.05 c.f.s.
Temperature - 62½°F. at mouth; see stations a to c of section II B 2.

M-55-8:
Width - mouth is 4 feet
Location - left bank of river in T. 27, R. 23, S. 7 - shortly above M-55-7
Flow - 0.75 c.f.s.
Temperature - 62½°F. at mouth; see stations a to c of section II B 2.

M-55-9:
Width - 3 feet near mouth which forms a 20-foot opening.
Location - enters left river bank in T. 27, R. 23, S. 18 - NE¼
Flow - 0.50 c.f.s. (1.5 c.f.s. - 1958)
Temperature - mouth is 57½°F.; see stations a to c of section II B 2.

M-55-10:
Width - 6 feet near mouth which forms a 20-foot opening.
Location - left bank of river in T. 27, R. 23, S. 18 - shortly above M-55-9
Flow - 1.25 to 1.50 c.f.s. (2.5 c.f.s. - 1958)
Temperatures - 58°F. at mouth; see stations a to c of section II B 2.

M-55-11:
Width - 50 feet at mouth below dam, average is near 4 feet above mouth
Location - enters left river bank in T. 27, R. 24, S. 13 - SE¼
Flow - 0.75 c.f.s.
Temperature - 62°F. near mouth; see stations c to f of section II B 2.

M-55-12:
Width - 5 feet at mouth
Location - right bank of river in T. 27, R. 24, S. 22 - SW¼ and SE¼ line
Flow - 0.30 c.f.s. (1.5 c.f.s. - 1958)
Temperature - 60½°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-13:
Width - 8 to 10 inches at mouth
Location - enters left river bank in T. 27, R. 24, S. 22 - SW¼ and SE¼ line - shortly above M-55-12.
Flow - 0.05 to 0.10 c.f.s.
Temperature - 51½°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-14:
Width - 6 feet at mouth
Location - from right bank of river in T. 27, R. 24, S. 22 - SW¼
Flow - 0.15 c.f.s.
Temperature - mouth is 55°F.; see stations f to g (August 7, 1959) of section II B 2.

M-55-15:
Width - 18 inches at mouth
Location - enters right bank of river in T. 27, R. 24, S. 22 and 27 line - SW¼ and NW¼ respectively
Flow - 0.15 c.f.s.
Temperature - mouth is 52½°F.; see stations f to g (August 7, 1959) of section II B 2.

M-55-16:
Width - 30 feet at mouth below dam
Location - right bank of river in T. 27, R. 24, S. 22 and 27 line - shortly above M-55-15
Flow - 10.0 to 12.0 c.f.s.
Temperature - 66°F. near mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-17:
Width - mouth is 6 feet
Location - enters left river bank in T. 27, R. 24, S. 27 - NW¼
Flow - 0.10 c.f.s.
Temperature - 58½°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-18(Nine Mile Creek):
Width - 25 feet at mouth
Location - enters right bank of river in T. 27, R. 24, S. 29 - SW¼
Flow - 2.50 c.f.s. (3.5 c.f.s. - 1958)
Temperature - 64½°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-19 (Credit River):
Width - 5 feet at mouth
Location - enters left river bank in T. 27, R. 24, S. 31 - NE¼
Flow - 1.75 c.f.s. (5.0 c.f.s. - 1958)
Temperature - 69°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

M-55-20:
Width - 6 inches at mouth
Location - enters right bank of river in T. 27, R. 24, S. 30 - SW¼
Flow - less than 0.05 c.f.s.
Temperature - 55½°F. at mouth; see stations f to g (August 7, 1959) of section II B 2.

Thursday August 6, 1959

M-55-21:
Width - 10 feet at mouth
Location - left river bank in T. 115, R. 21, S. 8 - NE¼
Flow - 0.45 c.f.s. (3.0 c.f.s. - 1958)
Temperature - mouth is 73°F.; see stations g (August 6, 1959) to h of section II B 2.

M-55-22:
Width - 12 feet at mouth
Location - enters right bank of river in T. 115, R. 21, S. 8 - shortly above M-55-21
Flow - 0.35 c.f.s.
Temperature - 58°F. in mouth; see stations g (August 6, 1959) to h of section II B 2.

M-55-23 (Eagle Creek):
Width - 25 feet at mouth
Location - left river bank in T. 115, R. 21, S. 7 and 8 line - NE¼ and NW¼ respectively
Flow - 12.42 c.f.s. (10.0 to 12.0 c.f.s. - 1958)
Temperature - mouth is 63°F.; see stations g (August 6, 1959) to h of section II B 2.

M-55-24:
Width - small; tile not measured
Location - enters right bank of river in T. 115, R. 21, S. 6 - NE¼
Flow - 0.20 c.f.s.
Temperature - not taken

M-55-25:
Width - 12 feet at mouth
Location - from left river bank in T. 115, R. 21, S. 6 - NW¼ and SW¼ line
Flow - 3.0 c.f.s.
Temperature - 81½°F. at mouth; see stations g (August 6, 1959) to h of section II B 2.

M-55-26 (Purgatory Creek):
Width - 30 to 35 feet at mouth
Location - enters right bank of river in T. 116, R. 22, S. 36 - SW¼
Flow - 1.0 to 1.5 c.f.s. (3.0 c.f.s. - 1958)
Temperature - 72°F. in mouth; see stations g (August 6, 1959) to h of section II B 2.

M-55-27:
Width - 2½ feet at mouth
Location - right river bank in T. 116, R. 22, S. 34 - NE¼
Flow - 0.10 c.f.s.
Temperature - mouth is 67°F.; see stations h to i of section II B 2.

M-55-28:
Width - 4 feet at mouth
Location - enters left bank of river in T. 115, R. 22, S. 3 - NW¼
Flow - 0.35 c.f.s.
Temperature - 54½°F. in mouth; see stations h to i of section II B 2.

M-55-29:
Width - mouth is 1 foot (6-foot high falls)
Location - left bank of river on T. 115-116 line, R. 22, S. 4 and 33 line respectively
Flow - 0.05 c.f.s.
Temperature - mouth is 57½°F.; see stations h to i of section II B 2.

M-55-30:
Width - 2½ feet at mouth
Location - enters left river bank on T. 115-116 line, R. 22, S. 4 and 33 line respectively - shortly above M-55-29
Flow - 0.10 c.f.s.
Temperature - 55°F. in mouth; see stations h to i of section II B 2.

M-55-31 (Terrell or Riley Creek):
Width - mouth is 6 feet
Location - right bank of river in T. 116, R. 22, S. 32 - SE¼
Flow - 0.20 c.f.s.
Temperature - mouth is 74°F.; see stations h to i of section II B 2.

M-55-32 (Bluff Creek):
Width - 10 feet at mouth
Location - enters right river bank in T. 116, R. 22, S. 32 (SE¼) - shortly above M-55-31
Flow - 2.0 to 2.5 c.f.s. (2.5 c.f.s. - 1958)
Temperature - 73°F. in mouth; see stations h to i of section II B 2.

M-55-33:
Width - mouth is 1 foot
Location - left bank of river on T. 115-116 line, R. 22, S. 5 (NW¼) and 32 (SW¼) line respectively
Flow - 0.10 c.f.s.
Temperature - mouth is 64°F.; see stations h to i of section II B 2.

M-55-34:
Width - 6 feet at mouth
Location - enters left river bank in T. 116, R. 22, S. 32 - SW¼
Flow - 1.25 to 1.50 c.f.s.
Temperature - 69°F. in mouth; see stations h to i of section II B 2.

M-55-35:
Width - 6 feet at mouth
Location - from left bank of river in T. 115, R. 22, S. 6 - NE¼
Flow - 0.75 to 1.0 c.f.s.
Temperature - mouth is 56°F.; see stations h to i of section II B 2.

7. Springs - Location, Temperature, and Flow
None

8. Nature and Use of Shoreline
The Minnesota River in this sector sets as straight a course as can be found north of Mankato. River bends are not quite as extreme or numerous when this portion of the river is compared with other areas below Mankato. Stream bank height has also been somewhat reduced (average near 8 feet) and steepness of slopes has been lessened. Of course, bends in the river still present more of the rawcut, steep, and/or vertical slopes. Soil profiles observed appear to be sandy or clay loams. Width of the valley of the Minnesota River varies from about a minimum of 1 mile (river's mouth) to a maximum near 4½ miles (Shakopee) with an average of approximately 2 miles. Bottom lands are fairly open as trees appear to be mainly confined to a narrow band or sprinkling on the river bank. Tree species consist mostly of mature elm, ash, maple, willow, cottonwood, and boxelder. Hills which form the valley's rim rise from 100 to 200 feet above the level of the river.

Bottomlands of the valley seem to be approximately 75% wild land with the remaining portion divided into farmland (20%) and dwellings or industry (5%).

9. Shade and Bank Cover
Shade on the river is limited to a thin border or spotting of mature elm, cottonwood, willow, boxelder, maple, and ash trees. For all practical purposes the waters receive no shade except during limited portions of the day when adjacent hills or trees provide some protection.

Bank cover in the form of grasses and herbaceous plants appears to be somewhat better than elsewhere. Height of the banks has lessened (few vertical cuts) and during periods of high water the Shakopee, Lyndale Avenue, and Cedar Avenue bridges back up and spread out the waters. Nevertheless, cover can still be considered poor.

10. Soil Erosion - Type and Extent
Erosion of river banks, gullies, and ravines is prominent. However, this lowermost portion of the river shows noticeably less evidence than in other sectors. Fewer vertical cut banks were seen. However, the slopes are still fairly steep and have little vegetation. Reduced bank heights and slopes, fewer bends, and a deepening of the river channel helps to reduce the effects of high water. Constrictions on the river formed by bridges and road grades also aid in backing up and spreading out floodwaters thus reducing damaging effects.

11. High Water Marks and Other Evidences of Floods
In the past the river has been subjected to extreme flood conditions. Cut banks, piles of debris, and flood plains attest to this. Presently the Minnesota River levels are known to be low. However, during periods of high water the lower bank levels, valley width, and manmade construction formed on the river aid in reducing high levels by backing up and spreading out flood waters. Road grades and bridges, however, have been inundated.

12. River Improvements - Structure Activities and Location
None are known.

B. Physical and Chemical Characteristics of Water

1. Turbidity and Color

Even during periods of little rainfall and runoff waters of the Minnesota River are very turbid. The color is an even moderate brown chocolate color.

2. Temperatures

River water and air temperatures were taken on August 6 and 7, 1959, at the following stations (refer to map):

August 7

a. Mendota Bridge (1:05 p.m. - 100% clouds) - air 67°F., water 84°F.

b. Above Mendota Bridge, at M-55-6 (12:00 noon - 100% clouds) - air 66°F., water 87½°F.

c. Cedar Avenue Bridge (11:20 a.m. - 100% clouds) - air 65°F., water 80½°F.

d. Three hundred feet downstream from the Northern States Power Black Dog Plant (11:15 a.m. - 100% clouds) - air 65°F., water 90°-91°F.

e. Side Channel to Black Dog Plant (11:05 a.m.--100% clouds) - air 65°F., water 95½°F.

f. Below Lyndale Avenue Bridge, 3/4 mile - just below M-55-12 - (10:30 a.m. - 100% clouds) - air 65°F., water 76°F.

g. Savage Bridge (8:45 a.m. - 100% clouds) - air 62½°F., water 77°F.

August 6

g. Savage Bridge (5:20 p.m. - 65% clouds) - air 78°F., water 81½°F.

h. Above Purgatory Creek, 1/3 mile (4:05 p.m. - 70% clouds) - air 77°F., water 80½°F.

i. Shakopee Bridge (2:25 p.m. - 70% clouds) - air 78°F., water 78½°F.

3. Water Quality

Analysis of surface water sample received September 2, 1958 (½ mile below Shakopee Bridge) and surface water oxygen test made on July 22, 1958 (station #10) - refer to map:

	P.P.M.
Total phosphorus	0.116
Chloride ion	10.8
Total nitrogen	1.225
Carbon dioxide	0
Total alkalinity	266.0
Dissolved oxygen	12.8

Waters in this portion of the sector are hard, and fertility ranges from good (phosphorus) to very good (nitrogen). Chloride ion content indicates pollution.

4. Pollution - Types and Sources

From Shakopee and downstream there are 5 known (visible) sewer pollution entrances. Aside from these the only other form of pollution is that which occurs from the tremendous volume of hot water which is introduced by the Northern States Power Black Dog plant in their cooling operations (refer to map). The hot water influences river temperatures considerably.

C. Biological Characteristics

1. Aquatic Plants

No aquatic plant life was observed.

2. Fishes

a. Fish Present (trapnetting and electro-fishing)

Common Name	Scientific Name
Shortnose Gar	Lepisosteus platostomus
Dogfish	Amia calva
Mooneye	Hiodon tergisus
Gizzard Shad	Dorosoma cepedianum
Bigmouth Buffalofish	Ictiobus cyprinellus
Smallmouth Buffalofish	Ictiobus bubalus
Quillback	Carpiodes cyprinus
Northern Carpsucker	Carpiodes carpio
Highfin Carpsucker	Carpiodes velifer
Common Whitesucker	Catostomus commersoni
Silver Redhorse	Moxostoma anisurum
Northern Redhorse	Moxostoma aureolum
Carp	Cyprinus carpio
Channel Catfish	Ictalurus punctatus
Northern Black Bullhead	Ictalurus melas
Flathead Catfish	Pylodictis olivaris
Northern Pike	Esox lucius
White Bass	Roccus chrysops
Eastern Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum
Largemouth Bass	Micropterus salmoides
Rock Bass	Ambloplites rupestris
White Crappie	Pomoxis annularis
Black Crappie	Pomoxis nigromaculatus
Freshwater Sheepshead	Aplodinotus grunniens

b. Number and Weight of Fish Captured

Minnesota River
SECTOR I - Four Shocking Runs
Date of Survey - Summer 1958

A.C. Shocker, Total Hours - 8.25

Species	Total Number	Number per Hour	Percent Composition of Total Catch	Total Pounds	Pounds per Hour
Shortnose Gar	5	0.61	0.8	2.9	0.35
Dogfish	2	0.24	0.3	5.5	0.67
Gizzard Shad	226	27.39	37.2	5.2	0.63
Bigmouth Buffalo	5	0.61	0.8	26.7	3.24
Quillback	5	0.61	0.8	4.5	0.54
Carpsucker	7	0.84	1.2	10.5	1.27
Common Sucker	2	0.24	0.3	1.1	0.13
Silver Redhorse	3	0.36	0.5	2.2	0.27
Northern Redhorse	13	1.58	2.1	4.5	0.54
Carp	259	31.39	42.7	509.9*	61.81
Channel Catfish	1	0.12	0.2	0.1	0.01
Flathead Catfish	3	0.36	0.5	2.1	0.25
Northern Pike	5	0.61	0.8	11.0	1.33
White Bass	18	2.18	3.0	3.2	0.39
Sauger	6	0.73	1.0	3.8	0.46
Walleye	1	0.12	0.2	5.7	0.69
Largemouth Bass	1	0.12	0.2	0.2	0.02
White Crappie	4	0.48	0.7	0.8	0.10
Black Crappie	2	0.24	0.3	0.5	0.06
Sheepshead	39	4.73	6.4	9.2	1.12
Totals 20	607	73.56	100.0	609.6	73.88

* Expanded from weights of 150 fish of total of 259

Minnesota River
SECTOR I - Station 10
Date of Survey - Summer 1958

	Trapnets - 9 Pots			9 Single-pot Sets*	
Species	Total Number	Number per Pot	Percent Composition of Total Catch	Total Pounds	Pounds per Pot
Dogfish	6	0.67	3.3	16.6	1.84
Mooneye	1	0.11	0.6	1.0	0.11
Bigmouth Buffalo	1	0.11	0.6	3.3	0.37
Quillback	1	0.11	0.6	1.4	0.16
Common Sucker	3	0.33	1.6	5.4	0.60
Northern Redhorse	1	0.11	0.6	1.2	0.13
Carp	124	13.78	67.8	162.8	18.09
Channel Catfish	2	0.22	1.0	1.9	0.21
Black Bullhead	2	0.22	1.0	0.5	0.06
Flathead Catfish	1	0.11	0.6	12.4	1.38
Northern Pike	10	1.11	5.5	24.0	2.67
White Bass	4	0.44	2.2	4.0	0.44
Walleye	2	0.22	1.0	3.8	0.42
Rock Bass	1	0.11	0.6	0.3	0.03
White Crappie	3	0.33	1.6	0.5	0.06
Black Crappie	19	2.11	10.4	3.1	0.34
Sheepshead	2	0.22	1.0	3.2	0.36
Totals 17	183	20.31	100.0	245.4	27.27

* Twelve trapnets were set. Three of these trapnets were tampered with and, therefore, are not included in the above table.

c. Game Fish Spawning Conditions
Spawning conditions for all game fish are believed to be poor. Tributary streams do not appear to possess adequate conditions, and the Minnesota River itself is very turbid with a shifting sand or silt bottom.

SECTOR II - From U.S. Highway #169 bridge at Shakopee (T. 115, R. 23, S. 1) to state highway #19 bridge at Henderson (T. 112, R. 26, S. 1).

A. Watershed Characteristics
1. Length and Width
Length - 44.5 miles
Width - average between 150 to 200 feet or near 180 feet

2. Water Depth, Flow, and Gradient
Depth - average near 3 feet
Flow - 415 c.f.s. on July 27, 1959, and 395 c.f.s. on August 14, 1959, at U.S. Corps of Engineers gaging station 2½ miles south of Carver.
Gradient - approximately 20 feet in 44.5 miles or about 0.1 inch per 100 feet (Report of Water Resources Investigation of Minnesota 1909-1912)

3. Bottom Types and Pool Types

The river bottom to a great degree is mostly shifting sand. Some silt was noted in slower moving waters of sheltered areas. There are also areas of gravel and boulder. However, they form a comparatively small part of the sector.

Pools are mainly of the C-2 type. However, there are A-2 and D-2 types. Waters in this sector appear to be divided into approximately 60% bars and 40% pools. See manual of stream survey procedures for description of pool types.

4. Dams and Other Permanent Obstructions

Highway and railroad bridges are the only obstructions of a permanent nature found in the sector.

5. Beaver Dams - Age and Felling Activity

Beaver activity is at a minimum. A few isolated old cuttings were seen on the downriver reconnaissance.

6. Tributaries - Width, Location, Flow, and Temperature

M-55-36:
Width - mouth is a 25-foot wide, sand delta
Location - enters right bank of river in T. 115, R. 23, S. 2 - NE¼
Flow - 1.75 to 2.00 c.f.s.
Temperature - 66½°F. in mouth; see stations i to j of section II B 2.

M-55-37:
Width - 9 feet at mouth
Location - from right river bank in T. 115, R. 23, S. 2 - NW¼
Flow - 1.75 to 2.00 c.f.s.
Temperature - at mouth 67°F.; see stations i to j of section II B 2.

M-55-38:
Width - 4 feet at mouth
Location - from right bank of river in T. 115, R. 23, S. 3 - SW¼
Flow - 0.60 c.f.s.
Temperature - in mouth 59½°F.; see stations i to j of section II B 2.

M-55-39:
Width - mouth is a 40-foot wide, sand delta
Location - enters right river bank in T. 115, R. 23, S. 4 (SE¼) and 9 (NE¼) line
Flow - 0.35 c.f.s.
Temperature - 80°F. at mouth; see stations i to j of section II B 2.

M-55-40 (Chaska Creek):
Width - 5 feet at mouth
Location - from right bank of river in T. 115, R. 23, S. 9 - SW¼
Flow - 0.75 c.f.s.
Temperature - at mouth 78°F.; see stations j to k of section II B 2.

M-55-41:
Width - 2½ feet at mouth
Location - from right river bank in T. 115, R. 23, S. 17 - SW¼
Flow - 0.1 c.f.s.
Temperature - 71°F. in mouth; see stations j to k of section II B 2.

M-55-42 (Carver Creek):
Width - 12 feet at mouth, thru 30-foot wide, sand delta
Location - enters right bank of river in T. 115, R. 23, S. 19 - NE¼.
Flow - 1.5 to 2.00 c.f.s. (silty)
Temperature - 74°F. at mouth; see stations j to k of section II B 2.

M-55-43:
Width - mouth is 4 feet
Location - from left bank of river in T. 115, R. 23, S. 20 - NE¼.
Flow - 0.75 to 1.00 c.f.s.
Temperature - mouth is 70°F.; see stations j to k of section II B 2.

M-55-44 (Sand Creek):
Width - 26 feet at mouth
Location - enters left river bank in T. 115, R. 23, S. 20 - SW¼
Flow - very slow and wide (couldn't estimate)
Temperature - 70°F. in mouth; see stations j to k of section II B 2.

M-55-45:
Width - 2½ feet in mouth
Location - from right bank of river in T. 115, R. 23, S. 19 (SE¼) and 20 (SW¼) line
Flow - 0.10 c.f.s.
Temperature - 70°F. at mouth; see stations k to l (August 6, 1959) of section II B 2.

M-55-46:
Width - mouth is 4 feet
Location - enters right river bank in T. 115, R. 23, S. 30 - SE¼
Flow - 0.10 c.f.s.
Temperature - mouth is 69½°F.; see stations k to l (August 6, 1959) of section II B 2.

M-55-47:
Width - 7 feet at mouth
Location - from left bank of river in T. 114, R. 23, S. 5 - SW¼
Flow - 0.35 c.f.s.
Temperature - 78½°F. in mouth.; see stations k to l (August 6, 1959) of section II B 2.

M-55-48:
Width - mouth is 7 feet
Location - enters left river bank in T. 114, R. 23, S. 7 - NE¼
Flow - 1.25 c.f.s.
Temperature - 65°F. in mouth; see stations k to l (August 6, 1959) of section II B 2.

M-55-49 (Bevens Creek):
Width - 8 feet at mouth
Location - from right bank of river in T. 114, R. 24, S. 11 - SW¼
Flow - 1.45 c.f.s. (6.0 c.f.s. - 1958)
Temperature - at mouth 78°F.; see stations l (August 5, 1959) to m of section II B 2.

M-55-50:
Width - mouth is 1½ feet
Location - enters right river bank in T. 114, R. 24, S. 31 - NW¼ and NE¼ line
Flow - 0.10 or 0.15 c.f.s.
Temperature - 64½°F. at mouth; see stations m to n of section II B 2.

M-55-51:
Width - mouth is 5 feet
Location - from left bank of river in T. 114, R. 24, S. 31 - SW¼
Flow - 0.30 c.f.s.
Temperature - 68°F. in mouth; see stations m to n of section II B 2.

M-55-52:
Width - 4 feet at mouth
Location - enters left river bank on T. 113 and 114 line, R. 25, S. 36 (SE¼) and 1 (NE¼) line respectively
Flow - 0.4 c.f.s. (milky)
Temperature - 62½°F. in mouth; see stations n to o of section II B 2.

M-55-53:
Width - 4 feet at mouth
Location - from right bank of river in T. 114, R. 25, S. 36 - NE¼
Flow - 0.15 c.f.s.
Temperature - 82°F. in mouth; see stations n to o of section II B 2.

M-55-54:
Width - mouth is 1 foot
Location - enters right river bank in T. 114, R. 25, S. 35 - SW¼ and SE¼ line
Flow - 0.05 c.f.s.
Temperature - 73½°F. in mouth; see stations n to o of section II B 2.

M-55-55 (High Island Creek):
Width - 6 feet at mouth
Location - from right bank of river in T. 113, R. 26, S. 24 - NW¼
Flow - 1.76 c.f.s.
Temperature - mouth is 84°F.; see stations p (August 4, 1959) to q of section II B 2.

M-55-56:
Width - mouth is 4 feet
Location - enters right river bank in T. 113, R. 26, S. 25 - NW¼
Flow - 0.40 c.f.s.
Temperature - 95½°F. in mouth (1:30 p.m. - CLEAR); see stations g to r of section II B 2.

7. Springs - Location, Temperature, and Flow

Spring Area A:
Location - left bank of river (Jordan bridge) in T. 114, R. 23, S. 7 - SW¼. This area is about 300 feet long and contains a myriad of springs.
Temperature - 48°F. to low 50's; see stations l (August 5, 1959) to m of section II B 2.
Flow - total near 1.5 to 2.0 c.f.s.

Spring Area B:
Location - left river bank in T. 114, R. 24, S. 12 - SW¼. Along 200 feet of shore there are over 50 springs.
Temperature - 48°F. to low 50's; see stations 1 (August 5, 1959) to m of section II B 2.
Flow - about 0.50 c.f.s. total

Spring Area C:
Location - left bank of river in T. 114, R. 24, S. 12 - SW¼. Along 200 feet of shore there are over 70 springs shortly above spring area B.
Temperature - 48°F. to low 50's; see stations 1 (August 5, 1959) to m of section II B 2.
Flow - near 1.0 c.f.s. total

Spring Area D:
Location-left river bank in T. 114, R. 24, S. 31 - SE¼. Three to four small springs.
Temperature - low 50's; see stations m to n of section II B 2.
Flow - minute

Spring Area F:
Location - left river bank in T. 114, R. 24, S. 31 - SW¼. Seven small springs.
Temperature - 48°F. to low 50's; see stations n to o of section II B 2.
Flow - 0.20 c.f.s. total

Spring Area F1
Location - left bank of river on T. 113-114 line, R. 25, S. 36 (SE¼) and 1 (NE¼) line. Six small springs just below M-55-52 and above sewer.
Temperature - 48°F. to low 50's; see stations n to o of section II B 2.
Flow - near 0.25 c.f.s. total

Spring Area G:
Location - left river bank in T. 113, R. 25, S. 4 - SE¼. Seventeen small springs.
Temperature - 48°F. to low 50's; see stations o to p (August 5, 1959) of section II B 2.
Flow - total near 0.40 c.f.s.

Spring Area H:
Location - right river bank in T. 113, R. 25, S. 4 - NW¼. Fifty-six small springs.
Temperature - 48°F. to 63½°F.; see stations o to p (August 5, 1959) of section II B 2.
Flow - about 1.0 c.f.s. total

Spring Area I:
Location - right bank of river in T. 113, R. 25, S. 5 - SE¼. Four minute springs.
Temperature - middle 50's; see stations o to p (August 5, 1959) of section II B 2.
Flow - 0.1 c.f.s. total

8. Nature and Use of Shoreline

Thru sector II the Minnesota River sets a very twisting north-north-easterly course. A number of oxbows are present. Stream bank height averages between 10 and 15 feet. The many river bends display vertical cuts of sand, sandy loam, and clay loam soils. As a whole, bank slopes are steep. Valley width along this portion of the river varies from a minimum near 7/8 mile to a maximum approximating 4 miles. Average valley width appears to be in the neighborhood of 2 miles. Tree density on the bottom lands has increased considerably over that seen below Shakopee. However, growth is confined to a scattering of trees or to a band bordering the river which doesn't exceed ½ mile in width. Species of trees present are mostly young willow and mature willows, boxelder, cottonwood, elm, ash, maple, and basswood. Hills forming the rim of the valley ascend from 100 to 300 feet above the river's level.

Land usage on the bottom lands appears to be divided into about 65% farmland, 30% wild land, and 5% homesites.

9. Shade and Bank Cover

For all practical purposes shade on the river is considered to be lacking. During certain portions of the day the locations of hills, river bends, and trees give a little protection.

Bank cover, as a whole, is considered to vary from poor to fair. Moderate to gradual sloping banks usually have a good cover of grasses, herbaceous plants, and young willow. However, steep or vertical cuts usually are barren or have a light growth of plant life at best. This portion of the river, however, is characterized by many bends and curves.

10. Soil Erosion - Type and Extent

Soil erosion along this portion of the river is very serious. Erosion of river banks was the most obvious during the course of the downriver canoe trip. Nevertheless, sheet and gully erosion in the bordering bottom farmlands and hills was seen to be extensive.

11. High Water Marks and Other Evidences of Floods

Flood evidence is widespread. Every curve of the river which is of any consequence has a vertical, barren-cut bank in addition to piles of logs and debris. Numerous deadheads and dead trees are scattered throughout the river's snaking course.

At the Carver gauging station high water levels of near 24 feet (1951) and 25 feet (1952) above the low summer of 1959 reading have been recorded.

12. River Improvements - Structure Activities and Locations

None are known

B. Physical and Chemical Characteristics of Water

1. Turbidity and Color

Here, as elsewhere on the Minnesota River, the waters are a moderate, brownish-chocolate color which becomes more dark and turbid during high waters. Secchi disk readings during the summer of 1958 were recorded at a steady 6 to 7 inches.

2. Temperatures

River water and air temperatures were recorded on August 4-6, 1959, at the following stations (refer to map).

August 6, 1959

i. Shakopee Bridge (2:25 p.m. - 70% clouds) - air 78°F., water 78½°F.

j. Chaska Bridge (12:45 p.m., 85% clouds) - air 75°F., water 80°F.

k. Above Carver, 1½ miles - 1st bend above M-55-43 - (11:30 a.m. - 90% clouds) - air 75½°F., water 79°F.

l. Jordan Bridge (8:45 a.m. - 100% clouds) - air 69°F., water 78°F.

August 5, 1959

l. Jordan Bridge (2:30 p.m. - 15% clouds) - air 88°F., water 82½°F.

m. Below Belle Plaine Bridge, 6 miles - in 7th river bend - (1:00 p.m. - 95% clouds) - air 86½°F., water 82°F.

n. Belle Plaine Bridge (11:30 a.m. - 99% clouds) - air 85°F., water 79°F.

o. Above Belle Plaine Bridge, 3 miles - just above M-55-54 - (10:30 a.m. - 50% clouds) - air 84°F., water 81°F.

p. Just below Blakeley Bridge (8:30 a.m. - 100% clouds) - air 78½°F., water 79½°F.

August 4, 1959

p. Blakeley Bridge (3:20 p.m. - 15% clouds) - air 89°F., water 81½°F.

q. Below Henderson Bridge - just below M-55-56 - (1:35 p.m. - 5% clouds) - air 88°F., water 81½°F.

r. Henderson Bridge (11:45 a.m. - clear) - air 83°F., water 77½°F.

3. Water Quality

Analysis of surface water samples received on September 2, 1958:

a. Chaska - 100 yards above sewer

	P.P.M.
Total phosphorus	0.198
Chloride ion	25.0
Total nitrogen	1.16
Carbon dioxide	8.4
Total alkalinity	281.0

b. Chaska - 100 feet below sewer

	P.P.M.
Total phosphorus	0.81
Chloride ion	55.5
Total nitrogen	2.73
Carbon dioxide	5.0
Total alkalinity	290.0

c. Belle Plaine - 100 yards above sewer and outlet to milk plant

	P.P.M.
Total phosphorus	0.219
Chloride ion	21.3
Total nitrogen	0.65
Carbon dioxide	7.0
Total alkalinity	258.0

d. Belle Plaine - ¼ mile below sewer and outlet of milk plant

	P.P.M.
Total phosphorus	0.19
Chloride ion	38.3
Total nitrogen	1.30
Carbon dioxide	8.8
Total alkalinity	258.0

Analysis of surface water dissolved oxygen tests taken on July 3, 8, 10, 14, and 17, 1958, at stations 5 thru 9 respectively:

	P.P.M.
Station 5	9.6
Station 6	8.7
Station 7	8.8
Station 8	7.4
Station 9	8.7

Waters of the river are hard. Fertility ranges from good (phosphorus), and moderate to very fertile (nitrogen). Chloride ion content is high, and indicates pollution. Oxygen levels are satisfactory.

4. Pollution - Types and Sources
Visible pollution was noted from a number of sewers in conjunction with a creamery and a beet factory.

C. Biological Characteristics
1. Aquatic Plants
Plant life is nonexistent or possibly very limited at best.

2. Fishes

a. Fish Present (trapnetting, electro-fishing, and seining)

Common Name	Scientific Name
Shortnose Gar	Lepisosteus platostomus
Gizzard Shad	Dorosoma cepedianum
Bigmouth Buffalofish	Ictiobus cyprinellus
Smallmouth Buffalofish	Ictiobus bubalus
Quillback	Carpiodes cyprinus
River Carpsucker	Carpiodes carpio
Highfin Carpsucker	Carpiodes velifer
Common White Sucker	Catostomus commersoni
Northern Hog Sucker	Hypentelium nigricans
Silver Redhorse	Moxostoma anisurum
Northern Redhorse	Moxostoma aureolum
Carp	Cyprinus carpio
Silver Chub	Hybopsis storeriana
Emerald Shiner	Notropis atherinoides
Spotfin Shiner	Notropis spilopterus
Central Bigmouth Shiner	Notropis dorsalis
Sand Shiner	Notropis deliciosus
Brassy Minnow	Hybognathus hankinsoni
Fathead Minnow	Pimephales promelas
Bluntnose Minnow	Pimephales notatus
Channel Catfish	Ictalurus punctatus
Black Bullhead	Ictalurus melas
Shovelhead Catfish	Pylodictis olivaris
Northern Pike	Esox lucius
White Bass	Roccus chrysops
Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum
Slenderhead Darter	Percina phoxocephala
Smallmouth Bass	Micropterus dolomieui
Green Sunfish	Lepomis cyanellus
Orangespotted Sunfish	Lepomis humilis
Bluegill	Lepomis macrochirus
White Crappie	Pomoxis annularis
Black Crappie	Pomoxis nigromaculatus
Sheepshead	Aplodinotus grunniens

b. Number and Weight or Size of Fish Captured

Minnesota River
Sector II - Nine Shocking Runs
Summer 1958

A.C. Shocker, Total Hours - 19.92

Species	Total Number	Number per Hour	Percent Composition of Total Catch	Total Pounds	Pounds per Hour
Shortnose Gar	4	0.20	0.3	2.9	0.15
Gizzard Shad	4	0.20	0.3	3.9	0.20
Bigmouth Buffalo	16	0.80	1.1	84.4	4.24
Smallmouth Buffalo	4	0.20	0.3	16.2	0.81
Quillback	80	4.02	5.6	112.3	5.64
Carpsucker (Highfin and River)	51	2.56	3.6	68.7	3.45
Common Sucker	8	0.40	0.6	3.6	0.18
Hog Sucker	2	0.10	0.1	2.5	0.13
Silver Redhorse	14	0.70	1.0	26.6	1.34
Northern Redhorse	115	5.77	8.1	112.8	5.66
Carp	855	42.92	60.3	1,778.4*	89.28
Channel Catfish	55	2.76	3.9	87.6	4.40
Flathead Catfish	15	0.75	1.1	21.1	1.06
Northern Pike	12	0.60	0.8	53.1	2.67
White Bass	70	3.51	4.9	21.2	1.06
Sauger	35	1.76	2.5	26.0	1.30
Walleye	42	2.11	3.0	100.4	5.04
Smallmouth Bass	2	0.10	0.1	0.5	0.02
White Crappie	5	0.25	0.4	0.1	trace
Black Crappie	3	0.15	0.2	0.6	0.03
Sheepshead	25	1.26	1.8	17.4	0.87
Totals 22	1,417	71.12	100.0	2,540.3	127.53

* Expanded from weights of 378 fish of total of 855; 378 fish weighed 785.4 pounds, or average of 2.08 pounds per fish.

Minnesota River
Sector II - Stations 6-9
Summer 1958

	Trapnets - 48 Pots			48 Single-pot Sets	
Species	Total Number	Number per Pot	Percent Composition of Total Catch	Total Pounds	Pounds per Pot
Shortnose Gar	22	0.46	2.2	35.1	0.73
Gizzard Shad	2	0.04	0.2	1.3	0.03
Bigmouth Buffalo	10	0.21	1.0	42.2	0.88
Quillback	36	0.75	3.5	36.6	0.76
Carpsucker	1	0.02	trace	0.5	0.01
Common Sucker	9	0.19	0.9	5.0	0.10
Silver Redhorse	6	0.12	0.6	10.7	0.22
Northern Redhorse	7	0.15	0.7	9.0	0.19
Carp	699	14.56	69.4	927.1	19.32
Channel Catfish	4	0.08	0.4	4.7	0.10
Black Bullhead	13	0.27	1.3	3.0	0.06
Shovelhead Catfish	9	0.19	0.9	7.9	0.16
Northern Pike	27	0.56	2.7	80.3	1.67
White Bass	59	1.23	5.9	59.0	1.23
Sauger	16	0.33	1.6	17.0	0.35
Walleye	11	0.23	1.1	11.0	0.23
White Crappie	9	0.19	0.9	3.4	0.07
Black Crappie	34	0.71	3.4	7.1	0.15
Sheepshead	33	0.69	3.3	23.4	0.49
Totals 19	1,007	20.98	100.0	1,284.3	26.75

Seining

The river in Sector II was seined with a 40' by 5' bag seine of ¼-inch mesh at 6 different locations (Nos. 8 thru 13 on map) for a total of 26,500 square feet or 0.61 acre.

Species	(Measurements Estimated) Size	Total Number	
Bigmouth Buffalofish	18 inches	1	
Quillback	fingerling	1	62
Quillback	no measurements taken	22	
Quillback	½ to 8 inches (27 were ½ inch or less)	39	
Common Sucker	no measurements taken	1	
Carp	5 to 10 inches	11	
Shiners (species unidentified)	-	1,234	
Fathead Minnow	-	3,282	
Bluntnose Minnow	-	4	
Channel Catfish	fingerling	3	6
Channel Catfish	4 inches	3	
Black Bullhead	6 inches	1	
White Bass	5 to 6 inches	16	
Darters (species unidentified)	-	4	
Bluegill	1 inch	1	
Sunfish (species unidentified)	2 inches	1	
White Crappie	3 to 5 inches	3	

c. Game Fish Spawning Conditions
Spawning conditions for game fish range from poor to fair at best. The Minnesota River contains shallow water, shifting sand bottoms, and is quite turbid. Tributary streams appear to be unsuitable, at least in the vicinity of their mouths.

SECTOR III - From Henderson Bridge in T. 112, R. 26, S. 1 and upstream for 38.3 miles to the mouth of the Blue Earth River in T. 108, R. 27, S. 14.

A. Watershed Characteristics
1. Length and Width
Length - 38.3 miles
Width - average between 125 and 175 feet or near 150 feet

2. Water Depth, Flow, and Gradient
Depth - average between 2 and 3 feet, maximum between 20 and 25 feet.
Flow - near 150 c.f.s. at Henderson (estimated 8-4-59); 257 c.f.s. (7-21-59) and 119 c.f.s. (8-10-59) at U.S. Corps of Engineers gaging station at the main street bridge in Mankato 1.8 miles below mouth of Blue Earth River.
Gradient - approximately 47 feet in 38.3 miles, or about 0.3 inch per 100 feet (Report of Water Resources Investigation of Minnesota, 1909-1912)

3. Bottom Types and Pool Types
Soils of the river bottom appear to be divided into approximately 95% sand, 3% boulder, and 2% rubble. Silt is minute.

The waters are composed of about 45% pools and 55% bars. A major pool type classification is believed to be C-2 altho other types exist such as D-2, A-2, and B-2. See manual of stream survey procedures for description of pool types.

4. Dams and Other Permanent Obstructions
No dams are present. However, bridges and remains of old bridges offer obstructions.

5. Beaver Dams - Age and Felling Activity
No beaver dams are present. Some thinly scattered beaver cuttings were seen. However, they appear to be old.

6. Tributaries - Width, Location, Flow, and Temperature
M-55-57 (Rush River):
Width - 12 feet at mouth
Location - enters right bank of river in T. 112, R. 26, S. 13 - SW¼ and SE¼ line
Flow - 2.88 c.f.s.
Temperature - 76°F. in mouth; see stations r to s (August 4, 1959) of section II B 2.

M-55-58 (LeSueur Creek):
Width - mouth is 3 feet
Location - from left river bank in T. 112, R. 26, S. 25 - NW¼
Flow - 0.75 c.f.s.
Temperature - 71½°F. at mouth; see stations r to s (August 4, 1959) of section II B 2.

M-55-59:
Width - 8 inches at mouth
Location - enters left bank of river in T. 112, R. 26, S. 35 - SE¼
Flow - 0.05 c.f.s.
Temperature - 81°F. in mouth; see stations s (July 29, 1959) to t of section II B 2.

M-55-60:
Width - mouth is 3 feet
Location - right river bank in T. 112, R. 26, S. 34 - SE¼
Flow - 0.50 c.f.s.
Temperature - 89°F. in mouth; see stations s (July 29, 1959) to t of section II B 2.

M-55-61:
Width - 1 foot at mouth
Location - enters right bank of river in T. 111, R. 26, S. 15 - NE¼
Flow - 0.10 c.f.s.
Temperature - 81°F. in mouth; see stations t to u (July 29, 1959) of section II B 2.

M-55-62:
Width - 2½ feet at mouth
Location - left bank of river in T. 111, R. 26, S. 15 - SE¼
Flow - 0.25 c.f.s.
Temperature - mouth is 74°F.; see stations t to u (July 29, 1959) of section II B 2.

M-55-63:
Width - 2 feet near mouth which flows over 6-foot wide delta
Location - enters right river bank in T. 110, R. 26, S. 4 - NW¼
Flow - 0.35 c.f.s.
Temperature - 64½°F. in mouth; see stations u (July 28, 1959) to v of section II B 2.

M-55-64:
Width - 3 feet at mouth
Location - left bank of river in T. 110, R. 26, S. 4 - NE¼
Flow - 0.50 c.f.s.
Temperature - 95½°F. in mouth; see stations u (July 28, 1959) to v of section II B 2.

M-55-65:
Width - small, not noted
Location - enters right river bank in T. 110, R. 26, S. 10 - NW¼
Flow - 0.10 c.f.s.
Temperature - 58°F. at mouth; see stations u (July 28, 1959) to v of section II B 2.

M-55-66:
Width - near mouth 2½ feet
Location - left bank of river in T. 110, R. 26, S. 10 - NW¼
Flow - 0.20 c.f.s.
Temperature - 88½°F. in mouth; see stations u (July 28, 1959) to v of section II B 2.

M-55-67:
Width - mouth is 8 feet
Location - enters left river bank in T. 110, R. 26, S. 15 - NE¼
Flow - 1.25 c.f.s.
Temperature - 87°F. at mouth; see stations v to w of section II B 2.

M-55-68:
Width - mouth is 2½ feet
Location - left bank of river in T. 110, R. 26, S. 28 - SW¼
Flow - 0.25 c.f.s.
Temperature - 60°F. in mouth; see stations v to w of section II B 2.

M-55-69:
Width - 2½ feet at mouth
Location - enters left river bank in T. 110, R. 26, S. 29 - SE¼
Flow - 0.30 c.f.s.
Temperature - 72½°F. at mouth; see stations v to w of section II B 2.

M-55-70:
Width - mouth is 5 feet
Location - left bank of river in T. 110, R. 26, S. 29 - SE¼
Flow - 0.40 c.f.s.
Temperature - 82½°F. in mouth; see stations v to w of section II B 2.

M-55-71:
Width - 1 foot in mouth
Location - enters right river bank in T. 109, R. 27, S. 1 - SE¼
Flow - 0.05 c.f.s.
Temperature - 62°F. in mouth (7-27-59, 9:25 p.m.); see stations x to y of section II B 2.

M-55-72:
Width - 4 feet at mouth
Location - left bank of river in T. 109, R. 26, S. 18 - SW¼
Flow - 0.4 c.f.s.
Temperature - 75½°F. in mouth; see stations x to y of section II B 2.

M-55-73:
Width - not noted, small
Location - right river bank in T. 109, R. 27, S. 13 - SW¼
Flow - 0.05 c.f.s.
Temperature - 66°F. at mouth; see stations x to y of section II B 2.

M-55-74:
Width - mouth is 3 feet
Location - enters left bank of river in T. 108, R. 26, S. 7 - SW¼ and SE¼ line
Flow - 0.35 c.f.s.
Temperature - mouth is 61°F.; see stations y to z of section II B 2.

M-55-75:
Width - 4 to 5 feet at mouth
Location - from left river bank in T. 108, R. 26, S. 18 - NW¼
Flow - 1.0 c.f.s.
Temperature - 82½°F. in mouth; see stations y to z of section II B 2.

7. Springs - Location, Temperature, and Flow

Spring Area J:
Location - right bank of river in T. 112, R. 26, S. 13 - SW¼
Temperature - 48°F. to 55°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 4 small springs; total flow - 0.05 c.f.s.

Spring Area K:
Location - left river bank in T. 112, R. 26, S. 25 - SW¼, along 200 feet of shore
Temperature - 48°F. to middle 50's; see stations r to s (August 4, 1959) of section II B 2.
Flow - 12 small springs; total flow - about 0.35 c.f.s.

Spring Area L:
Location - right river bank in T. 112, R. 26, S. 34 - NE¼
Temperature - 50°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 1 small spring - 0.05 c.f.s.

Spring Area M:
Location - right bank of river in T. 112, R. 26, S. 34 - NE¼
Temperature - 48°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 4 minute springs; flow not estimated

Spring Area N:
Location - right river bank in T. 112, R. 26, S. 34 - NE¼, shortly above area M
Temperature - 48°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 12 small springs; total c.f.s. - not over 0.30

Spring Area O:
Location - right bank of river shortly above area N in T. 112, R. 26, S. 34 - NE¼
Temperature - 48°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 7 small springs; total flow - near 0.15

Spring Area P:
Location - right river bank in T. 112, R. 26, S. 34 - NE¼, shortly above area O
Temperature - 52°F. at mouth - sources are eight 48°F. springs
Flow - 0.10 c.f.s.

Spring Area Q:
Location - right bank of river in T. 112, R. 26, S. 34 - NE¼, shortly above area P.
Temperature - 48°F.; see stations r to s (August 4, 1959) of section II B 2.
Flow - 17 small springs; total flow - about 0.35 c.f.s.

Spring Area R:
Location - left bank of river in T. 112, R. 26, S. 35 - SW¼, just above the old LeSueur bridge, along 250 feet of shore
Temperature - 52° to 60°F.; see stations s (July 29, 1959) to t of section II B 2.
Flow - 0.15 c.f.s. (total) - 5 small springs

Spring Area S:
Location - left river bank in T. 111, R. 26, S. 10 - NE¼
Temperature - 48°F. to lower 50's; see stations t to u (July 29, 1959) of section II B 2.
Flow - 15 small springs not over 0.3 c.f.s. (total)

Spring Area T:
Location - left bank of river in T. 111, R. 26, S. 10 - SE¼
Temperature - 48°F.; see stations t to u (July 29, 1959) of section II B 2.
Flow - 10 small springs; total - about 0.35 c.f.s.

Spring Area U:
Location - right bank of river in T. 111, R. 26, S. 15 - NE¼ and SE¼ line
Temperature - not taken; see stations t to u (July 29, 1959) of section II B 2.
Flow - area of minute springs; number and flow not taken

Spring Area V:
Location - left riverbank in T. 111, R. 26, S. 21 and 22 line
Temperature - 56° to 60°F.; see stations t to u (July 29, 1959) of section II B 2.
Flow - 8 minute springs; flow - not estimated

Spring Area W:
Location - left bank of river in T. 111, R. 26, S. 27 and 28 line
Temperature - 56°F.; see stations t to u (July 29, 1959) of section II B 2.
Flow - 4 minute springs; flow - not estimated

Spring Area X:
Location - left river bank in T. 111, R. 26, S. 28 - NE¼
Temperature - all near 56°F; see stations t to u (July 29, 1959) of section II B 2.
Flow - 6 minute springs; flow - not estimated

Spring Area Y:
Location - left bank of river in T. 111, R. 26, S. 28 - NE¼
Temperature - 54°F. (mouth); see stations t to u (July 29, 1959) of section II B 2.
Flow - small spring of 0.30 c.f.s.

Spring Area Z:
Location - left bank of river in T. 111, R. 26, S. 33 - NE¼.
Temperature - not recorded
Flow - minute (1 spring)

Spring Area AA:
Location - left bank of river in T. 111, R. 26, S. 33 - NE¼, along 100 feet of shore
Temperature - 49° to 62°F.; see stations u (July 28, 1959) to v of section II B 2.
Flow - 28 springs; total - not over 0.35 c.f.s.

Spring Area BB:
Location - left river bank in T. 111, R. 26, S. 33 - NE¼
Temperature - 52°F. at mouth; see stations u (July 28, 1959) to v of section II B 2.
Flow - 1 spring of 0.05 c.f.s.

Spring Area CC:
Location - right bank of river in T. 110, R. 26, S. 4 and 9 line
Temperature - 48° and 49°F.; see stations u (July 28, 1959) to v of section II B 2.
Flow - 2 springs not over 0.1 c.f.s.

Spring Area DD:
Location - left bank of river in T. 110, R. 26, S. 28 - NE¼ line
Temperature - 48°F. to middle 50's; see stations v to w of section II B 2.
Flow - 16 small springs totaling not over 0.40 c.f.s.

Spring Area EE:
Location - left bank of river in T. 110, R. 26, S. 28 - NW¼
Temperature - not recorded
Flow - 2 springs or seepages about 0.05 c.f.s. each

Spring Area FF:
Location - left river bank in T. 110, R. 26, S. 28 - SW¼
Temperature - 48°F.; see stations v to w of section II B 2.
Flow - 9 springs totaling 0.20 c.f.s.

Spring Area GG:
Location - right bank of river in T. 110, R. 26, S. 31 - NE¼
Temperature - 56° to 62°F.; see stations v to w of section II B 2.
Flow - 25 seepages with total of about 0.60 c.f.s.

8. Nature and Use of Shoreline

Shortly below the mouth of the Blue Earth River the Minnesota River makes a right angle bend. From this bend to Henderson the flow is very close to due north over a course that has many bends and oxbows. River banks as a whole are quite steep, and many barren vertical cuts are present which exhibit sandy loam and clay loam profiles. Average bank height ranges approximately between 12 and 15 feet. Width of the river valley varies from a minimum near 3/4 mile to a maximum of 3½ miles with an average of about 1½ miles. Bottom lands along the river have a scattering of trees either as a thin fringe or in small woodlots which do not go back over ½ mile from the river's edge. Tree species tend to be mainly willow, cottonwood, boxelder, and elm. Bordering hills range from 100 to 300 feet above the river.

Valley bottom lands to a large extent are used for agriculture (80%) with remaining portions being divided into wild land (15%) and homesites (5%).

9. Shade and Bank Cover
Shade on the river is derived only during certain portions of the day when hills and bordering trees give some protection. However, for practical purposes, the river may be considered open to the sun. Bank cover is poor as the steep or vertical cut slopes have little vegetation.

10. Soil Erosion - Type and Extent
River bank erosion was most serious and prominent during the trip downriver. However, sheet erosion from farm fields was quite noticeable. Erosion of gullies appears to be in a lesser degree altho this too should be considered of a serious nature.

11. High Water Marks and Other Evidences of Floods
Flood evidence is quite abundant in existing log jams, deadheads, and cut banks. An extreme high watermark of about 28.5 feet above the low August 1959 level has been noted at the Mankato gauging station (1881). High water in 1951 raised the level about 25 feet above the same 1959 reading. In the past extreme flooding has made many valley roads impassable to traffic.

12. River Improvements - Structure Activities and Location
In recent years the Mankato vicinity of the river has seen channel straightening and deepening as well as considerable diking in an effort to reduce the damaging effects of floods and high water.

B. Physical and Chemical Characteristics of Water
1. Turbidity and Color of Water
Waters of the sector were quite turbid thruout (1959) with the color being a uniform moderate chocolate brown. In 1958 Secchi disk readings ranged from 5 to 8 inches.

2. Temperatures
August 4, 1959
r. Henderson Bridge (11:45 a.m. - clear) - air 83°F., water 77½°F.

s. Old LeSueur Bridge (9:00 a.m. - clear) - air 79°F., water 76°F.

July 29, 1959
s. Old LeSueur Bridge (1:45 p.m. - 3% clouds) - air 87°F., water 82½°F.

t. Above LeSueur Bridge - just below Spring Area S - (12:20 p.m. - 45% clouds) - air 85½°F., water 84°F.

u. Midway between LeSueur and St. Peter (10:15 a.m. - 5% clouds) - air 79°F., water 79½°F.

July 28, 1959
u. Midway between LeSueur and St. Peter (5:30 p.m. -30% clouds) - air 87°F., water 86°F.

v. Below St. Peter Bridge, - at M-55-66 - (3:25 p.m. - 45% clouds) - air 87°F., water 84°F.

w. Near St. Peter State Hospital - at Spring Area GG - (1:25 p.m. - 65% clouds) - air 85°F., water 84°F.

July 27, 1959

x. Above St. Peter Bridge - just below M-55-72 - (8:20 p.m. - clear at dusk) - air 80½°F., water 81°F.

y. Above St. Peter Bridge, *100 miles (7:20 p.m. - clear) - air 85°F., water 85½°F.

z. Shortly above and below entrance of Blue Earth River (4:45 p.m. - clear) - air 87°F., water 85½°F.

3. Water Quality

Analysis of surface water samples taken on August 22, 1958:

P.P.M.	LeSueur ¼ mile below Green Giant Plant	LeSueur 200 feet below Old LeSueur Bridge	LeSueur 200 feet above Old LeSueur Bridge	St.Peter 200 feet below sewers	St.Peter 100 feet above sewers	Mankato 200 feet below sewers	Mankato 200 feet above sewers
Total phosphorus	0.121	0.299	0.114	0.239	0.167	0.099	0.116
Chloride ion	15.0	13.5	13.5	12.9	12.0	12.0	10.8
Total nitrogen	1.676	1.85	2.185	1.493	1.744	1.702	1.225
Carbon dioxide	0	0	0	0	0	0	0
Total alkalinity	231.0	250.0	255.0	245.0	244.0	240.0	266.0

Results of surface water dissolved oxygen tests done on June 18, 23, 27, 29, and July 3, 1958, at stations 1 thru 5 respectively:

	P.P.M.
Station 1	10.6
Station 2	9.5
Station 3	10.9
Station 4	9.9
Station 5	9.6

Waters of Sector III are hard. Fertility ranges from good (phosphorus), to good and very fertile (nitrogen). Chloride ion content indicates pollution throughout. Oxygen levels of surface waters are good.

4. Pollution - Types and Sources

Pollution is from sewers situated at almost every town on the river. At LeSueur, in addition to pollution from village sewers, the Green Giant Canning Company runs an additional three pipes into the river which carry byproducts of canning operations.

C. Biological Characteristics

1. Aquatic Plants

Evidence of aquatic vegetation is totally lacking.

2. Fishes

a. Fish Present (seining, trapnetting, and electro-fishing)

Common Name	Scientific Name
Shortnose Gar	Lepisosteus platostomus
Mooneye	Hiodon tergisus
Gizzard Shad	Dorosoma cepedianum
Bigmouth Buffalofish	Ictiobus cyprinellus
Smallmouth Buffalofish	Ictiobus bubalus
Quillback	Carpiodes cyprinus
River Carpsucker	Carpiodes carpio
Highfin Carpsucker	Carpiodes velifer
Common White Sucker	Catostomus commersoni
Northern Hog Sucker	Hypentelium nigricans
Silver Redhorse	Moxostoma anisurum
Northern Redhorse	Moxostoma aureolum
Carp	Cyprinus carpio
Emerald Shiner	Notropis atherinoides
Spotfin Shiner	Notropis spilopterus
Central Bigmouth Shiner	Notropis dorsalis
Sand Shiner	Notropis deliciosus
Brassy Minnow	Hybognathus hankinsoni
Fathead Minnow	Pimephales promelas
Bluntnose Minnow	Pimephales notatus
Channel Catfish	Ictalurus punctatus
Black Bullhead	Ictalurus melas
Yellow Bullhead	Ictalurus natalis
Shovelhead Catfish	Pylodictis olivaris
Northern Pike	Esox lucius
White Bass	Roccus chrysops
Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum
Slenderhead Darter	Percina phoxocephala
Smallmouth Bass	Micropterus dolomieui
Largemouth Bass	Micropterus salmoides
Green Sunfish	Lepomis cyanellus
Orangespotted Sunfish	Lepomis humilis
Rock Bass	Ambloplites rupestris
White Crappie	Pomoxis annularis
Black Crappie	Pomoxis nigromaculatus
Sheepshead	Aplodinotus grunniens

b. Number and Weight of Fish Captured

Minnesota River
Sector III - Eleven Shocking Runs
Date of Survey - Summer 1958

A.C. Shocker, Total Hours - 25.17

Species	Total Number	Number per Hour	Percent Composition of Total Catch	Total Pounds	Pounds per Hour
Shortnose Gar	33	1.31	1.3	24.7	0.98
Gizzard Shad	27	1.07	1.0	12.4	0.49
Bigmouth Buffalo	3	0.12	0.1	18.0	0.72
Smallmouth Buffalo	6	0.24	0.2	24.8	0.98
Quillback	163	6.48	6.2	129.9	5.16
Carpsucker	26	1.03	1.0	32.6	1.30
Common Sucker	8	0.32	0.3	3.3	0.13
Hog Sucker	9	0.36	0.3	7.8	0.31
Silver Redhorse	58	2.30	2.2	59.2	2.35
Northern Redhorse	128	5.08	4.9	84.9	3.37
Carp	1,742	69.21	66.6	2,549.6**	101.30
Channel Catfish	125*	4.97	4.8	46.7*	1.86
Flathead Catfish	21	0.83	0.8	33.2	1.32
Northern Pike	4	0.16	0.2	10.5	0.42
White Bass	104	4.13	4.0	28.2	1.12
Sauger	47	1.87	1.8	43.6	1.73
Walleye	17	0.68	0.7	36.5	1.45
Smallmouth Bass	11	0.44	0.4	4.0	0.16
Rock Bass	1	0.04	trace	0.2	0.01
White Crappie	4	0.16	0.2	0.8	0.03
Black Crappie	3	0.12	0.1	0.8	0.03
Sheepshead	74	2.94	2.9	65.2	2.59
Totals 22	2,614	103.86	100.0	3,216.9	127.81

* Catch does not include 35 fingerlings for which there is no weight
** Total pounds is expansion derived from average weight of 264 fish

Minnesota River
Sector III - Stations 1 thru 5
Date of Survey - Summer 1958

Species	Trapnets - 60 Pots: Total Number	Number per Pot	Percent Composition of Total Catch	60 Single-pot Sets: Total Pounds	Pounds per Pot
Shortnose Gar	24	0.40	1.4	39.9	0.66
Mooneye	1	0.02	trace	1.3	0.02
Smallmouth Buffalo	1	0.02	trace	3.6	0.06
Quillback	119	1.98	7.1	106.5	1.78
Common Sucker	8	0.13	0.5	6.5	0.11
Silver Redhorse	3	0.05	0.2	1.7	0.03
Northern Redhorse	6	0.10	0.4	5.8	0.10
Carp	1,228	20.47	73.6	776.5	12.94
Channel Catfish	14	0.23	0.9	39.3	0.66
Brown and Black Bullheads	22	0.37	1.3	8.6	0.14
Yellow Bullhead	1	0.02	trace	1.5	0.02
Shovelhead Catfish	3	0.05	0.2	12.8	0.21
Northern Pike	36	0.60	2.2	132.5	2.21
White Bass	65	1.08	3.9	58.0	0.97
Sauger	13	0.22	0.8	9.9	0.16
Walleye	15	0.25	0.9	29.9	0.50
Largemouth Bass	1	0.02	trace	0.4	0.01
Rock Bass	1	0.02	trace	0.2	trace
White Crappie	30	0.50	1.8	10.0	0.17
Black Crappie	52	0.87	3.1	14.6	0.24
Sheepshead	28	0.47	1.7	14.5	0.24
Totals 22	1,671	27.87	100.0	1,274.0	21.23

Seining

This portion of the river was seined in 7 different locations (Stations 1 thru 7 - see map) with a 40' by 5' bag seine of ¼-inch mesh covering a total area near 17,000 square feet or 0.4 acre (Stations 1 and 2 area not available).

Species	Size	Total Number
Shortnose Gar	Small	1
Gizzard Shad	No data recorded	No data recorded
Bigmouth Buffalofish	No data recorded	No data recorded
Quillback	Small and/or 4 inches	4
Hog Sucker	9 inches	1
Northern Redhorse	No data recorded	No data recorded
Highfin Carpsucker	No data recorded	No data recorded
Carp	Small and/or 5 inches	4
Emerald Shiner	No data recorded	No data recorded
Spotfin Shiner	No data recorded	No data recorded
Bigmouth Shiner	-	26
Sand Shiner	No data recorded	No data recorded
Shiners (species unidentified)	-	1,083
Brassy Minnow	No data recorded	No data recorded
Fathead Minnow	-	26
Bluntnose Minnow	-	4
Channel Catfish	Fingerling	4
Black Bullhead	-	1
White Bass	Small and/or 6 inches	5
Sauger	11 inches	1
Slenderhead Darter	No data recorded	No data recorded
Green Sunfish	No data recorded	No data recorded
Orangespot Sunfish	No data recorded	No data recorded
White Crappie	3 (small), and 17 are 3 to 4½ inches	20

c. Game Fish Spawning Conditions

Spawning conditions for game fish vary from poor to fair. Gravel and rubble is present. However, a greater share of the river is still shifting sand and quite turbid. A goodly portion of the river is shallow, and tributaries appear to offer little in the way of spawning facilities.

III. Data Pertaining to Entire Portion of River Surveyed

A. Fish Population Characteristics

1. Fish Present (seining, electro-fishing, and trapnetting)

Common Name	Scientific Name
Shortnose Gar	Lepisosteus platostomus
Dogfish	Amia calva
Mooneye	Hiodon tergisus
Gizzard Shad	Dorosoma cepedianum
Bigmouth Buffalofish	Ictiobus cyprinellus
Smallmouth Buffalofish	Ictiobus bubalus
Quillback	Carpiodes cyprinus
Northern Carpsucker	Carpiodes carpio
Highfin Carpsucker	Carpiodes velifer
Common White Sucker	Catostomus commersoni
Northern Hog Sucker	Hypentelium nigricans
Silver Redhorse	Moxostoma anisurum
Northern Redhorse	Moxostoma aureolum
Carp	Cyprinus carpio
Silver Chub	Hybopsis storeriana
Emerald Shiner	Notropis atherinoides
Spotfin Shiner	Notropis spilopterus
Central Bigmouth Shiner	Notropis dorsalis
Sand Shiner	Notropis deliciosus
Brassy Minnow	Hybognathus hankinsoni
Fathead Minnow	Pimephales promelas
Bluntnose Minnow	Pimephales notatus
Channel Catfish	Ictalurus punctatus
Black Bullhead	Ictalurus melas
Yellow Bullhead	Ictalurus natalis
Shovelhead Catfish	Pylodictis olivaris
Northern Pike	Esox lucius
White Bass	Roccus chrysops
Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum
Slenderhead Darter	Percina phoxocephala
Smallmouth Bass	Micropterus dolomieui
Largemouth Bass	Micropterus salmoides
Green Sunfish	Lepomis cyanellus
Orangespotted Sunfish	Lepomis humilis
Bluegill	Lepomis macrochirus
Rock Bass	Ambloplites rupestris
White Crappie	Pomoxis annularis
Black Crappie	Pomoxis nigromaculatus
Sheepshead	Aplodinotus grunniens

2. Fish Habitat

From observations made by the shocking crew during the summer of 1958 general habitat types as classified thru some visible physical features have been assigned to several species of fish taken during the period of electro-fishing.

Carp and carpsuckers were found almost everywhere in the river. However, the former appeared to be more concentrated around sewer openings and muddy or silty shorelines.

Northern and silver redhorse preferred fast water. Heavy concentrations of northern redhorse were found in riffle areas. Silver redhorse were taken in many places in the river other than fast water.

Sandbars were the favorite haunts of white bass especially where tributaries entered the river. However, they frequented many different types of habitat.

Rocky shorelines between Mankato and LeSeuer attracted sauger which could be found from 2 to 3 feet from the river banks. Below LeSeuer the saugers appeared to prefer sandbars to rocky shorelines.

Smallmouth bass, as past experience has shown in many other bodies of water, were found almost entirely along rocky shorelines.

Few northern pike were taken by electro-fishing. However, those which were captured always were in areas where there were springs in the river or flowing into the river.

The more swift waters or sandbars seemed to appeal to fingerling channel catfish. Hundreds of fingerlings were taken in 6 to 12 inches of water in this habitat. It was a rarity to find flathead catfish except along rocky shorelines.

3. Effectiveness of Electro-fishing

For shocking operations in the Minnesota River an alternating current producing generator was used which put out 230 volts and 6.3 amperes. A system of 3 electrodes stretched across the front of a 16-foot wooden barge on a boom was used. The electrodes were approximately 3 feet long and made of copper.

Water up to 4 feet in depth appeared to be covered quite well by the shocker. However, as the depth increased (below 4 feet) the effectiveness of the electrical field decreased. The ability of the electro-fishing gear to knock out fish so that they could be recovered varied with the species involved and water depth. Some reasons for the ineffectiveness of the shocker may be due to a weak electrical field, lack of a proper arrangement of electrodes, turbidity, hardness of water, depth of water, and water velocity.

In the portion of the Minnesota River covered the shocker worked best on carp, carpsuckers, walleyes, saugers, and white bass. Where the water was more than 3½ feet deep walleyes and catfish came up behind the barge and, therefore, it was necessary to keep a sharp watch so that they could be retrieved. A number of walleyes and saugers came to the river's surface 2 to 3 feet outside the electrodes, recovered, and swam away before they could be caught.

Northern pike, crappies, and bullheads were the least readily caught by the shocker's electrical field. Apparently, when excited by electricity, they react more quickly in making a swift and strong retreat and, therefore, are not easily caught. A goodly number of crappies and bullheads were present as noted by trapnetting.

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions **Sector I**

Date of Survey - Summer 1958

Species and Numbers of Fish in Length Groups

Total Length in Inches	Shovel-head Catfish	Sheeps-head	North-ern Pike	Dog-fish	Channel Catfish	Wall-eye	Short-nose Gar	Sauger	Large-mouth Bass
2.0 - 2.4		7							
2.5 - 2.9		4							
3.0 - 3.4		6							
3.5 - 3.9		2							
4.0 - 4.4	1	1			1				
4.5 - 4.9		3							
5.0 - 5.4									
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9									
7.0 - 7.4									1
7.5 - 7.9									
8.0 - 8.4									
8.5 - 8.9									
9.0 - 9.4									
9.5 - 9.9		1							
10.0 - 10.4		1							
10.5 - 10.9		3						1	
11.0 - 11.4									
11.5 - 11.9									
12.0 - 12.9	1	2						2	
13.0 - 13.9		2		1				1	
14.0 - 14.9	1	1			1	2	1	2	
15.0 - 15.9			1		1				
16.0 - 16.9		1		1			1		
17.0 - 17.9		1	1				3		
18.0 - 18.9				1					
19.0 - 19.9			1	1		1			
20.0 - 20.9			5	1					
21.0 - 21.9			3	1					
22.0 - 22.9			1	2					
23.0 - 23.9			1						
24.0 - 24.9			1			1			
25.0 - 25.9									
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	4	42	15	8	3	4	5	6	1

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions

Sector I (continued)

Species and Numbers of Fish in Length Groups

Total Length in Inches	White Bass	Moon-eye	Black Bull-head	Carp	Big-mouth Buffalo	North-ern Red-horse	Silver Red-horse	Common Sucker	Quill-back
2.0 - 2.4									
2.5 - 2.9									
3.0 - 3.4							1		
3.5 - 3.9						3			
4.0 - 4.4	4								
4.5 - 4.9	5					6			
5.0 - 5.4						1			
5.5 - 5.9									
6.0 - 6.4									
6.5 - 6.9				2					
7.0 - 7.4	1		1	4					
7.5 - 7.9	3			3					
8.0 - 8.4				5					
8.5 - 8.9	4			5					
9.0 - 9.4				12				1	
9.5 - 9.9			1	5					1
10.0 - 10.4				5					1
10.5 - 10.9				6					
11.0 - 11.4	1			12					1
11.5 - 11.9	1			9					
12.0 - 12.9	2			7		1	1	1	1
13.0 - 13.9				10					1
14.0 - 14.9		1		8				1	
15.0 - 15.9	1			16		1	1		1
16.0 - 16.9				16					
17.0 - 17.9				16					
18.0 - 18.9				13	2			1	
19.0 - 19.9				9				1	
20.0 - 20.9				4	2				
21.0 - 21.9				1	1				
22.0 - 22.9				1	1				
23.0 - 23.9				4					
24.0 - 24.9				1					
25.0 - 25.9				1					
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	22	1	2	175	6	14	3	5	6

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions **Sector I (continued)**

Species and Numbers of Fish in Length Groups

Total Length in Inches	River Carpsucker	Highfin Carpsucker	Gizzard Shad	Rock Bass	Black Crappie	White Crappie			
1.0 - 1.9			28						
2.0 - 2.9			8						
3.0 - 3.4			9						
3.5 - 3.9			16						
4.0 - 4.4			14			1			
4.5 - 4.9			9			2			
5.0 - 5.4			9		5				
5.5 - 5.9			1		7				
6.0 - 6.4			2		3	1			
6.5 - 6.9			2		2				
7.0 - 7.4					1				
7.5 - 7.9				1	2				
8.0 - 8.4						2			
8.5 - 8.9									
9.0 - 9.4					1				
9.5 - 9.9					2				
10.0 - 10.4						1			
10.5 - 10.9									
11.0 - 11.4									
11.5 - 11.9									
12.0 - 12.9									
13.0 - 13.9		3							
14.0 - 14.9		2							
15.0 - 15.9									
16.0 - 16.9	1								
17.0 - 17.9	1								
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	2	5	100	1	23	7			

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions

Sector II

Date of Survey - Summer 1958

Species and Numbers of Fish in Length Groups

Total Length in Inches	Shovel-head Catfish	Sheeps-head	North-ern Pike	Channel Catfish	Wall-eye	Short-nose Gar	Sauger	White Bass	Carp
3.0 - 3.4									
3.5 - 3.9									
4.0 - 4.4									
4.5 - 4.9	1								
5.0 - 5.4									
5.5 - 5.9				2				1	1
6.0 - 6.4								13	1
6.5 - 6.9								16	6
7.0 - 7.4		1		2				14	9
7.5 - 7.9	1	1		1				14	7
8.0 - 8.4		2		1				4	17
8.5 - 8.9		11		1				9	12
9.0 - 9.4		9		5			1	1	17
9.5 - 9.9		3							28
10.0 - 10.4		4					3		32
10.5 - 10.9	1	3					3	5	25
11.0 - 11.4	4	4			4		1	6	14
11.5 - 11.9		4		2			1	12	8
12.0 - 12.9	5	8		3	7		14	12	11
13.0 - 13.9	7	1		1	8		10	7	26
14.0 - 14.9	1	1		2	8	1	8	12	29
15.0 - 15.9	2	3		4	1	1	3	3	26
16.0 - 16.9	1			6	5		3	1	27
17.0 - 17.9		3	3	8	1	1	2		23
18.0 - 18.9				6	4		2		26
19.0 - 19.9			1	4					16
20.0 - 20.9			2	4	1	2			16
21.0 - 21.9			5	1	1	8			3
22.0 - 22.9			3		4	7			6
23.0 - 23.9			7	1	6	5			6
24.0 - 24.9			8		1				3
25.0 - 25.9			2		1	1			1
26.0 - 26.9	1								1
27.0 - 27.9			3						
28.0 - 28.9									
29.0 - 29.9			1						
30.0 - 30.9			1						
31.0 - 31.9									
32.0 - 32.9									
33.0 - 33.9									
34.0 - 34.9									
35.0 - 35.9									
36.0 - 36.9									
37.0 - 37.9			1						
TOTALS	24	58	37	54	52	26	51	139	397

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions Sector II (continued)

Species and Numbers of Fish in Length Groups

Total Length in Inches	Big-mouth Buffalo	Northern Redhorse	Silver Redhorse	Common Sucker	Quill-back	River Carp-sucker	Highfin Carp-sucker	Black Crappie	
3.0 - 3.4									
3.5 - 3.9									
4.0 - 4.4									
4.5 - 4.9									
5.0 - 5.4		2						3	
5.5 - 5.9		2						11	
6.0 - 6.4		3			1			4	
6.5 - 6.9		5		1	1		1	7	
7.0 - 7.4		1		1				1	
7.5 - 7.9					1			2	
8.0 - 8.4		3			1			6	
8.5 - 8.9		2	1	1			1	2	
9.0 - 9.4		5						1	
9.5 - 9.9		4		1	1				
10.0 - 10.4		2							
10.5 - 10.9		6		2	2				
11.0 - 11.4		1		2	2		2		
11.5 - 11.9		2		7	1		2		
12.0 - 12.9		12	2		20		16		
13.0 - 13.9	1	15		1	30	1	11		
14.0 - 14.9		15	4		27	1			
15.0 - 15.9		15	3	1	15	9	1		
16.0 - 16.9	1	7	1		10	3			
17.0 - 17.9		5	6		3	1			
18.0 - 18.9	6		1						
19.0 - 19.9	6		2						
20.0 - 20.9	5								
21.0 - 21.9	3		1			1			
22.0 - 22.9	1								
23.0 - 23.9									
24.0 - 24.9	2								
25.0 - 25.9	1								
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	26	109	21	17	115	16	34	37	

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions **Sector III**

Date of Survey - Summer 1958

Species and Numbers of Fish in Length Groups

Total Length in Inches	Shovel-head Catfish	Sheeps-head	North-ern Pike	Channel Catfish	Wall-eye	Short-nose Gar	Sauger	White Bass	Black Bull-head
2.5 - 2.9				2					
3.0 - 3.4				9					
3.5 - 3.9				21					
4.0 - 4.4				7					
4.5 - 4.9	1			6					
5.0 - 5.4				1				7	
5.5 - 5.9	2	2						25	1
6.0 - 6.4		1						26	
6.5 - 6.9	1	8		1				20	
7.0 - 7.4		7		5				15	3
7.5 - 7.9		9		3				9	3
8.0 - 8.4		7		2				6	3
8.5 - 8.9		4		1				2	6
9.0 - 9.4		6		1					4
9.5 - 9.9		7		1					1
10.0 - 10.4		6			1			4	
10.5 - 10.9	2	4			1		5	3	1
11.0 - 11.4	2	6					4	5	
11.5 - 11.9		6		1			6	4	
12.0 - 12.9	3	3			2	5	17	3	
13.0 - 13.9	3	6			4	10	7	3	
14.0 - 14.9	5	7		3	2	4	4	11	
15.0 - 15.9	3	2	1	4	4	4	8	2	
16.0 - 16.9		3		3	2	2	5	1	
17.0 - 17.9		2		4	1	1	1		
18.0 - 18.9		1	1	2	1		2		
19.0 - 19.9		3	1	2	7	1			
20.0 - 20.9		1	4	2	4	5			
21.0 - 21.9			5	1	2	4			
22.0 - 22.9			2			7			
23.0 - 23.9			7		1	8			
24.0 - 24.9			3			2			
25.0 - 25.9			5			3			
26.0 - 26.9			3			2			
27.0 - 27.9	1		2						
28.0 - 28.9			1						
29.0 - 29.9									
30.0 - 30.9	1		1						
31.0 - 31.9									
32.0 - 32.9									
33.0 - 33.9									
34.0 - 34.9			1						
35.0 - 35.9									
36.0 - 36.9			1						
TOTALS	24	101	38	82	32	58	59	146	22

4. Fish Sizes, Ages, and Growth Rates

a. Length-Frequency Distributions Sector III (continued)

Species and Numbers of Fish in Length Groups

Total Length in Inches	Carp	Common Sucker	Quillback	River Carpsucker	Gizzard Shad	Black Crappie	White Crappie		
~~2.5 - 2.9~~			1						
3.0 - 3.4			1		1				
3.5 - 3.9			2				1		
4.0 - 4.4			1	1	1				
4.5 - 4.9			8	1	8				
5.0 - 5.4			5		5	4	1		
5.5 - 5.9			5			5			
6.0 - 6.4			9			5			
6.5 - 6.9	15		3			5	1		
7.0 - 7.4	17		1			12	2		
7.5 - 7.9	29					3	5		
8.0 - 8.4	42	1				9	10		
8.5 - 8.9	41	2			1	8	10		
9.0 - 9.4	47	2	1	1	1	2			
9.5 - 9.9	34	1	2			3	1		
10.0 - 10.4	30		1						
10.5 - 10.9	34	1	7						
11.0 - 11.4	19	1	15	2	1				
11.5 - 11.9	13		35	1	1				
12.0 - 12.9	9	5	82	1	4				
13.0 - 13.9	16		30	1	2				
14.0 - 14.9	15	1	5	5	1				
15.0 - 15.9	8		4	5	1				
16.0 - 16.9	13	1		1					
17.0 - 17.9	15	1		1					
18.0 - 18.9	9								
19.0 - 19.9	5								
20.0 - 20.9	6								
21.0 - 21.9	4								
22.0 - 22.9	6								
23.0 - 23.9	2								
24.0 - 24.9									
25.0 - 25.9	2								
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	431	16	218	20	27	56	31		

b. Ages and Growth Rates of Important Species Captured

Fish Age-Class Distributions

Species	Sample Size	Subsample Size	Number of Fish in Age Groups <I	I	II	III	IV	V	VI	VII	VIII+
Northern Pike	92	76			17	27	19	8	3		2
White Bass	261	75	4	44	15	3	8	1			
Sauger	117	75		3	54	5	10	2	1		
Walleye	89	75			33	10	9	13	7	2	1
Smallmouth Bass	13	13		7	6						
White Crappie	69	69		25	17	20	5	2			
Black Crappie	114	75			52	16	4	3			

Fish Ages and Growth Rates

Calculated Mean Total Length in Inches at Time of Last Annulus Formation

Species	Age Groups (Number of Fish) I(N)	II(N)	III(N)	IV(N)	V(N)	VI(N)
Northern Pike		16.8(17)	19.5(27)	22.5(19)	25.4(8)	
White Bass	4.9(44)	10.6(15)		14.4(8)		
Sauger		10.7(54)	13.4(5)	15.5(10)		
Walleye		10.8(33)	15.1(10)	17.2(9)	19.9(13)	22.6(7)
Smallmouth Bass	3.1(7)	7.2(6)				
White Crappie	3.2(25)	6.5(17)	7.6(20)	8.2(5)		
Black Crappie		5.2(52)	7.4(16)	8.7(4)		

B. Nature and Use of the Watershed

The valley of the Minnesota River from Mendota to Mankato is quite broad (1 to 5 miles) with hills which form the valley rim being steep and ranging in height from moderately high to high (75 to 250 feet). Growth of trees on the bordering hills varies from light to moderate stands of hardwoods sparsely scattered with a few evergreens. Bottom lands from Mankato downstream to Shakopee have scattered, farm woodlots. Trees which line the river banks form a border usually not over $\frac{1}{2}$ mile deep and, in most instances, much less. From Shakopee to Mendota there is a conspicuous absence of trees on the bottom lands. Soils are quite variable but in the main appear to be a sandy clay or silt loam interspersed with areas of pure sand, gravel, and peat. The watershed over many years has been subject to considerable runoff and erosion. The river's vertical, raw-cut banks, the meandering course and many oxbows, and the numerous flood plains have resulted from runoffs, erosion, and extreme flood conditions.

Land usage in the watershed, or more properly the valley, is mainly for farming (about 60%) with the remainder being divided into approximately 30% wild land and 10% towns, villages, etc. In the near future it is expected that homesites and industry will become more extensive throughout the valley.

C. Overall Pollution and Erosion

In the past, plans have been made and, in some instances, carried out whereby sewage treatment plants have been installed in certain cities or villages on or along the river. However, during the canoe trip down the Minnesota River - from the Blue Earth River junction to the Mendota Bridge - much evidence of sewage pollution was observed and borne out by analysis of water samples collected. In Mankato 6 active sewer openings onto the river were seen. St. Peter had 3 such entrances, LeSueur - 2, Henderson - 1, Blakeley - 0, Belle Plaine - 1, Chaska - 3, Shakopee - 2, Savage (Savage Bridge) - 1, Lyndale Avenue Bridge - 1, and across from Northern States Power Black Dog Plant - 1. Other sources which add pollution to the river are a creamery at Belle Plaine and the Green Giant canning factory at LeSueur - the latter being quite offensive in odor.

Riverbank erosion is very serious as is sheet erosion (from farm fields) and gully erosion (from adjoining farmlands and bordering hills). Broad flood plains, logjams and vertical rawcut riverbanks attest to quick runoffs, erosion, and extreme flood conditions which have existed for many years.

D. History of Stream and Fishing Conditions

1. Comparison with Past Investigations

Observations made since 1934 indicate that the river is still polluted from Mankato downstream to the Mendota Bridge. Perhaps some pollution has been eliminated, or reduced. Nevertheless, wintertime dissolved oxygen testing, summer water analysis (1958), and visual observations (1959) indicate that considerable pollution is still present.

2. History of Fishing Conditions

a. Local Reports

On the downriver canoe trip 34 fishermen were observed and/or contacted. Fishing success varied from poor to good. A total of 24 channel catfish, 1 sheepshead, and 1 carp had been caught. Fishing pressure during the canoe trip reconnaissance of the river was concentrated at 4 different locations. In Mankato 8 fishermen were seen, halfway between St. Peter and LeSueur - 4 anglers, in Shakopee - 6, and between Riley and Bluff Creeks (just below Shakopee) - 13 anglers. A greater share of the pressure appears to be on catfish. However, a goodly amount is on walleyes with northern pike and bass receiving considerably less pressure.

Fishing success, in the past, appears to have been reasonably good as most of the anglers contacted talk of fair to moderate success, and their attitude appears to bear out satisfaction. The Bluff Creek area produces big catfish - 16 pounds and more. Good walleye fishing is said to exist in the vicinity of the Bloomington Ferry Bridge.

b. Census Data

No information available.

E. Record of Past Management

Fish stocking and removal records of the Section of Fisheries are vague as to the area on the river so they will be considered to encompass at least that portion from the Mendota Bridge to Mankato. In the following two tables the letters A, F, and Y refer to the size of the fish - adult, fingerling, and yearling, respectively.

1. Fish Stocking

Past (1945 thru 1954):

Bullheads	Walleyes	Suckers	Northern Pike	Crappies	Catfish
1,750 (A)	4,232 (F)	400 (Y)	120,000 (eyed eggs) 200 (A)	640 (F)	6 (A)

Recent (1955 thru 1959):

	Catfish	Walleye
1955-1956	-	-
1957	17,250 (F)	-
1958	-	33,170 (F)
1959	-	-

2. Fish Removal

Past (1945 thru 1954):

Species	Adult	Yearling	Fingerling	Other
Crappies	20,100	4,348	10,485	-
Sunfish	56	-	7,560	54
Walleye	163	254	390	52
Northern Pike	2,611	358	1,455	60
Sucker	1,612	390	-	-
Buffalofish	662	-	-	100
Carp	1,620	-	-	165
Largemouth Bass	23	-	-	-
Minnows	7,500	770	-	200
Catfish	52	-	-	-
Perch	30	-	-	-
Sheepshead	4,465	-	-	250
Silver Bass	1	-	-	-
Rock Bass	1	-	-	-
Bullheads	525	-	-	-

Present (1955 thru 1959):

Species	1955	1956	1957	1958	1959
Walleye	91 (A)	-	-	-	-
Northern Pike	-	1 (A)	97 (A)	-	40 (Y)
Carp	-	52,200 (lbs)	118,272 (lbs)	-	-
Bullheads	-	400 (A)	-	-	-

3. Special Regulations

Open to commercial fishing for rough fish, with one set line containing no more than 10 hooks, from Mankato to the Mississippi River. Only one end of the line can be staked down. One dollar is charged.

Open to promiscuous fishing in the backwater of the Minnesota River in Scott and Sibley Counties (winter, 1949 and 1950), Shakopee to Bloomington Ferry Bridge - (1-31-50 to 2-15-50), an area in LeSueur County - (1-27-50 to 2-28-50), and Shakopee to Belle Plaine - (1-24-50 to 2-15-50).

4. Special Projects and Activities

None are known.

IV. Stream Classifications

A. Ecological Classification

1. Large Rivers - River Lakes

Sectors I, II, & III:

Walleye-Crappie-Shad

B. Management Classification

Sectors I, II, & III:

Catfish and Walleye

V. Analysis of Management Problem

This partial river survey was conducted according to procedures used in surveying small streams. In addition, trapnets and electro-fishing gear were employed to sample the fish populations. Previous information about the Minnesota River is noticeably limited.

At the present time this portion of the river produces fair to moderately good angling for catfish and walleyes. Northern pike, bass, sauger , and sheepshead are also caught, but in lesser numbers. Many loops and oxbows have been formed by the river, and every bend has a pool in addition to a sandbar. However, from Shakopee and downstream the river is one big lengthy pool. For the most part, the riverbed is composed of sand. Nevertheless, there are scattered areas consisting of gravel, rubble, and/or boulder.

Shade on the river is not of great significance. However, during certain morning and afternoon hours the bordering trees and hills along the river's twisting course do provide some protection from the sun.

If the river were straightened for any reason thru channeling and dragline operations habitat for fish and other fauna would be even more drastically reduced.

Fishing pressure in the late summer (1959) was light to moderate. Very likely the pressure is greater during the early spring and summer. In recent years angling on warmwater streams has increased, and further increases should be anticipated. If erosion, flooding, and pollution control measures could be strengthened the waters could provide even better fish habitat.

VI. Credits and Signatures

Federal Aid Project DJ FW-1-R-2, 3, and 4

A. Field Work by

River Survey, River Netting, and River Shocking Crew
Leader: Philip A. Gilderhus
Aides: Thomas A. McConnell
James R. Lloyd

Follow-up River Survey Crew
Leader: Earl H. Huber
Aide: Jay P. Johnson

B. Laboratory and Preliminary Reports by

Albert T. Farnham
Earl H. Huber

C. Classifications and Recommendations by

Earl H. Huber
Stream Survey Biologist

Approved by Jerome H. Kuehn

Jerome H. Kuehn, Supervisor
Biological Surveys and Inventories Unit
Section of Research and Planning

Date March 14, 1960

dat

Classifications and Recommendations

Minnesota River, between junction of the Blue Earth River and Mendota Bridge
M-55

Blue Earth, Nicollet, LeSueur, Sibley, Scott, Carver, Hennepin, Dakota, and Ramsey Counties

Location

Beginning of Survey: Blue Earth and Nicollet Counties (T. 108, R. 27, S. 14 - mouth of Blue Earth River) - Mankato, Minnesota.

End of Survey: Dakota and Ramsey Counties (T. 28, R. 23, S. 28 - mouth of Minnesota River) - St. Paul, Minnesota (Mendota Bridge)

Dates of Field Work

June 17 thru September 8, 1958 and
July 27 thru August 7, 1959

I. Summary

From the Blue Earth River to the Mendota bridge (107 miles) the Minnesota River traverses a course which contains many loops, bends, and oxbows. The river is subjected to considerable erosion and pollution in addition to extreme flood conditions. Water levels occurring during 1959 were the lowest since 1934. Gage readings at Mankato and Carver have been 28.5 and 25 feet higher, respectively, than readings during 1959. Flows of the river are large - from 119 to over 2,000 c.f.s. Gradient of the river is slight. However, the watershed is indicative towards quick runoffs. Bottom type of the river, to a large extent, is sand.

Stream improvement on such a large river would be quite difficult, if not impractical. Pollution, however, could and should be strictly controlled. If the sand bottom type of the river as well as erosion could be further reduced habitat for game fish would be more improved. The tremendous volume of hot water entering the river, presumably from the cooling operations of the Northern States Power Black Dog Plant, is also a detriment to fish life.

As a whole fishing is believed to range from fair to good with pressure being light to moderate.

II. Classifications

Sectors I, II, & III.

A. Ecological Classification
Walleye-Crappie-Shad

B. Management Classification
Catfish-Walleye

III. Management Problems and Recommendations

A. Stream Improvement

River Sectors I, II, & III

1. Problems

A number of serious problems do exist. However, none appear to be easily and/or readily solvable. First of all, pollution is extensive. Almost every town has active sewer openings onto the river. In addition, there is pollution from the Green Giant canning factory at LeSueur, a creamery at Belle Plaine, and other sewer openings near the Savage and Lyndale Avenue bridges and across from the Northern States Power Black Dog Plant. Secondly, the Black Dog Plant uses and releases into the river a tremendous volume of hot water (95°F.) presumably resulting from cooling operations of the plant. This hot water appears to affect the river as far as its mouth as 87.5°F. temperatures appear in the vicinity of the Wold-Chamberlain Airport, and dead fish were observed from the power plant down to the Cedar Avenue Bridge. Last of all, the river bed, to a large extent, is shifting sand, and erosion in conjunction with extreme flooding is prevalent. River channel straightening would further deteriorate game fish habitat.

2. Outline of Materials and Applicable Methods

Stream improvement of a physical nature on such a large river would be very difficult, if not impractical. However, pollution can and should be eliminated. Further investigation of the hot water source at the Northern States Power Black Dog plant should be made.

B. Pollution and Pollution Abatement

As stated before, sewage pollution still exists either thru neglect or disinterest. Control measures should be strictly enforced.

C. Population Control Recommendations

1. Stocking Recommendations

a. Areas to be Stocked

Present conditions do not warrant stocking

b. Quotas to be Stocked

None at the present time

2. Fish Removal and Utilization Recommendations

None

D. Designation of Special Fish Areas Prior to Survey

Prior to Survey	As per Survey
None	None

E. Recommendations for Better Utilization of Species Present

Continued warm-water fisheries habitat management.

Approved:

_____

District Fisheries Supervisor

Date _____