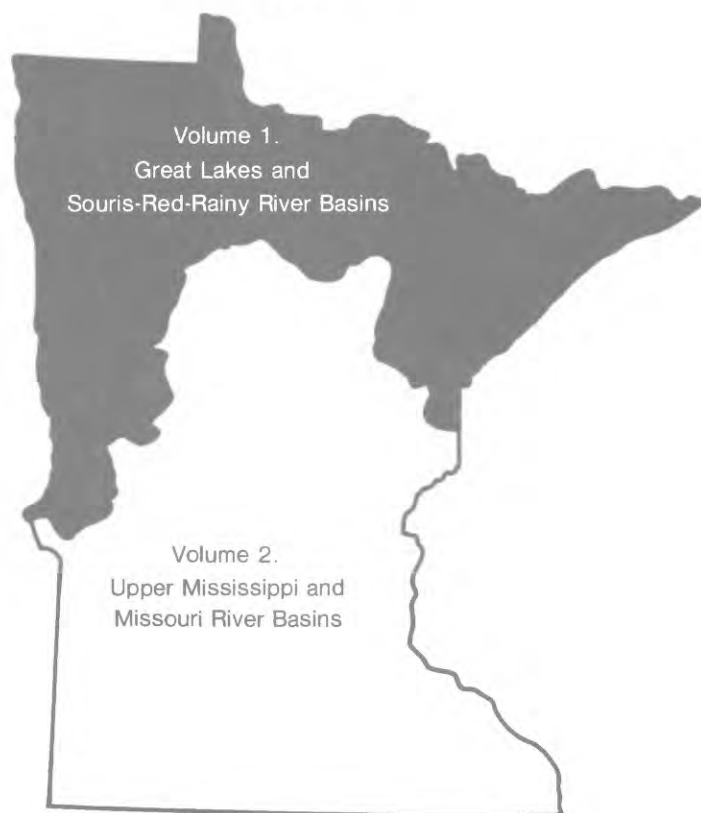




# Water Resources Data Minnesota Water Year 1982

## Volume 1. Great Lakes and Souris-Red-Rainy River Basins



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-82-1  
Prepared in cooperation with the Minnesota Department of  
Natural Resources, Division of Waters; the Minnesota  
Department of Transportation; and with other State,  
municipal, and Federal agencies

**CALENDAR FOR WATER YEAR 1982**

**1981**

OCTOBER							NOVEMBER							DECEMBER							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
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**1982**

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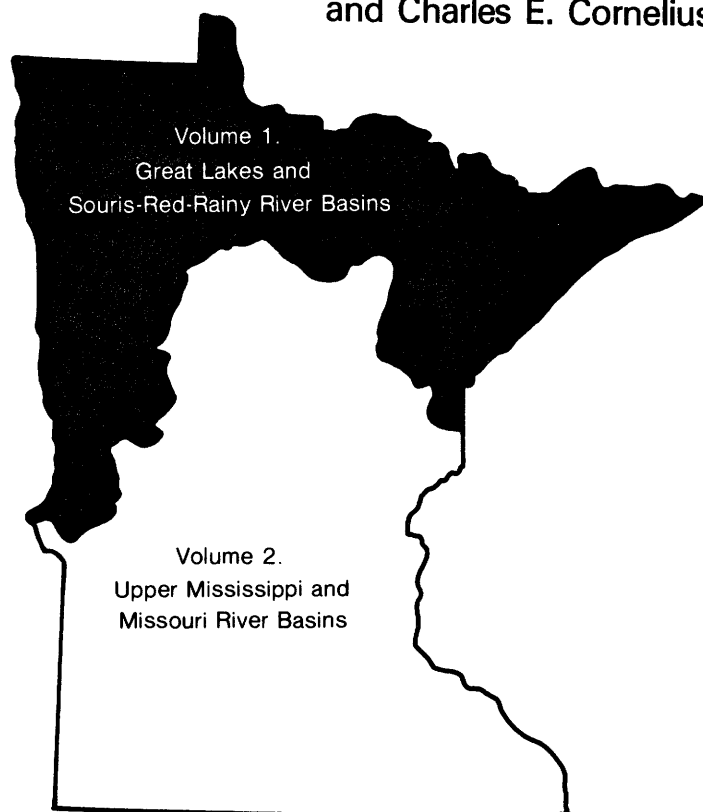
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11	12	13	14	15	16	17	15	16	17	18	19	20	21	12	13	14	15	16	17	18
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25	26	27	28	29	30	31	29	30	31					26	27	28	29	30		



# Water Resources Data Minnesota Water Year 1982

## Volume 1. Great Lakes and Souris-Red-Rainy River Basins

by Kurt T. Gunard, Joseph H. Hess, James L. Zirbel,  
and Charles E. Cornelius



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-82-1  
Prepared in cooperation with the Minnesota Department of  
Natural Resources, Division of Waters; the Minnesota  
Department of Transportation; and with other State,  
municipal, and Federal agencies

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

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U.S. Geological Survey  
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St. Paul, Minnesota 55101

## PREFACE

This volume of the annual hydrologic data report of Minnesota is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and water quality provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. Hydrologic data for Minnesota are contained in 2 volumes:

- Volume 1. Great Lakes and Souris-Red-Rainy River Basins
- Volume 2. Upper Mississippi and Missouri River Basins

This report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the preparation of this report:

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This report was prepared in cooperation with the State of Minnesota and with other agencies under the general supervision of Donald R. Albin, District Chief, Minnesota.

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## WATER RESOURCES DATA FOR MINNESOTA, 1982

### INTRODUCTION

Water resources data for the 1982 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume contains discharge records for 47 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 15 gaging stations, 2 stage stations, 20 partial-record stations, and 5 wells; and water levels for 47 observation wells. Also included are 43 high-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data, together with the data in Volume 2, represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

Records of discharge or stage of streams, and contents or stage of lakes and reservoirs were first published in a series of U.S. Geological Survey water-supply papers titled "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water supply papers titled "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers titled "Ground-Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities in the United States or may be purchased from Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202.

For water years 1961 through 1974, streamflow data were released by the Geological Survey in annual reports on a State-boundary basis. Water-quality records for water years 1964 through 1974 were similarly released either in separate reports or in conjunction with streamflow records.

Beginning with the 1975 water year, water data for streamflow, water quality, and ground water are published as an official Survey report on a State-boundary basis. These official Survey reports carry an identification number consisting of the two letter State abbreviation, the last two digits of the water year, and the volume number. For example, this report is identified as "U.S. Geological Survey Water-Data Report MN-82-1." Water-Data reports are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the district chief at the address given on the back of the title page or by telephone (612) 725-7841.

### COOPERATION

The U.S. Geological Survey and organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, for ground-water levels since 1948, and for water-quality records since 1952. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

Minnesota Department of Natural Resources, Division of Waters, Larry Seymour, director.

Minnesota Department of Transportation, Richard P. Braun, commissioner.

Minnesota Pollution Control Agency, Sandra Gardebring, executive director.

Metropolitan Waste Control Commission of the Twin Cities Area, George H. Frisch, chairman.

Metropolitan Council of the Twin Cities Area, Gerald J. Isaacs, chairman.

Elm Creek Conservation Commission, Fred G. Moore, chairman.

Red Lake Watershed District, Paul Brekken, president.

Middle River-Snake River Watershed District, Donald Rivard, chairman.

City of Eagan, Bea Blomquist, mayor.

Assistance in the form of funds or services was given by the Corps of Engineers, U.S. Army, in collecting records for 43 gaging stations and 17 water-quality stations published in this report.

Eleven gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State. Eight of these, on waters adjacent to the international boundary, are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

Some records for the Red River of the North, which borders the State on the west, were obtained at the request of other Federal agencies as a part of the program of the U.S. Department of the Interior for development of the Missouri River basin.

## HYDROLOGIC CONDITIONS

### PRECIPITATION AND STREAMFLOW

Normal annual precipitation in Minnesota ranges from 19 inches in the northwest to 32 inches in the southeast. The average annual runoff ranges from less than 2 inches in the west to more than 16 inches in the northeast. The 1982 water year began with rainfall amounts that were considerably above normal throughout the State during October. Total precipitation for the year was above normal over the entire State, except in the east-central part where it was slightly below normal. Annual runoff in 1982 ranged from 0.3 inch in parts of the west to more than 20 inches in the northeast. Runoff statewide averaged 130 percent of normal.

Records from stations in northern Minnesota indicate that runoff was near or above average during 1982. Runoff in the Baptism River near Beaver Bay in northeast Minnesota and in the Little Fork River near Littlefork in north-central Minnesota was above average for the year, 20.23 and 10.26 inches, respectively. Conversely, runoff in the Roseau River at Ross in northwest Minnesota was 2.52 inches, which is slightly below average. Figure 1 shows a comparison of monthly and annual mean discharges for these stations to median discharges for a 30-year base period.

Annual mean streamflow was below average at only a few stations in the northwest, north-central, and northeast areas. Most of the stations recorded average or above-average streamflow. Flow was excessive at a few stations.

No peaks of record were exceeded during 1982 at any gaging stations on streams for which records are published in this volume.

### WATER QUALITY

Dissolved-solids data from selected NASQAN stations were used to show variations in water quality in the Great Lakes and Souris-Red-Rainy River basins. With the exception of Roseau River below State Ditch 51 near Caribou, dissolved solids were generally lower than average throughout northern Minnesota (fig. 2). These lower concentrations correspond to the higher-than-normal runoff in this area.

The drinking-water standard of 10 mg/L nitrite plus nitrate nitrogen established by the U.S. Environmental Protection Agency was exceeded twice in ground-water samples from a well in Otter Tail County. The well, completed in outwash, was sampled December 3, 1981, and June 6, 1982; nitrite plus nitrate nitrogen concentrations in each of the samples were 11 and 13 mg/L, respectively. A ground-water sample collected from a shallow well in St. Louis County on August 24, 1982, had a manganese concentration of 300 ug/L. The drinking-water standard for manganese is 50 ug/L.

### GROUND-WATER LEVELS

Water levels in surficial aquifers throughout Minnesota remained near average during most of the year. Levels generally rose during the first quarter of the water year but varied from above average in the south-central part of Minnesota to below average throughout the western part. Water levels were stable during winter and rose in response to snowmelt in April and May. Springtime water levels in southern Minnesota continued above average; levels in central and northern Minnesota rose to average or above; levels in the northwest remained below average. Water levels in summer remained near seasonal average throughout the State, rising slightly in July and declining in August and September. Water levels in wells completed in confined aquifers in Minnesota remained near seasonal averages, rising to the highest level in spring and declining to the lowest level in summer.

A hydrograph of water levels in a representative observation well is shown in figure 3 for the period 1956 to 1982.

### DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting inch-pound units to International System of units (SI) on the inside of the back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is the primary energy donor in cellular life process. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP, therefore, provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as the organisms which produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35°C ± 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warmblooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms which produce blue colonies within 24 hours when incubated at 44.5°C ± 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria also found in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C ± 1.0°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the unconsolidated material of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m<sup>3</sup>), and periphyton and benthic organisms in grams per square meter (g/m<sup>2</sup>).

Dry mass refers to the weight of residue present after drying in an oven at 60°C for zooplankton and 105°C for periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and the ash mass, and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

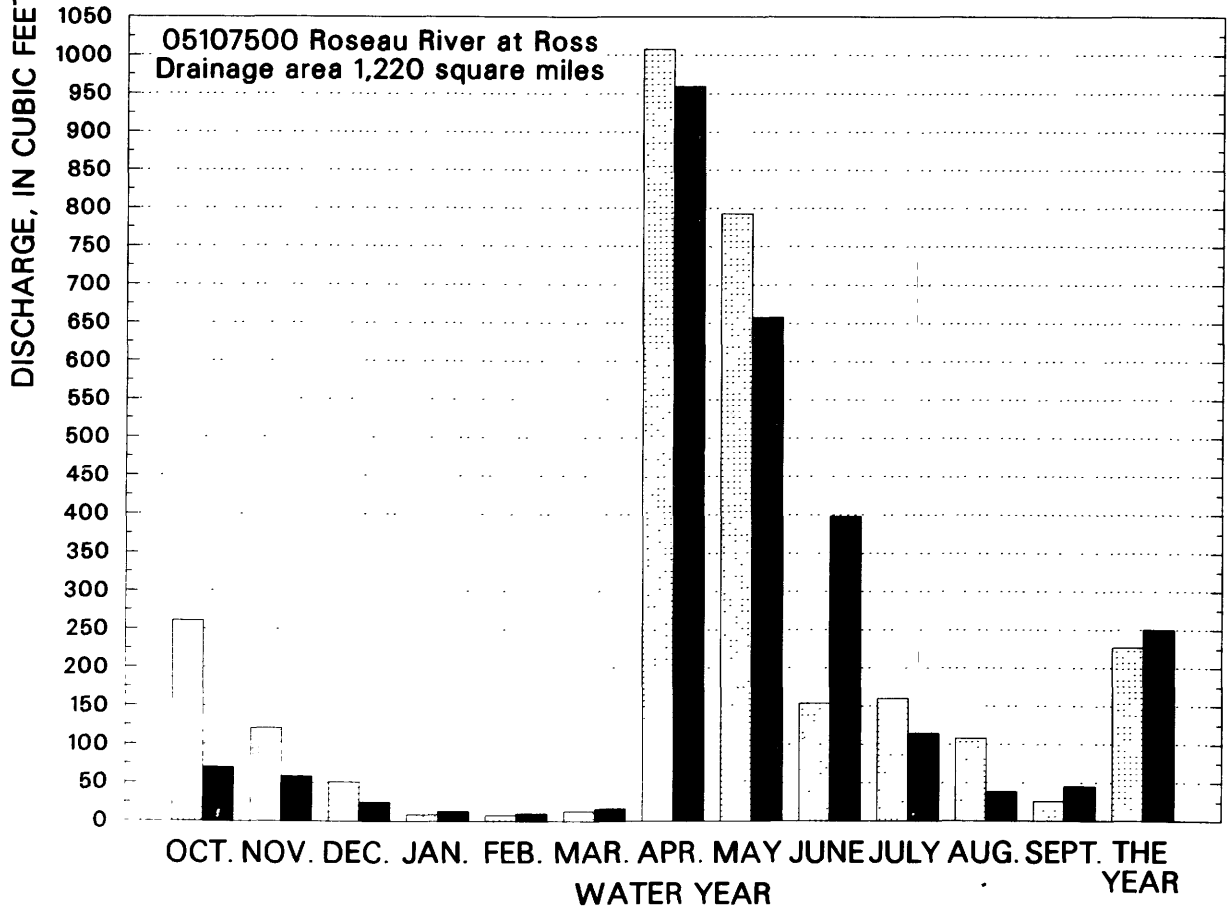
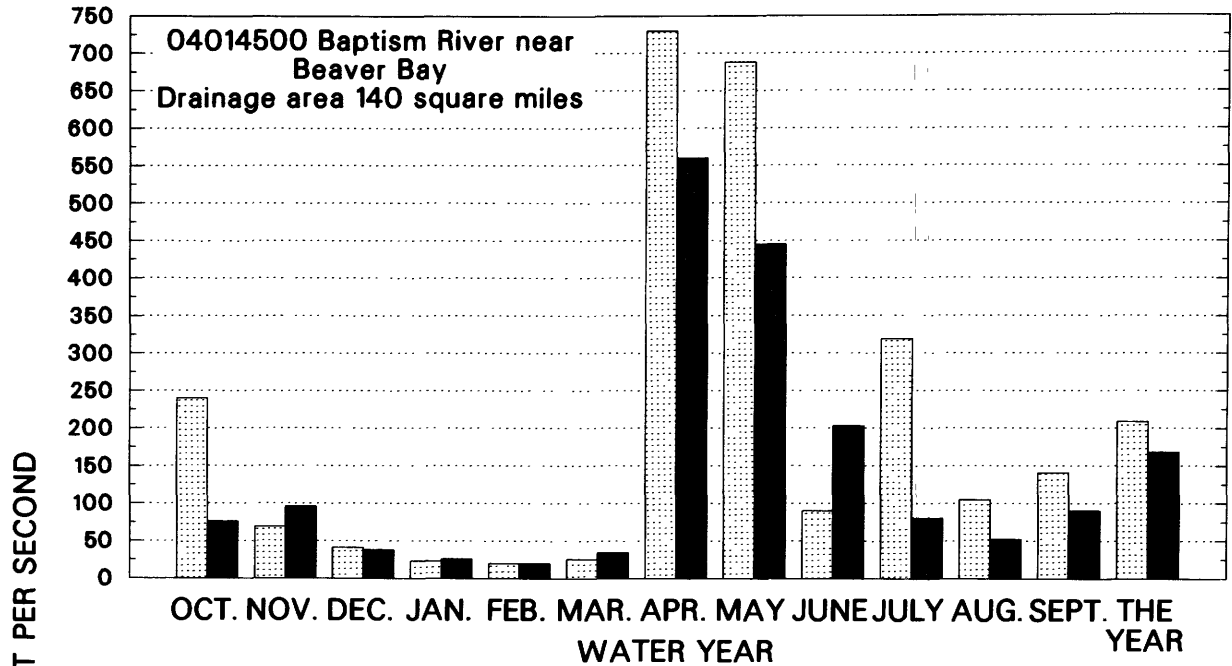
Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed Material.

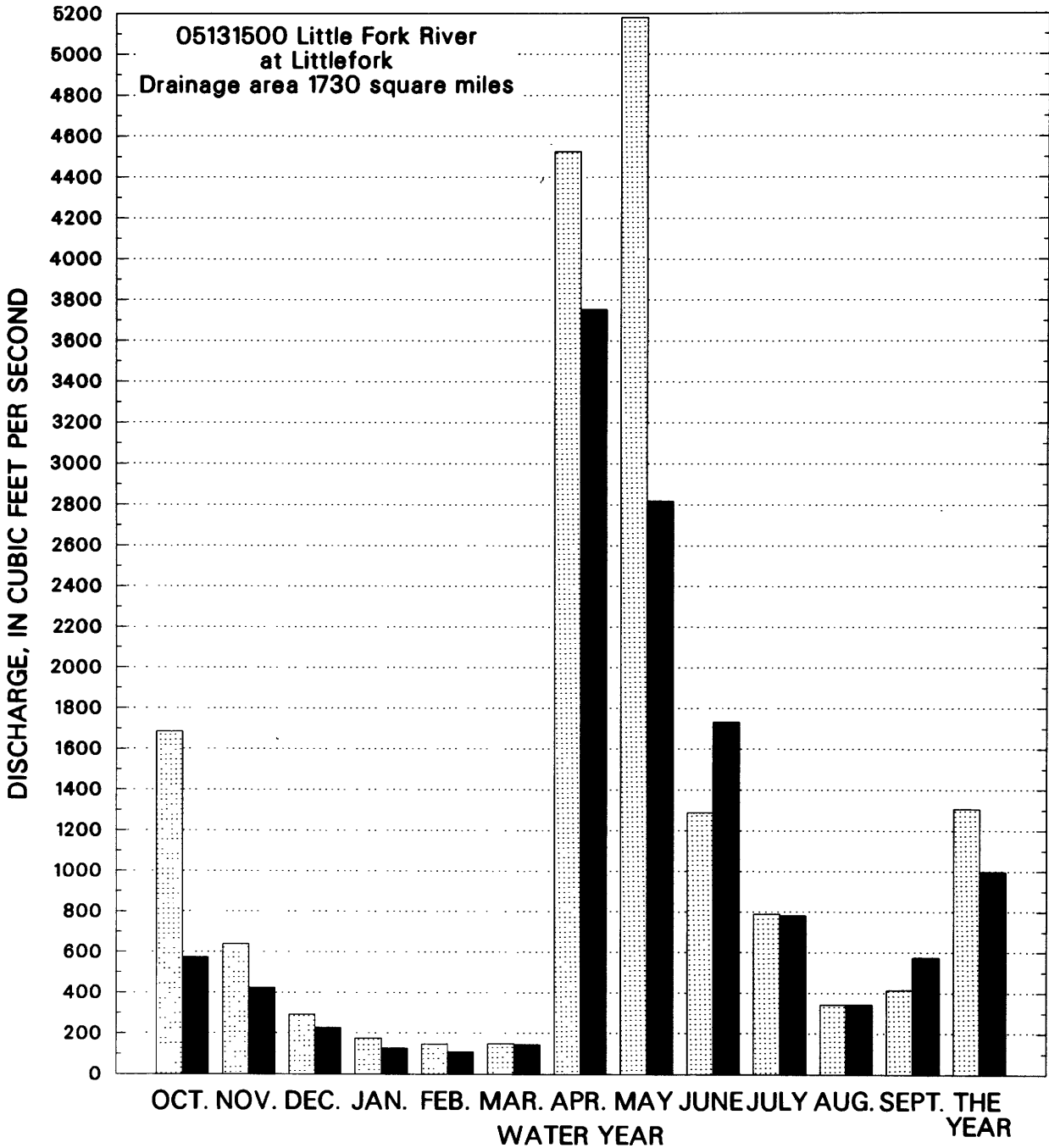
Cells/volume refers to the number of cells or any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, or about 646,000 gallons or 2,447 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.



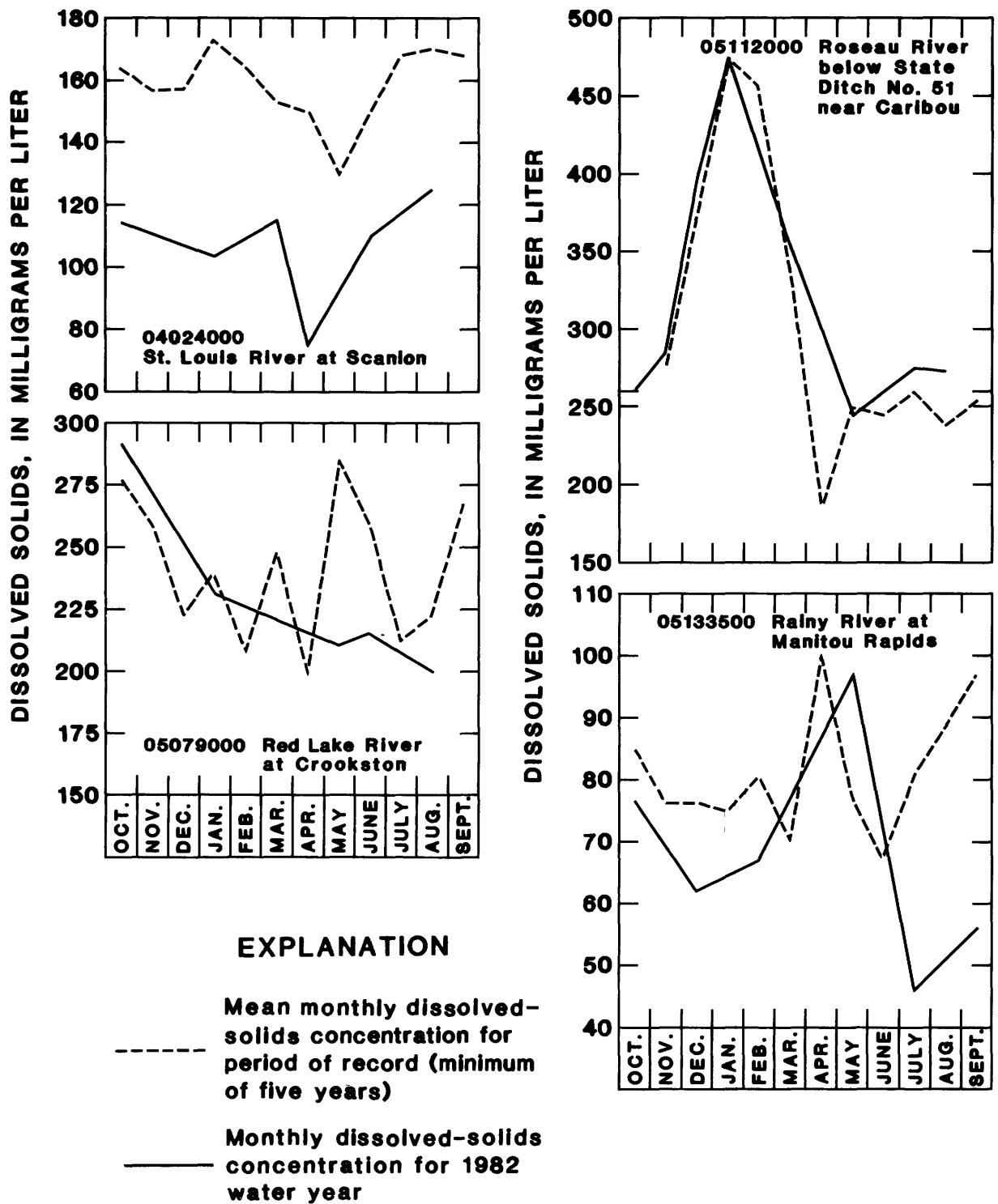
**Figure 1.--Comparison of discharges at three long-term representative gaging**



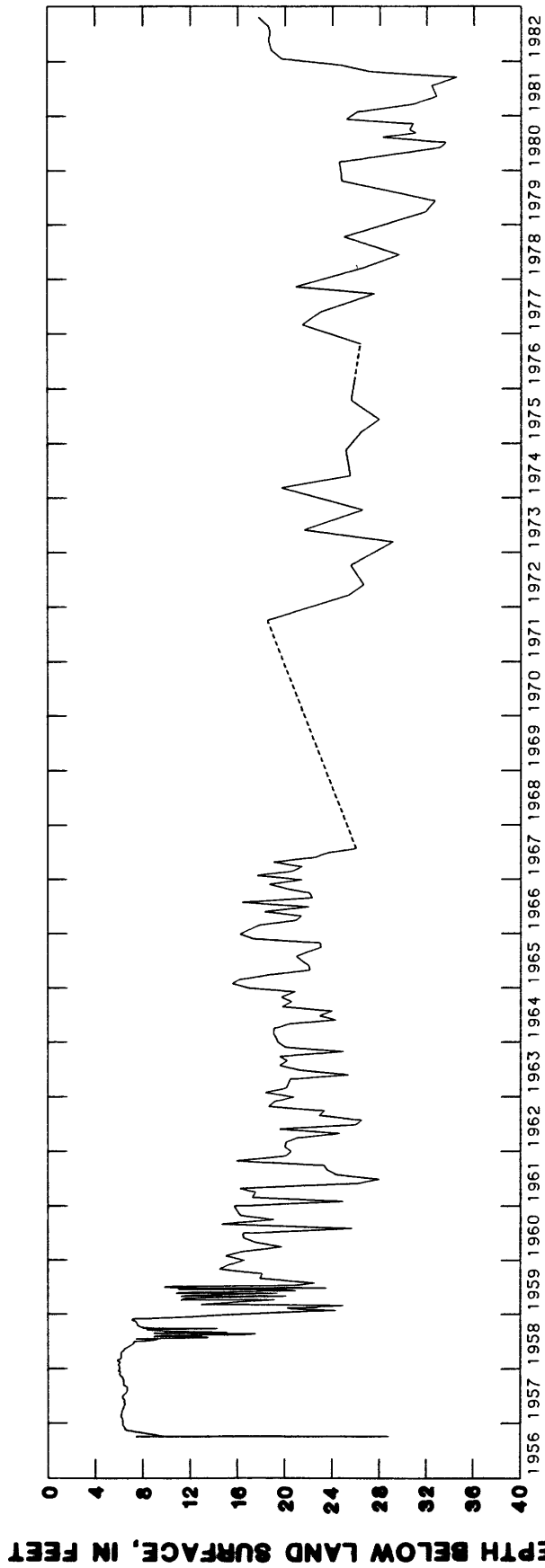
**EXPLANATION**

- Monthly and yearly mean discharges during 1982 water year
- Median of monthly and yearly mean discharges for water years 1951-80

*stations for the current year with median discharges for a 30-year base period*



**Figure 2.--Comparison of dissolved-solids concentrations for the current year with mean monthly values for the periods of record**



**Figure 3.--Hydrograph showing long-term changes in water level in well 155N47W11AAA03, Marshall County, for the 1956-82 water years**

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second (FT<sup>3</sup>/s, ft<sup>3</sup>/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to the amount of substance present in true chemical solution. In practice, however, the term includes all forms of substance that will pass through a 0.45 micrometer membrane filter, and thus may include some very small (colloidal) suspended particles. Analyses are performed on filtered samples.

Diversity index is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = -\sum_{i=1}^s \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

Where  $n_i$  is the number of individuals per taxon,  $n$  is the total number of individuals, and  $s$  is the total number of taxa in the sample of the community. Diversity index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate (CaCO<sub>3</sub>).

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an 8-digit number.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

## WATER RESOURCES DATA FOR MINNESOTA, 1982

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per gram (UG/G, ug/g) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (gram) of sediment.

Micrograms per kilogram (MG/KG, mg/kg) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (kilogram) of sediment.

Micrograms per liter (UG/L, ug/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represent the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L, and is based on the mass of sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

Organism is any living entity, such as an insect, phytoplankter, or zooplankter.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meters ( $m^2$ ), acres, or hectares. Periphyton benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter code numbers are unique five-digit code numbers assigned to each parameter placed into storage. These codes are assigned by the Environmental Protection Agency and are also used to identify data exchanged among agencies.

Partial-record station is a particular site where limited streamflow and(or) water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in distilled water (chemically dispersed).

Particle-size classification used in this report agrees with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology.

The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay	0.00024 - 0.004	Sedimentation.
Silt	.004 - .062	Sedimentation.
Sand	.062 - 2.0	Sedimentation or sieve.
Gravel	2.0 - 64.0	Sieve.

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic material is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass or volume.

Periphyton is the assemblage of microorganisms attached to and growing upon solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton is a useful indicator of water quality.

Pesticides are chemical compounds used to control undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides. Insecticides and herbicides, which control insects and plants respectively, are the two categories reported.

Picocurie (PC, pCi) is one trillionth ( $1 \times 10^{-12}$ ) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields  $3.7 \times 10^{10}$  radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells/mL of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algal mats or floating "moss" in lakes. Their concentrations are expressed as number of cells/mL of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column, and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [ $\text{mg C}/(\text{m}^2 \cdot \text{time})$  for periphyton and macrophytes and  $\text{mg C}/(\text{m}^3 \cdot \text{time})$  for phytoplankton] are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [ $\text{mg O}_2/(\text{m}^2 \cdot \text{time})$  for periphyton and macrophytes and  $\text{mg O}_2/(\text{m}^3 \cdot \text{time})$  for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of only readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Runoff in inches (IN, in) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

## WATER RESOURCES DATA FOR MINNESOTA, 1982

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge times mg/L times 0.0027.

Suspended-sediment load is quantity of suspended sediment passing a section in a specified period.

Total sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry weight or volume, that passes a section during a given time.

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lived.

Natural substrates refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organism lived.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and multiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest USGS topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is that part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of the total concentration in a water-sediment mixture. The water-sediment mixture is associated with (or sorbed on) that material retained on a 0.45 micrometer filter.

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata is the following:

Kingdom.....Animal  
 Phylum.....Arthropoda  
 Class.....Insects  
 Order.....Ephemeroptera  
 Family.....Ephemeridae  
 Genus.....Hexagenia  
Species            Hexagenia limbata

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration in milligrams per liter by 0.00136.

Tons per day is the quantity of substance in solution or suspension that passes a stream section during a 24-hour day.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determines all of the constituent in the sample.)

Total in bottom material is the total amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total in bottom material."

Total load (tons) is the total quantity of any individual constituent, as measured by dry mass or volume, that is dissolved in a specific amount of water (discharge) during a given time. It is computed by multiplying the total discharge, times the mg/L of the constituent, times the factor 0.0027, times the number of days.

Total recoverable refers to the amount of a given constituent that is in solution after a representative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharge. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WDR is used as an abbreviation for "Water-Data Report" in reference to published reports beginning in 1975.

WRD is used as an abbreviation for "Water-Resources Data" in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

#### DOWNSTREAM ORDER AND STATION NUMBER

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream stations is listed between them. A similar order is followed in listing stations on

first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indentation in a list of stations in the front of the report. Each indentation represents one rank. This downstream order and system of indentation show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These are in the same downstream order used in this report. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station such as 05041000, which appears just to the left of the station name, includes the 2-digit part number "05" plus the 6-digit downstream order number "041000".

#### NUMBERING SYSTEM FOR WELLS AND MISCELLANEOUS SITES

The 8-digit downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See Figure 4 below. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two digit sequential number.

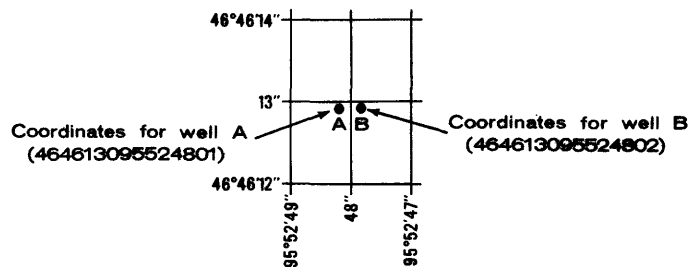


Figure 4.--Example of system for numbering well and miscellaneous sites

#### SPECIAL NETWORKS AND PROGRAMS

Hydrologic bench-mark station is one that provides hydrologic data for a basin in which the hydrologic regimen will likely be governed solely by natural conditions. Data collected at a bench-mark station may be used to separate effects of natural from manmade changes in other basins which have been developed and in which the physiography, climate, and geology are similar to those in the undeveloped bench-mark basin.

National stream-quality accounting network (NASQAN) is a data collection network designed by the U.S. Geological Survey to meet many of the information demands of agencies or groups involved in national or regional water-quality planning and management. Both accounting and broad-scale monitoring objectives have been incorporated into the network design. Areal configuration of the network is based on river-basin accounting units (identified by 8-digit hydrologic-unit numbers) designated by the Office of Water Data Coordination in consultation with the Water Resources Council. Primary objectives of the network are (1) to depict areal variability of streamflow and water-quality conditions nationwide on a year-by-year basis and (2) to detect and assess long-term changes in streamflow and stream quality.

Pesticide program is a network of regularly sampled water-quality stations where samples are collected to determine the concentration and distribution of pesticides in streams where potential contamination could result from the application of the commonly used insecticides and herbicides. Operation of the network is a Federal interagency activity.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radiosotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide base line information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

### EXPLANATION OF STAGE AND WATER-DISCHARGE RECORDS

#### COLLECTION AND COMPUTATION OF DATA

The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from either direct readings on a nonrecording gage or from a water-stage recorder that gives either a continuous graph of the fluctuations or a tape punched at selected time intervals. Measurements of discharge are made with a current meter, using the general methods adopted by the Geological Survey. These methods are described in standard text-books, in Water-Supply Paper 888, and in U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chapter A6.

For stream-gaging stations, rating tables giving the discharge for any stage are prepared from stage-discharge relation curves. If extensions to the rating curves are necessary to express discharge greater than measured, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, computation of flow over dams or weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharges are computed from the daily figures. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is computed by the shifting-control method, in which correction factors based on individual discharge measurements and notes by hydrologists and observers are used in applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is basically the shifting-control method.

At some stream-gaging stations the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

At some northern stream-gaging stations the stage-discharge relation is affected by ice in the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of gage-height record and occasional winter discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge for other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly change in contents is computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some gaging stations there are periods when no gage-height record is obtained or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range-in-stage, prior and subsequent records, discharge measurements, weather records, and comparison with records for other stations in the same or nearby basins. Likewise daily contents may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

The data in this report generally comprise a description of the station and tabulations of daily and monthly figures. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. For gaging stations on lakes and reservoirs a monthly summary table of stage and contents or a table showing the daily contents is given. Tables of daily mean gage heights are included for some streamflow stations and for some reservoir stations. Records are published for the water year, which begins on October 1 and ends on September 30.

The description of the gaging station gives the location, drainage area, period of record, notations of revisions of previously published records, type and history of gages, general remarks, average discharge, and extremes of discharge or contents. The location of the gaging station and the drainage area are obtained from most accurate maps available. River mileage, given under "LOCATION" for some stations, is that determined and used by the Corps of Engineers or other agencies. Periods for which there are published records for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD."

Previously published streamflow records of some stations have been found to be in error on the basis of data or information later obtained. Revisions of such records are usually published along with the current records in one of the annual or compilation reports. In order to make it easier to find such revised records, a paragraph headed "REVISED RECORDS" has been added to the description of all stations for which revised records have been published. Listed herein are all the reports in which revisions have been published, each followed by the water years for which figures are revised in that report. In listing the water years only one number is given; for instance, 1965 stands for the water year October 1, 1964, to September 30, 1965. If no daily, monthly, or annual figures of discharge are affected by the revision, the fact is brought out by notations after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the revised figure was first published is given. It should be noted that for all stations for which cubic feet per second per square mile and runoff in inches are published, a revision of the drainage area necessitates corresponding revision of all figures based on the drainage area. Revised figures of cubic feet per second per square mile and runoff in inches resulting from a revision of the drainage area only are usually not published in the annual series of reports.

The type of gage currently in use; the datum of the present gage referred to National Geodetic Vertical Datum; and a condensed history of the types, locations, and datums of previous gages used during the period of record are given under "GAGE." National Geodetic Vertical Datum is explained in "DEFINITION OF TERMS."

Information pertaining to the accuracy of the discharge records and to conditions which affect the natural flow of the gaging station is given under "REMARKS." For reservoir stations, information on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir is given under "REMARKS."

The average discharge for the number of years indicated is given under "AVERAGE DISCHARGE"; it is not given for stations having fewer than 5 complete years of record or for stations where changes in water development during the period of record cause the figure to have little significance. In addition, the median of yearly mean discharges is given for stream-gaging stations having 10 or more complete years of record if the median differs from the average by more than 10 percent. Under "EXTREMES" are given first, the extremes for the period of record, second, information available outside the period of record, and last, those for the current year. Unless otherwise qualified, the maximum discharge (or contents) is the instantaneous maximum corresponding to the crest stage obtained by use of a water-stage recorder (graphic or digital), a crest-stage gage, or a nonrecording gage read at the time of crest. If the maximum gage height did not occur on the same day as the maximum discharge (or contents), it is given separately. Similarly, the minimum is the instantaneous minimum unless otherwise qualified. For some stations, peak discharges are listed with "EXTREMES FOR CURRENT YEAR". If they are, all independent peaks above the selected base are published in tabular format with the time of occurrence and corresponding gage heights, including the maximum for the year. The base discharge, which is given in the table heading, is selected so that an average of about three peaks a year will be presented. Peak discharges are not published for any canals, ditches, drains, or for any stream for which the peaks are subject to substantial control by man. Time of day is expressed in 24-hour local standard time; for example, 12:30 a.m. is 0030, 1:30 p.m. is 1330. The minimums for these stations are published in a separate paragraph following the table of peaks.

The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also may be expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN"), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion, if the drainage area includes large noncontributing areas, or if the average annual rainfall over the drainage basin is usually less than 20 inches. In the yearly summary below the monthly summary, the figures shown are the appropriate daily discharges for the calendar and water years.

Footnotes to the table of daily discharge are introduced by the word "NOTE". Footnotes are used to indicate periods for which the discharge is computed or estimated by special methods because of no gage-height record, backwater from various sources, or other unusual conditions. Periods of no gage-height record are indicated if the period is continuous for a month or more or includes the maximum discharge for the year. Periods of backwater from an unusual source, of indefinite stage-discharge relation, or of any other unusual condition at the gage site are indicated only if they are a month or more in length and the accuracy of the records is affected. Days on which the stage-discharge relation is affected by ice are not indicated. The methods used in computing discharge for various unusual conditions have been explained in preceding paragraphs.

For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given.

Data collected at partial-record stations follow the information for continuous record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. Occasionally, a series of discharge measurements are made within a short time

## WATER RESOURCES DATA FOR MINNESOTA, 1982

period to investigate the seepage gains or losses along a reach of a stream or to determine the low-flow characteristics of an area. Such measurements are also given in special tables following the tables of partial-record stations.

## ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretations of records.

The station description under "REMARKS" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges are within 5 percent; "good," within 10 percent; and "fair," within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Figures of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 ft<sup>3</sup>/s; to tenths between 1.0 and 10 ft<sup>3</sup>/s; to whole numbers between 10 and 1,000 ft<sup>3</sup>/s; and to 3 significant figures above 1,000 ft<sup>3</sup>/s. The number of significant figures used is based solely on the magnitude of the figure. The same rounding rules apply to discharge figures listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

## OTHER DATA AVAILABLE

Information of a more detailed nature than that published for most of the gaging stations such as observations of water temperatures, discharge measurements, gage-height records, and rating tables is on file in the district office. Also most gaging-station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the district office.

## RECORDS OF DISCHARGE COLLECTED BY AGENCIES OTHER THAN THE GEOLOGICAL SURVEY

The National Water Data Exchange, Water Resources Division, U.S. Geological Survey, National Center, Reston, VA 22092, maintains an index of all discharge measurement sites in the State. Information on records available at specific sites can be obtained upon request.

## EXPLANATION OF WATER-QUALITY RECORDS

## COLLECTION AND EXAMINATION OF DATA

Surface-water samples for analyses usually are collected at or near gaging stations. The quality-of-water records are given immediately following the discharge records at these stations.

The descriptive heading for water-quality records gives the period of record for all water-quality data, the period of daily record for parameters that are measured on a daily basis (specific conductance, pH, dissolved oxygen, water temperature, sediment discharge, etc.), extremes for the period of daily record, extremes for the current year, and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, date of sampling and (or) other pertinent data are given in the table containing the chemical analyses of the ground water.

## WATER ANALYSIS

Most methods for collecting and analyzing water samples are described in the U.S. Geological Survey Techniques of Water-Resources Investigations listed on a following page.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

## WATER RESOURCES DATA FOR MINNESOTA, 1982

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the district office.

## WATER TEMPERATURE

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small daily temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published.

## SEDIMENT

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily loads of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of the quantities of suspended sediment, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included.

## EXPLANATION OF GROUND-WATER LEVEL RECORDS

## COLLECTION OF THE DATA

Only ground-water-level data from a basic network of observation wells are published herein. This basic network contains observation wells so located that the most significant data are obtained from the fewest wells in the most important aquifers.

Each well is identified by means of (1) a 15-digit number that is based on latitude and longitude and (2) a local number that is provided for local needs. See figure 4.

Measurements are made in many types of wells, under varying conditions of access and at different temperatures, hence, neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will ensure that measurements at each well are consistent.

Water-level measurements in this report are given in feet with reference to either NGVD of 1929 or land-surface datum (lsd). NGVD of 1929 is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum in NGVD of 1929 is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error in determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.

Hydrographs showing water-level fluctuations are included for 15 representative wells; 1 peat, 6 buried sand, and 8 surficial sand wells.



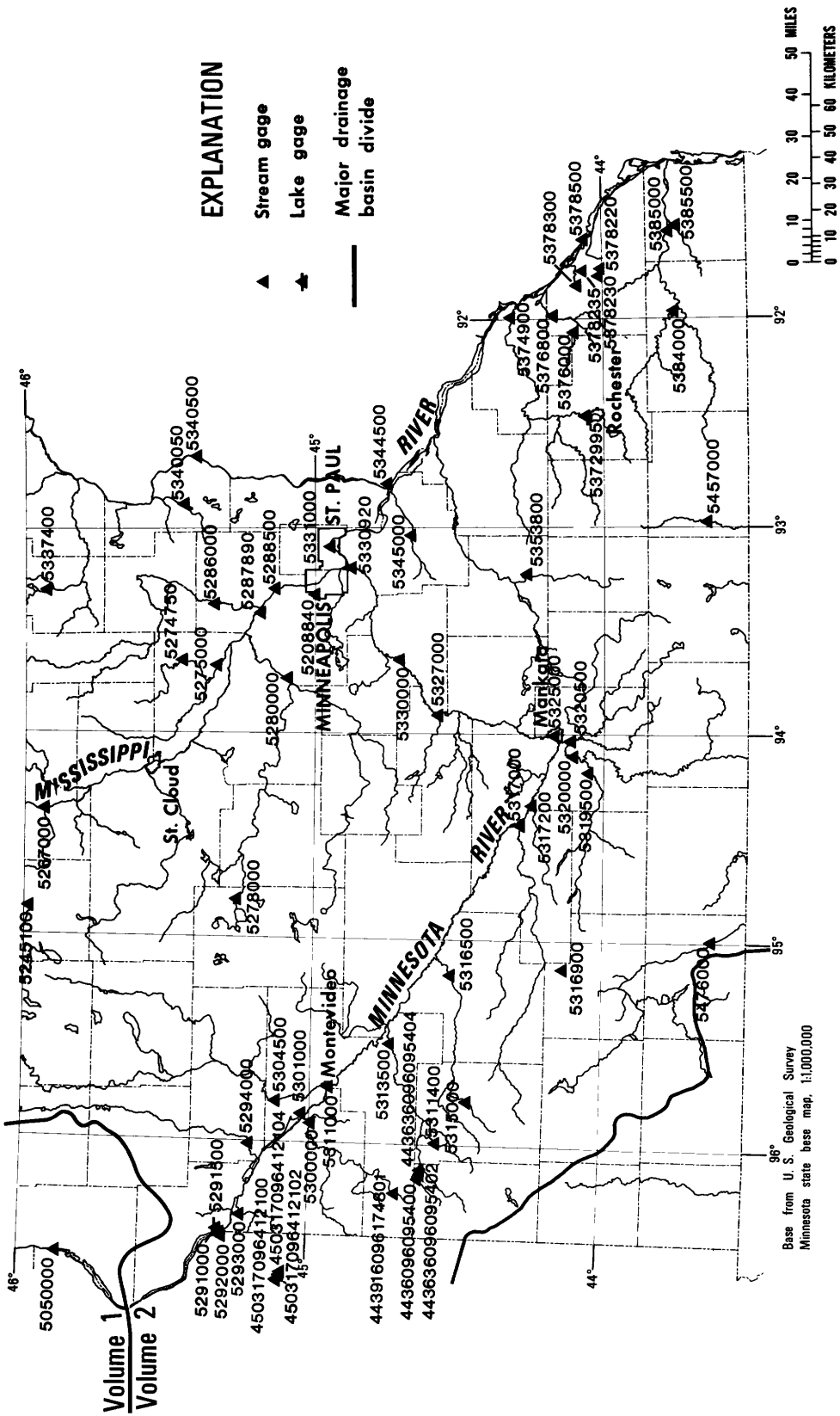
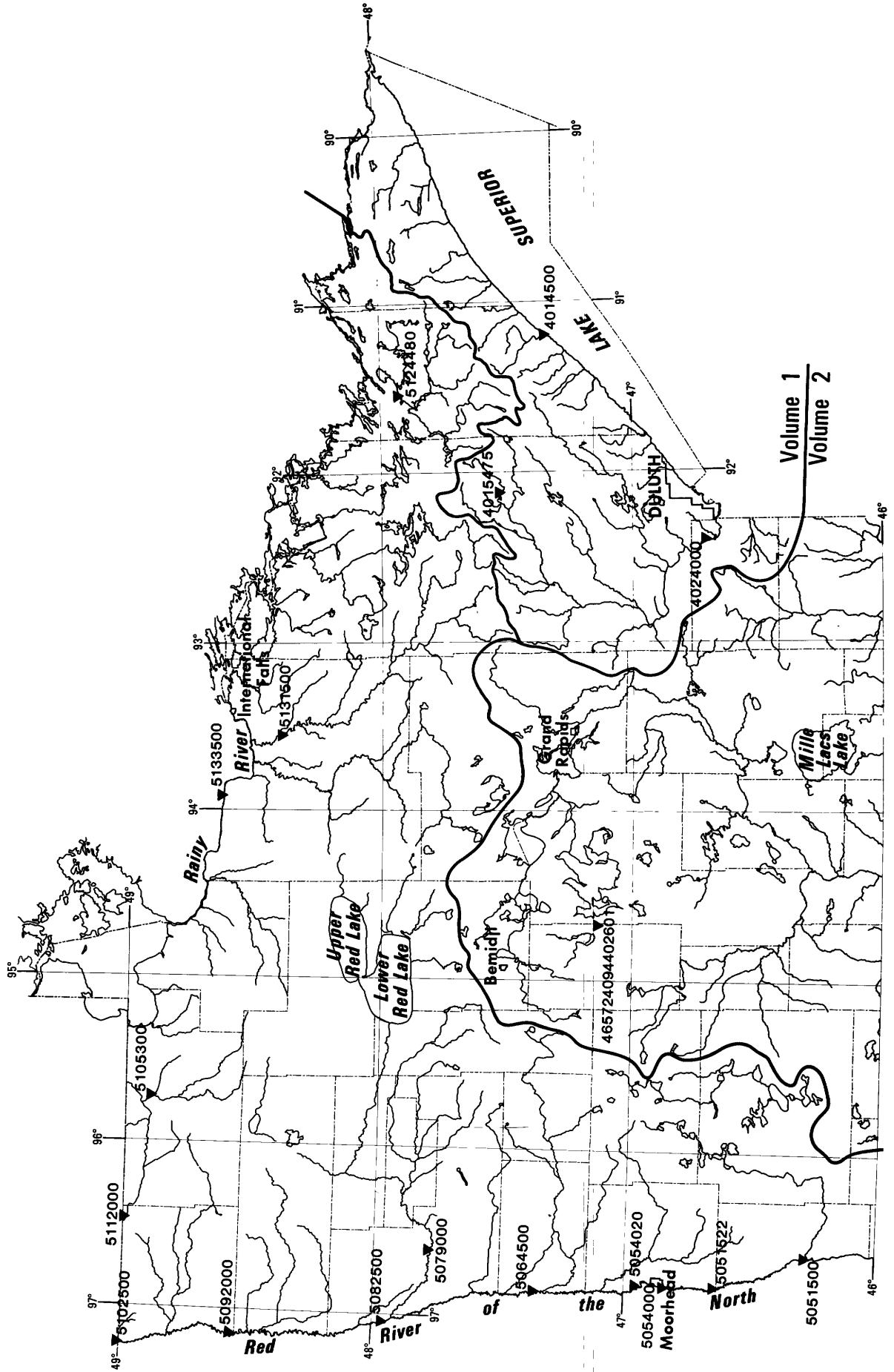


Figure 5.--Location of water-discharge stations



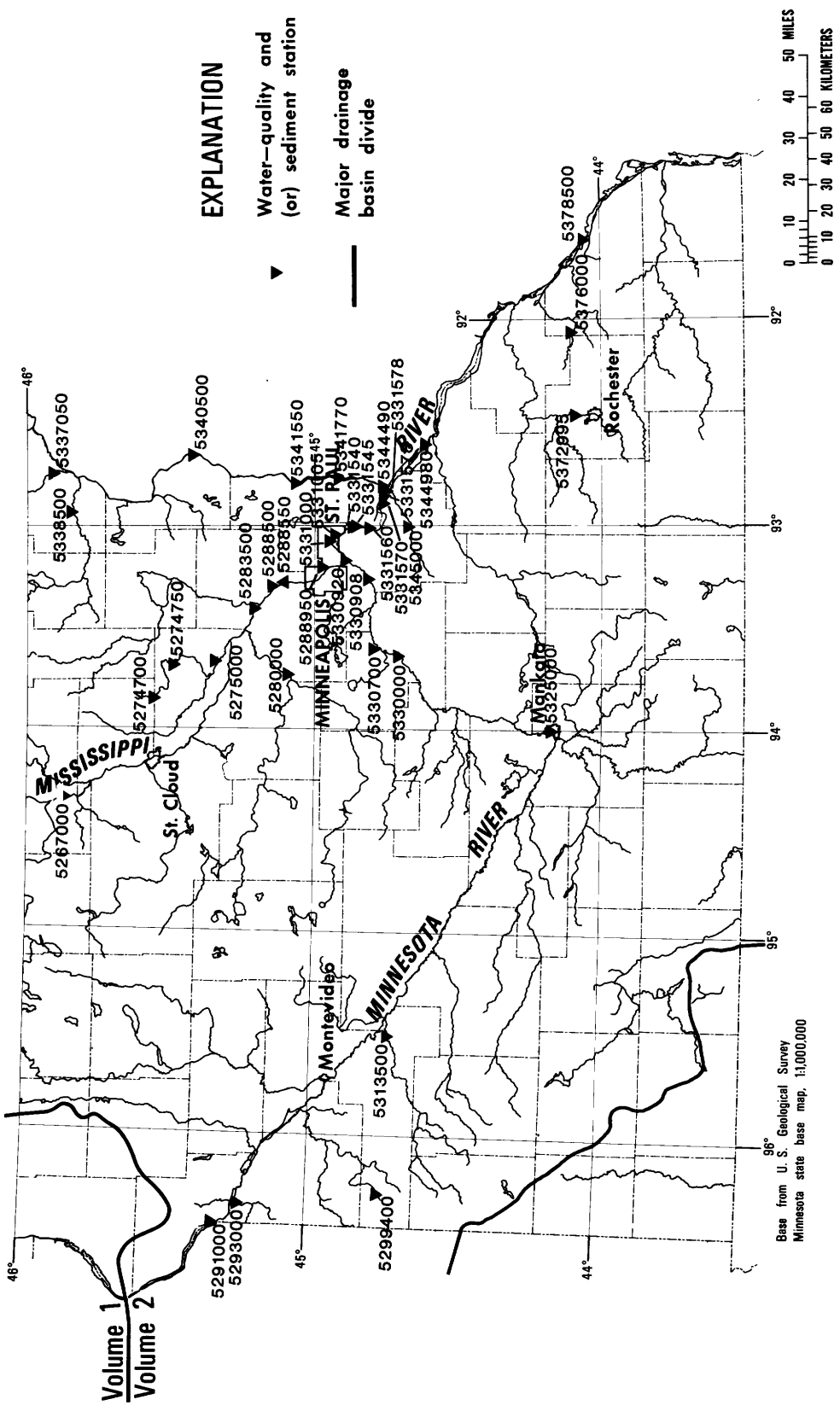


Figure 6.--Location of water-quality stations

## PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

Thirty-seven manuals by the U.S. Geological Survey have been published to date in the series on techniques describing procedures for planning and executing specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) is on surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises. The reports listed below are for sale by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett St., Alexandria, VA 22304 (authorized agent of the Superintendent of Documents, Government Printing Office).

- NOTE: When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".
- 1-D1. *Water temperature--influential factors, field measurement, and data presentation*, by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.
  - 1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.
  - 2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.
  - 2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.
  - 3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.
  - 3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.
  - 3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.
  - 3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.
  - 3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.
  - 3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.
  - 3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.
  - 3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.
  - 3-A9. *Measurement of time of travel and dispersion in streams by dye tracing*, by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.
  - 3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.
  - 3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.
  - 3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.
  - 3-B3. *Type curves for selected problems of flow to wells in confined aquifers*, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.
  - 3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.
  - 3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.
  - 3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.
  - 4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.
  - 4-A2. *Frequency curves*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.
  - 4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.
  - 4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.
  - 4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.
  - 4-D1. *Computation of rate and volume of stream depletion by wells*, by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.
  - 5-A1. *Methods for determination of inorganic substances in water and fluvial sediments*, by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.
  - 5-A2. *Determination of minor elements in water by emission spectroscopy*, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.
  - 5-A3. *Methods for analysis of organic substances in water*, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.
  - 5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, edited by P. E. Greenson, T. A. Ehle, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.
  - 5-A5. *Methods for determination of radioactive substances in water and fluvial sediments*, by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.
  - 5-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.
  - 7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments*, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.
  - 7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water*, by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.
  - 7-C3. *A model for simulation of flow in singular and interconnected channels*, by R. W. Schaffranek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.
  - 8-A1. *Methods of measuring water levels in deep wells*, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages.
  - 8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

## DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Minnesota have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station.

Station number	Station name	Drainage area (mi <sup>2</sup> )	Period of record
Streams tributary to Lake Superior			
04010000	Pigeon River above mouth of Arrow River, MN	256	1924-27
04011000	Brule River at mouth near Hoveland, MN	248	1911+
04011500	Devil Track River at mouth near Grand Marais, MN	a77	1911+
04012000	Cascade River at mouth near Grand Marais, MN	111	1911+
*04012500	Poplar River at Lutsen, MN	114	1911+, 1912-17, 1928-47, 1952-61
04013000	Cross River at Schroeder, MN	a91	1931-32
04015000	Beaver Creek (Beaver Bay Run) at Beaver Bay, MN	126	1911-14, 1928-31
04015455	South Branch Partridge River near Babbitt, MN	18.5	1977-80
04015500	Second Creek near Aurora, MN	29	1955-80
04017000	Embarrass River at Embarrass, MN	93.8	1942-64
04018000	Embarrass River near McKinley, MN	171	1953-62
04018900	East Two Rivers near Iron Junction, MN	40.0	1966-79
04019000	West Two Rivers near Iron Junction, MN	65.3	1953-62, 1965-79
04019300	West Swan River near Silica, MN	16.3	1963-79
04019500	East Swan River near Toivola, MN	112	1953-62, 1964-71
04020000	Swan River near Toivola, MN	254	1952-61
04021000	Whiteface River below (at) Meadowlands, MN	453	1909-17
04023000	Cloquet River at Independence, MN	a750	1909-17
04023500	St. Louis River near Cloquet, MN	a3,400	1903+
04024090	Elim Creek near Holyoke, MN	1.06	1976-78
04024093	Skunk Creek below Elim Creek near Holyoke, MN	8.83	1976-78
Red River of the North basin			
05030000	Otter Tail River near Detroit Lakes, MN	270	1937-71
05030500	Otter Tail River at German Church, near Fergus Falls, MN	a1,230	1904-17
05033900	Pelican River at Detroit Lakes, MN	-	1968-71, 1974-75
05034100	Pelican River at Detroit Lake outlet near Detroit Lakes, MN	-	1968-71, 1972-75
05035100	Long Lake outlet near Detroit Lakes, MN	-	1968-71
05035200	West Branch County Ditch No. 14 near Detroit Lakes, MN	-	1968-71
05035300	East Branch County Ditch No. 14 near Detroit Lakes, MN	-	1968-71
05035500	St. Clair Lake outlet near Detroit Lakes, MN	-	1968-75
05035600	Pelican River at Muskrat Lake outlet near Detroit Lakes, MN	-	1968-75
05037100	Pelican River at Sallie Lake outlet near Detroit Lakes, MN	-	1968-75
05039100	Pelican River at Lake Melissa outlet near Detroit Lakes, MN	-	1968-75
05040000	Pelican River near Detroit Lakes, MN	123	1942-53
05040500	Pelican River near Fergus Falls, MN	482	1909-12, 1942-80
05045500	Otter Tail River (Red River) near Fergus Falls, MN	a1,690	1909-10+

"See footnotes at end of table."

## DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi <sup>2</sup> )	Period of record
Red River of the North basin--Continued			
05046500	Otter Tail River near Breckenridge, MN	a2,040	1931-32, 1939-46†
05047000	Mustinka River (head of Bois de Sioux River) near Norcross, MN	-	1940-47†
05047500	Mustinka ditch above West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN	-	1943-55
05048000	Mustinka ditch below West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN	-	1943-55
05048500	West Branch Mustinka River (Twelve Mile Creek) below Mustinka ditch near Charlesville, MN	-	1943-55
05049000	Mustinka River above (near) Wheaton, MN	834	1915-24, 1930-58
05050500	Bois de Sioux River below Fairmont, ND	a1,540	1919-44
05051000	Rabbit River at Cambell, MN	266	1942-52
05054020	Red River of the North below Fargo, ND	-	1969-78
*05061200	Whiskey Creek at Barnesville, MN	25.3	1964-66
05063000	Wild Rice River near Ada, MN	a1,100	1948-54
*05063500	South Branch Wild River River near Borup, MN	254	1944-49
05067000	Marsh River below Ada, MN	-	1948-52
05068000	Sand Hill River at Beltrami, MN	a324	1943-58
05068500	Sand Hill ditch at Beltrami, MN	-	1943-58
05075500	Thief River near Gatske, MN	-	1953-56
05076500	Red Lake River at Thief River Falls, MN	a3,450	1909-18, 1920-30
05077000	Clearwater River near Pinewood, MN	132	1940-45
05077500	Clearwater River near Leonard, MN	153	1934-47
*05077700	Ruffy Brook near Gonvick, MN	45.2	1960-78
*05078000	Clearwater River at Plummer, MN	512	1939-79
05083500	Red River of the North at Oslo, MN	331,200	1936-37, 1941-43, 1945-60, 1973-78
05085500	Snake River at Warren, MN	a175	1945, 1953-56
05086000	Snake River at Alvarado, MN	309	1945, 1953-56
05086500	Snake River near Argyle, MN	481	1945
05087000	Middle River near Strandquist, MN	-	1953-56
05090500	Tamarac River near Strandquist, MN	-	1953-56
05091000	Tamarac River at Stephen, MN	-	1945
05091500	Tamarac River near Stephen, MN	a320	1945, 1953-55
05092500	Two Rivers (Middle Fork Two rivers) near Hallock, MN	131	1931-38
05093000	South Branch (South Fork) Two Rivers near Pelan, MN	281	1928-38, 1953-56
*05094000	South Branch Two Rivers at Lake Bronson, MN	444	1928-36, 1937, 1941-43, 1944, 1945-47, 1953-81
05094500	South Branch Two Rivers (Two Rivers) at Hallock, MN	-	1940-47

"See footnotes at end of table."

## DISCONTINUED GAGING STATIONS

25

Station number	Station name	Drainage area (mi <sup>2</sup> )	Period of record
Red River of the North basin--Continued			
05095000	Two Rivers (South Branch Two Rivers) at Hallock, MN	625	1911-14, 1929-30, 1938-39, 1941-43
05095500	Two Rivers below Hallock, MN	644	1945-55
05096000	North Branch (North Fork) Two Rivers near Lancaster, MN	a32	1929-38, 1941-55
05096500	State Ditch 85 near Lancaster, MN	a95	1929-38, 1942-55
05097000	North Branch Two Rivers at Lancaster, MN	209	1941-42, 1953-56
05097500	North Branch Two Rivers near Northcote, MN	386	1941-42, 1945-51
05098000	Two Rivers below North Branch near Hallock, MN	a1,060	1941-43
05103000	Roseau River (at) near Malung, MN	252	1928-46
05104000	South Fork (West Branch) Roseau River near Malung, MN	312	1911-14, 1928-46
05105000	Roseau River at Roseau, MN	-	1940-47
05105500	Roseau River near Roseau, MN	-	1930-60
05106000	Sprague Creek near Sprague, Manitoba	176	1928-81
05107000	Pine Creek near Pine Creek, MN	74.6	1928-53
05108000	Roseau River near Badger, MN	-	1928-69
05108500	Roseau River near Duxby, MN	-	1929-51, 1952-56
05109000	Badger Creek near Badger, MN	a2.2	1929-30, 1931-38
05109500	Roseau River near Haug, MN	-	1932-66
05110000	Roseau River at outlet of State Ditch 69 near Oak Point, MN	-	1939-42
05110500	Roseau River at head of State Ditch 51 near Oak Point, MN	-	1933-42
05111000	Roseau River at Oak Point, MN	-	1933-39, 1941-60
05112500	Roseau River at International boundary, near Caribou, MN	a1,590	1933-69
Lake of the Woods basin			
05124500	Isabella River near Isabella, MN	341	1953-61, 1976-77
05125000	South Kawishiwi River near Ely, MN	-	1953-61, 1976-78
05125500	Stony River near Isabella, MN	180	1953-64
05125550	Stony River near Babbitt, MN	219	1975-80
05126000	Dunka River near Babbitt, MN	53.4	1951-62, 1975-80
05126210	South Kawishiwi River above White Iron Lake near Ely, MN	-	1975-78
05126500	Bear Island River near Ely, MN	68.5	1953-62, 1975-77
05127205	Burntside River near Ely, MN	-	1967-78
05127207	Bjorkman's Creek near Ely, MN	1.36	1972-78
05127210	Armstrong Creek near Ely, MN	5.29	1967-78
05127215	Longstorff Creek near Ely, MN	8.84	1967-78
05127219	Shagawa Lake tributary at Ely, MN	1.84	1971-78
05127220	Burgo Creek near Ely, MN	3.04	1967-78

"See footnotes at end of table."

## DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi <sup>2</sup> )	Period of record
Lake of the Woods basin--Continued			
05127230	Shagawa River near Ely, MN	99	1967-78
05128340	Pike River near Biwabik, MN	-	1977-79
05128500	Pike River near Embarrass, MN	115	1953-64, 1976-79
05129000	Vermilion River below Vermilion Lake near Tower, MN	483	1911-17, 1928-81
05129500	Rainy River at International Falls, MN	14,900	1905-60
05130000	Sturgeon River (Lake) at Side Lake, MN	-	1938-47
05131000	Dark River near Chisholm, MN	50.6	1942-61, 1965-79
05131800	Deer Lake outlet (Deer Lake) near Effie, MN	-	1937-39 1940-46
*05132000	Big Fork River at Big Falls, MN	a1,460	1909-10†, 1911-12†, 1928-79
05132500	Big Fork River at Laurel, MN	-	1909
05133000	Black River near Loman, MN	-	1909
05139500	Warroad River near Warroad, MN	162	1946-80
*05140000	Bulldog Run near Warroad, MN	14.2	1946-51, 1966-77
*05140500	East Branch Warroad River near Warroad, MN	102	1946-54, 1966-77

\* Presently operated as high-flow partial-record station.

† Stage records only.

a Approximately.

HYDROLOGIC-DATA STATION RECORDS

STREAMS TRIBUTARY TO LAKE SUPERIOR

04010500 PIGEON RIVER AT MIDDLE FALLS, NEAR GRAND PORTAGE, MN  
(International gaging station)

LOCATION.--Lat 48°00'44", long 89°36'58", in SW¼ sec.24, T.64 N., R.6 E., Cook County, Hydrologic Unit 04010101, on the Grand Portage Indian Reservation, on right bank 400 ft (122 m) upstream from Middle Falls, 2.5 mi (4.0 km) upstream from Grand Portage Port of Entry, 3.5 mi (5.6 km) upstream from mouth, and 4.7 mi (7.6 km) north-east of village of Grand Portage.

DRAINAGE AREA.--600 mi<sup>2</sup> (1,554 km<sup>2</sup>).

PERIOD OF RECORD.--June to October 1921, April to November 1922, March 1923 to current year. Published as "at International Bridge" April 1924 to September 1940; as "below International Bridge" October 1940 to September 1965. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 744: 1927-28. WSP 804: 1934(M). WSP 974: Drainage area. WSP 1337: 1924(M), 1925, 1926-28(M), 1931(M), 1938(M), 1941(M), 1945-46(M), 1947, 1948(M), 1950(M).

GAGE.--Water-stage recorder. Datum of gage is 787.58 ft (240.054 m), National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 mi (9.3 km) upstream at datum 102.24 ft (31.163 m) higher. Oct. 1, 1940, to Dec. 31, 1975, at present site at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records good except those for winter period, which are fair.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--59 years (water years 1924-82), 503 ft<sup>3</sup>/s (14.24 m<sup>3</sup>/s), 11.38 in/yr (289 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,000 ft<sup>3</sup>/s (312 m<sup>3</sup>/s) May 5, 1934, gage height, 7.6 ft (2.32 m), site and datum then in use, from rating curve extended above 7,000 ft<sup>3</sup>/s (198 m<sup>3</sup>/s); minimum daily, 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s) Jan. 15-21, 1977; minimum recorded gage height, 1.24 ft (0.378 m) Jan. 7, 8, 15, 1977, but may have been less during period of no gage-height record, Jan. 16 to Apr. 17, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,820 ft<sup>3</sup>/s (165 m<sup>3</sup>/s) Apr. 25, gage height, 10.39 ft (3.167 m), no other peak above base of 3,000 ft<sup>3</sup>/s (85.0 m<sup>3</sup>/s); minimum daily discharge, 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) Dec. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	177	297	146	100	100	95	185	2330	837	247	268	152
2	206	276	151	100	100	95	205	2210	814	236	259	153
3	211	257	144	100	100	95	235	2070	774	239	246	158
4	235	239	144	100	100	95	250	1980	712	271	235	164
5	294	230	144	100	100	95	255	2110	663	326	227	157
6	366	224	140	100	100	94	250	2100	615	392	228	143
7	397	224	130	100	100	93	250	2020	577	897	293	133
8	355	214	110	100	100	92	245	1800	551	897	350	124
9	299	198	90	100	100	92	245	1590	555	721	339	118
10	264	195	80	100	100	92	240	1770	576	616	317	119
11	251	185	100	100	100	92	240	2100	575	617	284	117
12	235	177	120	100	100	94	250	1990	550	598	254	125
13	221	173	140	100	100	96	280	2130	501	625	229	152
14	240	165	130	100	100	98	420	2430	475	634	221	203
15	299	164	120	100	100	100	600	2190	462	633	212	224
16	300	159	115	100	100	105	750	1960	456	583	204	202
17	288	155	115	100	100	110	950	1810	442	535	197	188
18	329	152	115	100	100	118	1300	2110	410	563	192	189
19	348	152	110	100	100	122	1480	2220	388	538	186	203
20	350	140	110	100	100	126	1420	2010	372	478	179	205
21	321	122	110	100	100	130	1340	1790	369	423	179	200
22	296	99	110	100	100	132	1320	1600	362	392	190	189
23	272	124	110	100	100	134	2000	1450	350	368	192	176
24	256	132	105	100	100	136	3370	1330	335	350	191	175
25	250	139	105	100	95	138	5050	1230	326	329	192	180
26	235	137	105	100	95	138	5110	1150	314	317	186	183
27	241	147	105	100	95	140	4010	1080	293	313	180	174
28	232	136	105	100	95	144	3140	1020	281	338	171	165
29	241	146	105	100	---	148	2640	967	273	341	168	165
30	291	154	100	100	---	154	2510	925	261	308	159	166
31	315	---	100	100	---	162	---	882	---	287	153	---
TOTAL	8615	5312	3614	3100	2780	3555	40540	54354	14469	14412	6881	5002
MEAN	278	177	117	100	99.3	115	1351	1753	482	465	222	167
MAX	397	297	151	100	100	162	5110	2430	837	897	350	224
MIN	177	99	80	100	95	92	185	882	261	236	153	117
CFSM	.46	.30	.20	.17	.17	.19	2.25	2.92	.80	.78	.37	.28
IN.	.53	.33	.22	.19	.17	.22	2.51	3.37	.90	.89	.43	.31

CAL YR 1981 TOTAL 175770 MEAN 482 MAX 3240 MIN 50 CFSM .80 IN 10.90  
WTR YR 1982 TOTAL 162634 MEAN 446 MAX 5110 MIN 80 CFSM .74 IN 10.08

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN

LOCATION.--Lat 47°20'07", long 91°12'06", in SE¼NE¼ sec.15, T.56 N., R.7 W., Lake County, Hydrologic Unit 04010101, on right bank 400 ft (122 m) upstream from bridge on U.S. Highway 61, 0.3 mi (0.5 km) upstream from mouth, 4 mi (6 km) northeast of Silver Bay, and 7 mi (11 km) northeast of village of Beaver Bay.

DRAINAGE AREA.--140 mi<sup>2</sup> (363 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1927 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 894: 1939. WSP 1337: 1933-34(M), 1935.

GAGE.--Water-stage recorder. Datum of gage is 613.65 ft (187.041 m) National Geodetic Vertical Datum of 1919 (Corps of Engineers bench mark). Prior to Oct. 5, 1934, nonrecording gage, and Oct. 5, 1934 to Nov. 22, 1978, water-stage recorder at site 370 ft (113 m) downstream and at datum 3.68 ft (1.122 m) lower.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--55 years, 168 ft<sup>3</sup>/s (4.758 m<sup>3</sup>/s), 16.30 in/yr (414 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,000 ft<sup>3</sup>/s (283 m<sup>3</sup>/s) Sept. 24, 1977, gage height, 8.33 ft (2.539 m) site and datum then in use, from highwater mark in well, from rating curve extended above 4,200 ft<sup>3</sup>/s (119 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow; maximum gage height, 11.06 ft (3.371 m) Apr. 12, 1965, site and datum then in use, from floodmark (backwater from ice); no flow Jan. 14 to Mar. 2, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,300 ft<sup>3</sup>/s (36.8 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge		Gage height	
		(ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	(ft)	(m)
Apr. 25	0200	*3750	106	*11.32	3.450
May 5	1230	1830	51.8	9.68	2.950

Minimum daily discharge, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) Feb. 21 to Mar. 12; minimum recorded gage height, 5.73 ft (1.747 m) Mar. 12, but may have been less during period of no gage-height record Jan. 17 to Mar. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	387	125	50	29	20	19	200	631	198	29	63	51
2	400	114	50	29	20	19	250	564	171	27	57	72
3	285	105	49	28	20	19	280	507	146	53	53	70
4	281	100	46	28	20	19	300	808	128	99	50	62
5	294	95	48	27	20	19	250	1750	112	106	47	50
6	278	89	48	27	20	19	200	1390	98	138	46	43
7	242	84	48	26	20	19	170	973	91	610	201	37
8	189	80	47	26	20	19	150	702	86	606	456	34
9	152	71	46	25	20	19	130	551	84	466	392	32
10	154	67	45	24	20	19	120	718	167	657	263	49
11	168	65	45	24	20	19	110	900	152	634	172	109
12	151	63	44	23	20	19	130	799	153	713	122	209
13	159	62	44	23	20	23	150	1040	129	851	96	515
14	433	62	43	22	20	24	200	1060	107	974	85	413
15	399	63	42	22	20	23	270	854	99	690	71	316
16	304	63	41	22	20	23	450	870	85	488	61	294
17	340	62	40	22	20	23	800	855	77	551	50	266
18	441	60	39	22	20	23	896	1250	68	472	44	259
19	357	58	39	21	20	23	749	1090	62	312	48	206
20	306	48	38	21	20	23	710	804	59	220	44	183
21	270	52	37	21	19	23	679	610	59	187	39	153
22	219	56	36	21	19	24	858	476	57	181	106	132
23	178	56	36	21	19	26	1460	379	51	142	125	112
24	151	54	35	21	19	27	2450	318	46	117	116	102
25	140	51	34	21	19	27	3360	269	43	118	101	90
26	121	51	34	21	19	27	2440	232	38	104	80	82
27	119	51	33	21	19	27	1500	196	34	85	67	74
28	119	51	32	21	19	27	1060	168	31	69	57	70
29	127	51	32	21	---	27	856	151	36	63	50	70
30	136	51	31	20	---	50	734	186	33	68	49	72
31	135	---	30	20	---	100	---	212	---	68	47	---
TOTAL	7435	2060	1262	720	552	798	21912	21313	2700	9898	3258	4227
MEAN	240	68.7	40.7	23.2	19.7	25.7	730	688	90.0	319	105	141
MAX	441	125	50	29	20	100	3360	1750	198	974	456	515
MIN	119	48	30	20	19	19	110	151	31	27	39	32
CFSM	1.71	.49	.29	.17	.14	.18	5.21	4.91	.64	2.28	.75	1.01
IN.	1.98	.55	.34	.19	.15	.21	5.82	5.66	.72	2.63	.87	1.12

CAL YR 1981 TOTAL 64643.7 MEAN 177 MAX 1370 MIN 9.7 CFMSM 1.26 IN 17.18  
WTR YR 1982 TOTAL 76135.0 MEAN 209 MAX 3360 MIN 19 CFMSM 1.49 IN 20.23

NOTE.--No gage-height record Jan. 17 to Mar. 9.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued  
(National stream-quality accounting network station)

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1980 to September 1982 (discontinued).

WATER TEMPERATURES: October 1980 to September 1982 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 167 micromhos Feb. 18, 1981; minimum, 32 micromhos Apr. 25, 1982.

WATER TEMPERATURES: Maximum, 26.5°C July 7, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 131 micromhos Mar. 31; minimum, 32 micromhos Apr. 25, 26.

WATER TEMPERATURES: Maximum, 23.5°C July 6; minimum, 0.0°C several days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	BARO- METRIC PRES- SURE (MM OF HG) (00025)	TUR- BID- ITY (NTU) (00076)
OCT										
21...	1445	266	54	58	7.4	7.1	3.0	3.0	753	.90
JAN										
14...	1515	22	125	104	--	7.7	-10.0	.0	737	1.3
MAR										
10...	1040	19	120	110	7.6	7.6	-5.0	.0	736	1.3
APR										
21...	0945	594	55	50	7.4	7.0	1.0	.0	749	1.4
JUN										
22...	1000	57	80	79	7.6	7.7	12.0	14.0	743	1.1
AUG										
10...	1130	262	55	55	7.6	7.2	11.0	13.0	744	1.3
DATE		OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00300) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS (MG/L AS CACO3) (00900)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)
OCT										
21...	13.5	101	K10	52	30	8.0	7.9	2.6	3.1	.3
JAN										
14...	13.9	98	K2	K8	46	9.0	12	3.9	3.4	.2
MAR										
10...	13.4	95	K4	56	51	7.0	13	4.4	4.2	.3
APR										
21...	14.2	99	8	60	24	9.0	6.0	2.1	2.1	.2
JUN										
22...	9.0	90	K13	35	37	6.0	9.6	3.1	3.4	.3
AUG										
10...	9.6	93	45	210	31	9.0	8.4	2.5	1.7	.1
DATE		POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)
OCT										
21...	.2	22	8.3	2.5	.2	10	83	48	59.6	
JAN										
14...	.3	37	7.1	3.2	.2	14	79	67	4.7	
MAR										
10...	.3	44	8.5	3.6	.3	14	90	75	4.6	
APR										
21...	.6	15	6.0	1.9	.1	9.4	70	37	112	
JUN										
22...	.4	31	5.0	2.1	.2	7.6	53	50	8.2	
AUG										
10...	<.1	22	5.0	1.9	.2	9.5	100	43	70.7	

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	SEDI- MENT, SUS- PENDE (MG/L) (80154)	SEDI- MENT, CHARGE, SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 21...	.29	.040	.22	<.010	<.010	<.010	14	10	93
JAN 14...	.35	.070	.39	<.010	<.010	<.010	11	.68	98
MAR 10...	.47	.120	.60	<.010	<.010	<.010	11	.57	100
APR 21...	.63	.130	.42	.030	.010	<.010	16	26	81
JUN 22...	<.10	<.010	.30	<.010	<.010	<.010	8	1.3	93
AUG 10...	<.10	.080	.70	.020	<.010	<.010	3	2.3	82

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA) (01007)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR) (01034)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO) (01037)
OCT 21...	1445	1	0	100	43	<1	<1	20	10	<1
JAN 14...	1515	2	1	100	11	1	<1	20	10	1
APR 21...	0945	1	1	<100	9	1	<1	20	10	<1
AUG 10...	1130	1	1	100	11	<1	2	30	20	<1

DATE	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE) (01045)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN) (01055)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG) (71900)
OCT 21...	<1	9	6	420	330	5	<1	20	5	.4
JAN 14...	<1	8	4	240	190	4	<1	<10	3	<.1
APR 21...	<1	14	6	500	190	5	3	30	11	--
AUG 10...	<1	7	1	760	490	5	3	20	6	.1

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
OCT 21...	.2	<1	<1	<1	<1	<1	<1	50	40
JAN 14...	<.1	<1	<1	<1	<1	<1	<1	60	13
APR 21...	--	6	5	<1	<1	<1	<1	20	10
AUG 10...	<.1	7	1	<1	<1	<1	<1	40	10

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	86	72	81	64	63	63	88	83	86	98	96	97
2	72	66	69	65	63	64	88	81	85	99	97	98
3	66	64	65	69	64	68	82	81	82	97	96	97
4	69	63	67	70	69	70	85	72	80	96	96	96
5	68	65	66	71	68	70	85	83	84	97	95	96
6	66	64	65	69	68	68	85	83	84	96	95	95
7	64	63	64	70	68	69	85	82	84	95	94	95
8	64	63	63	71	70	70	92	71	80	95	94	95
9	65	63	64	74	70	72	88	82	84	95	94	95
10	68	64	66	75	72	73	92	88	89	96	94	95
11	68	65	66	75	71	74	93	89	91	98	96	97
12	67	65	66	76	72	73	89	87	88	99	97	98
13	68	65	66	78	76	77	87	86	87	101	99	100
14	70	62	66	77	76	76	88	86	87	101	100	100
15	62	60	61	76	75	76	90	88	89	101	99	100
16	61	59	60	77	74	76	93	90	91	99	98	99
17	69	60	64	75	74	75	95	92	94	100	98	99
18	65	58	61	76	75	75	97	95	96	101	100	101
19	59	57	58	77	75	76	100	97	99	102	101	102
20	58	57	58	80	72	78	101	99	100	102	101	102
21	57	56	57	76	66	71	101	100	100	103	102	102
22	58	56	57	89	67	76	101	100	100	103	102	102
23	59	57	58	91	85	88	104	100	102	103	101	102
24	60	57	59	87	83	85	107	103	105	101	100	101
25	61	58	60	83	81	82	112	101	107	102	100	101
26	65	61	63	87	81	84	101	100	100	101	100	101
27	64	61	63	84	82	83	101	99	100	102	101	101
28	66	64	65	83	80	82	99	97	98	102	100	101
29	66	65	66	85	81	83	98	97	98	100	99	100
30	66	63	64	86	83	84	98	97	98	100	99	99
31	64	62	63	---	---	---	99	97	98	100	99	99
MONTH	86	56	64	91	63	75	112	71	92	103	94	99

DAY	FEBRUARY			MARCH			APRIL			MAY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	100	99	99	110	108	109	121	111	116	41	39	40
2	101	99	100	109	107	108	112	107	109	42	40	41
3	100	99	99	108	107	107	112	105	109	43	42	42
4	100	98	99	109	107	108	106	103	104	49	42	47
5	101	99	100	109	108	109	104	97	100	48	40	43
6	101	99	100	109	108	108	97	94	96	41	40	40
7	102	101	102	109	107	108	95	93	94	42	40	41
8	103	102	102	109	108	108	95	93	94	43	41	42
9	108	102	103	109	108	108	96	93	95	45	42	43
10	119	105	111	109	108	109	97	94	96	46	44	45
11	106	105	105	110	109	109	96	92	94	45	43	44
12	106	104	105	117	109	111	95	92	93	44	42	43
13	106	105	106	122	115	117	93	84	89	48	43	45
14	107	106	106	120	111	113	85	78	82	44	43	44
15	107	106	107	119	112	115	79	72	76	47	43	45
16	107	106	107	116	111	113	73	57	68	48	46	47
17	107	106	106	117	111	112	58	49	54	48	46	47
18	107	106	107	118	113	115	52	49	51	48	44	46
19	109	107	108	117	113	115	52	50	51	45	44	44
20	111	108	109	114	111	112	81	50	65	45	44	45
21	109	108	109	120	110	112	72	50	60	47	45	46
22	110	109	109	121	112	116	51	47	50	49	46	48
23	114	110	112	124	116	119	46	39	44	51	48	50
24	112	110	111	129	120	124	39	34	37	52	50	51
25	110	108	109	129	121	124	35	32	33	55	52	54
26	111	108	109	121	116	119	34	32	33	56	54	55
27	111	110	110	119	117	118	36	33	34	58	56	57
28	110	109	110	118	115	117	38	35	36	61	58	59
29	---	---	---	118	116	117	42	37	39	63	59	61
30	---	---	---	129	117	123	40	39	39	63	60	62
31	---	---	---	131	120	126	---	---	---	60	58	58
MONTH	119	98	106	131	107	114	121	32	71	63	39	48

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN												
													JUNE			JULY			AUGUST			SEPTEMBER		
1	58	57	58	91	87	89	76	75	75	87	85	86												
2	58	57	57	90	88	89	78	76	77	92	86	89												
3	59	57	58	95	86	89	80	77	79	86	81	83												
4	61	59	60	87	76	80	81	80	81	82	80	81												
5	63	61	62	78	76	77	83	81	82	82	81	82												
6	65	62	63	77	72	75	85	83	84	84	81	83												
7	67	65	66	75	49	61	86	63	77	85	83	84												
8	68	67	67	49	47	48	63	54	58	88	84	86												
9	71	66	68	53	47	50	54	53	53	90	87	89												
10	72	64	68	53	47	49	53	52	53	98	88	91												
11	64	61	63	49	45	46	56	53	55	94	82	86												
12	65	62	63	53	49	50	59	56	57	89	80	84												
13	63	61	62	49	44	47	62	59	60	79	62	69												
14	64	62	63	43	40	41	65	62	63	62	60	61												
15	66	64	65	44	41	43	68	65	66	62	59	60												
16	73	65	67	49	45	47	71	68	70	60	59	59												
17	73	67	69	56	48	52	73	71	72	62	59	61												
18	70	68	69	51	50	51	75	73	74	61	59	60												
19	72	70	71	53	51	52	79	75	78	61	59	60												
20	73	71	73	57	53	55	78	77	78	62	60	61												
21	75	73	74	60	55	58	80	77	79	62	60	61												
22	76	73	75	59	58	58	86	78	82	64	61	62												
23	78	76	77	61	58	59	77	74	75	65	62	64												
24	80	77	79	65	61	62	76	71	73	66	64	65												
25	81	79	80	66	64	65	76	74	75	67	65	66												
26	83	80	82	67	66	66	75	74	74	69	66	67												
27	85	82	84	69	67	68	77	74	75	71	68	69												
28	87	84	85	72	69	70	77	75	76	73	70	71												
29	89	84	87	75	71	73	82	76	79	75	72	74												
30	89	87	88	76	75	75	82	81	82	75	73	74												
31	---	---	---	75	74	75	83	80	81	---	---	---												
MONTH	89	57	70	95	40	62	86	52	72	98	59	73												
YEAR	131	32	79																					

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN												
													OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	6.0	4.5	5.5	5.5	3.0	4.5	.0	.0	.0	.0	.0	.0												
2	6.0	3.5	4.5	4.5	3.0	4.0	.0	.0	.0	.0	.0	.0												
3	7.0	3.5	5.0	4.5	1.5	3.0	.0	.0	.0	.0	.0	.0												
4	7.0	6.5	6.5	5.5	3.5	4.5	.0	.0	.0	.0	.0	.0												
5	7.5	6.0	7.0	6.0	4.5	5.5	.0	.0	.0	.0	.0	.0												
6	8.5	7.0	7.5	4.5	2.5	3.5	.0	.0	.0	.0	.0	.0												
7	8.0	5.0	6.5	4.0	1.0	2.5	.0	.0	.0	.0	.0	.0												
8	7.5	5.0	6.5	3.5	1.0	2.5	.0	.0	.0	.0	.0	.0												
9	7.5	6.0	7.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0												
10	8.0	7.0	7.5	1.5	.0	.5	.0	.0	.0	.0	.0	.0												
11	8.0	7.0	7.5	1.0	.0	.5	.0	.0	.0	.0	.0	.0												
12	9.5	7.5	8.5	2.0	.0	1.0	.0	.0	.0	.0	.0	.0												
13	9.0	8.5	8.5	2.5	1.0	1.5	.0	.0	.0	.0	.0	.0												
14	9.5	8.5	9.0	3.5	2.0	2.5	.0	.0	.0	.0	.0	.0												
15	9.0	7.5	8.0	4.5	3.0	3.5	.0	.0	.0	.0	.0	.0												
16	9.5	6.5	8.0	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0												
17	9.0	8.5	8.5	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0												
18	8.5	4.0	6.0	3.0	1.5	2.0	.0	.0	.0	.0	.0	.0												
19	5.0	2.5	3.5	1.5	.0	.5	.0	.0	.0	.0	.0	.0												
20	6.0	4.0	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
21	4.0	1.5	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0												
22	2.5	.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0	.0												
23	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
24	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
25	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
27	2.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
28	2.5	1.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
29	5.0	2.5	3.5	.0	.0	.0	.0	.0	.0	.0	.0	.0												
30	6.5	4.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0												
31	6.5	5.0	6.0	---	---	---	.0	.0	.0	.0	.0	.0												
MONTH	9.5	.0	5.0	6.0	.0	1.5	.0	.0	.0	.0	.0	.0												



## STREAMS TRIBUTARY TO LAKE SUPERIOR

04015330 KNIPE RIVER NEAR TWO HARBORS, MN

LOCATION.--Lat 46°56'49", long 91°47'32", in SW1/4 sec.31, T.52 N., R.11 W., Lake County, Hydrologic Unit 04010102, on right bank 600 ft (183 m) downstream from bridge on U.S. Highway 61, 0.5 mi (0.8 km) upstream from bridge on County Highway 102, in town of Knife River, 0.8 mi (1.3 km) upstream from Lake Superior, and 7.8 mi (12.6 km) southwest of Two Harbors.

DRAINAGE AREA.--85.6 mi<sup>2</sup> (221.7 km<sup>2</sup>).

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, July 1974 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Altitude of gage is 640 ft (195 m), from topographic map.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--8 years, 86.0 ft<sup>3</sup>/s (2.436 m<sup>3</sup>/s), 13.64 in/yr (346 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,440 ft<sup>3</sup>/s (211 m<sup>3</sup>/s) May 10, 1979, gage height, 11.16 ft (3.402 m); minimum, no flow Dec. 2, 1976 to Mar. 4, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 800 ft<sup>3</sup>/s (22.7 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge		Gage height		Date	Time	Discharge		Gage height	
		(ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	(ft)	(m)			(ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	(ft)	(m)
Oct. 17	2030	1010	28.6	5.50	1.676	May 5	0645	2120	60.9	6.95	2.118
Apr. 17	2015	1880	53.2	6.62	2.018	July 3	0800	*3270	92.6	*8.03	2.448
Apr. 23	2315	1540	43.6	6.29	1.917	July 7	0530	2020	57.2	6.73	2.051
						July 9	1315	1420	40.2	5.99	1.826

Minimum daily discharge, 3.5 ft<sup>3</sup>/s (0.099 m<sup>3</sup>/s) Jan. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	128	39	23	6.9	4.4	5.6	450	176	30	27	30	16
2	93	34	22	6.6	4.5	5.8	400	155	30	19	24	24
3	54	30	21	6.2	4.5	5.8	540	121	26	1180	21	20
4	222	28	20	5.8	4.6	5.8	580	141	23	378	21	16
5	193	29	20	5.4	4.6	6.0	500	1280	20	356	19	12
6	128	28	19	5.1	4.7	6.0	400	572	19	597	18	9.9
7	83	23	19	4.8	4.7	6.0	300	332	18	1330	17	9.0
8	61	23	18	4.5	4.8	6.2	250	221	19	427	25	8.8
9	44	20	18	4.2	4.8	6.2	230	164	19	726	22	8.4
10	151	20	17	4.0	4.8	6.2	200	247	61	629	18	9.8
11	138	19	17	3.8	4.9	6.4	180	258	48	413	15	18
12	87	18	16	3.5	4.9	6.4	370	203	40	194	13	40
13	85	19	16	3.6	4.9	6.6	734	463	33	114	17	144
14	438	19	15	3.6	5.0	6.8	937	391	25	79	29	82
15	229	19	15	3.6	5.0	7.0	1160	271	107	70	24	94
16	133	19	14	3.7	5.0	7.3	1270	240	80	209	19	106
17	400	20	14	3.7	5.2	7.6	1580	239	48	261	15	87
18	480	19	13	3.7	5.2	7.9	1150	471	35	122	12	84
19	218	18	13	3.8	5.2	8.2	734	362	28	65	11	56
20	166	16	12	3.8	5.2	8.5	589	237	34	46	10	45
21	133	16	12	3.9	5.2	9.0	564	163	45	66	9.1	37
22	97	16	11	3.9	5.2	9.4	713	124	35	95	13	28
23	76	16	11	4.0	5.4	9.8	1000	96	26	52	21	24
24	62	15	10	4.0	5.4	10	1300	79	21	37	15	31
25	54	15	10	4.1	5.4	11	1070	65	19	39	14	33
26	44	20	9.6	4.1	5.4	13	598	56	16	33	14	28
27	49	27	9.2	4.2	5.6	19	402	48	14	28	11	23
28	48	27	8.6	4.2	5.6	24	295	42	14	22	9.5	21
29	47	24	8.2	4.3	---	30	240	37	50	21	9.0	21
30	47	23	7.8	4.3	---	70	202	34	42	44	9.3	22
31	42	---	7.4	4.4	---	200	---	30	---	43	9.8	---
TOTAL	4230	659	446.8	135.7	140.1	537.5	18938	7318	1025	7722	514.7	1157.9
MEAN	136	22.0	14.4	4.38	5.00	17.3	631	236	34.2	249	16.6	38.6
MAX	480	39	23	6.9	5.6	200	1580	1280	107	1330	30	144
MIN	42	15	7.4	3.5	4.4	5.6	180	30	14	19	9.0	8.4
CFSM	1.59	.26	.17	.05	.06	.20	7.37	2.76	.40	2.91	.19	.45
IN.	1.84	.29	.19	.06	.06	.23	8.23	3.18	.45	3.36	.22	.50

CAL YR 1981 TOTAL 30656.1 MEAN 84.0 MAX 1850 MIN 2.4 CFSM .98 IN 13.32  
WTR YR 1982 TOTAL 42824.7 MEAN 117 MAX 1580 MIN 3.5 CFSM 1.37 IN 18.61

NOTE.--No gage-height record Feb. 4 to Mar. 10.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE, AT HOYT LAKES, MN

LOCATION.--Lat 47°31'38", long 92°07'21", in SW¼NE¼ sec.9, T.58 N., R.14 W., St. Louis County, Hydrologic Unit 04010201, in Superior National Forest, 10 ft (3.0 m) upstream from bridge on County Highway 110, 1 mi (1.6 km) east of Hoyt Lakes.

DRAINAGE AREA.--106 mi<sup>2</sup> (275 km<sup>2</sup>) of which 6.0 mi<sup>2</sup> (15.5 km<sup>2</sup>) is noncontributing.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1978 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,455 ft (443 m), from topographic map.

REMARKS.--Records fair except those for period of no gage-height record, Jan. 27 to Mar. 2, which are poor.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,020 ft<sup>3</sup>/s (57.2 m<sup>3</sup>/s) Apr. 22, 1979, gage height, 10.89 ft (3.319 m); minimum, 0.88 ft<sup>3</sup>/s (0.025 m<sup>3</sup>/s) Feb. 15, 1981, gage height, 4.81 ft (1.466 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 0.50 ft<sup>3</sup>/s (0.014 m<sup>3</sup>/s) was measured Aug. 23, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 609 ft<sup>3</sup>/s (17.2 m<sup>3</sup>/s) Apr. 27, gage height, 8.42 ft (2.566 m); minimum daily, 2.7 ft<sup>3</sup>/s (0.076 m<sup>3</sup>/s) Jan. 20, 21, 25, 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	102	18	8.5	2.9	4.0	11	345	67	17	49	56
2	21	94	18	8.3	2.9	4.0	13	286	61	15	42	61
3	28	83	18	8.4	2.9	4.0	16	246	54	18	39	72
4	40	77	17	8.4	2.9	3.7	18	234	52	26	40	81
5	57	69	16	7.9	2.9	3.7	19	312	46	44	38	77
6	76	66	16	7.8	3.0	3.7	20	398	42	71	36	63
7	93	60	15	7.4	3.0	3.6	20	472	37	127	64	52
8	100	55	15	7.4	3.0	3.5	20	510	36	181	141	46
9	115	52	15	7.1	3.0	3.4	20	485	36	241	196	44
10	134	48	14	6.8	3.0	3.3	20	442	43	332	200	46
11	130	48	14	6.1	3.0	3.3	20	436	58	403	170	50
12	114	48	14	5.8	3.0	3.2	21	472	82	445	131	64
13	110	48	14	5.2	3.0	3.5	22	530	86	451	109	118
14	152	46	13	5.0	3.0	3.2	30	562	77	420	95	169
15	183	42	13	4.7	3.0	3.2	71	566	77	353	87	185
16	213	39	13	4.7	3.1	3.0	191	548	73	291	77	177
17	216	37	13	3.5	3.2	3.2	291	510	69	238	68	171
18	227	35	12	3.2	3.3	3.5	362	461	62	192	62	173
19	239	33	12	3.0	3.4	3.7	410	426	55	157	64	175
20	256	30	11	2.7	3.6	3.2	461	401	50	130	67	172
21	260	26	11	2.7	3.8	3.2	489	377	46	116	68	156
22	244	24	11	2.8	4.0	3.0	455	339	42	119	86	134
23	216	22	10	2.8	4.0	3.2	439	288	36	113	110	115
24	185	21	10	2.8	4.0	3.2	461	232	30	100	121	109
25	160	20	9.8	2.7	4.0	3.2	513	187	29	91	117	104
26	139	20	9.2	2.7	4.0	3.5	569	156	25	83	106	97
27	127	19	9.2	2.8	4.0	3.7	602	130	21	71	93	90
28	117	19	8.8	2.8	4.0	4.2	576	106	18	60	82	85
29	109	19	8.8	2.8	---	4.5	502	94	19	58	74	82
30	106	19	8.8	2.8	---	5.0	420	87	18	59	67	83
31	104	---	8.8	2.9	---	8.0	---	76	---	55	61	---
TOTAL	4286	1321	396.4	152.5	92.9	114.6	7082	10714	1447	5077	2760	3107
MEAN	138	44.0	12.8	4.92	3.32	3.70	236	346	48.2	164	89.0	104
MAX	260	102	18	8.5	4.0	8.0	602	566	86	451	200	185
MIN	15	19	8.8	2.7	2.9	3.0	11	76	18	15	36	44
CFSM	1.30	.42	.12	.05	.03	.04	2.23	3.26	.46	1.55	.84	.98
IN.	1.50	.46	.14	.05	.03	.04	2.49	3.76	.51	1.78	.97	1.09
CAL YR 1981	TOTAL	30483.12	MEAN	83.5	MAX	600	MIN	.96	CFSM	.79	IN	10.70
WTR YR 1982	TOTAL	36550.40	MEAN	100	MAX	602	MIN	2.7	CFSM	.94	IN	12.83

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--February 1976 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1976 to current year.

WATER TEMPERATURES: February 1976 to current year.

INSTRUMENTATION.--Specific conductance and water temperature recorder since February 1976.

REMARKS.--Extremes are published for years with 80 percent or more daily record.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water year 1980): Maximum, 268 micromhos Aug. 28 and 29, 1980; minimum, 63 micromhos April 11, 1980.

WATER TEMPERATURES (water years 1979, 1980): Maximum, 27.5°C June 25, 1980; minimum, 0.0°C on many days during winter periods.

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	---	---	---	123	122	122	131	130	130	---	---	---
2	---	---	---	122	122	122	131	129	130	---	---	---
3	---	---	---	122	120	122	129	128	129	---	---	---
4	---	---	---	121	118	120	130	129	129	---	---	---
5	---	---	---	118	115	116	132	129	131	---	---	---
6	---	---	---	115	114	114	135	133	134	---	---	---
7	---	---	---	114	112	112	138	136	137	---	---	---
8	---	---	---	112	110	111	141	138	140	---	---	---
9	---	---	---	112	110	111	147	141	145	---	---	---
10	---	---	---	112	112	112	154	148	152	---	---	---
11	---	---	---	112	110	110	160	155	158	---	---	---
12	---	---	---	111	110	110	164	161	163	---	---	---
13	---	---	---	112	110	111	167	165	166	---	---	---
14	---	---	---	112	110	112	168	167	168	219	216	218
15	---	---	---	112	108	111	170	168	169	219	216	219
16	114	107	110	108	104	106	172	170	171	216	182	205
17	107	94	100	104	104	104	173	172	173	221	199	214
18	94	91	92	106	103	104	173	173	173	224	221	223
19	92	91	92	110	92	104	173	173	173	225	223	224
20	91	88	90	106	92	110	173	173	173	226	223	225
21	88	83	85	121	116	118	173	173	173	227	226	227
22	83	82	82	123	121	122	173	172	173	228	227	227
23	86	83	85	124	123	124	173	171	172	228	227	228
24	87	86	86	126	124	126	172	171	172	229	226	229
25	88	85	87	127	126	126	173	171	172	230	229	230
26	96	89	93	127	126	126	173	173	173	231	230	231
27	105	96	101	129	127	128	---	---	---	232	231	231
28	112	105	109	130	129	129	---	---	---	232	231	231
29	120	112	116	130	130	130	---	---	---	232	231	232
30	122	121	122	131	130	130	---	---	---	231	221	228
31	122	121	122	---	---	---	---	---	---	232	230	231
MONTH				131	92	117						

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1				---	---	---	254	247	251	50	49	49
2				---	---	---	255	253	254	51	49	50
3				---	---	---	254	245	250	51	50	50
4				233	232	232	245	234	239	54	51	52
5				234	233	234	235	231	233	53	50	52
6				237	234	235	233	225	229	53	50	52
7				247	238	245	227	224	225	52	47	50
8				249	247	248	235	227	230	47	45	46
9				249	249	249	255	236	246	48	45	46
10				249	247	248	266	256	261	50	48	49
11				251	248	249	272	245	263	49	48	48
12				252	250	251	245	148	206	48	48	48
13				257	253	254	144	83	106	50	48	49
14				264	257	259	83	65	73	52	50	51
15				272	264	267	65	59	62	53	50	51
16				282	272	277	59	55	57	54	52	53
17				293	283	288	---	---	---	55	53	54
18				298	293	295	---	---	---	59	56	57
19				302	299	300	---	---	---	64	59	60
20				303	299	300	---	---	---	63	61	62
21				299	296	297	51	49	51	65	63	64
22				296	293	294	53	50	52	68	65	66
23				292	288	289	57	53	56	71	67	69
24				288	283	284	56	53	55	76	71	73
25				282	275	278	53	48	51	80	75	77
26				274	264	269	48	44	46	85	80	82
27				264	251	259	44	41	42	91	85	88
28				251	246	249	42	41	42	94	91	92
29				257	249	254	47	42	45	93	92	92
30				259	249	255	50	47	49	92	91	91
31				249	243	245	---	---	---	91	91	91
MONTH										94	45	62
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	92	91	91	162	158	160	121	115	117			
2	96	92	93	163	161	162	130	121	126			
3	103	97	100	163	151	154	136	130	133			
4	110	104	107	154	150	151	---	---	---			
5	115	110	112	156	150	152	---	---	---			
6	119	116	117	167	155	160	---	---	---			
7	124	119	122	164	118	143	---	---	---			
8	134	124	128	116	90	100	---	---	---			
9	143	134	138	89	78	83	---	---	---			
10	153	140	147	78	66	72	---	---	---			
11	156	153	155	65	62	63	---	---	---			
12	163	156	158	63	62	63	---	---	---			
13	169	159	166	65	62	63	---	---	---			
14	159	125	141	68	63	66	---	---	---			
15	124	117	120	71	67	70	---	---	---			
16	120	117	118	74	71	73	---	---	---			
17	123	117	121	78	74	76	---	---	---			
18	128	123	125	84	78	81	---	---	---			
19	134	129	131	89	84	87	---	---	---			
20	136	134	136	94	89	92	---	---	---			
21	137	135	136	98	94	96	---	---	---			
22	138	136	137	97	95	96	---	---	---			
23	143	138	140	105	97	101	---	---	---			
24	146	143	145	110	105	108	---	---	---			
25	150	146	148	110	109	110	---	---	---			
26	152	149	151	112	109	110	---	---	---			
27	155	152	154	114	111	113	---	---	---			
28	155	154	154	119	114	117	---	---	---			
29	157	154	155	119	116	117	---	---	---			
30	159	156	157	115	113	114	---	---	---			
31	---	---	---	114	113	114	---	---	---			
MONTH	169	91	133	167	62	105						

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	---	---	---	5.5	4.5	5.0	.0	.0	.0	---	---	---
2	---	---	---	5.5	4.0	5.0	.0	.0	.0	---	---	---
3	---	---	---	5.5	4.0	4.5	.0	.0	.0	---	---	---
4	---	---	---	5.5	4.5	5.0	.0	.0	.0	---	---	---
5	---	---	---	5.5	4.5	5.5	.0	.0	.0	---	---	---
6	---	---	---	4.5	3.5	4.0	.0	.0	.0	---	---	---
7	---	---	---	4.5	3.5	4.0	.0	.0	.0	---	---	---
8	---	---	---	4.0	2.0	3.5	.0	.0	.0	---	---	---
9	---	---	---	2.0	1.0	1.5	.0	.0	.0	---	---	---
10	---	---	---	2.0	1.5	1.5	.0	.0	.0	---	---	---
11	---	---	---	1.5	1.0	1.0	.0	.0	.0	---	---	---
12	---	---	---	2.5	1.0	1.5	.0	.0	.0	---	---	---
13	---	---	---	3.0	2.0	2.5	.0	.0	.0	.0	.0	.0
14	---	---	---	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
15	---	---	---	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
16	10.0	8.5	9.5	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0
17	9.5	9.0	9.5	4.5	4.0	4.5	.0	.0	.0	.0	.0	.0
18	9.0	6.0	7.5	4.0	2.5	3.5	.0	.0	.0	.0	.0	.0
19	6.0	5.0	5.5	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
20	6.0	5.0	5.5	1.5	.0	.5	.0	.0	.0	.0	.0	.0
21	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	4.0	2.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	2.0	1.0	1.5	.5	.0	.5	.0	.0	.0	.0	.0	.0
24	1.0	.5	.5	1.0	.5	.5	.0	.0	.0	.0	.0	.0
25	1.0	.0	.5	1.0	.5	.5	.0	.0	.0	.0	.0	.0
26	1.0	.0	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0
27	1.5	.0	1.0	.5	.0	.0	---	---	---	.0	.0	.0
28	1.5	1.0	1.0	.0	.0	.0	---	---	---	.0	.0	.0
29	3.5	1.5	2.0	.0	.0	.0	---	---	---	.0	.0	.0
30	5.5	3.5	4.0	.5	.0	.0	---	---	---	.0	.0	.0
31	6.0	5.0	5.5	---	---	---	---	---	---	.0	.0	.0
MONTH				5.5	.0	2.5						

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	---	---	---	---	---	---	.5	.5	.5	9.5	8.0	8.5
2	---	---	---	---	---	---	.5	.5	.5	10.5	8.5	9.5
3				.0	.0	.0	.5	.5	.5	11.0	9.0	10.0
4				.0	.0	.0	.5	.5	.5	13.5	10.5	11.5
5				.0	.0	.0	.5	.5	.5	13.0	12.0	12.5
6				.0	.0	.0	.0	.0	.0	12.0	10.5	11.5
7				.0	.0	.0	.0	.0	.0	10.5	9.0	9.5
8				.0	.0	.0	.5	.0	.0	10.5	7.5	9.0
9				.0	.0	.0	.0	.0	.0	10.5	9.0	10.0
10				.0	.0	.0	.5	.0	.5	11.0	9.0	10.0
11				.0	.0	.0	1.0	.0	.5	11.0	10.5	11.0
12				.0	.0	.0	1.5	.0	.5	11.0	10.5	11.0
13				.0	.0	.0	.5	.0	.5	11.0	10.5	10.5
14				.0	.0	.0	1.0	.0	.5	13.0	10.5	11.5
15				.0	.0	.0	.5	.0	.5	16.0	13.0	14.0
16				.5	.0	.0	1.0	.0	.5	16.0	15.5	15.5
17				.5	.0	.5	---	---	---	15.5	14.5	14.5
18				.5	.0	.0	---	---	---	14.5	14.0	14.0
19				.5	.0	.0	---	---	---	14.0	13.5	14.0
20				.5	.5	.5	1.0	.0	.5	14.5	12.5	13.5
21				.5	.5	.5	1.0	.0	.5	15.0	12.5	13.5
22				.5	.5	.5	4.5	1.0	2.5	15.5	13.0	14.0
23				.5	.5	.5	7.0	3.5	5.0	16.5	13.5	15.0
24				.5	.5	.5	9.0	6.0	7.5	17.5	14.0	15.5
25				.5	.5	.5	9.5	8.0	9.0	18.0	15.5	16.5
26				.5	.5	.5	9.5	8.0	8.5	19.5	16.0	17.5
27				.5	.5	.5	9.5	7.5	8.5	21.0	17.5	19.0
28				.5	.5	.5	9.5	7.5	8.5	21.0	18.0	19.5
29				.5	.5	.5	10.0	8.0	9.0	21.0	19.0	20.0
30				.5	.5	.5	9.5	8.5	9.0	21.0	18.5	20.0
31				.5	.5	.5	---	---	---	21.0	18.5	19.5
MONTH										21.0	7.5	13.5

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	19.0	16.0	16.5	23.0	18.0	20.5	22.0	20.5	21.5	17.5	15.0	16.0
2	17.0	14.0	15.0	22.5	19.0	20.5	21.5	19.5	20.5	---	---	---
3	18.5	15.0	16.5	21.0	20.0	20.0	---	---	---	---	---	---
4	19.5	15.5	17.0	21.5	19.0	20.0	---	---	---	---	---	---
5	20.0	16.5	18.0	24.0	20.0	22.0	---	---	---	---	---	---
6	20.0	17.0	18.5	25.5	22.5	23.5	---	---	---	---	---	---
7	19.0	17.5	17.5	24.0	21.5	22.5	---	---	---	---	---	---
8	18.0	15.5	16.5	22.5	20.5	21.5	---	---	---	---	---	---
9	18.0	16.5	17.0	21.5	18.5	20.0	---	---	---	---	---	---
10	18.5	16.0	17.0	18.5	17.0	17.5	---	---	---	---	---	---
11	18.0	16.0	17.0	18.5	16.0	17.0	---	---	---	---	---	---
12	18.0	16.0	17.0	20.0	17.5	18.5	---	---	---	---	---	---
13	19.0	16.0	17.5	19.5	18.0	19.0	---	---	---	---	---	---
14	19.0	18.0	18.5	20.5	18.5	19.5	---	---	---	---	---	---
15	19.5	17.0	18.5	21.5	19.5	20.5	---	---	---	---	---	---
16	18.5	16.5	17.5	21.5	20.5	21.0	---	---	---	---	---	---
17	18.5	16.0	17.5	23.5	21.0	22.0	---	---	---	---	---	---
18	18.0	17.0	17.5	22.0	21.0	21.5	---	---	---	---	---	---
19	17.0	16.0	16.5	21.5	20.0	20.5	---	---	---	---	---	---
20	18.0	15.5	16.5	22.0	19.5	20.5	---	---	---	---	---	---
21	18.5	16.0	17.0	23.0	21.5	22.0	21.5	20.0	20.5	---	---	---
22	19.5	16.5	18.0	24.0	21.0	22.5	21.0	19.0	20.0	---	---	---
23	19.5	18.0	18.5	24.5	21.5	23.0	21.0	19.5	20.0	---	---	---
24	19.0	18.0	18.5	23.0	22.0	22.5	20.0	19.0	19.5	---	---	---
25	20.5	16.5	18.5	22.5	21.5	22.0	19.5	18.0	18.5	---	---	---
26	21.0	17.0	19.0	24.0	21.5	22.5	18.0	17.0	17.5	---	---	---
27	21.5	18.5	20.0	24.0	21.5	22.5	17.0	15.5	16.0	---	---	---
28	20.0	18.0	19.0	24.5	21.5	23.0	16.5	14.5	15.5	---	---	---
29	20.5	17.0	18.5	22.5	21.5	22.0	16.0	15.0	15.5	---	---	---
30	21.5	17.0	19.0	23.0	21.0	21.5	16.0	14.5	15.5	---	---	---
31	---	---	---	23.0	21.5	22.0	15.5	15.0	15.5	---	---	---
MONTH	21.5	14.0	17.5	25.5	16.0	21.0						

STREAMS TRIBUTARY TO LAKE SUPERIOR  
04016000 PARTRIDGE RIVER NEAR AURORA, MN

LOCATION.--Lat 47°31'02", long 92°11'24", in SE¼SW¼ sec.12, T.58 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, on right bank at upstream side of highway bridge, 1,000 ft (305 m) downstream from Second Creek, 2.5 mi (4.0 km) east of Aurora, and 2.8 mi (4.5 km) upstream from mouth.

DRAINAGE AREA.--161 mi<sup>2</sup> (417 km<sup>2</sup>) of which 13.3 mi<sup>2</sup> (34.4 km<sup>2</sup>) is noncontributing.

PERIOD OF RECORD.--August 1942 to September 1982 (discontinued).

REVISED RECORDS.--WSP 974: 1942. WSP 1307: 1943(M). WDR MN-77-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,402.30 ft (427.421 m) National Geodetic Vertical Datum of 1929. Aug. 5, 1942, to Aug. 25, 1944, nonrecording gage, and Aug. 26, 1944, to July 1, 1956, water-stage recorder at site 45 ft (14 m) downstream at same datum.

REMARKS.--Records good except those for winter period and those for period of no gage-height record, Aug. 4 to Sept. 30, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Usable capacity, 20,000 acre-ft (24.7 hm<sup>3</sup>) between elevations 1,410 ft (430 m), natural lake level, and 1,440 ft (439 m). Storage began Apr. 9, 1955. Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir bypass station. Flow also affected by mining activities in Second Creek basin.

AVERAGE DISCHARGE (adjusted for storage and diversion).--40 years, 126 ft<sup>3</sup>/s (3.568 m<sup>3</sup>/s), 10.63 in/yr (270 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,230 ft<sup>3</sup>/s (91.5 m<sup>3</sup>/s) May 10, 1950, gage height, 7.86 ft (2.396 m); minimum daily, 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) Jan. 30, 31, 1961; minimum gage height, 0.88 ft (0.268 m) Mar. 2, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 700 ft<sup>3</sup>/s (19.8 m<sup>3</sup>/s) Apr. 27, May 14, gage height, 4.72 ft (1.439 m); minimum daily, 9.8 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) Mar. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1	43	111	32	24	23	14	34	454	97	46	72	90		
2	43	109	34	24	22	14	43	379	89	45	68	95		
3	44	103	35	24	22	14	51	322	81	57	66	100		
4	59	95	32	24	22	13	48	311	74	58	66	110		
5	63	74	31	24	22	12	48	342	69	77	70	100		
6	77	76	29	22	21	11	48	411	64	109	75	80		
7	58	88	28	21	21	10	48	475	61	153	85	70		
8	53	95	27	22	20	10	44	524	59	190	100	60		
9	59	86	27	21	19	9.8	39	535	63	232	120	60		
10	61	73	24	21	19	10	42	545	79	318	135	65		
11	59	63	24	23	18	12	44	547	90	426	165	70		
12	50	60	26	23	18	16	45	557	109	490	160	90		
13	55	59	25	21	18	22	41	626	121	509	145	120		
14	65	58	25	21	17	23	61	686	126	515	135	160		
15	60	55	24	22	17	25	94	693	133	472	115	180		
16	69	53	23	22	17	23	136	674	128	417	95	200		
17	96	49	22	22	16	20	135	641	119	357	90	200		
18	108	47	22	22	16	18	119	620	112	298	95	190		
19	105	44	22	22	16	16	139	576	107	255	90	200		
20	128	41	23	22	16	14	145	535	100	219	95	200		
21	133	39	27	22	15	14	187	499	92	190	90	190		
22	123	38	25	23	15	13	323	448	85	174	95	180		
23	168	39	25	22	15	14	432	392	77	162	130	170		
24	186	39	25	22	15	15	525	335	63	157	160	160		
25	177	38	26	23	14	16	599	279	61	147	150	150		
26	165	40	25	22	14	18	657	237	60	137	140	140		
27	147	38	25	22	14	19	691	201	56	125	130	140		
28	116	35	24	21	14	20	683	163	54	112	120	135		
29	104	33	24	22	---	20	632	137	54	100	110	135		
30	110	32	24	22	---	23	547	121	50	90	100	140		
31	110	---	24	22	---	30	---	109	---	79	95	---		
TOTAL	2894	1810	809	690	496	508.8	6680	13374	2533	6716	3362	3980		
MEAN	93.4	60.3	26.1	22.3	17.7	16.4	223	431	84.4	217	108	133		
MAX	186	111	35	24	23	30	691	693	133	515	165	200		
MIN	43	32	22	21	14	9.8	34	109	50	45	66	60		
†	+69.5	+14.5	+8.47	+1.81	+0.01	+1.19	+91.7	+20.9	+16.3	+17.9	+13.9	+11.4		
MEAN ‡	163	74.8	34.6	24.1	17.7	17.6	314	452	101	235	122	144		
CFSM ‡	1.01	.46	.21	.15	.11	.11	1.95	2.81	.63	1.46	.76	.89		
IN. ‡	1.17	.52	.25	.17	.11	.13	2.18	3.24	.70	1.68	.88	1.00		
CAL YR 1981 TOTAL	32863.5		MEAN	90.0	MAX	722	MIN	5.6	MEAN ‡	114	CFSM ‡	0.71	IN ‡	9.62
WTR YR 1982 TOTAL	43852.8		MEAN	120	MAX	693	MIN	9.8	MEAN ‡	142	CFSM ‡	0.88	IN ‡	12.02

† Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.

‡ Adjusted for change in contents and diversion.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04016500 ST. LOUIS RIVER NEAR AURORA, MN

LOCATION.--Lat 47°29'30", long 92°14'20", in NW¼SW¼ sec.22, T.58 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, on left bank at upstream side of highway bridge, 0.8 mi (1.3 km) downstream from Partridge River and 1.5 mi (2.4 km) south of Aurora.

DRAINAGE AREA.--290 mi<sup>2</sup> (751 km<sup>2</sup>) of which 13.3 mi<sup>2</sup> (34.4 km<sup>2</sup>) is noncontributing.

PERIOD OF RECORD.--August 1942 to current year.

REVISED RECORDS.--WSP 1337: 1950. WDR MN-77-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,371.24 ft (417.954 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 26, 1944, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity 20,000 acre-ft (24.7 hm<sup>3</sup>) between elevations 1,410 ft (430 m), natural lake level, and 1,440 ft (439 m). Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir enter above station. Flow also affected by mining activities in Second Creek (station 04015500) basin.

AVERAGE DISCHARGE (adjusted for storage and diversion).--40 years, 246 ft<sup>3</sup>/s (6.967 m<sup>3</sup>/s), 11.52 in/yr (293 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,380 ft<sup>3</sup>/s (152 m<sup>3</sup>/s) May 14, 1950, gage height, 8.37 ft (2.551 m); minimum daily, 4.0 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Jan. 29 to Feb. 10, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,440 ft<sup>3</sup>/s (40.8 m<sup>3</sup>/s) May 14, gage height, 4.22 ft (1.286 m); minimum daily, 28 ft<sup>3</sup>/s (0.79 m<sup>3</sup>/s) Mar. 6-8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	301	92	52	35	29	70	1020	294	84	237	215
2	62	287	93	52	34	29	90	940	265	79	216	225
3	62	277	93	51	34	29	110	861	238	111	204	222
4	89	261	85	50	34	29	120	877	217	106	189	223
5	100	231	83	49	33	29	115	995	198	133	173	219
6	125	221	83	48	33	28	110	1100	180	183	172	194
7	116	223	79	47	33	28	105	1150	171	277	188	166
8	108	228	76	47	32	28	100	1150	159	361	234	156
9	114	213	70	46	32	29	100	1130	162	492	256	152
10	124	189	67	46	32	30	100	1180	190	716	268	151
11	125	170	70	45	31	32	100	1240	198	897	315	154
12	121	160	73	45	31	35	105	1250	217	979	332	202
13	142	154	72	44	31	38	110	1350	224	984	340	278
14	207	150	70	44	31	42	150	1420	226	991	327	321
15	234	147	67	43	30	45	250	1410	231	981	305	369
16	253	143	63	43	30	44	451	1350	224	953	266	381
17	298	137	62	42	30	43	588	1300	215	890	243	405
18	357	132	62	42	30	42	592	1280	202	802	242	392
19	373	124	62	41	30	40	546	1210	190	726	249	404
20	408	117	61	41	30	38	530	1130	179	647	240	408
21	421	118	60	40	30	37	552	1060	166	580	244	394
22	405	107	59	40	30	37	682	978	153	522	308	369
23	443	106	58	39	30	37	820	884	140	481	343	346
24	454	103	58	39	30	38	950	781	124	460	354	327
25	434	103	57	38	29	39	1070	683	116	431	343	313
26	408	108	56	38	29	40	1150	600	112	396	323	297
27	376	109	55	37	29	43	1190	528	104	362	295	284
28	344	104	55	37	29	45	1200	462	100	330	270	273
29	319	98	54	36	---	47	1170	404	101	316	255	270
30	318	93	54	36	---	50	1100	359	91	291	240	281
31	311	---	53	35	---	60	---	325	---	258	222	---
TOTAL	7718	4914	2102	1333	872	1160	14326	30407	5387	15819	8199	8391
MEAN	249	164	67.8	43.0	31.1	37.4	478	981	180	510	264	280
MAX	454	301	93	52	35	60	1200	1420	294	991	354	408
MIN	62	93	53	35	29	28	70	325	91	79	172	151
†	+69.5	+14.5	+8.47	+1.81	+0.01	+1.19	+91.7	+20.9	+16.3	+17.9	+13.9	+11.4
MEAN ‡	318	178	76.3	44.8	31.2	38.6	569	1002	196	528	278	291
CFSM ‡	1.10	.61	.26	.15	.11	.13	1.96	3.46	.68	1.82	.96	1.00
IN. ‡	1.27	.69	.30	.18	.11	.15	2.19	3.98	.75	2.10	1.11	1.12
CAL YR 1981 TOTAL	77109		211	1370	23		235		0.81		11.02	
WTR YR 1982 TOTAL	100628		276	1420	28		298		1.03		13.96	

† Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.  
‡ Adjusted for change in contents and diversion.

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04018750 ST. LOUIS RIVER AT FORBES, MN

LOCATION.--Lat 47° 21'48", long 92°35'56", in NE1/4SE1/4 sec.3, T.56 N., R.18 W., St. Louis County, Hydrologic Unit 04010201, on right bank at downstream side of highway bridge, 0.5 mi (0.8 km) downstream from Eveleth Taconite Company dam, 0.6 mi (1.0 km) south of Forbes, 1.8 mi (2.9 km) upstream from Elbow Creek.

DRAINAGE AREA.--713 mi<sup>2</sup> (1,847 km<sup>2</sup>).

PERIOD OF RECORD.--August 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,293.11 ft (394.140 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 28, 1964, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter periods, which are poor. Natural flow of stream affected by continually changing iron-mining activities that include diversions for iron-ore processing, regulation of storage reservoirs and tailing ponds, and mine pit dewatering. There is some regulation at medium and low flows by Eveleth Taconite Company dam 1.5 mi (2.4 km) upstream.

AVERAGE DISCHARGE.--18 years, 546 ft<sup>3</sup>/s (15.46 m<sup>3</sup>/s), 10.40 in/yr (264 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,200 ft<sup>3</sup>/s (176 m<sup>3</sup>/s) Apr. 25, 1979, gage height, 17.71 ft (5.398 m); minimum daily, 15 ft<sup>3</sup>/s (0.42 m<sup>3</sup>/s) Jan. 9, 1981; minimum gage height, 5.14 ft (1.567 m) Nov. 26, 1972.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,010 ft<sup>3</sup>/s (85.2 m<sup>3</sup>/s) May 19, gage height, 12.66 ft (3.859 m); maximum gage height, 15.02 ft (4.578 m) Apr. 20 (backwater from ice); minimum daily discharge, 30 ft<sup>3</sup>/s (0.85 m<sup>3</sup>/s) Mar. 27, 29; minimum gage height, 5.31 ft (1.618 m) Dec. 7, 9, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	129	579	220	115	80	70	60	2200	874	264	478	376
2	164	556	228	110	80	70	150	2050	722	256	447	359
3	168	537	219	110	75	70	170	1890	680	346	425	360
4	244	496	257	105	75	70	150	1870	504	482	403	351
5	322	478	135	105	75	60	150	2140	624	588	380	340
6	309	441	246	105	75	60	140	2320	573	740	375	332
7	332	412	178	150	75	70	140	2240	350	909	393	308
8	331	404	216	50	75	90	140	2230	504	951	405	287
9	324	392	46	120	75	60	130	2190	419	1120	433	270
10	346	366	206	100	75	50	130	2280	566	1680	439	266
11	372	340	268	95	75	100	130	2490	428	1810	446	266
12	370	318	110	95	75	40	130	2510	559	1870	490	305
13	385	309	188	100	75	80	150	2610	559	1870	577	478
14	539	297	268	95	75	90	180	2790	374	1840	634	587
15	610	289	43	95	75	60	250	2900	552	1790	598	600
16	599	281	280	90	75	70	400	2910	591	1760	541	645
17	653	272	300	90	75	100	1000	2860	444	1680	483	685
18	863	269	50	90	75	60	1300	2940	473	1550	435	761
19	934	257	300	90	70	70	1500	3000	514	1400	434	769
20	937	245	170	85	70	100	1700	2890	507	1270	419	756
21	983	203	160	85	70	50	1900	2690	362	1130	398	755
22	986	66	200	85	70	120	2100	2480	460	1020	438	711
23	950	344	170	85	70	35	2190	2280	437	878	519	650
24	944	156	150	85	70	110	2310	2080	245	840	532	634
25	930	102	200	85	70	70	2380	1870	381	808	543	595
26	868	265	150	80	70	110	2460	1680	374	744	518	552
27	824	282	130	80	70	30	2460	1490	350	679	485	515
28	823	253	125	80	70	120	2440	1360	173	617	449	480
29	632	228	120	80	---	30	2400	1210	353	581	422	450
30	692	235	120	80	---	140	2320	868	297	572	403	420
31	615	---	115	80	---	100	---	975	---	525	390	---
TOTAL	18178	9672	5568	2900	2060	2355	31060	68293	14249	32570	14332	14863
MEAN	586	322	180	93.5	73.6	76.0	1035	2203	475	1051	462	495
MAX	986	579	300	150	80	140	2460	3000	874	1870	634	769
MIN	129	66	43	50	70	30	60	868	173	256	375	266
CFSM	.82	.45	.25	.13	.10	.11	1.45	3.09	.67	1.47	.65	.69
IN.	.95	.50	.29	.15	.11	.12	1.62	3.56	.74	1.70	.75	.78

CAL YR 1981 TOTAL 185176 MEAN 507 MAX 2840 MIN 15 CFSM .71 IN 9.66  
WTR YR 1982 TOTAL 216100 MEAN 592 MAX 3000 MIN 30 CFSM .83 IN 11.27

NOTE.--No gage-height record Jan. 14 to Mar. 3.

04024000 ST. LOUIS RIVER AT SCANLON, MN

LOCATION.--Lat 46°42'12", long 92°25'07", in NW¼ sec.30, T.49 N., R.16 W., Carlton County, Hydrologic Unit 04010201, on right bank 25 ft (8 m) downstream from lower bridge on U.S. Highway 61 at Scanlon, 0.6 mi (1.0 km) downstream from Minnesota Power and Light Co. powerplant, 3 mi (5 km) upstream from Thomson Reservoir, and 3.2 mi (5.1 km) upstream from Midway River.

DRAINAGE AREA.--3,430 m<sup>2</sup> (8,880 km<sup>2</sup>), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--January 1908 to current year. Monthly discharge only for some periods published in WSP 1307. Published as "near Thomson" 1908-50.

REVISED RECORDS.--WSP 1337: 1911-12.

GAGE.--Water-stage recorder. Datum of gage is 1,101.23 ft (335.655 m) National Geodetic Vertical Datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 mi (5 km) downstream and 50 ft (15 m) below powerplant at datum about 420 ft (128 m) lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes, combined capacity, 332,160 acre-ft (410 hm<sup>3</sup>); the water-discharge table shows the monthly change in contents (+).

AVERAGE DISCHARGE (UNADJUSTED).--74 years, 2,300 ft<sup>3</sup>/s (65.14 m<sup>3</sup>/s), 9.11 in/yr (231 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 37,900 ft<sup>3</sup>/s (1,070 m<sup>3</sup>/s) May 9, 1950; maximum gage height, 15.8 ft (4.816 m) May 9, 1950, from Minnesota Department of Transportation (discharge uncertain); minimum discharge, 54 ft<sup>3</sup>/s (1.53 m<sup>3</sup>/s) July 30, 1980; minimum daily, 88 ft<sup>3</sup>/s (2.49 m<sup>3</sup>/s) Aug. 24, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 26,700 ft<sup>3</sup>/s (756 m<sup>3</sup>/s) Apr. 18, gage height, 12.20 ft (3.719 m); minimum daily, 794 ft<sup>3</sup>/s (22.5 m<sup>3</sup>/s) Sept. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	900	3090	1930	1400	1400	1450	1900	6570	2470	1140	2330	1380
2	1000	3090	1800	1150	1400	1400	2000	5980	2410	1190	2000	1460
3	1100	2910	1860	1800	1400	1350	2000	5360	2180	865	1940	1070
4	1700	2500	1800	1100	1300	1300	1900	5330	1670	1420	1840	1180
5	2400	2490	1630	1500	1400	1200	2000	9990	1670	2830	1760	1470
6	2700	2120	1580	1600	1400	1500	1900	12000	1310	3870	1620	1340
7	2600	2140	1860	900	1400	1500	1800	11100	1400	6060	1540	1200
8	2400	1940	1640	1300	1400	1300	1700	9550	1390	8140	1430	941
9	2300	1900	1700	1400	1400	1150	1820	8410	1210	8810	1880	794
10	2100	1740	1460	1150	1400	1300	1750	8930	1600	9540	1700	1250
11	2100	1710	1420	1150	1400	1700	1840	11400	1630	10900	1510	1100
12	2100	1670	1600	1150	1400	1550	1900	13000	2040	10800	1410	1220
13	2400	1680	1600	1230	1400	1400	2770	12900	1670	9770	1370	1730
14	5000	1680	1690	1400	1400	1500	4900	13100	1660	8590	1730	2180
15	6000	1770	1400	1300	1400	1700	10800	13400	1580	7500	1960	2430
16	5300	1770	850	1200	1400	1900	18500	13100	1490	6510	1730	2700
17	5000	1790	900	1200	1400	1700	21800	12300	1410	5950	1600	2630
18	7000	1750	1000	1200	1400	1700	24500	12600	1560	5520	1430	2770
19	7000	1840	1400	1000	1500	1500	23100	13800	1490	5070	2060	2700
20	6780	1770	1300	1200	1600	1500	19900	13600	1470	4420	1690	2580
21	6440	1690	1150	1200	1600	1450	17400	12300	1580	4150	1560	2280
22	6010	1510	1800	1200	1500	1550	15300	10900	1470	3680	1640	2170
23	5570	1480	1500	1200	1450	1550	13200	9710	1470	3260	1560	1930
24	5110	1730	1200	1200	1450	1550	12000	8380	1300	2780	1580	1930
25	4760	1920	1500	1100	1500	1500	11400	7400	1330	3090	1690	1740
26	4340	2010	1750	1400	1500	1500	10400	6180	1130	3440	1650	1670
27	4140	1880	1600	1350	1450	1500	9770	5340	1130	2950	1670	1540
28	3780	1800	1550	1350	1450	1500	8910	4480	1180	2370	1500	1400
29	3560	1870	1300	1400	---	1500	8020	3710	1200	2060	1480	1420
30	3350	2030	1250	1400	---	1550	7150	3360	1100	2220	1510	1320
31	3150	---	1300	1400	---	1700	---	3020	---	2190	1480	---
TOTAL	118090	59270	46320	39530	40100	46450	262330	287200	46200	151085	51850	51525
MEAN	3809	1976	1494	1275	1432	1498	8744	9265	1540	4874	1673	1718
MAX	7000	3090	1930	1800	1600	1900	24500	13800	2470	10900	2330	2770
MIN	900	1480	850	900	1300	1150	1700	3020	1100	865	1370	794
†	+677	-456	-1025	-922	-1000	-1080	-2333	+1967	-37	+212	-356	+266
MEAN ‡	4486	1520	469	353	432	418	11077	11232	1503	5086	1317	1984
CFSM ‡	1.31	.44	.14	.10	.13	.12	3.23	3.27	.44	1.48	.38	.58
IN. ‡	1.51	.49	.16	.12	.13	.14	3.60	3.78	.49	1.71	.44	.65

CAL YR 1981 TOTAL 873509 MEAN 2393 MAX 14100 MIN 430 MEAN ‡ 2474 CFSM ‡ 0.72 IN. ‡ 9.79  
WTR YR 1982 TOTAL 1199950 MEAN 3288 MAX 24500 MIN 794 MEAN ‡ 2956 CFSM ‡ 0.86 IN. ‡ 11.70

† Change in contents, equivalent in cubic feet per second, in Whiteface Reservoir and Boulder, Island, Rice, and Fish Lakes; records furnished by Minnesota Power and Light Co.

‡ Adjusted for change in contents.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued  
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

LOCATION.--Samples collected at cableway 0.75 mi (1.21 km) downstream.

PERIOD OF RECORD.--Water years 1958-66, 1968 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1980 to September 1982 (discontinued).

WATER TEMPERATURES: October 1980 to September 1982 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count. No current extremes for specific conductance are given because more than 80 percent of the record is missing.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 336 micromhos Aug. 14, 1981; minimum, 68 micromhos June 10, 1981.

WATER TEMPERATURES: Maximum, 25.0°C July 12-14, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 23.0°C July 6, Aug. 18, 19; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE OF (DEG C) (00010)	BAROMETRIC PRESURE (MM OF HG) (00025)	TURBIDITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, (PER-CENT SATURATION) (00301)
OCT 20...	1515	6770	115	105	7.6	7.2	2.0	7.0	731	6.5	11.3	97
JAN 13...	1530	1150	147	138	--	7.6	-13.0	.0	728	3.1	12.8	92
MAR 09...	1445	1090	105	141	7.4	7.4	-20.0	.0	739	2.6	11.5	81
APR 20...	1100	19700	75	68	7.2	7.0	3.0	2.0	733	20	13.4	101
JUN 21...	1345	1640	160	143	7.9	7.8	23.0	18.0	736	2.1	9.0	99
AUG 09...	1430	2130	145	133	7.4	7.4	15.0	20.0	729	4.5	7.6	88

DATE	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI, FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS NONCARBONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)
OCT 20...	K170	1000	51	14	12	5.2	4.3	.3	1.2	37	8.9	4.2
JAN 13...	48	22	62	10	14	6.5	4.0	.2	.9	52	9.3	3.7
MAR 09...	K10	96	66	8.0	15	7.0	5.3	.3	1.0	58	11	3.8
APR 20...	94	K610	32	7.0	7.5	3.3	2.1	.2	1.3	25	6.0	2.3
JUN 21...	42	56	61	6.0	14	6.4	4.3	.2	1.1	55	10	4.0
AUG 09...	43	310	66	12	15	6.9	3.9	.2	.6	54	9.0	3.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)
OCT 20...	<.1	8.7	118	67	2160	.31	.040	.59	.050	<.010	<.010
JAN 13...	.1	8.3	103	79	320	.24	.060	.65	.020	.010	.010
MAR 09...	.1	9.0	114	87	336	.36	.080	.63	.030	.020	.010
APR 20...	<.1	5.4	75	43	3990	.19	.110	.53	.140	.020	.010
JUN 21...	.1	5.7	111	79	492	<.10	<.010	.50	.030	.020	.020
AUG 09...	.1	8.4	124	81	713	.25	.040	.90	.040	.030	.030

DATE	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 20...	80	1460	48
JAN 13...	13	40	95
MAR 09...	13	38	96
APR 20...	100	5320	88
JUN 21...	29	128	54
AUG 09...	37	213	92

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA) (01007)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	CADMIUM, TOTAL RECOV-ERABLE (UG/L AS CD) (01027)	CADMIUM, DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO) (01037)
OCT 20...	1515	1	0	100	49	<1	1	20	10	<1
JAN 13...	1530	1	0	100	19	1	<1	30	20	1
APR 20...	1100	1	1	<100	16	1	<1	20	10	2
AUG 09...	1430	2	2	100	19	<1	<1	20	20	<1

DATE	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG) (71900)
OCT 20...	<1	9	2	1500	520	5	<1	140	50	.4
JAN 13...	1	8	3	850	680	<1	<1	40	35	.2
APR 20...	<1	11	3	2400	330	5	2	250	110	--
AUG 09...	<1	6	3	1400	940	5	2	110	29	.2

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	
OCT 20...	.2	2	2	<1	<1	<1	<1	40	17	
JAN 13...	<.1	4	1	<1	<1	<1	<1	70	5	
APR 20...	--	9	5	<1	<1	<1	<1	20	7	
AUG 09...	<.1	6	2	<1	<1	<1	<1	40	5	
DATE	TIME	PCB, TOTAL (UG/L) (39516)	NAPH- THA- LENES, POLY- CHLOR. TOTAL (UG/L) (39250)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR- DANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L) (39360)	DDE, TOTAL (UG/L) (39365)	DDT, TOTAL (UG/L) (39370)	DI- AZINON, TOTAL (UG/L) (39570)	DI- ELDRIN, TOTAL (UG/L) (39380)
MAR 09...	1445	<.10	<.10	<.01	<.10	<.01	<.01	<.01	.01	<.01
APR 20...	1100	<.10	<.10	<.01	<.10	<.01	<.01	<.01	--	<.01
DATE	ENDO- SULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)	ETHION, TOTAL (UG/L) (39398)	HEPTA- CHLOR, TOTAL (UG/L) (39410)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MALA- THION, TOTAL (UG/L) (39530)	METH- OXY- CHLOR, TOTAL (UG/L) (39480)	METHYL PARA- THION, TOTAL (UG/L) (39600)	METHYL TRI- THION, TOTAL (UG/L) (39790)
MAR 09...	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
APR 20...	<.01	<.01	--	<.01	<.01	<.01	--	<.01	--	--
DATE	MIREX, TOTAL (UG/L) (39755)	PARA- THION, TOTAL (UG/L) (39540)	PER- THANE TOTAL (UG/L) (39034)	TOX- APHENE, TOTAL (UG/L) (39400)	TOTAL TRI- THION (UG/L) (39786)	2,4-D, TOTAL (UG/L) (39730)	2,4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	SILVEX, TOTAL (UG/L) (39760)	
MAR 09...	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
APR 20...	<.01	--	<.10	<.1	--	.02	<.01	<.01	<.01	
DATE	TIME	PCB, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39519)	PCN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39251)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39333)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39351)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39363)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39368)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39373)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39383)	
OCT 20...	1515	3	<1.0	<.1	<1.0	<.1	<.1	<.1	<.1	
APR 20...	1100	24	<1.0	<.1	<1.0	.2	<.1	<.1	<.1	
DATE	ENDO- SULFAN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39389)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39393)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39413)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG) (39423)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39343)	METH- OXY- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39481)	MIREX, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39758)	PER- THANE IN BOTTOM MATERIAL (UG/KG) (81886)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39403)	
OCT 20...	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.10	<1.0	
APR 20...	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.00	<10	



## STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1							---	---	---	144	134	138
2							---	---	---	140	137	138
3							---	---	---	137	134	136
4							---	---	---	138	134	136
5							---	---	---	148	135	142
6							---	---	---	153	137	146
7							---	---	---	136	130	133
8							---	---	---	138	131	134
9							---	---	---	142	131	138
10							143	134	138	141	131	135
11							148	142	145	156	141	149
12							148	145	147	156	144	152
13							146	139	142	145	134	137
14							139	131	136	143	134	136
15							135	130	132	158	144	151
16							137	133	135	167	158	164
17							144	136	140	167	162	164
18							152	143	148	168	153	163
19							152	146	149	153	143	147
20							147	134	142	149	144	146
21							135	130	133	150	143	145
22							132	129	130	144	142	143
23							135	132	134	145	141	143
24							136	133	134	145	141	143
25							137	134	135	146	140	143
26							146	134	138	150	145	148
27							151	139	143	152	148	149
28							145	137	140	152	148	150
29							144	139	141	155	152	153
30							142	140	141	157	151	154
31							140	137	139	---	---	---
MONTH										168	130	145

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	10.5	9.0	9.5	5.0	4.5	5.0	.5	.0	.0	.0	.0	.0
2	9.5	8.5	9.0	5.5	4.5	5.0	.0	.0	.0	.0	.0	.0
3	9.0	8.0	8.5	5.5	5.0	5.0	.5	.0	.5	.0	.0	.0
4	8.5	8.0	8.5	5.5	5.0	5.5	.5	.0	.0	.0	.0	.0
5	8.5	8.0	8.5	5.5	5.5	5.5	.0	.0	.0	.0	.0	.0
6	9.0	8.5	8.5	5.5	5.0	5.0	.0	.0	.0	.0	.0	.0
7	8.5	8.0	8.5	5.0	4.5	4.5	.0	.0	.0	.0	.0	.0
8	8.5	8.0	8.5	4.5	4.0	4.5	.0	.0	.0	.0	.0	.0
9	8.5	8.0	8.5	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
10	8.5	8.0	8.5	3.0	2.5	2.5	.0	.0	.0	.0	.0	.0
11	8.5	8.5	8.5	2.5	2.0	2.0	.0	.0	.0	.0	.0	.0
12	9.0	8.5	9.0	2.5	2.0	2.5	.0	.0	.0	.0	.0	.0
13	9.5	9.0	9.0	3.0	2.5	2.5	.0	.0	.0	.0	.0	.0
14	10.0	9.5	9.5	3.5	3.0	3.0	.0	.0	.0	.0	.0	.0
15	10.0	9.5	10.0	3.5	3.0	3.5	.0	.0	.0	.0	.0	.0
16	10.0	9.5	9.5	4.0	3.5	4.0	.0	.0	.0	.0	.0	.0
17	10.0	9.5	9.5	4.5	4.0	4.5	.0	.0	.0	.0	.0	.0
18	9.5	7.5	8.5	4.5	4.0	4.0	.5	.0	.0	.0	.0	.0
19	7.5	7.0	7.0	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
20	7.0	6.0	6.5	3.0	1.5	2.5	.0	.0	.0	.0	.0	.0
21	6.0	5.5	5.5	1.5	.5	1.0	.0	.0	.0	.0	.0	.0
22	5.5	4.0	4.5	.5	.5	.5	.0	.0	.0	.0	.0	.0
23	4.0	3.0	3.5	.5	.5	.5	.0	.0	.0	.0	.0	.0
24	3.0	2.0	2.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
25	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	2.0	1.0	1.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	2.5	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	3.0	2.0	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	4.5	3.0	3.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	5.5	4.5	5.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	10.5	1.0	6.5	5.5	.0	2.5	.5	.0	.0	.0	.0	.0

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	.0	.0	.0	---	---	---	.0	.0	.0			
2	.0	.0	.0	---	---	---	.0	.0	.0			
3	.0	.0	.0	---	---	---	.0	.0	.0			
4	.0	.0	.0	---	---	---	.0	.0	.0			
5	.0	.0	.0	---	---	---	.0	.0	.0			
6	.0	.0	.0	---	---	---	.0	.0	.0			
7	---	---	---	---	---	---	.0	.0	.0			
8	---	---	---	---	---	---	.0	.0	.0			
9	---	---	---	.0	.0	.0	.0	.0	.0			
10	---	---	---	.0	.0	.0	.0	.0	.0			
11	---	---	---	.0	.0	.0	.0	.0	.0			
12	---	---	---	.0	.0	.0	.0	.0	.0			
13	---	---	---	.0	.0	.0	.5	.0	.0			
14	---	---	---	.0	.0	.0	1.0	.0	.5			
15	---	---	---	.0	.0	.0	.0	.0	.0			
16	---	---	---	.0	.0	.0	.5	.0	.0			
17	---	---	---	.0	.0	.0	1.0	.0	.5			
18	---	---	---	.0	.0	.0	.5	.0	.5			
19	---	---	---	.0	.0	.0	1.5	.5	1.0			
20	---	---	---	.0	.0	.0	2.5	1.5	2.0			
21	---	---	---	.0	.0	.0	3.5	2.0	2.5			
22	---	---	---	.0	.0	.0	4.5	2.5	3.5			
23	---	---	---	.0	.0	.0	6.5	4.0	5.0			
24	---	---	---	.0	.0	.0	8.5	6.5	7.0			
25	---	---	---	.0	.0	.0	10.0	8.5	9.0			
26	---	---	---	.0	.0	.0	10.5	9.5	10.0			
27	---	---	---	.0	.0	.0	---	---	---			
28	---	---	---	.0	.0	.0	---	---	---			
29	---	---	---	.0	.0	.0	---	---	---			
30	---	---	---	.0	.0	.0	---	---	---			
31	---	---	---	.0	.0	.0	---	---	---			
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	21.0	19.5	20.5	21.0	20.0	20.5	17.5	16.5	17.0
2	---	---	---	21.5	20.5	21.0	20.0	18.0	19.0	17.5	17.0	17.0
3	---	---	---	21.0	20.5	21.0	18.5	17.0	18.0	17.5	16.5	17.0
4	---	---	---	20.5	20.5	20.5	18.5	15.5	17.5	18.0	17.0	17.5
5	---	---	---	22.0	20.0	20.5	19.5	16.5	18.0	18.0	17.5	17.5
6	---	---	---	23.0	22.0	22.5	19.0	16.0	17.0	18.0	17.0	17.5
7	---	---	---	22.5	20.5	21.5	19.5	16.5	17.5	17.5	17.0	17.0
8	---	---	---	20.5	20.0	20.5	20.5	17.0	18.5	17.5	17.0	17.0
9	---	---	---	20.5	18.5	19.5	21.0	18.0	20.0	18.0	17.0	17.5
10	---	---	---	18.5	17.5	18.0	20.0	19.5	19.5	18.0	17.5	17.5
11	---	---	---	18.5	17.5	18.0	20.0	19.0	19.5	19.0	18.0	18.5
12	---	---	---	19.5	18.0	18.5	20.5	19.0	20.0	19.5	19.0	19.0
13	---	---	---	19.5	18.5	19.0	20.0	19.5	20.0	19.0	18.0	18.5
14	---	---	---	20.5	19.5	20.0	20.5	19.5	20.0	18.0	16.0	17.0
15	---	---	---	20.5	20.0	20.0	20.5	20.0	20.5	16.0	14.5	15.0
16	---	---	---	20.5	19.5	20.0	21.5	21.0	21.5	14.0	13.5	14.0
17	---	---	---	22.0	20.5	21.0	22.5	21.5	22.0	13.5	13.5	13.5
18	---	---	---	22.0	21.5	22.0	23.0	22.0	22.5	13.5	13.0	13.5
19	---	---	---	22.0	20.5	21.5	23.0	22.0	22.5	13.5	13.0	13.5
20	---	---	---	21.0	20.0	20.5	22.5	22.0	22.0	13.5	12.5	13.0
21	---	---	---	21.5	21.0	21.0	22.0	21.5	22.0	12.5	12.0	12.5
22	18.5	17.0	18.0	22.0	21.5	22.0	21.5	21.0	21.5	12.5	12.0	12.5
23	18.5	17.5	18.0	22.5	21.5	22.0	21.5	21.0	21.0	13.0	12.5	13.0
24	18.5	17.5	18.0	22.5	21.5	22.0	21.5	20.5	21.0	13.0	12.5	13.0
25	19.0	18.0	18.5	22.0	21.5	22.0	21.0	20.0	20.5	12.5	12.0	12.5
26	19.5	18.0	18.5	22.0	21.5	22.0	20.5	19.0	20.0	12.5	12.0	12.5
27	20.0	18.5	19.0	22.0	21.5	22.0	19.0	18.0	18.5	12.5	12.0	12.0
28	20.5	19.5	20.0	22.0	16.0	19.0	18.0	17.5	18.0	12.5	12.0	12.0
29	20.5	19.5	20.0	22.0	15.0	20.5	17.5	17.0	17.5	13.0	12.0	12.5
30	21.0	19.5	20.0	21.5	18.0	20.5	17.5	16.5	17.0	13.5	12.5	13.0
31	---	---	---	21.5	19.0	20.5	17.0	16.5	17.0	---	---	---
MONTH				23.0	15.0	20.5	23.0	15.5	19.5	19.5	12.0	15.0



RED RIVER OF THE NORTH BASIN

05045950 ORWELL LAKE NEAR FERGUS FALLS, MN

LOCATION.--Lat 46°12'55", long 96°10'40", in SW¼ sec.26, T.132 N., R.44 W., Otter Tail County, Hydrologic Unit 09020103, at dam on Otter Tail River at outlet of Orwell Lake, 7 mi (11 km) southwest of Fergus Falls.

DRAINAGE AREA.--1,830 mi<sup>2</sup> (4,740 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1953 to current year. Prior to October 1971, published as Orwell Reservoir.

GAGE.--Water-stage recorder. Datum of gage is adjustment of 1912.

REMARKS.--Reservoir is formed by earth dam with concrete spillway with one taintor gate; storage began in March 1953. Capacity to elevation 1,070 ft (326 m) (maximum operating stage) is 14,100 acre-ft (17.4 hm<sup>3</sup>) of which 13,100 acre-ft (16.2 hm<sup>3</sup>) is controlled storage above elevation 1,048 ft (319 m) (minimum operating stage). Dead storage, 210 acre-ft (0.259 hm<sup>3</sup>). Figures given herein represent total contents. Reservoir is used for flood control and to increase low flow for water supply and pollution abatement.

COOPERATION.--Records furnished by Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 16,920 acre-ft (20.9 hm<sup>3</sup>) June 17, 1962, May 23, 1966, elevation, 1,072.38 ft (326.861 m); minimum (after initial filling), 844 acre-ft (1.04 hm<sup>3</sup>) Aug. 26, 27, 1953, elevation, 1,046.96 ft (319.113 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 14,280 acre-ft (17.6 hm<sup>3</sup>) Sept. 30, elevation, 1,070.16 ft (326.185 m); minimum, 1,930 acre-ft (2.38 hm<sup>3</sup>) Mar 12, elevation, 1,051.61 ft (320.531 m).

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30.....	1068.64	12640	
Oct. 31.....	1068.13	12130	-510
Nov. 30.....	1064.78	9220	-2910
Dec. 31.....	1061.46	6720	-2500
CAL YR 1981.....			-511
Jan. 31.....	1055.37	3370	-3350
Feb. 28.....	1054.36	2940	-430
Mar. 31.....	1055.60	3470	+530
Apr. 30.....	1056.28	3780	+310
May 31.....	1055.51	3430	-350
June 30.....	1054.28	2910	-520
July 31.....	1057.71	4460	+1550
Aug. 31.....	1065.53	9820	+5360
Sept. 30.....	1070.16	14280	+4460
WTR YR 1982.....			+1640

## RED RIVER OF THE NORTH BASIN

05046000 OTTER TAIL RIVER BELOW ORWELL DAM, NEAR FERGUS FALLS, MN

LOCATION.--Lat 46°12'35", long 96°11'05", in NE¼ sec.34, T.132 N., R.44 W., Otter Tail County, Hydrologic Unit 09020103, on left bank 0.7 mi (1.1 km) downstream from Orwell Dam, 6.1 mi (9.8 km) downstream from Dayton Hollow Dam, 8 mi (13 km) southwest of Fergus Falls, and 11.1 mi (17.9 km) downstream from Pelican River.

DRAINAGE AREA.--1,830 mi<sup>2</sup> (4,740 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1930 to current year. Prior to October 1952, published as Otter Tail River below Pelican River, near Fergus Falls. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 785: 1934(M). WSP 1208: 1947(M). WSP 1308: 1931(M).

GAGE.--Water-stage recorder. Datum of gage is 1,029.65 ft (313.837 m), adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft (0.61 m) higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi (9.8 km) upstream at datum 40.30 ft (12.283 m) higher.

REMARKS.--Records good. Flow regulated by Orwell Lake (station 05045950) beginning Mar. 21, 1953 and powerplants upstream.

AVERAGE DISCHARGE.--52 years, 303 ft<sup>3</sup>/s (8.581 m<sup>3</sup>/s), 219,500 acre-ft/yr (271 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,710 ft<sup>3</sup>/s (48.4 m<sup>3</sup>/s) June 17, 1953, gage height, 5.60 ft (1.707 m) backwater from aquatic vegetation; minimum, 0.70 ft<sup>3</sup>/s (0.020 m<sup>3</sup>/s) Aug. 5, 1970, gage height, 1.28 ft (0.390 m), result of regulation.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 849 ft<sup>3</sup>/s (24.0 m<sup>3</sup>/s) part of each day May 29-31, gage height, 3.71 ft (1.131 m) result of regulation; maximum gage height, 3.97 ft (1.210 m) Jan. 10 (backwater from ice); minimum, 23 ft<sup>3</sup>/s (0.65 m<sup>3</sup>/s) Apr. 2, gage height, 1.77 ft (0.539 m) result of regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	194	235	233	205	329	396	582	841	627	399	235
2	54	193	248	231	205	345	163	581	835	622	355	240
3	55	192	256	231	205	353	63	581	827	614	360	224
4	56	191	256	230	205	351	222	585	768	607	393	210
5	64	198	256	251	214	351	411	611	740	603	363	210
6	69	198	256	270	235	347	514	624	753	573	372	210
7	72	196	254	265	235	347	591	677	766	541	396	210
8	71	197	251	266	235	342	635	698	815	544	395	210
9	92	197	254	270	235	337	692	692	836	521	382	210
10	110	201	251	270	235	332	722	692	822	556	377	196
11	113	201	251	260	235	328	709	685	812	558	358	182
12	114	201	251	255	235	326	699	738	806	556	390	182
13	113	217	251	250	235	331	693	762	798	566	176	182
14	150	240	251	245	235	336	686	755	772	575	33	178
15	182	240	251	245	235	345	683	753	785	570	32	178
16	182	240	251	245	240	418	765	747	729	523	33	173
17	182	240	251	245	245	479	815	782	696	502	35	141
18	182	240	251	240	246	478	800	827	698	502	169	126
19	178	240	247	235	258	473	785	836	694	462	322	130
20	182	240	245	235	278	471	772	831	679	445	322	130
21	182	240	244	230	277	473	750	825	615	451	323	130
22	183	240	243	230	283	468	737	827	627	432	320	130
23	182	240	243	230	310	465	722	820	620	421	292	129
24	187	240	240	230	335	463	705	820	607	424	272	127
25	187	235	240	230	332	457	689	825	612	429	272	133
26	185	235	240	230	328	457	619	829	606	409	273	133
27	186	235	240	230	327	452	570	836	607	395	240	147
28	188	235	240	230	326	456	585	841	614	397	230	157
29	187	234	237	210	---	464	590	845	599	400	230	157
30	189	231	235	205	---	494	587	846	614	384	230	158
31	191	---	235	205	---	538	---	846	---	397	235	---
TOTAL	4323	6621	7654	7432	7169	12606	18370	23199	21593	15606	8579	5158
MEAN	139	221	247	240	256	407	612	748	720	503	277	172
MAX	191	240	256	270	335	538	815	846	841	627	399	240
MIN	54	191	235	205	205	326	63	581	599	384	32	126
AC-FT	8570	13130	15180	14740	14220	25000	36440	46020	42830	30950	17020	10230

CAL YR 1981 TOTAL 58186 MEAN 159 MAX 267 MIN 42 AC-FT 115400  
WTR YR 1982 TOTAL 138310 MEAN 379 MAX 846 MIN 32 AC-FT 274300

RED RIVER OF THE NORTH BASIN

05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD

LOCATION.--Lat 45°51'45", long 96°34'25", in SW¼SW¼ sec.27, T.128 N., R.47 W., Roberts County, Hydrologic Unit 09020101, on Sisseton Indian Reservation, on left bank just downstream from Big Slough Outlet, 300 ft (91 m) downstream from White Rock Dam, 4 mi (6 km) south of White Rock, and 5 mi (8 km) northwest of Wheaton, MN.

DRAINAGE AREA.--1,160 mi<sup>2</sup> (3,004 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1941 to current year.

GAGE.--Water-stage recorder. Datum of gage is 960.00 ft (292.608 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Jan. 14, 1943, nonrecording gage at same site at datum 0.11 ft (0.03 m) lower. Jan. 15, 1943, to Sept. 30, 1963, water-stage recorder at same site at datum 0.11 ft (0.03 m) lower.

REMARKS.--Records fair. Flow regulated by Lake Traverse-Boise de Sioux Flood Control and Water Conservation project (available capacity for flood control, 137,000 acre-ft or 169 hm<sup>3</sup>).

AVERAGE DISCHARGE.--41 years, 76.8 ft<sup>3</sup>/s (2.175 m<sup>3</sup>/s), 55,640 acre-ft/yr (68.6 hm<sup>3</sup>/yr); median of yearly mean discharges, 50 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s), 36,200 acre-ft/yr (45 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,770 ft<sup>3</sup>/s (107 m<sup>3</sup>/s), occurred during period Apr. 19-21, 1969, gage height, 15.07 ft (4.593 m), from floodmark; no flow at times in most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 414 ft<sup>3</sup>/s (11.7 m<sup>3</sup>/s) Apr. 16, gage height, 8.25 ft (2.515 m); no flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	.00	55	140	74	.29	.38	.04
2	.00	.00	.00	.00	.00	.00	60	115	30	.29	.40	.02
3	.00	.00	.00	.00	.00	.00	78	90	.03	.38	.40	.00
4	.00	.00	.00	.00	.00	.00	59	74	.00	.38	.42	.02
5	.00	.00	.00	.00	.00	.00	42	58	.00	.35	.40	.02
6	.00	.00	.00	.00	.00	.00	28	55	.00	.45	.40	.00
7	.00	.00	.00	.00	.00	.00	23	55	.00	.85	.35	.00
8	.00	.00	.00	.00	.00	.00	71	55	.00	3.6	.29	.00
9	.00	.00	.00	.00	.00	.00	209	52	.00	4.2	.27	.00
10	.00	.00	.00	.00	.00	.20	243	79	.00	2.1	.27	.00
11	.00	.00	.00	.00	.00	.50	205	116	.00	1.6	.25	.00
12	.00	.00	.00	.00	.00	.80	190	97	.00	19	.21	.03
13	.00	.00	.00	.00	.00	1.5	212	96	.00	58	.19	.00
14	.00	.00	.00	.00	.00	2.0	283	95	.28	47	.19	.04
15	.00	.00	.00	.00	.00	2.5	346	97	.10	6.6	.17	.09
16	.00	.00	.00	.00	.00	3.0	340	102	.02	16	.17	.00
17	.00	.00	.00	.00	.00	3.0	250	118	.08	1.8	.17	.10
18	.00	.00	.00	.00	.00	3.0	249	159	.09	.70	.17	.03
19	.00	.00	.00	.00	.00	3.0	285	160	.08	.55	.21	.09
20	.00	.00	.00	.00	.00	3.0	321	163	.12	.55	.17	.08
21	.00	.00	.00	.00	.00	3.0	315	143	.14	.50	.09	.02
22	.00	.00	.00	.00	.00	3.0	310	121	.14	.29	.06	.00
23	.00	.00	.00	.00	.00	3.0	308	121	.10	.48	.10	.03
24	.00	.00	.00	.00	.00	3.5	304	122	.23	.45	.06	.10
25	.00	.00	.00	.00	.00	3.5	308	122	.25	.25	.02	.00
26	.00	.00	.00	.00	.00	4.0	236	101	.21	.23	.02	.00
27	.00	.00	.00	.00	.00	4.0	174	73	.21	.23	.00	.00
28	.00	.00	.00	.00	.00	4.5	170	72	.29	.27	.00	.00
29	.00	.00	.00	.00	---	4.5	167	74	.38	.33	.00	.00
30	.00	.00	.00	.00	---	5.0	173	79	.35	.33	.00	.00
31	.00	---	.00	.00	---	60	---	82	---	.35	.00	---
TOTAL	.00	.00	.00	.00	.00	120.50	6014	3086	107.10	168.40	5.83	.71
MEAN	.000	.000	.000	.000	.000	3.89	200	99.5	3.57	5.43	.19	.024
MAX	.00	.00	.00	.00	.00	60	346	163	74	58	.42	.10
MIN	.00	.00	.00	.00	.00	.00	23	52	.00	.23	.00	.00
AC-FT	.00	.00	.00	.00	.00	239	11930	6120	212	334	12	1.4
CAL YR 1981	TOTAL	683.67	MEAN	1.87	MAX	24	MIN	.00	AC-FT	1360		
WTR YR 1982	TOTAL	9502.54	MEAN	26.0	MAX	346	MIN	.00	AC-FT	18850		

## RED RIVER OF THE NORTH BASIN

## 05051500 RED RIVER OF THE NORTH AT WAHPETON, ND

LOCATION.--Lat 46°15'55", long 96°35'40", in NE¼ sec.8, T.132 N., R.47 W., Richland County, Hydrologic Unit 09020104, on left bank in Wahpeton, 800 ft (240 m) downstream from confluence of Bois de Sioux and Otter Tail Rivers, and at mile 548.6 (882.7 km).

DRAINAGE AREA.--4,010 mi<sup>2</sup> (10,390 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1942 to current year. Gage-height records collected in this vicinity since 1917 are contained in reports of the U.S. Weather Bureau.

GAGE.--Water-stage recorder and concrete and wooden dam. Datum of gage is 942.97 ft (287.417 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft (240 m) upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm<sup>3</sup>) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm<sup>3</sup>), available for flood control; numerous other controlled lakes and ponds, and several powerplants.

AVERAGE DISCHARGE.--39 years (1943-82), 523 ft<sup>3</sup>/s (14.82 m<sup>3</sup>/s), 378,900 acre-ft/yr (467 hm<sup>3</sup>/yr); median of yearly mean discharges, 464 ft<sup>3</sup>/s (13.1 m<sup>3</sup>/s), 336,000 acre-ft/yr (414 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft<sup>3</sup>/s (261 m<sup>3</sup>/s) Apr. 10, 1969, gage height, 16.34 ft (4.980 m); minimum daily, 1.7 ft<sup>3</sup>/s (0.048 m<sup>3</sup>/s) Aug. 28 to Sept. 5, 9, 10, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--A stage of 17.0 ft (5.182 m), discharge, 10,500 ft<sup>3</sup>/s (297 m<sup>3</sup>/s) occurred in the spring of 1897 and has not been exceeded since.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,120 ft<sup>3</sup>/s (88.4 m<sup>3</sup>/s) Apr. 1, gage height, 12.26 ft (3.737 m) backwater from ice; minimum daily, 37 ft<sup>3</sup>/s (1.05 m<sup>3</sup>/s) Aug. 17.

## DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	184	155	189	200	352	3070	788	908	620	404	268
2	60	183	133	132	198	350	2700	780	905	636	419	258
3	60	184	152	132	188	359	1880	772	893	648	388	246
4	67	184	159	219	185	370	895	756	864	640	366	233
5	80	181	152	299	190	365	796	708	818	628	387	213
6	78	184	180	251	188	367	789	696	772	648	410	214
7	78	183	228	219	198	367	945	708	759	647	448	207
8	77	181	240	229	200	376	1070	744	761	590	450	206
9	75	183	214	210	200	323	967	800	777	627	434	205
10	82	180	207	190	218	345	1000	820	826	614	420	205
11	102	184	192	202	230	373	1090	820	823	596	408	196
12	115	180	218	222	242	366	1150	880	810	601	344	195
13	111	177	220	335	240	383	1200	916	797	610	403	191
14	115	186	205	465	240	383	1190	936	783	619	315	182
15	131	215	174	358	235	410	1210	944	765	616	99	200
16	174	221	173	278	245	425	1210	928	758	634	49	191
17	197	221	189	254	260	475	1220	940	732	618	37	186
18	199	220	215	254	290	535	1180	960	675	572	39	172
19	197	183	238	237	279	600	1120	1010	666	557	68	137
20	191	148	238	225	225	680	1090	1040	668	544	237	132
21	193	125	226	225	299	690	1100	1030	663	538	316	131
22	189	180	220	232	312	675	1080	1020	621	508	345	130
23	192	220	214	210	314	642	1060	997	609	486	341	125
24	190	190	204	161	315	650	1040	980	606	457	318	129
25	191	170	200	184	340	660	1010	975	573	456	283	130
26	188	164	209	206	351	692	996	963	605	458	296	126
27	195	141	208	215	355	710	932	959	607	450	293	128
28	269	175	192	215	355	760	808	936	622	421	267	136
29	194	198	178	214	---	890	784	927	647	412	231	154
30	180	162	190	212	---	1530	792	914	629	410	232	160
31	180	---	202	200	---	2570	---	906	---	403	237	---
TOTAL	4411	5487	6125	7174	7092	18673	35374	27553	21942	17264	9284	5386
MEAN	142	183	198	231	253	602	1179	889	731	557	299	180
MAX	269	221	240	465	355	2570	3070	1040	908	648	450	268
MIN	60	125	133	132	185	323	784	696	573	403	37	125
AC-FT	8750	10880	12150	14230	14070	37040	70160	54650	43520	34240	18410	10680
WTR YR 1982	TOTAL	165765	MEAN	454	MAX	3070	MIN	37	AC-FT	328800		

## RED RIVER OF THE NORTH BASIN

05051500 RED RIVER OF THE NORTH AT WAHPETON, ND--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (STAND- ARD UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)
APR 20...	1630	1090	488	8.3	11.5	6.0	230	46	28	11
AUG 24...	1145	321	385	8.2	22.0	24.0	195	32	28	6.0

DATE	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)
APR 20...	.3	5.7	71	8.1	.2	13	283	287	833
AUG 24...	.2	4.0	16	6.4	.2	15	252	227	218

DATE	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BORON, DIS- SOLVED (UG/L AS B) (01020)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)
APR 20...	1	50	10	0	16	10	.2	1	1
AUG 24...	2	60	30	0	12	10	.3	2	0

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	TEMPER- ATURE (DEG C) (00010)
OCT 08...	1755	76	522	11.0
NOV 20...	0920	148	412	.0
JAN 06...	1620	251	490	.0
FEB 18...	1450	282	675	.0
MAR 31...	1445	2560	366	.0
APR 06...	1730	827	418	.5
20...	1630	1090	488	6.0
MAY 19...	1620	1040	499	18.0
JUL 07...	0950	650	378	22.0
AUG 24...	1145	321	385	24.0

## RED RIVER OF THE NORTH BASIN

05051522 RED RIVER OF THE NORTH AT HICKSON, ND

LOCATION.--Lat 46°39'35", long 96°47'44", in SW¼ sec.19, T.137 N., R.48 W., Clay County, MN, Hydrologic Unit 09020104, on right bank 60 ft (18 m) downstream from bridge on township road 1 mi (2 km) southeast of Hickson, ND.

DRAINAGE AREA.--4,300 mi<sup>2</sup> (11,100 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1975 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 877.06 ft (267.3 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm<sup>3</sup>) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm<sup>3</sup>), available for flood control; numerous other controlled lakes and ponds, and several powerplants.

AVERAGE DISCHARGE.--7 years, 491 ft<sup>3</sup>/s (13.91 m<sup>3</sup>/s), 355,700 acre-ft/yr (439 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,600 ft<sup>3</sup>/s (272 m<sup>3</sup>/s) Apr. 18, 1979, gage height, 33.03 ft (10.068 m); no flow Oct. 26, 1976 to Jan. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,200 ft<sup>3</sup>/s (119 m<sup>3</sup>/s) Apr. 4, gage height, 23.07 ft (7.032 m) backwater from ice; minimum daily, 51 ft<sup>3</sup>/s (1.44 m<sup>3</sup>/s) Aug. 20.

## DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	197	244	210	220	355	3300	820	976	706	449	277
2	61	190	204	230	216	345	3650	828	975	690	443	284
3	63	191	168	202	212	346	4000	834	972	694	446	296
4	70	192	132	205	210	354	4150	828	963	696	441	299
5	74	192	99	220	210	360	3700	815	949	695	408	286
6	77	192	102	230	215	394	2900	786	922	685	406	269
7	76	188	152	237	212	401	2000	761	878	677	448	253
8	78	184	195	221	200	410	1440	759	849	695	449	256
9	72	184	230	215	225	411	1420	772	839	688	460	250
10	73	180	242	243	230	408	1580	822	848	666	453	252
11	77	184	230	236	248	366	1690	839	869	668	445	245
12	80	188	215	196	235	370	1760	844	884	644	436	246
13	100	192	215	170	232	388	1360	880	882	639	407	247
14	122	192	215	178	250	395	1210	930	869	643	385	237
15	122	188	215	244	268	427	1240	965	857	649	415	236
16	122	192	200	312	260	476	1240	981	844	643	297	234
17	137	200	150	366	264	542	1220	989	824	647	154	236
18	188	204	158	352	264	590	1220	991	817	647	83	234
19	216	214	190	300	260	649	1200	1010	781	616	59	222
20	224	214	210	280	262	726	1150	1040	750	588	51	205
21	228	129	235	266	264	742	1110	1070	746	587	95	169
22	228	96	234	256	266	758	1100	1090	742	575	280	157
23	228	118	234	240	271	774	1100	1080	729	547	348	155
24	224	227	240	216	285	779	1090	1060	711	528	372	152
25	224	310	232	196	292	782	1050	1050	709	511	372	148
26	224	286	230	164	301	775	1030	1040	673	493	355	153
27	224	230	226	176	328	786	1010	1030	673	489	328	156
28	224	220	215	200	351	800	978	1020	705	485	332	153
29	228	196	210	224	---	1070	888	1020	728	466	334	155
30	259	204	200	228	---	2180	833	996	716	449	306	168
31	219	---	192	216	---	2900	---	979	---	443	279	---
TOTAL	4600	5874	6214	7229	7051	21059	51619	28929	24680	18849	10530	6630
MEAN	148	196	200	233	252	679	1721	933	823	608	340	221
MAX	259	310	244	366	351	2900	4150	1090	976	706	460	299
MIN	58	96	99	164	200	345	833	759	673	443	51	148
AC-FT	9120	11650	12330	14340	13990	41770	102400	57380	48950	37390	20900	13150

WTR YR 1982 TOTAL 193270 MEAN 530 MAX 4150 MIN 51 AC-FT 383400

## RED RIVER OF THE NORTH BASIN

05051522 RED RIVER OF THE NORTH AT HICKSON, ND--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1976 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (STAND- ARD UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS AS CACO3) (00900)
JAN 07...	1135	237	510	7.9	-20.5	.0	5	3.0	12.6	89	257
JUN 01...	1510	972	468	8.4	19.0	17.5	15	56	8.4	91	219
JUL 08...	1100	695	398	8.1	29.0	24.0	30	120	6.5	80	195

DATE	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)
JAN 07...	47	34	12	.3	4.2	11	8.8	.2	15	300	282
JUN 01...	40	29	10	.3	5.1	27	7.4	.1	11	277	246
JUL 08...	37	25	8.6	.3	3.8	14	5.5	.1	14	224	223

DATE	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO- GEN, TOTAL (MG/L AS N) (00600)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS- PENDEED TOTAL (MG/L AS C) (00689)
JAN 07...	192	.17	.10	.450	.65	1.10	1.3	.070	.070	8.6	.3
JUN 01...	727	<.10	<.10	.190	2.0	2.20	--	.210	.050	8.5	1.2
JUL 08...	420	.19	.18	.230	1.4	1.60	1.8	.170	.060	7.5	1.0

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	TEMPER- ATURE (DEG C) (00010)
OCT 08...	1315	78	506	10.5
NOV 19...	1135	216	502	3.0
JAN 07...	1135	237	510	.0
FEB 18...	1005	272	495	.5
APR 06...	1220	2900	380	.0
JUN 01...	1510	972	468	17.5
JUL 08...	1100	695	398	24.0
AUG 24...	1725	381	425	24.0

## RED RIVER OF THE NORTH BASIN

05054000 RED RIVER OF THE NORTH AT FARGO, ND

LOCATION.--Lat 46°51'40", long 96°47'00", in NW¼NE¼ sec.18, T.139 N., R.48 W., Cass County, Hydrologic Unit 09020104, at city waterplant on 4th St. S. in Fargo, 25 mi (40 km) upstream from mouth of Sheyenne River, and at mile 453.0 (728.9 km).

DRAINAGE AREA.--6,800 mi<sup>2</sup> (17,600 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1901 to current year. Published as "at Moorhead, Minn." 1901. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1308: 1902-4, 1906-7, 1910-14, 1916, 1918, 1924. WSP 1388: 1905-6, 1917-20(M), 1935(M), 1938-39(M), 1943.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 861.8 ft (262.68 m) National Geodetic Vertical Datum of 1929. Oct. 1, 1960, to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft (1.71 m) higher. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm<sup>3</sup>) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm<sup>3</sup>), available for flood control; other controlled lakes and ponds and several powerplants. Some small diversions for municipal supply. Figures of daily discharge do not include diversions to cities of Fargo and Moorhead and from Sheyenne River.

AVERAGE DISCHARGE (UNADJUSTED).--81 years, 554 ft<sup>3</sup>/s (15.69 m<sup>3</sup>/s), 401,400 acre-ft/yr (495 hm<sup>3</sup>/yr); median of yearly mean discharges, 443 ft<sup>3</sup>/s (12.5 m<sup>3</sup>/s), 321,000 acre-ft/yr (396 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,300 ft<sup>3</sup>/s (716 m<sup>3</sup>/s) Apr. 15, 1969, gage height, 37.34 ft (11.381 m); no flow for many days in each year for period 1932-41, Sept. 30, Oct. 1, 2, 1970, Oct. 10-19, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1897 reached a stage of 39.1 ft (11.92 m) present datum, discharge, 25,000 ft<sup>3</sup>/s (708 m<sup>3</sup>/s) at site 1.5 mi (2.4 km) downstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,920 ft<sup>3</sup>/s (168 m<sup>3</sup>/s) Apr. 4, gage height, 25.07 ft (7.641 m) backwater from ice; minimum daily, 45 ft<sup>3</sup>/s (1.27 m<sup>3</sup>/s) Aug. 21.

## DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	218	200	198	200	340	4900	862	935	674	419	239
2	55	186	193	222	192	350	5500	854	935	671	408	237
3	46	177	169	224	192	355	5700	854	934	668	401	254
4	63	177	153	205	198	370	5800	846	932	668	401	266
5	71	177	118	203	200	370	5600	830	933	675	383	248
6	68	177	101	222	200	380	4950	798	945	648	361	240
7	63	172	102	229	192	400	3800	750	891	641	403	222
8	63	164	140	225	210	455	2880	726	837	688	422	213
9	63	168	190	245	194	450	2120	742	834	737	428	209
10	63	168	223	255	240	440	1820	798	828	673	427	210
11	65	168	225	258	220	425	1780	822	838	667	417	208
12	114	172	204	250	244	380	1880	830	887	649	410	222
13	97	168	189	232	238	405	1820	838	899	631	402	210
14	68	168	199	232	244	430	1860	910	893	635	359	202
15	88	177	209	250	252	450	1830	959	887	644	366	211
16	111	171	208	210	260	480	1770	977	874	655	352	200
17	190	182	199	325	260	515	1700	1020	849	748	229	196
18	177	206	168	285	265	575	1640	986	837	776	126	197
19	164	210	160	220	260	580	1580	995	812	785	74	189
20	177	215	193	185	270	700	1490	1020	769	697	46	181
21	190	187	213	155	265	760	1400	1060	733	649	45	164
22	190	121	228	270	260	740	1330	1100	724	624	106	144
23	190	99	227	260	240	740	1300	1080	719	592	250	132
24	186	136	220	250	270	740	1260	1060	709	547	335	131
25	186	250	230	245	285	730	1230	1050	682	526	350	135
26	195	305	221	210	295	740	1180	1030	658	492	341	127
27	192	240	207	170	300	730	1120	1010	628	470	310	120
28	198	215	202	165	325	800	1080	1000	649	467	302	136
29	198	205	200	190	---	1140	1000	1000	697	454	304	129
30	233	177	206	195	---	2500	902	981	689	429	284	124
31	243	---	202	200	---	4000	---	952	---	412	270	---
TOTAL	4067	5556	5899	6985	6771	22470	72222	28740	24437	19292	9731	5696
MEAN	131	185	190	225	242	725	2407	927	815	622	314	190
MAX	243	305	230	325	325	4000	5800	1100	945	785	428	266
MIN	46	99	101	155	192	340	902	726	628	412	45	120
AC-FT	8070	11020	11700	13850	13430	44570	143300	57010	48470	38270	19300	11300
†	1067	1035	1015	1113	1251	1260	1105	1207	1350	1567	1733	1335
MEAN †	148	202	206	243	264	746	2426	947	838	648	342	212
AC-FT †	9140	12060	12720	14960	14680	45830	144400	58220	49820	39840	21030	12640

## OBSERVED

## ADJUSTED

CAL YR 1981	TOTAL	71651	MEAN	196	MAX	1710	MIN	27	AC-FT	142100	MEAN	217	AC-FT	157110
WTR YR 1982	TOTAL	211866	MEAN	580	MAX	5800	MIN	45	AC-FT	420200	MEAN	601	AC-FT	435120

† Diversions in acre-feet to cities of Fargo and Moorhead.

‡ Adjusted for diversions to cities of Fargo and Moorhead.

RED RIVER OF THE NORTH BASIN

05054000 RED RIVER OF THE NORTH AT FARGO, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	HARDNESS (MG/L AS CaCO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg) (00925)
APR 09...	1150	2120	400	8.3	6.5	.0	175	42	17
AUG 25...	1215	368	415	8.2	24.5	23.0	204	34	29

DATE	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)
APR 09...	8.5	.3	7.4	68	7.5	.2	13	236	238
AUG 25...	9.5	.3	4.3	21	6.5	.2	16	275	246

DATE	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	ARSENIC, DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM, DIS-SOLVED (UG/L AS LI) (01130)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY, DIS-SOLVED (UG/L AS HG) (71890)	SELENIUM, DIS-SOLVED (UG/L AS SE) (01145)
APR 09...	1350	2	20	80	0	17	50	.6	0
AUG 25...	273	4	70	40	0	12	0	.3	0

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	TEMPERATURE (DEG C) (00010)
OCT 07...	1250	64	558	16.0
NOV 18...	1335	200	509	4.0
JAN 08...	1155	226	530	.0
FEB 17...	1525	259	538	.5
MAR 31...	1000	4100	255	.0
APR 09...	1150	2120	400	.0
MAY 27...	1140	1020	521	19.5
JUL 06...	1355	655	407	25.5
AUG 25...	1215	368	415	23.0

## RED RIVER OF THE NORTH BASIN

05054020 RED RIVER OF THE NORTH BELOW FARGO, ND

## WATER-QUALITY RECORDS

LOCATION.--Lat 46°55'50", long 96°47'05", in SW¼ sec. 19, T.140 N., R.48 W., Cass County, Hydrologic Unit 09020104, at bridge on county highway 2 mi (3.2 km) north of North Dakota State University campus in Fargo, and 12 mi (19 km) above mouth of Sheyenne River.

DRAINAGE AREA.--6,820 mi<sup>2</sup> (17,660 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1969 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (STAND- ARD UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)
NOV 18...	1430	200	572	8.5	3.0	4.0	10	265	50	34	18
JAN 07...	1530	E240	535	8.1	-16.0	.0	10	261	47	35	16
FEB 17...	1525	259	538	7.6	3.0	.5	5	261	47	35	14
MAY 27...	1300	1080	530	8.5	24.0	19.5	--	254	49	32	16
JUL 06...	1130	655	408	8.3	21.0	24.0	40	193	36	25	9.0
AUG 25...	0800	368	640	8.5	15.5	22.0	30	259	41	38	27

DATE	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NO2+NO3 SOLVED (MG/L AS N) (00631)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)
NOV 18...	.5	5.6	66	11	.2	2.2	315	313	170	.16	.020
JAN 07...	.4	5.2	24	11	.2	14	317	302	--	.21	.100
FEB 17...	.4	6.0	23	17	.3	20	314	312	220	.34	.050
MAY 27...	.4	5.7	88	9.5	.1	9.4	345	328	1010	<.10	.050
JUL 06...	.3	4.2	20	6.5	.1	13	237	230	419	.24	.060
AUG 25...	.7	20	33	47	.2	17	433	367	430	.51	.150

DATE	TIME	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)
MAY 27...	1300	3	69	<3	<10	<1	2	9	<1
AUG 25...	0800	5	100	<1	<10	<5	5	16	15

DATE	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	VANA- DIUM, DIS- SOLVED (UG/L AS V) (01085)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	CYANIDE TOTAL (MG/L AS CN) (00720)	
MAY 27...		32	4	<.1	2	<1	5.7	25	<.01
AUG 25...		17	2	<.1	11	<1	5.1	8	<.01

## RED RIVER OF THE NORTH BASIN

05061000 BUFFALO RIVER NEAR HAWLEY, MN

LOCATION.--Lat 46°51'00", long 96°19'45", in NW¼SE¼ sec.14, T.139 N., R.45 W., Clay County, Hydrologic Unit 09020106, near left downstream end of bridge on farm lane, 2 mi (3 km) southwest of Hawley.

DRAINAGE AREA.--322 mi<sup>2</sup> (834 km<sup>2</sup>).

PERIOD OF RECORD.--March 1945 to September 1980, annual maximum discharge WY 1981, March 1982 to August 1982.

REVISED RECORDS.--WSP 1308: 1945-46(M), 1948(M).

GAGE.--Water-stage recorder. Datum of gage is 1,111.91 ft (338.910 m) National Geodetic Vertical Datum of 1929. Prior to Jan. 29, 1953, nonrecording gage at bridge 1,800 ft (549 m) upstream at datum 3.17 ft (0.97 m) lower.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 72.7 ft<sup>3</sup>/s (2.059 m<sup>3</sup>/s), 52,670 acre-ft/yr (64.9 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft<sup>3</sup>/s (58.1 m<sup>3</sup>/s) July 1, 1975, gage height, 9.76 ft (2.975 m); minimum, 2.8 ft<sup>3</sup>/s (0.079 m<sup>3</sup>/s) Aug. 26, 1977; minimum gage height, 2.55 ft (0.777 m) Sept. 5, 1961.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 11.3 ft (3.44 m), present datum, spring of 1921, from information by local resident.

EXTREMES FOR CURRENT PERIOD.--March to August 1982: Maximum discharge during period, 468 ft<sup>3</sup>/s (13.3 m<sup>3</sup>/s) Apr. 2, gage height, 7.22 ft (2.201 m) (backwater from ice); minimum daily discharge, 10 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) Mar. 1; minimum gage height, 3.25 ft (0.991 m) July 7, 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1					---	10	360	92	61	27	35	20
2					---	16	455	90	59	26	33	21
3					---	16	410	82	56	26	31	20
4					---	12	216	73	51	24	29	18
5					---	12	181	76	53	23	28	17
6					---	12	241	76	52	22	27	15
7					---	14	274	71	50	22	29	14
8					---	14	250	66	49	21	29	13
9					---	22	226	68	50	21	27	12
10					---	20	233	67	51	24	25	12
11					---	20	234	65	53	25	24	11
12					---	25	228	63	51	15	22	12
13					---	40	252	62	49	10	21	14
14					---	65	317	62	47	7	20	16
15					---	100	361	75	44	6	19	16
16					---	125	355	81	41	5	18	16
17					---	140	324	88	38	5	19	17
18					---	150	297	100	36	4	20	18
19					---	150	268	115	34	4	20	27
20					---	135	241	119	33	7	20	29
21					---	120	211	114	31	12	19	23
22					---	140	187	111	31	14	18	19
23					---	140	165	101	29	14	17	17
24					---	21	91	89	29	11	18	14
25					---	15	60	137	29	7	17	13
26					---	18	45	125	69	3	16	13
27					---	15	45	110	65	2	17	13
28					---	12	60	100	63	2	18	---
29					---	---	120	93	60	2	21	---
30					---	---	215	90	58	2	21	---
31					---	---	285	---	59	---	21	---
TOTAL					---	2419	7090	2458	1250	2349	699	---
MEAN					---	78.0	236	79.3	41.7	75.8	22.5	---
MAX					---	285	455	119	61	25	35	---
MIN					---	10	90	58	28	21	16	---
AC-FT					---	4800	14060	4880	2480	4660	1390	---

## RED RIVER OF THE NORTH BASIN

05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

LOCATION.--Lat 46°46'20", long 96°37'40", in SW¼SW¼ sec.9, T.138 N., R.47 W., Clay County, Hydrologic Unit 09020106, near center of span on downstream side of highway bridge, 0.3 mi (0.5 km) downstream from Stony Creek and 1 mi (1.6 km) east of Sabin.

DRAINAGE AREA.--522 mi<sup>2</sup> (1,351 km<sup>2</sup>).

PERIOD OF RECORD.--March 1945 to September 1980, annual maximum discharge WY 1981, March 1982 to August 1982.

REVISED RECORDS.--WSP 1308: 1949(M).

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 902.39 ft (275.05 m) National Geodetic Vertical Datum of 1929 (levels by Soil Conservation Service). Prior to Aug. 17, 1948, nonrecording gage at site 1 mi (1.6 km) downstream at different datum.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 56.0 ft<sup>3</sup>/s (1.586 m<sup>3</sup>/s), 40,570 acre-ft/yr (50.0 hm<sup>3</sup>/yr); median of yearly mean discharges, 41.4 ft<sup>3</sup>/s (1.172 m<sup>3</sup>/s), 29,990 acre-ft/yr (37.0 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,500 ft<sup>3</sup>/s (241 m<sup>3</sup>/s) July 2, 1975, gage height, 19.90 ft (6.066 m); no flow for many days in most years.

EXTREMES FOR CURRENT PERIOD.--March to August 1982: Maximum discharge during period, 1,350 ft<sup>3</sup>/s (38.2 m<sup>3</sup>/s) Apr. 1, gage height, 13.12 ft (3.999 m) from highwater mark; no flow Mar. 1-10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						.00	1320	40	15	1.1	1.8	
2						.00	950	39	13	2.8	1.9	
3						.00	650	38	12	7.9	2.2	
4						.00	541	34	12	16	1.6	
5						.00	446	30	11	19	.88	
6						.00	368	28	11	17	.34	
7						.00	311	29	11	14	1.9	
8						.00	277	28	9.6	13	2.2	
9						.00	224	28	9.8	14	2.5	
10						.00	177	29	9.6	11	2.4	
11						2.0	152	30	8.1	8.2	2.5	
12						2.5	136	33	6.5	5.4	1.9	
13						3.0	133	38	6.7	7.7	1.3	
14						7.0	144	39	7.0	7.4	1.6	
15						16	160	56	5.2	7.6	1.8	
16						10	174	67	4.2	5.4	1.9	
17						10	168	70	3.7	5.7	2.0	
18						32	151	76	3.1	6.4	1.9	
19						385	138	90	2.8	7.0	1.8	
20						465	119	96	2.6	10	2.4	
21						465	111	90	2.5	10	3.0	
22						455	96	79	2.1	9.1	3.0	
23						408	88	66	2.0	6.7	3.0	
24						410	78	55	2.0	5.7	5.9	
25						355	72	47	1.6	5.2	6.7	
26						305	65	39	1.1	4.6	3.6	
27						285	58	32	1.1	3.5	2.4	
28						290	54	29	1.0	2.5	3.6	
29						430	47	26	1.5	2.1	3.2	
30						870	42	22	1.1	1.8	2.7	
31						1340	---	18	---	1.6	2.5	
TOTAL						6545.50	7450	1421	179.9	239.4	76.4	
MEAN						211	248	45.8	6.00	7.72	2.47	
MAX						1340	1320	96	15	19	6.7	
MIN						.00	42	18	1.0	1.1	.34	
AC-FT						12980	14780	2820	357	475	152	

## RED RIVER OF THE NORTH BASIN

05062000 BUFFALO RIVER NEAR DILWORTH, MN

LOCATION.--Lat 46°57'40", long 96°39'40", in SW¼SE¼ sec.6, T.140 N., R.47 W., Clay County, Hydrologic Unit 09020106, on left bank 4.5 mi (7.2 km) southeast of Kragnes, 6.5 mi (10.5 km) northeast of Dilworth, and 9 mi (14 km) downstream from South Branch.

DRAINAGE AREA.--1,040 mi<sup>2</sup> (2,690 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1308: 1931(M).

GAGE.--Water-stage recorder. Datum of gage is 878.31 ft (267.709 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Apr. 5, 1937, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--51 years, 128 ft<sup>3</sup>/s (3.625 m<sup>3</sup>/s), 92,740 acre-ft/yr (114 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,600 ft<sup>3</sup>/s (385 m<sup>3</sup>/s) July 2, 1975, gage height, 27.10 ft (8.260 m); no flow at times in 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,210 ft<sup>3</sup>/s (62.6 m<sup>3</sup>/s) Apr. 2, gage height, 17.80 ft (5.425 m); minimum, 6.9 ft<sup>3</sup>/s (0.20 m<sup>3</sup>/s) Sept 12, gage height, 2.20 ft (0.671 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	91	72	16	12	22	1820	163	96	26	50	22
2	17	89	65	16	12	24	2160	159	94	26	46	22
3	19	86	61	15	12	24	2020	156	89	26	43	19
4	24	83	59	15	12	24	1820	150	82	24	39	20
5	33	79	55	15	12	24	1560	139	76	23	35	19
6	39	77	53	15	12	22	1240	136	76	22	33	16
7	45	75	50	14	12	20	1020	134	77	25	32	14
8	55	71	43	14	12	22	736	128	74	27	32	13
9	68	71	38	14	12	22	654	122	72	39	37	12
10	84	71	36	14	12	24	586	125	73	83	33	11
11	86	69	35	14	12	24	531	125	70	192	29	9.1
12	88	70	34	13	12	25	509	122	67	193	27	8.1
13	89	70	33	13	12	26	477	121	65	151	25	11
14	86	68	32	13	12	28	476	125	61	118	24	12
15	87	67	28	13	12	32	515	138	57	94	22	16
16	89	68	28	13	12	42	557	163	52	81	21	19
17	96	71	27	13	13	65	564	170	48	73	22	19
18	104	72	26	13	14	165	541	191	44	71	27	20
19	106	72	25	13	15	190	499	205	41	68	23	18
20	108	67	23	13	16	220	452	217	39	66	25	27
21	120	66	22	13	16	335	405	224	37	77	23	42
22	123	67	21	13	17	450	366	217	33	116	21	31
23	118	69	20	12	18	500	330	206	31	127	21	22
24	111	72	20	12	18	505	300	187	30	126	20	18
25	104	74	19	12	20	480	272	168	31	118	18	18
26	97	71	19	12	20	460	247	151	30	96	16	16
27	92	65	18	12	22	430	224	135	30	82	16	14
28	88	64	18	12	22	425	203	121	30	72	15	14
29	86	66	17	12	---	545	181	114	30	63	17	13
30	89	69	17	12	---	940	171	106	29	57	21	15
31	92	---	16	12	---	1260	---	101	---	53	24	---
TOTAL	2460	2170	1030	413	403	7375	21436	4719	1664	2415	837	530.2
MEAN	79.4	72.3	33.2	13.3	14.4	238	715	152	55.5	77.9	27.0	17.7
MAX	123	91	72	16	22	1260	2160	224	96	193	50	42
MIN	17	64	16	12	12	20	171	101	29	22	15	8.1
AC-FT	4880	4300	2040	819	799	14630	42520	9360	3300	4790	1660	1050
CAL YR 1981	TOTAL	21828.0	MEAN	59.8	MAX	977	MIN	11	AC-FT	43300		
WTR YR 1982	TOTAL	45452.2	MEAN	125	MAX	2160	MIN	8.1	AC-FT	90150		

## RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN

LOCATION.--Lat 47°16'00", long 96°14'40", in NW¼NE¼ sec.27, T.144 N., R.44 W., Norman County, Hydrologic Unit 09020108, on left bank 100 ft (30 m) upstream from highway bridge, 0.8 mi (1.3 km) northeast of village of Twin Valley, and 2 mi (3 km) upstream from small tributary.

DRAINAGE AREA.--888 mi<sup>2</sup> (2,300 km<sup>2</sup>).

PERIOD OF RECORD.--June 1909 to September 1917, July 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 955: 1941. WSP 1308: 1915(M), 1917(M).

GAGE.--Water-stage recorder. Datum of gage is 1,008.16 ft (307.287 m) National Geodetic Vertical Datum of 1929 (Corps of Engineers bench mark). June 1909 to September 1917, nonrecording gage at site 0.2 mi (0.3 km) downstream at different datum. July 23, 1930, to Nov. 24, 1934, nonrecording gage at highway bridge 100 ft (30 m) downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft (24 m) upstream from present site at present datum.

REMARKS.--Records good except those for winter period, which are fair. Flow slightly regulated by Rice Lake and many other small lakes above station.

AVERAGE DISCHARGE.--60 years, 173 ft<sup>3</sup>/s (4.899 m<sup>3</sup>/s), 125,300 acre-ft/yr (154 hm<sup>3</sup>/yr); median of yearly mean discharges, 154 ft<sup>3</sup>/s (4.36 m<sup>3</sup>/s), 125,000 acre-ft/yr (154 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft<sup>3</sup>/s (261 m<sup>3</sup>/s) July 22, 1909, gage height, 20.0 ft (6.10 m), site and datum then in use, from rating curve extended above 3,300 ft<sup>3</sup>/s (93.5 m<sup>3</sup>/s); minimum, 0.5 ft<sup>3</sup>/s (0.014 m<sup>3</sup>/s) Nov. 4, 1939.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) Apr. 19, gage height, 6.51 ft (1.984 m); maximum gage height, 9.01 ft (2.746 m) Mar. 30 (backwater from ice); minimum daily discharge, 11 ft<sup>3</sup>/s (0.31 m<sup>3</sup>/s) Aug. 30, Sept. 2, 3, 7-10; minimum gage height, 1.07 ft (0.326 m) Sept. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	248	148	58	50	50	1050	685	408	89	45	12
2	59	242	135	57	50	50	1000	677	381	84	43	11
3	80	234	132	57	50	50	1000	615	356	81	41	11
4	107	222	122	57	50	50	900	576	326	78	39	12
5	128	213	92	57	50	50	800	542	303	76	37	12
6	173	216	67	57	50	51	600	524	281	72	35	12
7	204	222	101	57	50	51	500	508	262	71	35	11
8	219	216	113	57	50	51	540	488	250	73	32	11
9	215	203	105	56	50	52	560	464	254	77	31	11
10	208	197	100	56	50	52	550	445	239	66	29	11
11	202	184	95	55	50	52	520	445	223	68	27	12
12	207	179	90	55	50	53	652	443	216	62	26	15
13	207	173	87	54	50	53	735	428	204	58	25	16
14	206	175	84	54	50	53	816	408	193	53	25	16
15	209	175	80	53	50	53	895	400	187	49	24	17
16	209	180	77	53	50	74	1020	453	189	46	23	18
17	253	182	75	53	50	110	1140	550	178	43	25	18
18	278	192	73	53	50	190	1190	728	160	44	24	17
19	332	187	71	53	50	230	1200	804	141	65	22	17
20	339	175	70	53	50	240	1180	799	134	66	19	17
21	321	145	68	52	50	220	1150	809	125	64	18	17
22	312	122	66	52	50	180	1120	790	119	62	17	17
23	293	144	65	52	50	160	1080	727	115	59	18	16
24	281	181	64	52	50	160	1030	687	116	57	16	16
25	273	184	62	52	50	170	969	658	110	55	14	16
26	263	165	61	51	50	180	909	624	117	52	14	16
27	255	150	60	51	50	200	853	584	116	46	13	16
28	276	140	59	51	50	260	802	545	104	44	12	16
29	267	144	59	51	---	400	758	509	97	42	12	17
30	261	146	58	51	---	700	745	475	95	44	11	17
31	254	---	58	51	---	1110	---	443	---	44	12	---
TOTAL	6952	5536	2597	1671	1400	5355	26264	17833	5999	1890	764	441
MEAN	224	185	83.8	53.9	50.0	173	875	575	200	61.0	24.6	14.7
MAX	339	248	148	58	50	1110	1200	809	408	89	45	18
MIN	59	122	58	51	50	50	500	400	95	42	11	11
AC-FT	13790	10980	5150	3310	2780	10620	52090	35370	11900	3750	1520	875
CAL YR 1981	TOTAL	38809	MEAN 106	MAX 339	MIN 15	AC-FT 76980						
WTR YR 1982	TOTAL	76702	MEAN 210	MAX 1200	MIN 11	AC-FT 152100						

05064000 WILD RICE RIVER AT HENDRUM, MN

LOCATION.--Lat 47°16'05", long 96°47'50", in SE¼SE¼ sec.19, T.144 N., R.48 W., Norman County, Hydrologic Unit 09020108, near center of span on downstream side of highway bridge, 0.5 mi (0.8 km) east of Hendrum and 4 mi (6.4 km) upstream from mouth.

DRAINAGE AREA.--1,600 mi<sup>2</sup> (4,140 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1944 to current year.

REVISED RECORDS.--WSP 1728: 1958.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 836.75 ft (255.041 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers).

REMARKS.--Records fair. Large part of high flow diverted into Marsh River basin at overflow section 3.5 mi (5.6 km) east of Ada. Another diversion into the Marsh River basin formed in 1947, 1.5 mi (2.4 km) southeast of Ada and diverted water at all stages 1947-51, after which it was closed except for a small regulated flow diverted for abatement of pollution from Ada sewage plant effluent. Amount of diversion not known.

AVERAGE DISCHARGE.--38 years, 258 ft<sup>3</sup>/s (7.307 m<sup>3</sup>/s), 186,900 acre-ft/yr (230 hm<sup>3</sup>/yr); median of yearly mean discharges, 210 ft<sup>3</sup>/s (5.95 m<sup>3</sup>/s), 152,000 acre-ft/yr (187 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,350 ft<sup>3</sup>/s (265 m<sup>3</sup>/s) Apr. 10, 1978, gage height, 31.42 ft (9.577 m); maximum gage height, 32.30 ft (9.845 m) Apr. 21, 1979, backwater from Red River of the North; no flow some days in 1948-49.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,280 ft<sup>3</sup>/s (92.9 m<sup>3</sup>/s) Apr. 3, gage height, 22.51 ft (6.861 m), backwater from Red River of the North; minimum daily, 13 ft<sup>3</sup>/s (0.37 m<sup>3</sup>/s) Sept. 7,8; minimum gage height, 1.64 ft (0.500 m) Sept. 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	299	170	65	60	60	2870	725	436	100	68	21
2	100	290	170	65	60	60	3200	684	408	100	66	17
3	96	289	165	65	60	60	3250	653	375	99	61	16
4	97	275	150	65	60	60	3100	618	350	90	58	15
5	127	258	130	65	60	60	2800	575	331	94	56	14
6	159	241	105	65	60	60	2450	566	302	92	54	15
7	187	234	115	65	60	60	2100	496	294	90	54	13
8	234	236	115	65	60	60	1800	465	277	87	55	13
9	278	237	110	65	60	60	1500	430	260	118	50	14
10	285	223	105	65	60	60	1250	417	268	149	47	14
11	266	221	100	65	60	60	1100	441	254	146	45	14
12	276	210	100	65	60	60	1000	468	230	133	39	15
13	300	201	95	65	60	60	980	453	222	110	39	15
14	291	193	95	65	60	60	1000	423	214	100	38	19
15	293	191	95	65	60	60	1100	421	201	90	35	21
16	281	193	90	60	60	70	1500	443	189	82	35	22
17	294	193	90	60	60	80	1920	496	193	76	35	23
18	362	183	85	60	60	110	2000	652	182	72	49	31
19	422	194	85	60	60	240	1800	825	175	72	34	26
20	451	186	80	60	60	250	1600	960	159	216	38	23
21	467	184	80	60	60	240	1460	935	148	223	33	24
22	434	197	75	60	60	230	1360	931	141	208	32	24
23	420	189	75	60	60	200	1290	885	136	175	29	23
24	388	197	75	60	60	190	1170	810	130	156	26	22
25	368	195	75	60	60	185	1090	742	126	117	22	20
26	342	190	70	60	60	180	1010	700	118	107	22	19
27	343	180	70	60	60	200	940	654	119	94	20	19
28	312	155	70	60	60	250	877	599	124	85	18	20
29	320	160	70	60	---	470	820	545	116	75	21	21
30	320	165	70	60	---	1000	767	506	110	71	15	20
31	313	---	70	60	---	2000	---	468	---	70	16	---
TOTAL	8919	6359	3050	1935	1680	6795	49104	18986	6588	3497	1210	573
MEAN	288	212	98.4	62.4	60.0	219	1637	612	220	113	39.0	19.1
MAX	467	299	170	65	60	2000	3250	960	436	223	68	31
MIN	93	155	70	60	60	60	767	417	110	70	15	13
AC-FT	17690	12610	6050	3840	3330	13480	97400	37660	13070	6940	2400	1140

CAL YR 1981 TOTAL 48750.4 MEAN 134 MAX 1480 MIN 8.0 AC-FT 96700  
WTR YR 1982 TOTAL 108696.0 MEAN 298 MAX 3250 MIN 13 AC-FT 215600

## RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN

LOCATION.--Lat 47°21'10", long 96°50'50", on line between secs.24 and 25, T.145 N., R.49 W., Traill County, Hydro-logic Unit 09020107, on left bank on upstream side of highway bridge, 0.5 mi (0.8 km) west of Halstad, 2.5 mi (4.0 km) downstream from Wild Rice River, and at mile 375.2 (603.7 km).

DRAINAGE AREA.--21,800 mi<sup>2</sup> (56,500 km<sup>2</sup>), approximately, including 3,800 mi<sup>2</sup> (9,840 km<sup>2</sup>) in closed basins.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1936 to June 1937 (no winter records), April 1942 to September 1960 (spring and summer months only), May 1961 to current year.

REVISED RECORDS.--WSP 1388: 1936, 1950. WSP 1728: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 826.65 ft (251.963 m) National Geodetic Vertical Datum of 1929. Prior to July 17, 1961, nonrecording gage at same site and datum.

REMARKS.--Records good. Some regulation by many controlled lakes and reservoirs on tributaries.

AVERAGE DISCHARGE.--21 years (1961-82), 1,750 ft<sup>3</sup>/s (49.6 m<sup>3</sup>/s), 1,270,000 acre-ft/yr (1.56 km<sup>3</sup>/yr); median of yearly mean discharges, 1,540 ft<sup>3</sup>/s (43.6 m<sup>3</sup>/s), 1,120,000 acre-ft/yr (1.4 km<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft<sup>3</sup>/s (1,190 m<sup>3</sup>/s) Apr. 22, 1979, gage height, 39.00 ft (11.887 m); minimum observed, 5.4 ft<sup>3</sup>/s (0.15 m<sup>3</sup>/s) Oct. 8, 9, 12-14, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in 1897 reached a stage of about 38.5 ft (11.73 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 13,200 ft<sup>3</sup>/s (374 m<sup>3</sup>/s) Apr. 9, gage height, 27.13 ft (8.269 m) backwater from ice; minimum daily, 168 ft<sup>3</sup>/s (4.76 m<sup>3</sup>/s) Oct. 1.

## DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	168	780	950	350	310	455	8500	2710	1990	1040	718	345
2	173	740	740	340	310	460	10800	2480	1900	1000	695	336
3	193	703	575	330	310	465	12400	2340	1810	958	679	320
4	223	680	550	320	310	470	12700	2400	1760	938	668	303
5	236	630	545	320	310	475	13000	2510	1700	913	668	295
6	303	600	540	320	307	475	13100	2480	1660	881	674	301
7	402	620	536	300	307	475	13100	2380	1620	886	658	292
8	472	710	530	300	307	480	13100	2200	1620	906	636	285
9	505	820	520	300	307	480	13100	2020	1590	989	630	274
10	539	910	515	300	305	480	13000	1900	1540	1110	626	261
11	569	930	510	300	305	490	12900	1960	1490	1140	617	255
12	588	918	505	300	305	500	12400	1940	1430	1060	609	260
13	611	854	495	300	305	500	12000	1900	1380	1110	598	261
14	633	820	490	300	305	485	11500	1840	1340	1120	587	269
15	681	850	485	300	310	485	10900	1860	1300	1050	577	289
16	633	862	475	300	360	510	10200	2050	1260	988	542	282
17	675	850	465	300	370	590	10000	2390	1240	939	529	286
18	739	820	475	300	380	680	9500	2670	1220	909	527	292
19	858	769	451	305	390	830	8700	2810	1180	992	465	297
20	910	713	415	310	400	1000	8000	2930	1170	1260	370	289
21	930	630	390	315	405	1300	7420	2880	1140	1490	305	281
22	930	580	380	320	420	1450	6830	2800	1140	1440	268	272
23	950	565	380	320	430	1500	6330	2730	1130	1370	220	274
24	890	570	390	310	440	1600	5840	2600	1090	1320	206	304
25	760	600	390	310	440	1750	5280	2450	1090	1250	278	286
26	680	620	390	310	440	1800	4610	2320	1090	1140	389	257
27	710	700	390	310	440	1900	4010	2200	1050	1050	432	246
28	780	798	390	310	450	2000	3550	2100	1030	930	415	250
29	787	1010	380	310	---	2400	3230	2060	999	833	387	242
30	798	1030	370	310	---	3600	2960	2040	1010	783	364	241
31	815	---	360	310	---	6300	---	2040	---	746	357	---
TOTAL	19141	22682	14977	9630	9978	36385	278960	71990	40969	32541	15694	8445
MEAN	617	756	483	311	356	1174	9299	2322	1366	1050	506	282
MAX	950	1030	950	350	450	6300	13100	2930	1990	1490	718	345
MIN	168	565	360	300	305	455	2960	1840	999	746	206	241
AC-FT	37970	44990	29710	19100	19790	72170	553300	142800	81260	64550	31130	16750
CAL YR 1981	TOTAL	199326	MEAN	546	MAX	3800	MIN	123	AC-FT	395400		
WTR YR 1982	TOTAL	561392	MEAN	1538	MAX	13100	MIN	168	AC-FT	1114000		

## RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued  
(National stream-quality accounting network station)  
(Radiochemical station)

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-67, 1972 to current year.

REMARKS.--Letter K indicates non-ideal colony count and letter E indicates estimated value.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPE-CIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED SATURATION (00301)	COLIFORM, SOLVED (PER-CENT) (00301)	COLIFORM, FECCAL, UM-MF (COLS./100 ML) (31625)
DEC 18...	1540	475	735	8.1	-18.0	.0	7.3	12.4	86		K17
MAR 22...	1230	E1450	550	7.9	3.0	.0	24	10.1	71		97
APR 30...	1200	3000	538	8.4	17.0	12.5	32	9.8	94		<10
JUL 28...	1220	966	560	8.0	24.5	25.0	120	5.9	73		K65
SEP 10...	1345	262	515	8.7	29.5	23.0	11	11.9	146		K100
DATE	TIME	STREP-TOCOCCHI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARDNESS (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)
DEC 18...	K24	338	71	39	29	.7	6.1	91	31		.3
MAR 22...	<4	205	44	23	27	.8	8.0	46	25		.2
APR 30...	390	235	53	25	20	.6	6.9	87	11		.2
JUL 28...	720	231	48	27	28	.8	6.6	75	13		.2
SEP 10...	290	241	47	30	20	.6	6.9	48	11		.2
DATE	TIME	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)
DEC 18...	13	455	437	584	.24	.190	1.20	.110	.050		.090
MAR 22...	14	347	309	--	1.8	.480	19.0	.350	.240		.270
APR 30...	12	354	330	2870	.14	.230	2.40	.250	.110		.130
JUL 28...	17	357	340	931	.74	.100	1.90	.410	.220		.290
SEP 10...	14	406	311	287	<.10	.090	1.20	.130	.090		.080
DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	CHROMIUM, DIS-SOLVED (UG/L AS CR) (01030)		
DEC 18...	1540	4	3	100	89	1	<1	10	<10		
MAR 22...	1230	4	4	100	180	1	1	<10	<10		
APR 30...	1200	5	4	200	65	1	<3	<10	<10		
SEP 10...	1345	5	5	100	150	<1	<1	<10	<10		

## RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE) (01045)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN) (01055)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)
	DEC 18...	<3	8	2	430	21	4	2	50
MAR 22...	1	21	3	1300	37	10	4	160	62
APR 30...	<1	12	3	3800	9	7	2	370	<3
SEP 10...	1	6	2	370	4	<1	<1	50	2
DATE	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG) (71900)	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	
DEC 18...	.2	<.1	<1	<1	1	<1	30	7	
MAR 22...	.1	<.1	<1	<1	<1	<1	60	46	
APR 30...	.1	<.1	<1	<1	1	<1	40	<12	
SEP 10...	.2	<.1	1	<1	<1	<1	30	13	
DATE	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03516)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L) (09511)	
APR 30...	1200	<8.3	6.4	8.9	5.2	8.6	4.9	.12	
DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03516)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	
MAR 22...	1230			60	--	96			
APR 30...	1200			189	1530	99			
DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03516)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	
DEC 18...	1540			475	735	.0			
FEB 03...	1615			309	635	.0			
MAR 22...	1230			E1450	550	.0			
APR 01...	0950			8170	311	.0			
07...	1240			13000	339	1.0			
16...	1235			10700	409	6.0			
30...	1200			3000	538	12.5			
JUN 09...	1150			1570	560	15.0			
JUL 28...	1220			966	560	25.0			
SEP 10...	1345			262	515	23.0			
DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03516)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	
MAR 22...	1230			60	--	96			
APR 30...	1200			189	1530	99			
DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137) (03516)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90) (80060)	
DEC 18...	1540			475	735	.0			
FEB 03...	1615			309	635	.0			
MAR 22...	1230			E1450	550	.0			
APR 01...	0950			8170	311	.0			
07...	1240			13000	339	1.0			
16...	1235			10700	409	6.0			
30...	1200			3000	538	12.5			
JUN 09...	1150			1570	560	15.0			
JUL 28...	1220			966	560	25.0			
SEP 10...	1345			262	515	23.0			

RED RIVER OF THE NORTH BASIN

05067500 MARSH RIVER NEAR SHELLY, MN

LOCATION.--Lat 47°24'45", long 96°45'50", in NE¼NW¼ sec.3, T.145 N., R.48 W., Norman County, Hydrologic Unit 09020107, near center of span on downstream truss of bridge, 3.8 mi (6.1 km) southeast of Shelly and 10 mi (16 km) upstream from mouth.

DRAINAGE AREA.--151 mi<sup>2</sup> (391 km<sup>2</sup>).

PERIOD OF RECORD.--March 1944 to current year. Monthly discharge only for March 1944, published in WSP 1308.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 841.14 ft (356.379 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1965, nonrecording gage at datum 3.0 ft (0.914 m) higher.

REMARKS.--Records poor. Large part of high flow of Wild Rice River diverted into Marsh River basin at overflow section 4.6 mi (5.6 km) east of Ada. Another diversion from Wild Rice River basin formed in 1947, 1.5 mi (2.4 km) southeast of Ada and diverted water at all stages 1947-51, after which it was closed except for a small regulated flow diverted for abatement of pollution from Ada sewage plant effluent.

AVERAGE DISCHARGE.--38 years, 65.5 ft<sup>3</sup>/s (1.855 m<sup>3</sup>/s), 47,450 acre-ft/yr (58.5 hm<sup>3</sup>/yr); median of yearly mean discharges, 35 ft<sup>3</sup>/s (0.99 m<sup>3</sup>/s), 25,400 acre-ft/yr (31 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,880 ft<sup>3</sup>/s (138 m<sup>3</sup>/s) Apr. 19, 1979, gage height, 23.36 ft (7.120 m), from floodmark; no flow for many days most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,070 ft<sup>3</sup>/s (30.3 m<sup>3</sup>/s) Apr. 2, gage height, 13.06 ft (3.981 m); no flow Aug. 26 to Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.10	12	4.4	.12	.10	.45	756	13	4.8	.56	.08	.00
2	.20	11	4.4	.12	.10	.45	875	13	4.1	.36	.06	.00
3	.30	9.8	3.7	.12	.10	.45	732	12	3.2	.22	.06	.00
4	.50	9.0	3.2	.12	.10	.40	462	6.6	2.4	.22	.12	.00
5	.90	8.4	2.8	.12	.12	.40	421	7.2	1.1	4.6	1.4	.00
6	1.0	7.4	2.5	.14	.12	.35	429	6.6	1.3	3.1	.82	.00
7	2.0	7.0	2.2	.14	.12	.35	364	5.6	1.6	1.6	.32	.00
8	3.0	6.4	2.1	.14	.12	.35	356	8.4	2.0	.36	.22	.00
9	5.0	6.0	1.9	.14	.12	.30	329	9.6	3.1	.36	.15	.00
10	6.0	6.2	1.6	.11	.12	.30	293	11	3.0	.28	.08	.00
11	8.0	5.8	1.8	.07	.14	.30	212	14	2.8	2.2	.10	.00
12	12	5.6	1.9	.02	.14	.30	263	48	4.4	2.2	.08	.00
13	16	5.2	2.0	.02	.14	.30	283	39	4.4	2.2	.06	.00
14	21	4.6	2.1	.02	.14	.30	274	35	5.0	1.6	.04	.00
15	16	4.2	2.1	.03	.14	.30	340	31	5.6	.89	.02	.00
16	16	3.9	1.7	.04	.15	.60	785	30	5.2	1.6	.02	.00
17	18	3.6	1.3	.06	.22	.96	980	32	4.8	.89	.02	.00
18	24	3.4	.89	.08	.22	1.6	678	48	4.4	.45	.02	.00
19	21	3.4	.75	.12	.25	20	415	84	3.4	2.2	.04	.00
20	19	3.2	.72	.06	.28	25	236	75	2.8	2.1	.02	.00
21	24	3.2	.68	.08	.35	30	178	60	2.2	1.9	.02	.00
22	23	3.4	.56	.10	.45	40	147	45	2.2	.75	.02	.00
23	21	3.6	.45	.10	.40	35	97	33	1.6	2.4	.02	.00
24	21	3.6	.36	.10	.40	25	62	26	1.0	1.6	.02	.00
25	20	3.7	.34	.14	.40	22	45	19	2.1	.50	.01	.00
26	19	3.5	.32	.10	.50	20	34	16	2.1	.32	.00	.00
27	18	3.4	.28	.17	.50	20	24	13	1.6	.32	.00	.00
28	17	3.0	.25	.10	.45	98	19	9.8	1.2	.25	.00	.00
29	15	3.0	.20	.10	---	460	14	7.7	1.3	.20	.00	.00
30	13	3.1	.14	.14	---	609	16	5.4	.96	.12	.00	.00
31	12	---	.10	.08	---	781	---	5.0	---	.10	.00	---
TOTAL	393.00	159.6	47.74	3.00	6.39	2193.46	10119	768.9	85.66	36.45	3.82	.00
MEAN	12.7	5.32	1.54	.097	.23	70.8	337	24.8	2.86	1.18	.12	.000
MAX	24	12	4.4	.17	.50	781	980	84	5.6	4.6	1.4	.00
MIN	.10	3.0	.10	.02	.10	.30	14	5.0	.96	.10	.00	.00
AC-FT	780	317	95	6.0	13	4350	20070	1530	170	72	7.6	.00
CAL YR 1981	TOTAL	2459.48	MEAN	6.74	MAX	628	MIN	.00	AC-FT	4880		
WTR YR 1982	TOTAL	13817.02	MEAN	37.9	MAX	980	MIN	.00	AC-FT	27410		

## RED RIVER OF THE NORTH BASIN

05069000 SAND HILL RIVER AT CLIMAX, MN

LOCATION.--Lat 47°36'43", long 96°48'52", in NE¼NE¼ sec.30, T.148 N., R.48 W., Polk County, Hydrologic Unit 09020301, near center of span on downstream side of bridge on U.S. Highway 75 in Climax and 3.7 mi (6.0 km) upstream from mouth.

DRAINAGE AREA.--426 mi<sup>2</sup> (1,103 km<sup>2</sup>).

PERIOD OF RECORD.--March 1943 to current year (winter records incomplete prior to 1947). Monthly discharge only for some periods, published in WSP 1308 and 1728.

REVISED RECORDS.--WSP 1388: 1943(M), 1944, 1947(M). WSP 1728: 1951(M), 1960 (Average discharge).

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 820.10 ft (249.966 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1966, nonrecording gage at site 3.2 mi (5.1 km) upstream at datum 12.78 ft (3.90 m) higher. Nonrecording gage and crest-stage gage at site 3.2 mi (5.1 km) upstream at datum 12.78 ft (3.90 m) higher (used as supplementary gage during periods of backwater from the Red River).

REMARKS.--Records good except those for winter period, which are poor.

AVERAGE DISCHARGE.--36 years (water years 1947-82), 69.5 ft<sup>3</sup>/s (1.968 m<sup>3</sup>/s), 50,350 acre-ft/yr (62.1 hm<sup>3</sup>/yr); median of yearly mean discharges, 51 ft<sup>3</sup>/s (1.44 m<sup>3</sup>/s), 36,900 acre-ft/yr (45 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,560 ft<sup>3</sup>/s (129 m<sup>3</sup>/s) Apr. 14, 1965, gage height, 17.81 ft (5.428 m), site and datum then in use; maximum gage height, 32.79 ft (9.994 m) Apr. 23, 1979, from floodmark (backwater from Red River of the North); minimum daily discharge, 1.0 ft<sup>3</sup>/s (0.03 m<sup>3</sup>/s) Jan. 17, 18, 1962.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 820 ft<sup>3</sup>/s (23.2 m<sup>3</sup>/s) Apr. 15, gage height, 10.00 ft (3.048 m); maximum gage height, 14.17 ft (4.319 m) Apr. 9 (backwater from ice); minimum daily discharge, 5.5 ft<sup>3</sup>/s (0.16 m<sup>3</sup>/s) Feb. 1-4; minimum gage height, 3.90 ft (1.189 m) Feb. 1, 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	46	31	15	5.5	10	450	107	61	24	23	9.3
2	15	45	32	15	5.5	10	440	96	56	21	22	8.9
3	18	44	28	15	5.5	10	410	95	51	20	19	9.1
4	21	40	30	15	5.5	10	390	115	45	30	17	8.9
5	22	37	35	14	15	10	370	107	39	50	16	8.7
6	29	35	35	14	14	10	350	95	37	71	15	8.4
7	32	34	30	14	13	10	330	86	42	47	14	8.2
8	32	33	26	14	12	10	320	81	47	44	13	8.2
9	40	32	25	14	12	10	310	77	51	52	13	8.2
10	49	34	23	14	12	10	300	73	55	60	11	8.0
11	49	36	22	13	11	10	350	95	53	61	10	8.2
12	55	40	22	13	11	11	450	113	47	60	11	8.9
13	68	38	22	13	11	11	600	110	42	51	11	10
14	86	35	22	13	11	12	770	105	39	47	11	20
15	90	32	21	13	11	14	800	100	36	46	11	10
16	90	34	21	13	11	17	645	120	32	43	11	11
17	90	36	21	12	11	21	447	186	32	47	10	11
18	99	34	20	12	10	30	372	340	29	52	12	14
19	98	32	20	12	10	40	348	384	25	45	19	12
20	90	29	19	12	10	50	304	370	25	43	14	11
21	87	27	19	12	10	46	259	304	25	44	11	9.1
22	90	26	18	11	10	42	230	240	22	42	9.8	9.8
23	82	38	18	11	10	38	199	193	20	46	11	9.8
24	78	39	18	11	10	34	174	167	21	45	11	9.8
25	72	43	17	10	10	32	160	142	22	39	11	9.5
26	67	31	17	10	10	30	148	128	21	36	10	10
27	60	34	17	10	10	40	139	118	20	34	9.5	10
28	60	33	16	9.0	10	70	130	100	25	31	9.1	10
29	55	32	16	8.0	---	150	120	88	25	31	9.5	11
30	52	32	16	7.0	---	300	110	75	25	28	8.9	14
31	51	---	15	6.0	---	450	---	67	---	25	9.3	---
TOTAL	1845	1061	692	375.0	287.0	1548	10425	4477	1070	1315	393.1	305.0
MEAN	59.5	35.4	22.3	12.1	10.3	49.9	348	144	35.7	42.4	12.7	10.2
MAX	99	46	35	15	15	450	800	384	61	71	23	20
MIN	15	26	15	6.0	5.5	10	110	67	20	20	8.9	8.0
AC-FT	3660	2100	1370	744	569	3070	20680	8880	2120	2610	780	605
CAL YR 1981	TOTAL	11020.3	MEAN	30.2	MAX	288	MIN	7.7	AC-FT	21860		
WTR YR 1982	TOTAL	23793.1	MEAN	65.2	MAX	800	MIN	5.5	AC-FT	47190		

05074000 LOWER RED LAKE NEAR RED LAKE, MN

LOCATION.--Lat 47°57'27", long 95°16'34", in SW¼NW¼ sec.28, T.152 N., R.36 W., Clearwater County, Hydrologic Unit 09020302, on Red Lake Indian Reservation, on left bank just upstream from dam at outlet, 13 mi (21 km) northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi<sup>2</sup> (5,050 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--June 1930 to November 1932 (published as Red Lake at Redby), May 1933 to current year (published as Red Lake near Red Lake 1933-40); records on Upper Red Lake published as Red Lake at Waskish, April 1930 to September 1933, all in reports of Geological Survey. October 1921 to September 1929 gage heights at Redby and on Upper Red Lake at Waskish in files of Minnesota Department of Conservation (fragmentary).

GAGE.--Water-stage recorder. Datum of gage is 1,169.00 ft (356.311 m), adjustment of 1912 (levels by Corps of Engineers); gage readings have been reduced to elevations based on adjustment of 1912. May 1933 to Sept. 6, 1934, nonrecording gage at same site and datum. Nonrecording gages at Waskish and Redby at datum 69.00 ft (21.031 m) lower.

REMARKS.--Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 1178.53 ft (359.216 m) June 25, 1950; minimum recorded, 1169.80 ft (356.555 m) Nov. 20, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 1175.94 ft (358.427 m) July 5; maximum daily, 1175.06 ft (358.158 m) May 20; minimum, 1173.52 ft (357.689 m) Nov. 10, 30; minimum daily, 1173.76 ft (357.762 m) Mar. 6.

MONTHEND ELEVATION, IN FEET, OCTOBER 1981 TO SEPTEMBER 1982

Oct. 31 .....	1173.82	Feb. 28 .....	1173.81	June 30 .....	1174.64
Nov. 30 .....	1173.80	Mar. 31 .....	1173.85	July 31 .....	1174.77
Dec. 31 .....	1173.92	Apr. 30 .....	1174.50	Aug. 31 .....	1174.29
Jan. 30 .....	1173.85	May 31 .....	1174.78	Sept.30 .....	1173.92

NOTE.--Mean daily gage heights are available.

## RED RIVER OF THE NORTH BASIN

05074500 RED LAKE RIVER NEAR RED LAKE, MN

LOCATION.--Lat 47°57'27", long 95°16'35", in SW¼NW¼ sec.28, T.152 N., R.36 W., Clearwater County, Hydrologic Unit 09020302, on Red Lake Indian Reservation, on left bank 50 ft (15 m) downstream from dam at outlet of Lower Red Lake and 13 mi (21 km) northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi<sup>2</sup> (5,050 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--May 1933 to current year. Monthly discharge only for May 1933, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,167.00 ft (355.702 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft (15 m) upstream at datum 2.00 ft (0.610 m) higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records fair. Flow completely regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--49 years, 489 ft<sup>3</sup>/s (13.85 m<sup>3</sup>/s), 354,300 acre-ft/yr (437 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,600 ft<sup>3</sup>/s (102 m<sup>3</sup>/s) June 25, 1950, gage height, 11.19 ft (3.411 m), affected by seiches and backwater from aquatic vegetation, present datum, from rating curve extended above 1,400 ft<sup>3</sup>/s (39.6 m<sup>3</sup>/s); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,170 ft<sup>3</sup>/s (33.1 m<sup>3</sup>/s) July 4, gage height, 5.94 ft (1.811 m); maximum gage height, 6.03 ft (1.838 m) July 24; minimum daily discharge, 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) Apr. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	375	676	676	650	660	680	140	90	1010	934	1050	904
2	360	669	662	650	660	680	89	87	999	930	1050	900
3	360	669	680	650	660	680	167	84	992	942	1050	896
4	372	673	680	650	660	680	140	243	984	946	1040	896
5	375	673	680	650	660	680	119	519	976	965	1040	900
6	508	669	680	650	660	680	104	542	972	961	1040	893
7	709	666	680	650	660	680	84	542	988	961	1030	885
8	727	666	680	650	660	690	84	525	976	949	1020	882
9	730	651	680	650	660	690	84	525	984	968	1010	878
10	738	644	680	650	660	690	99	539	972	968	1000	878
11	730	644	680	650	670	690	80	567	961	961	992	885
12	727	640	680	650	670	690	90	560	961	961	980	893
13	730	640	680	650	670	690	94	550	953	961	980	893
14	727	644	600	650	670	690	107	550	949	957	976	900
15	723	648	550	650	670	690	128	560	953	984	972	889
16	720	648	550	650	670	690	143	600	946	996	972	874
17	727	644	550	650	670	690	128	700	953	996	968	882
18	730	644	550	650	670	690	109	900	946	972	972	874
19	712	644	550	650	670	700	102	1000	942	972	968	870
20	712	634	550	650	670	700	109	1050	942	976	957	863
21	709	623	550	650	670	700	111	1050	930	992	957	859
22	702	616	550	650	670	698	116	1050	927	988	961	856
23	694	612	600	650	680	669	114	1050	927	984	953	856
24	680	609	650	650	680	666	109	1050	934	1040	946	867
25	684	612	650	650	680	658	101	1040	927	1040	934	852
26	680	620	650	650	680	623	94	1040	927	1050	927	848
27	687	630	650	650	680	616	89	1030	927	1050	923	848
28	680	648	650	660	680	588	92	1020	946	1050	915	878
29	680	655	650	660	---	553	84	1030	946	1060	911	885
30	676	626	650	660	---	364	96	1020	938	1050	908	874
31	680	---	650	660	---	138	---	1020	---	1040	904	---
TOTAL	20044	19337	19618	20190	18720	20023	3206	22133	28688	30604	30306	26358
MEAN	647	645	633	651	669	646	107	714	956	987	978	879
MAX	738	676	680	660	680	700	167	1050	1010	1060	1050	904
MIN	360	609	550	650	660	138	80	84	927	930	904	848
AC-FT	39760	38350	38910	40050	37130	39720	6360	43900	56900	60700	60110	52280
CAL YR 1981	TOTAL	108177	MEAN	296	MAX	738	MIN	34	AC-FT	214600		
WTR YR 1982	TOTAL	259227	MEAN	710	MAX	1060	MIN	80	AC-FT	514200		

RED RIVER OF THE NORTH BASIN

05075000 RED LAKE RIVER AT HIGH LANDING, NEAR GOODRIDGE, MN

LOCATION.--Lat 48°02'34", long 95°48'28", in NW¼NW¼ sec.28, T.153 N., R.40 W., Pennington County, Hydrologic Unit 09020303, on left bank 50 ft (15 m) upstream from highway bridge at High Landing, 7 mi (11 km) south of Goodridge and 33 mi (53 km) upstream from Thief River.

DRAINAGE AREA.--2,300 mi<sup>2</sup> (6,000 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--September 1929 to current year. Prior to October 1930, published as "at Kratka".

GAGE.--Water-stage recorder. Datum of gage is 1,141.57 ft (347.951 m), adjustment of 1912 (levels by Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

REMARKS.--Records good except those for winter period, which are fair. Flow regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--53 years, 543 ft<sup>3</sup>/s (15.38 m<sup>3</sup>/s), 393,400 acre-ft/yr (485 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,060 ft<sup>3</sup>/s (115 m<sup>3</sup>/s) July 7, 1975, gage height, 13.39 ft (4.081 m); maximum gage height, 13.44 ft (4.097 m) July 3, 1975; no flow during infrequent periods in 1931-34, 1936-37.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,800 ft<sup>3</sup>/s (51.0 m<sup>3</sup>/s) Apr. 15, gage height, 10.37 ft (3.161 m) (backwater from ice); minimum daily, 304 ft<sup>3</sup>/s (8.61 m<sup>3</sup>/s) May 3; minimum gage height, 3.26 ft (0.994 m) May 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	527	822	818	680	680	690	500	328	1160	1020	1200	926
2	520	826	762	680	680	690	500	307	1150	1010	1180	918
3	502	826	787	680	680	690	420	304	1140	996	1170	912
4	505	824	727	680	680	690	440	718	1120	980	1140	918
5	517	813	746	680	680	690	440	1100	1100	1070	1110	912
6	540	809	760	680	680	690	460	1210	1100	1090	1100	920
7	611	811	780	680	680	690	480	1090	1110	1060	1080	927
8	762	803	800	680	680	690	500	1030	1110	1030	1060	923
9	830	803	810	680	680	690	540	984	1130	1030	1030	916
10	858	786	810	680	680	690	580	975	1180	1040	1030	916
11	870	785	780	680	680	700	640	1100	1160	1030	1020	919
12	886	795	750	680	680	700	740	1130	1130	1010	1020	921
13	887	793	730	680	680	700	860	1100	1110	1000	1010	936
14	873	788	720	680	680	700	1100	1080	1090	1000	1000	941
15	866	795	700	680	680	700	1610	1120	1080	1000	996	943
16	860	813	700	680	680	700	1260	1100	1070	1040	985	947
17	860	810	690	680	680	700	1030	1210	1060	1080	988	952
18	862	813	680	680	680	700	884	1400	1060	1070	985	945
19	864	817	680	680	680	700	809	1540	1050	1070	972	937
20	858	812	680	680	680	700	739	1590	1050	1060	965	935
21	854	865	680	680	690	700	712	1580	1040	1120	962	939
22	850	882	680	680	690	700	694	1540	1040	1150	975	941
23	838	789	680	680	690	700	671	1500	1040	1120	978	937
24	837	774	680	680	690	700	634	1450	1020	1250	970	940
25	822	776	680	680	690	700	578	1410	1010	1440	962	948
26	832	784	680	680	690	700	511	1380	1010	1420	948	949
27	830	709	680	680	690	700	461	1350	996	1350	944	947
28	842	754	680	680	690	720	424	1310	1010	1290	942	1010
29	851	794	680	680	---	820	392	1270	1060	1270	936	1030
30	848	755	680	680	---	1000	349	1220	1040	1260	926	1020
31	826	---	680	680	---	900	---	1190	---	1230	929	---
TOTAL	24088	24026	22390	21080	19120	22240	19958	35616	32426	34586	31513	28225
MEAN	777	801	722	680	683	717	665	1149	1081	1116	1017	941
MAX	887	882	818	680	690	1000	1610	1590	1180	1440	1200	1030
MIN	502	709	680	680	680	690	349	304	996	980	926	912
AC-FT	47780	47660	44410	41810	37920	44110	39590	70640	64320	68600	62510	55980
CAL YR 1981	TOTAL	125183	MEAN	343	MAX	887	MIN	60	AC-FT	248300		
WTR YR 1982	TOTAL	315268	MEAN	864	MAX	1610	MIN	304	AC-FT	625300		

## RED RIVER OF THE NORTH BASIN

## 05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN

LOCATION.--Lat 48°11'08", long 96°10'11", in NW¼SW¼ sec.3, T.154 N., R.43 W., Marshall County, Hydrologic Unit 09020304, on right bank, 0.2 mi (0.3 km) upstream from highway bridge, 5 mi (8 km) north of city of Thief River Falls, 7 mi (11 km) upstream from mouth, and 9 mi (14 km) downstream from Mud Lake National Wildlife Refuge.

DRAINAGE AREA.--959 mi<sup>2</sup> (2,484 km<sup>2</sup>).

PERIOD OF RECORD.--July 1909 to September 1917, April 1920 to September 1921, October 1922 to September 1924, October 1928 to September 1981. Monthly discharge only for some periods, annual maximums for water years 1919, 1922, 1925, 1926, published in WSP 1308. October 1981 to February 1982, operated as a high-flow partial-record station March to September 1982.

REVISED RECORDS.--WSP 925: Drainage area. WSP 1308: 1917(M), 1924(M), 1929(M), 1931-33(M), 1935(M), 1937(M).

GAGE.--Water-stage recorder and control of grouted boulders. Datum of gage is 1,112.33 ft (339.038 m) National Geodetic Vertical Datum of 1929 (levels by Minnesota Department of Transportation). Prior to May 4, 1939, nonrecording gages at same site and datum.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by Thief and Mud Lakes.

AVERAGE DISCHARGE.--64 years (water years 1910-1917, 1921, 1923-1924, 1929-1981), 158 ft<sup>3</sup>/s (4.475 m<sup>3</sup>/s), 114,500 acre-ft/yr (141 hm<sup>3</sup>/yr); median of yearly mean discharges, 106 ft<sup>3</sup>/s (3.00 m<sup>3</sup>/s), 76,800 acre-ft/yr (95 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,610 ft<sup>3</sup>/s (159 m<sup>3</sup>/s) May 13, 1950, gage height, 17.38 ft (5.297 m); no flow at times in some years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,130 ft<sup>3</sup>/s (60.3 m<sup>3</sup>/s) May 4, gage height, 11.27 ft (3.435 m); maximum gage height, 12.49 ft (3.807 m) Apr. 14 (backwater from ice); no flow on several days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1					---	.00	370	869	345	97	286	21
2					---	.00	340	841	316	88	269	23
3					---	.00	320	879	294	66	262	22
4					---	.00	300	1840	195	54	255	20
5					---	.00	280	1450	173	142	247	19
6					---	.00	260	1210	170	238	213	18
7					---	.00	250	879	171	211	193	18
8					---	.00	240	822	171	170	190	17
9					---	.00	230	775	185	154	189	17
10					---	.00	220	759	197	153	189	17
11					---	.00	300	808	196	137	187	14
12					---	.00	600	828	191	124	184	9.5
13					---	.00	900	815	185	142	183	6.6
14					---	.01	1150	779	181	150	180	4.9
15					---	.02	1390	759	176	157	149	3.9
16					---	.04	1620	805	171	140	120	3.6
17					---	.06	1890	869	166	179	116	3.4
18					---	.08	1890	978	164	240	117	2.9
19					---	.10	1820	1000	162	212	118	2.6
20					---	.20	1660	978	160	213	114	2.1
21					---	.30	1540	926	156	308	112	1.8
22					---	.70	1480	858	106	277	106	1.9
23					.00	1.3	1420	739	97	238	102	1.9
24					.00	1.4	1320	680	92	235	101	1.8
25					.00	1.5	1170	642	91	220	98	1.5
26					.00	1.5	1110	610	89	208	96	1.3
27					.00	1.5	1040	509	88	197	92	1.5
28					.00	1.5	992	472	90	181	69	3.1
29					---	10	933	459	98	225	41	3.6
30					---	100	889	451	98	293	28	3.2
31					---	400	---	436	---	305	23	---
TOTAL					---	520.21	27924	25725	4974	5754	4629	267.1
MEAN					---	16.8	931	830	166	186	149	8.90
MAX					---	400	1890	1840	345	308	286	23
MIN					---	.00	220	436	88	54	23	1.3
AC-FT					---	1030	55390	51030	9870	11410	9180	530

RED RIVER OF THE NORTH BASIN

05078000 CLEARWATER RIVER AT PLUMMER, MN

LOCATION.--Lat 47°55'24", long 96°02'46", in SE¼SW¼ sec. 4, T.151 N., R.42 W., Red Lake County, Hydrologic Unit 09020305, on right bank 200 ft (61 m) downstream from Soo Line Railroad bridge, 300 ft (91 m) downstream from bridge on U.S. Highway 59, 0.9 mi (1.4 km) northwest of railroad depot in Plummer, and 8 mi (13 km) upstream from Hill River.

DRAINAGE AREA.--512 mi<sup>2</sup> (1,326 km<sup>2</sup>).

PERIOD OF RECORD.--April 1939 to September 1979. October 1979 to February 1982, annual maximums only. March to September 1982.

GAGE.--Water-stage recorder. Datum of gage is 1,099.12 ft (335.012 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Nov. 10, 1939, nonrecording gage at site 100 ft (30 m) upstream at same datum.

REMARKS.--Records good except those for winter period, which are poor. Since 1968, undetermined amounts of water diverted for the flooding of wild rice paddies upstream.

AVERAGE DISCHARGE.--40 years (water years 1940-79), 179 ft<sup>3</sup>/s (5.069 m<sup>3</sup>/s), 129,700 acre-ft/yr (160 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,940 ft<sup>3</sup>/s (112 m<sup>3</sup>/s) Apr. 25, 1979, gage height, 12.31 ft (3.752 m); maximum gage height, 12.37 ft (3.770 m) Apr. 18, 1979 (backwater from ice); minimum discharge, 2.5 ft<sup>3</sup>/s (0.071 m<sup>3</sup>/s) May 16, 17, 1977, gage height, 1.71 ft (0.521 m).

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge		Gage height		Date	Time	Discharge		Gage height	
		(ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	(ft)	(m)			(ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	(ft)	(m)
Mar. 31	1030	957	27.1	a*9.20	2.804	May 12	0530	574	16.3	5.35	1.631
Apr. 16	1700	*1700	48.1	8.71	2.655	May 20	0230	1040	29.5	7.04	2.146
May 5	2330	927	26.3	6.67	2.033	July 17	0900	519	14.7	5.09	1.551
						July 25	2000	516	14.6	5.09	1.551

a Backwater from ice.

Minimum discharge (March to September 1982), 33 ft<sup>3</sup>/s (0.93 m<sup>3</sup>/s) Aug. 30 to Sept. 3 and Sept. 9, 10; minimum gage height, 2.40 ft (0.732 m) Sept. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1					---	86	850	223	227	193	312	33
2					---	83	750	212	208	175	273	33
3					---	81	700	203	188	166	239	35
4					---	80	650	576	190	167	225	39
5					---	110	600	884	185	292	206	37
6					---	100	560	858	176	326	198	35
7					---	70	540	572	182	251	192	36
8					---	80	520	436	178	220	166	36
9					---	82	500	357	167	207	144	34
10					---	81	500	338	210	224	135	37
11					---	80	500	448	211	233	160	37
12					---	80	600	569	193	226	138	40
13					---	80	800	514	172	211	119	41
14					---	80	970	466	152	188	111	44
15					---	80	1150	543	123	176	106	48
16					---	80	1590	713	101	262	88	51
17					---	79	1490	743	101	466	75	59
18					---	79	1260	901	98	350	82	59
19					---	79	1230	1010	98	299	73	59
20					---	79	1210	1030	109	268	59	53
21					---	79	1150	936	114	400	55	50
22					---	79	1030	786	113	462	55	48
23					---	79	910	632	117	408	53	47
24					160	80	799	533	126	372	49	42
25					200	80	697	459	129	486	45	42
26					160	80	608	395	128	462	43	42
27					120	82	470	382	128	363	40	47
28					100	100	344	355	136	296	37	53
29					---	250	286	323	211	298	36	64
30					---	500	230	285	221	333	33	88
31					---	900	---	260	---	307	33	---
TOTAL					---	3958	23494	16942	4692	9087	3580	1369
MEAN					---	128	783	547	156	293	115	45.6
MAX					---	900	1590	1030	227	486	312	88
MIN					---	70	230	203	98	166	33	33
AC-FT					---	7850	46600	33600	9310	18020	7100	2720

## RED RIVER OF THE NORTH BASIN

05078230 LOST RIVER AT OKLEE, MN

LOCATION.--Lat 47°50'35", long 95°51'30", in SE¼NE¼ sec.2, T.150 N., R.41 W., Red Lake County, Hydrologic Unit 09020305, on downstream side of bridge on State Highway 222 at northwest edge of Oklee, 12 mi (19 km) upstream from mouth.

DRAINAGE AREA.--266 mi<sup>2</sup> (689 km<sup>2</sup>).

PERIOD OF RECORD.--April 1960 to September 1981, February to September 1982. Monthly and daily figures for Apr. 1, 1960, to June 30, 1960, published in WSP 2113.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 1,126.94 ft (343.391 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site at datum 8.00 ft (2.438 m) higher. Sept. 9, 1960, to Sept. 30, 1964, nonrecording gage at same site at datum 8.00 ft (2.438 m) higher.

REMARKS.--Records fair except those for the winter period and those for period of indefinite stage-discharge relation (Aug. 27 to Sept. 30), which are poor.

AVERAGE DISCHARGE.--21 years (water years 1961-81), 75.9 ft<sup>3</sup>/s (2.149 m<sup>3</sup>/s), 54,990 acre-ft/yr (67.8 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,210 ft<sup>3</sup>/s (90.9 m<sup>3</sup>/s) Apr. 11, 1969, gage height, 14.91 ft (4.545 m), from floodmark; maximum gage height, 16.72 ft (5.096 m), present datum, May 24, 1962; no flow Feb. 16 to Mar. 21, 1963, Feb. 15 to Mar. 2, 1964, Jan. 6 to Mar. 11, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1897, 18.39 ft (5.605 m) present datum, Apr. 21, 1950 from floodmarks, discharge, 2,790 ft<sup>3</sup>/s (79.0 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,320 ft<sup>3</sup>/s (37.4 m<sup>3</sup>/s) Apr. 16, gage height, 12.04 ft (3.670 m); maximum gage height, 13.01 ft (3.965 m) Apr. 1, from high-water mark (backwater from ice); minimum daily discharge (February to September), 1.3 ft<sup>3</sup>/s (0.037 m<sup>3</sup>/s) Sept. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1					---	8.0	800	123	66	41	44	3.5
2					---	8.0	700	111	51	27	40	3.0
3					---	8.0	600	110	49	20	30	2.6
4					---	8.5	550	178	44	15	24	2.3
5					---	8.5	500	446	40	32	18	2.0
6					---	8.5	490	274	40	61	12	1.8
7					---	9.0	480	214	48	65	9.9	1.7
8					---	9.0	470	174	46	44	7.8	1.6
9					---	9.0	460	133	57	39	6.7	1.5
10					---	9.0	450	139	73	69	5.4	1.4
11					---	9.5	450	555	64	61	6.2	1.3
12					---	9.5	600	444	62	44	5.8	3.0
13					---	9.5	900	312	47	32	5.8	2.6
14					---	10	1110	257	34	27	5.2	2.2
15					---	11	1120	321	30	22	5.0	2.0
16					---	12	1080	300	26	27	4.4	5.0
17					---	13	846	549	24	263	3.8	4.5
18					---	25	638	829	22	131	3.8	4.0
19					---	25	521	615	21	83	4.0	3.5
20					---	20	410	495	22	61	4.2	3.0
21					---	19	455	387	22	534	5.6	2.7
22					---	19	279	281	19	419	5.8	2.4
23					---	19	257	218	20	249	7.1	2.1
24					7.5	19	237	178	24	155	8.0	1.9
25					7.5	20	204	170	22	161	11	1.7
26					7.5	20	175	139	19	93	8.6	1.6
27					7.5	21	168	122	11	62	7.0	3.0
28					8.0	23	152	103	11	44	6.0	7.0
29					---	30	142	95	33	44	5.0	10
30					---	100	132	83	58	61	4.5	10
31					---	900	---	76	---	53	4.0	---
TOTAL					---	1420.0	15376	8431	1105	3039	318.6	94.9
MEAN					---	45.8	513	272	36.8	98.0	10.3	3.16
MAX					---	900	1120	829	73	534	44	10
MIN					---	8.0	132	76	11	15	3.8	1.3
AC-FT					---	2820	30500	16720	2190	6030	632	188

## RED RIVER OF THE NORTH BASIN

05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN

LOCATION.--Lat 47°53'15", long 96°16'25", in NW¼ sec.22, T.151 N., R.44 W., Red Lake County, Hydrologic Unit 09020305, on left bank 40 ft (12 m) downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 mi (2.3 km) upstream from mouth, and 3 mi (5 km) downstream from Badger Creek.

DRAINAGE AREA.--1,370 mi<sup>2</sup> (3,550 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--June 1909 to September 1917, October 1934 to September 1981. Monthly discharge only for October, November, 1934, published in WSP 1308. October 1981 to February 1982, operated as a high-flow partial-record station. March to September 1982.

REVISED RECORDS.--WSP 355: 1911-12. WSP 1438: 1910-11, 1917(M).

GAGE.--Water-stage recorder. Datum of gage is 949.49 ft (289.405 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 12, 1911, nonrecording gage at site 0.5 mi (0.8 km) upstream and Sept. 12, 1911, to Sept. 30, 1917, nonrecording gage at site 40 ft (12 m) upstream at different datum.

REMARKS.--Records good except those for winter period, which are poor.

AVERAGE DISCHARGE.--55 years (water years 1910-17, 1935-81), 315 ft<sup>3</sup>/s (8.921 m<sup>3</sup>/s), 228,200 acre-ft/yr (281 hm<sup>3</sup>/yr); median of yearly mean discharges, 283 ft<sup>3</sup>/s (8.01 m<sup>3</sup>/s), 205,000 acre-ft/yr (253 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,300 ft<sup>3</sup>/s (292 m<sup>3</sup>/s) Apr. 25, 1979, gage height, 12.38 ft (3.773 m); maximum gage height observed, 17.5 ft (5.344 m) Apr. 5, 1913, site and datum then in use (backwater from ice); no flow Sept. 15, 1936, Sept. 14, 1939, Aug. 19-22, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,160 ft<sup>3</sup>/s (118 m<sup>3</sup>/s) Apr. 15, gage height, 7.76 ft (2.365 m); maximum gage height, 10.70 ft (3.261 m) Mar. 31 (backwater from ice); minimum discharge (March to September 1982), 29 ft<sup>3</sup>/s (0.82 m<sup>3</sup>/s) Sept. 11, gage height, 1.78 ft (0.543 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						120	2940	635	514	282	431	40
2						110	2890	596	455	239	416	36
3						98	2630	561	410	209	345	36
4						95	2430	806	380	205	310	36
5						97	2230	1540	368	264	275	38
6						150	2040	1700	351	420	266	38
7						125	1850	1300	364	372	251	36
8						80	1670	972	358	299	230	36
9						68	1510	809	361	273	200	34
10						92	1370	725	392	259	173	37
11						93	1380	914	452	284	168	31
12						93	1550	1480	412	290	187	38
13						93	2060	1330	361	263	165	40
14						94	2810	1140	312	266	147	43
15						94	3520	1140	267	224	142	41
16						110	3920	1470	221	210	135	52
17						150	3840	1680	197	673	116	58
18						200	3110	2200	183	709	101	67
19						300	2720	2410	175	509	102	65
20						200	2460	2170	170	417	92	67
21						190	2220	1870	175	1010	79	64
22						190	2010	1590	176	1250	77	60
23						200	1780	1320	178	921	74	55
24						200	1600	1100	181	688	73	54
25						210	1400	955	188	620	66	46
26						210	1250	840	191	653	62	41
27						210	1090	750	183	546	59	44
28						210	901	719	189	445	55	52
29						700	791	644	212	421	49	64
30						2700	688	599	281	443	41	71
31						3400	---	549	---	461	41	---
TOTAL						10882	62660	36514	8657	14125	4928	1420
MEAN						351	2089	1178	289	456	159	47.3
MAX						3400	3920	2410	514	1250	431	71
MIN						68	688	549	170	205	41	31
AC-FT						21580	124300	72430	17170	28020	9770	2820

## RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN

LOCATION.--Lat 47°46'32", long 96°36'33", in SW¼SW¼ sec.30, T.150 N., R.46 W., Polk County, Hydrologic Unit 09020303, on right bank at downstream side of Sargent Street bridge in Crookston, 0.3 mi (0.5 km) downstream from Interstate Power Co.'s dam, 0.6 mi (1.0 km) downstream from bridge on U.S. Highway 75, and 53 mi (85 km) upstream from mouth.

DRAINAGE AREA.--5,280 mi<sup>2</sup> (13,680 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1901 to current year. Monthly discharge only for some periods, published in WSP 1308.

Figures of daily discharge for Apr. 3-30, 1904, published in WSP 130, have been found unreliable and should not be used.

REVISED RECORDS.--WSP 1115: 1906, 1915-16, 1919-20, 1922, 1925, 1927, 1929. WSP 1308: 1916(M), 1919(M), 1928(M), 1930(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 832.72 ft (253.813 m) National Geodetic Vertical Datum of 1929. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft (91 m) upstream at same datum. July 1, 1909, to Sept. 25, 1911, nonrecording gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, Oct. 1, 1919, to Sept. 30, 1930, nonrecording gage, at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Diurnal fluctuation prior to 1975 caused by powerplant 1,000 ft (300 m) upstream. Runoff from 1,950 mi<sup>2</sup> (5,050 km<sup>2</sup>) in the headwaters of Red Lake River is completely controlled by dam at outlet of Lower Red Lake. Flow partially affected by occasional regulation at Thief and Mud Lakes in Thief River basin (see station 05076000).

AVERAGE DISCHARGE.--81 years, 1,122 ft<sup>3</sup>/s (31.78 m<sup>3</sup>/s), 812,900 acre-ft/yr (1,000 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,400 ft<sup>3</sup>/s (804 m<sup>3</sup>/s) Apr. 12, 1969, gage height, 27.33 ft (8.330 m); no flow for part of July 13, 1960 (caused by regulation of powerplant upstream).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,320 ft<sup>3</sup>/s (264 m<sup>3</sup>/s) Apr. 17, gage height, 16.12 ft (4.913 m); maximum gage height, 18.52 ft (5.645 m) Apr. 1 (backwater from ice); minimum discharge, 597 ft<sup>3</sup>/s (16.9 m<sup>3</sup>/s) Dec. 7, gage height, 3.86 ft (1.177 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	932	1270	1070	1000	960	870	5600	2200	2300	1560	2020	1070
2	1670	1240	1060	1000	950	870	5000	2100	2170	1510	1960	991
3	1970	1220	1030	1000	950	860	4500	1960	2030	1430	1900	1010
4	1690	1210	998	1000	950	860	4200	2050	1960	1380	1720	992
5	1550	1160	860	1000	940	850	4000	4770	1870	1490	1700	924
6	1710	1190	688	1000	940	850	3700	4760	1790	2030	1680	958
7	2120	1150	765	1000	940	840	3400	4340	1810	2110	1610	1050
8	2020	1150	780	1000	940	830	3300	3460	1810	1970	1530	923
9	1760	1150	840	990	930	830	3300	2990	1850	1800	1460	943
10	1750	1150	900	990	930	820	3300	2770	1960	1700	1400	981
11	1730	1140	960	990	930	820	3400	2720	1970	1670	1350	1010
12	1790	1120	980	990	920	810	3500	3190	2020	1640	1360	930
13	2510	1120	1000	990	920	810	3800	3580	1920	1580	1370	1040
14	3250	1120	1000	990	920	800	4300	3360	1850	1540	1320	1010
15	2770	1130	1000	990	910	800	7510	3230	1760	1540	1310	986
16	2240	1150	1000	980	910	800	8690	3600	1670	1480	1320	962
17	1950	1160	1000	980	910	820	8860	4370	1600	1660	1230	992
18	1890	1210	1000	970	900	850	7310	4660	1550	3160	1170	1050
19	1940	1230	1000	970	900	900	6800	5480	1520	2800	1180	989
20	1860	1200	1000	970	900	900	5580	5280	1520	2330	1180	985
21	1750	910	1000	970	890	900	5060	4880	1490	2410	1180	984
22	1650	916	1000	970	890	900	4620	4420	1490	3080	1170	988
23	1550	987	1000	970	890	900	4330	4000	1460	2840	1230	987
24	1440	1150	1000	970	880	900	4000	3550	1450	2470	1130	955
25	1400	1300	1000	970	880	900	3700	3270	1430	2200	1140	944
26	1360	1210	1000	970	880	920	3380	3070	1380	2240	1110	1000
27	1330	1120	1000	970	870	940	3140	2860	1390	2340	1110	964
28	1310	1030	1000	970	870	980	2940	2730	1400	2170	1070	1010
29	1300	954	1000	970	---	1150	2610	2610	1470	2030	1060	1080
30	1310	875	1000	970	---	2000	2380	2480	1460	2020	1030	1060
31	1310	---	1000	960	---	3500	---	2400	---	2030	995	---
TOTAL	54812	33922	29931	30460	25600	30780	136210	107140	51350	62210	41995	29768
MEAN	1768	1131	966	983	914	993	4540	3456	1712	2007	1355	992
MAX	3250	1300	1070	1000	960	3500	8860	5480	2300	3160	2020	1080
MIN	932	875	688	960	870	800	2380	1960	1380	1380	995	923
AC-FT	108700	67280	59370	60420	50780	61050	270200	212500	101900	123400	83300	59040

CAL YR 1981 TOTAL 284619 MEAN 780 MAX 6560 MIN 114 AC-FT 564500  
WTR YR 1982 TOTAL 634178 MEAN 1737 MAX 8860 MIN 688 AC-FT 1258000

NOTE.--No gage-height record Jan. 25 to Mar. 15.

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued  
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1962, 1974-76, 1979 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1980 to September 1982.  
WATER TEMPERATURES: October 1980 to September 1982.

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count. Extremes are published for years with 80 percent or more daily record. Malfunctions of the monitor resulted in less than 80 percent recorded daily record for the current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPE-CIFIC CONDUCTANCE (UMHOS) (00095)	SPE-CIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESURE (MM OF HG) (00025)	TURBIDITY (NTU) (00076)
OCT 28...	0930	1310	428	438	8.6	8.2	10.0	3.0	738	8.4
JAN 18...	1515	973	--	355	--	7.9	8.0	.0	733	34
MAR 16...	1210	800	377	365	7.9	7.9	3.0	.0	732	50
MAY 04...	1355	2050	440	431	8.3	8.0	15.0	16.5	729	31
JUN 30...	1235	1430	355	358	8.6	7.9	23.0	19.5	742	25
AUG 24...	1530	1130	350	328	8.3	8.2	21.0	21.5	735	17

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED SATURATION (00301)	COLIFORMS, FECA, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI, FECA, KF AGAR (COLS. PER 100 ML) (31673)	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS, NONCARBONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM ADSORPTION RATIO (00931)
OCT 28...	--	--	K80	960	233	33	57	22	6.6	.2
JAN 18...	10.6	75	42	91	183	3.0	47	16	4.4	.1
MAR 16...	13.2	94	K52	750	190	.00	48	17	4.8	.2
MAY 04...	9.5	102	K27	2800	228	58	60	19	4.3	.1
JUN 30...	--	--	130	960	178	14	45	16	4.3	.1
AUG 24...	7.9	93	--	150	172	11	44	15	3.8	.1

DATE	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
OCT 28...	2.4	200	42	4.5	.1	5.9	292	261	1030
JAN 18...	2.4	180	11	4.2	.1	3.3	243	197	638
MAR 16...	2.8	190	13	3.3	.1	3.5	236	207	510
MAY 04...	4.5	170	59	4.6	.1	4.6	227	258	1260
JUN 30...	2.4	164	20	2.5	.2	3.0	232	192	896
AUG 24...	2.3	161	18	2.8	.1	4.1	219	187	668

## RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	SEDI- MENT, DIS- SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 28...	.20	.060	1.10	.040	.020	<.010	50	178	96
JAN 18...	.09	.090	.62	.030	.020	<.010	--	--	--
MAR 16...	.15	.180	.99	.070	.040	.020	34	73	93
MAY 04...	<.10	.080	.80	.170	.050	<.010	84	465	94
JUN 30...	<.10	.030	.80	.110	.070	.020	65	251	97
AUG 24...	<.10	<.010	1.00	.060	.020	.010	--	--	--

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA) (01007)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR) (01034)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO) (01037)
OCT 28...	0930	3	2	100	60	<1	<1	20	10	<1
JAN 18...	1515	2	1	100	57	--	<1	--	<10	--
MAY 04...	1355	3	3	<100	56	<1	<1	30	30	1
AUG 24...	1530	3	3	100	58	1	<1	10	10	7

DATE	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE) (01045)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN) (01055)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG) (71900)
OCT 28...	<1	6	2	360	29	3	1	40	15	.7
JAN 18...	<1	--	3	370	23	--	<1	20	7	.1
MAY 04...	<1	6	2	1200	41	5	5	100	17	<.1
AUG 24...	2	5	4	590	15	3	2	90	9	<.1

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
OCT 28...	.3	3	2	<1	<1	<1	<1	30	5
JAN 18...	.1	--	2	<1	<1	<1	<1	100	78
MAY 04...	<.1	5	2	<1	<1	<1	<1	30	6
AUG 24...	<.1	5	2	<1	<1	<1	<1	40	4





05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND

LOCATION.--Lat 47°56'34", long 97°03'10", in SW¼NE¼ sec.33, T.152 N., R.50 W., Grand Forks County, Hydrologic Unit 09020301, on left bank on second floor of old sewage plant in Grand Forks, 2.3 mi (3.7 km) downstream from Red Lake River, and at mile 295.7 (475.8 km).

DRAINAGE AREA.--30,100 mi<sup>2</sup> (78,000 km<sup>2</sup>), approximately, including 3,800 mi<sup>2</sup> (9,840 km<sup>2</sup>) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1882 to current year. Monthly discharge only prior to May 1901, published in WSP 1308.

REVISED RECORDS.--WSP 855: 1936(M). WSP 1115: 1942. WSP 1175: 1897(M). WSP 1388: 1904, 1914-15, 1917-19, 1921-22, 1927, 1950. WSP 1728: Drainage area. WRD-ND-81-1: 1882, 1897 (M).

GAGE.--Water-stage recorder. Datum of gage is 778.35 ft (237.241 m) National Geodetic Vertical Datum of 1929. Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mi (0.5 km) upstream at present datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

REMARKS. Records good.

AVERAGE DISCHARGE.--100 years, 2,546 ft<sup>3</sup>/s (72.10 m<sup>3</sup>/s) 1,845,000 acre-ft/yr (2.27 km<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, about 85,000 ft<sup>3</sup>/s (2,410 m<sup>3</sup>/s) Apr. 10, 1897, gage height, 50.2 ft (15.30 m), site and datum then in use, from rating curve extended above 54,000 ft<sup>3</sup>/s (1,530 m<sup>3</sup>/s); minimum, 1.8 ft<sup>3</sup>/s (0.051 m<sup>3</sup>/s) Sept. 2, 1977, caused by unusual regulation during repair of dam at Grand Forks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 23,900 ft<sup>3</sup>/s (677 m<sup>3</sup>/s) Apr. 12, gage height, 37.18 ft (11.332 m); minimum daily, 884 ft<sup>3</sup>/s (25.0 m<sup>3</sup>/s) Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	884	2170	1470	1200	990	1290	11400	5960	4810	2430	2860	1350
2	960	2110	1380	1200	990	1280	13600	5490	4660	2500	2810	1330
3	1370	2060	1290	1200	990	1250	15600	5090	4450	2530	2720	1320
4	1920	1990	1200	1200	990	1250	17400	4840	4200	2460	2610	1300
5	2040	1900	1190	1200	990	1250	18500	5060	4020	2490	2470	1290
6	1890	1830	1080	1190	990	1250	18800	6460	3900	2530	2410	1280
7	1890	1800	1040	1180	990	1260	19000	7350	3790	2820	2350	1270
8	2300	1800	1120	1170	1000	1290	19800	6800	3710	3070	2250	1250
9	2590	1840	1110	1160	1000	1320	20800	5680	3800	3100	2180	1240
10	2550	1920	1050	1160	1000	1300	21000	4900	3790	3010	2080	1190
11	2480	1950	1040	1160	1000	1290	23100	4600	3750	2920	2000	1200
12	2550	1950	1060	1150	1010	1280	23600	4500	3730	2960	1980	1220
13	2640	1950	1080	1150	1020	1290	23900	4800	3700	2920	1900	1240
14	3040	1950	1150	1150	1030	1320	23800	5150	3600	2830	1880	1250
15	3840	1990	1170	1140	1040	1360	23700	5210	3450	2840	1870	1270
16	3970	2000	1110	1140	1050	1380	23600	5400	3300	2790	1860	1260
17	3570	2010	1090	1120	1060	1450	23400	5810	3160	2710	1830	1270
18	3140	2030	1080	1100	1080	1540	23200	6520	3010	2700	1740	1260
19	2870	2060	1100	1100	1100	1700	22700	7200	2910	3630	1690	1320
20	2890	2050	1100	1140	1120	2000	21600	7850	2840	4080	1650	1310
21	2910	1790	1100	1140	1140	2260	19700	8100	2780	4090	1570	1270
22	2840	1510	1100	1150	1160	2610	16700	8050	2730	4040	1500	1250
23	2730	1250	1100	1150	1180	3010	14000	7820	2690	4470	1440	1240
24	2650	1380	1100	1150	1200	3300	12100	7460	2680	4580	1440	1270
25	2550	1650	1100	1120	1200	3450	10700	6910	2610	4230	1350	1240
26	2410	1700	1100	1100	1210	3650	9660	6420	2550	3860	1290	1220
27	2340	1650	1100	1080	1210	3900	8860	6000	2520	3620	1350	1250
28	2280	1400	1100	1070	1250	4150	8060	5650	2520	3570	1430	1290
29	2230	1400	1100	1020	---	4690	7290	5350	2490	3390	1470	1290
30	2170	1500	1100	1020	---	6280	6540	5110	2450	3120	1440	1290
31	2170	---	1100	1020	---	9120	---	4930	---	2920	1410	---
TOTAL	76664	54590	35010	35230	29990	73770	522110	186470	100600	99210	58830	38030
MEAN	2473	1820	1129	1136	1071	2380	17400	6015	3353	3200	1898	1268
MAX	3970	2170	1470	1200	1250	9120	23900	8100	4810	4580	2860	1350
MIN	884	1250	1040	1020	990	1250	6540	4500	2450	2430	1290	1190
AC-FT	152100	108300	69440	69880	59490	146300	1036000	369900	199500	196800	116700	75430
WTR YR 1982	TOTAL	1310504	MEAN	3590	MAX	23900	MIN	884	AC-FT	2599000		

## RED RIVER OF THE NORTH BASIN

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND--Continued

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1949 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (STAND- ARD UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	HARD- NESS AS CACO3 (00900)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)
APR 23...	1025	14200	460	7.7	20.0	9.5	205	47	49	20
AUG 25...	1250	1300	364	8.4	12.0	22.0	188	14	44	19
25...	1251	1300	364	8.4	--	22.0	188	20	47	17

DATE	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR- BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA- LILITY LAB (MG/L AS CACO3) (90410)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2) (00405)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)
APR 23...	15	.5	7.2	192	.00	158	6.1	67	7.5	.2
AUG 25...	7.0	.2	3.8	213	.00	170	1.3	23	4.8	.2
25...	7.7	.3	3.1	--	--	168	1.3	26	4.5	.1

DATE	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N) (00618)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BORON, DIS- SOLVED (UG/L AS B) (01020)
APR , 1982 23...	13	306	277	11700	.70	--	.09	2	50
AUG 25...	6.5	231	214	811	.23	--	--	2	80
25...	7.1	235	214	825	--	<.10	.06	3	40

DATE	LITHIUM DIS- SOLVED (UG/L AS LI) (01130)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	MOLYB- DENUM, DIS- SOLVED (UG/L AS MO) (01060)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	STRON- TIUM, DIS- SOLVED (UG/L AS SR) (01080)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
APR 23...	17	60	0	0	.3	1	0	120	--
AUG 25...	14	20	0	10	.3	1	0	100	--
25...	11	6	<1	12	<.1	6	<1	110	8

## RED RIVER OF THE NORTH BASIN

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	TEMPER- ATURE (DEG C) (00010)
OCT				
23...	1500	2690	620	4.0
NOV				
23...	1355	1220	588	.0
DEC				
22...	1200	1190	592	.0
JAN				
22...	1055	1150	482	.0
FEB				
25...	1300	1220	480	.0
MAR				
23...	1645	3120	383	.0
APR				
05...	1140	19600	312	.0
08...	1420	19800	323	.5
13...	1135	23700	340	2.0
23...	1025	14200	460	9.5
26...	1320	9680	460	12.0
MAY				
03...	1240	4860	572	15.0
10...	1050	4970	550	13.0
18...	1000	6440	568	17.0
24...	1150	7240	538	16.5
JUN				
07...	1100	3670	540	17.0
24...	1045	2660	481	20.0
JUL				
26...	1105	3780	498	25.0
AUG				
25...	1250	1300	364	22.0
25...	1251	1300	364	22.0
SEP				
24...	1005	1320	355	12.0

## RED RIVER OF THE NORTH BASIN

05087500 MIDDLE RIVER AT ARGYLE, MN

LOCATION.--Lat 48°20'25", long 96°48'58", in NE¼NW¼ sec.15, T.156 N., R.48 W., Marshall County, Hydrologic Unit 09020309, at upstream side of bridge on County Highway 4 in Argyle and 14 mi (22 km) upstream from mouth. Prior to June 29, 1982, at site 800 ft (240 m) downstream.

DRAINAGE AREA.--265 mi<sup>2</sup> (686 km<sup>2</sup>).

PERIOD OF RECORD.--March to September 1945, October 1950 to September 1981. Monthly discharge only for some periods, published in WSP 1728. October 1981 to January 1982, operated as a high-flow partial-record station. February to September 1982.

GAGE.--Non-recording gage. Datum of gage is 828.53 ft (252.536 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 8, 1951, nonrecording gage and Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at site 800 ft (240 m) downstream at datum 1.0 ft (0.30 m) higher. Sept. 19, 1952, to June 28, 1982, recording gage at site 800 feet (240 m) downstream at present datum.

REMARKS.--Records good.

AVERAGE DISCHARGE.--31 years (water years 1951-81), 41.2 ft<sup>3</sup>/s (1.167 m<sup>3</sup>/s), 29,850 acre-ft/yr (36.8 hm<sup>3</sup>/yr); median of yearly mean discharges, 37 ft<sup>3</sup>/s (1.05 m<sup>3</sup>/s), 26,800 acre-ft/yr (33 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,260 ft<sup>3</sup>/s (121 m<sup>3</sup>/s) July 3, 1975, gage height, 16.59 ft (5.057 m) present datum, site then in use; no flow at times in most years.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1950 reached a stage of 15.25 ft (4.648 m) present datum, site then in use, from floodmarks, discharge, 2,790 ft<sup>3</sup>/s (79.0 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 711 ft<sup>3</sup>/s (20.1 m<sup>3</sup>/s) Apr. 18, gage height, 9.96 ft (3.036 m) present datum, site then in use; minimum daily (February to September), 0.26 ft<sup>3</sup>/s (0.007 m<sup>3</sup>/s) Sept. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1					---	1.2	257	50	23	10	17	.75
2					---	1.2	280	45	20	8.4	37	.67
3					---	1.2	300	45	18	8.4	33	.55
4					---	1.2	270	54	15	6.9	31	.53
5					---	1.2	250	54	14	18	28	.43
6					---	1.2	230	211	13	70	27	.43
7					---	1.2	210	245	13	218	25	.43
8					---	1.2	190	199	12	225	23	.58
9					---	1.2	180	146	13	180	19	.50
10					---	1.2	180	116	13	159	16	.39
11					---	1.2	180	95	14	88	13	.26
12					---	1.2	250	84	20	67	13	.55
13					---	1.3	338	80	35	56	11	.34
14					---	1.4	450	75	34	45	9.1	.45
15					---	2.5	600	74	31	43	8.4	.55
16					---	5.0	666	76	27	58	7.3	.53
17					---	8.0	699	108	23	49	7.8	.53
18					---	10	702	169	19	42	6.7	.55
19					---	8.5	560	195	16	33	5.2	.50
20					---	10	391	199	14	29	4.1	.45
21					---	12	290	174	12	28	3.9	.41
22					---	12	225	143	10	24	2.8	.32
23					---	9.5	176	114	10	22	2.4	.30
24					---	8.0	143	92	9.4	21	1.9	.27
25					1.2	7.0	117	76	8.6	19	1.6	.34
26					1.2	6.0	99	63	8.0	17	1.7	.39
27					1.2	6.5	87	51	7.6	15	2.0	.87
28					1.2	8.0	78	44	8.4	14	2.1	.64
29					---	20	66	36	13	16	1.1	.75
30					---	40	58	30	12	14	1.1	.58
31					---	100	---	27	---	17	.99	---
TOTAL					---	290.1	8522	3170	486.0	1620.7	363.19	14.84
MEAN					---	9.36	284	102	16.2	52.3	11.7	.49
MAX					---	100	702	245	35	225	37	.87
MIN					---	1.2	58	27	7.6	6.9	.99	.26
AC-FT					---	575	16900	6290	964	3210	720	.29

RED RIVER OF THE NORTH BASIN

05092000 RED RIVER OF THE NORTH AT DRAYTON, ND

LOCATION.--Lat 48°34'20", long 97°08'50", in SE½SE½SE¼ sec.24, T.159 N., R.51 W., Pembina County, Hydrologic Unit 09020311, on downstream end of east pier of interstate highway bridge, 1.5 mi (2.4 km) northeast of Drayton, and at mile 206.7 (332.6 km).

DRAINAGE AREA.--34,800 mi<sup>2</sup> (90,130 km<sup>2</sup>), approximately, includes 3,800 mi<sup>2</sup> (9,840 km<sup>2</sup>) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1936 to June 1937, April 1941 to current year (fragmentary prior to April 1949).

REVISED RECORDS.--WSP 1388: 1949-50. WSP 1728: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 755.00 ft (230.124 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 mi (2.4 km) upstream at datum 1.59 ft (0.485 m) higher.

REMARKS.--Records good. Some regulation by reservoirs on tributaries.

AVERAGE DISCHARGE.--33 years (1949-82), 3,778 ft<sup>3</sup>/s (107.0 m<sup>3</sup>/s), 2,737,000 acre-ft/yr (3.37 km<sup>3</sup>/yr); median of yearly mean discharges, 2,650 ft<sup>3</sup>/s (75.0 m<sup>3</sup>/s), 1,920,000 acre-ft/yr (2.4 km<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 92,900 ft<sup>3</sup>/s (2,630 m<sup>3</sup>/s) Apr. 28, 1979, gage height, 43.66 ft (13.308 m); minimum observed, 7.7 ft<sup>3</sup>/s (0.22 m<sup>3</sup>/s) Oct. 16, 1936, gage height, 1.75 ft (0.533 m), former site and datum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1897 reached a stage of about 41 ft (12.5 m), at site and datum in use prior to Nov. 30, 1954.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 35,500 ft<sup>3</sup>/s (1,010 m<sup>3</sup>/s) Apr. 17, gage height, 36.78 ft (11.211 m); minimum daily, 912 ft<sup>3</sup>/s (25.8 m<sup>3</sup>/s) Feb. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	931	2290	1570	1190	940	1220	9820	10100	5150	2680	4200	1460
2	950	2290	1640	1210	940	1230	10400	8500	4950	2640	3900	1430
3	960	2270	1660	1220	922	1250	15200	7200	4800	2660	3700	1390
4	1070	2210	1550	1220	912	1280	17000	6350	4600	2690	3520	1360
5	1450	2150	1440	1220	940	1280	16500	5850	4400	3200	3360	1340
6	1870	2080	1300	1220	960	1250	20000	5700	4200	3940	3200	1320
7	1980	1980	1210	1210	970	1280	21100	7000	4050	4520	3030	1280
8	1960	1940	1100	1190	960	1280	22400	8420	3970	4900	2900	1240
9	2060	1920	1050	1190	970	1280	24200	8880	3900	5020	2750	1230
10	2380	1920	1100	1180	970	1280	25500	7820	3940	4900	2590	1240
11	2560	1970	1100	1170	970	1280	26700	6820	4000	4560	2440	1220
12	2640	2010	1050	1180	970	1290	28200	6250	4020	4140	2310	1210
13	2600	2020	1050	1160	980	1290	31700	5830	4020	3860	2210	1210
14	2600	2010	1050	1160	1000	1290	33700	5750	4040	3680	2150	1210
15	2900	2020	1080	1160	1020	1290	34900	6000	4020	3520	2080	1210
16	3680	2040	1150	1130	1040	1290	35400	6650	3920	3420	2060	1210
17	4260	2040	1170	1110	1060	1290	35400	7750	3700	3380	2020	1210
18	4200	2040	1140	1090	1080	1290	35200	8600	3590	3280	2010	1240
19	3800	2040	1120	1060	1100	1290	31000	9500	3400	3180	1960	1230
20	3460	2040	1100	1050	1140	1350	28900	10500	3300	3620	1880	1240
21	3300	2040	1100	1060	1140	1470	27500	11400	3200	4440	1790	1250
22	3300	2010	1100	1080	1150	1740	25900	11800	3160	4740	1740	1260
23	3280	1780	1100	1070	1140	2040	24700	11400	3070	4720	1660	1230
24	3140	1490	1100	1040	1110	2240	23400	10200	2990	5120	1570	1230
25	3010	1340	1100	1050	1150	2660	22200	9000	2930	5660	1510	1230
26	2820	1360	1100	1010	1170	2800	20700	7900	2840	6020	1460	1220
27	2690	1460	1100	990	1200	3010	18900	7150	2750	5940	1400	1220
28	2590	1480	1100	980	1240	3300	16700	6500	2750	5780	1360	1250
29	2500	1420	1100	970	---	3700	14300	6050	2750	5560	1370	1260
30	2410	1440	1100	960	---	4750	12100	5700	2730	5180	1450	1260
31	2360	---	1150	950	---	7050	---	5400	---	4680	1470	---
TOTAL	79711	57100	36780	34480	29144	60340	709620	241970	111140	131630	71050	37890
MEAN	2571	1903	1186	1112	1041	1946	23650	7805	3705	4246	2292	1263
MAX	4260	2290	1660	1220	1240	7050	35400	11800	5150	6020	4200	1460
MIN	931	1340	1050	950	912	1220	9820	5400	2730	2640	1360	1210
AC-FT	158100	113300	72950	68390	57810	119700	1408000	479900	220400	261100	140900	75150
WTR YR 1982	TOTAL	1600855	MEAN	4386	MAX	35400	MIN	912	AC-FT	3175000		

RED RIVER OF THE NORTH BASIN

05092000 RED RIVER OF THE NORTH AT DRAYTON, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	HARDNESS (MG/L AS CaCO3) (00900)	HARDNESS NONCARBONATE (MG/L AS CaCO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM, DIS-SOLVED (MG/L AS Na) (00930)	SODIUM ADSORPTION RATIO (00931)
APR 22...	1615	24600	470	8.6	24.0	8.5	189	51	46	18	17	.6
AUG 30...	1420	1640	492	8.5	13.5	18.0	211	28	53	19	27	.8

DATE	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	BICARBONATE, FET-LAB (MG/L AS HCO3) (95440)	CARBONATE, FET-LAB (MG/L AS CO3) (95445)	ALKALINITY LAB (MG/L AS CaCO3) (90410)	CARBON DIOXIDE SOLVED (MG/L AS CO2) (00405)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
APR 22...	7.5	168	.00	138	.7	61	18	.2	13	303	269	20100
AUG 30...	4.9	223	.00	180	1.1	37	31	.2	8.0	343	291	1520

DATE	NITROGEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELENIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRONTIUM, DIS-SOLVED (UG/L AS SR) (01080)
APR 22...	1.20	.16	2	50	16	60	0	0	.6	2	3	120
AUG 30...	.23	--	2	80	12	250	0	10	.3	1	0	150

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	TEMPERATURE (DEG C) (00010)
NOV 13...	1630	2030	690	4.5
JAN 13...	1255	1160	550	.0
FEB 02...	1330	936	530	.0
MAR 23...	1650	2100	300	.0
APR 14...	1250	33700	395	2.0
19...	1335	31000	402	6.0
22...	1615	24600	470	8.5
26...	1255	20800	518	11.0
29...	1210	14400	520	10.0
MAY 07...	1400	7010	615	14.0
10...	1230	7880	482	13.5
13...	1225	5830	640	14.0
18...	1515	8660	570	15.0
25...	1230	9000	673	17.5
JUN 08...	1210	3960	632	16.0
23...	1125	3060	615	20.0
JUL 13...	1500	3620	658	25.5
AUG 30...	1420	1640	492	18.0

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA  
(International gaging station)

LOCATION.--Lat 49°00'30", long 97°12'40", in sec.2, T.1, R.2 E., on right bank 1,500 ft (460 m) downstream from Canadian National Railway bridge in Emerson, 0.8 mi (1.3 km) downstream from international boundary, 3.6 mi (5.8 km) downstream from Pembina River, and at mile 154.3 (248.3 km).

DRAINAGE AREA.--40,200 mi<sup>2</sup> (104,100 km<sup>2</sup>), approximately, includes 3,800 mi<sup>2</sup> (9,840 km<sup>2</sup>) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March to November 1902 (gage heights only), May 1912 to September 1929 (monthly discharge only, published in WSP 1308). October 1929 to current year.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft (213.360 m) National Geodetic Vertical Datum of 1929, by Geodetic Survey of Canada. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

REMARKS.--Records good. Discharge partially regulated by reservoirs on tributaries.

COOPERATION.--This station is one of the international gaging stations maintained by Canada under agreement with the United States.

AVERAGE DISCHARGE.--70 years (water years 1913-82), 3,295 ft<sup>3</sup>/s (93.31 m<sup>3</sup>/s), 2,387,000 acre-ft/yr (2.94 km<sup>3</sup>/yr); median of yearly mean discharges, 2,630 ft<sup>3</sup>/s (74.5 m<sup>3</sup>/s), 1,910,000 acre-ft/yr (2.4 km<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 95,500 ft<sup>3</sup>/s (2,700 m<sup>3</sup>/s) May 13, 1950, gage height, 90.89 ft (27.703 m); maximum gage height, 91.19 ft (27.795 m) May 1, 1979; minimum observed discharge, 0.9 ft<sup>3</sup>/s (0.025 m<sup>3</sup>/s) Feb. 6-8, 1937.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 34,000 ft<sup>3</sup>/s (963 m<sup>3</sup>/s) Apr. 18; minimum daily, 975 ft<sup>3</sup>/s (27.6 m<sup>3</sup>/s) Feb. 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	938	2370	1280	1150	1030	1220	6130	14300	5820	2900	4320	1600
2	911	2300	1180	1190	1010	1240	8140	12900	5510	2860	3950	1580
3	911	2280	1090	1210	1010	1250	9640	10200	5260	2830	3710	1550
4	918	2250	1040	1220	1000	1270	10700	8750	5050	2830	3540	1520
5	1010	2220	1070	1220	994	1280	11900	7580	4810	3100	3410	1470
6	1340	2190	1120	1220	980	1290	12900	6610	4700	4110	3330	1450
7	1790	2130	1150	1220	975	1290	14000	6840	4610	4490	3170	1400
8	1950	2030	1170	1210	982	1290	15100	7980	4780	4760	3030	1370
9	1950	1980	1180	1190	993	1290	16000	8960	5430	4920	2940	1340
10	2040	1950	1180	1190	996	1290	16700	9110	5260	4960	2830	1300
11	2300	1940	1170	1180	1000	1300	17300	8650	5080	4790	2660	1290
12	2530	1970	1150	1170	1010	1310	18900	7980	5030	4460	2520	1290
13	2570	2000	1120	1160	1000	1320	22000	7300	4840	4150	2410	1260
14	2560	2030	1080	1160	1000	1320	28500	6890	4680	3890	2360	1250
15	2610	2050	1070	1150	1010	1320	31200	6890	4590	3710	2290	1250
16	2820	2070	1060	1150	1030	1320	32700	7090	4470	3550	2250	1270
17	3350	2080	1040	1140	1050	1330	33600	7690	4290	3500	2210	1270
18	3750	2080	1020	1130	1070	1360	34000	8600	4090	3390	2160	1280
19	3740	2070	1010	1120	1080	1370	34000	9300	3910	3280	2120	1300
20	3460	2080	1000	1110	1100	1390	33400	10100	3730	3220	2060	1290
21	3220	2100	996	1090	1110	1420	32500	10700	3580	3510	2020	1300
22	3100	2090	992	1080	1110	1480	31400	11200	3440	3950	1990	1310
23	3080	2030	1030	1100	1120	1610	30000	11300	3360	4150	1990	1310
24	3030	1870	1090	1120	1140	1840	28500	11000	3250	4220	1890	1280
25	2940	1630	1130	1130	1160	2130	26700	10400	3190	4600	1780	1280
26	2840	1500	1130	1130	1170	2480	25000	9580	3130	5200	1690	1270
27	2710	1470	1140	1140	1190	2800	23400	8760	3050	5410	1630	1280
28	2620	1430	1140	1130	1210	3010	22100	8000	3000	5280	1550	1340
29	2540	1380	1140	1110	---	3220	19000	7280	2950	5160	1510	1340
30	2480	1330	1130	1090	---	3630	17000	6670	2930	4940	1510	1330
31	2440	---	1130	1060	---	4710	---	6210	---	4660	1570	---
TOTAL	74448	58900	34228	35670	29530	54380	662410	274820	127820	126780	76400	40370
MEAN	2402	1963	1104	1151	1055	1754	22080	8865	4261	4090	2465	1346
MAX	3750	2370	1280	1220	1210	4710	34000	14300	5820	5410	4320	1600
MIN	911	1330	992	1060	975	1220	6130	6210	2930	2830	1510	1250
AC-FT	147700	116800	67890	70750	58570	107900	1314000	545100	253500	251500	151500	80070

CAL YR 1981 TOTAL 561264 MEAN 1538 MAX 6110 MIN 246 AC-FT 1113000  
WTR YR 1982 TOTAL 1595756 MEAN 4372 MAX 34000 MIN 911 AC-FT 3165000

## RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued  
(National stream-quality accounting network station)  
(Pesticide station)

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978 to current year.

REMARKS.--Letter K indicates non-ideal colony count and letter E indicates estimated value.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	PH (STAND- ARD UNITS) (00400)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	TUR- BID- ITY (NTU) (00076)
NOV 17...	1035	E2250	650	8.6	.5	4.0	--
JAN 11...	1415	1260	600	7.9	-20.0	.0	5.2
FEB 24...	1230	1140	440	7.7	-6.5	.0	9.5
APR 27...	1335	23100	515	8.3	16.0	11.0	46
JUN 30...	1100	E2950	602	8.4	23.5	20.5	110
AUG 24...	1310	1970	534	8.4	16.0	22.0	87

DATE	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)
NOV 17...	12.9	101	K3	80	--	--
JAN 11...	12.4	87	113	176	273	65
FEB 24...	9.4	65	K17	K24	232	55
APR 27...	9.2	85	K30	480	197	49
JUN 30...	7.9	90	K13	K32	259	59
AUG 24...	7.9	93	K35	K90	206	48

DATE	TIME	PCB, TOTAL IN BOT- TOM MA- TERIAL (UG/L) (39516)	PCB, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39519)	ALDRIN, TOTAL (UG/L) (39330)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39333)	CHLOR- DANE, TOTAL (UG/L) (39350)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39351)	DDD, TOTAL (UG/L) (39360)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39363)	DDE, TOTAL (UG/L) (39365)
NOV 17...	1035	--	0	--	.0	--	.0	--	.6	--
FEB 24...	1230	<.10	--	<.01	--	<.10	--	<.01	--	<.01
APR 27...	1335	<.10	<1	<.01	<.1	<.10	<1.0	<.01	<.1	<.01

DATE	DDT, TOTAL (UG/L) (39370)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39373)	DI- AZINON, TOTAL (UG/L) (39570)	DI- ELDRIN TOTAL (UG/L) (39380)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39383)	ENDO- SULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39393)	ETHION, TOTAL (UG/L) (39398)	HEPTA- CHLOR, TOTAL (UG/L) (39410)
NOV 17...	--	.0	--	--	.1	--	--	.0	--	--
FEB 24...	<.01	--	.00	<.01	--	<.01	<.01	--	.00	<.01
APR 27...	<.01	<.1	<.01	<.01	.1	<.01	<.01	<.1	<.01	<.01

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER AT EMERSON, MANITOBA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39413)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATEL. TOTAL (UG/L) (39420)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATEL. TOTAL (UG/KG) (39423)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/L) (39340)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39343)	MALA- THION, TOTAL (UG/L) (39530)	METH- OXY- CHLOR, TOT. IN BOTTOM MATEL. TOTAL (UG/KG) (39481)	METHYL PARA- THION, TOTAL (UG/L) (39600)	METHYL TRI- THION, TOTAL (UG/L) (39790)	NAPH- THA- LENES, POLY- CHLOR. TOTAL (UG/L) (39250)
NOV 17...	.0	--	.0	--	.0	--	.0	--	--	--
FEB 24...	--	<.01	--	<.01	--	.00	--	.00	.00	<.10
APR 27...	<.1	<.01	<.1	<.01	.1	<.01	<.1	<.01	<.01	<.10

DATE	MIREX, TOTAL (UG/L) (39755)	PARA- THION, TOTAL (UG/L) (39540)	PER- THANE TOTAL (UG/L) (39034)	TOX- APHENE, TOTAL (UG/L) (39400)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39403)	TOTAL TRI- THION (UG/L) (39786)	2,4-D, TOTAL (UG/L) (39730)	2,4,5-T TOTAL (UG/L) (39740)	SILVEX, TOTAL (UG/L) (39760)
NOV 17...	--	--	--	--	.0	--	--	--	--
FEB 24...	<.01	.00	<.10	<1	--	.00	.03	.00	.00
APR 27...	<.01	<.01	<.10	<1	<10	<.01	.04	<.01	<.01

DATE	TIME	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB 24...	1230	22	68	--
APR 27...	1335	213	13300	99
JUN 30...	1100	188	--	100

## RED RIVER OF THE NORTH BASIN

05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN

LOCATION.--Lat 48°47'30", long 95°44'40", in NW¼SW¼ sec.6, T.161 N., R.39 W., Roseau County, Hydrologic Unit 09020314, on left bank 0.3 mi (0.5 km) downstream from South Fork and 1.5 mi (2.4 km) northwest of Malung.

DRAINAGE AREA.--573 mi<sup>2</sup> (1,484 km<sup>2</sup>).

PERIOD OF RECORD.--October 1946 to current year.

REVISED RECORDS.--WSP 2113: 1948, 1950, 1951, 1956(M), 1957(M), 1962(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,029.67 ft (313.843 m), adjustment of 1912.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, June 11 to July 21, which are poor. Some flow bypasses the gaging station through a natural overflow channel 0.8 mi (1.3 km) upstream and returns to river 0.5 mi (0.8 km) downstream. Overflow begins at stage of about 13.0 ft (4.0 m), discharge, 1,800 ft<sup>3</sup>/s (51.0 m<sup>3</sup>/s). These records include any flow in the overflow channel.

AVERAGE DISCHARGE.--36 years, 144 ft<sup>3</sup>/s (4.078 m<sup>3</sup>/s), 104,300 acre-ft/yr (129 hm<sup>3</sup>/yr); median of yearly mean discharges, 114 ft<sup>3</sup>/s (3.23 m<sup>3</sup>/s), 82,600 acre-ft/yr (102 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,750 ft<sup>3</sup>/s (163 m<sup>3</sup>/s) July 18, 1968, gage height, 22.32 ft (6.803 m); maximum gage height, 23.37 ft (7.123 m) Apr. 3, 1966 (backwater from ice); no flow for part of Jan. 15, 1952 (caused by construction of concrete control), July 23 to Sept. 8, 1961, Dec. 22 to Mar. 10, 1977, and Sept. 9-11, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,880 ft<sup>3</sup>/s (53.2 m<sup>3</sup>/s) Apr. 18, gage height, 13.24 ft (4.036 m); minimum, 4.0 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Jan. 18-20, gage height, 4.64 ft (1.414 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	51	33	6.7	4.9	5.7	100	254	90	16	35	38
2	22	51	31	6.7	4.9	5.7	100	232	78	15	30	35
3	32	52	29	6.9	4.9	5.9	95	216	69	15	29	31
4	46	52	28	6.9	4.9	6.0	90	204	61	20	30	28
5	59	52	22	7.4	4.8	6.1	85	198	54	40	26	25
6	64	50	26	7.4	4.7	6.1	80	210	48	130	27	21
7	70	48	31	7.4	4.6	6.1	75	219	48	170	24	13
8	78	48	27	7.4	4.6	6.1	70	207	44	160	25	13
9	70	46	24	7.4	4.6	5.9	65	198	46	150	23	14
10	69	46	22	7.2	4.6	5.8	60	184	57	130	18	12
11	66	46	22	7.2	4.4	5.7	200	178	70	110	15	11
12	65	44	22	6.3	4.3	5.8	350	173	70	95	13	9.4
13	66	46	21	5.5	4.2	5.9	600	175	65	80	12	8.9
14	69	46	20	5.1	4.2	5.9	900	173	60	65	11	8.0
15	74	44	18	4.8	4.2	6.0	1200	175	55	56	10	8.1
16	80	50	15	4.6	4.2	6.2	1400	187	50	50	9.0	8.7
17	85	48	14	4.3	4.4	6.4	1600	204	46	47	8.2	8.4
18	79	53	14	4.2	4.5	6.7	1820	245	43	44	9.5	8.6
19	70	61	13	4.0	4.6	6.9	1760	282	40	42	9.9	7.7
20	64	60	11	4.2	4.7	7.2	1430	310	37	39	8.8	7.5
21	59	48	12	4.2	4.8	7.4	1180	336	34	37	10	7.2
22	57	61	13	4.3	5.0	7.5	950	336	31	34	13	7.1
23	53	44	12	4.4	5.1	7.7	774	302	29	31	15	6.6
24	50	40	11	4.6	5.2	7.9	648	264	27	33	21	6.5
25	46	38	11	4.6	5.3	8.1	564	232	25	29	28	6.4
26	42	36	11	4.6	5.3	8.3	487	211	23	34	40	5.9
27	51	33	12	4.7	5.3	8.5	422	177	21	32	45	6.0
28	58	33	9.6	4.9	5.5	9.1	347	155	19	35	47	11
29	58	29	9.2	4.9	---	11	313	141	18	38	46	17
30	54	33	7.9	4.9	---	30	285	121	17	39	44	35
31	53	---	7.4	4.9	---	100	---	102	---	37	41	---
TOTAL	1825	1389	559.1	172.6	132.7	327.6	18050	6601	1375	1853	723.4	425.0
MEAN	58.9	46.3	18.0	5.57	4.74	10.6	602	213	45.8	59.8	23.3	14.2
MAX	85	61	33	7.4	5.5	100	1820	336	90	170	47	38
MIN	16	29	7.4	4.0	4.2	5.7	60	102	17	15	8.2	5.9
AC-FT	3620	2760	1110	342	263	650	35800	13090	2730	3680	1430	843
CAL YR 1981	TOTAL	13529.1	MEAN	37.1	MAX	502	MIN	1.2	AC-FT	26830		
WTR YR 1982	TOTAL	33433.4	MEAN	91.6	MAX	1820	MIN	4.0	AC-FT	66320		

05105300 ROSEAU RIVER BELOW ROSEAU, MN

LOCATION.--Lat 48°53'28", long 95°43'50", in SW¼SE¼ sec.31, T.163 N., R.39 W., Roseau County, Hydrologic Unit 09020314, at bridge on County Highway 28, 900 ft (274 m) downstream from Hay Creek and 3.2 mi (5.1 km) north-east of Roseau.

PERIOD OF RECORD.--Water years 1973 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPE-CIFIC CONDUCTANCE (UMHOS) (00095)	SPE-CIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATURATION) (00301)
NOV 02...	1540	54	388	372	8.6	12.0	3.0	40	11.7	89
DEC 14...	1545	25	440	347	7.8	.0	.0	30	11.0	79
JAN 25...	1600	6.1	620	630	7.6	-20.0	.0	29	2.5	18
MAR 22...	1515	9.5	510	519	7.2	.0	.0	20	4.2	30
MAY 25...	1555	258	338	339	8.1	23.0	19.0	50	8.7	98
JUL 12...	1545	124	305	315	8.2	29.0	23.0	40	8.0	98
AUG 31...	1530	44	--	285	8.2	19.0	15.0	45	8.9	92

DATE	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI, FECAL, KF AGAR (COLS./PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKALINITY LAB AS (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)
NOV 02...	K16	72	53	18	5.7	1.5	200	13	3.3	.1
DEC 14...	K32	88	49	16	5.3	1.2	180	13	3.1	.1
JAN 25...	230	K190	74	31	16	2.6	330	25	5.7	.2
MAR 22...	440	>400	58	24	13	4.5	260	18	7.7	.1
MAY 25...	120	K860	46	14	3.8	1.0	171	9.0	1.6	.1
JUL 12...	120	400	43	14	3.6	.7	160	5.0	1.5	.1
AUG 31...	96	270	38	13	3.8	.6	147	4.0	1.0	.1

DATE	SILICA, DIS-SOLVED (MG/L AS SiO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
NOV 02...	10	9	.06	1.0	<.010	<10	100	9	--	.4
DEC 14...	8.6	56	.14	--	<.010	40	88	18	17	--
JAN 25...	20	10	.19	1.2	.050	50	84	270	--	.5
MAR 22...	18	24	.39	2.9	.470	70	100	110	19	1.1
MAY 25...	7.7	54	<.10	1.7	.020	<10	77	19	23	.4
JUL 12...	8.6	8	<.10	.90	.020	100	50	9	23	.4
AUG 31...	8.2	3	<.10	1.2	.020	110	43	11	19	.4

## RED RIVER OF THE NORTH BASIN

05106500 ROSEAU RIVER AT ROSEAU LAKE, MN

LOCATION.--Lat 48°54'22", long 95°49'55", in SW¼SW¼ sec.28, T.163 N., R.40 W., Roseau County, Hydrologic Unit 09020314, at downstream side of bridge on County Road 123 at Roseau Lake, 3.5 mi (5.6 km) upstream from Pine Creek, 3.8 mi (6.1 km) downstream from Sprague Creek, and 7 mi (11 km) northwest of Roseau.

PERIOD OF RECORD.--November 1939 to current year (incomplete).

GAGE.--Water-stage recorder. Datum of gage is 1,018.59 ft (310.466 m), adjustment of 1928 (levels by Geodetic Survey of Canada); gage readings have been reduced to elevations adjustment of 1928. Prior to Aug. 26, 1970, and Oct. 18, 1979 to Sept. 30, 1980, nonrecording gage at same site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,036.86 ft (316.035 m) May 13, 1950; minimum observed, 1,019.75 ft (310.820 m) Aug. 16, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in July 1919 reached an elevation of about 1,034 ft (315.2 m).

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,032.46 ft (314.694 m) Apr. 20; minimum, less than 1,021.74 ft (311.426 m) Sept. 11-28.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22.90	23.30					29.20	30.43	24.48	22.05	23.57	22.32
2	23.69	23.22					---	30.16	24.17	21.95	23.42	22.25
3	24.02	23.18					---	29.91	23.82	21.88	23.26	22.19
4	24.24	---					---	29.69	23.44	21.85	23.05	22.16
5	24.52	---					---	29.47	23.08	22.38	22.78	22.12
6	24.69	---					---	29.23	22.85	23.94	22.59	22.05
7	24.73	---					28.94	29.00	22.80	24.84	22.73	21.98
8	24.69	---					28.33	28.77	23.04	25.13	23.28	21.86
9	24.64	---					28.15	28.53	23.19	24.94	23.32	21.76
10	24.56	---					28.57	28.31	23.78	24.59	23.14	21.74
11	24.52	---					29.10	28.06	24.26	24.27	22.88	---
12	24.45	---					29.86	27.83	24.33	23.97	22.58	---
13	24.59	---					30.29	27.57	24.11	23.52	22.34	---
14	24.88	---					31.25	27.32	23.89	23.24	22.17	---
15	24.96	---					31.85	27.27	23.69	22.90	22.04	---
16	24.90	---					31.92	27.33	23.46	22.67	21.95	---
17	24.81	---					32.15	27.36	23.20	22.60	21.88	---
18	24.69	---					32.25	27.42	22.97	22.60	21.93	---
19	24.49	---					32.42	27.47	22.80	22.57	22.51	---
20	24.26	---					32.44	27.47	22.74	22.46	22.84	---
21	24.04	---					32.43	27.45	22.75	22.35	22.67	---
22	23.83	---					32.37	27.38	22.65	22.32	22.55	---
23	23.65	---					32.27	27.26	22.51	22.26	22.54	---
24	23.47	---					32.12	27.02	22.39	22.88	22.49	---
25	---	---					31.96	26.72	22.29	23.39	22.41	---
26	23.02	---					31.76	26.42	22.21	23.29	22.38	---
27	23.30	---					31.53	26.12	22.21	22.98	22.44	---
28	23.21	---					31.28	25.79	22.19	22.79	22.48	---
29	23.20	---					31.00	25.43	22.15	22.88	22.49	22.05
30	23.27	---					30.75	25.10	22.11	23.38	22.46	22.45
31	23.32	---					---	24.79	---	23.58	22.41	---
MEAN	---	---					---	27.68	23.12	23.11	22.63	---
MAX	---	---					---	30.43	24.48	25.13	23.57	---
MIN	---	---					---	24.79	22.11	21.85	21.88	---

NOTE: Add 1,000 ft to obtain elevations in adjustment of 1928.

05107500 ROSEAU RIVER AT ROSS, MN

LOCATION.--Lat 48°54'37", long 95°55'18", in NE½SE¼ sec.27, T.163 N., R.41 W., Roseau County, Hydrologic Unit 09020314, on left bank 300 ft (91 m) downstream from highway bridge, 0.2 mi (0.3 km) north of Ross, and 2.3 mi (3.7 km) downstream from Pine Creek.

DRAINAGE AREA.--1,220 mi<sup>2</sup> (3,160 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--July 1928 to current year.

REVISED RECORDS.--WSP 1055: 1945. WSP 1175: Drainage area. WSP 1308: 1936(M). WSP 1508: 1948-49(P).

GAGE.--Water-stage recorder. Datum of gage is 1,018.44 ft (310.42 m), adjustment of 1928 (levels by Geodetic Survey of Canada). Prior to Mar. 13, 1929, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period, which are fair. High flow affected by natural storage in Roseau Lake.

AVERAGE DISCHARGE.--54 years, 262 ft<sup>3</sup>/s (7.420 m<sup>3</sup>/s), 189,800 acre-ft/yr (234 hm<sup>3</sup>/yr); median of yearly mean discharges, 235 ft<sup>3</sup>/s (6.66 m<sup>3</sup>/s), 170,000 acre-ft/yr (210 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,560 ft<sup>3</sup>/s (186 m<sup>3</sup>/s) May 12, 1950, gage height, 18.25 ft (5.563 m); no flow Aug. 29, 30, 1961, Jan. 3 to Mar. 3, 1977, Aug. 23-25, 1977 and Aug. 3, 1980.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 19 ft (5.8 m) in 1896. Other outstanding floods reached the following stages, from information by local residents: flood of July 1919, 17.5 ft (5.3 m); flood of 1927, about 16 ft (4.9 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,850 ft<sup>3</sup>/s (52.4 m<sup>3</sup>/s) Apr.21, gage height, 13.04 ft (3.975 m); minimum daily, 7.4 ft<sup>3</sup>/s (0.21 m<sup>3</sup>/s) Jan. 23-29; minimum gage height, 1.41 ft (0.430 m) Sept. 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	108	163	95	15	7.5	8.6	100	1390	293	43	202	70
2	201	156	92	15	7.5	8.7	100	1320	256	37	189	65
3	250	150	88	14	7.5	8.8	100	1240	219	33	175	60
4	277	147	85	13	7.5	8.9	100	1190	182	32	157	53
5	313	144	82	12	7.5	9.0	100	1140	149	66	136	46
6	333	141	80	12	7.5	9.1	95	1080	127	228	117	40
7	339	135	78	11	7.5	9.2	95	1030	129	341	119	34
8	337	128	76	11	7.5	9.3	90	987	143	385	157	29
9	330	118	72	10	7.5	9.4	90	943	153	364	173	23
10	319	111	68	9.8	7.5	9.5	100	899	205	324	161	20
11	314	104	66	9.4	7.5	9.6	200	852	261	281	142	18
12	304	103	64	8.8	7.6	9.8	500	810	274	247	117	17
13	322	102	62	8.4	7.6	9.8	900	757	253	202	97	16
14	358	103	60	8.0	7.6	10	1100	711	229	172	80	16
15	368	107	58	7.8	7.7	10	1300	698	209	142	66	15
16	361	114	52	7.5	7.7	10	1450	702	188	117	54	15
17	348	124	47	7.5	7.8	10	1600	703	164	107	42	14
18	331	127	42	7.5	7.9	10	1700	713	143	105	38	14
19	307	128	38	7.5	8.0	11	1750	717	127	101	68	14
20	278	121	34	7.5	8.0	11	1810	717	121	94	107	14
21	250	120	29	7.5	8.1	11	1840	713	121	86	106	13
22	225	120	27	7.5	8.2	11	1830	702	113	78	98	13
23	205	118	25	7.4	8.2	11	1820	679	102	73	95	13
24	184	114	23	7.4	8.3	11	1790	643	91	123	92	13
25	160	108	22	7.4	8.3	12	1760	611	82	184	86	12
26	155	105	20	7.4	8.4	13	1710	554	72	183	81	11
27	162	105	19	7.4	8.4	14	1660	506	66	156	79	12
28	157	103	18	7.4	8.5	16	1590	460	61	137	80	19
29	154	100	17	7.4	---	20	1510	413	53	136	80	34
30	161	98	17	7.5	---	30	1460	371	47	175	77	51
31	165	---	16	7.5	---	60	---	332	---	198	73	---
TOTAL	8076	3617	1572	284.5	218.8	400.7	30250	24583	4633	4950	3344	784
MEAN	261	121	50.7	9.18	7.81	12.9	1008	793	154	160	108	26.1
MAX	368	163	95	15	8.5	60	1840	1390	293	385	202	70
MIN	108	98	16	7.4	7.5	8.6	90	332	47	32	38	11
AC-FT	16020	7170	3120	564	434	795	60000	48760	9190	9820	6630	1560
CAL YR 1981	TOTAL	43664.3	MEAN 120	MAX 815	MIN 2.8	AC-FT 86610						
WTR YR 1982	TOTAL	82713.0	MEAN 227	MAX 1840	MIN 7.4	AC-FT 164100						

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51, NEAR CARIBOU, MN  
(International gaging station)

LOCATION.--Lat 48°58'54", long 96°27'46", in SE¼SW¼ sec.34, T.164 N., R.45 W., Kittson County, Hydrologic Unit 09020314, on left bank 400 ft (122 m) downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mi (1.0 km) west of Caribou.

DRAINAGE AREA.--1,570 mi<sup>2</sup> (4,070 km<sup>2</sup>), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April to October 1917, April 1920 to current year (no winter records in water years 1931, 1932, 1934-36, 1938-40, 1944-72). Published as "at Caribou," prior to April 1929; as "below Cutoff ditch, near Caribou" April 1929 to September 1936. Records published for both sites April 1929 to September 1930. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1308: 1938(M). WSP 1508: 1917(M), 1920, 1932(M), 1934-35(M). WSP 1913: 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 1,002.14 ft (305.452 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mi (1.0 km) upstream at datum 0.95 ft (0.290 m) lower.

REMARKS.--Records fair except those for the winter period, which are poor. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--25 years (water years 1921-30, 1933, 1937, 1941-43, 1973-82), 280 ft<sup>3</sup>/s (7.930 m<sup>3</sup>/s), 202,900 acre-ft/yr (250 hm<sup>3</sup>/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,080 ft<sup>3</sup>/s (116 m<sup>3</sup>/s) May 19, 1950, gage height, 11.81 ft (3.600 m); no flow Aug. 13, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of 1916 is reported to have reached a stage of about 15.5 ft (4.72 m) at former site.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,660 ft<sup>3</sup>/s (47.0 m<sup>3</sup>/s) Apr. 30 to May 2, gage height, 7.74 ft (2.359 m) May 1; maximum gage height, 8.11 ft (2.472 m) Apr. 15 (backwater from ice); minimum daily discharge, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Jan. 18 to Feb. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	274	150	23	12	16	95	1660	510	218	235	80
2	127	238	150	22	12	16	120	1650	458	222	243	77
3	211	223	145	21	13	16	150	1650	406	222	236	73
4	286	215	145	20	13	16	160	1630	356	214	219	68
5	319	234	140	20	13	16	160	1610	306	248	196	61
6	346	264	140	19	13	17	155	1570	269	389	180	56
7	368	266	135	18	13	17	150	1520	250	463	159	54
8	421	257	135	17	13	17	145	1490	246	512	139	47
9	491	248	135	16	13	17	140	1470	267	538	153	40
10	521	234	130	15	13	17	140	1470	304	533	180	35
11	524	226	130	15	13	18	200	1440	335	497	182	35
12	532	217	130	14	13	18	300	1400	372	443	169	32
13	552	213	130	14	13	18	400	1350	387	388	150	32
14	553	213	125	13	13	18	600	1310	375	348	124	30
15	565	214	125	13	13	18	770	1280	349	314	102	29
16	571	219	125	13	14	19	950	1250	319	282	78	25
17	567	224	120	13	14	19	1180	1230	293	249	63	25
18	550	232	115	12	14	19	1210	1200	262	212	56	23
19	532	234	70	12	14	19	1250	1160	239	182	50	24
20	506	230	45	12	14	19	1280	1110	227	154	44	22
21	472	220	40	12	14	20	1310	1070	214	138	72	23
22	435	210	37	12	14	20	1350	1030	210	115	114	21
23	399	205	34	12	15	20	1400	1010	202	98	116	23
24	370	195	32	12	15	20	1460	978	188	174	110	24
25	340	190	30	12	15	20	1500	935	173	265	101	24
26	302	180	29	12	15	20	1550	889	156	282	95	23
27	301	175	28	12	15	21	1580	830	147	269	87	26
28	300	165	27	12	15	25	1620	763	196	243	80	36
29	300	160	26	12	---	30	1640	694	225	221	81	40
30	298	155	25	12	---	40	1660	626	220	209	81	37
31	298	---	24	12	---	60	---	567	---	216	82	---
TOTAL	12453	6530	2852	454	381	646	24625	37842	8461	8858	3977	1145
MEAN	402	218	92.0	14.6	13.6	20.8	821	1221	282	286	128	38.2
MAX	571	274	150	23	15	60	1660	1660	510	538	243	80
MIN	96	155	24	12	12	16	95	567	147	98	44	21
AC-FT	24700	12950	5660	901	756	1280	48840	75060	16780	17570	7890	2270
CAL YR 1981	TOTAL	53744.0	MEAN 147	MAX 739	MIN 3.5	AC-FT 106600						
WTR YR 1982	TOTAL	108224.0	MEAN 297	MAX 1660	MIN 12	AC-FT 214700						

## RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued  
(National stream-quality accounting network station)

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1973 to current year.

WATER TEMPERATURES: October 1980 to September 1981.

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Extremes are published for those years with 80 percent or more record. Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water year 1981): Maximum, 803 micromhos Jan. 21, 1981; minimum, 261 micromhos Mar. 30, Apr. 1, 2, 1981.

WATER TEMPERATURES (water year 1981): Maximum, 27.0°C July 19, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 686 micromhos Feb. 8; minimum, 173 micromhos Apr. 3.

WATER TEMPERATURES: Maximum, 25.5°C July 20, 21; minimum, 0.0°C several days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	BARO- METRIC PRES- SURE (MM OF HG) (00025)	TUR- BID- ITY (NTU) (00076)
NOV 03...	1110	225	370	365	8.4	8.0	10.0	4.0	737	4.6
JAN 26...	1300	12	660	687	7.4	7.5	-17.0	.0	729	4.0
MAR 23...	1030	19	530	554	7.2	7.4	.5	.0	--	2.5
MAY 25...	1200	937	338	347	7.8	7.9	23.0	18.0	732	2.3
JUL 13...	1400	389	365	375	8.1	8.0	20.0	23.0	735	4.5
AUG 31...	1130	80	357	375	8.4	8.4	19.0	15.0	732	4.4

DATE	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED SATUR- ATION (PER- CENT) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS (MG/L) (00900)	HARD- NESS NONCAR- BONATE AS CACO3 (95902)	CALCIUM DIS- SOLVED (MG/L) AS CA (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L) AS MG (00925)	SODIUM, DIS- SOLVED (MG/L) AS NA (00930)	SODIUM AD- SORP- TION RATIO (00931)
NOV 03...	11.0	87	K9	39	202	12	48	20	5.7	.2
JAN 26...	.6	4	31	180	356	.00	83	36	13	.3
MAR 23...	1.2	9	K6	40	280	.00	66	28	12	.3
MAY 25...	7.0	77	K8	K840	176	8.0	44	16	3.6	.1
JUL 13...	6.2	75	48	220	194	2.0	48	18	4.8	.2
AUG 31...	9.1	94	K56	530	200	11	47	20	5.2	.2

## RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	POTASSIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
NOV 03...	1.5	190	14	3.5	.1	13	275	220	167
JAN 26...	2.8	380	16	4.2	.2	24	473	410	15.3
MAR 23...	2.5	300	15	4.3	.2	19	353	327	17.9
MAY 25...	2.4	168	12	2.3	.1	6.2	246	188	622
JUL 13...	1.0	192	8.0	1.9	.2	10	274	207	288
AUG 31...	1.1	189	10	2.5	.2	10	261	210	56.4

DATE	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	PHOSPHORUS, ORTHOPHENOLIC, DIS-SOLVED (MG/L AS P) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SEDIMENT, SUSPENDED, SIEVE DIAM. % FINER THAN .062 MM (70331)	
NOV 03...	.06	.050	.24	.030	.010	<.010	30	18	94
JAN 26...	.07	.500	1.40	.080	.050	.050	92	3.0	90
MAR 23...	<.01	.460	1.20	.050	.030	.010	29	1.5	98
MAY 25...	<.10	.070	1.10	.090	.060	.040	23	57	92
JUL 13...	<.10	.100	1.20	.140	.060	.050	12	13	96
AUG 31...	<.10	.020	1.10	.040	.040	.030	7	1.5	88

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	CHROMIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)
NOV 03...	1110	2	1	100	40	<1	<1	20	10	<1
JAN 26...	1300	3	3	<100	100	<1	<1	30	20	1
MAY 25...	1200	2	1	<100	39	<1	<1	10	10	2
AUG 31...	1130	3	3	<100	40	4	2	30	20	2

DATE	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)
NOV 03...	1	5	1	280	92	2	1	20	9	<.1
JAN 26...	--	7	--	1100	750	8	--	1700	1700	.1
MAY 25...	1	9	3	310	96	4	4	60	17	<.1
AUG 31...	2	12	4	330	72	4	3	30	8	<.1

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
NOV 03...	<.1	3	1	<1	<1	<1	<1	40	<4
JAN 26...	<.1	6	--	<1	<1	<1	<1	30	30
MAY 25...	<.1	4	1	<1	<1	<1	<1	40	3
AUG 31...	<.1	6	2	<1	<1	<1	<1	40	<4

DATE	TIME	PCB, TOTAL (UG/L) (39516)	NAPH- THA- LENES, POLY- CHLOR. TOTAL (UG/L) (39250)	ALDRIN, TOTAL (UG/L) (39330)	CHLOR- DANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L) (39360)	DDE, TOTAL (UG/L) (39365)	DDT, TOTAL (UG/L) (39370)	DI- AZINON, TOTAL (UG/L) (39570)	DI- ELDRIN TOTAL (UG/L) (39380)
MAR 23...	1030	<.10	<.10	<.01	<.10	<.01	<.01	<.01	.01	<.01
MAY 25...	1200	<.10	<.10	<.01	<.10	<.01	<.01	<.01	.01	<.01

DATE	ENDO- SULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)	ETHION, TOTAL (UG/L) (39398)	HEPTA- CHLOR, TOTAL (UG/L) (39410)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MALA- THION, TOTAL (UG/L) (39530)	METH- OXY- CHLOR, TOTAL (UG/L) (39480)	METHYL THION, TOTAL (UG/L) (39600)	METHYL THION, TOTAL (UG/L) (39790)
MAR 23...	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
MAY 25...	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01

DATE	MIREX, TOTAL (UG/L) (39755)	PARA- THION, TOTAL (UG/L) (39540)	PER- THANE TOTAL (UG/L) (39034)	TOX- APHENE, TOTAL (UG/L) (39400)	TOTAL TRI- THION (UG/L) (39786)	2,4-D, TOTAL (UG/L) (39730)	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	SILVEX, TOTAL (UG/L) (39760)
MAR 23...	<.01	<.01	<.10	<1	<.01	<.01	<.01	<.01	<.01
MAY 25...	<.01	<.01	<.10	<1	<.01	<.01	<.01	<.01	<.01

DATE	TIME	PCB, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39519)	PCN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39251)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39333)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39351)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39363)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39368)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39373)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39383)
NOV 03...	1110	<1	<1.0	<.1	<1.0	.6	<.1	<.1	<.1
MAY 25...	1200	<1	<1.0	<.1	<1.0	<.1	<.1	<.1	<.1

DATE	ENDO- SULFAN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39389)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39393)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39413)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG) (39423)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39343)	METH- OXY- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39481)	MIREX, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39758)	PER- THANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (81886)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG) (39403)
NOV 03...	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.10	<1.0
MAY 25...	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<1.00	<10

## RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	366	342	353	364	360	362	394	390	391	---	---	---
2	368	346	363	361	355	357	398	393	396	---	---	---
3	361	354	357	355	351	352	403	398	401	---	---	---
4	356	343	347	352	348	349	406	402	404	---	---	---
5	347	326	337	361	344	350	421	406	415	---	---	---
6	326	315	319	359	346	349	421	415	418	---	---	---
7	323	313	318	354	347	350	424	418	421	---	---	---
8	344	323	334	356	351	354	428	424	427	---	---	---
9	343	338	340	355	352	353	435	428	432	---	---	---
10	344	341	342	359	353	355	444	436	440	---	---	---
11	347	344	345	361	359	360	448	444	446	---	---	---
12	346	338	341	363	359	361	448	445	446	---	---	---
13	349	342	344	369	362	365	453	446	450	---	---	---
14	351	336	345	369	368	368	468	454	461	---	---	---
15	348	328	338	370	368	369	486	468	475	---	---	---
16	347	324	340	370	367	368	492	484	489	---	---	---
17	349	314	331	371	368	369	499	491	496	---	---	---
18	349	346	348	369	366	368	507	500	504	---	---	---
19	349	343	346	366	363	364	524	506	514	---	---	---
20	359	353	356	365	359	362	528	515	523	---	---	---
21	359	356	358	369	359	364	514	501	508	---	---	---
22	358	348	352	374	369	372	502	498	499	---	---	---
23	355	349	352	371	369	370	499	496	497	---	---	---
24	359	355	357	378	371	374	497	494	496	---	---	---
25	365	359	363	384	378	382	495	493	494	---	---	---
26	360	353	356	386	384	385	499	494	497	---	---	---
27	356	353	354	395	386	392	503	499	501	654	650	652
28	362	355	358	398	393	396	---	---	---	655	653	654
29	372	361	367	399	396	397	---	---	---	656	655	655
30	371	362	367	398	393	396	---	---	---	655	652	654
31	365	362	363	---	---	---	---	---	---	653	653	653
MONTH	372	313	348	399	344	367						
DAY	FEBRUARY			MARCH			APRIL			MAY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	653	652	653	594	591	592	302	271	295	284	281	282
2	653	652	653	591	590	591	306	229	264	288	282	285
3	654	652	653	591	589	590	272	173	209	289	284	286
4	660	654	657	590	589	589	186	176	181	294	290	292
5	670	661	666	592	589	590	195	190	192	296	291	294
6	680	671	675	593	591	591	202	199	200	297	295	296
7	685	681	683	594	592	593	209	205	207	297	295	296
8	686	684	685	599	594	597	220	213	217	299	296	298
9	685	683	684	603	599	601	236	225	230	297	296	296
10	683	683	683	608	603	605	241	225	233	298	296	297
11	683	682	683	611	608	609	267	261	264	299	295	297
12	683	682	683	613	610	612	266	247	256	300	297	298
13	684	682	683	613	610	612	253	231	243	299	297	298
14	685	683	684	610	606	608	234	215	222	302	299	301
15	684	682	683	606	597	603	219	208	213	305	301	303
16	682	680	681	596	586	591	213	208	210	310	306	308
17	680	675	678	585	572	580	215	205	208	318	310	314
18	675	667	671	573	560	568	227	218	224	322	317	320
19	667	658	662	560	556	558	225	209	217	326	321	324
20	658	646	653	557	551	555	238	212	228	333	327	330
21	646	635	640	556	548	551	241	238	240	337	333	335
22	634	625	629	549	544	547	244	240	242	340	337	338
23	626	617	621	544	539	542	265	245	252	342	338	340
24	617	611	614	535	528	532	261	256	258	342	340	341
25	610	605	607	525	521	523	259	257	258	343	339	340
26	604	600	602	518	507	513	258	255	256	345	341	342
27	601	597	599	504	499	501	270	260	267	353	345	349
28	597	593	595	495	431	477	275	270	272	363	352	356
29	---	---	---	425	287	374	278	274	276	368	362	366
30	---	---	---	315	243	284	282	278	280	376	364	370
31	---	---	---	280	237	254	---	---	---	382	376	379
MONTH	686	593	656	613	237	546	306	173	237	382	281	318

## RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	JUNE			JULY			AUGUST			SEPTEMBER		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	430	367	374	415	401	407	404	402	403			
2	373	367	370	415	411	413	405	404	404			
3	375	370	373	416	411	413	405	403	404			
4	371	365	368	419	413	416	405	404	404			
5	372	365	368	414	394	402	405	404	404			
6	378	369	373	393	383	387	405	404	404			
7	380	372	378	384	375	380	405	404	404			
8	379	375	377	387	379	383	405	404	404			
9	379	374	376	387	380	383	405	404	404			
10	381	375	378	383	364	379	405	404	404			
11	381	360	373	362	359	360	405	404	404			
12	357	348	351	366	361	364	405	404	404			
13	351	330	339	365	362	364	405	404	404			
14	338	330	334	367	361	363	405	404	404			
15	347	338	344	371	366	368	405	404	405			
16	349	344	348	378	370	373	405	404	405			
17	354	349	352	378	374	376	---	---	---			
18	353	349	351	381	377	378	---	---	---			
19	353	349	351	382	376	379	---	---	---			
20	363	354	359	388	380	383	---	---	---			
21	365	360	363	388	383	386	---	---	---			
22	362	359	361	389	386	388	---	---	---			
23	364	358	361	397	387	390	---	---	---			
24	365	361	363	388	376	382	---	---	---			
25	363	359	361	379	375	377	---	---	---			
26	371	360	366	389	373	381	---	---	---			
27	377	368	372	387	384	385	---	---	---			
28	399	369	386	390	385	388	---	---	---			
29	409	398	404	403	386	397	---	---	---			
30	407	402	404	404	402	403	---	---	---			
31	---	---	---	404	402	403	---	---	---			
MONTH	430	330	366	419	359	386						

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	8.5	6.5	7.5	4.5	4.0	4.5	.0	.0	.0	---	---	---
2	9.0	7.5	8.0	4.5	3.5	4.0	.0	.0	.0	---	---	---
3	9.0	8.0	8.5	5.0	3.5	4.5	.0	.0	.0	---	---	---
4	9.0	8.5	9.0	6.0	4.5	5.5	.0	.0	.0	---	---	---
5	9.0	8.5	9.0	6.0	4.5	5.5	.0	.0	.0	---	---	---
6	9.0	8.0	8.5	4.5	3.5	4.0	.0	.0	.0	---	---	---
7	9.0	8.0	8.5	4.5	3.5	4.0	.0	.0	.0	---	---	---
8	9.5	8.5	9.0	3.5	.0	2.0	.0	.0	.0	---	---	---
9	9.0	9.0	9.0	1.5	.5	1.0	.0	.0	.0	---	---	---
10	10.0	9.0	9.0	1.0	.5	.5	.0	.0	.0	---	---	---
11	10.0	9.0	9.5	1.0	.0	.5	.0	.0	.0	---	---	---
12	10.0	10.0	10.0	2.0	.0	.5	.0	.0	.0	---	---	---
13	10.0	9.5	10.0	1.0	.0	.5	.0	.0	.0	---	---	---
14	9.5	9.0	9.0	4.0	3.0	3.5	.0	.0	.0	---	---	---
15	9.0	8.5	9.0	4.0	3.5	4.0	.0	.0	.0	---	---	---
16	9.0	8.5	9.0	3.5	.5	1.5	.0	.0	.0	---	---	---
17	9.0	8.0	9.0	2.5	.5	.5	.0	.0	.0	---	---	---
18	8.0	6.0	7.0	2.0	.0	.5	.0	.0	.0	---	---	---
19	6.5	5.5	6.0	1.5	.0	.5	.0	.0	.0	---	---	---
20	6.5	5.5	6.0	.0	.0	.0	.0	.0	.0	---	---	---
21	5.0	3.5	4.5	.0	.0	.0	.0	.0	.0	---	---	---
22	3.5	2.0	3.0	.0	.0	.0	.0	.0	.0	---	---	---
23	2.0	1.0	1.5	.0	.0	.0	.0	.0	.0	---	---	---
24	1.0	.0	.5	.0	.0	.0	.0	.0	.0	---	---	---
25	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	1.0	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	2.5	1.0	1.5	.0	.0	.0	---	---	---	.0	.0	.0
29	4.0	2.0	3.0	.0	.0	.0	---	---	---	.0	.0	.0
30	5.0	4.0	4.5	.0	.0	.0	---	---	---	.0	.0	.0
31	5.0	4.5	5.0	---	---	---	---	---	---	.0	.0	.0
MONTH	10.0	.0	6.5	6.0	.0	1.5						

## RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.0	11.0	12.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	15.5	13.5	14.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	17.0	14.5	15.5
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	17.0	15.5	16.5
5	.0	.0	.0	.0	.0	.0	.5	.5	.5	15.5	13.5	14.0
6	.0	.0	.0	.0	.0	.0	.5	.5	.5	13.5	11.5	12.5
7	.0	.0	.0	.0	.0	.0	.5	.5	.5	11.5	9.5	10.0
8	.0	.0	.0	.0	.0	.0	.5	.5	.5	11.0	9.0	10.0
9	.0	.0	.0	.0	.0	.0	.5	.5	.5	11.0	10.0	10.5
10	.0	.0	.0	.0	.0	.0	.5	.5	.5	10.0	9.5	9.5
11	.0	.0	.0	.0	.0	.0	.5	.5	.5	11.0	9.5	10.0
12	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	12.0	11.0	11.5
13	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	12.0	11.5	11.5
14	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	12.0	11.5	12.0
15	.0	.0	.0	.0	.0	.0	3.0	1.0	1.5	13.0	12.0	12.5
16	.0	.0	.0	.0	.0	.0	6.0	3.5	5.0	13.5	13.0	13.0
17	.0	.0	.0	.0	.0	.0	7.0	5.0	6.0	13.5	12.5	13.0
18	.0	.0	.0	.0	.0	.0	7.5	6.0	7.0	14.0	13.5	14.0
19	.0	.0	.0	.0	.0	.0	7.0	6.0	6.5	14.0	13.5	14.0
20	.0	.0	.0	.0	.0	.0	6.0	5.0	5.5	15.0	13.0	14.0
21	.0	.0	.0	.0	.0	.0	6.5	5.0	5.5	15.5	14.0	15.0
22	.0	.0	.0	.0	.0	.0	8.0	6.0	7.0	16.5	14.5	15.5
23	.0	.0	.0	.0	.0	.0	10.5	8.0	9.0	17.5	15.5	16.5
24	.0	.0	.0	.0	.0	.0	12.5	10.5	11.0	18.5	16.5	17.5
25	.0	.0	.0	.0	.0	.0	12.5	10.0	11.0	19.0	18.0	18.5
26	.0	.0	.0	.0	.0	.0	10.0	8.5	9.0	20.0	18.0	19.0
27	.0	.0	.0	.0	.0	.0	10.5	8.5	9.5	21.5	19.5	20.5
28	.0	.0	.0	.0	.0	.0	11.0	9.5	10.0	22.5	21.0	22.0
29	---	---	---	.0	.0	.0	11.0	10.0	10.5	23.0	21.5	22.0
30	---	---	---	.0	.0	.0	11.5	9.5	10.5	21.5	19.0	20.0
31	---	---	---	.0	.0	.0	---	---	---	18.5	16.5	17.5
MONTH	.0	.0	.0	.0	.0	.0	12.5	.0	4.5	23.0	9.0	14.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	16.5	14.5	15.0	23.0	19.5	21.0	21.5	21.0	21.5	---	---	---
2	16.5	13.5	15.0	21.5	20.5	21.0	21.0	21.0	21.0	---	---	---
3	17.5	15.0	16.5	23.5	20.0	21.5	21.0	21.0	21.0	---	---	---
4	18.0	15.5	16.5	23.5	21.5	22.5	21.0	21.0	21.0	---	---	---
5	17.0	16.0	16.5	22.0	20.5	21.5	21.0	21.0	21.0	---	---	---
6	16.5	16.0	16.0	23.0	20.5	21.5	21.0	21.0	21.0	---	---	---
7	15.5	14.0	15.0	22.5	20.5	21.5	21.0	21.0	21.0	---	---	---
8	14.0	13.0	13.5	21.0	19.5	20.5	21.0	21.0	21.0	---	---	---
9	13.5	12.5	13.0	21.5	20.0	20.5	21.0	21.0	21.0	---	---	---
10	16.0	12.0	13.5	21.5	20.0	21.0	21.0	21.0	21.0	---	---	---
11	18.0	15.0	16.0	23.0	20.5	21.5	21.0	21.0	21.0	---	---	---
12	17.5	15.5	16.5	24.0	21.5	23.0	21.0	21.0	21.0	---	---	---
13	17.5	16.0	16.5	23.5	22.0	22.5	21.5	21.0	21.0	---	---	---
14	19.5	17.0	18.0	23.0	20.5	21.5	21.5	21.0	21.0	---	---	---
15	20.0	17.5	18.5	23.5	22.0	22.5	21.5	21.0	21.0	---	---	---
16	20.0	17.5	18.5	24.0	22.0	23.0	21.5	21.0	21.5	---	---	---
17	19.5	17.5	18.5	24.0	21.5	22.5	21.5	21.5	21.5	---	---	---
18	19.0	17.5	18.0	22.0	19.5	21.0	---	---	---	---	---	---
19	18.0	16.5	17.0	23.0	20.0	21.5	---	---	---	---	---	---
20	17.5	15.5	16.5	25.5	21.0	23.0	---	---	---	---	---	---
21	19.0	16.0	17.5	25.5	22.5	24.0	---	---	---	---	---	---
22	20.0	16.5	18.5	24.5	22.0	23.5	---	---	---	---	---	---
23	21.5	18.5	20.0	24.0	21.5	23.0	---	---	---	---	---	---
24	21.0	18.5	20.0	25.0	23.0	24.0	---	---	---	---	---	---
25	21.0	16.5	18.5	25.0	22.5	24.0	---	---	---	---	---	---
26	22.0	18.5	20.0	25.5	22.5	24.0	---	---	---	---	---	---
27	23.5	20.0	21.5	24.5	23.5	24.0	---	---	---	---	---	---
28	22.0	20.0	21.0	25.0	22.0	23.5	---	---	---	---	---	---
29	21.5	18.0	19.5	24.5	20.5	21.5	---	---	---	---	---	---
30	22.0	18.5	20.0	22.5	21.0	22.0	---	---	---	---	---	---
31	---	---	---	22.5	21.5	22.0	---	---	---	---	---	---
MONTH	23.5	12.0	17.5	25.5	19.5	22.5						

LAKE OF THE WOODS BASIN  
05124480 KAWISHIWI RIVER NEAR ELY, MN

(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'22", long 91°32'06", in SE¼SE¼ sec.24, T.63 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on left bank upstream from rapids, 2 mi (3 km) upstream from South Kawishiwi River, 2.2 mi (3.5 km) southwest of Fernberg Lookout Tower and 14 mi (23 km) east of Ely.

DRAINAGE AREA.--253 mi<sup>2</sup> (655 km<sup>2</sup>).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,450 ft (442 m), from topographic map.

REMARKS.--Records fair.

AVERAGE DISCHARGE.--16 years, 217 ft<sup>3</sup>/s (6.145 m<sup>3</sup>/s), 11.65 in/yr (296 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,720 ft<sup>3</sup>/s (48.7 m<sup>3</sup>/s) Apr. 24, 1976, gage height, 5.92 ft (1.804 m); minimum 4.5 ft<sup>3</sup>/s (0.13 m<sup>3</sup>/s) Jan. 30 to Feb. 2, 1977, gage height, 2.14 ft (0.652 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,110 ft<sup>3</sup>/s (31.4 m<sup>3</sup>/s) May 19, gage height, 5.40 ft (1.646 m); minimum, 29 ft<sup>3</sup>/s (0.82 m<sup>3</sup>/s) Oct. 1, gage height, 2.80 ft (0.853 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	94	97	76	61	49	46	378	735	169	125	68
2	33	94	96	76	61	49	45	412	696	163	118	69
3	31	94	96	75	60	49	52	453	658	165	115	67
4	31	92	96	74	60	48	53	502	626	165	113	63
5	32	94	96	74	60	48	51	602	590	163	111	62
6	36	94	94	74	59	48	50	670	553	169	107	63
7	34	96	94	73	58	47	47	728	525	179	105	62
8	34	94	94	72	58	47	47	775	497	174	105	58
9	32	92	92	72	58	47	46	808	475	172	107	56
10	33	91	91	72	58	46	46	876	475	176	103	56
11	33	91	91	71	57	48	46	946	453	174	102	56
12	33	91	91	70	56	47	46	981	438	182	99	60
13	37	92	90	70	56	50	45	1020	412	194	96	69
14	46	94	90	70	56	48	47	1050	397	206	94	69
15	47	94	88	69	55	48	51	1060	378	210	94	64
16	47	94	86	68	55	47	58	1070	363	210	91	64
17	54	94	85	68	54	46	67	1070	349	203	86	65
18	66	92	85	68	54	46	67	1090	331	192	86	68
19	68	92	84	67	54	47	69	1100	308	184	86	67
20	73	90	82	67	53	46	73	1100	296	179	85	68
21	74	90	85	66	53	46	76	1080	275	172	84	67
22	77	90	85	66	52	46	84	1050	262	167	86	65
23	79	90	84	65	52	45	99	1020	247	158	88	65
24	81	90	82	65	51	44	125	996	240	154	86	65
25	82	90	80	64	51	44	152	960	229	150	84	65
26	82	94	80	64	50	44	184	932	216	146	81	68
27	84	99	79	64	50	44	225	897	206	141	77	69
28	86	99	78	63	50	42	270	856	194	135	73	70
29	90	97	78	62	---	42	313	822	186	134	72	70
30	91	97	77	62	---	42	344	808	179	135	72	70
31	92	---	77	62	---	45	---	775	---	128	69	---
TOTAL	1751	2795	2703	2129	1552	1435	2924	26887	11789	5249	2900	1948
MEAN	56.5	93.2	87.2	68.7	55.4	46.3	97.5	867	393	169	93.5	64.9
MAX	92	99	97	76	61	50	344	1100	735	210	125	70
MIN	31	90	77	62	50	42	45	378	179	128	69	56
CFSM	.22	.37	.35	.27	.22	.18	.39	3.43	1.55	.67	.37	.26
IN.	.26	.41	.40	.31	.23	.21	.43	3.95	1.73	.77	.43	.29
CAL YR 1981	TOTAL	78037	MEAN 214	MAX 1210	MIN 25	CFSM .85	IN 11.47					
WTR YR 1982	TOTAL	64062	MEAN 176	MAX 1100	MIN 31	CFSM .70	IN 9.42					

NOTE.--No gage-height record Dec. 25 to Mar. 9.

LAKE OF THE WOODS BASIN

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued  
(Hydrologic bench-mark station)

WATER-QUALITY DATA

PERIOD OF RECORD.--Water years, 1968 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: July 1966 to September 1981.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE, AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	BARO- METRIC PRES- SURE (MM OF HG) (00025)	OXYGEN, DIS- SOLVED (MG/L) (00300)
OCT 14...	1200	47	32	31	7.5	7.1	10.0	10.5	--	10.0
MAR 10...	1230	46	--	29	7.3	7.0	.0	.0	721	12.8
JUN 15...	1425	372	<50	32	7.5	7.3	18.5	18.0	719	9.1
AUG 04...	1110	113	34	34	7.5	7.7	18.5	21.5	723	7.8
DATE		OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (00900)	HARD- NESS NONCAR- BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	SODIUM AD- SORP- TION RATIO (00931)
OCT 14...	95	K2	K14	13	.00	2.9	1.4	1.1	.1	
MAR 10...	93	<100	48	14	4.0	3.3	1.5	1.2	.1	
JUN 15...	102	K2	K150	13	3.0	2.9	1.4	1.0	.1	
AUG 04...	93	K6	K1100	13	1.0	3.1	1.3	1.2	.1	
DATE		POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)
OCT 14...	.2	15	3.1	.6	<.1	3.0	42	21	5.3	
MAR 10...	.4	10	2.5	.8	<.1	3.5	41	19	5.1	
JUN 15...	.3	10	5.0	.9	<.1	3.8	38	21	38.2	
AUG 04...	<.1	12	4.0	.3	<.1	3.3	44	20	13.4	
DATE		NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO- GEN,AM- MONIA + ORGANIC DIS. TOTAL (MG/L AS N) (00623)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
OCT 14...	.06	.06	.020	.020	.48	.48	.020	.010	6.9	
MAR 10...	.12	.12	.080	.040	.35	.31	.010	.010	9.8	
JUN 15...	.20	<.10	.020	.030	.60	.60	.040	.010	12	
AUG 04...	<.10	<.10	.010	.010	.20	.20	.010	<.010	9.6	

LAKE OF THE WOODS BASIN

05124990 FILSON CREEK NEAR ELY, MN

LOCATION.--Lat 47°50'05", long 91°40'27", in SE¼SW¼ sec.24, T.61 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on right bank 25 ft (7.6 m) upstream from culverts on Forest Route 181, also known as Spruce Road, 0.8 mi (1.3 km) upstream from mouth, and 10 mi (16 km) southeast of Ely.

DRAINAGE AREA.--9.66 mi<sup>2</sup> (25.02 km<sup>2</sup>).

PERIOD OF RECORD.--October 1974 to current year.

REVISED RECORDS.--WDR MN-79-1: 1975-76, 1978.

GAGE.--Water-stage recorder. Altitude of gage is 1,440 ft (439 m), from topographic map.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--8 years, 7.48 ft<sup>3</sup>/s (0.212 m<sup>3</sup>/s), 10.52 in/yr (267 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 426 ft<sup>3</sup>/s (12.1 m<sup>3</sup>/s) Sept. 13, 1980, gage height, 8.87 ft (2.704 m); no flow at times most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 89 ft<sup>3</sup>/s (2.52 m<sup>3</sup>/s) Apr. 23, gage height, 6.46 ft (1.969 m); maximum gage height, 7.70 ft (2.347 m) Apr. 20, from high-water mark (backwater from ice); minimum discharge, 0.15 ft<sup>3</sup>/s (0.004 m<sup>3</sup>/s) Aug. 18, gage height, 4.63 ft (1.411 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	8.7	2.2	1.9	.50	.36	2.0	28	20	.52	.71	.31
2	1.7	7.3	2.1	1.9	.50	.36	1.8	25	19	.62	.64	.36
3	1.3	7.1	2.1	1.9	.50	.31	1.7	23	17	.97	.51	.36
4	1.4	6.2	2.1	1.9	.50	.36	1.6	22	15	1.2	.42	.31
5	1.9	6.2	1.9	1.9	.50	.36	1.5	25	12	1.6	.32	.31
6	3.8	5.6	2.1	1.9	.45	.42	1.5	25	10	2.9	.37	.22
7	2.2	4.5	2.1	1.8	.45	.26	1.5	27	8.7	8.7	.48	.22
8	2.1	4.2	2.1	1.7	.45	.26	1.5	29	7.0	12	.55	.22
9	1.4	4.0	2.1	1.6	.45	.26	1.5	28	6.1	13	.70	.22
10	2.5	3.6	2.1	1.5	.45	.26	1.5	34	7.6	16	.70	.22
11	2.8	3.0	2.1	1.4	.40	.31	1.6	59	8.3	17	.55	.22
12	2.2	3.0	2.0	1.3	.40	.36	1.7	65	8.5	16	.55	.70
13	4.5	3.1	2.0	1.3	.40	.48	2.0	65	7.9	14	.48	1.2
14	11	3.1	2.0	1.2	.40	.42	3.5	61	6.2	12	.48	1.2
15	11	2.8	2.0	1.1	.40	.42	5.0	54	6.6	11	.42	1.3
16	8.0	2.2	2.0	1.0	.40	.42	7.0	49	6.6	9.0	.31	1.4
17	13	2.5	2.0	.95	.40	.36	10	43	5.8	7.3	.22	1.7
18	18	2.5	2.0	.90	.40	.42	15	43	4.4	5.4	.18	1.9
19	18	2.5	2.0	.85	.40	.42	20	48	3.5	3.9	.26	2.1
20	20	2.1	2.0	.80	.40	.55	30	45	2.4	3.2	.22	2.2
21	18	2.1	2.0	.75	.40	.80	55	38	2.1	2.6	.22	2.2
22	17	2.1	2.0	.70	.36	.75	70	32	2.2	1.8	.55	2.2
23	15	1.9	2.0	.65	.36	.75	82	27	2.5	1.5	.55	2.2
24	14	2.0	2.0	.65	.36	.70	62	23	2.4	1.6	.42	2.1
25	13	2.1	2.0	.65	.36	.70	61	20	1.7	1.4	.42	1.7
26	12	2.3	2.0	.60	.36	.65	58	17	1.2	1.2	.42	1.7
27	10	2.3	2.0	.60	.36	.60	49	13	.99	1.1	.36	1.4
28	10	2.2	2.0	.60	.36	.60	41	10	.89	.90	.26	1.3
29	9.7	2.2	2.0	.55	---	.65	36	9.2	.78	.96	.31	1.2
30	10	2.3	2.0	.55	---	.80	31	13	.57	.92	.31	1.2
31	9.5	---	1.9	.55	---	1.0	---	19	---	.87	.31	---
TOTAL	266.4	105.7	62.9	35.65	11.67	15.37	656.9	1019.2	197.93	171.16	13.20	33.87
MEAN	8.59	3.52	2.03	1.15	.42	.50	21.9	32.9	6.60	5.52	.43	1.13
MAX	20	8.7	2.2	1.9	.50	1.0	82	65	20	17	.71	2.2
MIN	1.3	1.9	1.9	.55	.36	.26	1.5	9.2	.57	.52	.18	.22
CFSM	.89	.36	.21	.12	.04	.05	2.27	3.41	.68	.57	.05	.12
IN.	1.03	.41	.24	.14	.04	.06	2.53	3.92	.76	.66	.05	.13

CAL YR 1981 TOTAL 2855.78 MEAN 7.82 MAX 68 MIN .09 CFSM .81 IN 11.00  
 WTR YR 1982 TOTAL 2589.95 MEAN 7.10 MAX 82 MIN .18 CFSM .74 IN 9.97

NOTE.--No gage-height record Jan. 12 to Mar. 1.

## LAKE OF THE WOODS BASIN

05127000 KAWLSHIWI RIVER NEAR WINTON, MN

LOCATION.--Lat 47°56'05", long 91°45'50", in NE¼NW¼ sec.20, T.63 N., R.11 W., Lake County, Hydrologic Unit 09030001, Superior National Forest, at powerplant of Minnesota Power & Light Co., just upstream from Fall Lake, and 1.8 mi (2.9 km) east of Winton.

DRAINAGE AREA.--1,229 mi<sup>2</sup> (3,183 km<sup>2</sup>).

PERIOD OF RECORD.--June 1905 to June 1907, October 1912 to September 1919 (fragmentary), September 1923 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WDR MN-77-1: Drainage area.

REMARKS.--Records fair. Daily discharge computed from powerplant records. Flow regulated by powerplant and by Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, and Garden Lakes.

COOPERATION.--Records collected by Minnesota Power & Light Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE (unadjusted).--63 years (water years 1906, 1916-17, 1919, 1924-82), 1,028 ft<sup>3</sup>/s (29.11 m<sup>3</sup>/s), 11.36 in/yr (289 mm/yr); median of yearly mean discharges, 968 ft<sup>3</sup>/s (27.4 m<sup>3</sup>/s) 10.70 in/yr (272 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16,000 ft<sup>3</sup>/s (453 m<sup>3</sup>/s) May 18, 1950; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 5,630 ft<sup>3</sup>/s (159 m<sup>3</sup>/s) May 15; no flow Mar. 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	262	1200	595	484	298	631	150	3460	2600	794	1080	493
2	198	1070	499	484	315	631	226	3650	2420	729	979	496
3	133	960	595	484	399	663	290	3380	2130	826	865	466
4	133	960	396	410	399	631	323	3600	2190	729	865	431
5	133	960	310	399	399	598	194	3760	2130	729	897	464
6	230	928	161	399	399	631	161	4060	2100	874	930	465
7	315	960	513	399	334	596	313	4090	1830	994	962	564
8	334	831	563	367	417	562	264	4110	1590	994	865	270
9	302	960	603	441	452	594	328	4020	1580	994	854	611
10	399	960	432	468	452	541	263	4060	1580	865	792	450
11	367	928	361	367	387	562	312	4470	1580	896	889	416
12	450	878	377	399	484	592	395	4630	1680	1760	1000	714
13	484	760	345	399	484	560	363	4850	1720	2970	1050	751
14	678	792	330	399	419	461	329	4710	1490	3500	1220	450
15	774	792	347	399	452	558	525	5630	1420	2930	1220	463
16	855	760	398	367	452	427	475	5260	1170	2730	1260	474
17	1130	760	398	367	484	685	576	4970	1120	2840	1120	530
18	973	792	430	367	452	778	604	4940	1120	3720	1010	530
19	1130	760	398	348	484	584	809	4940	994	2500	962	498
20	1600	792	430	367	484	389	789	5040	994	2330	801	466
21	1750	743	430	274	419	390	885	5140	1240	2410	930	712
22	1840	725	398	339	484	373	1110	5170	1160	2100	833	797
23	1730	628	398	380	484	330	1140	5050	1190	1840	895	867
24	1560	563	398	399	452	244	1500	5390	1030	1490	694	964
25	1540	628	398	367	484	344	1550	4380	1080	1300	824	996
26	1480	493	431	317	550	330	1600	4080	960	1330	792	932
27	1480	628	431	266	634	229	1270	3810	928	1260	727	851
28	1450	563	431	380	727	231	1530	3230	992	1270	695	794
29	1290	461	399	367	---	101	2050	2850	928	1240	556	891
30	1160	595	452	334	---	13	2550	2600	798	1170	428	921
31	1230	---	484	350	---	.00	---	2620	---	1160	494	---
TOTAL	27390	23830	13131	11887	12680	14259	22874	131950	43744	51274	27489	18727
MEAN	884	794	424	383	453	460	762	4256	1458	1654	887	624
MAX	1840	1200	603	484	727	778	2550	5630	2600	3720	1260	996
MIN	133	461	161	266	298	.00	150	2600	798	729	428	270
†	+154	-137	-42	-92	-189	-268	-570	+156	-49	+45	-36	+40
MEAN ‡	1038	657	382	291	264	192	192	4412	1409	1699	851	664
CFSM ‡	.84	.53	.31	.24	.21	.16	.16	3.59	1.15	1.38	.69	.54
IN. ‡	.97	.60	.36	.27	.22	.18	.17	4.14	1.28	1.59	.80	.60
CAL YR 1981 TOTAL	414255.00			MEAN 1135	MAX 6040	MIN 32	MEAN ‡ 1140	CFSM ‡ .93	IN ‡ 12.60			
WTR YR 1982 TOTAL	399235.00			MEAN 1094	MAX 5630	MIN .00	MEAN ‡ 1013	CFSM ‡ .82	IN ‡ 11.20			

† Change in contents, equivalent in cubic feet per second, in Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, Farm, South Farm, and Garden Lakes.

‡ Adjusted for change in reservoir content.

## LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN

(International gaging station)

LOCATION (REVISED).--Lat 48°04'57", long 91°39'09", in SE¼SE¼ sec.30, T.65 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on island in Jackfish Bay of Basswood Lake, used to determine discharge at outlet [lat 48°06'21", long 91°38'51", in sec.19, T.65 N., R.10 W., on international boundary 14 mi (23 km) northeast of Winton].

DRAINAGE AREA.--1,740 mi<sup>2</sup> (4,510 km<sup>2</sup>), approximately (above outlet of Basswood Lake).

PERIOD OF RECORD.--March to June 1924, September 1925 to March 1928, January 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 955: Drainage area. WSP 1145: 1935, 1937.

GAGE.--Water-stage recorder. Datum of gage is 1,296.80 ft (395.265 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Oct. 27, 1938, nonrecording gages at several sites in vicinity of gage, at datum 3.0 ft (0.914 m) higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft (0.914 m) higher.

REMARKS.--Records good. Some regulation by powerplant on Kawishiwi River at Winton, MN, and by many lakes located upstream from station.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--54 years (water years 1926, 1927, 1931-82), 1,389 ft<sup>3</sup>/s (39.34 m<sup>3</sup>/s), 10.84 in/yr (275 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,600 ft<sup>3</sup>/s (442 m<sup>3</sup>/s) May 24, 1950, gage height 9.94 ft (3.030 m), present datum; minimum, 55 ft<sup>3</sup>/s (1.56 m<sup>3</sup>/s) Nov. 18, 1976, gage height, 1.67 ft (0.509 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,420 ft<sup>3</sup>/s (182 m<sup>3</sup>/s) May 22, gage height, 6.61 ft (2.015 m); minimum, 314 ft<sup>3</sup>/s (8.89 m<sup>3</sup>/s) Oct. 3, gage height, 2.52 ft (0.768 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	328	1160	929	644	602	593	651	1630	4980	1620	1820	1020
2	323	1180	919	647	596	613	636	1860	4810	1570	1740	1000
3	318	1190	914	655	586	634	670	2020	4610	1620	1660	963
4	323	1190	902	653	582	649	661	2240	4410	1620	1620	937
5	328	1170	895	653	578	666	638	2560	4220	1600	1570	903
6	336	1180	874	648	573	677	610	2840	4040	1660	1530	867
7	336	1170	838	649	570	692	589	3110	3850	1670	1510	833
8	336	1140	812	641	570	707	567	3350	3710	1640	1490	803
9	332	1140	788	635	562	725	547	3570	3580	1640	1470	781
10	336	1120	755	629	562	747	533	3880	3500	1630	1420	770
11	341	1110	778	640	562	770	525	4090	3370	1590	1380	760
12	346	1110	774	642	562	787	518	4340	3230	1610	1350	790
13	360	1110	760	638	562	826	515	4620	3110	1640	1310	812
14	385	1100	745	637	562	834	520	4880	3010	1770	1290	811
15	390	1090	729	634	562	837	533	5160	2930	1930	1260	790
16	400	1080	710	631	562	836	549	5450	2820	2050	1250	777
17	430	1060	692	629	562	840	578	5640	2730	2160	1240	795
18	460	1060	682	623	562	858	610	5900	2610	2230	1260	788
19	495	1040	673	627	562	861	638	6160	2490	2300	1270	781
20	538	1020	670	623	562	862	664	6300	2370	2330	1240	773
21	579	1010	678	618	562	851	709	6380	2270	2370	1230	761
22	650	1010	669	615	562	837	763	6400	2170	2380	1270	754
23	732	993	663	628	562	821	834	6380	2080	2360	1270	761
24	823	979	657	628	562	790	931	6300	2030	2320	1260	765
25	880	978	650	628	562	772	1040	6180	2000	2250	1220	774
26	947	994	646	628	563	756	1150	6050	1930	2170	1190	781
27	982	980	648	628	570	739	1240	5890	1850	2080	1140	800
28	1040	971	648	628	581	717	1300	5740	1790	2000	1120	819
29	1080	959	648	625	---	691	1370	5590	1740	1960	1100	830
30	1120	946	647	619	---	680	1480	5440	1670	1930	1070	860
31	1140	---	646	611	---	672	---	5210	---	1870	1050	---
TOTAL	17414	32240	23039	19634	15925	23340	22569	145160	89910	59570	41600	24659
MEAN	562	1075	743	633	569	753	752	4683	2997	1922	1342	822
MAX	1140	1190	929	655	602	862	1480	6400	4980	2380	1820	1020
MIN	318	946	646	611	562	593	515	1630	1670	1570	1050	754
CFSM	.32	.62	.43	.36	.33	.43	.43	2.69	1.72	1.11	.77	.47
IN.	.37	.69	.49	.42	.34	.50	.48	3.10	1.92	1.27	.89	.53
CAL YR 1981	TOTAL	563701	MEAN	1544	MAX	6810	MIN	297	CFSM	.89	IN	12.05
WTR YR 1982	TOTAL	515060	MEAN	1411	MAX	6400	MIN	318	CFSM	.81	IN	11.01

## LAKE OF THE WOODS BASIN

05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO

(International gaging station)

LOCATION (REVISED).--Lat 48°21'14", long 92°13'01", at Campbell's Camp, on Lac La Croix Lake, used to determine discharge at outlet [Lat 48°23'00", long 92°10'40", 2.5 mi (4.0 km) east of Campbell's Camp].

DRAINAGE AREA.--5,170 mi<sup>2</sup> (13,390 km<sup>2</sup>).

PERIOD OF RECORD.--September 1921 to January 1922, April 1922 to current year, in reports of Geological Survey. Monthly discharge only for some periods, published in WSP 1308. August 1921 to current year, in reports of Water Survey of Canada.

GAGE.--Water-stage recorder. Gage readings have been reduced to elevations, United States and Canada Boundary Survey datum. Prior to October 1933, nonrecording gages at various sites on Lac la Croix. October 1933 to Mar. 13, 1963, nonrecording gage at present site and datum.

REMARKS.--Records excellent.

COOPERATION.--This station is maintained by Canada under agreement with the United States.

AVERAGE DISCHARGE.--60 years (water years 1923-82), 3,805 ft<sup>3</sup>/s (107.8 m<sup>3</sup>/s), 9.99 in/yr (254 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,200 ft<sup>3</sup>/s (799 m<sup>3</sup>/s) May 31 to June 2, 1950, elevation, 1,193.30 ft (363.718 m); minimum, 535 ft<sup>3</sup>/s (15.2 m<sup>3</sup>/s) at times in February, March and April 1924, elevation, 1,181.50 ft (360.121 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,400 ft<sup>3</sup>/s (351 m<sup>3</sup>/s) May 27-30, elevation, 1,188.20 ft (362.163 m) May 28; minimum, 1,350 ft<sup>3</sup>/s (38.2 m<sup>3</sup>/s) Oct. 8, elevation, 1,182.55 ft (360.441 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1380	1550	2030	1750	1650	1450	1640	3900	12000	5960	7420	3780
2	1380	1570	2020	1760	1640	1450	1650	4100	12000	5810	7280	3730
3	1400	1600	2030	1770	1620	1440	1810	4300	11800	5750	7080	3670
4	1400	1610	2020	1750	1610	1430	1850	4550	11600	5700	6930	3630
5	1390	1610	2020	1750	1600	1430	1850	4820	11300	5660	6740	3560
6	1380	1660	2020	1730	1600	1420	1850	5100	11200	5760	6590	3490
7	1370	1690	1990	1730	1590	1410	1850	5320	10900	5760	6440	3410
8	1370	1670	1970	1720	1580	1410	1850	5620	10700	5830	6250	3330
9	1390	1710	1980	1700	1570	1410	1840	5960	10500	5950	6140	3270
10	1400	1730	1970	1690	1570	1420	1840	6330	10300	6020	6010	3240
11	1410	1770	1960	1700	1560	1440	1840	6640	10200	6090	5880	3190
12	1410	1800	1970	1690	1550	1450	1840	7040	9960	6250	5750	3220
13	1410	1820	1960	1680	1550	1460	1840	7480	9730	6400	5590	3250
14	1410	1850	1940	1680	1550	1480	1840	7950	9570	6690	5460	3210
15	1400	1860	1930	1660	1540	1490	1850	8400	9330	6900	5330	3150
16	1390	1870	1930	1650	1540	1480	1860	8830	9090	7110	5180	3070
17	1410	1880	1910	1650	1530	1480	1880	9220	8870	7250	5050	3070
18	1400	1920	1890	1640	1520	1500	1910	9660	8640	7360	4970	3040
19	1430	1930	1880	1640	1510	1510	1940	10100	8400	7570	4850	2990
20	1440	1930	1870	1630	1490	1520	1970	10600	8170	7710	4740	2950
21	1440	1950	1880	1630	1480	1520	2020	11000	7970	7820	4660	2910
22	1440	1950	1870	1640	1480	1530	2090	11300	7750	7950	4650	2850
23	1440	1950	1870	1690	1480	1540	2200	11700	7450	8030	4560	2820
24	1460	1940	1850	1700	1470	1540	2360	11900	7230	8040	4460	2780
25	1430	1970	1830	1690	1460	1560	2560	12100	7090	8040	4370	2750
26	1470	2020	1800	1690	1460	1560	2810	12200	6860	8010	4280	2700
27	1470	1990	1800	1690	1450	1570	3060	12400	6640	7950	4120	2670
28	1510	2030	1790	1670	1460	1580	3290	12400	6480	7870	4070	2710
29	1530	2040	1790	1670	---	1580	3510	12400	6310	7760	4010	2650
30	1540	2050	1780	1660	---	1610	3700	12400	6120	7660	3910	2600
31	1520	---	1770	1650	---	1610	---	12200	---	7560	3860	---
TOTAL	44220	54920	59320	52350	43110	46280	64400	267920	274160	214220	166630	93690
MEAN	1426	1831	1914	1689	1540	1493	2147	8643	9139	6910	5375	3123
MAX	1540	2050	2030	1770	1650	1610	3700	12400	12000	8040	7420	3780
MIN	1370	1550	1770	1630	1450	1410	1640	3900	6120	5660	3860	2600
CFSM	.28	.35	.37	.33	.30	.29	.42	1.67	1.77	1.34	1.04	.60
IN.	.32	.40	.43	.38	.31	.33	.46	1.93	1.97	1.54	1.20	.67
CAL YR 1981	TOTAL	1463580	MEAN	4010	MAX	13000	MIN	1330	CFSM	.78	IN	10.53
WTR YR 1982	TOTAL	1381220	MEAN	3784	MAX	12400	MIN	1370	CFSM	.73	IN	9.94

## LAKE OF THE WOODS BASIN

05128200 VERMILION LAKE NEAR SOUDAN, MN

LOCATION.--Lat 47°49'52", long 92°16'20", in SW¼SE¼ sec.20, T.62 N., R.15 W., St. Louis County, Hydrologic Unit 09030002, on south shore of Vermilion Lake, 2 mi (3.2 km) northwest of Soudan.

PERIOD OF RECORD.--October 1913 to July 1915, July 1941 to November 1942, June 1946 to current year (fragmentary during 1947).

GAGE.--Water-stage recorder. Datum of gage is 1,355.10 ft (413.034 m) National Geodetic Vertical Datum of 1929. October 1913 to July 1915, nonrecording gage at Tower, 2 mi (3.2 km) southwest of present gage, at datum about 1,354.60 ft (412.882 m). July 1941 to November 1942, and June 1946 to June 1951, nonrecording gage approximately 13 mi (20.9 km) northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,359.52 ft (414.382 m) May 16, 1950; minimum observed, 1,356.02 ft (413.315 m) Jan. 29, 1942; minimum 1,355.96 ft (413.297 m) Dec. 14, 1976, result of wind action.

EXTREMES OUTSIDE PERIOD OF RECORD.--Elevation on June 6, 1913, was 1,359.94 ft (414.510 m), determined from reference point set by local observers.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, not determined; maximum daily, 1,358.60 ft (414.101 m) May 20-22; minimum, 1,356.87 ft (413.574 m) Oct. 3; minimum daily, 1,356.90 ft (413.583 m) Oct. 3.

## MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

Oct. 31 .....	1357.38	Feb. 24 .....	1357.07	June 30 .....	1357.77
Nov. 30 .....	1357.23	Mar. 31 .....	1357.05	July 31 .....	1357.59
Dec. 31 .....	1357.15	Apr. 30 .....	1358.05	Aug. 31 .....	1357.25
Jan. 31 .....	1357.15	May 31 .....	1358.41	Sept.30 .....	1357.30

NOTE.--Elevations other than those shown above are available.

## LAKE OF THE WOODS BASIN

05129115 VERMILION RIVER NEAR CRANE LAKE, MN

LOCATION.--Lat 48°15'53", long 92°33'57", in NE¼ sec. 30, T.67 N., R.17 W., St. Louis County, Hydrologic Unit 09030002, in Superior National Forest, on left bank 350 ft (107 m) downstream from bridge on Forest Route 491, 3.5 mi (5.6 km) upstream from mouth, and 3.5 mi (5.6 km) west of village of Crane Lake.

PERIOD OF RECORD.--August 1979 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,180 ft (360 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,100 ft<sup>3</sup>/s (87.8 m<sup>3</sup>/s) Apr. 25, 1982, gage height, 13.04 ft (3.975 m); minimum, 38 ft<sup>3</sup>/s (1.08 m<sup>3</sup>/s) Aug. 13, 14, 1980, gage height, 3.68 ft (1.122 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1979 reached a stage of 15.15 ft (4.618 m), from high-water mark, discharge, about 4,600 ft<sup>3</sup>/s (130 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,100 ft<sup>3</sup>/s (87.8 m<sup>3</sup>/s) Apr. 25, gage height, 13.04 ft (3.975 m); minimum, 127 ft<sup>3</sup>/s (3.60 m<sup>3</sup>/s) Oct. 1, gage height, 4.67 ft (1.423 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	142	565	323	210	190	174	215	2180	1800	632	471	261
2	158	548	319	210	190	172	227	2040	1710	614	471	273
3	170	536	317	200	190	171	252	1920	1640	598	466	261
4	210	519	312	200	190	165	263	1870	1570	596	444	260
5	264	503	307	200	190	165	274	2030	1500	608	427	248
6	343	484	303	200	180	164	274	2110	1430	659	419	242
7	398	480	300	200	180	160	276	2090	1390	666	425	242
8	410	464	294	190	180	158	281	2020	1320	648	423	242
9	419	449	286	190	180	162	283	1940	1290	635	400	238
10	417	440	278	190	180	172	288	1900	1500	648	390	230
11	406	429	270	190	180	177	288	1930	1590	648	392	223
12	396	427	260	190	180	180	293	1970	1560	642	388	232
13	394	427	260	190	180	184	300	2040	1500	651	384	260
14	388	419	250	190	180	185	289	2140	1420	672	380	266
15	384	404	250	190	180	189	382	2340	1320	672	374	273
16	386	394	240	190	180	188	611	2480	1240	670	358	276
17	404	380	240	190	180	186	950	2550	1170	664	339	291
18	487	364	230	190	180	183	1400	2630	1110	632	339	298
19	575	353	230	190	180	182	1660	2710	1050	608	349	307
20	640	341	230	190	180	182	1810	2790	1000	603	336	301
21	656	336	230	190	180	182	1920	2830	951	606	328	298
22	656	330	230	190	180	181	2060	2800	918	601	334	293
23	645	326	230	190	180	181	2420	2720	879	588	336	289
24	627	321	230	190	180	183	2840	2610	867	578	325	286
25	608	316	230	190	180	182	3060	2480	826	570	321	281
26	580	321	220	190	180	178	3090	2360	802	548	308	281
27	565	328	220	190	180	174	3030	2240	760	531	300	278
28	560	326	220	190	180	175	2780	2140	720	512	284	284
29	560	326	220	190	---	175	2570	2040	689	498	276	301
30	578	325	210	190	---	187	2370	1950	661	491	269	298
31	583	---	210	190	---	211	---	1880	---	482	260	---
TOTAL	14009	12181	7949	5980	5090	5508	36756	69730	36183	18771	11316	8113
MEAN	452	406	256	193	182	178	1225	2249	1206	606	365	270
MAX	656	565	323	210	190	211	3090	2830	1800	672	471	307
MIN	142	316	210	190	180	158	215	1870	661	482	260	223
CAL YR 1981	TOTAL	235488	MEAN	645	MAX	2370	MIN	106				
WTR YR 1982	TOTAL	231586	MEAN	634	MAX	3090	MIN	142				

NOTE; No gage-height record Jan. 17 to Feb. 28.

## LAKE OF THE WOODS BASIN

05129400 RAINY LAKE NEAR FORT FRANCES, ONTARIO  
(International gaging station)

LOCATION.--Lat 48°38'30", long 93°20'00", at Five Mile dock, approximately 5 mi (8 km) northeast of town of Fort Frances.

PERIOD OF RECORD.--January 1910 to September 1917 and October 1934 to current year, in reports of Geological Survey. August 1911 to September 1979, in reports of Water Survey of Canada. Prior to October 1949, published as "at Ranier, Minn.", and as "at Fort Frances, Ontario" October 1949 to September 1964.

GAGE.--Water-stage recorder. Datum of gage is at National Geodetic Vertical Datum of 1929 (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 mi (5 km) northeast at Ranier, Minn., at same datum. January 1950 to October 1964, water-stage recorder on Government dock at Pither's Point at Fort Frances and supplementary gage in town pumping station, 0.5 mi (0.8 km) south, used during winter months, at same datum.

COOPERATION.--This station is one of the international gaging stations maintained by Canada under agreement with the United States.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,112.97 ft (339.233 m) July 5, 1950; minimum observed, 1,101.26 ft (335.664 m) Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,108.31 ft (337.813 m) July 5, maximum daily elevation, 1,108.16 ft (337.767 m) July 10; minimum, 1,104.44 ft (336.633 m) Mar. 31; minimum daily, 1,104.56 ft (336.670 m) Apr. 1.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

Oct. 31 .....	1107.24	Feb. 28 .....	1105.55	June 30 .....	1107.75
Nov. 30 .....	1107.21	Mar. 31 .....	1104.58	July 31 .....	1107.98
Dec. 31 .....	1106.65	Apr. 30 .....	1105.74	Aug. 31 .....	1107.50
Jan. 31 .....	1106.02	May 31 .....	1108.05	Sept.30 .....	1107.44

NOTE.--Elevations other than those shown are available.

## LAKE OF THE WOODS BASIN

05130500 STURGEON RIVER NEAR CHISHOLM, MN

LOCATION.--Lat 47°40'25", long 92°54'00", in NE¼NW¼ sec.20, T.60 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, on left bank 1,000 ft (305 m) upstream from highway bridge, 0.6 mi (1.0 km) downstream from East Branch Sturgeon River, and 11.5 mi (18.5 km) north of Chisholm.

DRAINAGE AREA.--187 mi<sup>2</sup> (484 km<sup>2</sup>).

PERIOD OF RECORD.--August 1942 to current year.

REVISED RECORDS.--WSP 1438: 1946.

GAGE.--Water-stage recorder. Datum of gage is 1,305.7 ft (397.977 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft (305 m) downstream at different datum. Aug. 25, 1944, to Sept. 30, 1975, at present site at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--40 years, 124 ft<sup>3</sup>/s (3.512 m<sup>3</sup>/s), 9.00 in/yr (229 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,630 ft<sup>3</sup>/s (103 m<sup>3</sup>/s) May 7, 1950, gage height, 7.41 ft (2.259 m), present datum, from rating curve extended above 1,600 ft<sup>3</sup>/s (45.3 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow; minimum daily, 3.8 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Jan. 31 to Feb. 3, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s)	(m <sup>3</sup> /s)	Gage height (ft)	(m)
Apr. 18	2130	*1220	34.6	*a5.34	1.628
May 16	1430	743	21.0	4.32	1.317

Minimum daily discharge, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) Feb. 21 to Mar. 29; minimum gage height, 1.56 ft (0.475 m) Mar. 17, 19-25.

a Ice jam.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	138	78	33	20	19	46	382	225	67	106	60
2	75	135	77	32	20	19	52	348	210	61	111	91
3	76	129	76	31	20	19	60	321	194	62	112	88
4	106	125	76	31	20	19	64	327	180	82	91	78
5	127	126	71	30	20	19	66	426	168	134	84	67
6	155	123	74	29	20	19	67	468	155	200	78	60
7	165	120	72	29	20	19	68	468	148	256	82	56
8	158	118	69	28	20	19	70	419	141	271	83	53
9	144	116	61	27	20	19	70	367	142	266	78	52
10	139	114	63	27	20	19	70	357	174	249	71	50
11	134	112	64	26	20	19	70	391	178	229	62	51
12	129	110	64	26	20	19	70	430	177	217	56	74
13	134	108	66	25	20	19	75	479	163	242	95	128
14	144	106	65	25	20	19	100	551	152	267	106	137
15	143	104	59	24	20	19	220	688	170	260	107	136
16	143	102	54	24	20	19	450	730	171	293	96	123
17	170	100	52	24	20	19	780	699	156	255	82	127
18	218	98	51	23	20	19	1120	699	142	222	76	129
19	239	97	49	23	20	19	1160	716	137	191	79	124
20	261	95	47	23	20	19	1130	688	130	166	73	120
21	247	93	46	22	19	19	995	618	128	175	70	111
22	231	92	44	22	19	19	893	530	120	151	95	102
23	212	90	43	22	19	19	821	461	109	136	105	99
24	191	88	42	22	19	19	787	394	97	138	99	96
25	174	87	40	21	19	19	767	355	86	135	95	94
26	162	85	39	21	19	19	724	325	78	120	84	90
27	156	84	38	21	19	19	650	292	71	112	75	86
28	149	82	37	21	19	19	568	262	65	105	68	84
29	146	81	36	21	---	19	486	247	70	100	63	90
30	144	80	35	21	---	25	432	242	70	104	58	89
31	142	---	34	21	---	32	---	235	---	107	57	---
TOTAL	4873	3138	1722	775	552	608	12931	13915	4207	5373	2597	2745
MEAN	157	105	55.5	25.0	19.7	19.6	431	449	140	173	83.8	91.5
MAX	261	138	78	33	20	32	1160	730	225	293	112	137
MIN	59	80	34	21	19	19	46	235	65	61	56	50
CFSM	.84	.56	.30	.13	.11	.11	2.31	2.40	.75	.93	.45	.49
IN.	.97	.62	.34	.15	.11	.12	2.57	2.77	.84	1.07	.52	.55

CAL YR 1981	TOTAL	42644	MEAN 117	MAX 844	MIN 22	CFSM .63	IN 8.48
WTR YR 1982	TOTAL	53436	MEAN 146	MAX 1160	MIN 19	CFSM .78	IN 10.63

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN

LOCATION.--Lat 48°23'45", long 93°32'57", in NE¼SE¼ sec.9, T.68 N., R.25 W., Koochiching County, Hydrologic Unit 09030005, on right bank at town of Littlefork, 0.9 mi (1.4 km) upstream from bridge on State Highway 217, 2.8 mi (4.5 km) upstream from Beaver Creek, and 19 mi (31 km) upstream from mouth.

DRAINAGE AREA.--1,730 mi<sup>2</sup> (4,481 km<sup>2</sup>), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June to November 1909, April to November 1910, April 1911 to June 1917, September 1917, October 1917 to March 1919 (gage heights only), June 1928 to current year.

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1913, 1916, 1928-32, 1934. WRD MN-74: 1963.

GAGE.--Water-stage recorder. Datum of gage is 1,083.59 ft (330.278 m) National Geodetic Vertical Datum of 1929. June 23, 1909, to Mar. 4, 1917, nonrecording gage and July 21, 1937, to Oct. 23, 1979, water-stage recorder at site 1.2 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower; Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, nonrecording gage at site 1.18 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--59 years (water years 1912-16, 1929-82), 1,051 ft<sup>3</sup>/s (29.76 m<sup>3</sup>/s), 8.25 in/yr (210 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,000 ft<sup>3</sup>/s (708 m<sup>3</sup>/s) Apr. 18, 1916, May 11, 1950, gage height, 37.00 ft (11.278 m); minimum observed, 21 ft<sup>3</sup>/s (0.59 m<sup>3</sup>/s) Aug. 26, 27, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, about 12,800 ft<sup>3</sup>/s (362 m<sup>3</sup>/s) Apr. 21, gage height, 18.09 ft (5.514m)(back water from ice); minimum daily, 147 ft<sup>3</sup>/s (4.16 m<sup>3</sup>/s) Jan. 29 to Mar. 28; minimum gage height, 2.53 ft (0.771 m) Mar. 11, 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	394	1210	387	210	147	147	180	4490	1800	585	390	288
2	658	1130	415	210	147	147	200	4040	1690	558	373	270
3	718	1050	393	205	147	147	250	3610	1560	536	369	256
4	792	978	365	200	147	147	300	3370	1460	495	361	252
5	1190	918	362	200	147	147	380	4180	1350	500	345	277
6	1920	874	323	200	147	147	425	4960	1240	568	349	313
7	2290	818	309	195	147	147	595	4840	1180	634	349	313
8	2230	780	319	195	147	147	665	4460	1140	860	325	302
9	2030	726	307	190	147	147	645	3960	1080	1050	294	288
10	1860	688	269	190	147	147	600	3560	1480	1140	302	266
11	1770	664	250	185	147	147	555	4020	2200	1140	329	235
12	1650	640	287	185	147	147	530	4510	2190	1120	309	232
13	1580	624	332	180	147	147	525	4400	2060	1060	294	246
14	1540	607	337	180	147	147	550	4740	1860	1230	298	246
15	1540	590	328	175	147	147	925	6220	1650	1210	288	274
16	1570	585	318	175	147	147	2960	8270	1460	1200	277	455
17	1520	568	304	170	147	147	6490	8780	1360	1240	369	624
18	1790	541	290	170	147	147	8380	8560	1350	1180	394	646
19	2680	513	285	165	147	147	9860	9770	1270	1040	369	634
20	2880	497	275	165	147	147	11300	11000	1170	895	329	652
21	2730	381	265	160	147	147	12500	10000	1080	786	309	664
22	2520	327	255	160	147	147	11500	7850	994	718	313	652
23	2280	357	250	155	147	147	11000	6170	962	652	317	611
24	2030	426	245	155	147	147	10100	5020	918	640	321	580
25	1810	495	240	155	147	147	9870	4210	839	602	398	520
26	1570	485	235	150	147	147	9230	3510	766	539	421	500
27	1440	440	230	150	147	147	7830	3010	712	505	398	475
28	1370	426	225	150	147	147	6660	2630	646	479	398	470
29	1320	411	220	147	---	150	5750	2340	612	454	377	460
30	1300	418	215	147	---	158	5030	2130	602	432	333	440
31	1270	---	210	147	---	170	---	1940	---	408	309	---
TOTAL	52242	19167	9045	5421	4116	4594	135785	160550	38681	24456	10607	12454
MEAN	1685	639	292	175	147	148	4526	5179	1289	789	342	415
MAX	2880	1210	415	210	147	170	12500	11000	2200	1240	421	664
MIN	394	327	210	147	147	147	180	1940	602	408	277	232
CFSM	.97	.37	.17	.10	.09	.09	2.62	2.99	.75	.46	.20	.24
IN.	1.12	.41	.19	.12	.09	.10	2.92	3.45	.83	.53	.23	.27
CAL YR 1981	TOTAL	379400	MEAN	1039	MAX	6090	MIN	105	CFSM	.60	IN	8.16
WTR YR 1982	TOTAL	477118	MEAN	1307	MAX	12500	MIN	147	CFSM	.76	IN	10.26

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued  
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969, 1971, 1973 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1980 to September 1981.

WATER TEMPERATURES: October 1980 to September 1981.

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 299 micromhos Feb. 21, 1981; minimum, 99 micromhos Apr. 30, May 1, 1981.

WATER TEMPERATURES: Maximum, 26.0°C July 7, 8, 12-14, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 255 micromhos Mar. 29, 30; minimum, 82 micromhos Apr. 19.

WATER TEMPERATURES: Maximum, 25.5°C July 6, Aug. 5, 7; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTANTANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
OCT 01...	1600	--	435	190	172	8.3	7.6	5.0	7.5	735
DEC 14...	1630	--	337	160	150	7.8	7.6	-9.0	.0	734
FEB 02...	0830	145	--	230	223	7.3	7.5	-20.0	.0	737
MAY 20...	0825	--	11100	114	104	7.9	7.4	11.0	13.5	733
JUL 21...	1130	--	780	130	124	7.7	7.6	20.0	22.0	731
SEP 13...	1400	--	238	180	192	7.7	7.9	14.0	17.0	732
DATE	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, UM-MF (COLS./100 ML) (31625)	STREP-TOCOCCI, FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
OCT 01...	8.5	11.1	96	83	250	92	12	24	7.9	1.5
DEC 14...	5.5	13.6	97	K3	44	81	11	21	7.0	3.2
FEB 02...	7.4	10.2	72	K2	K11	109	9.0	28	9.6	4.5
MAY 20...	90	8.3	83	190	K1500	59	.00	17	4.1	2.0
JUL 21...	7.2	7.7	92	K10	30	64	7.0	17	5.3	2.5
SEP 13...	12	8.7	94	K15	150	88	5.0	23	7.4	3.8
DATE	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
OCT 01...	.1	1.5	80	7.0	2.0	.1	6.8	142	100	167
DEC 14...	.2	1.2	70	8.8	2.3	<.1	7.4	126	93	115
FEB 02...	.2	1.9	100	11	2.9	<.1	11	173	130	67.7
MAY 20...	.1	1.0	63	7.0	2.0	<.1	5.0	112	76	3360
JUL 21...	.1	.7	57	6.0	2.1	.1	7.0	122	75	257
SEP 13...	.2	1.1	83	8.0	2.4	.2	8.2	144	104	92.5

## LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDEDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 01...	.16	.070	.62	.040	.010	--	--	--	--
DEC 14...	.16	.030	.77	.030	.020	<.010	--	--	--
FEB 02...	.33	.090	3.70	<.010	<.010	<.010	--	--	--
MAY 20...	.18	.040	1.40	.100	.030	<.010	--	--	--
JUL 21...	<.10	.060	.80	.060	.030	<.010	22	46	98
SEP 13...	<.10	.070	.40	.050	.020	<.010	13	8.4	97

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA) (01007)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR) (01034)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO) (01037)
OCT 01...	1600	3	3	<50	2	1	1	30	10	2
FEB 02...	0830	5	2	100	32	<1	<1	20	10	1
MAY 20...	0825	1	1	100	42	1	1	20	10	2
SEP 13...	1400	3	3	100	29	1	<1	<10	<10	3

DATE	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE) (01045)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN) (01055)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG) (71900)
OCT 01...	<1	6	<1	840	230	2	1	60	32	<.1
FEB 02...	<1	9	3	1200	690	3	1	40	28	.2
MAY 20...	2	13	6	6100	310	6	3	180	21	.6
SEP 13...	2	4	2	970	330	4	4	60	23	.6

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL RECOV- ERABLE (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
OCT 01...	<.1	7	1	<1	<1	2	<1	20	4
FEB 02...	<.1	1	1	<1	<1	<1	<1	70	70
MAY 20...	.1	14	4	<1	<1	<1	<1	50	11
SEP 13...	.3	5	1	<1	<1	<1	<1	50	<4

## LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	198	183	189	165	164	164	161	157	158	194	192	193
2	195	173	181	165	164	165	157	154	155	197	193	195
3	171	157	162	161	159	160	157	155	156	199	196	198
4	180	151	165	163	160	161	159	156	158	200	198	199
5	157	149	151	163	162	162	159	158	158	201	200	201
6	184	152	164	163	161	162	160	158	159	203	201	202
7	183	177	181	162	161	162	161	159	160	206	201	202
8	177	167	172	163	161	162	156	155	156	206	201	202
9	167	163	164	157	155	156	159	156	157	203	202	203
10	164	162	163	157	155	156	161	158	160	204	202	203
11	161	159	160	158	156	157	163	160	162	205	202	204
12	165	161	163	160	158	159	164	162	163	206	204	205
13	173	165	169	162	159	160	165	164	164	207	205	206
14	174	172	173	158	156	157	165	164	164	208	206	207
15	173	171	172	160	157	159	166	164	165	210	207	208
16	174	171	172	161	160	161	168	165	166	211	208	209
17	171	168	169	162	160	161	172	168	170	213	210	211
18	173	171	172	162	161	161	174	171	173	215	212	214
19	174	171	172	162	161	161	177	174	176	216	214	215
20	177	173	176	156	155	156	179	176	177	217	215	216
21	174	169	171	158	154	156	180	178	179	216	215	216
22	170	166	168	161	158	159	181	179	180	217	215	216
23	161	160	161	160	158	159	183	180	181	218	216	217
24	160	158	159	162	160	160	186	182	184	219	217	218
25	160	158	159	161	160	160	185	184	185	220	218	219
26	159	157	158	156	155	155	186	184	185	220	219	220
27	161	158	159	156	155	155	188	186	187	222	220	221
28	164	161	162	158	155	156	188	187	187	222	221	221
29	160	158	159	159	156	157	189	187	188	223	221	222
30	163	160	161	159	156	158	190	189	190	222	221	222
31	164	163	164	---	---	---	192	190	191	223	221	222
MONTH	198	149	167	165	154	159	192	154	171	223	192	210
DAY	FEBRUARY			MARCH			APRIL			MAY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	223	222	222	242	241	242	201	198	200			
2	223	222	223	243	241	242	189	187	188			
3	224	222	223	243	241	242	188	185	186			
4	225	223	224	244	242	243	185	181	183			
5	226	224	225	245	243	244	187	185	186			
6	227	225	226	244	243	244	185	181	183			
7	228	226	227	244	243	243	181	179	180			
8	228	227	228	245	243	244	184	177	180			
9	230	228	229	245	244	244	178	173	176			
10	232	229	231	247	245	246	178	174	176			
11	234	232	233	247	245	246	174	171	172			
12	235	232	234	248	246	247	177	174	175			
13	236	234	235	248	247	248	175	170	173			
14	238	236	237	249	247	248	179	167	174			
15	239	237	238	249	247	248	167	148	160			
16	239	238	238	249	248	248	154	129	138			
17	240	238	239	249	248	248	129	102	120			
18	241	239	240	250	248	249	107	87	96			
19	241	239	240	251	249	249	86	82	84			
20	242	240	241	250	249	250	92	83	87			
21	241	239	240	250	248	249	100	90	97			
22	241	239	240	250	248	249	98	87	92			
23	242	239	240	252	249	250	98	94	96			
24	242	240	241	252	250	251	106	88	95			
25	242	240	241	251	249	250	111	96	105			
26	242	241	242	250	249	249	106	102	105			
27	243	241	242	251	248	249	102	93	96			
28	243	241	242	252	248	250	---	---	---			
29	---	---	---	255	251	253	---	---	---			
30	---	---	---	255	237	250	---	---	---			
31	---	---	---	225	220	223	---	---	---			
MONTH	243	222	234	255	220	246						

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	JUNE			JULY			AUGUST			SEPTEMBER		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1				---	---	---	163	161	162	180	174	176
2				---	---	---	166	161	163	178	173	175
3				---	---	---	168	165	167	179	171	175
4				---	---	---	171	168	169	178	173	175
5				---	---	---	173	170	171	175	173	174
6				---	---	---	174	172	173	174	172	173
7				---	---	---	175	173	174	174	172	173
8				---	---	---	177	175	176	176	173	174
9				---	---	---	180	176	178	178	175	176
10				---	---	---	182	178	180	181	177	179
11				---	---	---	184	181	182	186	181	183
12				---	---	---	184	182	183	187	184	186
13				---	---	---	185	183	184	187	177	182
14				---	---	---	185	183	184	181	178	179
15				---	---	---	190	183	186	180	178	179
16				---	---	---	192	187	189	178	171	174
17				---	---	---	190	188	189	171	159	164
18				---	---	---	189	186	188	164	159	162
19				---	---	---	191	187	189	167	164	165
20				---	---	---	189	183	186	166	154	160
21				255	124	170	191	182	187	154	145	149
22				135	131	133	189	182	185	145	139	142
23				136	134	135	188	182	185	143	139	141
24				140	135	138	190	184	187	144	140	143
25				144	139	141	190	185	188	141	139	140
26				149	144	146	185	173	178	139	138	138
27				152	149	150	172	165	168	138	137	137
28				155	152	153	169	167	168	139	136	137
29				158	154	156	172	169	170	143	139	141
30				161	157	159	176	172	174	143	141	142
31				163	160	161	178	175	176	---	---	---
MONTH							192	161	179	187	136	163

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	8.0	6.0	7.0	4.5	4.0	4.0	.0	.0	.0	.0	.0	.0
2	7.5	6.0	6.5	4.5	4.0	4.0	.0	.0	.0	.0	.0	.0
3	7.0	6.0	6.5	4.5	4.0	4.5	.0	.0	.0	.0	.0	.0
4	7.0	6.5	7.0	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0
5	7.5	7.0	7.5	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0
6	8.5	7.5	8.0	4.5	4.0	4.0	.0	.0	.0	.0	.0	.0
7	8.0	7.5	8.0	4.0	3.5	3.5	.0	.0	.0	.0	.0	.0
8	7.5	7.5	7.5	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
9	7.5	7.0	7.5	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
10	8.0	7.5	7.5	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
11	8.5	7.5	8.0	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
12	8.5	8.0	8.5	2.5	1.0	1.5	.0	.0	.0	.0	.0	.0
13	9.0	8.5	9.0	3.0	1.5	2.0	.0	.0	.0	.0	.0	.0
14	9.5	9.0	9.0	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
15	9.0	8.5	9.0	3.5	3.0	3.0	.0	.0	.0	.0	.0	.0
16	9.5	8.5	9.0	3.5	3.5	3.5	.0	.0	.0	.0	.0	.0
17	9.0	9.0	9.0	3.5	3.5	3.5	.0	.0	.0	.0	.0	.0
18	9.0	7.5	8.0	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
19	7.5	7.0	7.0	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
20	7.0	6.5	7.0	1.5	.5	1.0	.0	.0	.0	.0	.0	.0
21	6.0	5.0	5.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
22	5.0	4.0	4.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
23	4.0	2.5	3.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	2.5	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	2.0	1.0	1.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	1.0	.5	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	1.0	.5	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	4.0	2.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	4.5	4.0	4.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	9.5	.5	6.0	5.0	.0	2.0	.0	.0	.0	.0	.0	.0

## LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.5	9.5	10.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.5	10.0	10.5
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	10.5	11.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.5	11.5	12.0
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.5	12.0	12.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	11.5	11.5
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.5	10.5	11.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	10.0	10.5
9	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	10.5	10.5
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	10.5	11.5
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	11.5	11.5
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.5	11.0	11.5
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.5	11.0	11.5
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.5	11.5	11.5
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	13.0	11.5	12.0
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.0	13.0	13.5
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.5	14.0	14.5
18	.0	.0	.0	.0	.0	.0	.0	.0	.0	15.0	14.5	15.0
19	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.5	13.5	14.5
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.0	13.5	13.5
21	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.0	13.5	13.5
22	.0	.0	.0	.0	.0	.0	.5	.0	.5	14.5	13.5	14.0
23	.0	.0	.0	.0	.0	.0	2.0	.5	1.0	15.0	14.0	14.5
24	.0	.0	.0	.0	.0	.0	4.5	2.0	3.0	16.0	15.0	15.5
25	.0	.0	.0	.0	.0	.0	6.0	4.5	5.5	17.0	16.0	16.5
26	.0	.0	.0	.0	.0	.0	7.0	6.0	6.5	18.0	16.5	17.5
27	.0	.0	.0	.0	.0	.0	7.5	7.0	7.5	19.0	17.5	18.5
28	.0	.0	.0	.0	.0	.0	8.5	7.5	8.0	20.0	18.0	19.0
29	---	---	---	.0	.0	.0	9.0	8.0	8.5	20.0	19.0	19.5
30	---	---	---	.0	.0	.0	10.0	9.0	9.5	19.5	18.5	19.0
31	---	---	---	.0	.0	.0	---	---	---	19.0	18.0	18.5
MONTH	.0	.0	.0	.0	.0	.0	10.0	.0	1.5	20.0	9.5	13.5
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	18.0	16.5	17.0	21.5	19.0	20.5	23.5	21.5	22.5	18.0	16.0	17.0
2	17.0	15.5	16.5	22.0	20.0	21.0	23.0	20.5	21.5	18.0	16.5	17.0
3	17.0	15.5	16.5	22.0	21.5	21.5	23.0	21.5	22.0	18.5	15.5	17.0
4	17.5	16.0	16.5	23.0	21.0	22.0	24.0	21.5	22.5	20.0	16.0	17.5
5	18.0	17.0	17.5	24.0	22.0	23.0	25.5	22.0	23.5	19.5	17.5	18.0
6	18.0	17.5	17.5	25.5	23.5	24.5	25.0	23.0	24.0	18.5	16.5	17.5
7	17.5	16.5	17.0	24.5	23.0	23.5	25.5	23.0	24.0	17.5	16.5	17.0
8	17.5	16.5	17.0	23.5	21.5	23.0	23.5	21.0	22.5	19.0	17.0	18.0
9	17.0	16.0	16.5	23.0	21.5	22.0	21.0	19.5	20.5	20.5	18.0	19.0
10	16.5	15.0	16.0	21.5	21.0	21.0	21.0	18.0	19.5	22.0	19.5	20.5
11	17.0	15.5	16.5	22.0	20.5	21.5	21.0	18.5	19.5	21.0	20.0	20.5
12	17.0	15.5	16.5	22.5	20.5	21.5	21.5	18.5	20.0	19.5	18.0	19.0
13	17.5	16.0	17.0	22.5	21.0	21.5	21.0	20.0	20.5	18.0	16.5	17.5
14	19.0	17.0	18.0	23.0	21.0	22.0	22.5	20.0	21.0	16.5	15.0	16.0
15	19.0	17.5	18.0	23.0	21.5	22.0	24.0	21.0	22.5	15.0	14.0	14.5
16	18.0	17.5	18.0	23.0	22.0	22.5	25.0	21.5	23.0	14.0	13.0	13.5
17	18.0	17.0	17.5	23.5	22.0	22.5	24.5	22.0	23.5	13.5	13.0	13.0
18	18.5	17.0	17.5	23.0	22.0	22.5	23.5	22.5	22.5	14.5	12.5	13.5
19	17.5	16.5	17.0	22.5	21.5	22.0	24.0	21.5	22.5	14.0	13.0	13.5
20	17.5	16.0	17.0	23.5	21.0	22.0	23.5	21.5	22.0	13.0	12.0	12.5
21	17.5	16.0	17.0	24.5	22.5	23.0	22.0	20.5	21.0	13.0	11.5	12.0
22	19.0	16.5	17.5	25.0	22.5	23.5	21.5	20.0	20.5	13.0	11.5	12.5
23	19.5	17.5	18.5	24.5	23.0	24.0	22.5	20.0	21.0	13.0	12.5	12.5
24	19.0	18.5	18.5	24.0	23.0	23.5	21.5	19.5	20.5	13.0	11.5	12.0
25	20.0	17.5	18.5	24.5	23.0	23.5	20.0	19.0	19.5	12.5	11.0	11.5
26	20.5	18.0	19.5	24.5	22.5	23.5	19.0	17.0	18.0	13.0	11.0	12.0
27	21.5	19.0	20.5	24.0	22.5	23.5	17.5	16.0	16.5	12.5	12.0	12.0
28	21.0	19.5	20.0	25.0	22.5	23.5	17.5	15.0	16.0	12.0	12.0	12.0
29	20.5	18.5	19.5	23.5	22.5	23.0	18.0	16.0	16.5	13.5	12.0	13.0
30	20.5	18.5	19.5	24.0	21.5	23.0	17.0	15.5	16.0	13.5	11.5	12.5
31	---	---	---	24.0	22.5	23.0	16.0	15.5	16.0	---	---	---
MONTH	21.5	15.0	17.5	25.5	19.0	22.5	25.5	15.0	20.5	22.0	11.0	15.0

## LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN

(International gaging station)

LOCATION.--Lat 48°38'04", long 93°54'47", in NW¼SE¼ sec.36, T.160 N., R.26 W., Koochiching County, Hydrologic Unit 09030004, on left bank at Manitou Rapids, 4 mi (6 km) west of Indus.

DRAINAGE AREA.--19,400 mi<sup>2</sup> (50,200 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1928 to current year. Monthly discharge only for some periods, published in WSP 1308. October 1911 to October 1924 (gage heights only) at site near Birchdale in files of Corps of Engineers. Published as "near Birchdale" 1932-34.

GAGE.--Water-stage recorder. Datum of gage is 1,062.48 ft (323.844 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 10, 1934, nonrecording gage at site near Birchdale 7 mi (11 km) downstream at different datum.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant at International Falls. Some regulation at low and medium flows by Rainy and Namakan Lakes.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--54 years, 12,790 ft<sup>3</sup>/s (362.2 m<sup>3</sup>/s), 8.95 in/yr (227 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,600 ft<sup>3</sup>/s (2,030 m<sup>3</sup>/s) May 12, 1950, gage height, 21.04 ft (6.413 m); minimum daily, 928 ft<sup>3</sup>/s (26.3 m<sup>3</sup>/s) Dec. 26, 1929.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 38,400 ft<sup>3</sup>/s (1,090 m<sup>3</sup>/s) Apr. 22, gage height, 14.03 ft (4.276 m); minimum, 5,400 ft<sup>3</sup>/s (153 m<sup>3</sup>/s) Oct. 1, gage height, 2.86 ft (0.872 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5560	8270	8730	9000	8500	9500	8660	22300	28000	11400	23200	10800
2	6190	8910	9470	7500	8500	10000	7750	21200	28700	8930	23400	10200
3	7080	9400	9570	8000	9000	9500	7470	20900	28400	9790	23300	9850
4	7710	9560	9670	9000	8500	10000	7280	19600	27800	10300	23200	9680
5	8260	8810	9670	9000	8000	9500	7210	19000	26000	10400	23100	9630
6	9280	8350	9730	9500	9000	10000	7170	21300	25000	10900	23000	9430
7	10600	8810	9440	9500	9000	9500	7130	23300	24700	12000	21600	7800
8	11300	8680	9400	8500	9000	9500	7090	22900	24600	12600	20800	8460
9	11200	8580	9360	8500	8500	9500	7070	22000	24600	13000	20200	8730
10	10900	8340	9300	8500	8500	10000	6980	20600	25600	15500	17200	8410
11	10600	8480	9200	9000	8500	10000	7080	20200	28000	16500	15800	8420
12	10200	8220	9200	9000	8500	10000	6800	20900	28900	17100	15200	8540
13	9850	8180	9200	9000	8500	10000	6820	21300	28800	19200	12500	8620
14	9600	8340	9200	9000	9000	10000	7710	21500	28400	20200	11100	8550
15	9430	8380	9200	8500	9000	9500	9740	22800	27900	21500	10700	8560
16	9200	8470	9200	9000	8500	9000	13500	25400	27500	22200	10600	8700
17	8960	8950	9200	8500	9000	9500	17700	27800	27100	23900	10600	8940
18	8890	9110	9200	9000	9000	9500	21500	28700	26800	24300	10700	8900
19	9380	8950	9200	9000	9000	10500	24700	29600	26600	24300	10700	8620
20	10200	8810	9200	9000	8500	10000	27900	32000	26300	23500	10700	8390
21	10500	8520	9200	9000	8500	10000	33300	33800	25800	19100	11000	8050
22	10300	8250	9000	8500	9000	10000	37700	34300	23200	17000	11200	8110
23	9920	8110	8500	8500	8500	10000	35200	31300	19200	16500	11300	7700
24	9790	8140	8000	8000	9000	9500	32800	28300	17200	16300	11200	7620
25	9560	8220	7500	8000	8500	9380	31100	26700	16700	16200	11300	7460
26	9210	8420	6000	8000	8500	8890	30500	28100	14200	16100	11400	7230
27	8750	8360	7500	8500	9500	8670	29200	27800	12800	16100	11300	7210
28	8540	8530	8000	8500	9500	8360	27300	27000	12500	17400	11300	7480
29	8350	8500	8500	8000	---	8300	25400	26400	12100	19900	11300	7580
30	8260	8430	9000	8000	---	7930	23600	25800	11900	21000	11200	7790
31	8010	---	9200	8500	---	8320	---	25900	---	22600	11200	---
TOTAL	285580	257080	276740	267500	245000	294350	523360	778700	705300	525720	461300	255460
MEAN	9212	8569	8927	8629	8750	9495	17450	25120	23510	16960	14880	8515
MAX	11300	9560	9730	9500	9500	10500	37700	34300	28900	24300	23400	10800
MIN	5560	8110	6000	7500	8000	7930	6800	19000	11900	8930	10600	7210
CFSM	.48	.44	.46	.45	.45	.49	.90	1.30	1.21	.87	.77	.44
IN.	.55	.49	.53	.51	.47	.56	1.00	1.49	1.35	1.01	.88	.49
CAL YR 1981	TOTAL	3910540	MEAN	10710	MAX	29800	MIN	4720	CFSM	.55	IN	7.50
WTR YR 1982	TOTAL	4876090	MEAN	13360	MAX	37700	MIN	5560	CFSM	.69	IN	9.35

## LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued  
(National stream-quality accounting network station)

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968-70, October 1977 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1980 to September 1982.

WATER TEMPERATURES: October 1980 to September 1982.

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 166 micromhos July 2, 1982; minimum, 72 micromhos July 31, Aug. 2, 1982.

WATER TEMPERATURES: Maximum, 25.0°C July 18, Aug. 14, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 166 micromhos July 2; minimum, 72 micromhos July 31, Aug. 2.

WATER TEMPERATURES: Maximum, 23.5°C July 6, Aug. 17; minimum, 0.0°C several days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	DIS- CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (STAND- ARD UNITS) (00400)	PH LAB (STAND- ARD UNITS) (00403)	TEMPER- ATURE AIR (DEG C) (00020)	TEMPER- ATURE (DEG C) (00010)	BARO- METRIC PRES- SURE (MM OF HG) (00025)	
OCT	01...	1145	--	5540	123	120	8.1	7.3	2.0	7.5	731
DEC	15...	1045	9200	--	123	75	7.6	7.4	-20.0	.0	735
FEB	02...	1130	8500	--	100	79	7.4	7.5	25.0	.0	739
MAY	20...	1230	--	32100	114	104	7.6	7.4	16.0	13.5	734
JUL	20...	1530	--	23600	79	65	7.4	7.1	30.0	19.5	728
SEP	14...	1130	--	8530	105	85	7.3	7.5	8.0	15.0	738
DATE	TUR- BID- ITY (NTU) (00076)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD- NESS (MG/L AS CACO3) (00900)	HARD- NONCAR- BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	
OCT	01...	3.8	10.6	92	K11000	730	44	8.0	12	3.5	3.5
DEC	15...	1.6	13.4	95	K6500	150	30	7.0	8.4	2.3	3.2
FEB	02...	6.0	12.0	85	600	390	32	9.0	8.8	2.4	3.8
MAY	20...	27	8.6	86	K700	410	53	5.0	14	4.3	2.6
JUL	20...	2.5	8.1	92	440	110	27	4.0	7.3	2.1	1.8
SEP	14...	3.4	7.7	79	K840	900	27	.00	7.6	2.0	3.5
DATE	SODIUM AD- SORP- TION RATIO (00931)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	ALKA- LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	
OCT	01...	.2	.9	36	5.7	6.4	<.1	2.4	78	56	1170
DEC	15...	.3	.7	23	6.4	4.7	<.1	1.5	62	41	1540
FEB	02...	.3	1.0	23	6.3	5.2	<.1	2.1	68	44	1560
MAY	20...	.2	.8	48	7.0	2.7	<.1	3.3	97	64	8410
JUL	20...	.2	.5	23	4.0	1.9	.1	2.0	46	34	2930
SEP	14...	.3	.6	27	5.0	4.1	<.1	.6	56	40	1290

## LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P) (00671)	SEDI- MENT, DIS- SUS- PENDE (MG/L) (80154)	SEDI- MENT, DIS- SUS- PENDE (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 01...	.10	.070	.28	.100	.010	--	26	389	76
DEC 15...	.10	.040	.46	.030	.010	<.010	4	99	67
FEB 02...	.15	.030	.59	<.010	<.010	<.010	12	280	89
MAY 20...	.24	.020	.92	.070	.020	<.010	--	--	--
JUL 20...	<.10	.030	.30	.020	.010	<.010	4	284	68
SEP 14...	<.10	.070	1.50	.040	<.010	<.010	7	169	82

DATE	TIME	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS- SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA) (01007)	BARIUM, DIS- SOLVED (UG/L AS BA) (01005)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD) (01027)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR) (01034)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO) (01037)
OCT 01...	1145	3	3	<50	2	1	1	20	10	2
FEB 02...	1130	1	1	<100	15	1	<1	20	10	<1
MAY 20...	1230	2	1	<100	39	1	1	30	20	2
SEP 14...	1130	1	1	100	15	1	<1	<10	<10	3

DATE	COBALT, DIS- SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU) (01042)	COPPER, DIS- SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE) (01045)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN) (01055)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG) (71900)
OCT 01...	1	6	<1	350	100	2	1	20	14	<.1
FEB 02...	<1	26	4	110	46	3	1	10	5	<.1
MAY 20...	2	9	5	1500	180	4	3	80	9	.5
SEP 14...	2	6	4	200	46	4	4	20	3	.8

DATE	MERCURY DIS- SOLVED (UG/L AS HG) (71890)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI) (01067)	NICKEL, DIS- SOLVED (UG/L AS NI) (01065)	SELE- NIUM, TOTAL (UG/L AS SE) (01147)	SELE- NIUM, DIS- SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG) (01077)	SILVER, DIS- SOLVED (UG/L AS AG) (01075)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)
OCT 01...	<.1	7	1	<1	<1	<1	<1	20	6
FEB 02...	<.1	<1	<1	<1	<1	<1	<1	30	10
MAY 20...	.3	8	5	<1	<1	<1	<1	50	9
SEP 14...	.3	3	1	<1	<1	<1	<1	20	12

## LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	125	121	123	93	85	89	122	118	120	128	122	124
2	122	116	118	90	87	88	122	113	117	141	128	137
3	125	119	123	93	87	90	120	90	114	141	131	138
4	117	111	114	92	89	91	119	112	115	129	119	122
5	112	107	110	95	92	93	120	113	116	122	116	119
6	112	107	110	96	91	93	118	73	93	120	114	115
7	106	103	105	99	95	97	105	101	103	119	114	117
8	105	101	103	97	92	95	119	103	107	127	117	121
9	114	103	109	99	95	97	116	109	112	123	118	120
10	122	113	118	101	97	99	122	117	120	123	120	121
11	132	121	127	101	99	100	119	103	113	121	112	117
12	141	133	136	103	101	102	118	113	116	117	111	114
13	143	140	141	104	101	103	121	117	118	114	111	112
14	148	142	145	107	103	104	122	118	120	113	110	111
15	151	144	147	105	104	104	129	123	125	121	112	117
16	145	140	143	107	105	106	135	129	133	119	109	115
17	144	135	140	107	105	106	138	132	134	112	106	109
18	118	93	96	105	103	105	137	136	136	109	105	107
19	96	92	94	106	104	105	136	132	133	111	108	110
20	97	93	94	107	105	106	135	132	134	108	105	107
21	96	93	94	111	106	109	135	132	134	112	106	108
22	95	90	93	110	99	106	133	131	132	117	111	114
23	99	88	91	102	96	99	139	130	134	114	108	111
24	90	89	89	107	100	104	143	137	141	115	111	114
25	91	88	89	111	108	110	144	143	144	110	105	107
26	92	87	89	110	107	108	150	142	145	110	107	109
27	90	88	89	113	111	112	149	138	146	108	100	105
28	91	88	89	119	113	117	137	132	134	108	101	105
29	100	90	92	122	118	120	135	131	134	108	102	104
30	93	88	91	125	119	122	129	124	126	110	108	109
31	93	90	91	---	---	---	126	123	124	109	98	102
MONTH	151	87	109	125	85	103	150	73	125	141	98	114
DAY	FEBRUARY			MARCH			APRIL			MAY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	107	97	100	108	103	105	127	122	123	117	115	116
2	103	100	101	104	95	99	141	128	135	120	115	117
3	100	90	93	108	100	105	158	138	150	123	116	120
4	106	93	98	108	104	106	163	120	150	123	120	122
5	107	104	106	108	105	106	133	119	125	125	121	123
6	105	93	102	111	105	108	153	133	144	123	120	122
7	106	92	97	111	106	110	161	153	158	121	116	118
8	106	93	101	115	107	111	162	145	154	116	114	115
9	113	93	102	116	107	113	149	145	147	115	112	113
10	111	103	107	116	108	113	149	144	147	117	112	115
11	114	105	109	113	109	111	148	144	146	117	113	115
12	116	111	113	122	112	117	152	147	149	118	113	115
13	115	108	113	113	109	111	152	147	149	121	114	116
14	107	100	102	112	100	105	150	133	145	131	100	106
15	104	102	104	112	104	108	137	128	133	116	101	103
16	113	99	105	110	108	109	141	136	138	102	99	101
17	115	106	111	110	105	107	145	135	141	102	100	101
18	108	105	107	105	103	104	135	113	122	106	101	103
19	106	103	105	108	106	107	112	93	99	108	105	107
20	111	102	106	107	102	104	112	92	100	111	107	109
21	112	105	110	105	102	103	111	91	94	112	102	108
22	108	103	105	106	104	105	98	92	95	101	98	99
23	109	107	108	108	105	107	110	94	104	104	98	101
24	110	105	108	111	106	109	114	109	111	121	97	110
25	110	104	106	114	109	112	118	113	116	123	102	112
26	111	107	109	114	109	112	117	114	116	125	106	114
27	110	101	106	119	111	117	119	114	116	119	102	111
28	104	100	102	118	115	116	123	119	121	115	104	110
29	---	---	---	121	116	119	122	115	119	121	112	115
30	---	---	---	131	119	125	118	112	115	135	118	125
31	---	---	---	132	124	129	---	---	---	131	110	119
MONTH	116	90	105	132	95	110	163	91	129	135	97	112

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	JUNE			JULY			AUGUST			SEPTEMBER		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	113	109	110	156	118	142	87	73	76	118	93	102
2	116	106	110	166	146	156	92	72	80	113	99	104
3	107	103	105	164	134	150	85	76	82	118	100	109
4	108	106	108	152	132	142	90	75	79	115	101	107
5	113	108	111	147	128	134	89	74	79	116	99	104
6	114	110	112	135	126	130	88	74	79	110	98	104
7	111	105	110	146	121	134	96	77	88	135	101	115
8	113	105	110	151	128	135	93	78	82	128	99	116
9	112	108	111	144	111	125	97	81	88	125	99	111
10	113	108	111	126	116	121	105	88	98	120	104	110
11	110	106	108	137	109	127	103	86	90	120	102	108
12	108	105	106	137	108	124	94	87	91	116	100	107
13	107	103	105	126	99	116	117	92	104	119	93	97
14	106	104	105	132	94	114	117	104	109	99	97	99
15	106	101	103	110	93	99	112	95	103	99	96	97
16	105	102	104	112	92	96	104	96	99	100	97	99
17	103	99	102	110	87	95	107	93	97	103	98	100
18	103	98	100	109	76	94	111	94	101	109	103	106
19	103	100	102	106	86	92	110	100	104	112	109	110
20	106	102	104	96	78	87	112	102	106	112	111	111
21	114	102	105	119	85	109	116	98	107	116	111	114
22	117	106	111	108	92	100	114	100	107	117	115	116
23	128	114	122	109	85	98	114	97	102	120	116	118
24	134	115	122	106	88	96	110	99	105	117	111	115
25	134	117	122	104	85	91	120	100	111	115	111	113
26	149	116	132	109	85	95	124	99	104	115	113	114
27	144	122	137	100	82	88	115	101	108	115	113	113
28	144	124	133	95	85	92	110	97	101	123	113	119
29	150	126	133	99	75	83	112	90	100	123	119	121
30	141	119	131	94	77	83	107	88	101	122	116	119
31	---	---	---	90	72	77	109	91	99	---	---	---
MONTH	150	98	113	166	72	111	124	72	96	135	93	109
YEAR	166	72	111									

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	8.5	6.0	7.5	5.0	3.5	4.5	.0	.0	.0	.0	.0	.0
2	9.0	6.0	7.5	5.0	4.0	4.5	.5	.0	.0	.0	.0	.0
3	8.0	6.5	7.5	5.0	4.0	4.5	.0	.0	.0	.0	.0	.0
4	7.5	7.5	7.5	6.0	4.5	5.0	.0	.0	.0	.0	.0	.0
5	8.0	7.5	8.0	5.5	4.0	5.0	.0	.0	.0	.0	.0	.0
6	9.0	7.5	8.0	4.5	3.5	4.0	.0	.0	.0	.0	.0	.0
7	8.5	7.0	8.0	4.5	3.0	4.0	.0	.0	.0	.0	.0	.0
8	8.0	7.5	8.0	4.0	2.0	3.0	.0	.0	.0	.0	.0	.0
9	7.5	7.5	7.5	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
10	8.5	7.5	8.0	2.0	1.5	1.5	.0	.0	.0	.0	.0	.0
11	9.0	8.0	8.5	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
12	9.0	8.5	8.5	3.0	1.5	2.0	.0	.0	.0	.0	.0	.0
13	9.5	9.0	9.5	3.5	2.0	3.0	.0	.0	.0	.0	.0	.0
14	9.5	9.0	9.5	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
15	9.5	8.5	9.0	4.0	3.5	3.5	.0	.0	.0	.0	.0	.0
16	9.5	8.0	9.0	4.0	3.5	4.0	.0	.0	.0	.0	.0	.0
17	9.5	8.0	9.0	4.0	3.5	3.5	.0	.0	.0	.0	.0	.0
18	8.0	6.0	7.0	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
19	7.5	6.0	6.5	2.5	1.0	2.0	.0	.0	.0	.0	.0	.0
20	7.0	5.5	6.5	1.0	.0	.5	.0	.0	.0	.0	.0	.0
21	5.5	4.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	4.5	3.0	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	3.0	2.0	2.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
24	2.0	1.5	1.5	.5	.5	.5	.0	.0	.0	.0	.0	.0
25	1.5	.5	1.0	.5	.5	.5	.0	.0	.0	.0	.0	.0
26	1.0	.0	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0
27	2.0	.5	1.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
28	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	4.0	2.0	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	5.0	3.5	4.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
31	5.0	4.0	4.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	9.5	.0	6.0	6.0	.0	2.0	.5	.0	.0	.0	.0	.0



LAKE OF THE WOODS BASIN

05134200 RAPID RIVER NEAR BAUDETTE, MN

LOCATION.--Lat 48°32'10", long 94°33'45", in SE¼NE¼ sec.1, T.158 N., R.31 W., Lake of the Woods County, Hydrologic Unit 09030007, on left bank 20 ft (6 m) upstream from bridge on State Highway 72, 1.2 mi (1.9 km) downstream from North Branch Rapid River, and 12 mi (19 km) south of Baudette.

DRAINAGE AREA.--543 mi<sup>2</sup> (1,406 km<sup>2</sup>).

PERIOD OF RECORD.--October 1956 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,093.92 ft (333.427 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation bench mark).

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--26 years, 311 ft<sup>3</sup>/s (8.808 m<sup>3</sup>/s), 7.78 in/yr (198 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,550 ft<sup>3</sup>/s (214 m<sup>3</sup>/s) Apr. 26, 1979, gage height, 21.13 ft (6.440 m); no flow Dec. 20, 1976 to Mar. 9, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 11, 1950, reached a stage of 21.1 ft (6.431 m), from information by local residents and Minnesota Department of Transportation, discharge, about 7,500 ft<sup>3</sup>/s (210 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s) Apr. 16, gage height, 15.4 ft (4.69 m), from high-water mark (backwater from ice); minimum daily discharge, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) Feb. 24 to March 26; minimum gage height, 2.49 ft (0.759 m) Mar. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	382	455	135	32	15	14	50	878	425	128	385	192
2	595	432	130	31	15	14	60	828	395	121	360	196
3	605	405	125	29	15	14	60	786	352	107	328	194
4	675	385	120	28	15	14	60	937	312	94	287	186
5	771	370	115	27	15	14	55	1410	280	182	249	180
6	866	352	110	26	15	14	55	1460	257	452	240	164
7	857	332	105	24	15	14	55	1320	294	450	308	140
8	768	318	100	23	15	14	50	1190	422	405	285	122
9	692	289	95	22	15	14	50	1090	430	382	259	110
10	695	267	90	22	15	14	50	1020	495	468	240	100
11	703	255	85	21	15	14	100	1070	515	442	212	93
12	661	243	80	21	15	14	500	1120	472	392	184	88
13	661	243	80	20	15	14	1000	1070	425	335	165	90
14	653	241	75	20	15	14	2000	1050	388	278	147	97
15	613	243	73	19	15	14	3600	1130	365	629	132	92
16	572	328	70	19	15	14	3700	1410	328	1230	122	90
17	548	400	67	18	15	14	3250	1590	308	1310	111	97
18	572	405	64	18	15	14	2820	1690	280	1280	118	125
19	578	382	62	17	15	14	2450	1800	247	1020	204	132
20	565	338	59	17	15	14	2110	1770	240	815	263	132
21	542	243	56	17	15	14	1830	1610	257	709	249	131
22	510	250	53	16	15	14	1630	1380	257	618	348	121
23	485	230	50	16	15	14	1520	1190	229	523	470	110
24	458	210	47	16	14	14	1420	1030	217	520	472	106
25	432	195	45	16	14	14	1340	892	204	613	440	106
26	402	180	43	16	14	14	1230	786	183	550	410	99
27	458	170	41	15	14	15	1130	706	162	482	360	103
28	442	160	39	15	14	16	1040	626	148	430	303	332
29	458	150	37	15	---	20	975	560	148	405	251	809
30	468	140	35	15	---	25	914	500	146	438	215	966
31	462	---	33	15	---	35	---	452	---	415	200	---
TOTAL	18149	8611	2319	626	415	475	35104	34351	9181	16223	8317	5503
MEAN	585	287	74.8	20.2	14.8	15.3	1170	1108	306	523	268	183
MAX	866	455	135	32	15	35	3700	1800	515	1310	472	966
MIN	382	140	33	15	14	14	50	452	146	94	111	88
CFSM	1.08	.53	.14	.04	.03	.03	2.16	2.04	.56	.96	.49	.34
IN.	1.24	.59	.16	.04	.03	.03	2.40	2.35	.63	1.11	.57	.38

CAL YR 1981 TOTAL 74189.0 MEAN 203 MAX 1940 MIN 8.3 CFSM .37 IN 5.08  
WTR YR 1982 TOTAL 139274.0 MEAN 382 MAX 3700 MIN 14 CFSM .70 IN 9.54

## LAKE OF THE WOODS BASIN

05140520 LAKE OF THE WOODS AT WARROAD, MN

(International gaging station)

LOCATION.--Lat 48°54'15", long 95°18'57", in SW¼SE¼ sec.29, T.163 N., R.36 W., Roseau County, Hydrologic Unit 09030009, on left bank of Warroad River in Warroad, 300 ft (91 m) downstream from Canadian National railroad bridge, 1,000 ft (305 m) downstream from bridge on State Highway 11, and 4,000 ft (1,200 m) upstream from mouth of Warroad River.

DRAINAGE AREA.--27,200 mi<sup>2</sup> (70,400 km<sup>2</sup>).

PERIOD OF RECORD.--April to September 1978 (monthend elevations only), October 1978 to current year. Records collected prior to April 1978 are in reports of the Water Survey of Canada.

GAGE.--Water-stage recorder. Datum of gage is 1,000.00 ft (304.800 m) Lake of the Woods datum; gage readings have been reduced to elevations based on Lake of the Woods datum.

REMARKS.--Runoff conditions of the Warroad River can affect water levels obtained at this station. Water level subject to fluctuation caused by change in direction and velocity of wind and seiches.

COOPERATION.--This station is one of the International gaging stations maintained by the United States under agreement with Canada.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,062.36 ft (323.807 m) Sept. 12, 1978; maximum daily, 1,061.84 ft (323.649 m) Sept. 12, 1978; minimum elevation recorded, 1,055.94 ft (321.851 m) Sept. 4, 1980; minimum daily recorded, 1,056.52 ft (322.027 m) Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,061.36 ft (323.503 m) Aug. 8; maximum daily, 1,060.97 ft (323.384 m) Aug. 1; minimum 1,057.61 ft (322.360 m) Mar. 13; minimum daily, 1057.66 ft (322.375 m) Mar. 13.

ELEVATION, IN FEET LAKE OF THE WOODS DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
MEAN VALUES

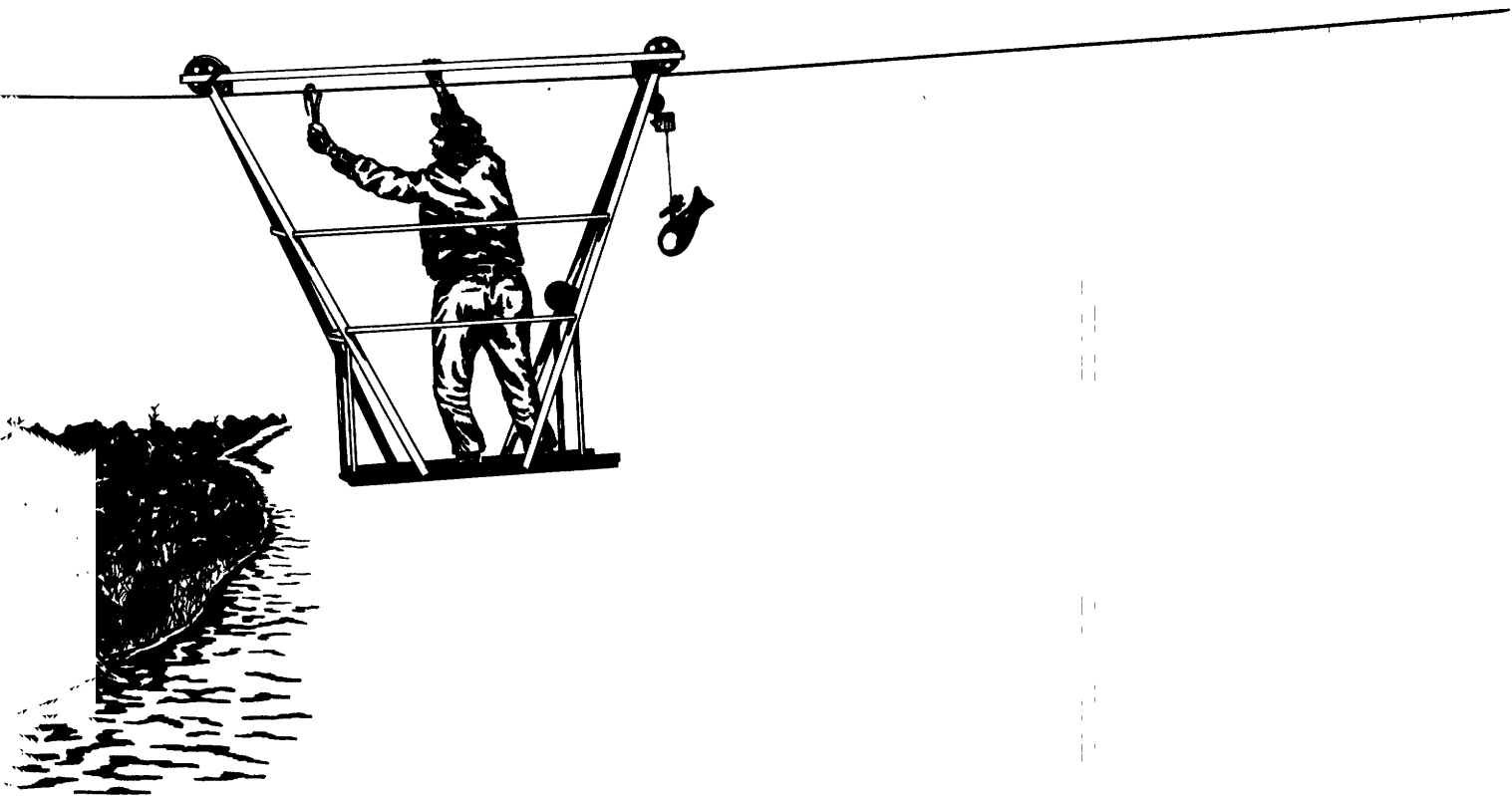
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1059.30	1058.97	1058.95	1058.70	1058.22	1057.75	1057.77	1059.02	1060.33	1060.38	1060.97	1060.38
2	1058.95	1059.07	1058.90	1058.72	1058.18	1057.77	1057.83	1059.04	1060.45	1060.37	1060.89	1060.31
3	1058.96	1058.96	1058.89	1058.68	1058.17	1057.77	1057.79	1059.02	1060.27	1060.43	1060.84	1060.34
4	1058.98	1058.92	1058.83	1058.70	1058.14	1057.74	1057.81	1059.08	1060.28	1060.38	1060.80	1060.24
5	1058.95	1058.94	1058.89	1058.67	1058.13	1057.73	1057.80	1059.14	1060.29	1060.46	1060.88	1060.57
6	1058.99	1058.97	1058.90	1058.64	1058.11	1057.72	1057.80	1059.00	1060.43	1060.34	1060.91	1060.35
7	1058.99	1058.97	1058.84	1058.66	1058.07	1057.74	1057.80	1059.04	1060.28	1060.32	1060.76	1060.18
8	1059.08	1058.95	1058.85	1058.62	1058.06	1057.73	1057.79	1059.33	1060.52	1060.31	1060.81	1060.09
9	1058.99	1058.66	1058.85	1058.59	1058.04	1057.75	1057.80	1059.47	1060.63	1060.50	1060.95	1060.16
10	1059.04	1058.90	1058.87	1058.55	1058.03	1057.73	1057.78	1059.45	1060.39	1060.42	1060.86	1060.28
11	1059.09	1058.94	1058.85	1058.57	1057.99	1057.73	1057.82	1059.42	1060.48	1060.36	1060.78	1060.22
12	1059.07	1058.84	1058.83	1058.58	1057.99	1057.74	1057.84	1059.50	1060.47	1060.34	1060.68	1060.31
13	1058.80	1058.88	1058.82	1058.57	1057.97	1057.66	1057.89	1059.55	1060.54	1060.44	1060.69	1060.29
14	1058.96	1058.99	1058.80	1058.55	1057.97	1057.73	1058.05	1059.62	1060.60	1060.47	1060.73	1060.60
15	1059.00	1058.98	1058.80	1058.49	1057.92	1057.74	1058.13	1059.82	1060.66	1060.52	1060.62	1060.21
16	1058.91	1058.88	1058.79	1058.48	1057.95	1057.72	1058.27	1059.83	1060.54	1060.55	1060.72	1060.01
17	1059.04	1058.95	1058.78	1058.50	1057.93	1057.72	1058.09	1059.79	1060.76	1060.08	1060.69	1060.13
18	1059.18	1059.26	1058.79	1058.48	1057.87	1057.72	1058.18	1059.81	1060.58	1060.47	1060.65	1059.93
19	1058.90	1059.18	1058.79	1058.43	1057.87	1057.74	1058.23	1060.05	1060.59	1060.58	1060.68	1060.17
20	1059.11	1059.02	1058.79	1058.44	1057.83	1057.73	1058.26	1060.11	1060.57	1060.57	1060.65	1060.11
21	1058.96	1058.94	1058.77	1058.43	1057.85	1057.68	1058.32	1060.08	1060.63	1060.74	1060.60	1059.97
22	1059.03	1058.93	1058.76	1058.43	1057.81	1057.70	1058.38	1060.15	1060.63	1060.75	1060.66	1059.94
23	1058.91	1058.89	1058.76	1058.39	1057.82	1057.71	1058.46	1060.16	1060.57	1060.66	1060.62	1060.13
24	1058.79	1058.88	1058.76	1058.38	1057.81	1057.69	1058.54	1060.16	1060.58	1060.69	1060.54	1060.17
25	1058.90	1059.06	1058.76	1058.36	1057.79	1057.72	1058.65	1060.19	1060.58	1060.72	1060.49	1059.87
26	1058.82	1059.04	1058.76	1058.37	1057.79	1057.73	1058.71	1060.27	1060.43	1060.76	1060.49	1059.87
27	1059.07	1058.93	1058.72	1058.31	1057.81	1057.74	1058.77	1060.29	1060.48	1060.71	1060.43	1060.33
28	1059.16	1058.79	1058.71	1058.26	1057.78	1057.73	1058.83	1060.34	1060.47	1060.70	1060.47	1060.28
29	1059.07	1058.77	1058.70	1058.28	---	1057.75	1058.87	1060.25	1060.58	1060.74	1060.39	1059.79
30	1058.92	1058.83	1058.71	1058.25	---	1057.76	1058.92	1060.35	1060.42	1060.72	1060.38	1059.79
31	1058.83	---	1058.69	1058.25	---	1057.71	---	1060.26	---	1060.68	1060.38	---
MEAN	1058.99	1058.94	1058.80	1058.49	1057.96	1057.73	1058.17	1059.73	1060.50	1060.52	1060.68	1060.17
MAX	1059.30	1059.26	1058.95	1058.72	1058.22	1057.77	1058.92	1060.35	1060.76	1060.76	1060.97	1060.60
MIN	1058.79	1058.66	1058.69	1058.25	1057.78	1057.66	1057.77	1059.00	1060.27	1060.08	1060.38	1059.79

WTR YR 1982 MEAN 1059.23 MAX 1060.97 MIN 1057.66

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or flood-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of annual maximum stage and discharge at high-flow stations and the second is a table of discharge measurements made at miscellaneous sites for both low flow and high flow.



**HIGH-FLOW PARTIAL-RECORD STATIONS**





## High-flow partial-record stations

The following table contains annual maximum discharge for high-flow stations. A high-flow partial-record station is equipped with a crest-stage gage, a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained, and discharge measurements may have been made for purposes of establishing the stage-discharge relation, but these are not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at high-flow partial-record stations during water year 1982

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of Record	Date	Annual maximum	
						Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Superior							
04011370	Little Devil Track River near Grand Marais, MN	Lat 47°47'09", long 90°19'44", in NE¼ NW¼ sec.9, T.61 N., R.1 E., Cook County, Hydrologic Unit 04010101, at culvert on County Highway 12, 1.6 miles upstream from mouth, and 2.5 miles north of Grand Marais.	7.49	1961-82	4-24-82	17.95	155
04012500	Poplar River at Lutsen, MN	Lat 47°38'23", long 90°42'31", in SW¼ NE¼ sec.33, T.60 N., R.3 W., Cook County, Hydrologic Unit 04010101, 350 ft upstream from bridge on U.S. Highway 61 at Lutsen, and 0.3 mile upstream from mouth.	112	1912-17#, 1928-47#, 1952-61#, 1972-82	4-26-82	5.44	1,260
04013200	Caribou River near Little Marais, MN	Lat 47°27'51", long 91°01'50", in NW¼ SE¼ sec.36, T.58 N., R.6 W., Lake County, Hydrologic Unit 04010101, at culvert on U.S. Highway 61, 0.2 mile upstream from mouth, and 5.2 miles northeast of Little Marais.	22.7	1961-82	4-24-82	14.05	690
04015200	Encampment River tributary at Silver Creek, MN	Lat 47°07'01", long 91°36'04", in NE¼ SE¼ sec.33, T.54 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 3, 0.3 mile north of Silver Creek, and 1.4 miles upstream from mouth.	.96	1960-82	5- 5-82	8.48	62
04015250	Silver Creek tributary near Two Harbors,	Lat 47°04'40", long 91°36'49", in SW¼ NE¼ sec.16, T.53 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 3, 1.0 mile upstream from mouth, and 4.5 miles northeast of Two Harbors.	3.72	1965-82	5- 5-82	6.27	375
04015300	Little Stewart River near Two Harbors, MN	Lat 47°03'52", long 91°40'03", in SE¼ NE¼ sec.24, T.53 N., R.11 W., Lake County, Hydrologic Unit 04010102, at culvert on county highway, 2.0 miles upstream from mouth, and 2.7 miles north of Two Harbors.	5.54	1960-82	5- 5-82	9.94	†
04015370	Talmadge River at Duluth, MN	Lat 46°53'20", long 91°55'21", in SE¼ NE¼ sec.24, T.51 N., R.13 W., St. Louis County, Hydrologic Unit 04010102, at culvert on U.S. Highway 61, 0.6 mile upstream from mouth, and 0.5 mile northeast of Duluth city limits.	5.79	1964-82	4-16-82	14.16	168
04015400	Miller Creek at Duluth, MN	Lat 46°49'01", long 92°10'42", in SE¼ NE¼ sec.13, T.50 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, at culvert on U.S. Highway 53, 0.2 mile northwest of Duluth city limits.	4.92	1960-82	5- 4-82	15.18	87

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1982

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of Record	Annual maximum		
					Date	Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Superior--Continued							
04020480	North Branch Whiteface River near Fairbanks, MN	Lat 47°22'20", long 91°56'28", at common corner of secs.35, 36, 1, and 2, along line between T.57 N., and T.56 N., R.13 W., St. Louis County, Hydrologic Unit 04010201, on right downstream wingwall of double box culvert on County Highway 16, 2 miles upstream from the mouth of Jenkins Creek, and 0.7 mile west of Fairbanks.	17.1	1979-82	4-24-82	12.40	205
04020700	Bug Creek at Shaw, MN	Lat 47°06'40", long 92°21'03", in SW¼ SE¼ sec.34, T.54 N., R.16 W., St. Louis County, Hydrologic Unit 04010201, at left bank on downstream side of culverts on County Road 15 at Shaw, and 7.5 miles upstream from mouth.	24.0	1979-82	7- 4-82	14.40	350
04021205	Floodwood River above Floodwood, MN	Lat 46°17'15", long 92°53'40", in NE¼NW¼ sec.32, T.52 N., R.20 W., St. Louis County, Hydrologic Unit 04010201, at bridge on County Highway 835, 500 ft west of State Highway 73, and 2 miles north of Floodwood.	198	1972-82	4-17-82	---	c2,000
04024095	Nemadji River near Holyoke, MN	Lat 46°31'04", long 92°23'22", in NE¼NE¼ sec.32, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at bridge on State Highway 23, 3.5 miles north of Holyoke.	118	1972-82	4-15-82	11.26	1,470
04024100	Rock Creek near Blackhoof, MN	Lat 45°32'10", long 92°22'12", in SW¼ SE¼ sec.21, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 4.0 miles upstream from mouth, and 4.4 miles east of Blackhoof.	4.94	1961-65, 1967-82	3-31-82	a16.72	330
04024110	Rock Creek tributary near Blackhoof, MN	Lat 46°32'14", long 92°22'05", in NE¼SE¼ sec.21, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 0.1 mile upstream from mouth, and 4.5 miles east of Blackhoof.	.20	1961-82	3-31-82	a12.84	†
04024200	South Fork Nemadji River near Holyoke, MN	Lat 46°29'38", long 92°24'36", in SE¼SE¼ sec.6, T.46 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 1.7 miles downstream from Clear Creek, and 2.0 miles northwest of Holyoke.	19.4	1961-82	3-31-82	a11.75	440
Red River of the North basin							
05047700	West Branch Mustinka River tributary near Graceville, MN	Lat 45°36'53", long 96°19'47", in NE¼NW¼ sec.28, T.125 N., R.45 W., Traverse County, Hydrologic Unit 09020102, at culvert on county highway, 6.0 miles northeast of Graceville.	3.37	1964-82	7-21-82	b8.11	39
05049200	Eighteenmile Creek near Wheaton, MN	Lat 45°47'18", long 96°31'52", on west quarter of line between secs.24 and 25, T.127 N., R.47 W., Traverse County, Hydrologic Unit 09020102, at culvert on County Highway 67, 1.4 miles upstream from mouth, and 2.0 miles southwest of Wheaton.	68.5	1965-68, 1970-82	3-30-82	a10.70	320

"See footnotes at end of the table."

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1982

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of Record	Annual maximum		
					Date	Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Red River of the North basin--Continued							
05050700	Rabbit River near Nashua, MN	Lat 46°04'30", long 96°18'24", in SE¼ NE¼ sec.15, T.130 N., R.45 W., Wilkin County, Hydrologic Unit 09020101, at right downstream piling of bridge on County Road 19, 2.6 miles north of Nashua, 4.8 miles upstream from mouth of South Fork Rabbit River.	56.1	1979-82	3-30-82	a13.06	325
05060800	Buffalo River near Callaway, MN	Lat 47°01'17", long 95°54'43", in SW¼ SE¼ sec.17, T.141 N., R.41 W., Becker County, Hydrologic Unit 09020106, at culvert on U.S. Highway 59, 2.7 miles north of Callaway.	94.5	1960-82	4- 1-82	a16.86	†
05061200	Whiskey Creek at Barnesville, MN	Lat 46°39'35", long 96°23'54", in SE¼ SW¼ sec.20, T.137 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on State Highway 34, 0.7 mile upstream from Blue Eagle Lake, and 1.0 mile northeast of Barnesville.	25.3	1961-64, 1965-66#, 1967-82	5-17-82	b3.67	40
d05061400	Spring Creek above Downer, MN	Lat 46°44'37", long 96°25'12", in NW¼ NW¼ sec.30, T.138 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on county road, 3.1 miles east of Downer.	5.81	1961-82	5-17-82	e7.14	†
05062280	Mosquito Creek near Bagley, MN	Lat 47°27'02", long 95°22'55", in SW¼NW¼ sec.21, T.146 N., R.37 W., Clearwater County, Hydrologic Unit 09020108, at culvert on State Highway 92, 5.0 miles south of Bagley.	3.98	1961-82	4-16-82	b10.64	73
05062470	Marsh creek tributary near Mahnomen, MN	Lat 47°19'31", long 96°04'41", in SE¼SW¼ sec.36, T.145 N., R.43 W., Norman County, Hydrologic Unit 09020108, at culvert on State Highway 31, 0.1 mile upstream from mouth, and 5.2 miles west of Mahnomen.	11.9	1961-82	4-15-82	b12.22	99
05062700	Wild Rice River tributary near Twin Valley, MN	Lat 47°17'47", long 96°19'42", in SW¼SE¼ sec.12, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020107, at culvert on State Highway 31, 1.2 miles upstream from mouth, and 4.1 miles northwest of Twin Valley.	4.72	1961-82	4-15-82	11.97	76
05062800	Coon Creek near Twin Valley, MN	Lat 47°15'51", long 96°20'34", in NE¼NE¼ sec.26, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 28, 1.3 miles upstream from mouth, and 4.0 miles west of Twin Valley.	50.8	1962-82	3-31-82	a11.82	410
05063200	Spring Creek tributary near Ogema, MN	Lat 47°07'22", long 95°57'35", in SE¼SE¼ sec.11, T.142 N., R.42 W., Becker County, Hydrologic Unit 09020108, at culvert on county highway, 2.0 miles northwest of Ogema.	4.99	1963-82	3-30-82	a7.52	51
05063500	South Branch Wild Rice River near Borup, MN	Lat 47°11'40", long 96°34'40", in NW¼NW¼ sec.24, T.143 N., R.47 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 193, 3.5 miles upstream from Wild Rice River, and 4.0 miles northwest of Borup.	254	1944-49#, 1972-82	3-31-82	a14.34	†

"See footnotes at end of the table."

## Annual maximum discharge at high-flow partial-record stations during water year 1982

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of Record	Annual maximum		
					Date	Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Red River of the North basin--Continued							
05073600	South Branch Battle River at Northome, MN	Lat 47°52'17", long 94°17'45", in NW¼NE¼ sec.25, T.151 N., R.29 W., Koochiching County, Hydrologic Unit 09020302, at culvert on U.S. Highway 71, 0.7 mile west of Northome, and 3.1 miles upstream from Battle Lake.	2.80	1960-82	4-24-82	15.29	96
05073750	Spring Creek near Blackduck, MN	Lat 47°46'23", long 94°31'22", in NW¼NW¼ sec.32, T.150 N., R.30 W., Beltrami County, Hydrologic Unit 09020302, at culvert on County Highway 304, 3.1 miles north of Blackduck, and 3.2 miles upstream from mouth.	7.96	1960-82	4-24-82	15.22	†
05073800	Perry Creek tributary near Shooks, MN	Lat 47°52'00", long 94°32'52", in NW¼SW¼ sec.30, T.151 N., R.30 W., Beltrami County, Hydrologic Unit 09020302, at culvert on State Highway 72, 5.2 miles west of Shooks.	1.14	1960-82	4-15-82	8.11	70
05075700	Mud River near Grygla, MN	Lat 48°19'31", long 95°44'35", at common corner of secs.13, 14, 23, and 24, T.156 N., R.40 W., Hydrologic Unit 09020304, Marshall County, at bridge on State Highway 89, 6 miles west of Grygla.	170	1979-82	4-15-82	16.90	800
05077700	Ruffy Brook near Gonvick, MN	Lat 47°44'50", long 95°24'45", in SE¼SE¼ sec.5, T.149 N., R.37 W., Clearwater County, Hydrologic Unit 09020305, on downstream side of bridge on County Highway 17, 4.0 miles upstream from mouth, and 4.8 miles east of Gonvick.	45.2	1960-78#, 1979-82	4-15-82	4.59	249
05078180	Silver Creek near Clearbrook, MN	Lat 47°38'43", long 95°26'33", in NW¼ sec.13, T.148 N., R.38 W., Clearwater County, Hydrologic unit 09020305, at culvert on county highway, 3.4 miles south of Clearbrook.	4.96	1960-82	7-21-82	8.60	†
05078400	Clearwater River tributary near Plummer, MN	Lat 47°52'34", long 96°08'35", in SE¼SE¼ sec.22, T.151 N., R.43 W., Red Lake County, Hydrologic Unit 09020305, at culvert on county highway, 1.2 miles upstream from mouth, and 5.3 miles southwest of Plummer.	6.51	1961-82	7-16-82	11.80	†
05086900	Middle River near Newfolden, MN	Lat 48°22'04", long 96°16'47", in NE¼NE¼ sec.3, T.156 N., R.44 W., Marshall County, Hydrologic Unit 09020309, at bridge on township road, 2.0 miles northeast of Newfolden.	91.1	1979-82	4-15-82	15.29	270
05094000	South Branch Two Rivers at Lake Bronson, MN	Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., Kittson County, Hydrologic Unit 09020312, 70 ft upstream from culvert on U.S. Highway 59 at town of Lake Bronson, and 3.4 miles downstream from dam at outlet of Bronson Lake.	444	1929-36#, 1937#, 1941-47#, 1954-81#, 1982	4- 2-82	7.94	1,040
Lake of the Woods basin							
05129650	Little Fork River at Cook, MN	Lat 47°51'15", long 92°41'55", in SE¼NE¼ sec.13, T.62 N., R.19 W., St. Louis County, Hydrologic Unit 09030005, at bridge on U.S. Highway 53, 0.6 mile west of Cook.	61.5	1968-82	4-19-82	16.00	463

"See footnotes at end of the table."

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1982

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of Record	Annual maximum	
					Date	Gage height (feet)
Lake of the Woods basin--Continued						
05130300	Borlin Creek near Chisholm, MN	Lat 47°36'14", long 92°51'58", in SE½SE¼ sec.9, T.59 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, at culvert on State Highway 73, 1.3 miles upstream from mouth, and 7.8 miles north of Chisholm.	13.7	1959-82	4-18-82	12.64 260
05131750	Big Fork River near BigFork, MN	Lat 47°44'56", long 93°46'31", in SW¼NE¼ sec.27, T.61 N., R.27 W., Itasca County, Hydrologic Unit 09030006, at bridge on State Highway 6, 5.5 miles west of Bigfork.	602	1973-82	5-18-82	13.39 1,810
05131878	Bowerman Brook near Craigville, MN	Lat 47°55'29", long 93°45'34", in NE¼NW¼ sec.26, T.63 N., R.27 W., Koochiching County, Hydrologic Unit 09030006, on left downstream wing-wall of bridge on State Highway 6, 2.4 miles upstream from mouth, and 7.0 miles west of Craigville.	25.0	1979-82	4-20-82	14.53 580
05132000	Big Fork River at Big Falls, MN	Lat 48°11'45", long 93°48'25", in SW¼SE¼ sec.35, T.155 N., R.25 W., Koochiching County, Hydrologic Unit 09030006, on left bank at village of Big Falls, 700 ft downstream from falls, 0.3 mile downstream from bridge on U.S. Highway 71, and 4.8 miles upstream from Sturgeon River.	1460	1929-79#, 1980-82	4-20-82	15.00 12,300
05140000	Bulldog Run near Warroad, MN	Lat 48°51'30", long 95°20'18", in SW¼SE¼ sec.7, T.162 N., R.36 W., Roseau County, Hydrologic Unit 09030009, 10 ft (revised) downstream from culvert on county highway, 0.8 mile upstream from mouth, and 2.5 miles south of Warroad.	11.1	1946-51#, 1966-77#, 1978-82	4-14-82	6.90 265
05140500	East Branch Warroad River near Warroad, MN	Lat 48°51'29", long 95°18'40", in NE¼ sec.17, T.162 N., R.36 W., Roseau County, Hydrologic Unit 09030009, at upstream side of highway bridge, 3.3 miles upstream from mouth, and 2.5 miles south of Warroad.	45.8	1946-54#, 1966-77#, 1978-82	4-17-82	8.67 546

# Operated as a continuous-record gaging station.

† Discharge not determined.

a Backwater from ice.

b Affected by shifting control.

c Estimated; gage height unknown.

d Name revised.

e Backwater from debris.

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (\*); measurements of peak flow by a dagger (†).

## Discharge measurements made at miscellaneous sites during water year 1982

Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
					Date	Discharge (ft <sup>3</sup> /s)
Red River of the North basin						
Wild Rice River	Red River of the North	Lat 47°17'29", long 96°26'09", on line between sec.13, T.144 N., R.46 W., and sec.18, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24, 3.2 miles southeast of Ada, MN (05062900).	-	1945-51, 1965-73, 1975-76, 1978-79	3-31-82	2,100
Snake River	Red River of the North	Lat 48°11'50", long 96°46'45", in SE† sec.36, T.155 N., R.48 W., Marshall County, Hydrologic Unit 09020309, at bridge on Minnesota Street in Warren, MN (05085500).	175	1945#, 1946-49, 1953-56#, 1970-72, 1974-76, 1978-79	4- 1-82 4-13-82	242 370
Roseau River	Red River of the North	Lat 48°53'28", long 95°43'50", in SW†SE† sec.31, T.163 N., R.39 W., Roseau County, Hydrologic Unit 09020314, at bridge on County Highway 28, 900 feet downstream from Hay Creek, and 3.2 miles northeast of Roseau, MN (05105300).	-	1973-80	11- 2-81 12-14-81 1-25-82 3-22-82 5-25-82 7-12-82 8-31-82	55 *25 *6.1 *9.5 270 125 44
Lake of the Woods basin						
Vermilion River	Crane Lake	Lat 47°57'41", long 92°28'33", in SE†SW† sec.2, T.63 N., R.17 W., St. Louis County, Hydrologic Unit 09030002, on left bank 200 ft downstream from dam at outlet of of Vermilion Lake, 4.4 miles upstream from Two Mile Creek, and 14.2 miles northwest of Tower, MN (05129000).	483	1911-17#, 1928-81#	10-19-81	224
Gold Portage outlet from Kabetogama Lake	Rainy River	Lat 48°31'56", long 93°05'14", in SW†SW† sec.19, T.70 N., R.21 W., St. Louis County, Hydrologic Unit 09030003, 10 miles northeast of Ray, MN (05129290).	-	1981	11- 3-81 5-10-82 5-13-82 5-25-82 6- 9-82 7-22-82 7-29-82 8-19-82 9-17-82	285 9.1 34 322 397 554 608 547 477

# Operated as a continuous-record gaging station.

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Water-quality partial-record stations are particular sites where chemical-quality, biological and (or) sediment data are collected systematically over a period of years for use in hydrologic analyses.

482018092292001 MUKOODA LAKE NEAR CRANE LAKE, MN

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 20...	0930	--	73	55	61	7.6	7.6	11.0	<1	2.90	10.8
AUG 17...	1045	14.0	73	57	62	8.5	7.8	21.4	12	4.5	8.1

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE IT-FLD AS HCO3) (99440)	CAR- BONATE IT-FLD AS CO3) (99445)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)
MAY 20...	100	28	6.1	3.0	1.3	.7	33	--	2.0	.3	38
AUG 17...	95	27	6.1	2.8	1.2	.6	26	4.0	2.0	.5	44

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 20...	.05	2	<.01	.52	.016	<.001	6	<1	3.30	.500
AUG 17...	.06	<1	<.01	.50	.010	<.001	6	<1	1.90	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482018092292001 MUKOODA LAKE NEAR CRANE LAKE, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 20,82 0930	AUG 17,82 1045
TOTAL CELLS/ML	5400	3100
DIVERSITY: DIVISION	1.3	0.7
..CLASS	1.3	0.7
..ORDER	2.5	1.8
...FAMILY	2.5	1.8
....GENUS	2.8	1.9

OGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	870#	16	--	-
....MELOSIRA	330	6	--	-
..FRAGILARIALES				
...FRAGILARIAEAE				
....SYNEDRA	1500#	27	*	0
..NAVICULALES				
...GOMPHONEMACEAE				
....GOMPHONEMA	--	-	87	3
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...DICTYOSPHAERIAEAE				
....DICTYOSPHAERIUM	83	2	--	-
...OOCYSTACEAE				
....ANKISTRODESMUS	350	6	29	1
....OOCYSTIS	--	-	72	2
...SCENEDESMACEAE				
....GLOEOACTINIUM	--	-	160	5
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....ANACYSTIS	1200#	21	160	5
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	-	1700#	54
....APHANIZOMENON	330	6	--	-
....CYLINDROSPERMUM	410	8	--	-
..OSCILLATORIALES				
...OSCILLATORIAEAE				
....LYNGBYA	--	-	870#	28
....OSCILLATORIA	410	8	--	-
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	*	0	29	1

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482226092283301 SANDPOINT LAKE BELOW HARRISON NARROWS NEAR CRANE LAKE, MN

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 18...	0940	--	14	44	48	6.9	7.2	13.4	1.80	9.6
AUG 17...	1015	8.00	12	54	60	7.7	7.9	22.0	2.60	7.9

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 18...	96	16	46	.06	.07	.58	.026	.006	4.40	<.100
AUG 17...	93	22	54	.07	<.01	.20	.018	.005	.300	<.100

482226092283301 SANDPOINT LAKE BELOW HARRISON NARROWS NEAR CRANE LAKE, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 18,82 0940	AUG 17,82 1015
TOTAL CELLS/ML	990	3500
DIVERSITY: DIVISION	1.8	0.9
.CLASS	1.8	0.9
..ORDER	2.6	1.9
...FAMILY	3.0	2.0
....GENUS	3.3	2.5

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..BACILLARIALES				
...NITZSCHIAEAE				
....NITZSCHIA	70	7	--	-
..EUPODISCALES				
...COSCONODISCACEAE				
....CYCLOTELLA	42	4	--	-
....MELOSIRA	99	10	28	1
....STEPHANODISCUS	--	-	69	2
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	--	-	97	3
....DIATOMA	56	6	--	-
....SYNEDRA	28	3	--	-
....TABELLARIA	--	-	41	1
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...MICRACTINIACEAE				
....MICRACTINIUM	56	6	--	-
...OOCYSTACEAE				
....ANKISTRODESMUS	56	6	*	0
....OOCYSTIS	--	-	120	4
...PALMELLACEAE				
....SPHAEROCYSTIS	56	6	110	3
...SCENEDESMACEAE				
....SCENEDESMUS	56	6	28	1
..TETRASPORALES				
...GLOEOCYSTACEAE				
....GLOEOCYSTIS	--	-	41	1
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	99	10	*	0
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...SYNURACEAE				
....MALLOMONAS	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....AGMENELLUM	--	-	840#	24
....ANACYSTIS	310#	31	830#	24
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	-	1200#	35
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....EUGLENA	14	1	*	0
....TRACHELOMONAS	42	4	--	-
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...GLENODINIACEAE				
....GLENODINIUM	--	-	*	0

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482239092491101 ASH RIVER AT ASH RIVER FALLS NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	STREAM- FLOW, INSTAN- TANEOUS (CFS) (00061)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)
AUG 16...	1300	3.30	2.9	207	211	8.2	7.9	23.5	7.9	96	134

DATE	SULFIDE TOTAL (MG/L AS S) (00745)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDE (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
AUG 16...	<.5	1	<.01	.030	.37	.40	.053	.032	.900	<.100

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482308092483301 ASH RIVER ABOVE MOUTH OF CANNON CREEK NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)
AUG 16...	1400	2.60	209	212	8.8	7.8	22.0	.90	10.5	125

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SULFIDE TOTAL (MG/L AS S) (00745)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDE (MG/L) (00530)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
AUG 16...	112	13	<.5	2	.040	.46	.50	.042	14.0	<.100

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482347092494401 ASH RIVER BELOW MOUTH OF CANNON CREEK NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (MG/L) (00301)	BICAR- BONATE (MG/L AS HCO3) (99440)	CAR- BONATE (MG/L AS CO3) (99445)
AUG 16...	1415	11.5	213	8.7	8.0	20.5	.90	6.5	75	111	10

DATE	SULFIDE TOTAL (MG/L AS S) (00745)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDE (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
AUG 16...	<.5	3	<.01	.040	1.2	1.20	.037	.002	7.80	<.100

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482451092471001 ASH RIVER AT ENTRANCE TO SULLIVAN BAY NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM-PLING DEPTH (FEET) (00003)	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)
MAY 17...	1730	--	6	150	149	7.4	7.6	15.1
AUG 16...	1515	2.80	7	158	169	9.4	8.2	24.0

DATE	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	BICAR-BONATE IT-FLD (MG/L) AS HCO3 (99440)	CAR-BONATE IT-FLD (MG/L) AS CO3 (99445)	SULFIDE TOTAL (MG/L) AS S (00745)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
MAY 17...	1.00	12.3	127	86	--	--	115	.16	--
AUG 16...	.90	11.9	146	38	30	<.5	123	.17	3

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L) AS N (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L) AS N (00610)	NITRO-GEN, ORGANIC TOTAL (MG/L) AS N (00605)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L) AS N (00625)	PHOS-PHORUS, TOTAL (MG/L) AS P (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L) AS P (00666)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	.13	--	--	.63	.035	.023	2.60	<.100
AUG 16...	<.01	.010	.89	.90	.046	.007	9.50	<.100

ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS  
 482451092471001 ASH RIVER AT ENTRANCE TO SULLIVAN BAY NEAR RAY, MN--Continued  
 PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17,82 1730	AUG 16,82 1515		
TOTAL CELLS/ML	1500	430000		
DIVERSITY: DIVISION	0.6	0.1		
..CLASS	0.6	0.1		
...ORDER	1.7	0.7		
...FAMILY	1.7	0.7		
...GENUS	1.8	0.8		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..ACHNANTHALES				
...ACHNANTHACEAE				
....ACHNANTHES	28	2	--	-
....COCCONEIS	--	-	*	0
..BACILLARIALES				
...NITZSCHIA	1000#	69	--	-
...NITZSCHIA				
..EUNOTIALES				
...EUNOTIACEAE				
....EUNOTIA	--	-	--	-
..EUPODISCALES				
...COSCINODISCACEAE				
....CYCLOTELLA	42	3	*	0
....MELOSIRA	56	4	*	0
....STEPHANODISCUS	--	-	--	-
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	--	-	--	-
....DIATOMA	--	-	--	-
....FRAGILARIA	--	-	--	-
....SYNEDRA	130	8	--	-
..NAVICULALES				
...GOMPHONEMACEAE				
....GOMPHONEMA	--	-	--	-
...NAVICULACEAE				
....NAVICULA	56	4	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	--	-	--	-
....TETRAEDRON	--	-	*	0
...COCCOMYXACEAE				
....ELAKATOTHRIX	--	-	--	-
...DICTYOSPHAERIALES				
....DICTYOSPHAERIUM	--	-	--	-
...OOCYSTACEAE				
....ANKISTRODESMUS	14	1	--	-
....ECHINOSPHAERELLA	--	-	--	-
....OOCYSTIS	--	-	*	0
....SELENASTRUM	--	-	--	-
....TREUBARIA	--	-	--	-
...PALMELLACEAE				
....SPHAEROCYSTIS	--	-	--	-
...SCENEDESMACEAE				
....ACTINASTRUM	--	-	--	-
....CRUCIGENIA	--	-	--	-
....SCENEDESMUS	--	-	*	0
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CARTERIA	--	-	--	-
....CHLAMYDOMONAS	28	2	*	0
...VOLVOCACEAE				
....PANDORINA	--	-	*	0
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...DINOBRYACEAE				
....DINOBRYON	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)				
.CRYPTOPHYCEAE				
..CRYPTOMONADALES				
...CRYPTOCHRYSIDACEAE				
....CHROOMONAS	--	-	--	-
...CRYPTOMONADACEAE				
....CRYPTOMONAS	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482459092320101 O'LEARY LAKE NEAR CRANE LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY 20...	1030	--	52	62	68	7.4	7.4	12.7	5	3.00	11.0
AUG 17...	0940	8.70	36	70	71	9.2	7.8	21.2	16	2.80	11.8

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATURATION) (00301)	HARDNESS (MG/L AS CaCO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS Ca) (00915)	MAGNESIUM DIS-SOLVED (MG/L AS Mg) (00925)	SODIUM DIS-SOLVED (MG/L AS Na) (00930)	POTASSIUM DIS-SOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLORIDE DIS-SOLVED (MG/L AS Cl) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY 20...	106	32	7.4	3.3	1.3	.8	34	--	2.0	.5	42
AUG 17...	138	31	7.4	3.0	1.2	.8	21	7.0	3.0	.4	48

DATE	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOROPHYLL-A PLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOROPHYLL-B PLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY 20...	.06	1	<.01	.50	.031	<.001	15	1	6.50	<.100
AUG 17...	.07	<1	<.01	.30	.013	<.001	8	<1	4.90	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482459092320101 O'LEARY LAKE NEAR CRANE LAKE, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 20,82 1030	AUG 17,82 0940
TOTAL CELLS/ML	140000	94000
DIVERSITY: DIVISION	0.0	0.0
.CLASS	0.0	0.0
..ORDER	0.2	0.2
...FAMILY	0.2	0.2
....GENUS	0.2	0.7

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..NAVICULALES				
...NAVICULACEAE				
....NAVICULA	*	0	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	--	-	*	0
..ZYGNEMATALES				
...DESMIDIACEAE				
....SPONDYLOSIUM	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	140000#	98	--	-
...GOMPHOSPHAERIA	--	-	1700	2
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	-	8300	9
....APHANIZOMENON	2600	2	83000#	88
..OSCILLATORIALES				
...OSCILLATORIAEAE				
....OSCILLATORIA	--	-	920	1
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	*	0	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482545092495401 KABETOGAMA LAKE AT SULLIVAN BAY OUTLET NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (MG/L) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (MG/L) (00301)
MAY 17...	1710	--	18	140	139	7.5	7.6	15.3	1.10	8.7	90
AUG 18...	1145	3.00	16	132	110	9.7	8.6	22.0	.90	10.4	123

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	80	--	103	.14	.06	.72	.033	.007	6.30	<.100
AUG 18...	42	13	82	.11	<.01	.80	.048	.003	5.20	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482545092495401 KABETOGAMA LAKE AT SULLIVAN BAY OUTLET NEAR RAY, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17, 82 1710	AUG 18, 82 1145		
TOTAL CELLS/ML	2200	160000		
DIVERSITY: DIVISION	1.4	0.2		
..CLASS	1.4	0.2		
...ORDER	2.5	1.5		
...FAMILY	3.0	1.5		
....GENUS	3.4	1.9		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..BACILLARIALES				
...NITZSCHIACEAE				
....NITZSCHIA	390#	18	--	-
..EUPODISCALES				
...COSCONODISCAEAE				
....CYCLOTELLA	130	6	*	0
....MELOSIRA	520#	23	3400	2
..FRAGILARIALES				
...FRAGILARIAEAE				
...MERIDION	14	1	--	-
...SYNEDRA	70	3	*	0
..NAVICULALES				
...CYMBELLACEAE				
....CYMBELLA	14	1	--	-
...GOMPHONEMACEAE				
....GOMPHONEMA	42	2	--	-
...NAVICULACEAE				
....NAVICULA	56	3	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	--	-	*	0
....TETRAEDRON	--	-	*	0
...DICTYOSPHAERIAEAE				
....DICTYOSPHAERIUM	380#	17	--	-
...OOCYSTACEAE				
....ANKISTRODESMUS	56	3	--	-
....KIRCHNERIELLA	28	1	--	-
...SCENEDESMACEAE				
....CRUCIGENIA	56	3	--	-
....SCENEDESMUS	200	9	*	0
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	98	4	*	0
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...OCHROMONADACEAE				
....OCHROMONAS	56	3	--	-
...SYNURACEAE				
....MALLOMONAS	42	2	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....ANACYSTIS	84	4	--	-
....GOMPHOSPHAERIA	--	-	9600	6
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	-	21000	13
....APHANIZOMENON	--	-	57000#	34
...OSCILLATORIALES				
...OSCILLATORIAEAE				
....OSCILLATORIA	--	-	73000#	44
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	--	-	*	0

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482607092511701 KABETOGAMA LAKE AT MOUTH OF MEADWOOD BAY NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)	OXYGEN, DIS- SOLVED SATUR- ATION) (00301)
MAY 17...	1640	--	37	94	98	7.3	7.5	11.0	1.60	10.2	96
AUG 18...	1115	3.60	39	74	63	9.6	8.2	22.3	1.10	11.2	133

!

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	54	--	68	.09	.15	.73	.029	.005	5.60	<.100
AUG 18...	19	10	54	.07	--	.60	.041	--	9.50	<.100

ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482607092511701 KABETOGAMA LAKE AT MOUTH OF MEADWOOD BAY NEAR RAY, MN--Continued

PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17,82 1640		AUG 18,82 1115	
TOTAL CELLS/ML	3900		230000	
DIVERSITY: DIVISION	0.4		0.0	
..CLASS	0.4		0.0	
...ORDER	1.3		0.7	
...FAMILY	1.3		0.7	
...GENUS	1.6		1.4	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..BACILLARIALES				
...NITZSCHIACEAE				
....NITZSCHIA				
	140	4	--	-
...EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA				
	2700#	70	--	-
....STEPHANODISCUS				
	--	-	*	0
..FRAGILARIALES				
...FRAGILARIAEAE				
....DIATOMA				
	390	10	--	-
....FRAGILARIA				
	200	5	--	-
....SYNEDRA				
	220	6	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...OOCYSTACEAE				
....ANKISTRODESMUS				
	28	1	--	-
...VOLVOCALES				
...CHLAMYDOMONADACEAE				
	84	2	*	0
....CHLAMYDOMONAS				
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....ANACYSTIS				
	56	1	41000#	18
...NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA				
	--	-	130000#	58
....APHANIZOMENON				
	--	-	54000#	24
..OSCILLATORIALES				
...OSCILLATORIAEAE				
....OSCILLATORIA				
	--	-	*	0
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
	28	1	--	-
....PERIDINIUM				

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482616092372201 NAMAKAN LAKE NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 17...	1230	--	67	46	52	6.9	7.3	8.0	2.70	--
AUG 18...	1230	8.20	80	41	45	7.6	7.8	21.5	2.50	7.8

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	--	18	41	.06	.12	.61	.018	.007	5.60	<.100
AUG 18...	91	16	38	.05	.07	<.10	.012	.001	1.00	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482616092372201 NAMAKAN LAKE NEAR RAY, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17,82 1230	AUG 18,82 1230		
TOTAL CELLS/ML	1500	1500		
DIVERSITY: DIVISION	0.8	1.2		
..CLASS	0.8	1.2		
...ORDER	1.4	1.2		
...FAMILY	1.5	1.3		
...GENUS	1.7	1.6		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..ACHNANTHALES				
...ACHNANTHACEAE				
....ACHNANTHES	14	1	--	-
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	140	10	--	-
..FRAGILARIALES				
...FRAGILARIACEAE				
....DIATOMA	1000#	69	--	-
....FRAGILARIA	--	-	1000#	66
....HANNAEA	14	1	--	-
....SYNEDRA	29	2	--	-
..NAVICULALES				
...CYMBELLACEAE				
....CYMBELLA	14	1	--	-
...NAVICULACEAE				
....NAVICULA	14	1	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	14	1	29	2
...DICTYOSPHAERIACEAE				
....DICTYOSPHAERIUM	58	4	--	-
...OOCYSTACEAE				
....OOCYSTIS	--	-	58	4
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...SYNURACEAE				
....MALLEMONAS	--	-	29	2
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....AGMENELLUM	--	-	230#	15
....ANACYSTIS	--	-	170	11
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	14	1	--	-
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	130	9	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482709092264601 NAMAKAN LAKE AT MOUTH OF NAMAKAN RIVER, ONTARIO

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 18...	1040	--	16	35	41	7.0	7.4	11.2	2.40	11.1
AUG 17...	1100	9.40	27	43	43	7.6	7.8	22.0	3.00	8.8

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 18...	106	15	36	.05	.05	.47	.018	.017	4.40	<.100
AUG 17...	104	14	50	.07	.13	<.10	.012	.003	1.10	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482709092264601 NAMAKAN LAKE AT MOUTH OF NAMAKAN RIVER, ONTARIO--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 18,82 1040	AUG 17,82 1100		
TOTAL CELLS/ML	1100	240		
DIVERSITY: DIVISION	0.7	1.0		
..CLASS	0.7	1.0		
..ORDER	1.6	1.2		
...FAMILY	1.6	2.1		
....GENUS	2.2	2.3		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	220#	20	--	-
....MELOSIRA	--	-	72#	29
....STEPHANODISCUS	--	-	14	6
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	130	12	--	-
....FRAGILARIA	530#	50	--	-
....SYNEDRA	43	4	--	-
....TABELLARIA	--	-	14	6
.NAVICULALES				
...NAVICULACEAE				
....NAVICULA	14	1	--	-
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	--	-	29	12
...DICTYOSPHAERIACEAE				
....DICTYOSPHAERIUM	--	-	58#	24
...OOCYSTACEAE				
....ANKISTRODESMUS	43	4	--	-
....OOCYSTIS	--	-	58#	24
.VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	29	3	--	-
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....EUGLENA	29	3	--	-
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	29	3	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

482721093003901 KABETOGAMA LAKE NEAR RAY, MN

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY DISK) (M) (00078)	OXYGEN, DIS- SOLVED CENT SATUR- ATION) (MG/L) (00300)	OXYGEN, DIS- SOLVED CENT SATUR- ATION) (MG/L) (00301)
MAY 17...	1515	--	34	85	90	7.5	7.7	10.3	2.00	12.0	110
AUG 18...	0915	3.00	32	89	79	9.6	8.4	21.6	.90	11.0	131

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	48	--	62	.08	.03	.87	.045	.008	13.0	<.100
AUG 18...	19	15	62	.08	<.01	.80	.063	.003	42.0	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482721093003901 KABETOGAMA LAKE NEAR RAY, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17, 82 1515	AUG 18, 82 0915		
TOTAL CELLS/ML	7800	270000		
DIVERSITY: DIVISION	0.3	0.0		
..CLASS	0.3	0.0		
..ORDER	0.9	0.8		
...FAMILY	0.9	0.8		
....GENUS	1.3	1.2		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..ACHNANTHALES				
...ACHNANTHACEAE				
....ACHNANTHES	72	1	--	--
..EUPODISCALES				
...COSCINODISCACEAE				
....CYCLOTELLA	6100#	79	--	--
....MELOSIRA	650	8	--	--
..FRAGILARIALES				
...FRAGILARIACEAE				
....SYNEDRA	430	6	--	--
..NAVICULALES				
...NAVICULACEAE				
....NAVICULA	220	3	--	--
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	72	1	--	--
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...DINOBRYACEAE				
....DINOBRYON	72	1	--	--
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....ANACYSTIS	--	--	60000#	22
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	--	28000	10
....APHANIZOMENON	--	--	180000#	68
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	72	1	--	--
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	72	1	--	--

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482747092503001 KABETOGAMA LAKE IN LOST BAY NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00300) (00301)
MAY 17...	1600	--	35	78	85	7.2	7.6	10.5	2.10	--
AUG 18...	1030	3.00	37	89	75	9.9	8.9	23.3	1.00	12.0 145

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	42	--	57	.08	.04	.53	.029	.023	8.70	<.100
AUG 18...	25	11	61	.08	<.01	.90	.037	.004	17.0	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482747092503001 KABETOGAMA LAKE IN LOST BAY NEAR RAY, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17,82 1600	AUG 18,82 1030		
TOTAL CELLS/ML	5200	130000		
DIVERSITY: DIVISION	0.7	0.0		
..CLASS	0.7	0.0		
..ORDER	1.5	0.9		
...FAMILY	1.6	0.9		
....GENUS	1.9	1.5		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
..BACILLARIOPHYCEAE				
...BACILLARIALES				
....NITZSCHIAEAE				
.....NITZSCHIA	96	2	--	-
...EUPODISCALES				
...COSCINODISCACEAE				
....CYCLOTELLA	3400#	66	--	-
....MELOSIRA	340	6	--	-
...STEPHANODISCUS	--	-	*	0
..FRAGILARIALES				
...FRAGILARIACEAE				
....SYNEDRA	380	7	--	-
..NAVICULALES				
...GOMPHONEMACEAE				
....GOMPHONEMA	48	1	--	-
...NAVICULACEAE				
....NAVICULA	240	5	--	-
...SURIPELLALES				
...SURIPELLACEAE				
....CYMATOPLEURA	48	1	--	-
CHLOROPHYTA (GREEN ALGAE)				
..CHLOROPHYCEAE				
...CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	290	6	--	-
...OOCYSTACEAE				
....ANKISTRODESMUS	96	2	--	-
CHRYSOPHYTA				
..CHRYSOPHYCEAE				
...OCHROMONADALES				
...DINOBRYPYCEAE				
....DINOBRYPYON	48	1	--	-
...SYNURACEAE				
....MALLOMONAS	--	-	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
..CYANOPHYCEAE				
...CHROOCOCCALES				
...CHROOCOCCACEAE				
....GOMPHOSPHAERIA	--	-	35000#	27
...NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	190	4	64000#	49
....APHANIZOMENON	--	-	31000#	24

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

482951092531601 SHOEPACK LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 19...	1500	--	22	22	28	6.0	6.5	14.5	70	1.70	9.1
AUG 17...	1430	4.70	21	20	28	6.6	6.9	22.2	80	1.50	9.9

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE IT-PLD (MG/L AS HCO3) (99440)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)
MAY 19...	93	10	2.3	1.1	1.1	.7	6.0	4.0	1.1	48
AUG 17...	119	10	2.3	1.0	1.0	.4	5.0	4.0	1.0	46

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 19...	.07	2	.14	.69	.021	.011	230	40	4.70	.700
AUG 17...	.06	2	.02	.70	.014	.001	410	24	2.20	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482951092531601 SHOEPACK LAKE NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 19,82 1500	AUG 17,82 1430		
TOTAL CELLS/ML	16000	5600		
DIVERSITY: DIVISION	0.3	1.2		
..CLASS	0.3	1.2		
..ORDER	0.3	1.2		
...FAMILY	0.3	1.7		
....GENUS	0.3	2.5		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUNOTIALES				
...EUNOTIACEAE				
....EUNOTIA	* 0	--	--	--
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	* 0	--	58	1
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	--	--	58	1
....SYNEDRA	* 0	--	--	--
....TABELLARIA	--	--	58	1
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....TETRAEDRON	* 0	--	--	--
...OOCYSTACEAE				
....ANKLSTRODESMUS	82	1	72	1
....KIRCHNERIELLA	--	--	680	12
....QUADRIGULA	--	--	58	1
....SELENASTRUM	--	--	230	4
...PALMELLACEAE				
....SPHAEROCYSTIS	--	--	660	12
...SCENEDESMACEAE				
....CRUCIGENIA	--	--	170	3
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	250	2	--	--
..ZYGNEMATALES				
...DESMIDIACEAE				
....COSMARIUM	--	--	29	1
....STAURASTRUM	--	--	29	1
CHRYSOPHYTA				
.XANTHOPHYCEAE				
..MISCHOCOCCALES				
...SCIADACEAE				
....CENTRITRACTUS	* 0	--	--	--
CRYPTOPHYTA (CRYPTOMONADS)				
.CRYPTOPHYCEAE				
..CRYPTOMONADALES				
...CRYPTOCHRYSIDACEAE				
....CHROOMONAS	* 0	--	--	--
...CRYPTOMONADACEAE				
....CRYPTOMONAS	* 0	--	--	--
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROCOCCALES				
...CHROCOCCACEAE				
....AGMENELLUM	82	1	230	4
....ANACYSTIS	15000#	96	330	6
....GOMPHOSPHAERIA	--	--	2900#	52
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELONAS	--	--	29	1

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482958092484501 CRUISER LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 19...	1350	--	89	19	24	6.3	7.0	10.8	<1	5.0	10.8
AUG 17...	1315	25.0	90	18	31	6.8	7.2	15.2	9	8.0	12.1

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)
MAY 19...	103	9	2.2	.8	.8	.5	8.0	2.0	.2	17
AUG 17...	125	8	2.1	.7	.7	.3	8.0	3.0	.6	16

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDE (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 19...	.02	2	.01	.34	.008	<.001	10	2	2.30	<.100
AUG 17...	.02	<1	<.01	.50	.008	.002	3	3	<.100	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482958092484501 CRUISER LAKE NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 19,82 1350	AUG 17,82 1315
TOTAL CELLS/ML	5700	2300
DIVERSITY: DIVISION	0.6	0.6
.CLASS	0.6	0.6
..ORDER	0.8	1.3
...FAMILY	0.8	1.3
....GENUS	0.9	1.5

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	150	3	14	1
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	140	2	120	5
....SYNEDRA	*	0	--	--
....TABELLARIA	--	--	220	9
..RHIZOSOLENIALES				
...RHIZOSOLENIAEAE				
....RHIZOSOLENIA	*	0	--	--
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...OOCYSTACEAE				
....ANKISTRODESMUS	83	1	--	--
....CLOSTERIOPSIS	*	0	--	--
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...OCHROMONADACEAE				
....OCHROMONAS	*	0	--	--
.XANTHOPHYCEAE				
..MISCHOCOCCALES				
...SCIADACEAE				
....CENTRITRACTUS	41	1	--	--
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	5000#	88	--	--
....GOMPHOSPHERIA	--	--	1400#	63
...NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	--	490#	22
...OSCILLATORIALES				
...OSCILLATORIAEAE				
....OSCILLATORIA	140	2	--	--
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	55	1	--	--
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIAEAE				
....PERIDINIUM	*	0	--	--

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483000092392601 NAMAKAN LAKE ABOVE KETTLE FALLS NEAR INTERNATIONAL FALLS, MN

## WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 17...	1400	--	56	48	51	7.2	7.4	7.6	2.60	13.0
AUG 18...	1315	11.8	100	41	44	7.5	7.4	20.1	3.6	7.4

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 17...	113	20	42	.06	.12	.50	.016	.001	5.10	<.100
AUG 18...	84	--	40	.05	.04	.30	.008	.002	.300	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483000092392601 NAMAKAN LAKE ABOVE KETTLE FALLS NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 17,82 1400	AUG 18,82 1315
TOTAL CELLS/ML	2200,	3500
DIVERSITY: DIVISION	0.6	0.6
.CLASS	0.6	0.6
..ORDER	1.1	1.3
...FAMILY	1.2	1.3
....GENUS	2.0	2.3

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
...CYCLOTELLA	750#	34	*	0
...MELOSIRA	1000#	46	55	2
...STEPHANODISCUS	--	--	*	0
..FRAGILARIALES				
...FRAGILARIAEAE				
...FRAGILARIA	170	8	--	--
...HANNAEA	29	1	--	--
...TABELLARIA	--	--	220	6
..NAVICULALES				
...NAVICULACEAE				
...NAVICULA	14	1	--	--
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
...SCHROEDERIA	14	1	--	--
...MICRACTINIACEAE				
...MICRACTINIUM	43	2	--	--
...OOCYSTACEAE				
...ANKISTRODESMUS	14	1	--	--
...OOCYSTIS	--	--	41	1
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...OCHROMONADACEAE				
...OCHROMONAS	--	--	28	1
...SYNURACEAE				
...MALLOMONAS	58	3	--	--
CRYPTOPHYTA (CRYPTOMONADS)				
.CRYPTOPHYCEAE				
..CRYPTOMONADALES				
...CRYPTOMONADACEAE				
...CRYPTOMONAS	--	--	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
...AGMENELLUM	--	--	390	11
...ANACYSTIS	--	--	690#	20
...GOMPHOSPHAERIA	--	--	1500#	44
..NOSTOCALES				
...NOSTOCACEAE				
...ANABAENA	--	--	500	14
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
...TRACHELONAS	14	1	--	--
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
...PERIDINIUM	72	3	--	--

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483103092482501 OSLO LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- COBALT UNITS) (00080)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 20...	1130	--	33	19	24	6.5	6.7	14.2	20	2.40	9.7
AUG 17...	1145	9.40	35	19	37	6.9	6.9	20.4	42	3.00	8.8

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE IT-PLD (MG/L AS HCO3) (99440)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)
MAY 20...	97	9	2.1	1.0	1.1	.6	8.0	3.0	1.0	30
AUG 17...	101	9	2.1	.9	1.0	.4	8.0	3.0	.7	32

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 20...	.04	3	.10	.94	.017	.007	91	3	6.00	<.100
AUG 17...	.04	1	<.01	.50	.008	<.001	210	100	1.00	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483103092482501 OSLO LAKE NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 20,82 1130	AUG 17,82 1145
TOTAL CELLS/ML	450	2500
DIVERSITY: DIVISION	1.8	1.1
.CLASS	1.8	1.1
..ORDER	2.1	1.9
...FAMILY	2.1	1.9
....GENUS	2.3	1.9

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCACEAE				
....MELOSTRA	--	-	140	6
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...OOCYSTACEAE				
....QUADRIGULA	--	-	58	2
...SCENEDESMACEAE				
....SCENEDESMUS	55	12	29	1
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	120#	27	--	-
....CHLOROGONIUM	14	3	--	-
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..OCHROMONADALES				
...DINOBRYACEAE				
....DINOBRYON	41	9	220	9
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	180#	39	--	-
...GOMPHOSPHAERIA	--	-	1000#	40
..NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	-	1000#	41
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	28	6	14	1
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	14	3	29	1

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483226092001401 LOCATOR LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	COLOR (PLAT- INUM- COBALT UNITS) (00080)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 19...	1300	--	49	25	36	6.3	69.0	12.4	20	2.80	10.0
AUG 17...	1530	9.70	48	26	32	7.4	6.9	21.3	40	3.1	9.8

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	HARD- NESS (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	POTAS- SIUM, DIS- SOLVED (MG/L AS K) (00935)	BICAR- BONATE IT-PLD (MG/L AS HCO3) (99440)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)
MAY 19...	97	12	2.7	1.2	1.2	.6	6.0	5.0	1.0	32
AUG 17...	116	11	2.7	1.1	1.0	.3	5.0	4.0	.7	34

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, RESIDUE AT 105 DEG. C, SUS- PENDED (MG/L) (00530)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	IRON, DIS- SOLVED (UG/L AS FE) (01046)	MANGA- NESE, DIS- SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 19...	.04	3	.06	.50	.014	.008	94	6	5.00	<.100
AUG 17...	.05	1	<.01	.30	.011	<.001	40	5	<.100	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483226092001401 LOCATOR LAKE NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 19,82 1300	AUG 17,82 1530		
TOTAL CELLS/ML	1700	7800		
DIVERSITY: DIVISION	1.7	0.9		
..CLASS	1.7	0.9		
...ORDER	2.1	1.3		
...FAMILY	2.5	1.3		
...GENUS	2.5	2.1		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	14	1	--	-
....MELOSIRA	--	-	43	1
....STEPHANODISCUS	14	1	*	0
..FRAGILARIALES				
...FRAGILARIAEAE				
....TABELLARIA	--	-	1300#	17
..NAVICULALES				
...NAVICULACEAE				
....FRUSTULIA	--	-	*	0
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCAEAE				
....SCHROEDERIA	--	-	*	0
...OOCYSTACEAE				
....ANKISTRODESMUS	69	4	--	-
....OOCYSTIS	--	-	*	0
....TREUBARIA	--	-	*	0
...PALMELLACEAE				
....SPHAEROCYSTIS	210	12	--	-
...SCENEDESMACEAE				
....CRUCIGENIA	220	13	--	-
..VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	170	10	--	-
CHRYSOPHYTA				
.CHRYSOPHYCEAE				
..CHROMULINALES				
...CHRYSAMOEBACEAE				
....CHRYSAMOEBEA	41	2	--	-
..OCHROMONADALES				
...DINOBRYPHYCEAE				
....DINOBRYPHYON	14	1	*	0
...OCHROMONADACEAE				
....OCHROMONAS	55	3	--	-
CRYPTOPHYTA (CRYPTOMONADS)				
.CRYPTOPHYCEAE				
..CRYPTOMONADALES				
...CRYPTOCHRYSIDACEAE				
....CHROOMONAS	--	-	*	0
...CRYPTOMONADACEAE				
....CRYPTOMONAS	28	2	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCAEAE				
....ANACYSTIS	790#	47	2600#	34
....GOMPHOSPHAERIA	--	-	2900#	37
..NOSTOCALES				
...NOSTOCAEAE				
....ANABAENA	--	-	140	2
....APHANIZOMENON	--	-	580	7
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....TRACHELOMONAS	69	4	*	0
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	--	-	*	0

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483304093062701 RAINY LAKE AT BLACK BAY NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00300)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)
MAY 19...	0910	--	7	77	83	7.2	7.5	14.3	.90	9.1	92
AUG 16...	1210	2.60	6	90	80	9.7	8.0	22.4	.80	13.1	157

DATE	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR- BONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 19...	42	--	72	.10	.14	.79	.050	.008	7.60	<.100
AUG 16...	25	13	64	.09	<.01	2.70	.062	.008	17.0	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483304093062701 RAINY LAKE AT BLACK BAY NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 19,82 0910	AUG 16,82 1210		
TOTAL CELLS/ML	6900	150000		
DIVERSITY: DIVISION	0.5	0.0		
.CLASS	0.5	0.0		
..ORDER	1.5	0.8		
...FAMILY	1.6	0.8		
....GENUS	2.4	1.5		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCAEAE				
....CYCLOTELLA	360	5	--	--
....MELOSIRA	4000#	57	--	--
....STEPHANODISCUS	79	1	--	--
..FRAGILARIALES				
...FRAGILARIACEAE				
....ASTERIONELLA	1100#	15	--	--
....FRAGILARIA	79	1	--	--
....SYNEDRA	300	4	--	--
....TABELLARIA	180	3	--	--
..NAVICULALES				
...CYMBELLACEAE				
....CYMBELLA	*	0	--	--
...NAVICULACEAE				
....NAVICULA	160	2	--	--
..SURIRELLALES				
...SURIRELLACEAE				
....SURIRELLA	40	1	--	--
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...DICTYOSPHAERIACEAE				
....DICTYOSPHAERIUM	260	4	--	--
...OOCYSTACEAE				
....ANKISTRODESMUS	60	1	--	--
...SCENEDESMACEAE				
....COELASTRUM	160	2	--	--
....SCENEDESMUS	79	1	--	--
..ZYGNEMATALES				
...DESMIDIACEAE				
....COSMARIUM	60	1	--	--
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....GOMPHOSPHAERIA	--	--	40000#	27
...NOSTOCALES				
...NOSTOCACEAE				
....ANABAENA	--	--	30000#	20
....APHANIZOMENON	--	--	79000#	53
EUGLENOPHYTA (EUGLENOIDS)				
.EUGLENOPHYCEAE				
..EUGLENALES				
...EUGLENACEAE				
....EUGLENA	*	0	--	--
....TRACHELOMONAS	79	1	--	--
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	--	--	*	0

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%  
 \* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483622092560701 RAINY LAKE AT BRULE NARROWS NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	SAM- PLING DEPTH (FEET) (00003)	RESER- VOIR DEPTH (FEET) (72025)	SPE- CIFIC CON- DUCT- ANCE (UMHOS) (00095)	SPE- CIFIC CON- DUCT- ANCE LAB (UMHOS) (90095)	PH (UNITS) (00400)	PH LAB (UNITS) (00403)	TEMPER- ATURE (DEG C) (00010)	TRANS- PAR- ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS- SOLVED (MG/L) (00300)
MAY 19...	1000	--	17	41	48	6.9	7.4	7.3	2.40	12.5
AUG 16...	1330	10.8	15	42	48	7.8	7.6	19.7	3.4	9.7

DATE	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION) (00301)	BICAR- BONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L) (70300)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS, TOTAL (MG/L AS P) (00665)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P) (00666)	CHLOR-A PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO- PLANK- TON CHROMO FLUOROM (UG/L) (70954)
MAY 19...	108	18	40	.05	.08	.46	.016	.001	4.90	<.100
AUG 16...	110	20	42	.06	<.01	.10	.008	<.001	1.20	<.100

## ANALYSIS OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483622092560701 RAINY LAKE AT BRULE NARROWS NEAR INTERNATIONAL FALLS, MN--Continued

## PHYTOPLANKTON ANALYSES, MAY 1982 TO AUGUST 1982

DATE TIME	MAY 19,82 1000	AUG 16,82 1330		
TOTAL CELLS/ML	3500	750		
DIVERSITY: DIVISION	0.7	1.2		
.CLASS	0.7	1.2		
..ORDER	0.9	1.6		
...FAMILY	0.9	1.6		
....GENUS	1.7	1.8		
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
BACILLARIOPHYTA (DIATOMS)				
.BACILLARIOPHYCEAE				
..EUPODISCALES				
...COSCINODISCACEAE				
....CYCLOTELLA	830#	24	14	2
....MELOSIRA	2100#	61	120#	15
..FRAGILARIALES				
...FRAGILARIACEAE				
....FRAGILARIA	--	--	130#	17
....SYNEDRA	56	2	29	4
..NAVICULALES				
...ENTOMONEIDACEAE				
....ENTOMONEIS	*	0	--	--
...NAVICULACEAE				
....PINNULARIA	*	0	--	--
CHLOROPHYTA (GREEN ALGAE)				
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...CHLOROCOCCACEAE				
....SCHROEDERIA	--	--	29	4
...OOCYSTACEAE				
....ANKISTRODESMUS	130	4	--	--
....KIRCHNERIELLA	*	0	--	--
...VOLVOCALES				
...CHLAMYDOMONADACEAE				
....CHLAMYDOMONAS	170	5	--	--
CYANOPHYTA (BLUE-GREEN ALGAE)				
.CYANOPHYCEAE				
..CHROOCOCCALES				
...CHROOCOCCACEAE				
....ANACYSTIS	84	2	430#	58
PYRRHOPHYTA (FIRE ALGAE)				
.DINOPHYCEAE				
..DINOKONTAE				
...PERIDINIACEAE				
....PERIDINIUM	28	1	--	--

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%

\* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

## WATER QUALITY DATA AT STREAMFLOW STATIONS

Field determinations of water temperature and specific conductance are made at many streamflow stations in addition to those that are also regular water-quality stations. These data are usually collected at regular intervals during routine visits to the station. Additional data for each station are published elsewhere in this report.

## WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
04010500 PIGEON RIVER AT MIDDLE FALLS NEAR GRAND PORTAGE, MN							
OCT. 22, 1981...	296	2.0	70	APR. 27.....	3960	4.0	50
DEC. 01.....	143	.0	95	MAY 04.....	1930	3.0	---
DEC. 10.....	73	.5	---	JUNE 15.....	454	---	---
JAN. 15, 1982...	95	.0	98	JULY 20.....	466	---	---
FEB. 17.....	107	.5	---	AUG. 11.....	301	16.0	70
MAR. 09.....	92	.0	85	SEPT. 29.....	151	10.0	---
04014500 BAPTISM RIVER NEAR BEAVER BAY, MN							
OCT. 21, 1981...	259	2.7	54	APR. 21.....	537	.0	55
NOV. 30.....	51	.0	85	APR. 26.....	2290	4.5	<50
JAN. 14, 1982....	22	.0	125	APR. 28.....	1110	3.0	<50
MAR. 10.....	19	.0	120	JUNE 22.....	57	14.0	80
APR. 13.....	153	.0	92	AUG. 10.....	278	13.0	55
04015330 KNIFE RIVER NEAR TWO HARBORS, MN							
OCT. 21, 1981...	141	4.0	88	APR. 14.....	824	.5	60
DEC. 01.....	22	.5	160	APR. 19.....	623	1.0	60
JAN. 12, 1982...	3.5	.0	133	JUNE 23.....	26	15.0	120
MAR. 11.....	10	.5	225	AUG. 13.....	18	16.5	165
04015475 PARTRIDGE RIVER ABOVE COLBY LAKE NEAR HOYT LAKES, MN							
OCT. 15, 1981...	186	9.0	115	APR. 20.....	465	.0	44
DEC. 02.....	18	.0	135	MAY 05.....	314	12.0	55
JAN. 06, 1982...	7.4	.5	155	JUNE 17.....	68	16.0	128
MAR. 03.....	3.9	.0	250	AUG. 03.....	40	21.0	124
04016000 PARTRIDGE RIVER NEAR AURORA, MN							
OCT. 16, 1981...	65	9.0	430	APR. 19.....	142	2.0	410
DEC. 02.....	34	.0	510	JUNE 17.....	117	18.0	313
JAN. 06, 1982...	21	.5	320	AUG. 03.....	67	21.5	325
MAR. 03.....	14	.0	577				
04016500 ST. LOUIS RIVER NEAR AURORA, MN							
OCT. 16, 1981...	251	9.0	155	APR. 19.....	555	1.5	84
DEC. 02.....	89	.0	135	JUNE 17.....	222	20.0	57
JAN. 07, 1982...	47	.5	400	AUG. 03.....	214	21.5	59
MAR. 04.....	29	.0	160				

## MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO-MHOS)
04018750 ST. LOUIS RIVER AT FORBES, MN							
OCT. 21, 1981...	985	6.0	155	MAR. 04.....	121	.0	---
DEC. 03.....	300	.0	262	APR. 22.....	2060	3.0	125
JAN. 07, 1982...	272	.5	170	JUNE 25.....	397	18.0	210
JAN. 13.....	126	.0	280	AUG. 05.....	383	23.0	165
04024000 ST. LOUIS RIVER AT SCANLON, MN							
OCT. 20, 1981...	6810	7.0	115	APR. 20.....	20400	2.0	75
DEC. 02.....	1840	.5	140	JUNE 21.....	1690	18.0	160
JAN. 13, 1982...	1150	.0	147	AUG. 09.....	2560	20.0	145
MAR. 09.....	1090	.0	105				
04024098 DEER CREEK NEAR HOLYOKE, MN							
OCT. 05, 1981...	11	10.0	225	APR. 30.....	4.7	7.0	285
NOV. 19.....	2.7	3.0	290	JUNE 08.....	1.8	16.5	305
JAN. 07, 1982...	1.9	.0	360	JULY 29.....	1.8	17.0	275
MAR. 02.....	3.0	2.0	300				
05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR FERGUS FALLS, MN							
NOV. 24, 1981...	227	4.0	450	APR. 08.....	632	3.0	350
JAN. 18, 1982...	249	.0	470	MAY 28.....	845	20.0	420
FEB. 18.....	249	3.0	450	JULY 13.....	600	24.5	400
MAR. 24.....	456	3.0	440	SEPT. 21.....	129	15.0	440
05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SOUTH DAKOTA							
NOV. 24, 1981...	1.0	---	---	APR. 13.....	169	---	625
JAN. 18, 1982...	.0	---	---	APR. 23.....	307	12.0	675
FEB. 18.....	.0	---	---	JUNE 24.....	.0	---	---
MAR. 23.....	3.0	---	---	JULY 14.....	61	26.5	1000
MAR. 31.....	60	---	---	SEPT. 21.....	.02	---	---
APR. 08.....	23	3.0	640				
05061000 BUFFALO RIVER NEAR HAWLEY							
FEB. 24, 1982...	21	.0	420	MAY 27.....	65	22.5	740
MAR. 24.....	91	1.0	450	JULY 28.....	48	24.5	740
APR. 02.....	464	2.0	400	AUG. 26.....	16	17.5	730
APR. 08.....	244	2.5	500	SEPT. 27.....	13	13.0	800
05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN							
FEB. 23, 1982...	.0	---	---	JUNE 24.....	2.0	19.0	970
MAR. 23.....	408	2.5	450	JULY 29.....	2.1	21.0	940
APR. 02.....	1090	3.0	380	AUG. 26.....	3.2	17.5	900
APR. 16.....	177	12.0	650	SEPT. 27.....EST.	5.0	---	---
MAY 27.....	33	21.5	1100				

## MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICROMHOS)
05062000 BUFFALO RIVER NEAR DILWORTH, MN							
OCT. 27, 1981...	92	3.0	825	APR. 16.....	558	10.5	550
DEC. 04.....	59	1.5	850	APR. 29.....	181	---	---
DEC. 17.....	28	.5	875	MAY 27.....	136	19.0	900
JAN. 29, 1982...	12	---	---	JUNE 24.....	30	19.5	760
FEB. 23.....	18	.0	800	JULY 28.....	72	24.0	720
MAR. 23.....	500	2.0	410	AUG. 26.....	16	17.5	670
APR. 02.....	2200	2.0	320	SEPT. 27.....	14	13.0	650
APR. 08.....	714	1.5	540				
05062500 WILD RICE RIVER AT TWIN VALLEY, MN							
OCT. 27, 1981...	254	2.0	480	APR. 13.....	725	1.0	425
DEC. 08.....	111	.5	580	MAY 05.....	540	14.5	300
JAN. 20, 1982...	53	.0	490	JULY 08.....	73	23.0	462
MAR. 18.....	189	.0	389	AUG. 26.....	14	17.0	525
MAR. 31.....	1090	.5	260				
05064000 WILD RICE RIVER AT HENDRUM, MN							
OCT. 27, 1981...	343	2.5	500	APR. 13.....	982	2.5	410
DEC. 08.....	119	.5	650	APR. 17.....	1930	---	---
JAN. 19, 1982...	61	.0	520	MAY 05.....	579	15.0	390
MAR. 18.....	93	.0	525	JULY 08.....	86	21.0	516
APR. 01.....	2810	.5	---	AUG. 25.....	22	19.0	520
05067500 MARSH RIVER NEAR SHELLY, MN							
OCT. 27, 1981...	17	2.5	530	APR. 13.....	289	2.0	360
DEC. 08.....	2.3	1.0	850	MAY 05.....	7.2	12.5	640
JAN. 19, 1982...	.11	.5	---	JULY 02.....	.37	19.0	744
MAR. 17.....	.99	1.0	1040	AUG. 25.....	.007	---	---
APR. 01.....	756	.5	280				
05069000 SANDHILL RIVER AT CLIMAX, MN							
OCT. 28, 1981...	61	5.0	660	APR. 14.....	789	1.5	400
DEC. 08.....	30	.5	770	APR. 17.....	419	3.0	600
JAN. 19, 1982...	12	.0	560	MAY 04.....	115	16.0	550
MAR. 17.....	21	.0	460	JULY 01.....	24	21.0	680
APR. 01.....	455	.5	300	AUG. 25.....	11	17.0	610
05074500 RED LAKE RIVER NEAR RED LAKE, MN							
NOV. 05, 1981...	674	7.0	220	APR. 22.....	116	6.0	265
DEC. 17.....	553	.0	---	MAY 24.....	1050	15.5	252
JAN. 28, 1982...	658	.0	---	JULY 23.....	977	24.0	280
MAR. 22.....	699	1.0	320	SEPT. 02.....	900	18.5	255

## MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO-MHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (MICRO-MHOS)
05075000 RED LAKE RIVER AT HIGH LANDING NEAR GOODRIDGE, MN							
NOV. 04, 1981...	790	5.0	290	APR. 15.....	1650	5.0	270
DEC. 16.....	702	.0	310	MAY 24.....	1440	19.0	259
JAN. 28, 1982...	676	.0	290	JULY 23.....	1130	23.0	290
MAR. 22.....	693	.0	320	SEPT. 02.....	917	18.0	200
APR. 14.....	1080	1.0	250				
05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN							
NOV. 04, 1981...	17	5.0	800	APR. 14.....	1100	.0	270
FEB. 23, 1982...	0	---	---	MAY 27.....	492	22.0	485
MAR. 23.....	1.3	.0	---	JULY 20.....	208	25.0	490
APR. 02.....	354	.0	300	SEPT. 02.....	22	15.5	535
05078000 CLEARWATER RIVER AT PLUMMER, MN							
FEB. 24, 1982...	156	.0	520	MAY 04.....	596	15.0	565
MAR. 24.....	78	.0	480	JUNE 09.....	165	13.0	500
MAR. 31.....	950	.5	180	JUNE 29.....	226	18.0	575
APR. 14.....	969	1.5	295	AUG. 24.....	47	19.0	650
APR. 18.....	1190	3.0	410				
05078230 LOST RIVER AT OKLEE, MN							
OCT. 29, 1981...	52	5.0	770	APR. 14.....	1150	1.0	335
FEB. 24, 1982...	7.5	.0	440	MAY 03.....	112	18.0	560
MAR. 24.....	19	.0	---	JUNE 29.....	34	15.0	724
MAR. 31.....	900	.0	260	AUG. 24.....	8.8	19.0	650
APR. 12.....	603	.0	340				
05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN							
OCT. 28, 1981...	335	5.0	640	APR. 13.....	1790	.0	330
FEB. 24, 1982...	141	.0	540	MAY 04.....	694	16.5	550
MAR. 15.....	94	.0	650	JULY 01.....	292	18.0	600
APR. 01.....	2800	.0	225	AUG. 24.....	72	21.0	660
05079000 RED LAKE RIVER AT CROOKSTON, MN							
OCT. 27, 1981...	1270	2.5	430	APR. 15.....	7500	1.5	315
DEC. 07.....	644	.5	410	MAY 04.....	1980	16.5	440
JAN. 18, 1982...	973	.0	240	JUNE 30.....	1410	19.5	355
MAR. 16.....	800	.0	377	AUG. 25.....	1090	20.0	345
05087500 MIDDLE RIVER AT ARGYLE, MN							
NOV. 04, 1981...	8.0	4.0	720	APR. 13.....	338	.0	280
FEB. 25, 1982...	1.2	.0	710	MAY 27.....	52	20.0	438
MAR. 23.....	9.5	.0	680	JULY 21.....	29	25.0	540
APR. 01.....	257	---	310	SEPT. 01.....	.78	19.5	615

## MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

## WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

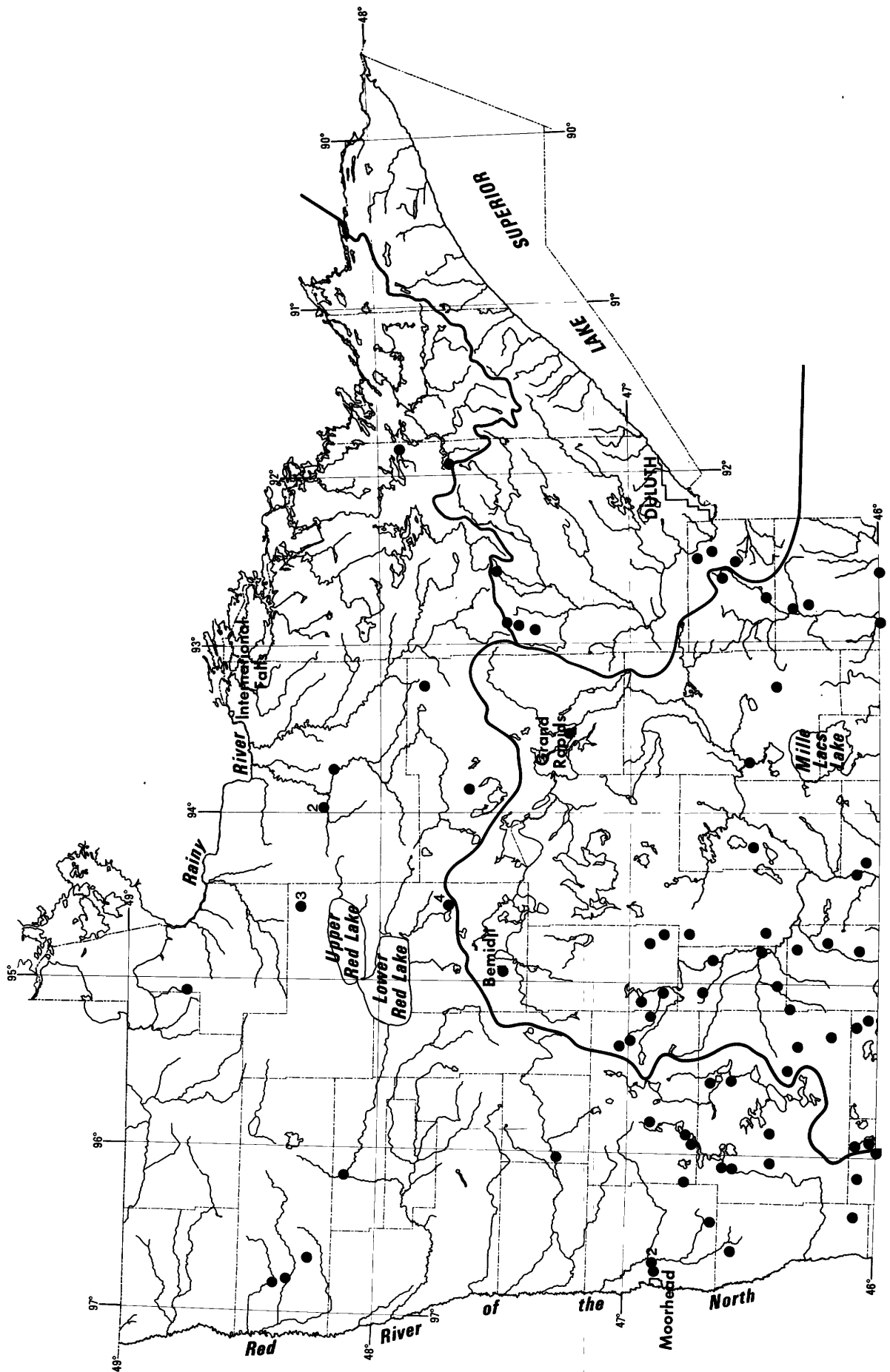
DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERA- TURE (°C)	SPECIFIC CONDUCT- TANCE (MICRO- MHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERA- TURE (°C)	SPECIFIC CONDUCT- TANCE (MICRO- MHOS)
05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN							
NOV. 03, 1981...	53	4.5	352	APR. 21.....	1220	.5	240
DEC. 15.....	17	.0	---	MAY 26.....	208	17.5	310
JAN. 27, 1982...	4.7	.0	630	JULY 22.....	35	24.0	390
MAR. 24.....	8.3	.0	540	SEPT. 01.....	38	17.0	250
APR. 14.....	928	1.0	165				
05107500 ROSEAU RIVER AT ROSS, MN							
NOV. 03, 1981...	148	4.5	333	APR. 20.....	1810	.5	260
DEC. 15.....	58	.0	440	MAY 25.....	606	17.5	328
JAN. 26, 1982...	7.4	.0	610	JULY 22.....	78	24.5	375
MAR. 24.....	11	.0	540	AUG. 31.....	74	16.0	324
APR. 15.....	1310	3.0	200				
05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN							
NOV. 03, 1981...	221	3.7	370	APR. 21.....	1290	5.0	240
DEC. 15.....	125	.0	450	MAY 19.....	1120	14.0	---
JAN. 07, 1982...	2.8	.0	---	MAY 25.....	939	18.0	338
JAN. 26.....	12	.0	660	JULY 13.....	391	23.0	365
MAR. 23.....	19	.0	530	JULY 13.....	388	23.0	365
APR. 01.....	89	.0	302	AUG. 31.....	81	15.0	357
APR. 15.....	766	1.0	220	SEPT. 28.....	36	11.5	---
05124480 KAWISHIWI RIVER NEAR ELY, MN							
OCT. 14, 1981...	46	10.5	32	JUNE 15.....	371	18.0	<50
MAR. 10, 1982...	46	.0	133	AUG. 04.....	117	22.5	34
MAY 06.....	660	10.5	32				
05124990 FILSON CREEK NEAR ELY, MN							
OCT. 13, 1981...	7.0	9.0	<50	APR. 26.....	61	6.0	<50
DEC. 01.....	2.2	.0	37	MAY 05.....	25	12.0	22
JAN. 05, 1982...	1.9	.5	45	JUNE 16.....	6.8	15.0	<50
MAR. 02.....	.34	.0	43	AUG. 04.....	.38	25.0	38
APR. 20.....	30	.0	38				
05127000 KAWISHIWI RIVER NEAR WINTON, MN							
OCT. 14, 1981...	350	---	---	MAY 06, 1982....	4380	8.0	60
05127500 BASSWOOD RIVER NEAR WINTON, MN							
JUNE 22, 1982...	2230	19.0	<36				
05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO							
SEPT. 02, 1982...	3860	18.0	<50				

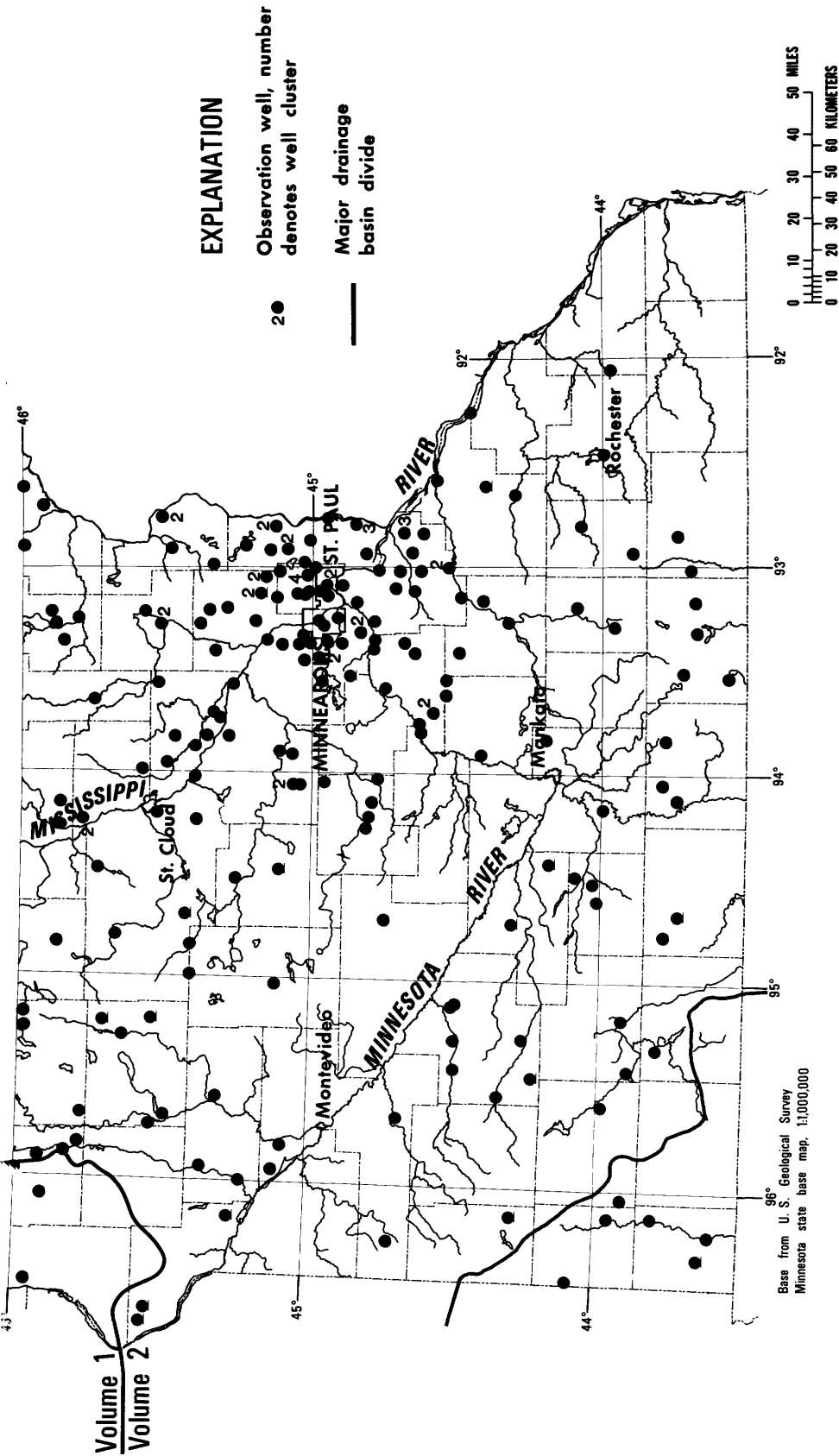
## MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

## WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERA- TURE (°C)	SPECIFIC CONDUCTANCE (MICRO- MHOS)	DATE	MEASURED DISCHARGE (ft <sup>3</sup> /s)	TEMPERA- TURE (°C)	SPECIFIC CONDUCTANCE (MICRO- MHOS)
05129115 VERMILLION RIVER NEAR CRANE LAKE, MN							
OCT. 19, 1981...	584	9.0	---	APR. 26.....	2960	7.0	50
NOV. 30.....	324	.0	73	MAY 03.....	1850	13.0	50
JAN. 14, 1982...	189	.5	65	MAY 24.....	2550	18.0	60
MAR. 03.....	181	.0	75	JUNE 21.....	976	17.0	60
APR. 21.....	1890	.0	45	AUG. 02.....	478	23.5	70
05130500 STURGEON RIVER NEAR CHISHOLM, MN							
OCT. 13, 1981...	126	9.0	85	APR. 01.....	45	.5	130
NOV. 30.....	79	.0	80	APR. 16.....	455	.5	70
JAN. 08, 1982...	28	.5	---	APR. 21.....	1030	.0	51
FEB. 08.....	20	.0	136	JUNE 24.....	98	19.0	66
MAR. 01.....	19	.0	140	AUG. 02.....	102	20.5	113
05131500 LITTLE FORK RIVER AT LITTLEFORK, MN							
OCT. 01, 1981...	427	8.0	190	APR. 23.....	11100	---	---
NOV. 03.....	1040	5.5	75	APR. 27.....	7860	7.0	95
DEC. 14.....	338	.0	160	MAY 19.....	10200	15.5	80
FEB. 01, 1982...	147	.0	220	JULY 21.....	785	22.0	130
APR. 02.....	197	.0	188	SEPT. 13.....	237	17.0	180
05133500 RAINY RIVER AT MANITOU RAPIDS, MN							
OCT. 01, 1981...	5610	7.3	123	JULY 20.....	23600	19.5	79
APR. 27, 1982...	29900	7.0	95	SEPT. 14.....	8180	15.0	105
05134200 RAPID RIVER NEAR BAUDETTE, MN							
NOV. 02, 1981...	412	5.0	150	APR. 16.....	3810	1.0	110
DEC. 16.....	70	.0	---	MAY 21.....	1650	13.0	155
FEB. 03, 1982...	15	.0	---	JULY 23.....	526	19.5	---
APR. 01.....	50	.0	257	SEPT. 15.....	92	11.0	215

**GROUND-WATER RECORDS**





**Figure 8.--Location of ground-water wells**

## GROUND-WATER LEVELS

## BECKER COUNTY

464613095524801. Local number, 138N41W17ADA01.

LOCATION.--Lat 46°46'13", long 95°52'48", in NE¼SE¼NE¼ sec.17, T.138 N., R.41 W., Hydrologic Unit 09020103, east shore of Lake Sallie.

Owner: U.S. Geological Survey.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 234 ft (71.3 m), screened 222 to 234 ft (67.7 to 71.3 m).

DATUM.--Land-surface datum is 1,333.2 ft (406.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.40 ft (1.34 m) above land-surface datum.

REMARKS.--Water level affected by pumping of nearby well.

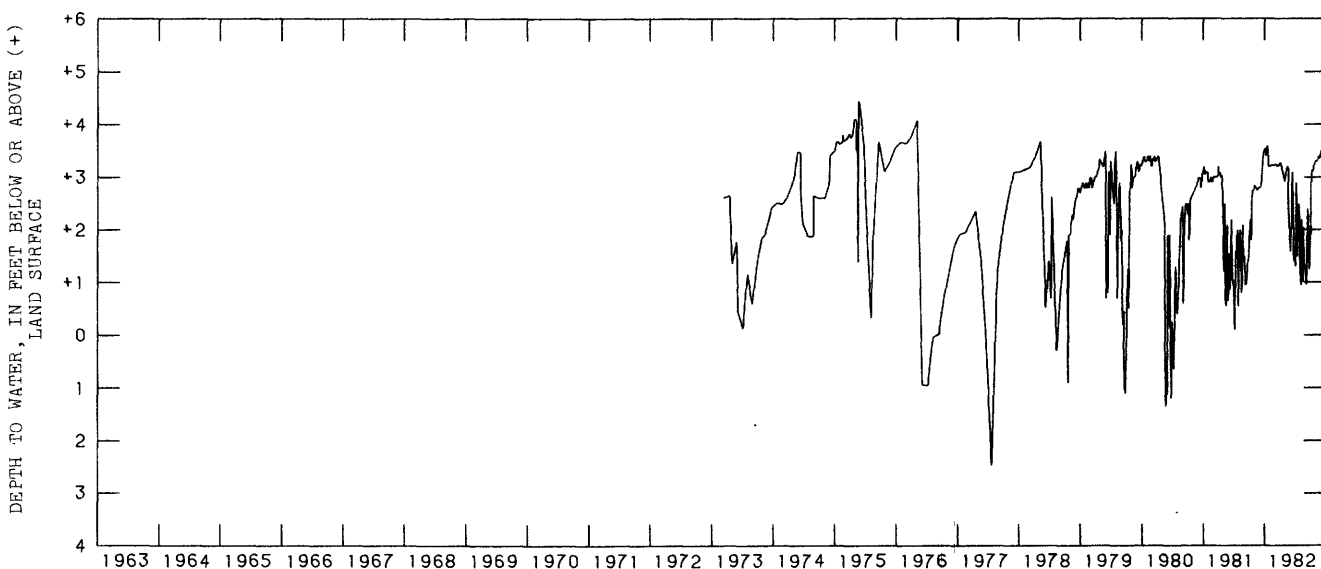
PERIOD OF RECORD.--March 1973 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.44 ft (1.35 m) above land-surface datum, May 23, 27, 1975; lowest, 2.47 ft (0.75 m) below land-surface datum, July 25, 1977.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982  
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	1.95	2.85	2.80	3.55	.....	.....	3.28	3.06	1.59	1.30	0.95	0.95
10	2.20	.....	2.80	3.40	.....	3.25	.....	.....	2.09	2.90	2.20	1.25
15	1.80	.....	.....	3.55	.....	3.20	.....	3.20	3.10	1.49	1.00	2.40
20	2.60	2.75	.....	3.60	.....	3.25	.....	3.21	2.40	2.25	2.05	2.00
25	2.75	2.80	3.43	3.20	.....	3.20	.....	2.13	1.40	2.50	1.45	1.25
BOM	2.75	2.80	3.50	.....	.....	3.25	2.92	1.96	1.70	1.35	1.20	1.70

WTR YEAR 1982 HIGHEST 4.37 MAY 22, 1982 LOWEST 0.32 OCT. 6, 1981



138N41W17ADA01

464401095571301. Local number, 138N42W26CDA01.

LOCATION.--Lat 46°44'01", long 95°57'13", in NE¼SE¼SW¼ sec.26, T.138 N., R.42 W., Hydrologic Unit 09020103, on Don Bullock farm.

Owner: Don Bullock.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 90 ft (27.4 m), screened 88 to 90 ft (26.8 to 27.4 m).

DATUM.--Altitude of land-surface datum is 1,390 ft (424 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.

PERIOD OF RECORD.--November 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 52.62 ft (16.04 m) below land-surface datum, June 13, 1980, Nov. 23, 1980; lowest, 53.99 ft (16.46 m) below land-surface datum, Jan. 22, 1979.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 21	53.65	APR 26	53.76	MAY 29	53.36	JUL 3	52.96	AUG 7	53.42	SEP 11	53.38

## BECKER COUNTY--Continued

464550096095901. Local number, 138N43W18CDA01.

LOCATION.--Lat 46°45'50", long 96°09'59", in NE¼SE¼SW¼ sec.18, T.138 N., R.18 W., Hydrologic Unit 09020103, on Fred Kraft farm.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 77 ft (23.5 m), screened 75 to 77 ft (22.9 to 23.5 m).

DATUM.--Altitude of land-surface datum is 1,420 ft (433 m). Measuring point: Top of casing, 3.75 ft (1.14 m) above land-surface datum.

PERIOD OF RECORD.--November 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 58.47 ft (17.82 m) below land-surface datum, June 1, 1980; lowest, 60.67 ft (18.49 m) below land-surface datum, Mar. 21, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 21	60.67	APR 26	60.15	MAY 29	60.14	JUL 3	60.03	AUG 7	60.14	SEP 11	60.33

465422095495501. Local number, 140N41W26CCD01.

LOCATION.--Lat 46°54'22", long 95°49'55", in SE¼SW¼SW¼ sec.26, T.140 N., R.41 W., Hydrologic Unit 09020103, on Paul Scarie farm.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 53 ft (16.2 m), screened 51 to 53 ft (15.5 to 16.2 m).

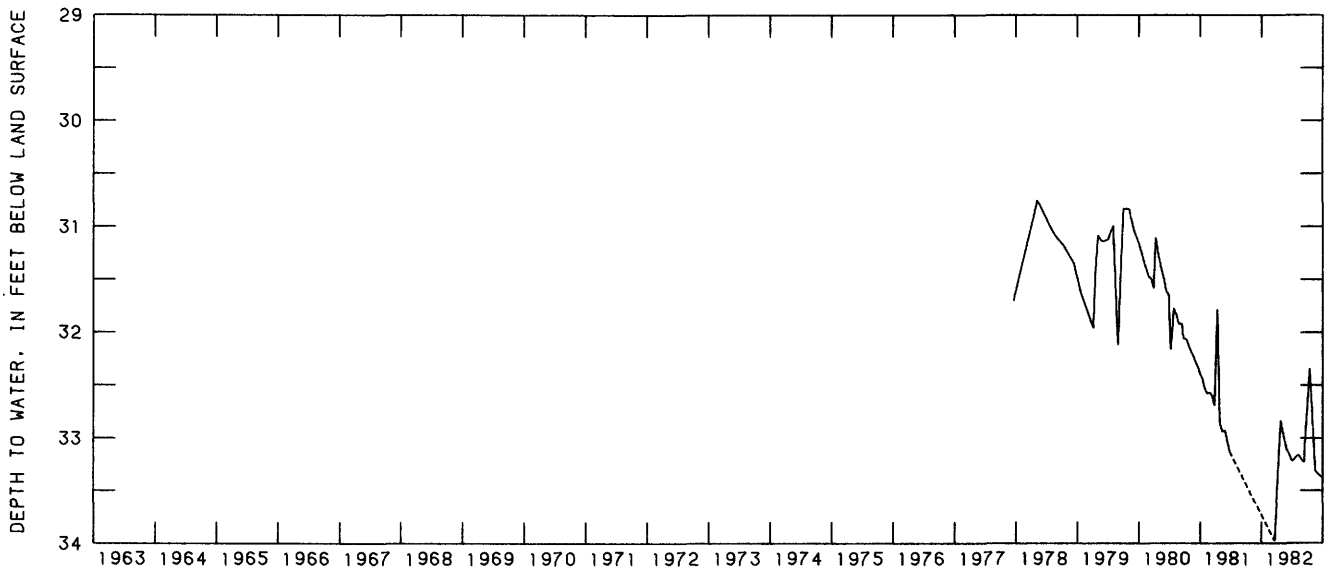
DATUM.--Altitude of land-surface datum is 1,422 ft (433 m). Measuring point: Top of casing, 2 40 ft (0.73 m) above land-surface datum.

PERIOD OF RECORD.--December 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.75 ft (9.37 m) below land-surface datum, May 8, 1978; lowest, 33.98 ft (10.36 m) below land-surface datum, Mar. 21, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 21	33.98	APR 26	32.83	MAY 29	33.09	JUL 3	33.22	AUG 7	33.16	SEP 11	33.23



140N41W26CCD01

## GROUND-WATER LEVELS

## BELTRAMI COUNTY

474111094331401. Local number, 149N31W25DCD01.

LOCATION.--Lat 47°41'11", long 94°33'14", in SE¼SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.

Owner: U.S. Geological Survey.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 2 in (0.05 m), depth 157 ft (47.8 m), screened 154 to 157 ft (46.9 to 47.8 m).

DATUM.--Land-surface datum is 1,450 ft (442 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 70.63 ft (21.53 m) below land-surface datum, July 28, 1980; lowest, 104.5 ft (31.85 m) below land-surface datum, July 27, 1981.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	104.0	DEC 16	102.5	MAY 21	103.3	JUL 23	102.5	SEP 15	102.1

474111094331402. Local number, 149N31W25DCD02.

LOCATION.--Lat 47°41'11", long 94°33'14", in SE¼SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.

Owner: U.S. Geological Survey

AQUIFER.--Sandy till of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 65 ft (19.8 m), screened 62 to 65 ft (18.9 to 19.8 m).

DATUM.--Land-surface datum is 1,448 ft (441.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.51 ft (0.46 m) below land-surface datum, May 21, 1982; lowest, 15.95 ft (4.86 m) below land-surface datum, Sept. 15, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	3.73	DEC 16	4.71	MAY 21	1.51	JUL 23	11.68	SEP 15	15.95

474111094331403. Local number, 149N31W25DCD03.

LOCATION.--Lat 47°41'11", long 94°33'14", in SE¼SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.

Owner: U.S. Geological Survey

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 130 ft (39.6 m), screened 127 to 130 ft (38.7 to 39.6 m).

DATUM.--Land-surface datum is 1,449.7 ft (441.9 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 69.60 ft (21.21 m) below land-surface datum, July 28, 1980; lowest, 102.6 ft (31.27 m) below land-surface datum, July 27, 1981.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	101.9	SEP 15	93.00

## BELTRAMI COUNTY--Continued

474111094331404. Local number, 149N31W25DCD04.

LOCATION.--Lat 47°41'11", long 94°33'14", in SE½SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.

Owner: U.S. Geological Survey.

AQUIFER.--Sandy till of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 77 ft (23.5 m), screened 74 to 77 ft (22.6 to 23.5 m).

DATUM.--Land-surface datum is 1,449.3 ft (441.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.80 ft (0.85 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.45 ft (7.15 m) below land-surface datum, July 28, 1980; lowest, 74.58 ft (22.73 m) below land-surface datum, July 23, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	63.75	DEC 16	64.33	MAY 21	72.40	JUL 23	74.58	SEP 15	71.80

481711094331601. Local number, 156N31W36DAA01.

LOCATION.--Lat 48°17'11", long 94°33'16", in NE½NE¼SE¼ sec.36, T.156 N., R.31 W., Hydrologic Unit 09020302, at Ludlow Lookout Tower.

Owner: U.S. Geological Survey.

AQUIFER.--Sandy clay of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 139 ft (42.4 m), screened 136 to 139 ft (41.4 to 42.4 m).

DATUM.--Land-surface datum is 1,194.6 ft (364.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.15 ft (6.55 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.85 ft (0.26 m) below land-surface datum, Nov. 2, 1981; lowest, 3.28 ft (1.00 m) below land-surface datum, Feb. 3, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	0.85	DEC 16	1.76	FEB 3	3.28	MAY 21	2.92	JUL 23	1.19	SEP 15	Well destroyed

481711094331602. Local number, 156N31W36DAA02.

LOCATION.--Lat 48°17'11", long 94°33'16", in NE½NE¼SE¼ sec.36, T.156 N., R.31 W., Hydrologic Unit 09020302, at Ludlow Lookout Tower.

Owner: U.S. Geological Survey

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 107 ft (32.6 m), screened 104 to 107 ft (31.7 to 32.6 m).

DATUM.--Land-surface datum is 1,195.8 ft (364.5 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.90 ft (0.58 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.87 ft (1.18 m) below land-surface datum, Sept. 15, 1982; lowest, 4.78 ft (1.46 m) below land-surface datum, Apr. 23, 1981.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	4.60	DEC 16	4.54	FEB 3	4.49	MAY 21	4.21	JUL 23	4.30	SEP 15	3.87

GROUND-WATER LEVELS

BELTRAMI COUNTY--Continued

481711094331603. Local number, 156N31W36DAA03  
 LOCATION.--Lat 48°17'11", long 94°33'16", in NE¼NE¼SE¼ sec.36, T.156 N., R.31 W., Hydrologic Unit 09020302, at  
 Ludlow Lookout Tower.

Owner: U.S. Geological Survey.

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 82 ft (25.0 m), screened 79  
 to 82 ft (24.1 to 25.0 m).

DATUM.--Land-surface datum is 1,196.7 ft (364.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top  
 of casing, 3.00 ft (0.91 m) above land-surface datum.

PERIOD OF RECORD.--July 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.72 ft (0.83 m) below land-surface datum, July 23, 1982;  
 lowest, 4.81 ft (1.47 m) below land-surface datum, Apr. 23, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	4.49	DEC 16	4.45	FEB 3	4.44	MAY 21	4.35	JUL 23	2.72	SEP 15	Well destroyed

CARLTON COUNTY

463437092313301. Local number, 047N17W07AAB01.  
 LOCATION.--Lat 46°34'37", long 92°31'33", in NW¼NE¼NE¼ sec.7, T.47 N., R.17 W., Hydrologic Unit 04010301, on Merle  
 Olson farm.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.04 m), depth 33 ft (10.1 m), screened  
 31 to 33 ft (9.4 to 10.1 m).

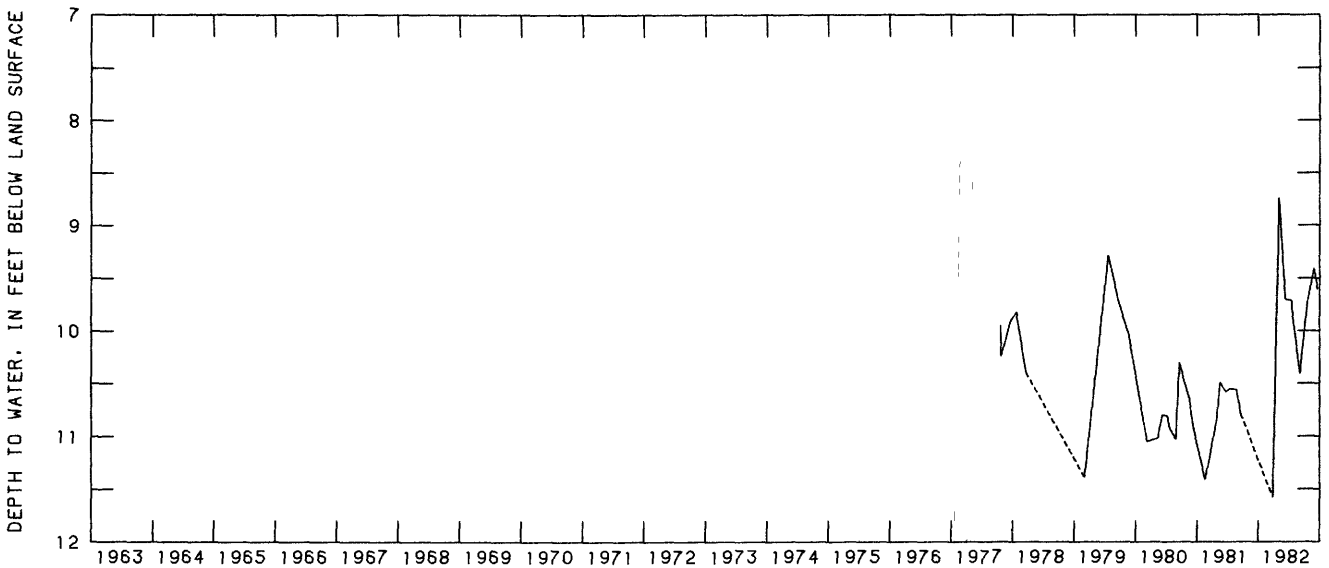
DATUM.--Altitude of land-surface datum is 1,110 ft (338 m). Measuring point: Top of casing, 4.00 ft (1.22 m)  
 above land-surface datum.

PERIOD OF RECORD.--October 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.74 ft (2.66 m) below land-surface datum, May 5, 1982;  
 lowest, 11.58 ft (3.53 m) below land-surface datum, Mar. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 29	11.58	MAY 5	8.74	JUN 11	9.70	JUL 15	9.71	SEP 6	10.41

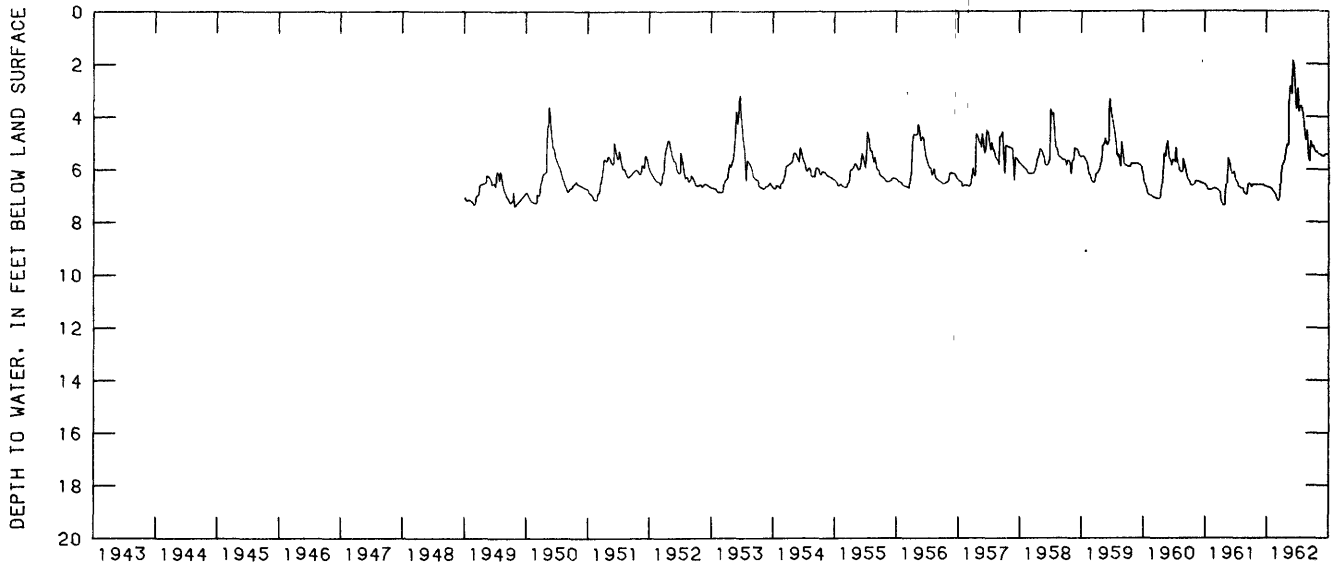


047N17W07AAB01

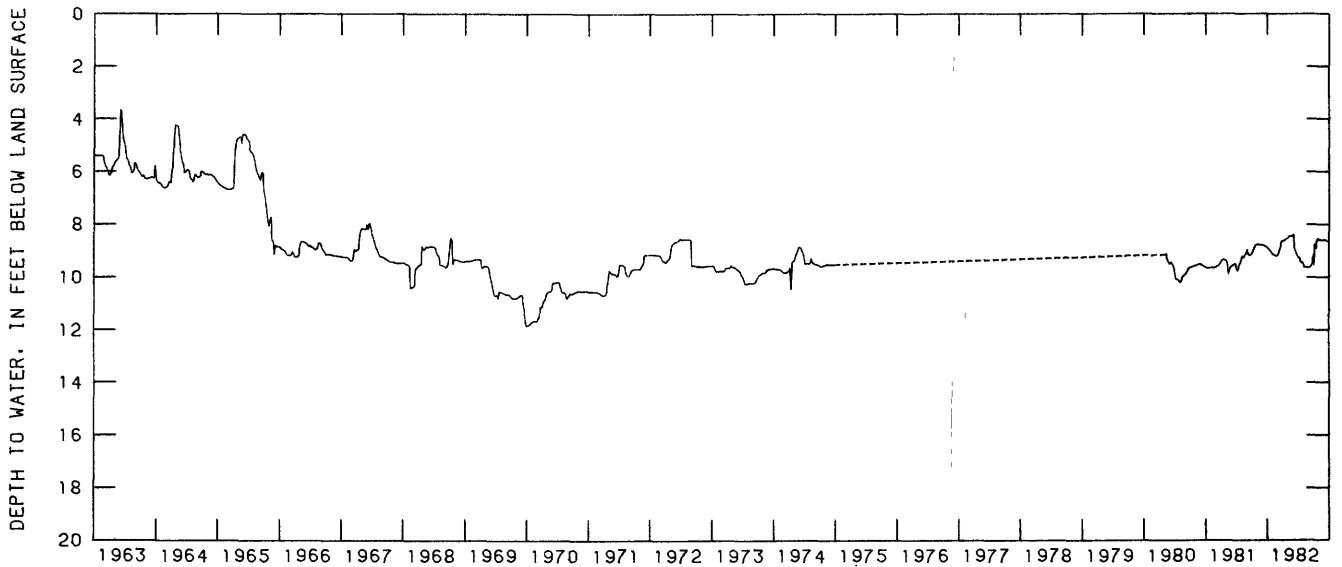


GROUND-WATER LEVELS

CLAY COUNTY--Continued



137N45W30CDB01



137N45W30CDB01

## GROUND-WATER LEVELS

## CLAY COUNTY--Continued

465237096383901. Local number, 139N47W05CDC01.

LOCATION.--Lat 46°52'37", long 96°38'39", in SW¼SE¼SW¼ sec.5, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.4 mi (3.9 km) east of Dilworth.

Owner: City of Moorhead, MS-1.

AQUIFER.--Surficial sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 8 in (0.20 m), depth 131 ft (39.9 m), slotted 91 to 107 ft (27.7 to 32.6 m).

DATUM.--Land-surface datum is 916.7 ft (279.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 3.60 ft (1.10 m) above land-surface datum.

REMARKS.--Water level affected by pumping from nearby wells.

PERIOD OF RECORD.--January 1947 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.19 ft (3.72 m) below land-surface datum, July 15, 1947; lowest, 30.59 ft (9.32 m) below land-surface datum, July 23, 1980.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	29.23	DEC 4	29.09	FEB 23	29.54	APR 16	29.29	MAY 27	28.81	AUG 17	30.52

465328096391001. Local number, 139N47W06AAA01.

LOCATION.--Lat 46°53'27", long 96°39'08", in NE¼NE¼NE¼ sec.6, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.7 mi (4.3 km) northeast of Dilworth.

Owner: U.S. Geological Survey, M-80.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in (0.08 m), depth 103 ft (31.4 m), casing slotted near bottom.

DATUM.--Altitude of land-surface datum is 915 ft (279 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.

REMARKS.--Water level affected by pumping.

PERIOD OF RECORD.--July 1949 to April 1966, November 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.94 ft (5.16 m) below land-surface datum, July 16, 1949; lowest, 28.88 ft (8.80 m) below land-surface datum, Aug. 17, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	28.22	DEC 4	28.19	FEB 23	28.14	APR 16	28.43	MAY 27	28.21	AUG 17	28.88

465231096415801. Local number, 139N48W11ABA01.

LOCATION.--Lat 46°52'31", long 96°41'58", in NE¼NW¼NE¼ sec.11, T.139 N., R.48 W., Hydrologic Unit 09020104, at Dilworth.

Owner: City of Dilworth.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in (0.20 m), depth 152 ft (46.3 m).

DATUM.--Altitude of land-surface datum is 908 ft (277 m). Measuring point: Top of recorder platform, 2.40 ft (0.73 m) above land-surface datum.

REMARKS.--Water level affected by pumping.

PERIOD OF RECORD.--May 1965 to current year.

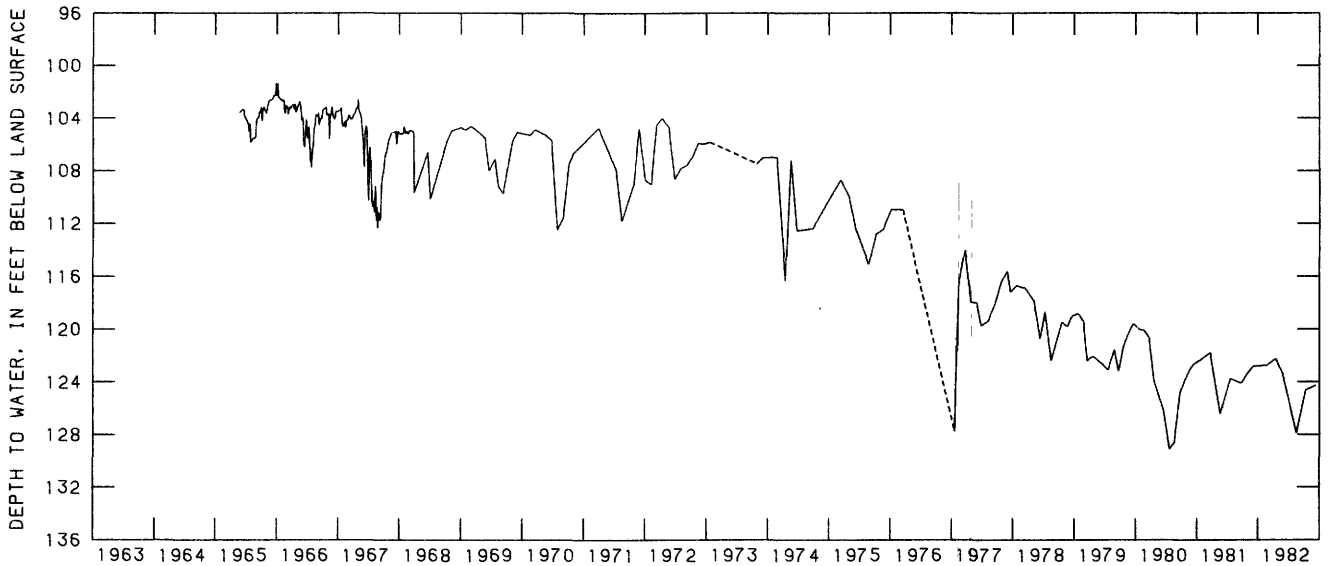
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 101.3 ft (30.88 m) below land-surface datum, Dec. 29, 1965; lowest, 129.1 ft (39.35 m) below land-surface datum, July 23, 1980.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	123.4	DEC 4	122.8	FEB 23	122.7	APR 16	122.2	MAY 27	123.3	AUG 17	127.9

GROUND-WATER LEVELS

CLAY COUNTY--Continued



139N48W11ABA01

GRANT COUNTY

455254096051901. Local number, 128N43W21CBB01.  
 LOCATION.--Lat 45°52'54", long 96°05'19", in NW¼NW¼SW¼ sec.21, T.128 N., R.43 W., Hydrologic Unit 09020101.  
 Owner: Edward Ellison.  
 AQUIFER.--Buried sand of Pleistocene Age.  
 WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in (0.15 m), depth 56 ft (17.1 m), screened 51 to 56 ft (15.5 to 17.1 m).  
 DATUM.--Altitude of land-surface datum is 1,090 ft (332 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.  
 PERIOD OF RECORD.--October 1980 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.42 ft (4.09 m) below land-surface datum, Feb. 24, 1981; lowest, 13.80 ft (4.21 m) below land-surface datum, May 26, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	13.62	MAY 28	13.58	JUN 29	13.61	JUL 2	13.60	AUG 25	13.59	SEP 30	13.58
NOV 17	13.59	JUN 4	13.60								

455932095582601. Local number, 129N42W09CCC01.  
 LOCATION.--Lat 45°59'32", long 95°58'26", in SW¼SW¼SW¼ sec.9, T.129 N., R.42 W., Hydrologic Unit 09020102, in Elbow Lake.  
 Owner: City of Elbow Lake, old well 2.  
 AQUIFER.--Buried sand and gravel of Pleistocene Age.  
 WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 214 ft (65.2 m), screened 200 to 220 ft (61.0 to 67.1 m).  
 DATUM.--Altitude of land-surface datum is 1,222 ft (372 m). Measuring point: Top of platform, 1.40 ft (0.43 m) above land-surface datum.  
 REMARKS.--Water level affected by pumping.  
 PERIOD OF RECORD.--February 1964 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 74.70 ft (22.77 m) below land-surface datum, Mar. 7, 1980; lowest, 80.54 ft (24.55 m) below land-surface datum, Aug. 31, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	75.20	DEC 31	75.30	FEB 27	75.10	APR 30	75.50	JUL 31	75.20	SEP 30	75.40
NOV 30	75.10	JAN 30	75.20	MAR 31	75.10	JUN 30	75.58	AUG 31	75.50		

## GRANT COUNTY--Continued

460249096094301. Local number, 130N44W25BCB01.

LOCATION.--Lat 46°02'49", long 96°09'43", in NW¼SW¼NW¼ sec.25, T.130 N., R.44 W., Hydrologic Unit 09020101.

Owner: Adams Bros.

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in (0.30 m), depth 105 ft (32.0 m), screened 85 to 105 ft (25.9 to 32.0 m).

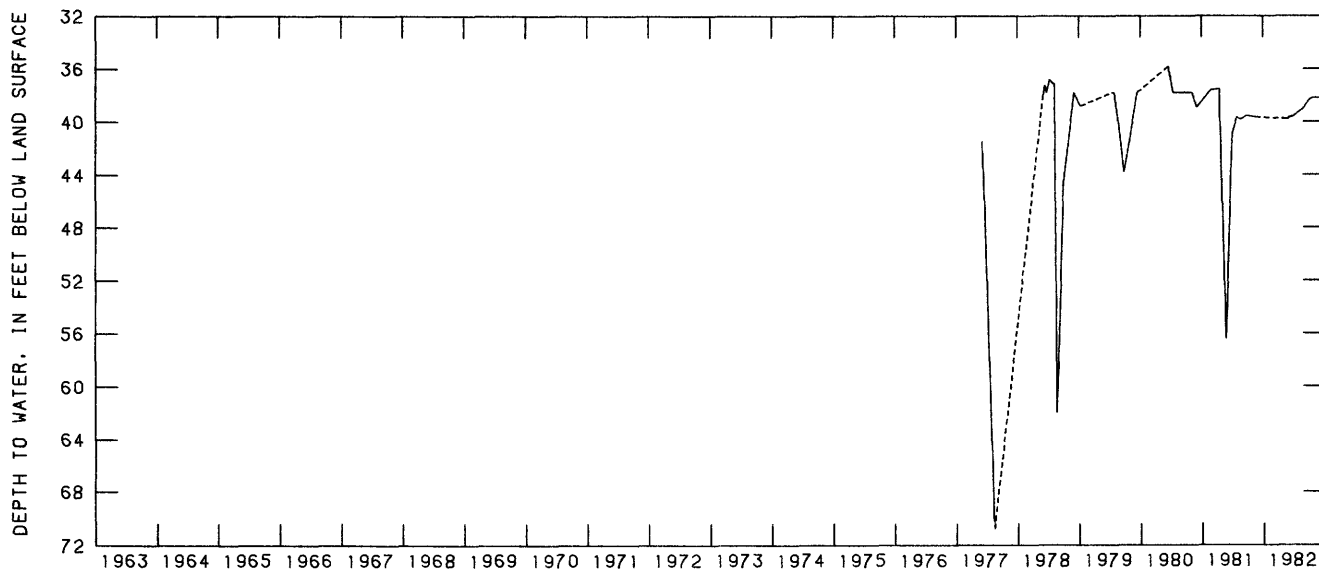
DATUM.--Altitude of land-surface datum is 1,092 ft (333 m). Measuring point: Opening in casing, 0.20 ft (0.06 m) above land-surface datum.

PERIOD OF RECORD.--June 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.80 ft (10.91 m) below land-surface datum, June 16, 1980; lowest, 61.97 ft (18.89 m) below land-surface datum, Aug. 22, 1978.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	39.61	MAY 28	39.82	JUN 29	39.59	JUL 2	39.55	AUG 25	39.01	SEP 30	38.35
NOV 17	39.67	JUN 4	39.67								



130N44W25BCB01

GROUND-WATER LEVELS

ITASCA COUNTY

474917093144601. Local number, 062N23W35BAB01.

LOCATION.--Lat 47°49'17", long 93°14'46", in NW¼NE¼NW¼ sec.35, T.62 N., R.23 W., Hydrologic Unit 09030005, at Thistledew Ranger Station.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 29 ft (8.8 m), screened 27 to 29 ft (8.2 to 8.8 m).

DATUM.--Altitude of land-surface datum is 1,393 ft (425 m). Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.

REMARKS.--Measured weekly by State Forestry personnel.

PERIOD OF RECORD.--September 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.35 ft (5.29 m) below land-surface datum, Aug. 20, 1975; lowest, 21.22 ft (6.47 m) below land-surface datum, Aug. 24, Sept. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 31	18.85	MAY 19	21.10	JUN 16	20.35	JUL 14	20.05	AUG 18	19.85	SEP 21	19.95
APR 13	18.87	26	20.95	30	19.85	28	19.85	SEP 8	19.85	29	19.90

473840093515101. Local number, 148N25W08DDD01.

LOCATION.--Lat 47°38'40", long 93°51'51", in SE¼SE¼SE¼ sec.8, T.148 N., R.25 W., Hydrologic Unit 09030006, at Spring Lake.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 10 ft (3.0 m), screened 8 to 10 ft (2.4 to 3.0 m).

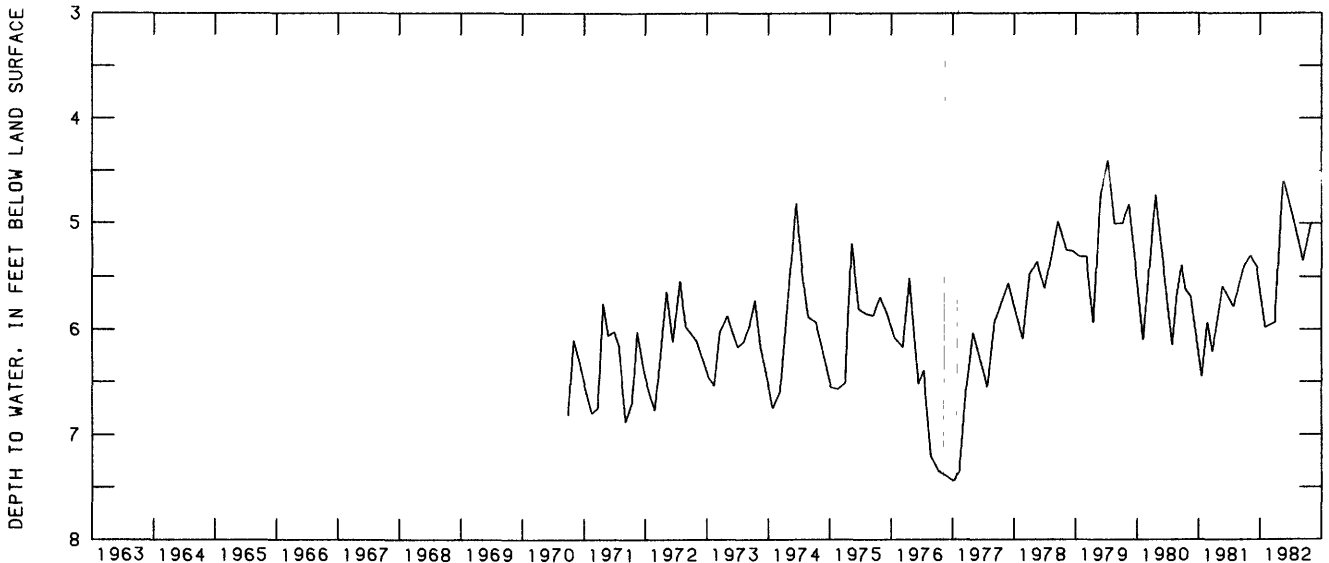
DATUM.--Altitude of land-surface datum is 1,350 ft (411 m). Measuring point: Top of casing, 3.40 ft (1.04 m) above land-surface datum.

PERIOD OF RECORD.--September 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.40 ft (1.34 m) below land-surface datum, July 13, 1979; lowest, 7.44 ft (2.27 m) below land-surface datum, Jan. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	5.30	FEB 1	5.98	MAR 30	5.93	MAY 19	4.57	JUL 19	4.95	SEP 13	5.35
DEC 14	5.41										



148N25W08DDD01



GROUND-WATER LEVELS

KOOCHICHING COUNTY--Continued

481345093582802. Local number, 155N26W21DAA02.

LOCATION.--Lat 48°13'45", long 93°58'28", in NE¼NE¼SE¼ sec.21, T.155 N., R.26 W., Hydrologic Unit 09030006, in Pine Island State Park.

Owner: U.S. Geological Survey.

AQUIFER.--Peat of Quaternary Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 3 ft (0.9 m), screened 0 to 3 ft (0.0 to 0.9 m).

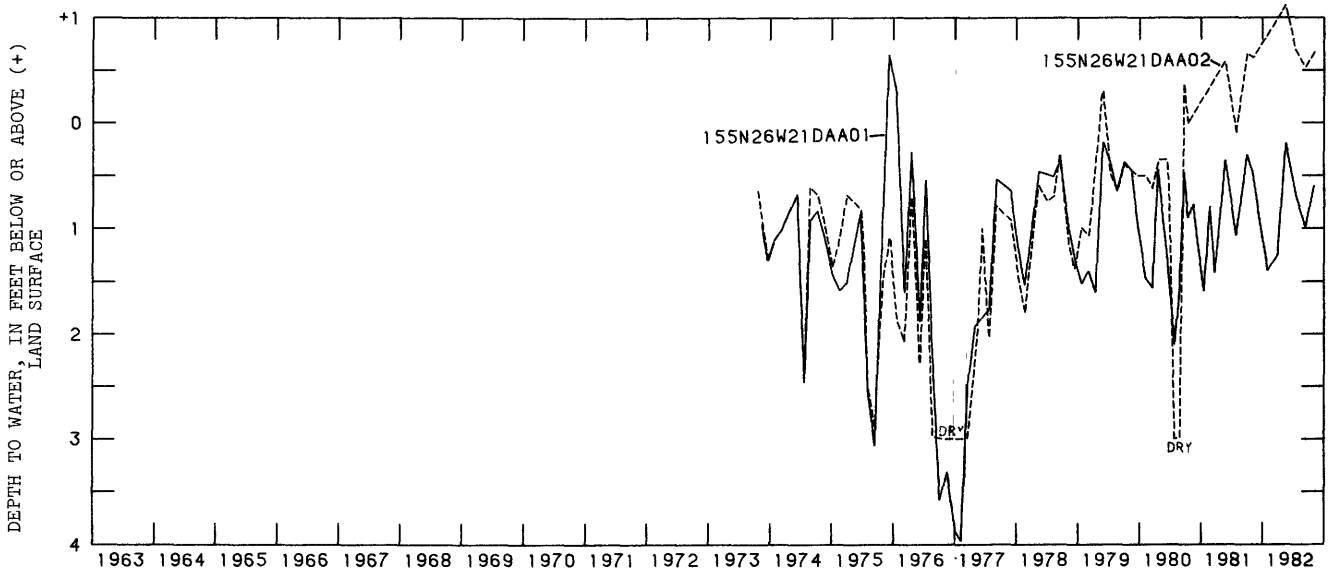
DATUM.--Altitude of land-surface datum is 1,208 ft (368 m). Measuring point: Top of plastic casing, 2.50 ft (0.76 m) above land-surface datum.

PERIOD OF RECORD.--October 1973 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.12 ft (0.34 m) above land-surface datum, May 19, 1982; lowest, dry below land-surface datum, Oct. 4, 1976 to Mar. 21, 1977; Aug. 25, 1980.

WATER LEVEL, IN FEET BELOW OR ABOVE (+) LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	0.66	NOV 4	0.62	MAY 19	+1.12	JUL 19	+0.69	SEP 13	+0.52



155N26W21DAA01, 155N26W21DAA02



GROUND-WATER LEVELS

MARSHALL COUNTY

481604096391501. Local number, 155N47W11AAA03.  
 LOCATION.--Lat 48°16'04", long 96°39'15", in NE¼NE¼NE¼ sec.11, T.155 N., R.47 W., Hydrologic Unit 09020309, 6.5 mi (10.5 km) northeast of Warren.  
 Owner: U.S. Geological Survey.  
 AQUIFER.--Buried sand and gravel of Pleistocene Age.  
 WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 86 ft (26.2 m), screened 83 to 86 ft (25.3 to 26.2 m).  
 DATUM.--Altitude of land-surface datum is 905 ft (276 m). Measuring point: Wood floor of instrument shelter, 3.10 ft (0.94 m) above land-surface datum.  
 REMARKS.--Water level affected by pumping from nearby city well. Water-level hydrograph for this well is in the introduction to this volume.  
 PERIOD OF RECORD.--October 1956 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.83 ft (1.78 m) below land-surface datum, Feb. 26, 1958; lowest, 34.62 ft (10.55 m) below land-surface datum, Sept. 24, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

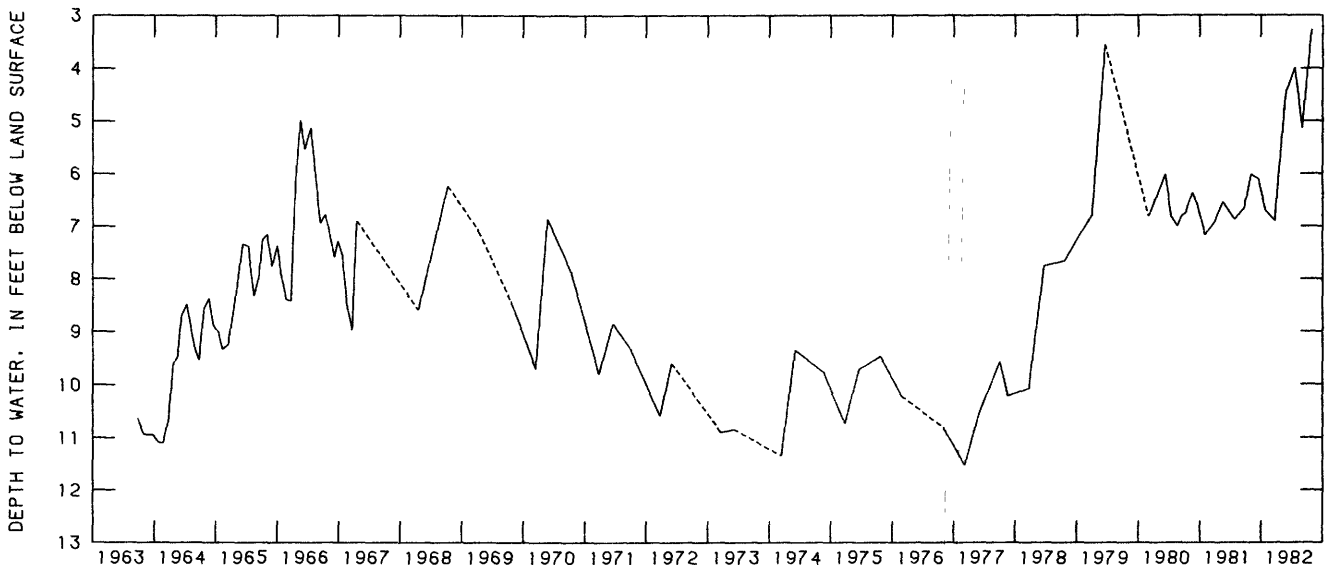
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	s27.11	JAN 27	19.77	MAR 27	18.87	MAY 27	18.60	JUL 21	18.76	SEP 1	18.58
DEC 16	s24.80										

s Nearby well being pumped.

482048096481901. Local number, 156N48W10DAA02.  
 LOCATION.--Lat 48°20'48", long 96°48'19", in NE¼NE¼SE¼ sec.10, T.156 N., R.48 W., Hydrologic Unit 09020309, northeast of Argyle.  
 Owner: U.S. Geological Survey.  
 AQUIFER.--Surficial sand and gravel of Pleistocene Age.  
 WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 26 ft (7.9 m), screened 24 to 26 ft (7.3 to 7.9 m).  
 DATUM.--Altitude of land-surface datum is 851 ft (259 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.  
 REMARKS.--Water level affected by pumping.  
 PERIOD OF RECORD.--September 1963 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.55 ft (1.08 m) below land-surface datum, June 19, 1979; lowest, 11.53 ft (3.51 m) below land-surface datum, Mar. 9, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	6.02	JAN 27	6.69	MAR 23	6.90	MAY 27	4.47	JUL 21	3.99	SEP 1	5.14
DEC 16	6.10										



156N48W10DAA02

## GROUND-WATER LEVELS

## MARSHALL COUNTY--Continued

482354096501001. Local number, 157N48W27BAA01.

LOCATION.--Lat 48°23'54", long 96°50'10", in NE¼NE¼NW¼ sec.27, T.157 N., R.48 W., Hydrologic Unit 09020311, 4.3 mi (6.9 km) north of Argyle.

Owner: U.S. Geological Survey.

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation artesian well, diameter 1½ in (0.03 m), depth 24 ft (7.3 m), screened 22 to 24 ft (6.7 to 7.3 m).

DATUM.--Altitude of land-surface datum is 844 ft (257 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.

PERIOD OF RECORD.--October 1971 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.88 ft (0.57 m) below land-surface datum, July 29, 1975; lowest, 6.65 ft (2.03 m) below land-surface datum, May 27, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	5.20	DEC 16	5.09	MAR 23	5.52	MAY 27	6.65	JUL 21	4.85	SEP 1	4.98

## OTTER TAIL COUNTY

462538095530201. Local number, 134N41W08CCC01.

LOCATION.--46°25'38", long 95°53'02", in SW¼SW¼SW¼ sec.8, T.134 N., R.41 W., Hydrologic Unit 09020103, 0.9 mi (1.4 km) west of County Roads 35 and 22.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 43 ft (13.1 m), screened 40 to 43 ft (12.2 to 13.1 m).

DATUM.--Altitude of land-surface datum is 1,368 ft (417 m). Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.

PERIOD OF RECORD.--November 1967 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.31 ft (7.71 m) below land-surface datum, June 1, 1974; lowest, 28.73 ft (8.76 m) below land-surface datum, Mar. 15, 1982.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 15	28.28	DEC 16	28.47	FEB 12	28.69	APR 13	27.49	JUL 14	27.30	SEP 14	27.69
NOV 12	28.33	JAN 12	28.57	MAR 15	28.73	JUN 16	27.30	AUG 17	27.54		

462522096031901. Local number, 134N43W14ADB01.

LOCATION.--Lat 46°25'22", long 96°03'19", in NW¼SE¼NE¼ sec.14, T.134 N., R.43 W., Hydrologic Unit 09020103, on Ron Heikes farm.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 50 ft (15.2 m), screened 48 to 50 ft (14.6 to 15.2 m).

DATUM.--Altitude of land-surface datum is 1,280 ft (390 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--November 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.04 ft (7.33 m) below land-surface datum, May 2, 1980; lowest, 26.52 ft (8.08 m) below land-surface datum, Jan. 2, 1981.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 21	26.18	APR 26	25.13	MAY 29	25.22	JUL 3	25.63	AUG 7	26.13	SEP 11	26.48

## GROUND-WATER LEVELS

## OTTER TAIL COUNTY--Continued

463418095334201. Local number, 136N39W23DCC01.

LOCATION.--Lat 46°34'18", long 95°33'42", in SW¼SW¼SE¼ sec.23, T.136 N., R.39 W., Hydrologic Unit 09020103, at Perham dump.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 26 ft (7.9 m), screened 24 to 26 ft (7.3 to 7.9 m).

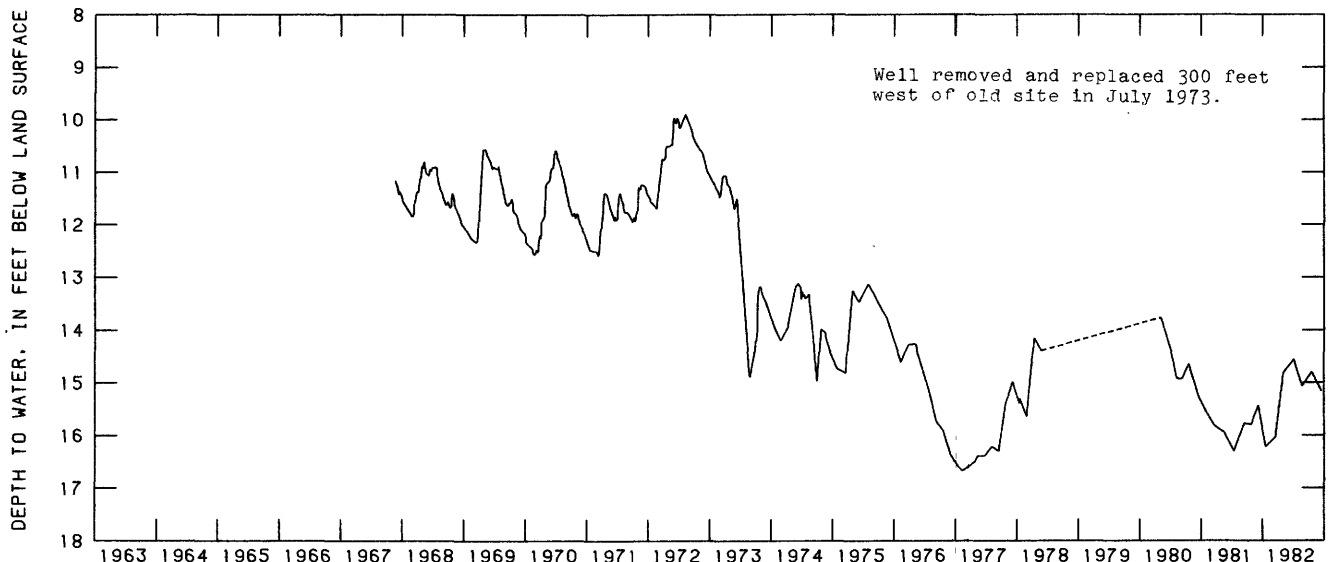
DATUM.--Altitude of land-surface datum is 1,350 ft (411 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.

PERIOD OF RECORD.--November 1967 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.90 ft (3.02 m) below land-surface datum, Aug. 10, 1972; lowest, 16.67 ft (5.08 m) below land-surface datum, Feb. 9, 1977.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	15.79	JAN 20	16.22	MAR 18	16.03	MAY 6	14.82	JUL 6	14.56	AUG 26	15.07
DEC 9	15.43										



136N39W23DCC01

463650096042801. Local number, 136N43W10AAA01.

LOCATION.--Lat 46°36'50", long 96°04'28", in NE¼NE¼NE¼ sec.10, T.136 N., R.43 W., Hydrologic Unit 09020103, on Oliver Haugrud farm.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 22 ft (6.7 m), screened 20 to 22 ft (6.1 to 6.7 m).

DATUM.--Altitude of land-surface datum is 1,322 ft (403 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--July 1977 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.89 ft (2.10 m) below land-surface datum, Apr. 16, 1980; lowest, 8.67 ft (2.64 m) below land-surface datum, Dec. 1, 1980, Sept. 11, 1982.

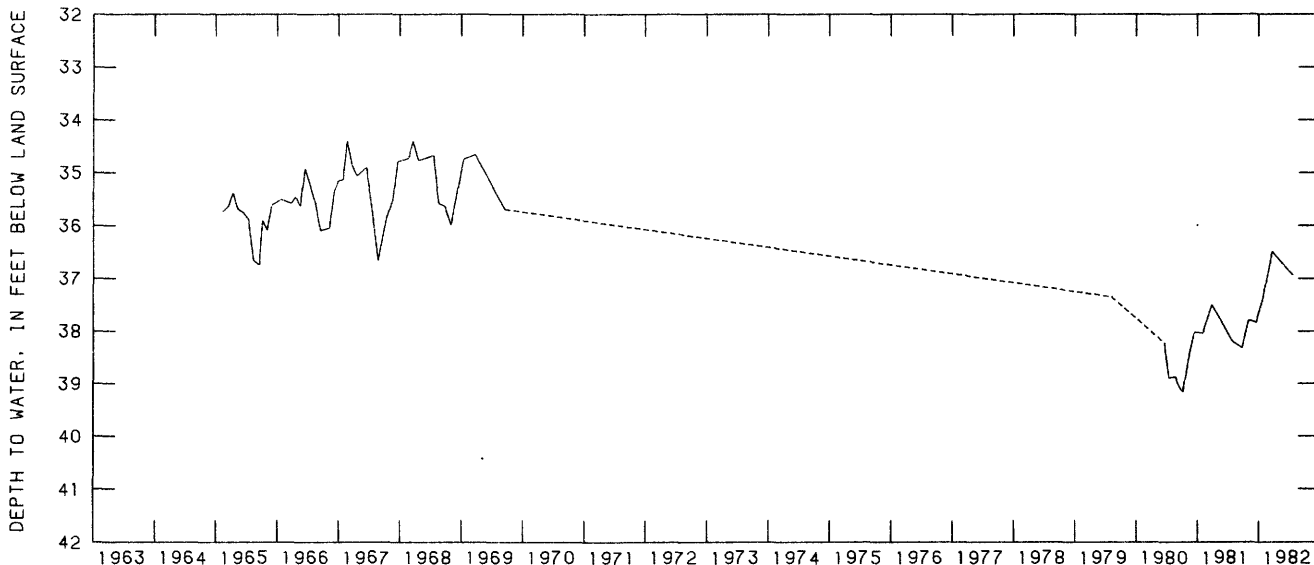
## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 21	8.26	APR 26	7.86	MAY 29	8.00	JUL 3	8.16	AUG 7	8.41	SEP 11	8.67



GROUND-WATER LEVELS

PENNINGTON COUNTY--Continued



154N43W33ADA01

ST. LOUIS COUNTY

472638092533601. Local number, 057N20W05DAD01.  
 LOCATION.--Lat 47°26'38", long 92°53'36", in SE¼NE¼SE¼ sec.5, T.57 N., R.20 W., Hydrologic Unit 04010201, 2.5 mi (4.0 km) east of Hibbing.  
 Owner: Burlington Northern, Inc.  
 AQUIFER.--Biwabik Iron Formation of Middle Precambrian Age.  
 WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 430 ft (131 m), cased to 315 ft (96.0 m).  
 DATUM.--Altitude of land-surface datum is 1,470 ft (448 m). Measuring point: Top of platform, 1.20 ft (0.37 m) above land-surface datum.  
 PERIOD OF RECORD.--August 1955 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 55.29 ft (16.85 m) below land-surface datum, Sept. 22, 1972; lowest, 69.07 ft (21.05 m) below land-surface datum, Jan. 15, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	58.08	JAN 7	57.40	MAR 1	57.60	APR 20	58.18	JUN 24	57.97	AUG 2	57.29
NOV 30	57.37										

472230092561001. Local number, 057N20W31DBC01.  
 LOCATION.--Lat 47°22'30", long 92°56'10", in SW¼NW¼SE¼ sec.31, T.57 N., R.20 W., Hydrologic Unit 04010201, 1.4 mi (2.25 km) south of Hibbing.  
 Owner: Mesaba County Club.  
 AQUIFER.--Buried sand and gravel of Pleistocene Age.  
 WELL CHARACTERISTICS.--Drilled unused artesian and water-table well, diameter 18 in (0.46 m), depth 92 ft (28.0 m), screened 82 to 92 ft (25.0 to 28.0 m).  
 DATUM.--Altitude of land-surface datum is 1,391 ft (424 m). Measuring point: Hole east side of pump base, 3.00 ft (0.91 m) above land-surface datum.  
 REMARKS.--Water level affected by pumping.  
 PERIOD OF RECORD.--February 1958 to March 1965, July 1979 to current year.  
 EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.85 ft (1.78 m) below land-surface datum, May 23, 1962; lowest, 15.05 ft (3.56 m) below land-surface datum, June 30, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 16	7.02	DEC 2	7.49	APR 20	7.65

## ST. LOUIS COUNTY--Continued

473102092345001. Local number, 058N18W12CCC01.

LOCATION.--Lat 47°31'02", long 92°34'50", in SW¼SW¼SW¼ sec.12, T.58 N., R.18 W., Hydrologic Unit 04010201, 1 mi (1.6 km) west of Virginia.

Owner: U.S. Steel Corp.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 97 ft (29.6 m), slotted casing between 67 to 97 ft (20.4 to 29.6 m).

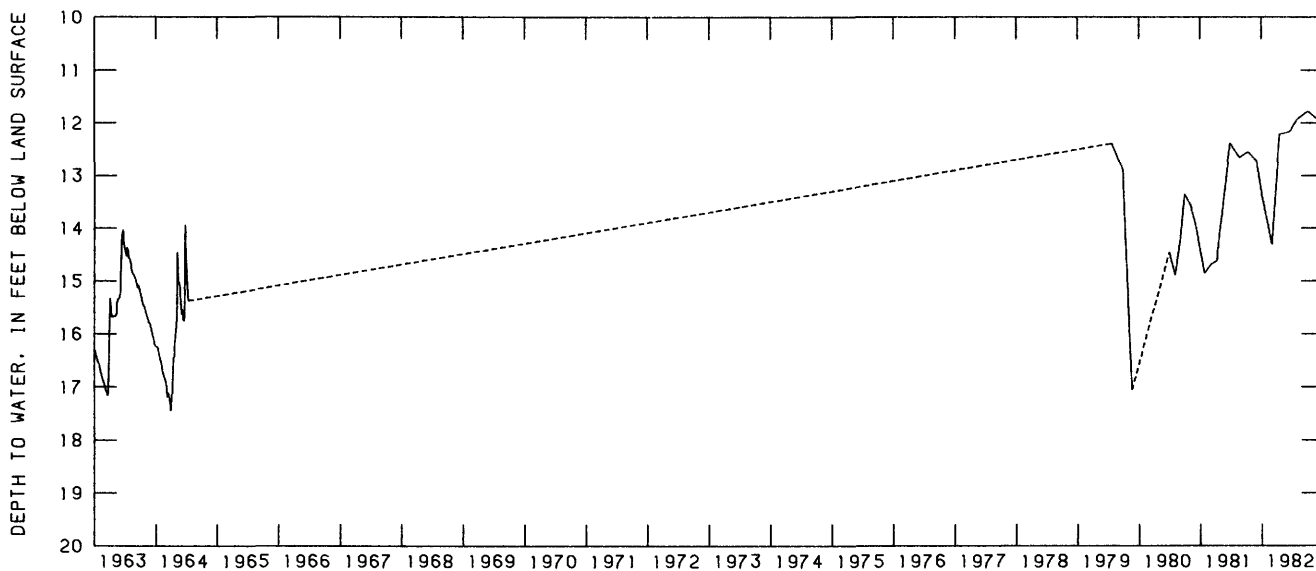
DATUM.--Land-surface datum is 1,427.5 ft (435.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Edge of vent pipe, 1.90 ft (0.58 m) above land-surface datum.

PERIOD OF RECORD.--December 1954 to July 1964, July 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.64 ft (3.24 m) below land-surface datum, July 20, 1957; lowest, 17.47 ft (5.32 m) below land-surface datum, Apr. 2, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	12.55	JAN 6	13.42	MAR 3	14.31	APR 19	12.22	JUN 18	12.16	AUG 3	11.93
DEC 2	12.71										



058N18W12CCC01

473011092524301. Local number, 058N20W16DBC01.

LOCATION.--Lat 47°30'11", long 92°52'43", in SW¼NW¼SE¼ sec.16, T.58 N., R.20 W., Hydrologic Unit 04010201, in Chisholm.

Owner: City of Chisholm.

AQUIFER.--Buried sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 40 ft (12.2 m), screened 30 to 40 ft (9.1 to 12.2 m).

DATUM.--Altitude of land-surface datum is 1,500 ft (457 m). Measuring point: Top of wood platform, 1.70 ft (0.52 m) above land-surface datum.

REMARKS.--Water level affected by pumping. Water-level subject to freezing during winter months.

PERIOD OF RECORD.--August 1953 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.23 ft (0.07 m) below land-surface datum, May 10, 1954; lowest, 15.60 ft (4.75 m) below land-surface datum, Mar. 23-24, 1957.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	2.60	NOV 30	2.76	JUN 24	2.33	AUG 2	1.21

## GROUND-WATER LEVELS

## ST. LOUIS COUNTY--Continued

474253091574101. Local number, 060N13W01BBA01.

LOCATION.--Lat 47°42'53", long 91°57'41", in NE¼NW¼NW¼ sec.1, T.60 N., R.13 W., Hydrologic Unit 09030001, at Babbitt water tower.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 30 ft (9.1 m), screened 27 to 30 ft (8.2 to 9.1 m).

DATUM.--Altitude of land-surface datum is 1,485 ft (453 m). Measuring point: Top of 3 in (0.08 m) pipe, 4.00 ft (1.22 m) above land-surface datum.

PERIOD OF RECORD.--October 1975 to June 1978, July 1979 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.70 ft (6.31 m) below land-surface datum, Oct. 6, 1975; lowest, 26.03 ft (7.93 m) below land-surface datum, June 14, 1977.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	21.20	MAY 1	22.97	JUN 1	22.58	JUL 2	22.17	AUG 1	22.00	SEP 1	21.66
APR 1	23.80										

475502091494601. Local number, 063N12W26ABB01.

LOCATION.--Lat 47°55'02", long 91°49'46", in NW¼NW¼NE¼ sec.26, T.63 N., R.12 W., Hydrologic Unit 09030001, at Ely.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 9 ft (2.7 m), screened 7 to 9 ft (2.1 to 2.7 m).

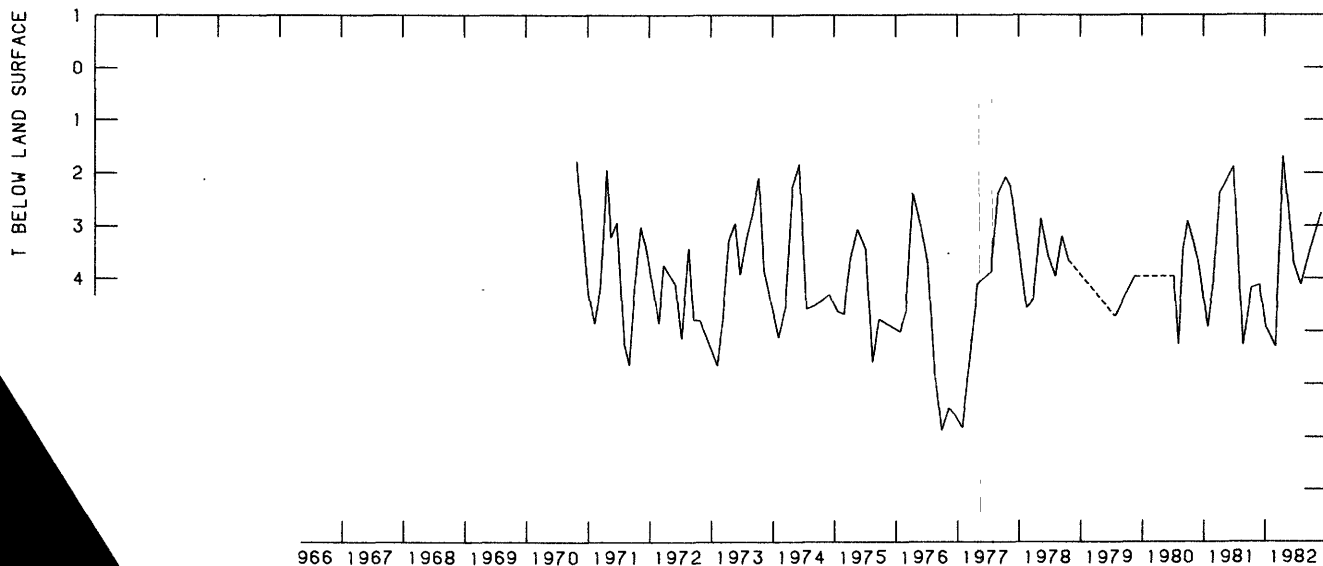
DATUM.--Altitude of land-surface datum is 1,342 ft (409 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.

PERIOD OF RECORD.--October 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.68 ft (0.51 m) below land-surface datum, Apr. 20, 1982; lowest, 6.87 ft (2.09 m) below land-surface datum, Sept. 27, 1976.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 14	4.18	JAN 5	4.91	MAR 3	5.29	APR 20	1.68	JUN 22	3.71	AUG 3	4.12
DEC 1	4.12										



## GROUND-WATER LEVELS

## TRAVERSE COUNTY

455700096314001. Local number, 129N47W25CDC01.

LOCATION.--Lat 45°57'00", long 93°31'40", in SW¼SE¼SW¼ sec.25, T.129 N., R.47 W., Hydrologic Unit 09020101, 9 mi (14.5 km) north of Wheaton.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 39 ft (11.9 m), open end.

DATUM.--Altitude of land-surface datum is 1,010 ft (308 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--October 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.05 ft (2.15 m) below land-surface datum, July 14, 1978; lowest, 12.36 ft (3.77 m) below land-surface datum, Oct. 18, 1974.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	11.98	JAN 18	12.22	APR 8	11.07	JUN 24	11.42	AUG 17	11.97	SEP 21	12.07
NOV 24	12.03										

## WILKIN COUNTY

460422096193701. Local number, 130N45W15BCC01.

LOCATION.--Lat 46°04'22", long 96°19'37", in SW¼SW¼NW¼ sec.15, T.130 N., R.45 W., Hydrologic Unit 09020101, 2 mi (3.5 km) north of Nashua.

Owner: Earl Davison

AQUIFER.--Buried sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in (0.41 m), depth 226 ft (68.9 m), screened 181 to 226 ft (55.2 to 68.9 m).

DATUM.--Altitude of land-surface datum is 994 ft (303 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.

PERIOD OF RECORD.--October 1980 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.67 ft (1.73 m) below land-surface datum, Apr. 15, 1981; lowest, 6.09 ft (1.86 m) below land-surface datum, Oct. 24, 1980.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	5.83	MAY 28	5.86	JUN 29	5.73	JUL 2	5.69	AUG 25	5.70	SEP 30	5.68
NOV 17	5.98	JUN 4	5.79								

463422096341701. Local number, 136N47W23CCC01.

LOCATION.--Lat 46°34'22", long 96°34'17", in SW¼SW¼SW¼ sec.23, T.136 N., R.47 W., Hydrologic Unit 09020106, 7.5 mi (12.1 km) east of Wolverton.

Owner: U.S. Geological Survey.

AQUIFER.--Surficial sand of Pleistocene Age.

WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.03 m), depth 62 ft (18.9 m), screened 58 to 62 ft (17.7 to 18.9 m).

DATUM.--Land-surface datum is 953.9 ft (290.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.

PERIOD OF RECORD.--October 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.61 ft (0.80 m) below land-surface datum, Mar. 21, 1966; lowest, 9.42 ft (2.87 m) below land-surface datum, Feb. 16, 1977.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	7.43	DEC 4	7.74	FEB 23	8.44	APR 16	6.21	MAY 27	5.85	AUG 17	6.77

## QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE OF SAMPLE	TIME	SPE-CIFIC CON-DUCT-ANCE	SPE-CIFIC CON-DUCT-ANCE	PH (UNITS)	PH LAB (UNITS)	TEMPER-ATURE (DEG C)
					(UMHOS) (00095)	(UMHOS) (90095)			
OTTER TAIL									
462100095414501	133N40W11BCC01	1120TSH	81-12-03	1230	360	392	6.8	7.9	12.0
		1120TSH	82-06-07	1330	375	402	8.0	7.9	12.0
462715095323001	134N39W01ACD02	1120TSH	81-12-03	1130	500	479	6.6	7.5	9.0
		1120TSH	82-06-07	1300	480	498	7.6	7.6	9.5
463245095331501	136N39W35DAD02	1120TSH	82-06-07	1230	550	584	7.7	7.8	8.5
463500095331501	136N39W14DDD01	1120TSH	81-12-03	1030	465	517	8.0	7.9	9.0
		1120TSH	82-06-07	1200	500	531	8.0	7.9	9.0
ST LOUIS									
472217093033502	056N21W06BBA02 KTB-26	111HLCN	82-08-24	1320	715	722	8.0	7.8	8.0

DATE OF SAMPLE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
OTTER TAIL				
81-12-03	55	2.1	3.7	40
82-06-07	58	2.8	4.2	10
81-12-03	74	9.1	.05	7100
82-06-07	80	9.9	<.10	7600
82-06-07	83	3.3	5.2	20
81-12-03	68	12	11	40
82-06-07	71	12	13	60
ST LOUIS				
82-08-24	27	16	5.5	12

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE OF SAMPLE	TIME	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS-NONCARBONATE (MG/L AS CACO3) (95902)	MAGNESIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM AD-SORPTION RATIO (00931)	
ST LOUIS										
472217093033502	056N21W06BBA02	KTB-26	111HLCN	82-08-24	1320	280	19	51	38	1.2

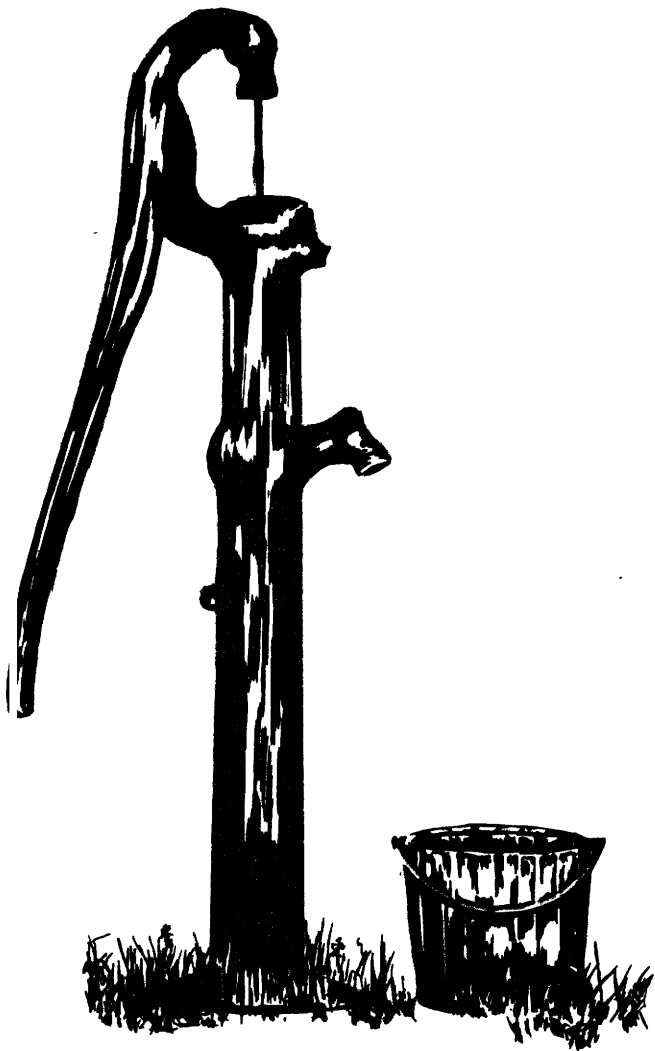
DATE OF SAMPLE	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	FLUORIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, VOLATILE, DIS-SOLVED (MG/L) (00520)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, ORTHO, TOTAL (MG/L AS P) (70507)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)
ST LOUIS												
82-08-24	259	88	1.4	20	438	422	99	--	--	--	--	48

DATE OF SAMPLE	BERYLLIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGANESE, DIS-SOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DIS-SOLVED (UG/L AS MO) (01060)	STRONTIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANADIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
ST LOUIS												
82-08-24	<1	<1	<3	<10	<10	10	300	140	110	<6.0	<4	.2

DATE OF SAMPLE PHENOLS (UG/L) (32730)

ST LOUIS

82-08-24 2



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## FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI). This report contains both the inch-pound and SI unit equivalents in the station manuscript descriptions.

Multiply inch-pound units	By	To obtain SI units
<i>Length</i>		
inches (in)	$2.54 \times 10^1$	millimeters (mm)
	$2.54 \times 10^{-2}$	meters (m)
feet (ft)	$3.048 \times 10^{-1}$	meters (m)
miles (mi)	$1.609 \times 10^0$	kilometers (km)
<i>Area</i>		
acres	$4.047 \times 10^3$	square meters (m <sup>2</sup> )
	$4.047 \times 10^{-1}$	square hectometers (hm <sup>2</sup> )
	$4.047 \times 10^{-3}$	square kilometers (km <sup>2</sup> )
square miles (mi <sup>2</sup> )	$2.590 \times 10^0$	square kilometers (km <sup>2</sup> )
<i>Volume</i>		
gallons (gal)	$3.785 \times 10^0$	liters (L)
	$3.785 \times 10^0$	cubic decimeters (dm <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic meters (m <sup>3</sup> )
million gallons	$3.785 \times 10^3$	cubic meters (m <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
cubic feet (ft <sup>3</sup> )	$2.832 \times 10^1$	cubic decimeters (dm <sup>3</sup> )
	$2.832 \times 10^{-2}$	cubic meters (m <sup>3</sup> )
cfs-days	$2.447 \times 10^3$	cubic meters (m <sup>3</sup> )
	$2.447 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
acre-feet (acre-ft)	$1.233 \times 10^3$	cubic meters (m <sup>3</sup> )
	$1.233 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
	$1.233 \times 10^{-6}$	cubic kilometers (km <sup>3</sup> )
<i>Flow</i>		
cubic feet per second (ft <sup>3</sup> /s)	$2.832 \times 10^1$	liters per second (L/s)
	$2.832 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$2.832 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
gallons per minute (gal/min)	$6.309 \times 10^{-2}$	liters per second (L/s)
	$6.309 \times 10^{-2}$	cubic decimeters per second (dm <sup>3</sup> /s)
	$6.309 \times 10^{-5}$	cubic meters per second (m <sup>3</sup> /s)
million gallons per day	$4.381 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$4.381 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
<i>Mass</i>		
tons (short)	$9.072 \times 10^{-1}$	megagrams (Mg) or metric tons

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