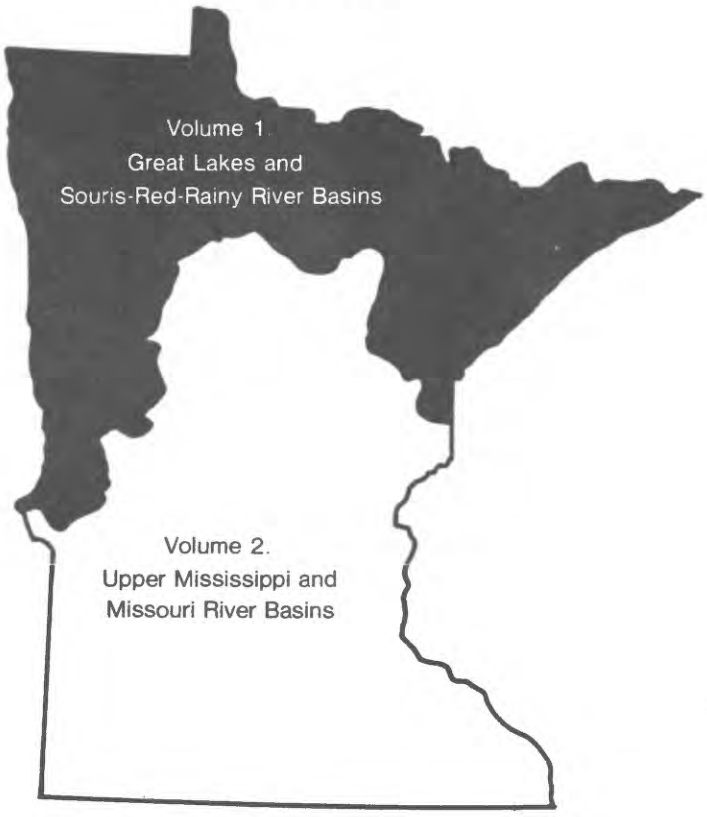
Water Resources Data Minnesota Water Year 1985

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-85-1
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 1985

1984

OCTOBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

1985

JANUARY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

FEBRUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

MARCH

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

APRIL

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

MAY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

JUNE

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

JULY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

AUGUST

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

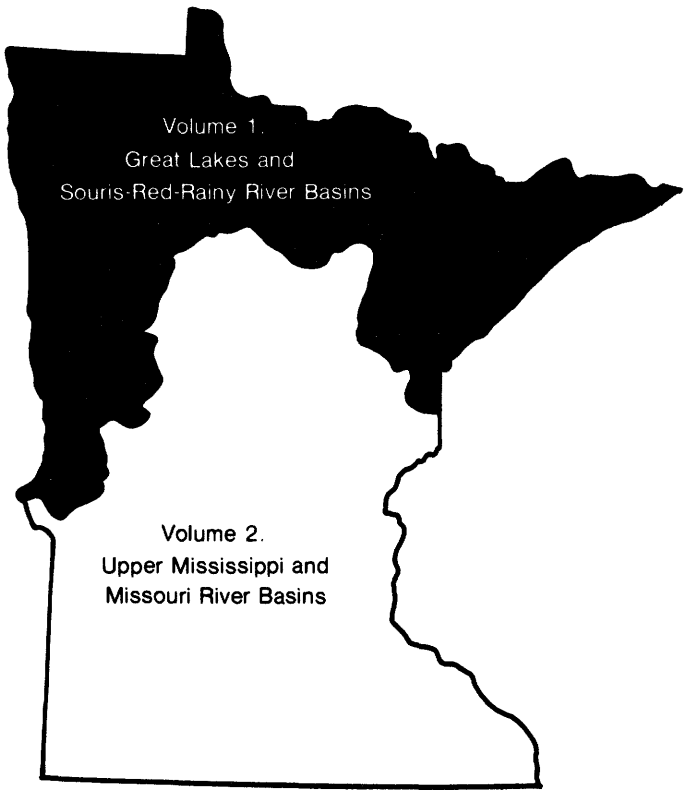
SEPTEMBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Water Resources Data Minnesota Water Year 1985

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-85-1
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

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

District Chief, Water Resources Division
U.S. Geological Survey
702 Post Office Building
St. Paul, Minnesota 55101

1987

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 two 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:

Mark R. Have, Water-Quality Specialist, Minnesota District
Henry W. Anderson, Jr., Ground-Water Project Chief, Minnesota District

Most of the data were collected, processed, and tabulated by the following individuals:

Allan D. Arntson
Ruth E. Bergstrom
Howard D. Braden
Alex Brietkrietz
John L. Callahan
Rosa L.V. Chamblee
Paul E. Felsheim
William A. Gothard
Roderick L. Johnson
Wallace W. Larson
Gregory R. Melhus
Gregory B. Mitton
Charles J. Smith
Gregory W. Stratton
Sandra J. Surratt
Lan H. Tornes
Duane A. Wicklund

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.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. USGS/WRD/HD-88/208	2.	3. Recipient's Accession No.

4. Title and Subtitle
Water Resources for Minnesota, Water Year 1985
Volume 1, Great Lakes and Souris-Red-Rainy River Basins

5. Report Date
November 1987

6.

7. Author(s) Kurt T. Gunard, Joseph H. Hess, James L. Zirbel, and Charles E. Cornelius

8. Performing Organization Rept. No.
USGS-WDR-MN-85-1

9. Performing Organization Name and Address
U. S. Geological Survey, Water Resources Division
702 Post Office Building
St. Paul, Minnesota 55101

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U. S. Geological Survey, Water Resources Division
702 Post Office Building
St. Paul, Minnesota 55101

13. Type of Report & Period Covered
Annual Oct. 1, 1984 to Sept. 30, 1985

14.

15. Supplementary Notes
Prepared in cooperation with the State of Minnesota and with other agencies.

16. Abstract (Limit: 200 words)

Water-resources data for the 1985 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 in wells and springs. This volume contains discharge records for 46 gaging stations; stage-only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 8 gaging stations, 7 partial-record stations, 10 lake stations, and 12 wells; and water levels for 26 observation wells. Also included are 38 high-flow partial-record stations. Additional water data were collected at various sites, not part of 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 operated by the U. S. Geological Survey and cooperating State and Federal agencies in Minnesota.

17. Document Anelysis e. Descriptors

*Minnesota, *Hydrologic data, *Surface water, *Ground water, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analyses, Sediments, Water temperatures, Sampling sites, Water levels, Water analyses, Data collection

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: No restriction on distribution. This report may be purchased from: National Technical Information Service Springfield, VA 22161	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 199
	20. Security Class (This Page) UNCLASSIFIED	22. Price

CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS--Continued

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED

Note.--Data for partial-record stations and miscellaneous sites for both surface-water quantity and quality are published in separate sections of the data report. See references at the end of this list for page numbers for these sections.

[*Letters after station name designates type of data: (d) discharge; (e) gage height, elevation, or contents; (c) chemical, radio-chemical, or pesticides; (b) biological or micro-biological; (p) physical (water temperature, sediment, or specific conductance)*]

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED

GROUND-WATER LEVELS

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED--Continued

QUALITY OF GROUND WATER

WATER RESOURCES DATA FOR MINNESOTA, 1985

INTRODUCTION

The Water Resources Division of the U.S Geological Survey, in cooperation with State agencies, obtains a large amount of data pertaining to the water resources of Minnesota each water year. These data, accumulated during many years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series entitled "Water Resources Data - Minnesota."

Water resources data for the 1985 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 46 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 8 gaging stations, 7 partial-record stations, 10 lake stations, and 12 wells; and water levels for 26 observation wells. Also included are 38 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.

This series of annual reports for Minnesota began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for Minnesota were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Parts 4, 5 and 6A." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply papers can be consulted in the libraries of the principal cities of the United States and may be purchased from Distribution Branch, Text Products Section, U.S. Geological Survey, 604 Pickett Street, Alexandria, VA 22304.

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and volume number. For example, this volume is identified as the "U.S. Geological Survey Water-Data Report MN-85-1. For archiving and general distribution, the reports for 1971-1974 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche 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, Lawrence D. Seymour, director.

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

Minnesota Pollution Control Agency, Thomas J. Kalitowski, executive director.

Metropolitan Waste Control Commission of the Twin Cities Area, Peter E. Meintsman, chairperson.

Metropolitan Council of the Twin Cities Area, Sandra Gardebring, chairperson.

Elm Creek Conservation Commission, Gerald E. Butcher, chairperson.

Fond du Lac Reservation Business Commission, W. J. Houle, chairperson.

Red Lake Watershed District, Truman Sandland, president.

Red Lake Reservation Business Committee, Roger Jordain, chairperson.

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

White Earth Reservation Business Committee, Darrell Wadena, Chairperson.

Assistance in the form of funds or services was given by the Corps of Engineers, U.S. Army, in collecting records for 48 gaging stations and 12 water-quality stations published in this report. Thirteen 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 water 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."

SUMMARY OF HYDROLOGIC CONDITIONS

PRECIPITATION

Precipitation during the 1985 water year varied from normal in a small area of the southeast to 16 inches above normal in parts of north-central and northwestern Minnesota (fig. 1). Normal annual precipitation in Minnesota ranges from 19 inches in the northwest to 32 inches in the southeast. Precipitation during water year 1985 ranged from 24 inches in parts of the northwest to 40 inches in central Minnesota and small parts of the northeast and southeast. Except for November, precipitation was above normal statewide during the first quarter of the 1985 water year. During the second quarter, precipitation was near normal to slightly below, except during March when it was above normal statewide, with the exception of the "arrowhead" where it was slightly below. Precipitation during the third quarter generally was above normal over most of the State, except in the southeast where it was below normal during the entire quarter. The fourth quarter began with below-normal precipitation statewide during July. Precipitation during the remainder of the quarter was excessive over most of the State, being slightly below normal in parts of the north.

STREAMFLOW

Average annual runoff in Minnesota ranges from 1 inch in the west to 14 inches in the northeast. Annual runoff in 1985 ranged from 1.2 inches on the western border to almost 19 inches in the northeast (fig. 2) and varied from 60 to 80 percent of average in parts of northeast and south-central Minnesota to 300 percent of average in a small part of the northwest. The southwest had the greatest area of above-average runoff, ranging from 200 to 280 percent of the long-term average. Small areas in the south-central, southeast, and "arrowhead" regions of the State had the lowest average runoff, ranging from 63 to 102 percent of the long-term average. Runoff in the large remaining area of the State ranged from 125 to 200 percent of the long-term average, with a few exceptions.

Records for stations in northern Minnesota in 1985 indicate variations in annual runoff from slightly above average in the northeast to twice the average runoff in the northwest. Runoff in the Roseau River at Ross, in northwestern Minnesota, was 5.38 inches -- twice the 57-year average annual runoff of 2.65 inches, in contrast to the previous year when the lowest September flow for the period of record occurred. Farther east in northern Minnesota, runoff in the Little Fork River at Littlefork was 12.95 inches -- 1.5 times the average annual runoff of 8.36 inches and the 6th highest in 62 years of record. In northeastern Minnesota, runoff in the Baptism River near Beaver Bay was 17.31 inches -- only 5 percent higher than the 58-year average annual runoff of 16.49 inches. A comparison of annual and monthly mean discharges for these stations to median discharges for a 30-year base period is shown in figure 3.

Despite record, or near record, monthly flow volumes in some areas during 1985, no peaks of record were exceeded at any station on streams for which records are published in this volume, with the exception of two recently established stations with less than 10 years of record and one longer-term station in north-central Minnesota.

WATER QUALITY

Four U.S. Geological Survey National Stream-Quality Accounting Network (NASQAN) stations are used to monitor variability in concentrations of chloride and in nitrate as nitrogen in, and between, the three major basins covered in this volume (figs. 4 and 5): the Lake Superior, Rainy River, and Red River of the North basins.

Chloride concentrations generally were higher than the monthly median at the four NASQAN stations, except St. Louis River at Scanlon. Chloride con- centrations at Scanlon were below the median in five out of six samples.

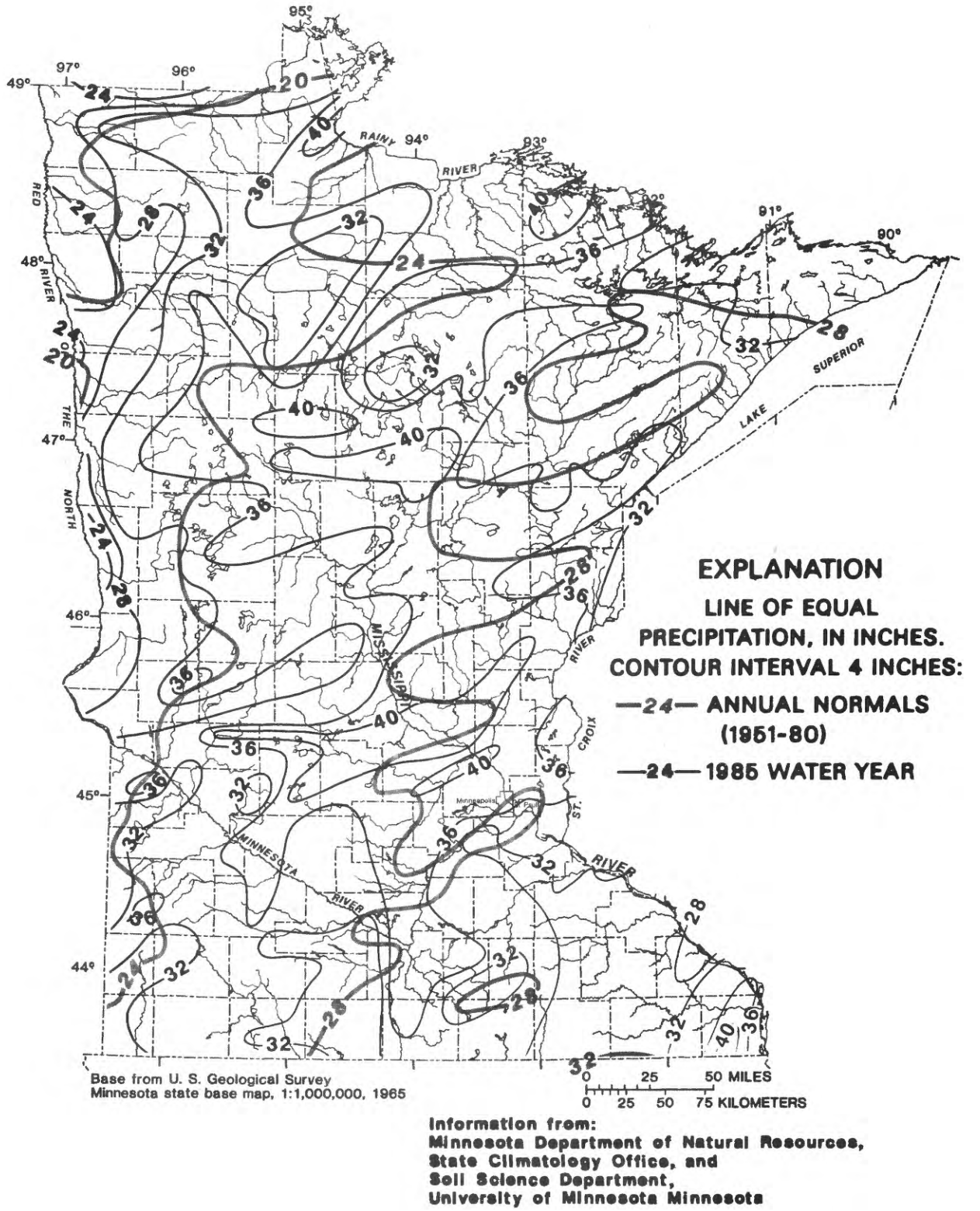


Figure 1.--Precipitation, in inches, during 1985 water year compared with normal annual precipitation for Minnesota

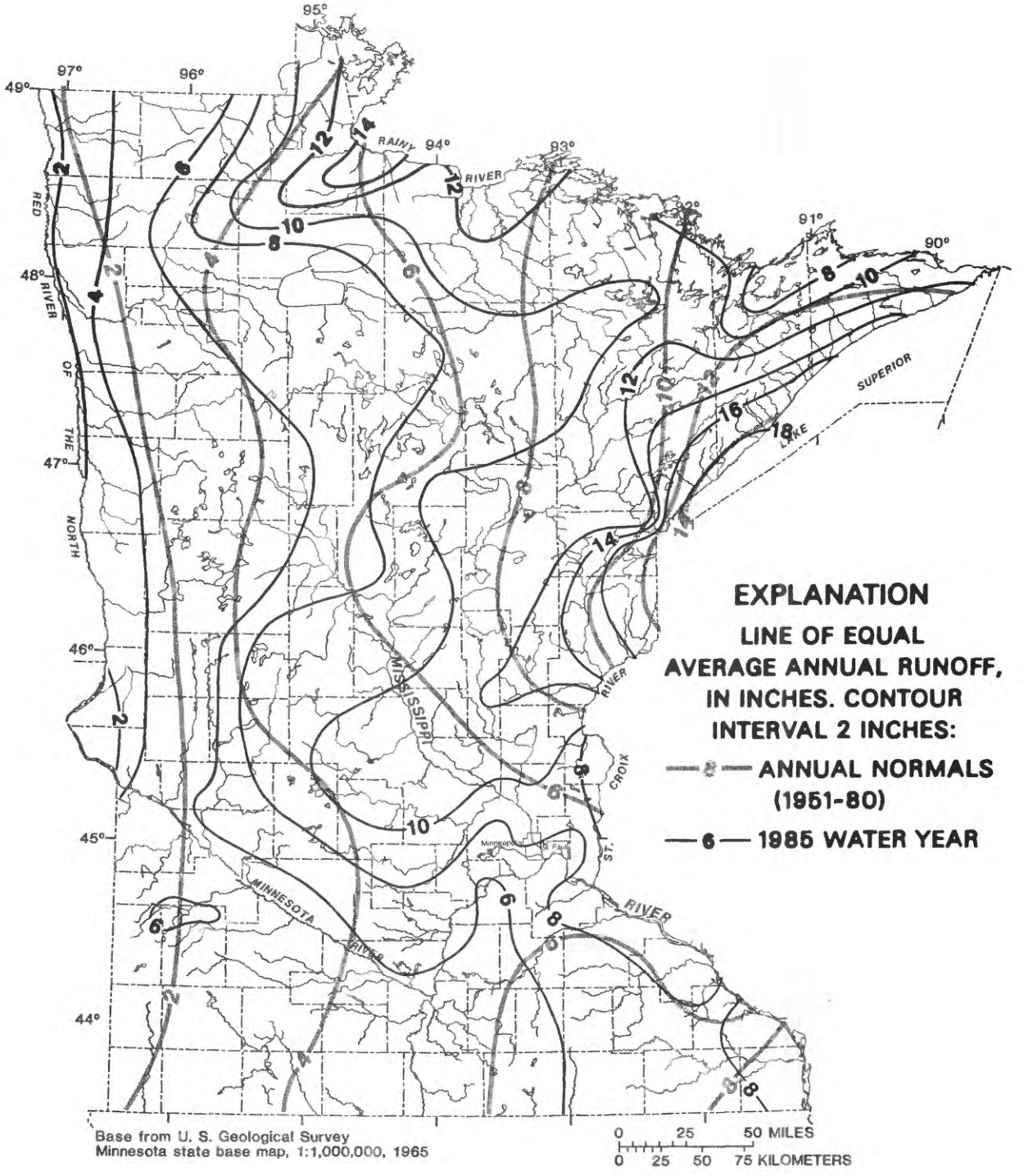


Figure 2.--Average annual runoff, in inches, for the 1985 water year compared with average annual runoff for a 30-year base period

Nitrate concentrations reported as nitrogen (analysis for nitrate plus nitrite as nitrogen, but nitrite concentration assumed to be negligible) were the same or slightly higher than the monthly medians for the four stations shown in figure 5.

Twelve ground-water samples were collected and analyzed for major ions. All nitrate-nitrogen concentrations were below the primary drinking-water standard of 10 mg/L (U.S. Environmental Protection Agency, 1985).

GROUND-WATER LEVELS

Water levels in unconfined (water-table) aquifers generally were above normal in 16 of 32 observation wells at the begining of the 1985 water year. Water levels generally rose during early fall and declined in late fall through winter. During winter 1985 (January through March), water levels in 47 percent of the observation wells were in the normal range, 34 percent were above normal, and 19 percent below normal. Water levels generally rose slightly in spring 1985 such that water levels were normal in 56 percent of the observation wells, above normal in 31 percent, and below normal in 13 percent. Water levels continued to rise during summer so that they were above normal in 16 of the 32 observation wells in unconfined aquifers, water levels in 14 of the wells were in the normal range, and water levels in 2 wells were below normal. During summer 1985, new monthly record-high-water levels were recorded in 11 of the 32 observation wells. Figure 6 shows the seasonal fluctuation of water levels relative to normal levels, based on water-level fluctuations in 32 wells in unconfined aquifers. Levels for the 1985 water year are compared to the long-term normal for each month and are grouped by seasons. Water levels in southeastern Minnesota were consistently above normal throughout the 1985 water year -- similar to water levels in the adjacent area of Wisconsin. Water levels in parts of central and northwestern Minnesota also were above normal. Water levels in northeastern Minnesota were below normal in fall and winter but were in the normal range in spring and summer. In southwestern Minnesota, water levels declined in most areas and, by the end of the water year (September 1985), were below normal -- similar to water levels reported from adjacent areas in South Dakota.

Water levels in confined drift and bedrock aquifers generally were above normal throughout the 1985 water year. Water levels generally rose during winter and spring followed by a seasonal decline in summer 1985 (fig 7). Seasonal water levels in 52 observation wells in confined aquifers were compared to long-term normal levels. In fall 1984 (October through December) and in winter 1985 (January through March), above-normal levels were recorded in 69 percent of the wells in confined aquifers, normal levels were recorded in 18 percent of the wells, and below-normal levels in about 13 percent of the wells. Water levels rose seasonally in spring, so that above-normal water levels were recorded during the months of April, May, and June 1985 in 65 percent of the observation wells in confined aquifers, normal levels were recorded in 21 percent of the wells, and below-normal levels were recorded in only 14 percent of the wells. During summer 1985, water levels in 30 of the 52 observation wells in confined aquifers remained above normal and were in the normal range in 16 wells. Numerous seasonal record-high-water levels were recorded in north-central, southeastern, and southwestern Minnesota. New monthly record-high-water levels were recorded in 21 of the 52 observation wells in confined aquifers during the fall. New monthly record-high-water levels were recorded in 18 of the wells during winter and again during spring. New monthly record-high-water levels were recorded in 15 of the wells during summer. Levels in the Mount Simon-Hinckley aquifer in the Twin Cities basin were consistently below normal, and new seasonal record-low-water levels were recorded.

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a national data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of the hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, and aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

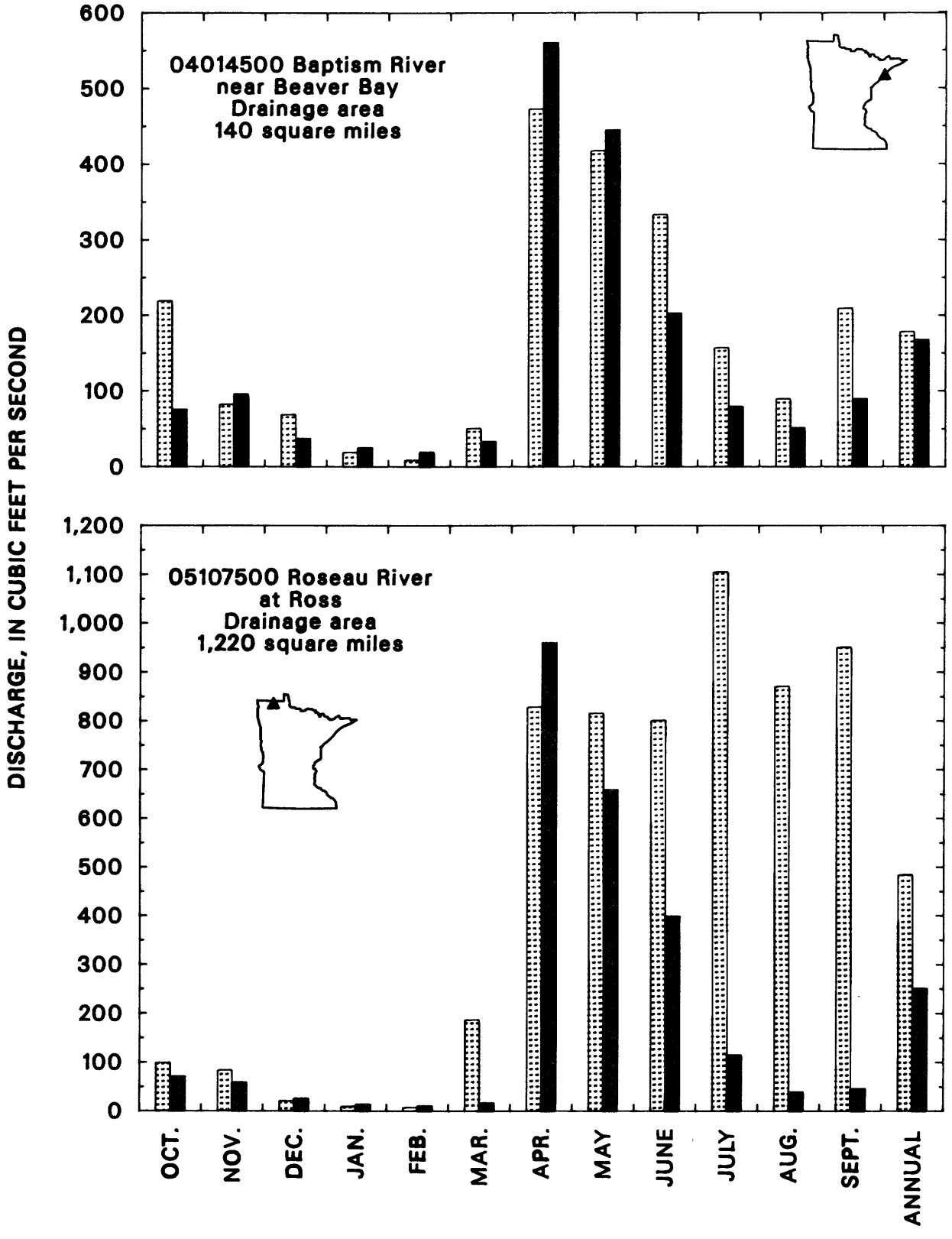
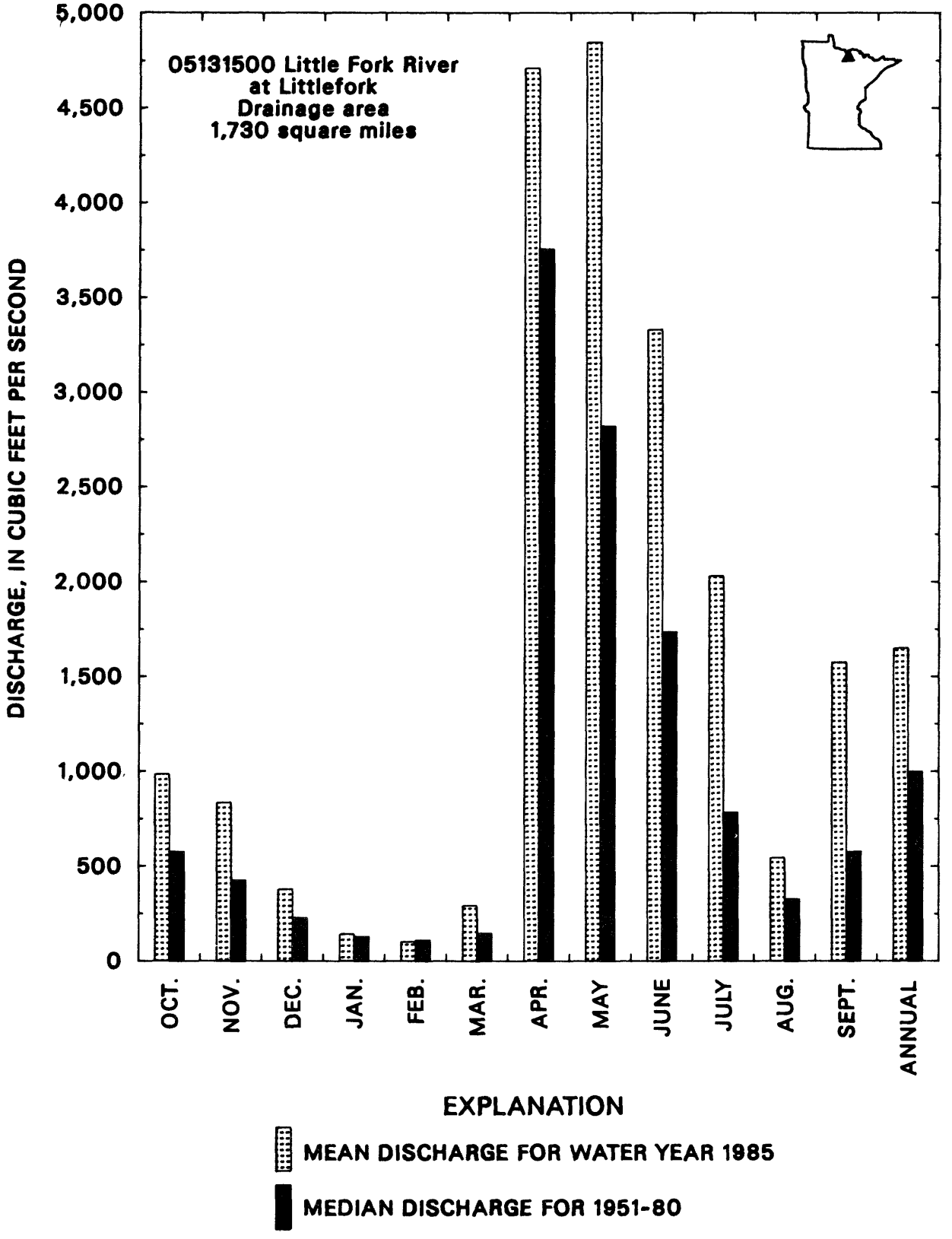


Figure 3.--Comparison of discharges at three long-term representative gaging



stations for the 1985 water year with median discharge for water years 1951-80

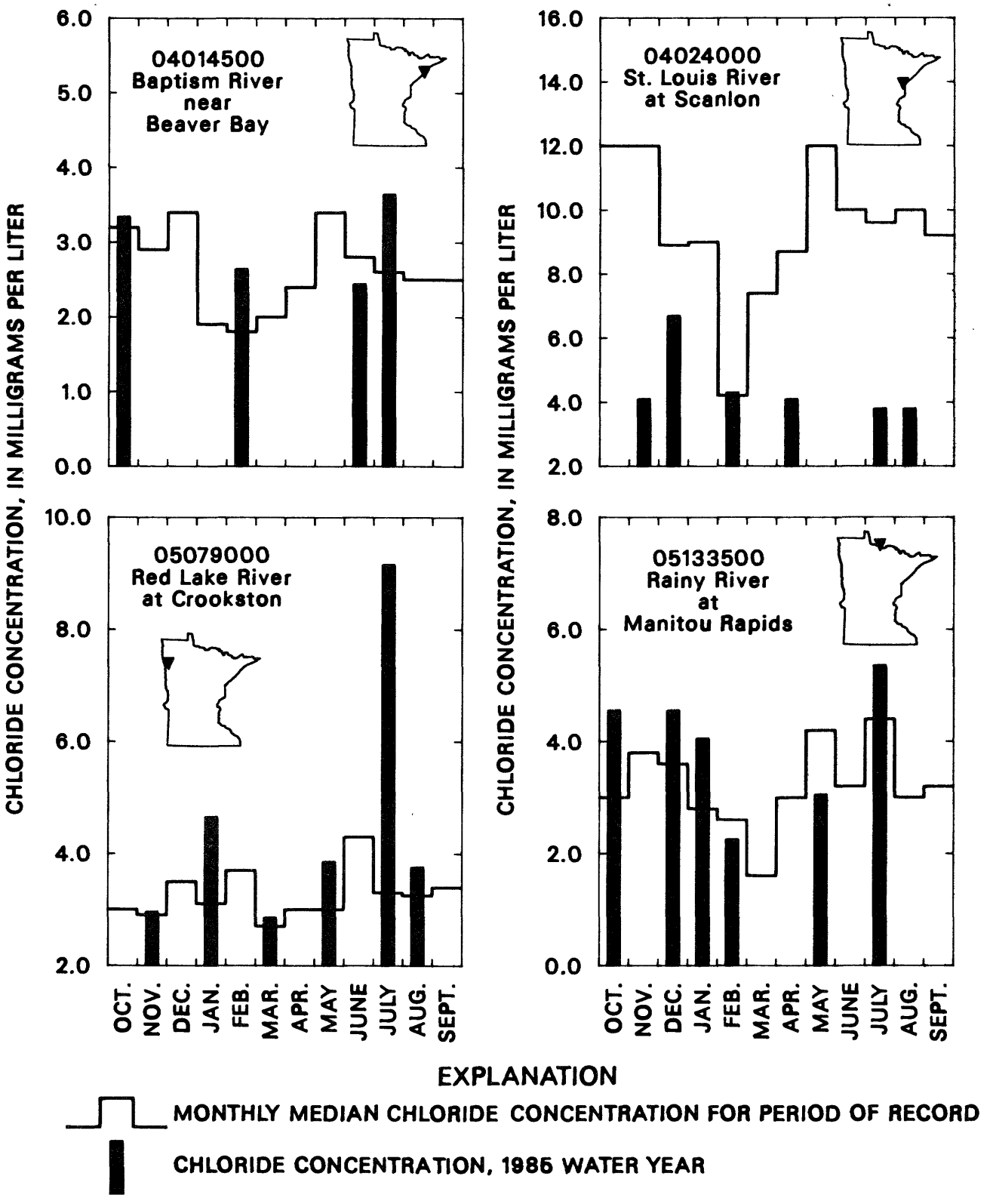


Figure 4.--Comparison of chloride concentrations for the 1985 water year with median monthly values for the period of record

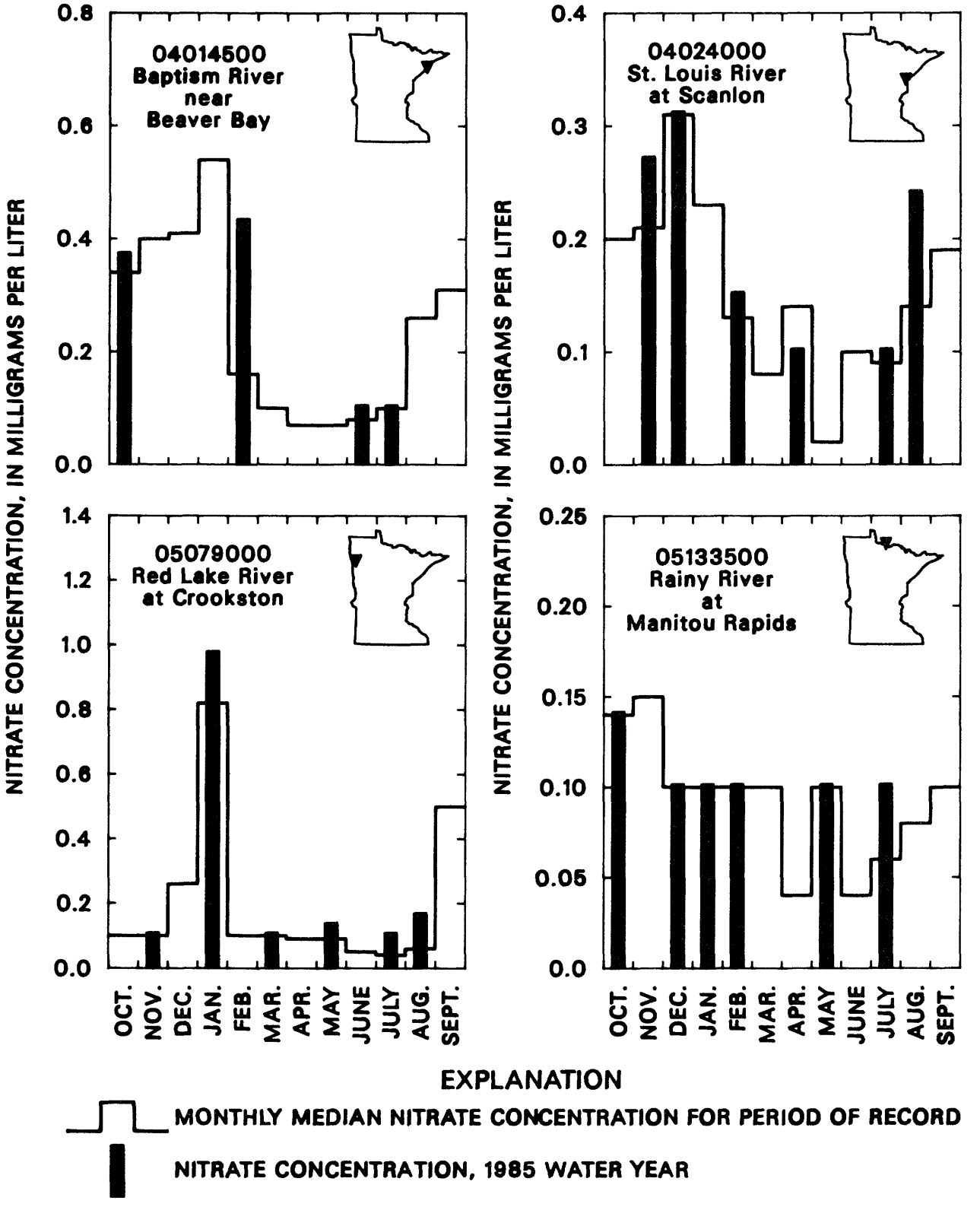


Figure 5.--Comparison of nitrate concentrations for the 1985 water year with median monthly values for the period of record

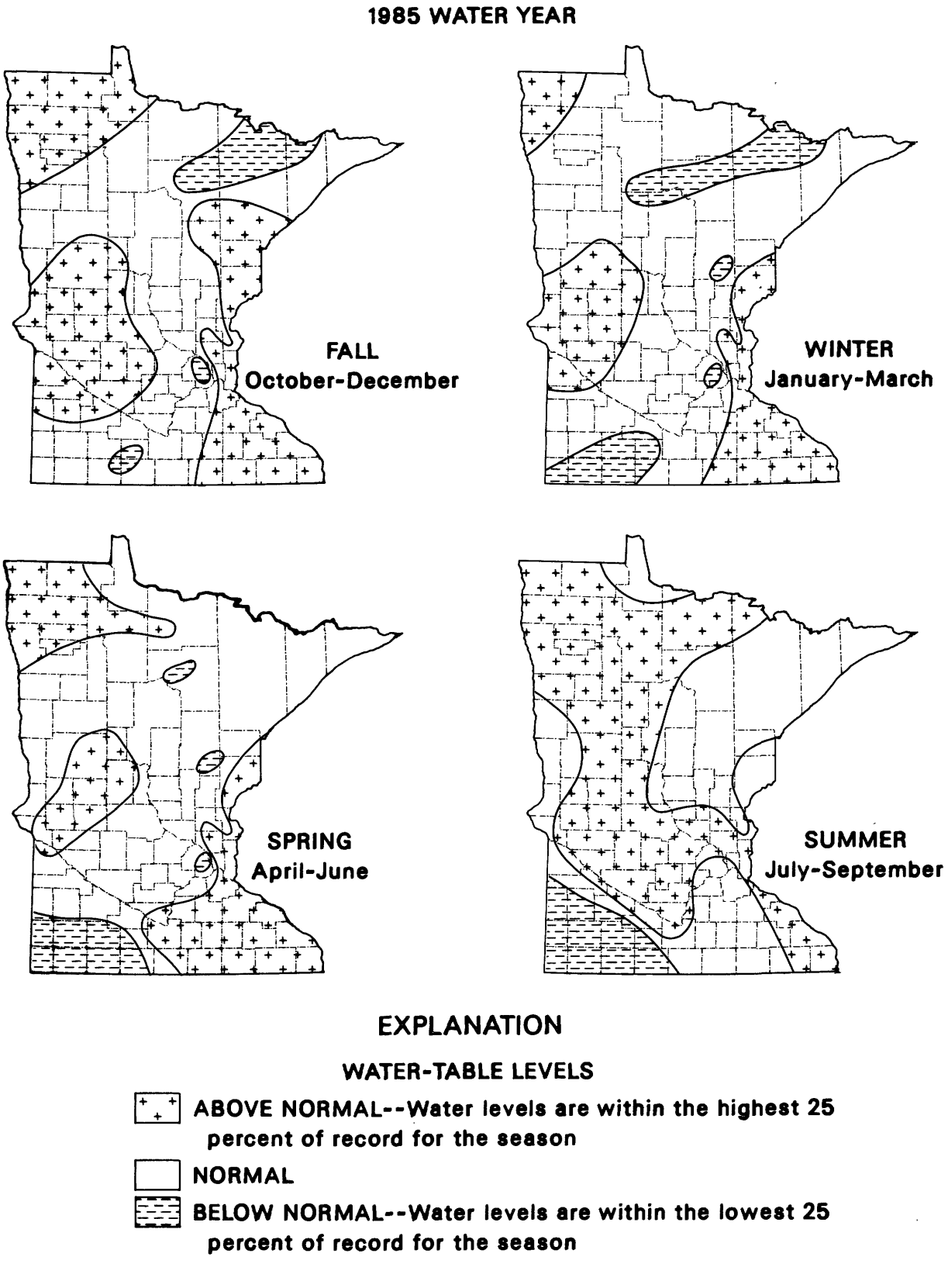


Figure 6.--Relationship of seasonal water-table levels to long-term mean levels

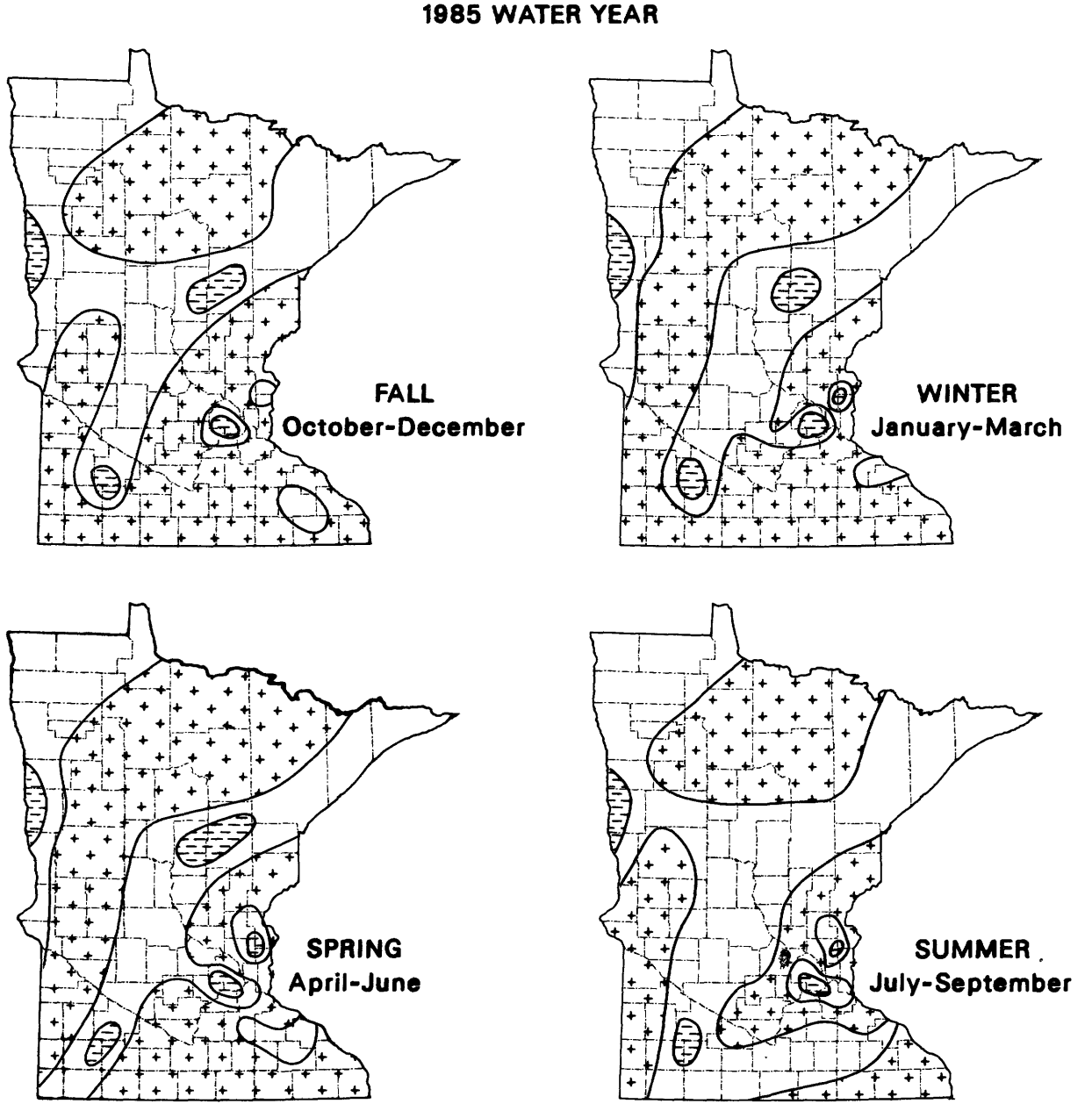


Figure 7.--Relstionship of seasonsl water levels in confined aquifers to long-term mesn levels

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. 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 baseline 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 THE RECORDS

The surface-water and ground-water records published in this report are for the 1985 water year that began October 1, 1984, and ended September 30, 1985. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for the surface and ground water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 9, 10, 11, and 12. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

STATION IDENTIFICATION NUMBERS

Each data station, whether streamsite or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The system used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water well sites differ, but both are based on geographic location. The "downstream order" system is used for regular surface-water stations and the "latitude-longitude" system is used for wells and, in Minnesota, for surface-water stations where only miscellaneous measurements are made.

Downstream Order System 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 sections is listed between them. A similar order is followed by 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 front of the report. Each indention represents one rank. This downstream order and system of indention 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 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."

Latitude-Longitude 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 8 on following page. 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.

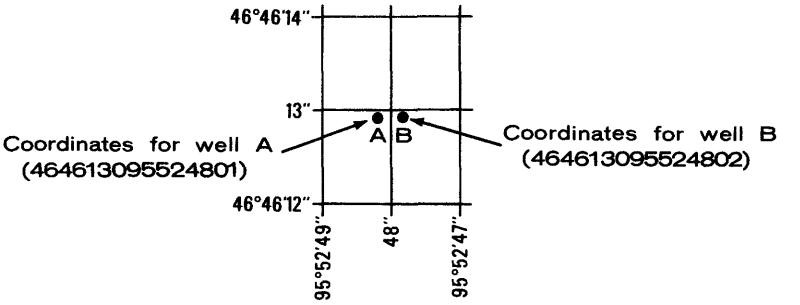


Figure 8.--Example of system for numbering wells and miscellaneous sites

RECORDS OF STAGE AND WATER DISCHARGE

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharge may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarily, are those for which stage or content may be computed or estimated with reasonable accuracy for any time, or period of time. They may be obtained using a continuous stage-recording device, but need not be. Because daily mean discharges and end-of-day contents commonly are published for such stations, they are referred to as "daily stations".

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "High-flow partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record and high-flow partial-record stations for which data are given in this report are shown in figures 9 and 11.

Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relationships between stage and discharge. These data, together with supplemental information, such as weather records, are used to compute daily discharges. The data obtained at a complete-record gaging station on a lake or reservoir consist of a record of stage and of notations regarding factors that may affect the relationship between stage and lake content. These data are used with stage-area and stage-capacity curves or tables to compute water-surface areas and lake storage.

Continuous records of stage are obtained with analog recorders that trace continuous graphs of stage or with digital recorders that punch stage values on paper tapes at selected time intervals. Measurements of discharge are made with current meters using methods adapted by the Geological Survey as a result of experience accumulated since 1880. These methods are described in standard textbooks, in Water-Supply Paper 2175, and in U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter A6.

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If it is necessary to define extremes of discharge outside the range of current-meter measurements, the curves are extended using: (1) logarithmic-plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow-over-dams or weirs; or (4) step-backwater techniques.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. 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 determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting-control method also is used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

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.

In computing records of lake or reservoir contents, it is necessary to have available from surveys, curves, or tables defining the relationship of stage and content. The application of stage to the stage-content curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-content relationship changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relationship. Even when this is done, the contents computed may become increasingly in error as time since the last survey increases. Discharge over lake or reservoir spillways are computed from stage-discharge relationships much as other stream discharges are computed.

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 from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

The records published for each gaging station consist of two parts, the manuscript or station description and the data table for the current water year. The manuscript provides, under various headings, descriptive information, such as station location; period of record; average discharge; historical extremes; record accuracy; and other remarks pertinent to station operation and regulation. The following information as appropriate is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station description .

LOCATION.--Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.--Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.--This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time when the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

REVISED RECORDS.--Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all reports in which revisions have been published for the station and water years to which the revisions apply. If a revision did not include daily, monthly, or annual figures of discharge, that fact is noted 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 most recently revised figure was first published is given.

GAGE.--The type of gage in current use, the datum of the current gage referred to National Geodetic Vertical Datum of 1929 (see glossary), and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS.--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

AVERAGE DISCHARGE.--The discharge value given is the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record, and only water years of complete record are included in the computation. It is not computed for stations where diversions, storage, or other water-use practices cause the value to be meaningless. If water developments significantly altering flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated following the development. The median of yearly mean discharges also is given under this heading for stations having 10 or more water years of record, if the median differs from the average given by more than 10 percent.

EXTREMES FOR PERIOD OF RECORD.--Extremes may include maximum and minimum stages and maximum and minimum discharges or content. Unless otherwise qualified, the maximum discharge or content is the instantaneous maximum corresponding to the highest stage that occurred. The highest stage may have been obtained from a graphic or digital recorder, a crest-stage gage, or by by direct observation of a nonrecording gage. If the maximum stage did not occur on the same day as the maximum discharge or content, it is given separately. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and is reported in the manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Included here is the information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

EXTREMES FOR THE CURRENT YEAR.--Extremes given here are similar to those for the period of record, except the peak discharge listing which may include secondary peaks. For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330. The minimum for the current water year appears below the table of peak data.

REVISIONS.--If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the District office to determine if the published records were ever revised after the station was discontinued. Of course, if the data were obtained by computer retrieval, the data would be current and there would be no need to check because any published revision of data is always accompanied by revision of the corresponding data in computer storage.

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.

The daily table for stream-gaging stations gives 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 maximun and minimum daily discharges, respectively, for the month. Discharge for the month also is usually 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 or if the drainage area includes large noncontributing areas. In the yearly summary below the monthly summary, the figures shown are the appropriate discharges for the calendar and water years. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversions or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

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. 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.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated", or by listing the dates of the estimated record in the REMARKS paragraph of the station desciption.

Accuracy of the Records

The accuracy of streamflow records 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 measurements of stage, measurements of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS." "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the true; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned, are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundreth of a cubic foot per second for values less than 1 ft^3/s; to the nearest tenth between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1000 ft^3/s; and to 3 significant figures for more than 1000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharges listed for partial-record stations and miscellaneous sites.

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 Records 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.

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 as well as an index of records of discharge collected by other agencies but not published by the Geological Survey. Information on records available at specific sites can be obtained upon request.

RECORDS OF SURFACE-WATER QUALITY

Records of surface water quality ordinarily are obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuing or partial-record station, where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between "continuing records" as used in this report and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 10.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

On-Site Measurement and Collection

In obtaining water quality data, a major concern needs to be assuring that the data obtained represents the in situ quality of water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen need to be made onsite when the samples are taken. To assure that measurements made in the laboratory also represent the in situ water, carefully prescribed procedures need to be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in publications on "Techniques of Water-Resources Investigations ," Book 1, Chap. D2; Book 3, Chap. C2; Book 5 Chap. A1, A3, and A4. All of these references are listed on p. 17 of this report. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey District office.

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. All samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors which must be evaluated by the collector.

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.

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 U.S.G.S. district office whose address is given on the back of the title page of this report.

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 diurnal 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. Water temperatures measured at the time of water-discharge measurements are on file in the District office.

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 and in predicting long-term sediment-discharge characteristics of the stream.

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

Laboratory Measurements

Samples for indicator bacteria and specific conductance are analyzed locally. All other samples are analyzed in the Geological Survey laboratories in Arvada, Colo., Doraville, Ga., or Iowa City, Ia. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chap. C1. Methods used by the Geological Survey laboratories are given in TWRI, Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data , and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information, when appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of stage and Water Discharge"; same comments apply.

PERIOD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.--Information on instrumentation is given only if a water-quality monitor, temperature recorder, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.--Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

EXTREMES.--Maximums and minimums are given only for parameters measured daily or more frequently. None are given for parameters measured weekly or less frequently , because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Enviromental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this report:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organisms count less than 0.5 percent (organisms may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

RECORDS OF GROUND-WATER LEVELS

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Minnesota are shown in figure 12.

Although, in this report, records of water levels are presented for fewer than 200 wells, records are obtained through cooperative efforts of many Federal, State, and local agencies for several hundred observation wells throughout Minnesota and are placed in computer storage. Each spring, the Minnesota Department of Natural Resources, Division of Waters publishes a report for the previous water year entitled "Observation Well Data Summary, Water Year 19__." This report contains hydrographs of recorder wells, detailed maps showing the location of active observation wells, and other useful items. Information about the availability of the data in the water-level file may be obtained from the District Chief, Minnesota District. (See address on back of front page).

Data Collection and Computation

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used at each observation well assure that measurements at each well are of consistent accuracy and reliability.

Tables of water-level data are presented by counties arranged in alphabetical order. The prime identification number for a given well is the 15-digit number that appears in the upper left corner of the table. The secondary identification number is the local well number, an alphanumeric number, derived from the township-range location of the well.

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum 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 20 representative wells; 1 bedrock, 9 surficial-sand, and 10 buried-sand wells.

Data Presentation

Each well consists of two parts, the station description and the data table of water levels observed during the water year. The description of the well is presented first through use of descriptive headings preceeding the tabular data. The comments to follow clarify information presented under the various headings.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes and seconds); a landline location designation; the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

AQUIFER.-- This entry designates by name(if a name exists) and geologic age the aquifer(s) open to the well.

WELL CHARACTERISTICS.--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and includes additional information such as casing breaks, collapsed screen, and other changes since construction.

DATUM.--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in the top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

REMARKS.--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that are also water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers.

PERIOD OF RECORD.--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of the publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following year. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

EXTREMES FOR THE PERIOD OF RECORD.--This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level.

RECORDS OF GROUND-WATER QUALITY

Records of ground-water quality in this report differ from other types of records in that for most sampling sites they consist of only one set of measurements for the water year. The quality of ground water ordinarily changes only slowly; therefore, for most general purposes one annual sampling, or only a few samples taken at infrequent intervals during the year, is sufficient. Frequent measurement of the same constituents is not necessary unless one is concerned with a particular problem, such as monitoring for trends in nitrate concentration. In the special cases where the quality of ground water may change more rapidly, more frequent measurements are made to identify the nature of the changes.

Data Collection and Computation

The records of ground-water quality in this report were obtained mostly as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some counties but none are presented for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality statewide. Such a view can be attained only by considering records for this year in context with similar records obtained for these and other counties in earlier years.

Most methods for collecting and analyzing water samples are described in the "U.S. Geological Survey Techniques of Water-Resources Investigation" manuals listed on a following page. The values reported in this report represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. All samples were

obtained by trained personnel. The wells sampled were pumped long enough to assure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Data Presentation

The records of ground-water quality are published in a section titled QUALITY OF GROUND WATER immediately following the ground-water-level records. Data for quality of ground water are listed alphabetically by County, and are identified by well number. The prime identification number for wells sampled is the 15-digit number derived from the latitude-longitude locations. No descriptive statements are given for ground-water-quality records; however, the well number, depth of well, date of sampling, and other pertinent data are given in the table containing the chemical analyses of the ground water. The REMARK codes listed for surface-water-quality records are also applicable to ground-water-quality records.

ACCESS TO WATSTORE DATA

The National WATer Data STOrage and REtrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from each of the Water Resources Division's district offices (see address given on back of the title page).

General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

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 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 sheet 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^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

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.

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^3/s, ft^3/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.

Dissolved-solids concentration of water is determined either analytically by the "residue-on-evaporation" method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination of dissolved solids, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. Therefore, in the mathematical calculation of dissolved-solids concentration, the bicatbonate value, in milligrams per liter, is multiplied by 0.492 to reflect the change.

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

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

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 ($CaCO_3$).

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.

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.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases, The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

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 (1×10^{-12}) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10^{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 [mg C/(m^2 · time) for periphyton and macrophytes and mg C/(m^3 · 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 [mg O_2/(m^2 · time) for periphyton and macrophytes and mg O_2/(m^3 · 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.

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

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.

Return period is the average time interval between occurrences of a hydrological event of a given or greater magnitude, usually expressed in years. May also be called recurrence interval.

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.

Bed load is the sediment that is transported in a stream by rolling, sliding, or skipping along the bed and very close to it. In this report, bed load is considered to consist of particles in transit within 0.25 ft of the streambed.

Bed load discharge (tons per day) is the quantity of bed load measured by dry weight that moves past a section as bed load in a given time.

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).

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

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.

Total-sediment load or total load is a term which refers to the total sediment (bed load plus suspended-sediment load) that is in transport. It is not synonymous with total-sediment discharge.

7-day 10 year low flow ($7\ Q_{10}$) is the discharge at the 10-year recurrence interval taken from a frequency curve of annual values of the lowest mean discharge for 7 consecutive days (the 7-day low flow).

Sodium-adsorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

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 appoximating 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 a streamflow may be applied to discharge whether or not it is affected by diversion of 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 miltiplate 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. 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.....Ephermeridae
Genus.....Hexageria
Species.....Hexagenia limbata

Thermograph is an instrument that continuously records variations of temperature on a chart. The more general term "temperature recorder" is used in the table headings and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

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 percent 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.

Tritium Network is a network of stations which has been established to provide baseline 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.

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1980, is called the "1980 water year."

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

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 discharges. 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.

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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting 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) pertains to 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). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for 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-A10. *Discharge ratings at gaging stations,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 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-A13. *Computation of continuous records of streamflow,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.

3-A14. *Use of flumes in measuring discharge,* by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.

3-A15. *Computation of water-surface profiles in open channels.* by Jacob Davidian: USGS--TWRI Book 3, Chapter A15. 1984. 48 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.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

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. Greeson, T. A. Ehlke, 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-A6. *Quality assurance practices for the chemical and biological analyses of water and fluvial sedments,* by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 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. Schaffrannek, 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-A2. *Installation and service manual for U.S. Geological Survey manometers* by J. D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 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^2)	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
04016000	Partridge River near Aurora, MN	161	1942-82
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

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Red River of the North basin--Continued		
05045500	Otter Tail River (Red River) near Fergus Falls, MN	a1,690	1909-10†
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
05062500	Wild Rice River at Twin Valley, MN	888	1909-17 1930-83
05063000	Wild Rice River near Ada, MN	a1,100	1948-54
*05063500	South Branch Wild Rice 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
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
05094500	South Branch Two Rivers (Two Rivers) at Hallock, MN	-	1940-47
05095000	Two Rivers (South Branch Two Rivers) at Hallock, MN		1911-14 1929-30 1938-39 1941-43

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

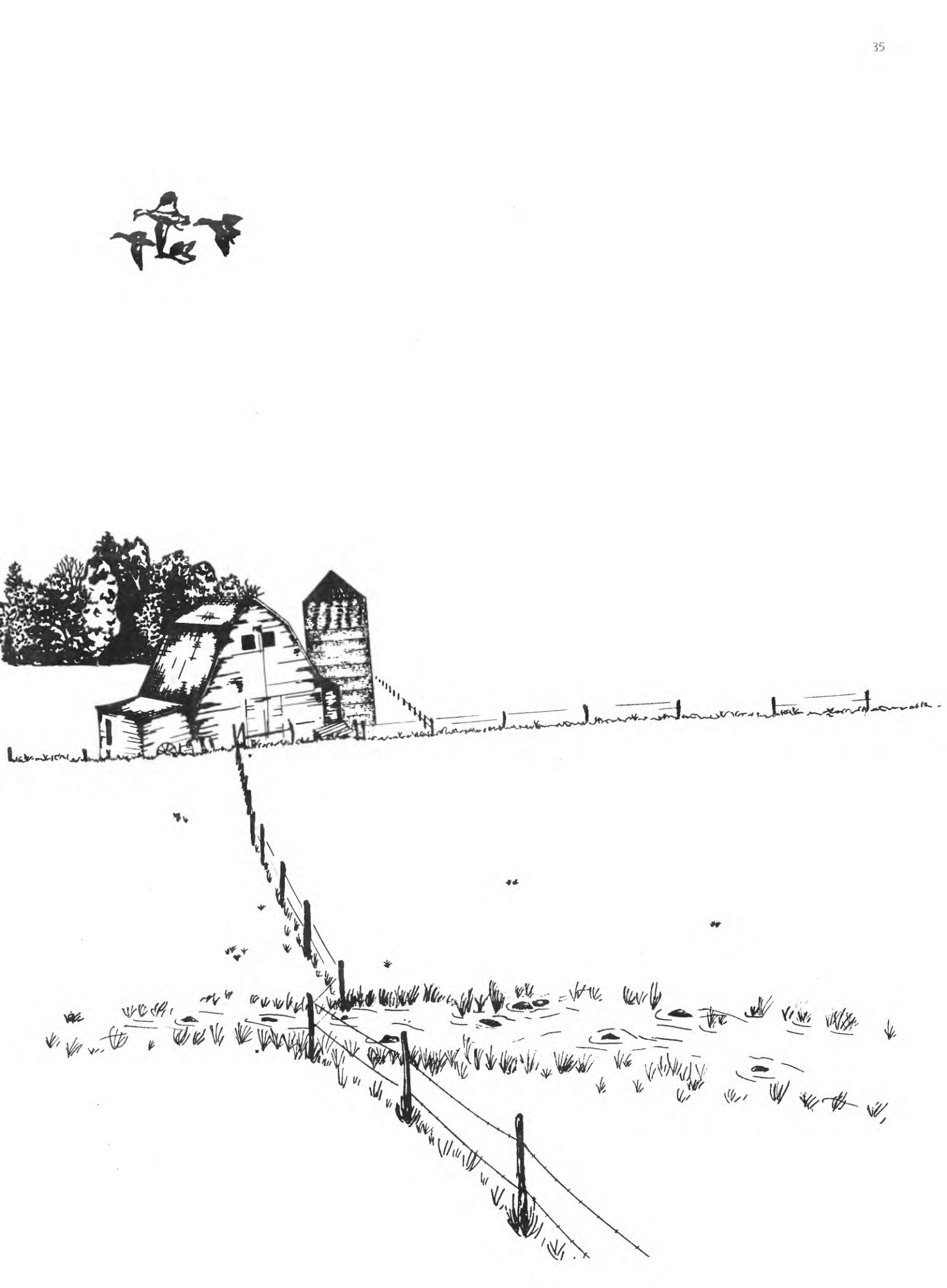
Station number	Station name	Drainage area (mi^2)	Period of record
05095500	Two Rivers below Hallock, MN	644	1945-55
05096000	North Branch (North Fork) Two Rivers near Lancaster, MN	a32	1929-38, 1941-55
05096500	State Ditch 85 near Lancaster, MN	a95	1929-38, 1942-55
05097000	North Branch Two Rivers at 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
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

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Lake of the Woods basin--Continued		
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
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.




Red River of the North
Rainy River
Upper Red Lake
Lower Red Lake
Bemidji
Grand Rapids
Moorhead
International Falls
Mille Lacs Lake
LAKE SUPERIOR
DULUTH
5112000
5102500
5140521
5106500
5107500
5140520
5104500
5094000
5092000
5087500
5134200
5133500
5129400
5129290
5126000
5131500
5132000
5129115
5127500
4010500
5127000
5124480
5128200
5124990
5130500
4015330
5076000
5075000
5074000
5074500
05078000
5078500
5078230
5082500
5079000
5069000
5067500
5064500
5064000
5062500
5062000
5061000
5061500
5054000
5051522
5051500
5045950
5046000
5201500
5291000
5212700
5216860
5211000
5206000
5206500
5210500
5218500
5219000
5220500
5230500
5231000
5227500
5246500
5247000
5247500
5284000
5336700
4014500
4015330
Volume 1
Volume 2

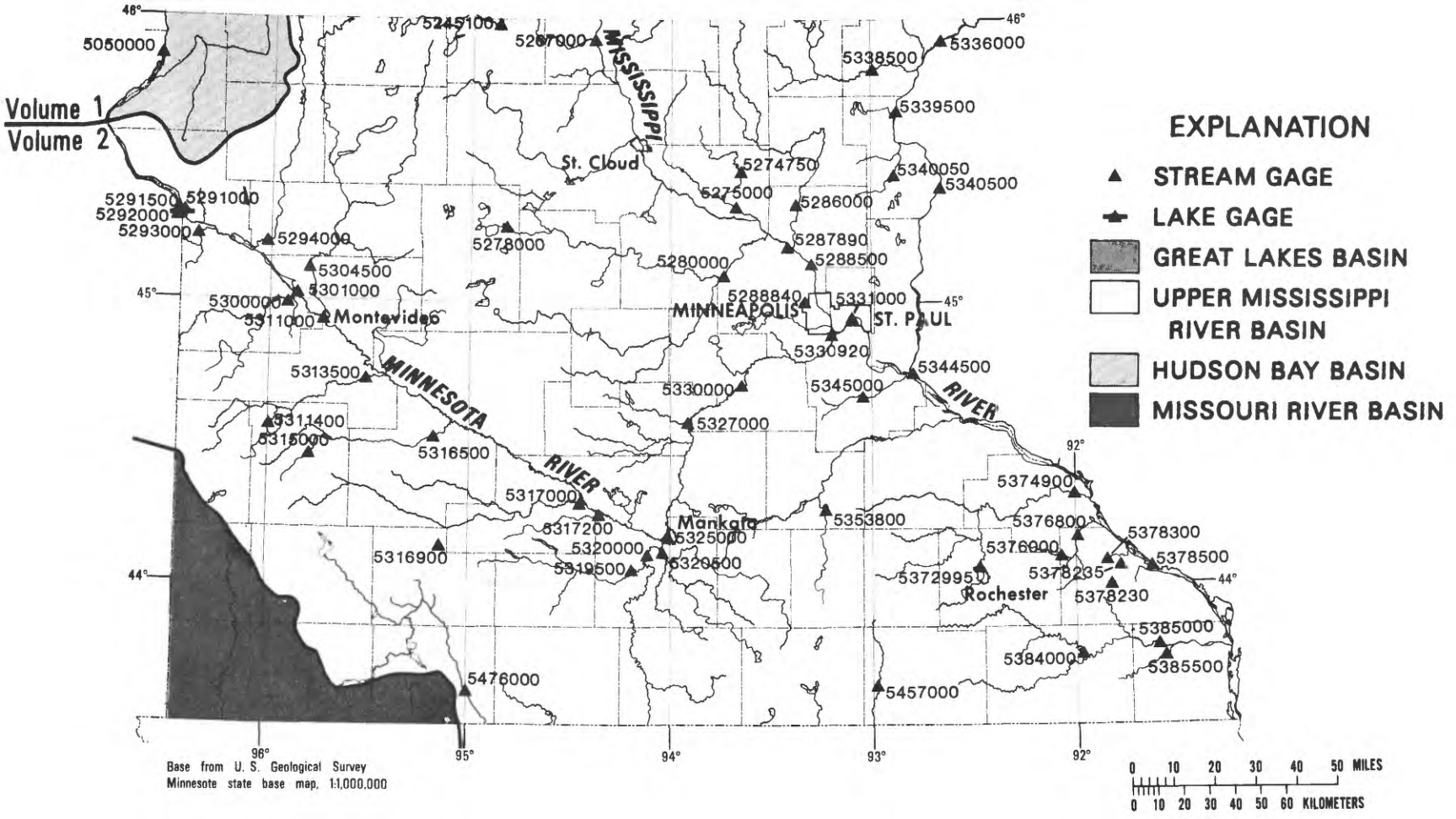
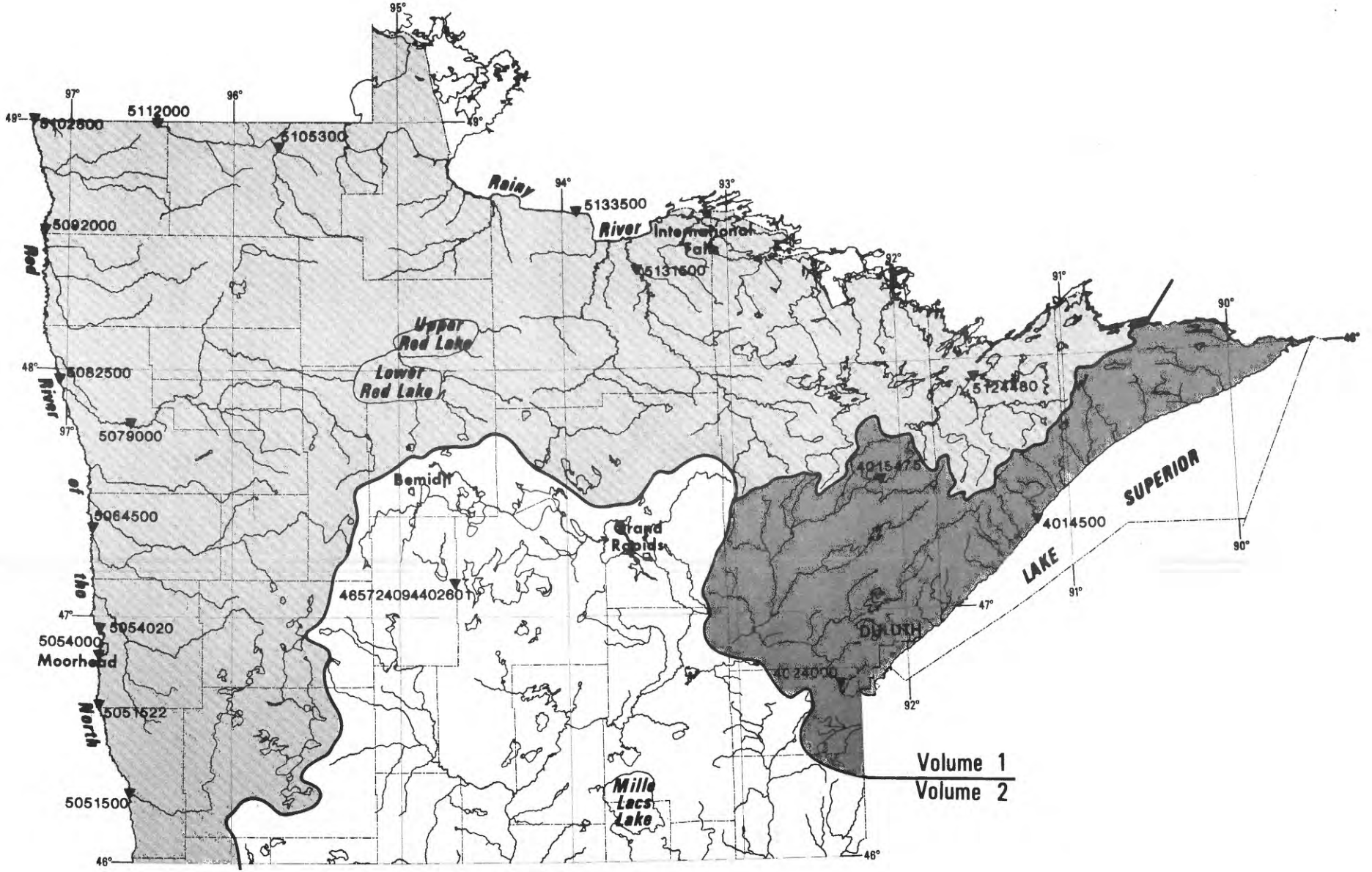


Figure 9.--Location of lake and stream-gaging stations


95°
97°
96°
49°
5112000
5102500
5105300
Rainy
94°
93°
5133500
River
International Falls
5131600
5092000
Red
92°
91°
90°
Upper Red Lake
Lower Red Lake
48°
5082500
River
97°
5079000
5124180
4015475
Bemidji
5064500
of the
Grand Rapids
SUPERIOR
4014500
LAKE
90°
91°
47°
46572409440260 1
5054020
5054000
Moorhead
DULUTH
40 24000
92°
North
5051622
Volume 1
Volume 2
Mille Lacs Lake
5051500
46°

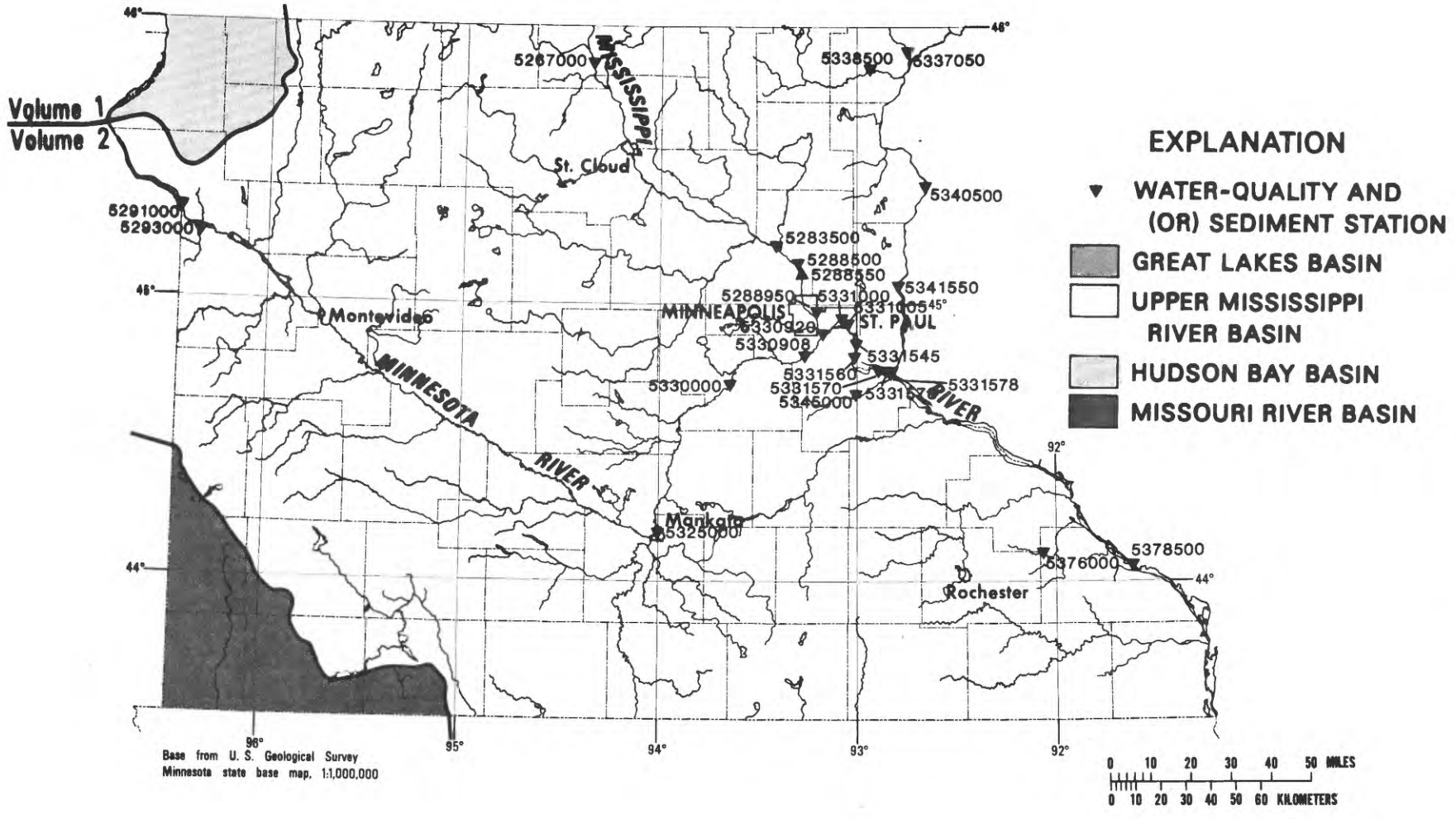


Figure 10.--Location of surface-water-quality stations

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 SW¼NE¼ sec.24, T.64 N., R.6 E., Cook County, Hydrologic Unit 04010101, on the Grand Portage Indian Reservation, on right bank 400 ft upstream from Middle Falls, 2.5 mi upstream from Grand Portage Port of Entry, 3.5 mi upstream from mouth, and 4.7 mi northeast of village of Grand Portage.

DRAINAGE AREA.--600 mi^2.

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 above National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 mi upstream at datum 102.24 ft higher. Oct. 1, 1940, to Dec. 31, 1975, at present site at datum 2.00 ft higher.

REMARKS.--Estimated daily discharges: Nov. 19-23 and Dec. 2 to Apr. 21. Records good except those for periods with ice effect, Nov. 19-23 and Dec. 2 to Apr. 21, which are fair. Satellite telemeter at station.

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

AVERAGE DISCHARGE.--62 years (water years 1924-85), 507 ft^3/s, 11.48 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,000 ft^3/s, May 5, 1934, gage height, 7.6 ft, site and datum then in use, from rating curve extended above 7,000 ft^3/s; minimum daily, 1.0 ft^3/s, Jan. 15-21, 1977; minimum recorded gage height, 1.24 ft, 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.--Peak discharges greater than base discharge of 3,000 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 24	1200	*4,010	*9.06	No other peak greater than base discharge.			

Minimum discharge, 55 ft^3/s, Oct. 14, 15; minimum gage height, 2.33 ft, Oct. 13, 14, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	311	198	150	100	85	210	1320	1620	862	356	250
2	91	250	175	145	98	85	220	1200	1400	829	334	244
3	86	300	160	140	98	85	220	1110	1180	860	314	455
4	83	396	145	135	98	85	220	1170	1000	814	301	556
5	79	447	130	135	98	85	220	1450	908	795	397	482
6	77	396	120	130	98	85	220	1560	874	785	1100	414
7	74	340	115	130	98	85	220	1860	834	795	1080	366
8	69	303	110	125	98	84	220	1730	802	926	782	330
9	66	336	105	125	98	90	220	1510	779	924	578	299
10	64	340	100	121	98	95	230	1380	766	837	493	275
11	62	298	98	118	97	100	240	1460	690	744	472	254
12	59	262	97	115	97	110	270	1700	604	662	538	241
13	57	261	96	112	96	115	300	1740	558	618	1090	227
14	57	228	95	110	95	120	350	1580	518	613	924	216
15	56	219	100	108	95	120	400	1400	479	614	721	206
16	65	195	350	107	95	120	550	1310	450	589	583	202
17	175	175	500	106	95	120	700	1270	463	543	545	318
18	370	171	450	105	94	120	700	1220	487	545	596	545
19	764	165	400	103	94	120	800	1180	480	598	569	485
20	1040	160	350	102	93	125	1500	1140	448	628	506	413
21	731	155	300	100	93	130	3000	1070	417	718	448	369
22	550	150	270	100	92	135	3650	992	767	663	401	383
23	439	145	250	100	91	140	3750	926	1270	598	368	494
24	371	140	230	100	90	145	3800	875	1080	535	381	1140
25	326	139	220	100	89	150	3370	839	833	574	397	1230
26	304	137	210	100	88	160	2570	839	729	587	366	977
27	305	151	200	100	87	172	1940	834	913	534	336	778
28	398	214	190	100	86	180	1590	781	1070	479	308	658
29	392	232	180	100	---	190	1450	726	1060	438	292	587
30	355	220	170	100	---	200	1410	710	950	416	274	690
31	317	---	160	100	---	205	---	1200	---	383	259	---
TOTAL	7980	7236	6274	3522	2649	3841	34540	38082	24429	20506	16109	14084
MEAN	257	241	202	114	94.6	124	1151	1228	814	661	520	469
MAX	1040	447	500	150	100	205	3800	1860	1620	926	1100	1230
MIN	56	137	95	100	86	84	210	710	417	383	259	202
CFSM	.43	.40	.34	.19	.16	.21	1.92	2.05	1.36	1.10	.87	.78
IN.	.49	.45	.39	.22	.16	.24	2.14	2.36	1.51	1.27	1.00	.87
AC-FT	15830	14350	12440	6990	5250	7620	68510	75540	48450	40670	31950	27940

CAL YR 1984 TOTAL 181417 MEAN 496 MAX 3440 MIN 56 CFSM .83 IN 11.25 AC-FT 359800
WTR YR 1985 TOTAL 179252 MEAN 491 MAX 3800 MIN 56 CFSM .82 IN 11.11 AC-FT 355500

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 upstream from bridge on U.S. Highway 61, 0.3 mi upstream from mouth, 4 mi northeast of Silver Bay, and 7 mi northeast of village of Beaver Bay.

DRAINAGE AREA.--140 mi^2.

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 above National Geodetic Vertical Datum of 1929 (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 downstream and at datum 3.68 ft lower.

REMARKS.--Estimated daily discharge: Nov. 14 to Apr. 8. Records good except those for period with ice effect, Nov. 14 to Apr. 8, which are fair.

AVERAGE DISCHARGE.--58 years, 170 ft^3/s, 16.49 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,000 ft^3/s, Sept. 24, 1977, gage height, 8.33 ft, site and datum then in use, from highwater mark in well, from rating curve extended above 4,200 ft^3/s on basis of slope-area measurement of peak flow; maximum gage height, 11.06 ft, 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 greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 19	1700	*1,560	* 9.45	May 31	2000	1,410	9.23

Minimum daily discharge, 9.7 ft^3/s, Feb. 27, 28; minimum gage height, 5.49 ft, Feb. 5, 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	112	105	33	11	9.8	80	316	1200	387	24	94
2	37	82	95	31	11	9.8	70	279	816	309	21	101
3	32	94	85	29	10	9.8	110	249	560	235	19	780
4	29	98	80	28	10	9.8	140	266	397	358	18	654
5	26	97	75	28	10	9.8	110	309	322	588	39	427
6	26	88	72	27	10	9.8	90	324	262	475	99	316
7	24	80	70	27	9.8	9.8	86	413	247	370	70	232
8	24	96	67	26	9.8	9.8	100	375	211	286	51	162
9	22	113	65	26	9.8	10	119	339	174	203	48	129
10	26	107	63	25	9.8	11	162	343	144	149	49	115
11	21	84	61	24	9.8	11	272	678	123	116	47	99
12	21	75	58	23	9.8	12	290	696	107	90	130	75
13	22	70	56	22	9.8	13	339	868	94	75	500	64
14	23	70	54	21	9.8	13	347	714	82	65	301	57
15	26	70	51	20	9.8	14	610	654	74	59	188	53
16	127	69	90	19	9.8	14	917	678	70	50	130	50
17	548	68	145	18	9.8	16	720	583	301	44	102	58
18	497	66	130	18	9.8	20	594	465	283	125	94	67
19	1240	64	110	17	9.8	40	744	396	218	132	76	68
20	1170	62	97	16	9.8	100	938	339	175	98	63	74
21	747	60	82	15	9.8	80	1090	283	134	102	56	66
22	488	60	70	15	9.8	70	1020	235	175	90	50	85
23	328	58	60	14	9.8	100	966	200	183	74	60	241
24	238	56	52	14	9.8	160	1040	175	149	69	100	550
25	185	55	47	13	9.8	100	910	194	172	85	109	458
26	163	54	42	13	9.8	92	696	335	441	70	86	330
27	148	57	39	13	9.7	130	525	324	616	56	70	246
28	156	170	38	12	9.7	190	404	266	903	45	57	191
29	139	140	37	12	---	140	354	228	810	37	52	160
30	126	120	36	12	---	100	351	304	578	32	48	296
31	110	---	34	12	---	90	---	1130	---	28	47	---
TOTAL	6811	2495	2166	623	277.4	1604.4	14194	12958	10021	4902	2804	6298
MEAN	220	83.2	69.9	20.1	9.91	51.8	473	418	334	158	90.5	210
MAX	1240	170	145	33	11	190	1090	1130	1200	588	500	780
MIN	21	54	34	12	9.7	9.8	70	175	70	28	18	50
CFSM	1.57	.59	.50	.14	.07	.37	3.38	2.99	2.39	1.13	.65	1.50
IN.	1.81	.66	.58	.17	.07	.43	3.77	3.44	2.66	1.30	.75	1.67
AC-FT	13510	4950	4300	1240	550	3180	28150	25700	19880	9720	5560	12490

CAL YR 1984 TOTAL 69428.0 MEAN 190 MAX 1700 MIN 12 CFSM 1.36 IN 18.45 AC-FT 137700
WTR YR 1985 TOTAL 65153.8 MEAN 179 MAX 1240 MIN 9.7 CFSM 1.28 IN 17.31 AC-FT 129200

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.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
10...	1315	21	107	105	7.6	7.7	12.0	11.0	0.8	749	11.0
JAN											
08...	1530	27	110	104	7.1	7.4	-12.0	0.0	2.5	750	16.0
MAY											
07...	1100	418	60	61	7.4	7.4	12.0	9.0	1.5	739	11.2
SEP											
10...	1330	116	75	69	7.5	7.7	15.5	15.0	0.8	752	9.8

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
10...	K1300	56	12	4.0	3.7	0.4	--	41	6.3	3.6	0.3
JAN											
08...	K2	K3	12	4.0	3.5	0.4	38	39	9.7	3.3	0.2
MAY											
07...	K22	K6	6.9	2.2	2.1	0.5	15	18	7.2	2.6	0.2
SEP											
10...	K1	220	8.0	2.7	2.0	0.3	26	27	<0.2	2.4	<0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
10...	8.3	80	<0.10	0.03	0.3	<0.01	<0.01	<0.01	1	92
JAN										
08...	15	74	0.37	0.07	0.8	0.01	0.01	<0.01	6	85
MAY										
07...	6.7	45	0.43	0.03	0.5	<0.01	<0.01	<0.01	4	97
SEP										
10...	9.1	79	<0.10	0.13	0.9	0.45	0.02	<0.01	3	82

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
10...	1315	10	1	11	<0.5	<1	<1	<3	2	120	<1
JAN											
08...	1530	50	1	14	<0.5	<1	9	<3	1	200	2
MAY											
07...	1100	110	1	9	<0.5	<1	10	<3	3	190	1
SEP											
10...	1330	90	2	13	<0.5	<1	8	<3	4	380	4

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
10...	<4	3	<0.1	<10	2	<1	<1	38	<6	9
JAN										
08...	<4	2	0.2	<10	<1	<1	<1	35	<6	25
MAY										
07...	<4	3	<0.1	<10	2	<1	<1	21	<6	11
SEP										
10...	<4	5	<0.1	<10	1	<1	<1	27	<6	4

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015330 KNIFE RIVER NEAR TWO HARBORS, MN

LOCATION.--Lat 46°56'49", long 91°47'32", in SW¼NW¼ sec.31, T.52 N., R.11 W., Lake County, Hydrologic Unit 04010102, on right bank 600 ft downstream from bridge on U.S. Highway 61, 0.5 mi upstream from bridge on County Highway 102, in town of Knife River, 0.8 mi upstream from Lake Superior, and 7.8 mi southwest of Two Harbors.

DRAINAGE AREA.--85.6 mi^2.

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

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 640 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 1 to Apr. 8. Records fair except those for period with ice effect, Nov. 1 to Apr. 8, which are poor.

AVERAGE DISCHARGE.--11 years, 93.1 ft^3/s, 14.77 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,440 ft^3/s, May 10, 1979, gage height, 11.16 ft; minimum, no flow Dec. 2, 1976 to Mar. 4, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 800 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 19	1015	*2,400	*7.15	May 31	0815	1,650	6.39
Apr. 13	0400	1,560	6.16	June 26	1930	1,130	5.68
Apr. 23	0300	1,100	5.53	July 18	1415	965	5.41
May 10	2330	1,580	6.30	Sept. 3	0615	1,740	6.35

Minimum daily discharge, 4.0 ft^3/s, Jan. 20, 21; minimum gage height, 2.71 ft Aug. 4, 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	150	27	5.0	4.1	4.2	100	180	528	87	12	26
2	29	140	22	4.8	4.1	4.2	100	144	243	101	11	30
3	24	130	20	4.7	4.1	4.3	250	121	138	83	9.8	1000
4	21	120	18	4.6	4.1	4.3	400	105	95	128	11	391
5	19	110	17	4.5	4.1	4.4	300	97	80	246	9.8	192
6	19	100	16	4.4	4.1	4.4	250	97	64	144	24	118
7	19	95	15	4.3	4.1	4.5	200	101	65	87	25	79
8	18	90	14	4.2	4.1	4.7	180	93	64	67	19	49
9	17	85	13	4.1	4.1	4.9	154	83	48	47	15	39
10	16	80	12	4.1	4.1	5.3	278	298	37	35	13	37
11	16	75	11	4.1	4.1	6.0	492	980	30	30	13	33
12	16	70	11	4.1	4.1	7.0	558	528	26	24	53	27
13	17	65	10	4.1	4.1	8.0	1140	426	22	21	272	24
14	17	60	10	4.1	4.1	12	474	290	19	20	133	21
15	17	55	10	4.1	4.1	17	456	405	17	17	67	20
16	41	50	50	4.1	4.1	25	558	654	16	16	43	18
17	412	47	40	4.1	4.1	40	380	474	18	15	36	21
18	287	44	30	4.1	4.1	60	350	298	17	420	27	19
19	1780	42	20	4.1	4.1	80	385	197	15	298	23	19
20	1160	40	16	4.0	4.1	100	390	138	13	116	20	24
21	580	37	13	4.0	4.1	90	588	103	12	68	18	23
22	368	34	11	4.1	4.1	120	642	80	19	44	17	34
23	274	32	9.5	4.1	4.1	250	1040	67	19	30	71	218
24	223	30	8.5	4.1	4.1	200	825	55	14	27	115	599
25	193	29	7.5	4.1	4.1	170	528	55	154	60	105	305
26	189	28	7.0	4.1	4.1	200	354	68	895	43	59	178
27	177	32	6.5	4.1	4.1	300	254	62	762	29	38	118
28	185	50	6.0	4.1	4.2	250	193	50	415	23	27	88
29	161	40	5.7	4.1	---	200	160	44	236	17	24	70
30	163	32	5.4	4.1	---	150	177	93	138	15	24	357
31	163	---	5.2	4.1	---	120	---	1000	---	14	21	---
TOTAL	6657	1992	467.3	130.6	114.9	2450.2	12156	7386	4219	2372	1355.6	4177
MEAN	215	66.4	15.1	4.21	4.10	79.0	405	238	141	76.5	43.7	139
MAX	1780	150	50	5.0	4.2	300	1140	1000	895	420	272	1000
MIN	16	28	5.2	4.0	4.1	4.2	100	44	12	14	9.8	18
CFSM	2.51	.78	.18	.05	.05	.92	4.73	2.78	1.65	.89	.51	1.62
IN.	2.89	.87	.20	.06	.05	1.06	5.28	3.21	1.83	1.03	.59	1.82

CAL YR 1984 TOTAL 37878.2 MEAN 103 MAX 1780 MIN 5.2 CFSM 1.20 IN 16.46
WTR YR 1985 TOTAL 43477.6 MEAN 119 MAX 1780 MIN 4.0 CFSM 1.39 IN 18.89

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

LOCATION.--Lat 47°31'38", long 92°7'21", in SW¼NE¼ sec.9, T.58 N., R.14 W., St. Louis County, Hydrologic Unit 04010201, in Superior National Forest, 10 ft upstream from bridge on County Highway 110, 1 mi east of Hoyt Lakes.

DRAINAGE AREA.--106 mi^2 of which 6.0 mi^2 is noncontributing.

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Elevation of gage is 1,455 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 12-14, Dec. 1 to Mar. 18, Mar. 22, 23, 28 Mar. 30 to Apr. 13, and Apr. 18-20, 27-30. Records fair except for periods of no gage-height record, Nov.12-14, Mar. 22, 23, 28, Mar. 30 to Apr. 13 and Apr. 18-20, 27-30, and for period with ice effect, Dec. 1 to Mar. 18, which are poor.

AVERAGE DISCHARGE.--7 years, 91.4 ft^3/s, 11.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,020 ft^3/s, Apr. 22, 1979, gage height, 10.89 ft minimum, 0.88 ft^3/s, Feb. 15, 1981, gage height, 4.81 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 0.50 ft^3/s was measured Aug. 23, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 644 ft^3/s, July 6, gage height, 8.29 ft; maximum gage height, 8.42 ft, Apr. 26; minimum daily discharge, 1.5 ft^3/s, Feb. 3-20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	79	20	5.0	1.6	1.9	27	342	371	518	54	78
2	32	68	19	4.5	1.6	2.0	25	286	492	423	46	109
3	31	64	18	4.0	1.5	2.0	24	241	544	340	41	167
4	30	57	17	3.7	1.5	2.1	23	204	506	476	36	229
5	29	53	16	3.5	1.5	2.2	23	193	414	604	35	256
6	27	49	15	3.3	1.5	2.3	23	191	314	635	42	246
7	27	46	14	3.1	1.5	2.4	23	202	239	610	58	216
8	26	45	13	3.0	1.5	2.5	23	200	183	516	61	181
9	25	45	12	2.9	1.5	2.6	23	189	146	381	53	148
10	24	45	12	2.8	1.5	2.7	23	173	122	257	45	124
11	22	44	11	2.7	1.5	2.8	25	189	100	178	40	106
12	20	42	10	2.6	1.5	2.9	30	234	86	138	43	87
13	18	39	10	2.5	1.5	3.0	35	266	77	113	50	74
14	18	38	10	2.4	1.5	3.1	45	266	66	94	58	63
15	18	37	10	2.3	1.5	3.2	71	248	56	81	60	57
16	19	35	15	2.3	1.5	3.4	102	229	54	69	54	55
17	27	34	20	2.2	1.5	3.6	114	222	76	57	52	89
18	48	32	42	2.2	1.5	4.0	110	213	94	72	59	118
19	83	28	30	2.1	1.5	7.8	110	189	104	106	58	132
20	119	25	29	2.1	1.5	10	110	165	99	116	50	130
21	144	22	25	2.0	1.6	8.8	125	145	87	114	43	122
22	147	20	22	2.0	1.6	10	165	127	95	109	41	118
23	140	18	20	1.9	1.6	14	278	115	118	96	41	129
24	128	16	18	1.9	1.7	18	404	100	118	90	41	239
25	118	16	16	1.9	1.7	20	506	89	103	99	43	331
26	107	16	14	1.8	1.7	23	569	92	158	103	41	383
27	101	18	12	1.8	1.8	33	550	100	296	94	38	374
28	105	20	10	1.7	1.8	36	470	96	444	82	35	314
29	109	21	8.0	1.7	---	37	420	86	538	74	34	246
30	107	21	7.0	1.7	---	34	370	86	568	67	32	202
31	97	---	6.0	1.6	---	30	---	185	---	62	36	---
TOTAL	1981	1093	501.0	79.2	43.7	330.3	4846	5663	6668	6774	1420	5123
MEAN	63.9	36.4	16.2	2.55	1.56	10.7	162	183	222	219	45.8	171
MAX	147	79	42	5.0	1.8	37	569	342	568	635	61	383
MIN	18	16	6.0	1.6	1.5	1.9	23	86	54	57	32	55
CFSM	.60	.34	.15	.02	.02	.10	1.53	1.73	2.09	2.07	.43	1.61
IN.	.70	.38	.18	.03	.02	.12	1.70	1.99	2.34	2.38	.50	1.80
AC-FT	3930	2170	994	157	87	655	9610	11230	13230	13440	2820	10160

CAL YR 1984 TOTAL 29297.6 MEAN 80.0 MAX 613 MIN 6.0 CFSM .76 IN 10.28 AC-FT 58110
WTR YR 1985 TOTAL 34522.2 MEAN 94.6 MAX 635 MIN 1.5 CFSM .89 IN 12.12 AC-FT 68470

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 years 1980, 1985): Maximum, 268 microsiemens Aug. 28 and 29, 1980; minimum, 42 microsiemens April 24-25, 1985.
WATER TEMPERATURES (water years 1979-1980, 1985): Maximum, 27.5°C June 25, 1980; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 215 microsiemens Oct. 6; minimum, 42 microsiemens Apr. 24-25.
WATER TEMPERATURES: Maximum, 24.0°C Aug. 8; minimum, 0.0°C on many days during winter period.

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	205	197	199	107	104	106	159	155	157	166	162	164
2	197	194	196	106	105	106	156	151	153	172	166	169
3	195	190	192	107	105	106	152	151	152	178	171	175
4	193	190	191	105	103	104	155	153	154	183	178	180
5	199	192	195	103	102	103	156	153	155	187	183	185
6	215	199	205	104	102	103	156	155	156	190	187	189
7	212	204	208	103	101	102	157	156	157	193	190	192
8	212	202	207	103	101	102	158	157	157	195	192	193
9	213	201	208	102	101	102	159	157	158	198	194	197
10	213	200	205	104	101	102	161	159	160	199	198	199
11	210	200	205	105	103	104	165	162	164	200	199	199
12	210	199	202	106	104	105	173	166	169	200	199	200
13	207	198	202	107	105	106	182	175	178	201	199	200
14	210	198	204	106	105	106	188	183	185	200	199	200
15	208	199	206	106	104	105	194	189	191	203	200	201
16	204	199	201	111	106	109	196	180	188	203	201	202
17	194	183	185	115	112	113	198	186	195	204	203	204
18	198	184	189	123	117	120	195	181	185	205	204	204
19	190	177	185	134	124	129	182	167	176	212	208	210
20	176	148	164	144	136	140	167	163	165	212	210	211
21	147	134	141	150	144	148	166	163	164	212	211	212
22	133	118	124	154	151	153	163	156	160	212	211	211
23	117	107	112	157	154	156	156	151	153	212	209	211
24	107	102	104	161	158	160	152	149	150	209	206	207
25	101	100	101	163	162	163	154	151	153	207	205	206
26	102	100	101	165	163	164	157	155	156	205	202	204
27	104	101	103	166	164	165	156	155	155	203	201	202
28	106	103	104	166	164	165	155	154	154	201	198	200
29	109	105	107	165	160	162	155	153	154	---	---	---
30	109	107	108	161	158	160	158	155	156	---	---	---
31	108	107	108	---	---	---	162	157	159	---	---	---
MONTH	215	100	167	166	101	126	198	149	164	---	---	---

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	194	193	193	104	94	99	63	60	62
2	---	---	---	194	192	193	95	88	92	66	63	64
3	---	---	---	194	193	194	92	87	89	67	65	66
4	---	---	---	193	192	192	104	93	100	68	66	67
5	201	200	200	194	192	193	104	97	102	68	66	67
6	202	200	201	195	191	193	98	96	97	68	66	67
7	202	200	201	194	192	193	103	98	101	69	67	68
8	202	200	201	195	193	194	107	103	105	70	68	69
9	202	201	202	194	192	193	107	103	105	71	69	70
10	203	201	201	195	192	194	103	96	100	76	71	74
11	203	199	201	195	193	194	96	89	92	78	75	77
12	200	198	199	196	193	194	91	89	90	76	72	75
13	199	197	199	196	194	195	92	90	91	73	69	71
14	199	196	198	199	195	197	103	93	99	69	67	68
15	198	197	197	199	196	197	95	75	83	68	67	67
16	199	197	198	200	198	199	75	67	71	67	65	66
17	199	197	198	201	198	199	67	63	65	69	66	67
18	198	197	197	202	200	201	63	58	60	71	69	70
19	199	197	198	203	199	201	60	55	57	71	70	70
20	200	198	199	204	199	202	56	54	55	71	69	70
21	199	197	198	203	192	200	59	56	58	72	70	71
22	200	197	199	195	171	184	59	57	58	74	72	73
23	199	196	198	171	162	166	57	49	54	76	74	74
24	199	197	198	165	154	161	49	42	46	78	75	76
25	197	196	197	159	150	156	45	42	43	82	78	80
26	196	193	194	151	133	143	44	43	43	86	82	84
27	195	193	194	132	119	126	46	44	45	86	84	85
28	196	194	195	117	99	108	50	47	48	85	83	84
29	---	---	---	99	90	94	55	51	53	85	84	85
30	---	---	---	99	89	93	59	56	57	85	83	84
31	---	---	---	107	100	105	---	---	---	82	68	75
MONTH	---	---	---	204	89	176	107	42	75	86	60	72

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	67	58	62	56	53	54	106	101	104	117	107	113
2	57	52	55	60	55	57	108	106	107	106	103	105
3	53	52	52	62	59	61	109	106	107	106	93	101
4	55	53	54	62	53	58	107	106	107	92	78	84
5	58	55	56	53	51	52	108	106	107	77	72	74
6	62	58	60	53	51	52	111	108	109	73	70	71
7	65	61	63	55	52	53	116	111	113	73	70	71
8	67	65	66	61	55	58	123	117	120	78	72	75
9	67	65	66	66	61	64	123	120	122	83	78	81
10	69	65	66	72	67	69	120	115	118	87	83	85
11	71	68	70	75	71	73	115	110	112	91	87	89
12	73	71	72	78	75	76	112	103	107	96	91	93
13	74	72	73	83	78	81	106	102	104	99	95	97
14	76	73	74	89	83	86	111	105	108	100	99	99
15	79	74	76	92	87	90	117	111	114	100	98	99
16	82	79	81	95	92	93	119	117	118	99	97	98
17	87	82	85	96	94	95	119	117	118	98	95	96
18	86	80	83	96	94	96	120	118	119	95	91	92
19	81	79	80	97	96	97	119	117	118	92	88	89
20	79	77	78	98	97	98	120	118	119	87	83	85
21	78	76	77	98	94	97	123	119	121	86	83	84
22	78	77	77	93	88	90	127	123	125	87	86	87
23	80	77	78	89	86	87	129	126	128	86	81	83
24	81	79	80	89	86	87	129	126	128	81	71	75
25	80	75	78	87	83	85	126	120	123	71	62	66
26	75	68	71	84	82	83	120	117	118	61	56	58
27	67	61	64	87	82	85	118	116	117	56	55	56
28	60	54	57	92	87	90	120	117	118	58	56	57
29	55	52	53	95	92	93	122	119	120	60	58	59
30	53	52	52	97	94	96	124	122	123	62	60	61
31	---	---	---	101	97	99	125	116	122	---	---	---
MONTH	87	52	69	101	51	79	129	101	116	117	55	83

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	9.5	7.0	8.5	2.0	.0	1.0	.5	.0	.5	.5	.5	.5
2	10.0	8.5	9.0	.5	.0	.5	.5	.0	.5	.5	.5	.5
3	10.5	8.5	9.5	1.0	.0	.5	.5	.0	.5	.5	.0	.5
4	11.0	9.5	10.0	1.0	.5	1.0	.5	.0	.5	.5	.0	.5
5	11.0	9.0	10.0	1.0	.5	.5	.5	.0	.5	.5	.0	.0
6	12.5	10.5	11.5	1.0	.5	.5	.5	.0	.5	.5	.0	.5
7	12.5	11.5	12.0	1.5	.5	1.0	.5	.0	.5	.5	.5	.5
8	14.0	12.0	13.0	2.0	1.0	1.5	.5	.0	.5	.5	.5	.5
9	13.5	12.5	13.0	1.5	1.0	1.5	.5	.0	.5	.5	.5	.5
10	13.5	13.0	13.5	1.5	.5	1.0	.5	.0	.5	.5	.0	.5
11	13.5	13.0	13.5	1.0	.5	1.0	.5	.5	.5	.5	.5	.5
12	13.5	13.5	13.5	1.5	.5	1.0	.5	.5	.5	.5	.0	.5
13	15.0	13.5	14.0	1.5	1.0	1.5	.5	.0	.5	.5	.0	.5
14	16.0	14.5	15.0	1.5	1.5	1.5	.5	.0	.5	.5	.5	.5
15	15.0	14.0	14.5	1.5	.5	1.0	.5	.0	.5	.5	.5	.5
16	14.0	12.0	12.5	.5	.0	.5	.5	.0	.5	.5	.0	.5
17	11.5	10.0	11.0	.5	.0	.5	.5	.0	.0	.5	.0	.5
18	10.0	9.0	9.5	.5	.0	.5	.5	.0	.5	.5	.5	.5
19	8.5	8.0	8.5	.5	.0	.5	.5	.0	.5	.5	.0	.5
20	8.0	7.0	7.5	.5	.0	.5	.5	.0	.0	.5	.0	.5
21	7.0	6.5	7.0	.5	.0	.5	.5	.0	.0	.5	.0	.5
22	6.5	6.0	6.5	.5	.5	.5	.5	.0	.5	.5	.0	.5
23	6.0	5.5	5.5	.5	.5	.5	.5	.0	.0	.5	.5	.5
24	5.5	4.5	5.0	1.0	.5	.5	.5	.0	.5	.5	.5	.5
25	5.5	5.0	5.0	1.0	1.0	1.0	.5	.0	.5	.5	.5	.5
26	6.0	5.0	5.5	1.5	1.0	1.5	.5	.0	.5	.5	.5	.5
27	7.5	5.5	6.5	1.5	1.0	1.5	.5	.0	.5	.5	.5	.5
28	7.0	4.5	5.5	1.0	.5	1.0	.5	.0	.5	.5	.5	.5
29	4.5	3.5	4.5	.5	.5	.5	.5	.0	.5	---	---	---
30	4.5	2.5	3.5	.5	.5	.5	.5	.5	.5	---	---	---
31	2.5	2.0	2.0	---	---	---	.5	.0	.5	---	---	---
MONTH	16.0	2.0	9.0	2.0	.0	1.0	.5	.0	.5	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	.5	.0	.5	.5	.0	.5	12.5	10.0	11.5
2	---	---	---	.5	.5	.5	.5	.0	.5	12.5	10.5	11.5
3	---	---	---	.5	.5	.5	1.0	.0	.5	13.0	10.5	12.0
4	---	---	---	.5	.5	.5	1.0	.5	.5	13.5	11.0	12.0
5	.5	.5	.5	.5	.0	.5	1.0	.5	.5	14.0	12.0	13.0
6	.5	.0	.5	.5	.5	.5	1.5	.5	1.0	14.5	12.5	13.5
7	.5	.0	.5	.5	.0	.5	1.5	.5	1.0	15.0	12.0	13.5
8	.5	.0	.5	.5	.5	.5	1.0	.5	.5	15.5	12.5	14.0
9	.5	.0	.5	.5	.5	.5	2.0	.0	1.0	17.0	14.0	15.5
10	.5	.0	.5	.5	.5	.5	3.0	1.0	2.0	16.5	15.0	15.5
11	.5	.0	.5	.5	.0	.5	3.0	1.0	2.0	15.5	14.5	15.0
12	.5	.0	.5	.5	.5	.5	2.5	1.5	2.0	15.0	13.5	14.5
13	.5	.0	.5	.5	.5	.5	1.5	.5	1.0	15.0	12.0	13.5
14	.5	.0	.5	.5	.5	.5	1.5	.5	1.0	14.0	12.5	13.0
15	.5	.0	.5	.5	.5	.5	2.5	.5	1.5	13.0	12.0	12.5
16	.5	.0	.5	.5	.5	.5	3.0	.5	1.5	13.0	12.0	12.5
17	.5	.0	.5	.5	.5	.5	4.0	2.0	3.0	13.0	11.0	12.0
18	.5	.0	.5	.5	.5	.5	6.5	3.5	5.0	14.0	11.0	12.5
19	.5	.0	.5	.5	.0	.5	9.0	5.5	7.0	15.0	13.0	14.0
20	.5	.0	.5	.5	.0	.5	10.5	8.0	9.5	14.0	12.5	13.5
21	.5	.0	.5	.5	.5	.5	12.5	9.5	11.0	15.0	12.0	13.5
22	.5	.0	.5	.5	.5	.5	12.0	11.0	11.5	16.5	13.5	15.0
23	.5	.0	.5	.5	.5	.5	11.0	7.5	9.5	18.0	15.0	16.5
24	.5	.0	.5	.5	.5	.5	7.0	4.5	5.5	19.5	17.0	18.5
25	.5	.5	.5	.5	.5	.5	4.5	3.5	4.0	18.5	15.5	17.5
26	.5	.5	.5	.5	.5	.5	5.5	3.5	4.5	15.5	14.5	15.0
27	.5	.5	.5	.5	.0	.5	6.0	4.5	5.5	15.5	13.5	14.5
28	.5	.0	.5	.5	.0	.5	8.5	5.0	6.5	16.0	13.5	15.0
29	---	---	---	.5	.0	.5	11.0	8.0	9.5	15.0	13.5	14.0
30	---	---	---	.5	.0	.5	12.5	10.5	11.5	15.5	13.0	14.0
31	---	---	---	.5	.0	.0	---	---	---	14.5	13.0	13.5
MONTH	---	---	---	.5	.0	.5	12.5	.0	4.0	19.5	10.0	14.0

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	13.0	11.5	12.5	17.5	15.5	16.5	22.0	19.5	21.0	18.0	15.5	17.0
2	12.0	10.5	11.0	19.0	16.0	17.5	22.0	19.5	21.0	17.0	15.5	16.0
3	13.0	10.5	11.5	20.0	17.5	18.5	23.5	20.0	22.0	15.5	15.0	15.0
4	13.0	11.5	12.5	19.0	17.0	18.0	22.5	21.0	21.5	16.0	14.5	15.0
5	14.5	11.5	13.0	19.0	16.5	17.5	22.0	20.5	21.0	17.0	15.0	16.0
6	13.5	12.5	13.0	19.5	17.5	18.5	23.0	20.5	21.5	18.0	16.5	17.0
7	16.0	12.5	14.5	21.0	18.0	19.5	23.5	21.0	22.0	18.5	16.5	18.0
8	16.5	15.0	15.5	22.0	19.5	21.0	24.0	21.0	22.5	18.0	17.5	18.0
9	16.5	14.5	15.5	22.0	20.5	21.0	23.0	21.5	22.0	17.5	16.5	17.0
10	17.0	15.0	16.0	21.0	19.5	20.5	21.5	20.0	21.0	17.5	16.0	17.0
11	16.5	15.5	16.0	20.5	18.5	19.5	20.5	18.5	19.5	16.5	15.0	16.0
12	17.0	14.5	16.0	21.5	19.0	20.5	19.5	17.5	18.0	16.0	14.5	15.0
13	17.5	15.0	16.5	22.5	20.5	21.5	18.5	17.0	17.5	15.5	13.5	14.5
14	18.5	16.0	17.5	22.0	21.0	21.5	18.5	17.0	17.5	15.5	13.0	14.5
15	19.0	16.0	17.5	21.0	20.0	20.5	19.0	16.5	17.5	16.0	13.5	14.5
16	19.0	17.0	18.0	22.0	18.5	20.0	20.5	17.0	18.5	15.0	14.5	14.5
17	18.0	16.5	17.0	22.0	19.5	20.5	19.5	17.5	18.5	16.0	15.0	15.5
18	16.5	15.5	16.0	22.0	20.5	21.0	18.5	16.5	17.5	17.5	16.0	16.5
19	17.5	15.0	16.0	22.5	21.0	21.5	16.5	15.5	15.5	18.5	17.5	18.0
20	19.0	16.0	17.5	22.5	20.5	21.5	16.0	15.0	15.5	18.5	15.5	17.0
21	19.5	17.5	18.5	22.5	20.5	21.5	17.5	15.0	16.0	15.0	14.0	14.5
22	19.0	16.5	17.5	22.0	19.5	20.5	17.0	16.0	16.5	14.0	13.5	13.5
23	16.5	15.0	15.5	22.0	20.0	21.0	16.0	16.0	16.0	13.5	11.5	13.0
24	18.0	15.0	16.5	21.0	20.0	20.5	16.5	15.5	16.0	11.0	9.0	10.0
25	17.5	16.0	16.5	21.0	19.0	20.0	19.0	15.5	17.0	9.5	8.0	9.0
26	16.0	15.5	16.0	21.5	19.5	20.5	18.5	16.0	17.5	9.0	7.5	8.5
27	16.5	15.5	15.5	22.0	19.5	21.0	19.0	16.5	17.5	8.5	7.5	8.0
28	15.5	14.5	15.0	22.5	20.0	21.0	19.0	16.5	17.5	8.0	7.5	8.0
29	14.5	14.0	14.0	22.0	20.0	21.0	18.0	17.0	17.5	8.0	7.5	7.5
30	16.5	13.5	15.0	21.0	19.5	20.5	19.0	15.5	17.0	7.5	5.5	7.0
31	---	---	---	22.0	19.0	20.5	17.5	16.0	16.5	---	---	---
MONTH	19.5	10.5	15.5	22.5	15.5	20.0	24.0	15.0	18.5	18.5	5.5	14.0

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 downstream from Partridge River and 1.5 mi south of Aurora.

DRAINAGE AREA.--290 mi^2 of which 13.3 mi^2 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 above National Geodetic Vertical Datum of 1929. Prior to Aug. 26, 1944, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Dec. 16 to Apr. 1. Records good except for periods with ice effect, Dec. 16 to Apr. 1, 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 between elevations 1,410 ft, natural lake level, and 1,440 ft. 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 basin.

AVERAGE DISCHARGE (adjusted for storage and diversion).--43 years, 250 ft^3/s, 11.71 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,380 ft^3/s, May 14, 1950, gage height, 8.37 ft; minimum daily, 4.0 ft^3/s, Jan. 29 to Feb. 10, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,400 ft^3/s, July 6, gage height, 4.15 ft; minimum daily, 22 ft^3/s, Feb. 4 to Mar. 8; minimum gage height, 0.93 ft. Oct. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	172	78	56	24	22	95	976	826	1030	167	193
2	43	192	79	54	23	22	91	886	982	942	152	201
3	43	167	81	52	23	22	96	802	1010	838	139	310
4	45	143	80	51	22	22	100	746	958	1010	130	343
5	47	163	80	49	22	22	105	691	880	1270	138	373
6	48	159	74	47	22	22	111	680	774	1380	134	413
7	46	142	71	45	22	22	111	658	680	1320	146	388
8	44	137	73	44	22	22	104	630	595	1200	157	355
9	43	134	74	43	22	23	94	595	508	1050	148	329
10	45	130	75	42	22	23	88	560	444	881	137	310
11	47	139	78	40	22	24	89	615	389	723	128	288
12	45	124	75	39	22	25	96	680	351	597	140	266
13	43	112	68	38	22	27	150	718	316	501	154	240
14	43	110	73	37	22	31	197	713	283	429	156	221
15	42	106	71	36	22	35	233	696	251	376	159	207
16	46	110	76	35	22	39	248	664	237	331	155	208
17	96	100	88	34	22	43	270	642	276	295	154	240
18	85	92	93	33	22	49	270	615	282	332	145	251
19	114	81	95	32	22	56	252	585	279	333	137	288
20	134	79	95	32	22	62	256	545	273	334	132	299
21	156	83	92	31	22	75	301	502	256	339	125	295
22	167	86	87	30	22	82	408	462	269	317	116	293
23	157	86	83	29	22	94	844	422	255	294	118	338
24	151	86	80	29	22	106	1140	386	246	294	126	511
25	150	88	76	28	22	120	1190	366	258	298	124	636
26	150	90	72	27	22	145	1220	354	393	286	122	692
27	157	93	68	27	22	170	1350	343	568	273	117	710
28	178	93	66	26	22	190	1330	329	960	245	110	683
29	181	85	64	26	---	180	1210	315	1090	221	114	625
30	189	80	61	26	---	140	1080	315	1090	201	107	604
31	195	---	58	25	---	115	---	545	---	185	126	---
TOTAL	2973	3462	2384	1143	620	2030	13129	18036	15979	18125	4213	11110
MEAN	95.9	115	76.9	36.9	22.1	65.5	438	582	533	585	136	370
MAX	195	192	95	56	24	190	1350	976	1090	1380	167	710
MIN	42	79	58	25	22	22	88	315	237	185	107	193
†	+50.2	+25.8	10.4	0	0	+10	+88.9	+19.2	+29.1	+20.2	+18.2	+29.5
MEAN ‡	146	141	87.3	36.9	22.1	75.5	527	601	562	605	154	400
CFSM ‡	.50	.49	.30	.13	.08	.26	1.82	2.07	1.94	2.09	.53	1.38
IN. ‡	.58	.54	.35	.15	.08	.30	2.03	2.39	2.16	2.41	.61	1.54

CAL YR 1984 TOTAL 81758 MEAN 223 MAX 1070 MIN 30 MEAN ‡ 245 CFSM ‡ .85 IN. ‡ 11.52
WTR YR 1985 TOTAL 93204 MEAN 255 MAX 1380 MIN 22 MEAN ‡ 280 CFSM ‡ .97 IN. ‡ 13.13

† 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 NE¼SE¼ sec.3, T.56 N., R.18 W., St. Louis County, Hydrologic Unit 04010201, on right bank at downstream side of highway bridge, 1.8 mi downstream from Eveleth Taconite Company dam, 0.6 mi south of Forbes, 1.8 mi upstream from Elbow Creek.

DRAINAGE AREA.--713 mi^2.

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

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

REMARKS.--Estimated daily discharges: Nov. 18-24, and Dec. 2 to Apr.10: Records good except for periods with ice effect, Nov. 18-24 and Dec. 2 to Apr. 10, 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 1.8 mi upstream.

AVERAGE DISCHARGE.--21 years, 560 ft^3/s, 10.67 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,200 ft^3/s, Apr. 25, 1979, gage height, 17.71 ft; minimum daily, 8.0 ft^3/s, Sept. 11, 1984, gage height 5.05 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,980 ft^3/s, Apr. 25, gage height, 12.40 ft; minimum daily, 9.4 ft^3/s, Oct. 12; minimum gage height, 5.07 ft, Oct. 12, 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	496	251	190	105	25	550	2510	1790	1920	428	310
2	15	393	250	185	105	130	500	2280	1890	1900	400	387
3	63	406	245	180	100	80	470	2060	1900	1830	374	499
4	310	455	245	175	100	40	440	1870	1890	1800	355	652
5	12	412	240	170	100	140	420	1720	1840	1950	358	679
6	14	387	240	165	100	90	400	1540	1720	2110	374	764
7	297	390	235	160	98	80	380	1560	1590	2170	361	832
8	102	387	235	160	97	100	370	1470	1450	2140	355	795
9	10	374	235	155	96	180	350	1280	1300	2030	358	741
10	36	361	230	155	94	100	330	1290	1150	1840	348	696
11	352	316	230	150	92	90	272	1520	1020	1620	336	645
12	9.4	310	230	150	110	90	342	1570	909	1390	332	594
13	70	332	130	145	110	150	245	1630	815	1200	368	547
14	393	352	270	145	110	140	503	1650	741	1050	371	503
15	10	339	100	140	110	130	622	1630	666	916	355	462
16	14	263	300	140	110	130	625	1620	605	792	352	448
17	462	275	280	135	110	40	642	1550	594	707	352	482
18	18	280	280	135	110	150	717	1450	581	737	352	503
19	513	270	280	130	100	100	693	1360	611	775	336	499
20	425	260	280	130	90	200	764	1270	584	730	320	537
21	448	255	270	125	110	100	792	1160	560	696	310	543
22	458	250	260	125	120	100	912	1070	567	666	300	540
23	462	250	250	120	30	400	1600	984	571	618	294	625
24	455	245	240	120	110	350	2480	901	543	605	313	952
25	526	245	230	115	90	300	2730	846	540	645	316	1160
26	543	251	225	115	20	500	2830	815	890	625	304	1280
27	506	257	220	110	120	650	2850	771	1340	584	294	1310
28	526	254	210	110	80	750	2830	737	1550	554	281	1300
29	523	254	205	110	---	750	2770	703	1760	516	278	1250
30	516	254	200	105	---	700	2710	727	1890	482	278	1210
31	486	---	190	105	---	600	---	1230	---	455	272	---
TOTAL	8657.4	9573	7286	4355	2727	7385	32139	42774	33857	36053	10425	21745
MEAN	279	319	235	140	97.4	238	1071	1380	1129	1163	336	725
MAX	543	496	300	190	120	750	2850	2510	1900	2170	428	1310
MIN	9.4	245	100	105	20	25	245	703	540	455	272	310
CFSM	.39	.45	.33	.20	.14	.33	1.50	1.94	1.58	1.63	.47	1.02
IN.	.45	.50	.38	.23	.14	.39	1.68	2.23	1.77	1.88	.54	1.13
AC-FT	17170	18990	14450	8640	5410	14650	63750	84840	67160	71510	20680	43130

CAL YR 1984 TOTAL 189108.4 MEAN 517 MAX 2280 MIN 8.0 CFSM .73 IN 9.87 AC-FT 375100
WTR YR 1985 TOTAL 216976.4 MEAN 594 MAX 2850 MIN 9.4 CFSM .83 IN 11.32 AC-FT 430400

STREAMS TRIBUTARY TO LAKE SUPERIOR

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 downstream from Minnesota Power Co. powerplant, 3 mi upstream from Thomson Reservoir, and 3.2 mi upstream from Midway River.

DRAINAGE AREA.--3,430 mi^2, 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 above National Geodetic Vertical Datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 mi downstream and 50 ft (15 m) below powerplant at datum about 420 ft lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

REMARKS.--Estimated daily discharge Dec. 18 to Feb. 26. Records good except for period with ice effect, Dec. 18 to Feb. 26, which are fair. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes, combined capacity, 332,160 acre-ft; the waterdischarge table shows the monthly change in contents (†).

AVERAGE DISCHARGE (UNADJUSTED).--77 years, 2,330 ft^3/s, 9.22 in/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 16,300 ft^3/s, Apr. 25, gage height, 9.35 ft; minimum daily, 665 ft^3/s Oct. 5; minimum gage height, 1.92 ft, Nov. 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	905	1780	1660	1500	1100	1220	1940	8800	10500	10600	1420	1460
2	676	1530	1580	1250	1100	1270	1820	8170	11700	9500	1360	1310
3	789	1370	1520	900	1100	1250	1880	7080	10600	8390	1210	1980
4	871	1390	1240	1850	1100	1240	1950	6260	9490	7340	1070	2870
5	665	1350	1210	1800	1150	983	1840	5520	8860	6940	1140	3000
6	696	1300	869	1700	1150	1090	1780	5100	8140	6900	1220	2650
7	1060	1590	1100	1550	1200	1240	1640	4870	6990	6640	1280	2140
8	961	1860	2020	1400	1200	1250	1500	4770	5720	5950	1150	2100
9	744	1790	1920	1300	1200	1250	1270	4430	4930	5290	1200	2110
10	816	2110	1750	1500	1200	1280	1350	4110	4280	4930	1100	1760
11	884	1760	1670	1300	1200	1370	1310	4870	3660	4880	1050	2170
12	835	1580	1690	1200	1150	1360	1330	8830	3120	4410	1300	2110
13	730	1620	1170	1300	1150	1310	1530	9820	2590	3990	1600	1920
14	1120	1710	1110	1450	1150	1440	1860	9370	2280	3470	1720	1670
15	852	1890	1690	1200	1150	1540	2160	8770	2050	2980	1660	1360
16	1040	1270	2130	1400	1150	1540	2350	8830	1970	2570	1390	1290
17	2060	1950	2520	1500	1150	1570	2340	8260	2230	2300	1300	1330
18	1820	1470	1500	1400	1170	1620	2320	7300	2400	2630	1310	1450
19	2510	1170	1700	1370	1170	2020	2390	6160	2150	3970	986	1630
20	2860	1720	1900	1330	1170	2400	2500	5350	2030	4240	1030	1880
21	3440	1570	1800	1300	1180	2270	2810	4660	2020	3460	1180	1830
22	2980	1740	1500	1300	1180	2330	3680	4280	2110	2830	1150	2000
23	2870	1740	1300	1290	1180	2750	7480	3940	2040	2500	1310	2190
24	2690	1800	1200	1280	1180	2730	14800	3620	1990	2410	1490	3610
25	2470	1850	1130	1250	1180	2620	15800	3590	1840	2830	1440	5200
26	2280	1830	1080	1220	1180	2950	14700	3660	4450	3140	1360	4860
27	2250	1840	1900	1200	1180	3300	13400	3790	11000	2620	1360	4410
28	2160	1900	2100	1180	1230	3300	11700	3500	14100	2170	1380	4240
29	1960	1800	1300	1160	---	2920	10200	3050	13200	1890	1250	4050
30	2000	1810	980	1140	---	2390	8950	3050	11700	1750	1310	4160
31	1880	---	920	1100	---	2280	---	5170	---	1580	1210	---
TOTAL	49874	50090	47159	41620	32600	58083	140580	178980	170140	135100	39936	74740
MEAN	1609	1670	1521	1343	1164	1874	4686	5774	5671	4358	1288	2491
MAX	3440	2110	2520	1850	1230	3300	15800	9820	14100	10600	1720	5200
MIN	665	1170	869	900	1100	983	1270	3050	1840	1580	986	1290
†	+660	-378	-888	-863	-773	-198	+2054	+1650	+362	-182	-211	+262
MEAN ‡	2269	1292	633	480	391	1676	6740	7424	6033	4176	1077	2753
CFSM ‡	.66	.38	.18	.14	.11	.49	1.97	2.16	1.76	1.22	.31	.80
IN. ‡	.76	.42	.21	.16	.12	.56	2.19	2.50	1.96	1.40	.36	.90

CAL YR 1984 TOTAL 976742 MEAN 2669 MAX 15500 MIN 639 MEAN ‡ 2557 CFSM ‡ .75 IN ‡ 10.15
WTR YR 1985 TOTAL 1018902 MEAN 2792 MAX 15800 MIN 665 MEAN ‡ 2919 CFSM ‡ .85 IN ‡ 11.55

† 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 reservoir contents.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1955, 1958-66, 1968 to current year.

REMARKS.--Letter K indicates non-ideal colony count. Samples are collected at cableway 0.75 mi (1.21 km) downstream from gage.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
OCT											
09...	1500	--	703	158	149	7.6	7.7	13.0	11.5	2.0	734
NOV											
20...	1500	--	2010	171	136	7.1	7.3	-3.0	0.0	2.4	739
FEB											
11...	1430	--	1360	150	149	7.0	7.0	-8.0	0.5	2.0	732
MAR											
25...	1230	2620	--	142	156	7.3	7.1	6.0	0.5	2.0	735
MAY											
06...	1300	--	5390	140	118	7.4	7.0	13.0	14.0	3.5	723
JUL											
30...	1330	--	1840	120	128	7.6	7.4	12.0	22.0	4.1	738

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
09...	10.6	7	180	16	7.9	4.6	1.0	57	61	15	3.7
NOV											
20...	13.6	4	28	14	7.1	3.9	0.9	52	53	14	3.7
FEB											
11...	12.3	56	K11	15	7.7	4.6	1.1	62	59	11	4.0
MAR											
25...	11.8	K8	28	13	7.0	5.6	2.5	51	50	16	6.6
MAY											
06...	9.4	K20	20	12	6.0	3.6	1.7	33	40	14	4.2
JUL											
30...	7.4	23	20	14	6.6	3.2	0.9	39	49	9.8	4.0

DATE	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)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
09...	0.2	6.7	112	<0.10	0.01	0.4	0.02	0.01	<0.01	5	94
NOV											
20...	0.1	8.2	106	0.24	0.07	0.7	0.02	<0.01	<0.01	4	88
FEB											
11...	0.1	10	115	0.27	0.02	0.7	0.03	0.01	0.01	5	90
MAR											
25...	0.1	6.6	106	0.31	0.07	0.7	0.04	0.02	0.02	7	90
MAY											
06...	<0.1	4.4	90	0.15	0.07	0.9	0.03	<0.01	0.01	24	98
JUL											
30...	<0.1	6.9	128	<0.10	0.13	0.9	<0.01	<0.01	<0.01	13	97

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
09...	1500	<10	1	15	<0.5	<1	<1	<3	3	260	<1
MAR											
25...	1230	80	<1	18	<0.5	<1	4	<3	10	400	17
MAY											
06...	1300	80	1	19	<0.5	<1	10	<3	3	380	2
JUL											
30...	1330	90	2	19	0.7	2	20	<3	5	930	4

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
09...	<4	20	<0.1	<10	3	<1	<1	48	<6	4
MAR										
25...	4	61	<0.1	<10	1	<1	<1	41	<6	8
MAY										
06...	<4	25	0.3	<10	<1	<1	<1	36	<6	55
JUL										
30...	<4	51	0.2	<10	<1	<1	<1	45	<6	30

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024098 DEER CREEK NEAR HOLYOKE, MN

LOCATION.--Lat 46°31'30", long 92°23'20", in NE¼SE¼ sec.29, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, on left bank 179 ft west of State Highway No. 23, 0.9 mi upstream from mouth and 4.0 mi north of Holyoke.

DRAINAGE AREA.--7.77 mi^2.

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

GAGE.--Water-stage recorder. Datum of gage is 786.14 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Dec. 3 to Mar. 27. Records good except those for periods of no gage-height record, Dec. 31 to Jan. 5, 8-27, and periods with ice effect, Dec. 3-30, Jan. 6, 7, Jan.28 to Mar. 27, 30, which are fair.

AVERAGE DISCHARGE.--9 years, 7.18 ft^3/s, 12.55 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,000 ft^3/s, Sept. 3, 1985, gage height, 32.76 ft, from floodmarks, from rating curve extended above 1000 ft^3/s, on basis of flow through culvert computations; minimum discharge, 0.20 ft^3/s, Aug. 13, 16, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2000 ft^3/s, Sept. 3, gage height, 32.76 ft, from floodmarks, from rating curve extended above 1000 ft^3/s, on basis of flow through culvert computations; minimum daily discharge, 1.4 ft^3/s, Jan. 1 to Feb. 20; minimum gage height, 11.23 ft, Dec. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	8.3	2.2	1.4	1.4	5.0	3.3	7.2	31	3.3	3.0	3.5
2	2.4	6.1	2.1	1.4	1.4	7.0	5.7	5.4	14	3.3	3.1	7.1
3	2.3	4.9	2.1	1.4	1.4	10	50	4.7	10	2.9	3.1	541
4	2.4	10	2.1	1.4	1.4	8.0	33	4.5	6.5	4.2	3.0	31
5	2.3	8.6	2.1	1.4	1.4	8.7	23	4.8	5.4	5.4	3.1	13
6	2.3	5.9	2.1	1.4	1.4	7.1	17	4.6	4.6	3.3	3.2	8.5
7	2.4	5.2	2.1	1.4	1.4	7.4	10	4.8	4.2	3.3	3.1	6.8
8	2.8	6.0	2.2	1.4	1.4	7.4	5.8	4.0	4.0	3.1	3.1	6.6
9	2.8	5.7	2.3	1.4	1.4	30	4.7	3.5	3.5	2.9	3.1	5.7
10	2.8	4.8	2.4	1.4	1.4	40	11	4.4	3.1	2.7	3.1	5.1
11	2.6	3.9	2.6	1.4	1.4	45	9.2	36	2.9	2.7	3.0	4.0
12	2.6	3.5	2.8	1.4	1.4	28	9.4	21	2.9	2.4	5.6	3.7
13	2.7	3.2	2.8	1.4	1.4	25	17	15	2.9	2.4	5.2	3.6
14	2.9	3.1	3.3	1.4	1.4	54	12	8.7	2.9	2.4	3.6	3.4
15	3.2	3.1	3.3	1.4	1.4	36	15	28	2.7	2.4	3.4	3.4
16	12	2.8	33	1.4	1.4	33	13	59	2.7	2.4	3.3	3.2
17	76	2.6	16	1.4	1.4	45	11	33	2.7	2.2	3.3	4.7
18	28	2.7	5.6	1.4	1.4	40	12	15	2.7	9.8	3.1	3.2
19	125	3.3	3.3	1.4	1.4	32	43	8.4	2.7	4.1	3.2	3.2
20	38	4.0	2.6	1.4	1.4	46	22	5.6	2.7	3.1	3.3	3.1
21	17	3.7	2.3	1.4	2.6	20	46	5.5	2.6	2.6	3.4	3.0
22	10	2.9	2.1	1.4	2.4	11	79	19	3.5	2.4	3.5	3.5
23	7.4	2.6	2.0	1.4	2.5	4.0	80	13	2.9	2.8	4.2	16
24	5.8	2.6	1.9	1.4	2.6	3.0	51	3.5	2.6	4.0	3.6	26
25	4.9	2.6	1.7	1.4	2.7	4.2	29	3.3	2.9	3.9	3.5	10
26	4.7	2.9	1.7	1.4	2.5	11	18	31	10	3.3	3.0	6.9
27	4.5	3.2	1.6	1.4	2.2	9.7	12	14	9.7	3.0	3.2	5.4
28	4.2	3.3	1.6	1.4	4.0	8.5	9.6	10	7.1	2.9	3.2	4.8
29	4.0	2.8	1.5	1.4	---	3.8	8.7	8.7	4.9	3.0	3.4	4.7
30	4.0	2.5	1.5	1.4	---	3.2	9.4	30	4.0	3.1	3.5	46
31	4.2	---	1.5	1.4	---	2.5	---	117	---	3.2	3.4	---
TOTAL	388.8	126.8	116.4	43.4	49.5	595.5	669.8	532.6	164.3	102.5	106.0	790.1
MEAN	12.5	4.23	3.75	1.40	1.77	19.2	22.3	17.2	5.48	3.31	3.42	26.3
MAX	125	10	33	1.4	4.0	54	80	117	31	9.8	5.8	541
MIN	2.3	2.5	1.5	1.4	1.4	2.5	3.3	3.3	2.6	2.2	3.0	3.0
CFSM	1.61	.54	.48	.18	.23	2.47	2.87	2.21	.71	.43	.44	3.39
IN.	1.86	.61	.56	.21	.24	2.85	3.21	2.55	.79	.49	.51	3.78
AC-FT	771	252	231	86	98	1180	1330	1060	326	203	210	1570

CAL YR 1984 TOTAL 3039.0 MEAN 8.30 MAX 219 MIN 1.2 CFSM 1.07 IN 14.55 AC-FT 6030
WTR YR 1985 TOTAL 3685.7 MEAN 10.1 MAX 541 MIN 1.4 CFSM 1.30 IN 17.64 AC-FT 7310

RED RIVER OF THE NORTH BASIN

05045500 OTTER TAIL RIVER NEAR FERGUS FALLS, MN

WATER-QUALITY RECORDS

LOCATION.--Lat 46°13'45", long 96°07'00", in SW1/4 sec.20, T.132 N., R.43 W., Otter Tail County, Hydrologic Unit 09020103, on left bank 500 ft downstream from Dayton Hollow Dam, 5 miles downstream from Pelican River, and 5 miles southwest of city of Fergus Falls.

DRAINAGE AREA.--1,810 mi^2 (4690 km^2), approximately.

PERIOD OF RECORD.--April-September 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
APR							
18...	1600	--	388	--	8.4	11.0	747
MAY							
01...	1300	--	--	--	--	--	--
16...	0925	--	390	--	8.0	15.0	750
20...	1300	--	--	--	--	--	--
21...	1300	--	--	--	--	--	--
22...	1430	--	--	--	--	--	--
JUN							
05...	1430	--	--	--	--	--	--
18...	1600	1190	373	373	8.2	19.0	755
JUL							
05...	1300	--	--	--	--	--	--
19...	1300	--	--	--	--	--	--
24...	1510	1130	355	--	8.2	23.5	747
AUG							
08...	0930	--	--	--	--	--	--
29...	1430	946	356	--	7.9	19.5	757
SEP							
11...	1000	--	--	--	--	--	--
24...	1545	874	354	--	8.2	13.5	754

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	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 DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)
APR						
18...	10.0	<0.10	0.05	0.6	0.03	0.02
MAY						
01...	--	--	--	--	0.02	--
16...	8.7	0.14	0.14	3.6	0.03	0.03
20...	--	--	--	--	0.04	--
21...	--	--	--	--	0.04	--
22...	--	--	--	--	0.05	--
JUN						
05...	--	--	--	--	0.04	--
18...	10.1	<0.10	0.03	0.6	0.06	0.03
JUL						
05...	--	--	--	--	0.05	--
19...	--	--	--	--	0.05	--
24...	8.4	<0.10	0.05	0.3	0.04	0.04
AUG						
08...	--	--	--	--	0.08	--
29...	8.8	0.11	<0.01	0.4	0.07	<0.01
SEP						
11...	--	--	--	--	0.05	--
24...	10.3	<0.10	0.15	0.5	0.06	0.03

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 southwest of Fergus Falls.

DRAINAGE AREA.--1,830 mi^2, 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 (maximum operating stage) is 14,100 acre-ft of which 13,100 acre-ft is controlled storage above elevation 1,048 ft (minimum operating stage). Dead storage is 210 acre-ft. 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, June 17, 1962, May 23, 1966, elevation, 1,072.38 ft; minimum (after initial filling), 844 acre-ft, Aug. 26, 27, 1953, elevation, 1,046.96 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 15,950 acre-ft, July 8, elevation, 1,071.58 ft; minimum, 1,720 acre-ft, Apr. 8, elevation, 1,050.90 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,057.54	4,370	
Oct. 31	1,060.90	6,340	+1,970
Nov. 30	1,063.28	8,020	+1,680
Dec. 31	1,061.08	6,460	-1,560
CAL YR 1984			+500
Jan. 31	1,058.75	5,010	-1,450
Feb. 28	1,057.25	4,220	-790
Mar. 31	1,053.00	2,400	-1,820
Apr. 30	1,056.03	3,660	+1,260
May 31	1,060.00	5,750	+2,090
June 30	1,071.18	15,720	+9,970
July 31	1,069.68	13,750	-1,970
Aug. 31	1,066.52	10,670	-3,080
Sept. 30	1,065.79	10,030	-640
WTR YR 1985			+5,660

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 downstream from Orwell Dam, 6.1 mi downstream from Dayton Hollow Dam, 8 mi southwest of Fergus Falls, and 11.1 mi downstream from Pelican River.

DRAINAGE AREA.--1,830 mi^2, 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, adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi upstream at datum 40.30 ft higher.

REMARKS.--Estimated daily discharges: Jan. 19-21. Records good except those for period with ice effect, Jan. 19-21, which are fair. Flow regulated by Orwell Lake (station 05045950) beginning Mar. 21, 1953 and power-plants upstream.

AVERAGE DISCHARGE.--55 years, 311 ft^3/s, 225,300 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,710 ft^3/s, June 17, 1953, gage height, 5.60 ft, backwater from aquatic vegetation; minimum, 0.70 ft^3/s, Aug. 5, 1970, gage height, 1.28 ft, result of regulation.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,270 ft^3/s, June 27, gage height, 4.29 ft, result of regulation; minimum, 30 ft^3/s, Oct. 1, gage height, 1.99 ft, result of regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	238	278	260	288	315	527	806	784	1250	1140	893
2	78	209	278	259	282	335	519	794	709	1250	1140	896
3	78	177	278	259	280	335	510	781	779	1240	1130	898
4	78	178	278	256	277	339	502	772	891	1250	1140	899
5	76	178	278	256	277	344	496	760	944	1190	1130	899
6	76	175	278	254	276	340	486	726	962	1080	1130	904
7	76	173	271	254	274	340	482	708	1020	1090	1130	905
8	76	173	271	255	271	338	441	711	1080	1130	1120	910
9	76	174	270	254	271	384	418	712	1100	1160	1120	911
10	78	178	267	254	270	421	432	712	1060	1150	1120	913
11	81	178	266	254	269	422	446	720	1040	1150	1110	915
12	81	178	265	254	266	446	474	751	1100	1140	1120	917
13	81	178	265	255	264	469	503	877	1120	1140	1110	917
14	82	179	262	249	263	461	520	985	1130	1130	1110	917
15	113	182	260	254	261	477	532	1000	1130	1110	1110	917
16	131	182	263	255	262	493	535	1020	1120	1090	1110	920
17	198	182	265	254	260	494	594	1040	1120	1090	1110	921
18	239	181	263	256	260	495	640	1040	1120	1080	1100	920
19	285	184	261	256	260	501	633	1050	1120	1080	1100	921
20	311	184	260	256	260	545	630	998	1120	1070	1090	923
21	314	184	260	256	260	579	624	968	1170	1070	1080	920
22	314	186	260	274	269	591	622	981	1190	1060	1080	916
23	314	196	260	300	267	608	632	992	1190	1060	1080	916
24	314	204	260	302	271	610	675	993	1190	1100	1070	912
25	312	206	260	303	274	604	717	1000	1190	1170	1060	911
26	267	223	260	299	277	595	791	1010	1220	1180	1060	909
27	238	233	255	294	282	585	853	1020	1250	1180	1050	880
28	239	233	256	293	288	572	843	1020	1260	1180	952	855
29	239	234	260	291	---	561	829	1020	1260	1160	892	855
30	239	254	260	292	---	547	817	1020	1250	1140	892	833
31	238	---	260	288	---	534	---	961	---	1140	892	---
TOTAL	5370	5814	8228	8296	7579	14680	17723	27948	32619	35310	33478	27123
MEAN	173	194	265	268	271	474	591	902	1087	1139	1080	904
MAX	314	254	278	303	288	610	853	1050	1260	1250	1140	923
MIN	48	173	255	249	260	315	418	708	709	1060	892	833
CFSM	.10	.11	.15	.15	.15	.26	.32	.49	.59	.62	.59	.49
IN.	.11	.12	.17	.17	.15	.30	.36	.57	.66	.72	.68	.55
AC-FT	10650	11530	16320	16460	15030	29120	35150	55430	64700	70040	66400	53800

CAL YR 1984 TOTAL 133467 MEAN 365 MAX 799 MIN 36 CFSM .20 IN 2.71 AC-FT 264700
WTR YR 1985 TOTAL 224168 MEAN 614 MAX 1260 MIN 48 CFSM .34 IN 4.56 AC-FT 444600

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-63, 1965-66, April-September 1985.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
APR									
18...	0915	400	412	8.2	8.0	10.0	749	12.2	37
MAY									
16...	0800	395	404	8.1	8.0	15.0	750	9.5	39
JUN									
19...	0750	383	387	8.2	7.9	18.5	753	11.0	--
JUL									
25...	0745	368	379	8.2	7.9	23.5	755	8.8	35
AUG									
30...	0730	370	383	8.1	8.0	19.5	758	9.3	34
SEP									
25...	0935	367	394	8.2	8.1	13.5	752	10.7	--

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY, CARBONATE IT-FLD (MG/L - CACO3) (99430)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
APR									
18...	27	9.0	4.1	--	194	19	8.4	0.1	10
MAY									
16...	27	8.1	<0.1	186	186	27	7.4	0.1	11
JUN									
19...	--	--	--	218	194	14	6.8	0.2	--
JUL									
25...	25	7.8	3.4	200	192	9.4	6.9	0.2	15
AUG									
30...	26	7.8	3.3	190	--	11	6.8	0.2	15
SEP									
25...	--	--	--	--	195	9.3	7.5	0.1	--

DATE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
APR									
18...	225	<0.10	1.0	0.8	0.06	0.07	7.2	--	--
MAY									
16...	281	0.15	1.7	1.6	0.07	<0.01	--	8.4	1.2
JUN									
19...	--	<0.10	0.9	0.8	0.06	0.03	--	8.8	0.6
JUL									
25...	243	<0.10	1.0	0.3	0.06	0.03	--	9.7	1.0
AUG									
30...	229	<0.10	0.6	0.5	0.06	0.05	--	7.9	0.3
SEP									
25...	241	<0.10	0.6	0.5	0.06	0.04	--	7.8	0.5

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 downstream from White Rock Dam, 4 mi south of White Rock, and 5 mi northwest of Wheaton, MN.

DRAINAGE AREA.--1,160 mi^2, approximately.

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

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

REMARKS.--Estimated daily discharges: Oct. 31 to Mar. 20. 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).

AVERAGE DISCHARGE.--44 years, 78.4 ft^3/s, 56,800 acre-ft/yr; median of yearly mean discharges, 52 ft^3/s, 37,700 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,770 ft^3/s, occurred during period Apr. 19-21, 1969, gage height, 15.07 ft, from floodmark; no flow at times in most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 860 ft^3/s, Mar. 31, gage height, 9.19 ft; no flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.23	467	107	.40	.00	5.0	829	138	165	130	68	.39
2	.10	538	169	.40	.00	8.0	817	136	114	203	67	.46
3	.04	487	133	.38	.00	11	796	171	91	204	67	.48
4	.10	461	118	.36	.00	20	779	213	88	206	68	.53
5	.10	469	114	.34	.00	25	637	213	160	169	68	.55
6	.23	467	104	.34	.00	31	485	213	323	84	68	.59
7	.40	442	88	.32	.00	35	479	213	459	82	66	.66
8	.48	425	76	.30	.00	38	415	180	464	82	65	.90
9	.48	309	71	.28	.00	41	343	154	468	83	36	2.0
10	.45	246	73	.26	.00	45	344	147	516	83	.23	10
11	.40	285	79	.24	.00	48	338	149	576	84	.18	26
12	.50	256	77	.22	.00	52	334	154	574	84	.21	70
13	.68	242	76	.20	.00	55	334	147	600	86	.13	66
14	.82	235	76	.20	.00	62	321	149	649	86	.10	62
15	.82	244	76	.18	.00	71	322	179	650	62	.09	52
16	.90	322	76	.16	.00	83	312	237	652	28	.10	69
17	.85	238	76	.14	.01	93	295	231	655	26	.10	94
18	.80	226	76	.14	.03	102	289	232	684	28	.10	60
19	77	164	73	.13	.06	107	283	234	634	32	.07	1.3
20	163	117	38	.13	.10	111	278	231	572	34	.07	4.2
21	160	117	1.6	.12	.15	111	272	228	572	36	.07	10
22	159	116	.96	.12	.21	113	181	232	566	34	.15	8.7
23	159	112	.77	.12	.30	126	85	251	471	33	.19	4.4
24	213	112	.65	.12	.40	174	84	257	372	35	.17	6.6
25	273	112	.63	.11	.60	474	81	252	369	52	.18	5.8
26	274	112	.60	.11	.70	756	77	249	371	67	.21	7.9
27	287	112	.55	.10	1.0	852	74	240	368	67	.25	2.8
28	294	91	.52	.10	2.0	852	70	235	270	66	.26	6.0
29	334	110	.50	.10	---	845	101	235	88	66	.32	5.2
30	368	107	.45	.06	---	847	144	239	85	69	.34	4.6
31	370	---	.40	.01	---	849	---	218	---	70	.39	---
TOTAL	3139.38	7741	1783.63	6.19	5.56	7042.0	10199	6357	12626	2471	576.91	583.06
MEAN	101	258	57.5	.20	.20	227	340	205	421	79.7	18.6	19.4
MAX	370	538	169	.40	2.0	852	829	257	684	206	68	94
MIN	.04	91	.40	.01	.00	5.0	70	136	85	26	.07	.39
CFSM	.09	.22	.05	.000	.000	.20	.29	.18	.36	.07	.02	.02
IN.	.10	.25	.06	.00	.00	.23	.33	.20	.40	.08	.02	.02
AC-FT	6230	15350	3540	12	11	13970	20230	12610	25040	4900	1140	1160

CAL YR 1984	TOTAL	68828.43	MEAN	188	MAX	972	MIN	.00	CFSM .16	IN 2.21	AC-FT	136500
WTR YR 1985	TOTAL	52530.73	MEAN	144	MAX	852	MIN	.00	CFSM .12	IN 1.68	AC-FT	104200

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 downstream from confluence of Bois de Sioux and Otter Tail Rivers and at mile 548.6.

DRAINAGE AREA.--4,010 mi^2, 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 above National Geodetic Vertical Datum of 1929. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Dec. 3 to Mar. 20. Records good except those for period with ice effect, Dec. 3 to Mar. 20, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft at elevation 1,070 ft above National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft, available for flood control; numerous other controlled lakes and ponds, and several powerplants.

AVERAGE DISCHARGE.--42 years (1943-85), 532 ft^3/s, 385,400 acre-ft/yr; median of yearly mean discharges, 470 ft^3/s, 341,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft^3/s, Apr. 10, 1969, gage height, 16.34 ft; minimum daily, 1.7 ft^3/s, Aug. 28 to Sept. 5, 9, 10, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--A stage of 17.0 ft, discharge, 10,500 ft^3/s, occurred in the spring of 1897 and has not been exceeded since.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,690 ft^3/s, June 1, gage height, 10.71 ft; minimum daily, 31 ft^3/s, Oct. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	576	354	253	280	327	1460	957	3450	1320	1170	900
2	31	539	348	273	316	333	1430	952	3410	1280	1160	925
3	36	793	419	263	316	382	1400	931	2530	1310	1160	930
4	55	938	482	276	320	413	1370	934	1790	1310	1150	922
5	60	867	508	279	320	395	1340	974	1400	1310	1150	921
6	68	812	488	261	318	449	1190	981	1290	1290	1150	916
7	74	775	430	258	300	483	1010	943	1360	1180	1140	912
8	71	711	463	231	304	485	973	917	1460	1100	1140	939
9	71	678	461	231	315	494	872	879	1480	1100	1130	963
10	75	557	420	261	311	526	751	842	1480	1130	1140	944
11	77	346	402	244	295	600	746	873	1540	1130	1130	941
12	71	469	388	243	297	703	755	915	1570	1130	1200	938
13	66	553	309	260	304	821	780	1310	1670	1130	1170	954
14	81	598	388	269	330	1030	820	1780	1770	1120	1130	980
15	125	433	413	241	296	1390	820	1800	1780	1120	1120	981
16	151	230	420	258	300	1870	824	1860	1740	1110	1100	975
17	207	419	352	267	309	2310	828	2180	1720	1090	1100	970
18	296	490	299	254	307	2520	846	1970	1740	1100	1090	988
19	549	459	377	227	299	2550	893	1620	1770	1090	1090	1010
20	1280	440	396	216	325	2430	889	1450	1740	1070	1090	992
21	1680	334	400	282	344	2170	878	1360	1660	1060	1070	964
22	1490	356	342	271	328	1430	897	1280	1660	1060	1110	940
23	1180	338	297	276	317	1000	866	1300	1650	1050	1100	928
24	924	343	295	314	309	1210	775	1290	1560	1080	1080	931
25	797	382	281	309	324	1540	812	1270	1460	1110	1070	928
26	780	382	308	285	315	1470	831	1250	1450	1160	1060	922
27	707	344	310	285	300	1520	853	1230	1680	1190	1070	912
28	629	288	323	323	317	1570	905	1220	1820	1190	1070	905
29	626	244	253	314	---	1550	911	1220	1750	1190	1050	874
30	646	345	211	299	---	1510	911	1260	1490	1180	945	861
31	720	---	243	297	---	1490	---	2530	---	1190	903	---
TOTAL	13658	15039	11380	8320	8716	36971	28636	40278	52870	35880	34238	28166
MEAN	441	501	367	268	311	1193	955	1299	1762	1157	1104	939
MAX	1680	938	508	323	344	2550	1460	2530	3450	1320	1200	1010
MIN	31	230	211	216	280	327	746	842	1290	1050	903	861
CFSM	.11	.13	.09	.07	.08	.30	.24	.32	.44	.29	.28	.23
IN.	.13	.14	.11	.08	.08	.34	.27	.37	.49	.33	.32	.26
AC-FT	27090	29830	22570	16500	17290	73330	56800	79890	104900	71170	67910	55870

CAL YR 1984 TOTAL 279041 MEAN 762 MAX 4500 MIN 31 CFSM .19 IN 2.59 AC-FT 553500
WTR YR 1985 TOTAL 314152 MEAN 861 MAX 3450 MIN 31 CFSM .22 IN 2.91 AC-FT 623100

WATER-QUALITY RECORDS

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT					
25...	1100	812	775	5.5	6.0
JAN					
03...	1310	270	425	-3.0	0.0
FEB					
28...	1430	320	650	8.5	0.0
MAR					
26...	1025	1450	595	9.0	3.5
APR					
16...	1155	879	580	--	9.5
JUN					
04...	1135	1830	542	13.0	15.5
JUL					
24...	1120	1130	425	16.5	23.0
SEP					
11...	1240	978	420	15.0	17.5

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	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)
MAR										
26...	1025	1450	595	8.8	9.0	3.5	60	32	18	8.2
SEP										
11...	1240	978	420	8.2	15.0	17.5	37	28	9.0	4.1

DATE	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	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)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3) (71851)
MAR									
26...	190	5	160	140	15	0.2	3.6	268	1.0
SEP									
11...	190	3	160	22	10	0.1	15	221	1.0

DATE	TIME	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
MAR											
26...	1025	2	50	50	<1	29	110	0.1	2	<1	200
SEP											
11...	1240	2	50	10	<1	13	<10	<0.1	1	1	130

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 downstream from bridge on township road, and 1 mi southeast of Hickson, ND.

DRAINAGE AREA.--4,300 mi^2, 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 above National Geodetic Vertical Datum of 1929.

REMARKS.--Estimated daily discharges: Oct. 29 and Dec. 10 to Mar. 28. Records good except those for period of no gage-height record, Oct. 29, and period with ice effect, Dec. 10 to Mar. 28, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft at elevation 1,070 ft above National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft, available for flood control; numerous other controlled lakes and ponds, and several powerplants.

AVERAGE DISCHARGE.--10 years, 548 ft^3/s, 397,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,600 ft^3/s, Apr. 18, 1979, gage height, 33.03 ft; no flow Oct. 26, 1976, to Jan. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,680 ft^3/s, June 3, gage height, 18.71 ft; minimum daily, 52 ft^3/s, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	734	247	235	289	338	1510	963	2400	1590	1130	940
2	61	519	304	247	306	347	1460	974	3180	1370	1120	928
3	58	399	266	266	294	352	1420	979	3600	1260	1110	931
4	53	637	262	274	305	359	1370	968	3570	1250	1100	943
5	52	940	386	268	325	375	1340	959	2990	1260	1100	950
6	66	961	487	266	349	382	1310	972	2110	1260	1090	997
7	90	953	528	265	347	391	1230	984	1510	1260	1090	949
8	101	924	494	244	316	417	1080	975	1360	1200	1090	958
9	106	825	475	252	337	437	1010	959	1410	1130	1080	1020
10	107	771	481	237	325	442	976	946	1440	1090	1080	1030
11	112	697	475	236	315	469	876	934	1470	1090	1080	1000
12	112	453	441	270	311	529	835	942	1500	1100	1090	981
13	119	359	417	281	313	633	834	953	1530	1100	1120	966
14	149	547	376	266	295	806	848	1090	1590	1100	1130	966
15	165	684	354	267	288	945	868	1510	1670	1090	1100	977
16	162	599	394	294	312	1180	873	1720	1720	1090	1070	981
17	176	344	412	295	318	1580	874	1750	1710	1080	1070	981
18	222	268	403	283	298	1990	880	1940	1740	1270	1070	977
19	350	332	350	289	282	2330	885	2000	1720	1380	1050	986
20	500	453	332	287	293	2560	915	1760	1720	1430	1050	996
21	973	481	365	289	277	2620	925	1510	1720	1360	1050	1000
22	1460	495	375	264	278	2520	920	1400	1670	1240	1050	999
23	1510	464	367	245	285	2140	926	1320	1620	1170	1060	979
24	1270	448	321	258	291	1700	931	1290	1600	1140	1060	962
25	1050	451	313	240	302	1520	910	1280	1580	1120	1050	956
26	909	471	296	255	310	1750	904	1260	1480	1110	1040	957
27	855	480	288	281	316	1780	923	1250	1400	1140	1040	957
28	789	425	284	283	327	1580	930	1230	1480	1150	1030	947
29	743	412	274	296	---	1590	957	1230	1670	1150	1040	939
30	691	312	295	281	---	1570	970	1240	1730	1140	1040	922
31	684	---	258	286	---	1530	---	1450	---	1140	988	---
TOTAL	13755	16838	11320	8300	8604	37162	30690	38738	55890	37260	33268	29075
MEAN	444	561	365	268	307	1199	1023	1250	1863	1202	1073	969
MAX	1510	961	528	296	349	2620	1510	2000	3600	1590	1130	1030
MIN	52	268	247	235	277	338	834	934	1360	1080	988	922
AC-FT	27280	33400	22450	16460	17070	73710	60870	76840	110900	73910	65990	57670

CAL YR 1984 TOTAL 296319 MEAN 810 MAX 5050 MIN 52 AC-FT 587700
WTR YR 1985 TOTAL 320900 MEAN 879 MAX 3600 MIN 52 AC-FT 636500

WATER-QUALITY RECORDS

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT						
30...	1045	668	935	8.9	-4.0	1.0
DEC						
18...	1150	404	470	--	-25.0	0.0
JAN						
22...	1245	270	520	8.0	-5.0	0.0
MAR						
01...	1050	335	690	--	3.5	0.0
26...	1330	1740	488	8.2	12.5	2.0
APR						
17...	1100	871	1240	8.7	10.0	8.0
JUN						
05...	1140	2920	508	--	13.5	15.5
AUG						
02...	1010	1210	465	7.9	22.0	22.0

DATE	TIME	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	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)
OCT							
30...	1045	16	13.0	75	48	32	14
JAN							
22...	1245	18	12.2	49	35	16	5.8
APR							
17...	1100	18	11.8	57	36	18	6.7
AUG							
02...	1010	65	8.5	--	30	10	3.8

DATE	ALKA-LINITY 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)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
OCT							
30...	205	0.5	240	23	0.2	16	594
JAN							
22...	246	4.7	28	11	0.1	9.9	303
APR							
17...	146	0.6	120	11	0.2	7.3	390
AUG							
02...	191	4.6	33	6.6	0.2	17	281

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	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)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	PHENOLS TOTAL (UG/L) (32730)
OCT								
30...	0.56	0.02	1.9	0.20	0.15	130	13	<1
JAN								
22...	<0.10	0.25	1.0	0.06	0.05	60	10	--
APR								
17...	0.10	0.06	1.4	0.13	0.09	70	--	<1
AUG								
02...	0.18	0.13	1.3	0.17	0.08	60	10	<1

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 upstream from mouth of Sheyenne River, and at mile 453.0.

DRAINAGE AREA.--6,800 mi^2, 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 above National Geodetic Vertical Datum of 1929. Oct. 1, 1960 to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft higher. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.

REMARKS.--Estimated daily discharges: Dec. 7-11, Dec. 15 to Feb. 28, Apr. 4-10, and May 7-20. Records good except those for period of ice effect, Dec. 15 to Feb. 28, and periods of no gage-height record, Dec. 7-10, Apr. 4-10, and May 7-20, which are fair. Flow regulated by Orwell Reservoir, capacity 14,100 acre-ft at elevation 1,070 ft above National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity 137,000 acre-ft, 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).--84 years, 562 ft^3/s, 407,200 acre-ft/yr; median of yearly mean discharges, 450 ft^3/s, 326,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,300 ft^3/s, Apr. 15, 1969, gage height, 37.34 ft; 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 present datum, discharge, 25,000 ft^3/s at site 1.5 mi downstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,690 ft^3/s, June 5, gage height, 20.08 ft; minimum daily, 34 ft^3/s, Oct. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	634	267	290	267	438	1710	1010	2280	1760	1250	988
2	51	529	230	282	273	404	1660	1000	3230	1550	1230	967
3	42	406	233	278	264	404	1640	1050	4070	1370	1230	953
4	39	398	225	270	252	429	1610	1060	4570	1310	1220	966
5	34	631	234	260	298	430	1550	1040	4600	1330	1210	990
6	44	859	341	250	316	430	1470	1010	3960	1320	1190	1060
7	71	915	450	228	325	441	1390	1010	2640	1320	1180	1070
8	63	918	560	225	343	442	1320	1020	1900	1290	1170	1130
9	78	867	540	224	296	467	1140	1010	1680	1190	1160	1360
10	81	764	520	232	354	494	1040	980	1620	1130	1160	1300
11	65	698	500	217	315	524	948	980	1640	1110	1150	1240
12	63	633	409	216	354	563	840	989	1630	1120	1220	1180
13	86	390	395	250	335	665	817	989	1640	1130	1210	1120
14	250	362	377	261	324	805	823	1060	1670	1130	1220	1090
15	388	490	337	246	318	1210	833	1520	1760	1130	1200	1060
16	491	437	331	247	331	1650	848	1560	1850	1120	1160	1060
17	355	388	323	274	329	2110	887	1750	1870	1150	1150	1050
18	288	296	308	275	333	2620	913	1780	1850	1260	1130	1030
19	601	267	300	263	340	3100	934	1960	1850	1570	1110	1030
20	952	305	285	250	359	3290	944	2000	1860	1860	1090	1020
21	1010	383	290	237	331	3290	940	1890	1890	1940	1090	1040
22	1410	399	300	224	327	2910	962	1690	1860	1760	1090	1040
23	1720	407	313	211	339	2380	969	1570	1770	1540	1100	1010
24	1610	389	316	220	349	2210	976	1480	1720	1400	1130	981
25	1320	377	292	222	405	2030	951	1470	1700	1310	1110	965
26	1070	381	281	253	382	2040	931	1470	1610	1260	1070	966
27	924	397	275	292	381	2280	1000	1450	1520	1330	1070	963
28	855	409	260	293	437	2200	1010	1410	1510	1290	1070	952
29	775	379	298	302	---	1710	995	1390	1680	1280	1090	948
30	697	358	294	269	---	1800	1000	1390	1820	1260	1080	937
31	659	---	292	276	---	1750	---	1590	---	1270	1050	---
TOTAL	16160	15066	10376	7837	9277	45516	33051	41578	65250	41790	35590	31466
MEAN	521	502	335	253	331	1468	1102	1341	2175	1348	1148	1049
MAX	1720	918	560	302	437	3290	1710	2000	4600	1940	1250	1360
MIN	34	267	225	211	252	404	817	980	1510	1110	1050	937
AC-FT	32050	29880	20580	15540	18400	90280	65560	82470	129400	82890	70590	62410
(+)	1115	1008	1064	1137	1119	1057	1094	1356	1289	1788	1275	1118
MEAN*	539	519	352	272	351	1485	1120	1363	2197	1377	1169	1068
AC-FT*	33160	30890	21640	16680	19520	91340	66650	83830	13690	84680	71860	63500

CAL YR 1984 TOTAL 358648 MEAN 980 MAX 9450 MIN 34 AC-FT 711400 MEAN* 1006 AC-FT* 728440
WTR YR 1985 TOTAL 352957 MEAN 967 MAX 4600 MIN 34 AC-FT 700100 MEAN* 984 AC-FT* 714470

\+ - Diversions in acre-feet to cities of Fargo and Moorhead.
* - Adjusted for diversions to cities of Fargo and Moorhead.

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

WATER-QUALITY RECORDS

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

REMARKS.--Letter E indicates estimated value.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT						
26...	1150	1020	635	--	11.0	6.5
DEC						
18...	1505	302	820	--	-4.0	E0.0
JAN						
23...	1130	211	520	--	--	0.0
MAR						
21...	1150	3390	395	8.1	--	2.0
APR						
03...	1450	1940	--	--	7.5	3.5
10...	1430	1030	630	8.5	11.0	6.0
MAY						
21...	1100	1890	860	--	15.0	14.0
JUN						
05...	1420	4600	410	--	20.5	16.5
JUL						
31...	1645	1300	456	--	23.0	23.0
SEP						
18...	1710	1040	--	--	20.0	16.5

DATE	TIME	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)	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)
MAR											
21...	1150	38	18	10	7.1	120	66	11	0.1	8.2	239

DATE	TIME	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
MAR											
21...	1150	2	30	80	<10	17	60	0.1	1	<1	120

RED RIVER OF THE NORTH BASIN

05054020 RED RIVER OF THE NORTH BELOW FARGO, ND

LOCATION.--Lat 46°55'50", long 96°47'05', in SW¼NE¼ 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 (19.3 km) above mouth of Sheyenne River.

DRAINAGE AREA.--6,820 mi^2 (17,660 km^2), approximately.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	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)
OCT											
26...	1150	1020	620	8.2	12.0	6.5	11.3	50	31	24	7.4
DEC											
18...	1505	302	845	7.3	-20.0	0.0	13.8	65	53	30	13
JAN											
23...	1130	211	530	8.2	-3.5	0.0	16.1	38	27	13	4.6
MAR											
21...	1150	3390	400	8.4	14.5	2.0	11.4	44	18	12	7.1
APR											
10...	1430	1030	630	8.5	11.0	6.0	11.7	62	35	22	8.1
AUG											
01...	1300	1290	468	7.9	27.0	23.5	8.3	45	31	11	4.2

DATE	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)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CYANIDE TOTAL (MG/L AS CN) (00720)
OCT										
26...	129	190	11	0.2	15	430	1.60	0.41	70	--
DEC										
18...	248	180	22	0.2	15	520	0.12	0.08	120	--
JAN										
23...	246	44	13	0.1	7.5	306	<0.10	0.11	60	--
MAR										
21...	114	69	9.3	0.2	12	252	1.50	0.22	40	--
APR										
10...	178	150	12	0.2	11	419	0.45	0.10	120	<0.01
AUG										
01...	193	40	7.3	0.2	18	275	0.19	0.10	60	--

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	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)
APR									
10...	1430	10	3	76	<1	10	<1	3	16

DATE	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)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	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									
10...	4	34	5	0.3	<1	5	<1	240	15

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 southwest of Hawley.

DRAINAGE AREA.--322 mi^2.

PERIOD OF RECORD.--March 1945 to current year, WY 1981 (annual maximum only), March 1982 to current year (no winter records).

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

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

REMARKS.--Estimated daily discharges: Nov. 12-14 and Feb. 28 to Mar. 17. Records good.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 72.7 ft^3/s, 52,670 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft^3/s, July 1, 1975, gage height, 9.76 ft; minimum, 2.8 ft^3/s, Aug. 26, 1977; minimum gage height, 2.55 ft, Sept. 5, 1961.

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

EXTREMES FOR CURRENT PERIOD:--October to November 1984 and February to September 1985: Maximum discharge during period, 1,060 ft^3/s, May 13, gage height, 8.58 ft; minimum discharge, 11 ft^3/s, Oct.2, 3, 6; minimum gage height, 3.19 ft; Oct.6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	41			---	47	107	264	426	185	80	58
2	13	35			---	40	115	326	549	152	71	63
3	13	33			---	34	103	263	675	130	63	64
4	13	33			---	33	93	147	670	114	61	65
5	13	33			---	40	87	90	566	102	60	63
6	13	33			---	46	76	76	454	91	59	105
7	14	34			---	57	68	69	374	83	55	152
8	14	34			---	63	62	68	318	77	52	134
9	14	33			---	82	56	60	263	74	50	118
10	19	34			---	134	55	55	217	68	49	105
11	18	35			---	226	53	267	220	65	47	93
12	16	35			---	231	51	726	259	63	59	82
13	20	36			---	217	53	957	239	62	74	71
14	48	36			---	253	65	1050	217	59	69	63
15	57	36			---	334	66	997	211	56	63	57
16	71	---			---	234	63	926	207	55	61	56
17	60	---			---	173	59	844	193	59	58	55
18	49	---			---	221	62	752	180	74	55	52
19	82	---			---	248	65	642	166	97	50	52
20	123	---			---	321	58	536	147	94	47	51
21	115	---			---	318	57	426	135	83	45	78
22	94	---			---	238	75	336	146	75	53	77
23	85	---			---	250	82	270	155	69	60	68
24	78	---			---	257	107	224	140	81	52	63
25	67	---			---	265	113	188	147	103	47	60
26	60	---			---	222	109	164	203	92	43	57
27	56	---			---	175	100	143	243	132	40	53
28	51	---			33	154	90	127	226	152	39	51
29	47	---			---	135	84	118	232	110	38	47
30	43	---			---	125	109	115	211	98	51	47
31	40	---			---	116	---	292	---	89	59	---
TOTAL	1419	---			---	5289	2343	11518	8389	2844	1710	2160
MEAN	45.8	---			---	171	78.1	372	280	91.7	55.2	72.0
MAX	123	---			---	334	115	1050	675	185	80	152
MIN	13	---			---	33	51	55	135	55	38	47
CFSM	.14	---			---	.53	.24	1.16	.87	.29	.17	.22
IN.	.16	---			---	.61	.27	1.33	.97	.33	.20	.25
AC-FT	2810	---			---	10490	4650	22850	16640	5640	3390	4280

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 downstream from Stony Creek and 1 mi east of Sabin.

DRAINAGE AREA.--522 mi^2.

PERIOD OF RECORD.--March 1945 to current year, WY 1981 (annual maximum only), March 1982 to current year (no winter records).

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

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

REMARKS.--Estimated daily discharges: Oct. 7, 8, 18, 28, Nov. 1-17, Mar. 1-21, 24, 31, Apr. 7, 14, 21, 28, May 5, 12, 19, 26, 27, June 9, 16, 23, 30, July 7, 14, 21, 28, Aug. 4, 11, 18, 25, and Sept. 1, 2, 8, 15, 22, 29. Records fair.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 56.0 ft^3/s, 40,570 acre-ft/yr; median of yearly mean discharges, 41.4 ft^3/s, 29,990 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,500 ft^3/s, July 2, 1975, gage height, 19.90 ft; no flow on many days in most years.

EXTREMES FOR CURRENT PERIOD.--October to November 1984 and February to September 1985: Maximum discharge during period, 1,660 ft^3/s, June 2, gage height, 13.69 ft, from highwater mark; minimum discharge, 0.02 ft^3/s, Oct. 5, gage height, 3.46 ft, backwater from debris; minimum gage height, 3.44 ft, July 17.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	36			---	3.9	104	88	896	42	68	11
2	.30	35			---	4.3	101	80	1580	37	66	12
3	.06	34			---	7.1	105	70	1230	34	61	19
4	.06	34			---	8.6	110	66	810	31	50	19
5	.02	33			---	13	96	61	621	24	40	18
6	.04	33			---	20	85	54	476	21	34	48
7	.10	33			---	25	75	49	332	20	28	73
8	.15	33			---	29	68	48	224	18	22	103
9	.22	33			---	32	62	44	158	14	20	150
10	1.8	32			---	40	56	44	120	11	16	151
11	6.5	32			---	48	49	53	102	7.0	16	151
12	6.7	32			---	55	47	87	95	4.9	16	156
13	10	31			---	100	52	182	92	3.4	20	153
14	35	30			---	150	52	316	88	3.1	20	138
15	30	24			---	215	53	360	86	2.6	32	116
16	41	23			---	295	55	395	115	1.7	42	97
17	42	23			---	350	52	419	113	1.2	46	81
18	43	---			---	344	51	439	94	1.6	43	68
19	76	---			---	336	49	364	88	2.5	33	56
20	88	---			---	320	49	257	85	2.0	28	51
21	92	---			---	302	50	188	76	22	22	46
22	94	---			---	271	53	145	70	87	19	50
23	86	---			---	247	64	112	68	84	15	64
24	73	---			---	239	77	92	67	83	12	64
25	62	---			---	235	96	81	61	78	10	57
26	52	---			---	214	114	74	60	63	8.6	52
27	43	---			---	174	120	63	60	55	8.4	48
28	42	---			1.9	149	113	51	58	57	5.7	45
29	41	---			---	134	102	48	52	63	7.3	44
30	38	---			---	121	93	54	46	73	8.2	42
31	38	---			---	115	---	148	---	70	9.4	---
TOTAL	1043.15	---			---	4596.9	2253	4532	8023	1017.0	826.6	2183
MEAN	33.7	---			---	148	75.1	146	267	32.8	26.7	72.8
MAX	94	---			---	350	120	439	1580	87	68	156
MIN	.02	---			---	3.9	47	44	46	1.2	5.7	11
CFSM	.07	---			---	.28	.14	.28	.51	.06	.05	.14
IN.	.07	---			---	.33	.16	.32	.57	.07	.06	.16
AC-FT	2070	---			---	9120	4470	8990	15910	2020	1640	4330

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 southeast of Kragnes, 6.5 mi northeast of Dilworth, and 9 mi downstream from South Branch.

DRAINAGE AREA.--1,040 mi^2, 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 above National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Apr. 5, 1937, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 1-5, and Nov. 10 to Mar. 25. Records good except those for periods with ice effect, Nov. 1-5 and Nov. 10 to Mar. 25, which are fair.

AVERAGE DISCHARGE.--54 years, 131 ft^3/s, 94,910 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,600 ft^3/s, July 2, 1975, gage height, 27.10 ft; no flow at times in 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,940 ft^3/s, June 5, gage height, 15.53 ft; minimum, 13 ft^3/s, Oct. 1, gage height, 3.18 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	95	60	29	23	37	241	224	603	247	183	69
2	14	98	59	29	22	39	226	284	964	228	163	76
3	14	90	58	29	21	40	221	354	1420	205	147	80
4	15	92	57	29	20	41	219	361	1800	182	136	85
5	17	84	56	28	19	40	212	303	1930	163	126	87
6	17	80	54	28	19	39	202	222	1840	148	115	93
7	20	82	52	27	19	38	188	176	1630	136	104	126
8	23	82	51	27	19	38	171	153	1270	123	95	176
9	25	77	51	26	19	40	156	141	874	111	87	225
10	27	68	51	26	18	55	143	133	572	101	80	248
11	27	65	51	26	18	80	133	179	429	94	75	238
12	31	65	50	26	18	130	125	455	377	87	76	228
13	33	67	46	26	18	180	121	752	359	82	87	223
14	47	64	43	26	18	300	124	889	346	80	109	215
15	236	62	41	26	18	405	131	1170	347	76	125	203
16	335	63	40	26	18	515	138	1570	337	72	109	185
17	312	64	38	26	18	610	139	1760	326	71	103	163
18	217	64	34	26	18	715	137	1790	320	82	104	144
19	238	62	33	26	18	810	134	1710	301	87	103	132
20	413	62	32	26	18	910	137	1540	276	95	95	121
21	419	60	32	26	19	955	136	1270	253	106	86	110
22	372	61	31	25	19	930	132	996	245	105	80	106
23	328	62	31	25	20	640	145	766	235	132	76	121
24	285	62	31	25	22	495	165	570	222	152	82	127
25	248	62	30	24	25	480	193	448	212	157	85	125
26	215	64	30	24	28	460	221	361	214	165	78	119
27	187	63	30	24	32	416	240	307	234	273	67	110
28	164	64	29	24	35	356	247	268	259	312	61	103
29	143	65	29	24	---	310	241	241	267	265	58	96
30	127	62	29	24	---	279	227	250	259	218	57	88
31	115	---	29	24	---	256	---	320	---	198	56	---
TOTAL	4678	2111	1288	807	579	10639	5245	19963	18721	4553	3008	4222
MEAN	151	70.4	41.5	26.0	20.7	343	175	644	624	147	97.0	141
MAX	419	98	60	29	35	955	247	1790	1930	312	183	248
MIN	14	60	29	24	18	37	121	133	212	71	56	69
CFSM	.15	.07	.04	.03	.02	.33	.17	.62	.60	.14	.09	.14
IN.	.17	.08	.05	.03	.02	.38	.19	.71	.67	.16	.11	.15
AC-FT	9280	4190	2550	1600	1150	21100	10400	39600	37130	9030	5970	8370

CAL YR 1984 TOTAL 69218.8 MEAN 189 MAX 2890 MIN 4.7 CFSM .18 IN 2.48 AC-FT 137300
WTR YR 1985 TOTAL 75814.0 MEAN 208 MAX 1930 MIN 14 CFSM .20 IN 2.71 AC-FT 150400

RED RIVER OF THE NORTH BASIN

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 east of Hendrum and 4 mi upstream from mouth.

DRAINAGE AREA.--1,600 mi^2, approximately.

PERIOD OF RECORD.--March 1944 to September 1984 and May to September 1985. Operated as a high-flow partial-record station October 1984 to April 1985.

REVISED RECORDS.--WSP 1728: 1958.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 836.75 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers).

REMARKS.--Estimated daily discharges: May 10, 29, June 24, July 1, 20, and Aug. 30. Records fair. Large part of high flow diverted into Marsh River basin at overflow section 3.5 mi east of Ada. Another diversion into the Marsh River basin formed in 1947, 1.5 mi 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.--40 years, (Water Years 1945-84), 260 ft^3/s, 188,400 acre-ft/yr; median of yearly mean discharges, 219 ft^3/s, 159,000 acre-ft/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,230 ft^3/s, May 16, gage height, 25.14 ft; minimum daily (May to September), 183 ft^3/s, Sept.28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								653	1330	1700	921	754
2								670	1970	1250	836	596
3								614	2150	1010	761	518
4								548	2090	906	730	476
5								504	1910	769	732	521
6								486	1700	658	742	503
7								484	1430	572	689	462
8								446	1280	524	618	406
9								410	1060	468	558	386
10								400	907	433	521	348
11								2420	801	404	469	310
12								3420	797	379	467	289
13								4370	849	354	454	267
14								4920	836	337	510	248
15								5120	813	314	533	229
16								5210	760	295	458	225
17								5180	708	284	436	217
18								4990	674	299	382	208
19								4480	630	433	368	204
20								3780	575	540	351	215
21								3020	554	641	327	200
22								2270	568	622	305	194
23								1610	676	562	295	197
24								1240	620	530	285	197
25								1240	570	828	304	195
26								1170	777	1270	286	187
27								1120	1930	1550	271	187
28								921	2450	1620	235	183
29								880	2340	1560	246	185
30								849	2090	1280	350	189
31								866	---	1080	895	---
TOTAL								64291	35845	23472	15335	9296
MEAN								2074	1195	757	495	310
MAX								5210	2450	1700	921	754
MIN								400	554	284	235	183
CFSM								1.30	.75	.47	.31	.19
IN.								1.49	.83	.55	.36	.22
AC-FT								127500	71100	46560	30420	18440

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 a line between secs.24 and 25, T.145 N., R.49 W., Traill County, Hydrologic Unit 09020107, on left bank on upstream side of highway bridge, 0.5 mi west of Halstad, 2.5 mi downstream from Wild Rice River, and at mile 375.2.

DRAINAGE AREA.--21,800 mi^2, approximately, including 3,800 mi^2 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 above National Geodetic Vertical Datum of 1929. Prior to July 17, 1961, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 7 and Nov. 16 to Mar. 27. Records good except those for estimated daily discharges, which are fair.

AVERAGE DISCHARGE.--24 years (1961-85), 1,773 ft^3/s, 1,285,000 acre-ft/yr; median of yearly mean discharges, 1,650 ft^3/s, 1,195,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft^3/s, Apr. 22, 1979, gage height, 39.00 ft; minimum observed, 5.4 ft^3/s, Oct. 8, 9, 12-14, 1936.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,400 ft^3/s, May 13, gage height, 19.07 ft; minimum daily 124 ft^3/s, Oct. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	170	1630	850	680	625	535	3240	2050	3820	4170	2550	2000
2	174	1320	845	675	610	555	3110	2130	4640	3850	2360	1830
3	171	1350	790	670	600	580	3020	2120	5830	3400	2230	1680
4	157	1500	740	660	575	600	2960	2100	6860	2960	2130	1620
5	144	1550	780	660	550	595	2930	2140	7470	2590	2060	1620
6	134	1680	830	680	540	595	2840	2130	7730	2360	2050	1630
7	125	1680	820	700	530	595	2760	2060	7650	2220	2000	1680
8	124	1690	850	700	520	600	2680	1960	6830	2120	1950	1690
9	127	1620	940	710	500	610	2540	1870	5590	2030	1880	1690
10	147	1510	965	720	510	615	2350	1800	4490	1930	1810	1810
11	157	1430	955	720	500	650	2200	4190	3780	1810	1760	1950
12	150	1310	915	715	490	730	2100	8520	3450	1710	1750	1940
13	170	1300	900	700	485	900	2000	10100	3360	1640	1770	1850
14	184	1270	860	700	470	1190	1830	10000	3270	1610	1820	1760
15	310	1150	840	710	455	1600	1760	9250	3170	1580	1860	1710
16	1230	1130	820	715	450	2150	1750	9560	3170	1550	1870	1660
17	2060	1030	790	720	450	3200	1760	10000	3180	1520	1920	1610
18	2160	1090	790	720	440	4320	1740	9980	3160	1520	1790	1570
19	1860	1090	830	685	445	5380	1720	9500	3110	1660	1710	1530
20	2250	970	850	690	450	6200	1710	8680	3020	2050	1670	1490
21	3200	988	830	695	460	7000	1700	7670	2960	2390	1630	1460
22	3480	996	810	695	465	7820	1710	6530	2930	2570	1580	1440
23	3370	995	792	670	475	9000	1750	5390	2930	2550	1540	1430
24	3360	990	800	650	475	8000	1870	4630	2920	2360	1520	1410
25	3230	970	810	650	475	7430	1920	4160	2920	2270	1530	1380
26	2920	960	800	645	490	5880	1990	3800	2870	2600	1550	1370
27	2540	950	760	640	500	4800	2010	3480	3490	2870	1520	1340
28	2220	940	735	635	525	4350	1990	3180	4210	3120	1470	1340
29	2000	900	710	630	---	4260	2000	2930	4380	3260	1480	1320
30	1820	840	680	625	---	3850	1990	2790	4320	3130	1510	1310
31	1710	---	680	620	---	3490	---	3230	---	2840	1930	---
TOTAL	41854	36829	25367	21085	14060	98080	65930	157930	127510	74240	56200	48120
MEAN	1350	1228	818	680	502	3164	2198	5095	4250	2395	1813	1604
MAX	3480	1690	965	720	625	9000	3240	10100	7730	4170	2550	2000
MIN	124	840	680	620	440	535	1700	1800	2870	1520	1470	1310
AC-FT	83020	73050	50320	41820	27890	194500	130800	313300	252900	147300	111500	95450

CAL YR 1984 TOTAL 844927 MEAN 2309 MAX 21800 MIN 124 AC-FT 1676000
WTR YR 1985 TOTAL 767205 MEAN 2102 MAX 10100 MIN 124 AC-FT 1522000

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

WATER-QUALITY DATA

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLE LOCATION, CROSS SECTION (FT FM L BANK) (00009)	DEPTH TO TOP OF SAMPLE INTERVAL (FT) (72015)	TEMPERATURE (DEG C) (00010)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
NOV							
08...	1240	20.0	1.6	0.0	818	--	14.1
08...	1241	20.0	4.0	0.0	819	--	14.2
08...	1242	40.0	1.6	0.0	822	--	14.5
08...	1243	40.0	4.0	0.0	823	--	14.5
08...	1244	60.0	1.6	0.0	824	--	14.5
08...	1245	60.0	4.0	0.0	825	8.5	14.5
08...	1246	80.0	1.6	0.0	827	--	14.4
08...	1247	110	1.6	0.0	827	--	14.5
08...	1248	110	4.0	0.0	827	--	14.5
08...	1249	130	1.6	0.0	826	8.5	14.6
08...	1250	130	4.0	0.0	828	--	14.6
08...	1251	150	1.6	0.0	827	--	14.6
08...	1252	150	4.0	0.0	826	8.5	14.5
08...	1253	170	1.6	0.0	828	--	14.6
08...	1254	170	4.0	0.0	828	--	14.6
08...	1255	190	1.6	0.0	828	--	14.5
08...	1256	190	4.0	0.0	828	--	14.5

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	COLIFORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
NOV										
08...	1415	1720	826	8.5	3.0	0.0	43	14.5	130	--
29...	1400	890	935	8.4	-2.0	0.5	1.5	12.1	300	260
JAN										
07...	1330	688	580	8.1	-13.0	0.0	--	--	--	--
MAR										
14...	1450	1190	550	5.9	3.0	0.5	13	11.4	--	--
APR										
02...	1350	3100	540	8.2	11.0	5.0	--	--	--	--
MAY										
10...	1245	1800	600	8.2	25.0	23.5	67	9.3	81	19
JUN										
07...	1235	7650	465	--	17.5	19.5	--	--	--	--
27...	1155	3530	572	8.1	14.0	19.0	240	6.2	--	--
AUG										
01...	1120	2570	472	--	23.5	22.0	--	--	--	--
SEP										
20...	1330	1500	550	8.0	9.0	13.0	41	10.4	--	--

DATE	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	ALKALINITY, CARBONATE IT-FLD (MG/L - CAC03) (99430)	ALKALINITY FIELD (MG/L AS CACO3) (00410)
NOV									
08...	79	46	38	9.4	227	--	--	--	--
29...	85	49	45	9.5	259	--	--	--	231
MAR									
14...	50	26	23	8.2	175	--	--	--	151
MAY									
10...	64	35	23	7.0	217	288	0	230	240
JUN									
27...	58	32	15	5.2	187	--	--	--	--
AUG									
01...	--	--	--	--	--	242	0	198	198
SEP									
20...	51	30	20	4.9	211	268	0	220	220

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	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)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
NOV							
08...	220	19	0.3	17	600	--	--
29...	220	25	0.3	17	633	0.55	0.76
MAR							
14...	65	19	0.2	14	329	--	--
MAY							
10...	110	11	0.2	9.8	397	--	--
JUN							
27...	98	10	0.2	12	376	0.67	0.14
SEP							
20...	59	13	0.2	17	355	0.43	0.14

DATE	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-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV							
29...	1.6	0.47	0.42	0.37	25	60	100
JUN							
27...	1.1	0.37	0.10	0.07	694	6610	100
SEP							
20...	1.1	0.31	0.23	0.19	110	446	96

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	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)
NOV										
08...	1415	10	4	68	<0.5	<1	1	<3	2	14
MAR										
14...	1450	20	2	54	<0.5	1	<1	<3	4	35
MAY										
10...	1245	10	3	77	<0.5	<1	<1	<3	7	6
SEP										
20...	1330	20	4	110	<0.5	<1	<1	<3	3	12

DATE	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)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	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)
NOV									
08...	<1	52	16	0.1	<10	2	<1	310	8
MAR									
14...	<1	23	62	0.1	<10	3	<1	170	33
MAY									
10...	8	32	4	<0.1	<10	7	<1	230	13
SEP									
20...	2	24	4	<0.1	<10	25	<1	180	12

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 southeast of Shelly and 10 mi upstream from mouth.

DRAINAGE AREA.--151 mi^2.

PERIOD OF RECORD.--March 1944 to September 1983 and April to September 1985. Monthly discharge only for March 1944, published in WSP 1308. Operated as a high-flow partial-record station October 1983 to March 1985.

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

REMARKS.--Estimated daily discharges: Apr. 3, 7, 9, 11, 14, 16, 18, 21, 25, May 5, 28, July 14, Aug. 16, 18, 31, Sept 1, and 20. Records fair. Large part of high flow of Wild Rice River diverted into Marsh River basin at overflow section 4.6 mi east of Ada. Another diversion from Wild Rice River basin formed in 1947, 1.5 mi 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.--39 years (water years 1945-83), 65.5 ft^3/s, 47,450 acre-ft/yr; median of yearly mean discharges, 38 ft^3/s, 27,500 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,880 ft^3/s, Apr. 19, 1979, gage height, 23.36 ft, from floodmark; no flow for many days most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,380 ft^3/s, May 13, gage height, 13.23; minimum daily (April to September), 0.36 ft^3/s July 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							21	123	27	26	12	6.0
2							26	94	21	21	8.4	3.7
3							28	49	14	13	6.4	4.3
4							29	27	13	12	4.6	13
5							26	20	18	9.0	5.6	10
6							20	14	17	9.3	3.6	7.0
7							19	12	17	7.0	2.4	6.0
8							19	9.8	13	4.3	1.4	4.6
9							16	8.0	11	3.2	1.4	3.7
10							14	7.2	8.7	2.5	1.1	3.1
11							10	92	9.3	1.9	.96	2.5
12							8.7	903	7.4	1.3	1.0	2.2
13							9.5	1120	7.2	1.1	1.4	1.9
14							9.8	1320	6.2	.90	1.1	1.9
15							10	1110	5.0	.82	.82	1.4
16							8.0	1150	3.9	.68	10	1.6
17							5.8	1090	4.4	.62	69	2.5
18							6.4	709	6.4	.62	33	5.4
19							7.2	306	6.0	.62	16	5.4
20							7.0	210	10	.36	9.3	4.0
21							7.5	160	8.7	.68	4.8	3.2
22							8.0	130	7.2	.62	2.8	3.6
23							19	145	4.8	.50	1.8	3.1
24							18	129	5.4	.56	1.8	2.2
25							16	37	4.1	4.3	1.3	2.5
26							14	52	3.9	6.0	.96	1.8
27							13	39	3.4	44	.82	1.6
28							12	30	17	45	.68	1.6
29							11	26	30	28	20	2.5
30							9.8	22	27	21	18	2.5
31							---	33	---	16	10	---
TOTAL							428.7	9227.0	337.0	282.88	252.44	114.8
MEAN							14.3	298	11.2	9.13	8.14	3.83
MAX							29	1320	30	45	69	13
MIN							5.8	7.2	3.4	.36	.68	1.4
CFSM							.10	1.97	.07	.06	.05	.03
IN.							.11	2.27	.08	.07	.06	.03
AC-FT							850	18300	668	561	501	228

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 upstream from mouth.

DRAINAGE AREA.--426 mi^2.

PERIOD OF RECORD.--March 1943 to September 1984 (winter records incomplete prior to 1947). Monthly discharge only for some periods, published in WSP 1308 and 1728. October 1984 to May 1985, operated as a high-flow partial-record station. June to September 1985.

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 above National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1966, nonrecording gage at site 3.2 mi upstream at datum 12.78 ft higher.

REMARKS.--Estimated daily discharges: June 1-13, 20, 21, 24, 25 and Aug. 14. Records fair.

AVERAGE DISCHARGE.--38 years (water years 1947-84), 71.8 ft^3/s, 52,020 acre-ft/yr; median of yearly mean discharges, 52 ft^3/s, 37,700 acre-ft/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 974 ft^3/s, Aug. 17, gage height, 10.50 ft, from graph based on gage readings; minimum daily (June to September) 58 ft^3/s.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									300	336	425	182
2									400	333	382	171
3									360	306	369	156
4									320	267	347	135
5									290	232	325	119
6									260	196	298	111
7									230	167	270	104
8									210	139	253	92
9									190	118	234	85
10									170	106	215	76
11									150	94	204	74
12									130	86	195	71
13									115	79	189	69
14									103	73	175	65
15									96	69	164	61
16									89	65	147	58
17									86	64	591	97
18									81	77	580	89
19									73	96	360	79
20									74	95	246	78
21									74	99	202	79
22									75	104	172	88
23									73	116	157	82
24									73	175	162	84
25									74	176	151	92
26									82	189	144	94
27									95	253	139	89
28									165	291	148	84
29									285	354	282	77
30									326	415	226	75
31									---	449	189	---
TOTAL									5049	5619	7941	2816
MEAN									168	181	256	93.9
MAX									400	449	591	182
MIN									73	64	139	58
CFSM									.39	.43	.60	.22
IN.									.44	.49	.69	.25
AC-FT									10010	11150	15750	5590

RED RIVER OF THE NORTH BASIN

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 northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi^2, 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, adjustment of 1912 (levels by U.S. Army 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 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, June 25, 1950; minimum recorded, 1169.80 ft, Nov. 20, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 1175.64 ft, June 25; maximum daily, 1175.32 ft, July 2, 6; minimum, 1173.07 ft, Nov. 1; minimum daily, 1173.51 ft, Nov. 1.

MONTHEND ELEVATION, IN FEET, OCTOBER 1984 TO SEPTEMBER 1985

Oct. 31 ..... 1174.25	Feb. 28 ..... 1173.84	June 30 ..... 1175.31
Nov. 30 ..... 1174.20	Mar. 31 ..... 1174.00	July 31 ..... 1174.97
Dec. 31 ..... 1174.07	Apr. 30 ..... 1174.51	Aug. 31 ..... 1175.00
Jan. 31 ..... 1173.92	May 31 ..... 1175.04	Sept.30 ..... 1174.86

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 downstream from dam at outlet of Lower Red Lake and 13 mi northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi^2, 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, adjustment of 1912 (levels by U.S. Army Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft upstream at datum 2.00 ft higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft higher.

REMARKS.--Estimated daily discharges: Nov. 1 to Mar. 8. Records fair. Flow completely regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--52 years, 498 ft^3/s, 360,800 acre-ft/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,200 ft^3/s, May 31, gage height, 5.41 ft; maximum gage height, 6.37 ft, June 25; minimum daily discharge, 54 ft^3/s, Oct.4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	450	450	800	800	800	331	328	865	360	930	872
2	63	450	450	800	800	800	351	328	796	342	915	766
3	60	450	460	800	800	800	345	323	767	468	919	752
4	54	450	470	800	800	790	320	331	765	676	946	740
5	84	450	720	800	800	780	320	337	825	687	938	727
6	121	450	880	800	800	770	331	432	929	673	946	723
7	125	450	860	800	800	790	339	560	953	691	965	717
8	126	450	840	800	800	820	331	574	977	702	972	717
9	126	400	820	800	800	833	320	581	969	716	953	711
10	125	450	800	800	800	822	325	584	956	720	953	705
11	121	450	790	810	800	822	317	606	957	778	957	700
12	121	440	790	810	800	822	301	634	949	870	972	697
13	127	400	790	810	800	833	307	626	980	896	896	787
14	157	300	790	810	800	822	312	634	1050	911	870	922
15	147	450	790	810	800	815	323	662	1080	919	940	952
16	145	480	790	810	800	826	312	676	1080	930	962	988
17	152	460	790	810	800	811	304	680	1070	942	917	1020
18	136	440	800	810	800	826	312	684	1070	953	715	1040
19	165	440	800	810	800	648	312	694	1090	957	666	1020
20	167	440	800	810	800	317	323	684	1130	961	637	676
21	166	440	800	810	800	314	323	655	1140	968	531	320
22	167	440	800	810	800	317	328	658	1150	968	316	176
23	166	440	800	810	800	320	339	669	1130	957	238	211
24	165	440	800	810	800	320	331	844	1110	996	194	504
25	168	440	800	810	800	317	331	1110	1110	996	153	620
26	287	440	800	800	800	325	323	1140	885	1020	194	759
27	470	450	800	800	800	345	323	1140	841	1010	457	839
28	477	450	800	800	800	314	325	1140	723	988	635	950
29	461	450	800	800	---	323	325	1150	485	965	837	979
30	461	450	800	800	---	323	325	1150	394	949	871	996
31	441	---	800	800	---	323	---	1120	---	930	897	---
TOTAL	5810	13190	23480	24950	22400	19088	9709	21734	28226	25899	23292	22586
MEAN	187	440	757	805	800	616	324	701	941	835	751	753
MAX	477	480	880	810	800	833	351	1150	1150	1020	972	1040
MIN	54	300	450	800	800	314	301	323	394	342	153	176
CFSM	.10	.23	.39	.41	.41	.32	.17	.36	.48	.43	.39	.39
IN.	.11	.25	.45	.48	.43	.36	.19	.41	.54	.49	.44	.43
AC-FT	11520	26160	46570	49490	44430	37860	19260	43110	55990	51370	46200	44800

CAL YR 1984	TOTAL	224572	MEAN	614	MAX	1060	MIN	54	CFSM	.32	IN 4.28	AC-FT 445400
WTR YR 1985	TOTAL	240364	MEAN	659	MAX	1150	MIN	54	CFSM	.34	IN 4.59	AC-FT 476800

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 upstream from highway bridge at High Landing, 7 mi south of Goodridge and 33 mi upstream from Thief River.

DRAINAGE AREA.--2,300 mi^2, 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, adjustment of 1912 (levels by U.S. Army Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

REMARKS.--Estimated daily discharges: Nov. 3 to Mar. 20. Records good except those for periods with ice effect, Nov. 3 to Mar. 20, which are fair. Flow regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--56 years, 559 ft^3/s, 405,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,060 ft^3/s, July 7, 1975, gage height, 13.39 ft; maximum gage height, 13.44 ft, July 3, 1975; no flow during infrequent periods in 1931-34, 1936-37.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,490 ft^3/s, Aug. 18, gage height, 11.61 ft; minimum daily, 69 ft^3/s, Oct. 4; minimum gage height, 1.68 ft, Oct. 4, 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	107	489	520	900	890	890	564	439	1740	931	1070	1420
2	84	412	540	900	890	890	596	418	1350	806	1060	1490
3	71	495	570	900	890	890	640	403	1080	719	1060	1490
4	69	600	620	900	890	850	623	392	964	708	1120	1440
5	72	590	670	900	890	800	577	385	911	804	1190	1360
6	73	580	720	900	890	900	550	383	942	860	1180	1270
7	103	560	900	900	890	950	545	526	992	879	1160	1180
8	128	540	940	900	890	930	514	663	1010	868	1150	1100
9	131	530	940	900	890	930	498	662	975	851	1150	1040
10	130	520	920	900	890	930	486	669	984	833	1150	998
11	131	490	910	890	890	930	499	734	999	818	1150	957
12	129	520	910	890	890	930	492	834	993	816	1190	918
13	129	520	910	890	890	930	492	877	980	845	1220	890
14	167	520	910	890	890	940	476	860	996	872	1210	881
15	267	450	910	890	890	960	480	906	1060	889	1180	939
16	282	300	910	890	890	1050	472	1150	1100	902	1180	1030
17	255	460	910	890	890	1220	452	1090	1110	932	2110	1310
18	250	580	910	890	890	1320	439	981	1120	936	2460	1380
19	343	570	910	890	890	1380	436	919	1130	939	2460	1430
20	539	560	910	890	890	1340	426	882	1140	936	2370	1630
21	506	560	900	890	890	1200	444	860	1180	932	2230	1530
22	441	560	900	890	890	1040	577	848	1240	926	2050	1120
23	406	560	900	890	890	862	551	825	1240	932	1880	746
24	382	560	900	890	890	802	558	807	1250	962	1720	632
25	363	560	900	890	890	797	525	945	1390	996	1400	743
26	353	560	900	890	890	711	515	1160	1610	998	1100	812
27	427	560	900	890	890	689	502	1220	1530	1020	904	890
28	568	540	900	890	890	657	480	1240	1640	1040	891	942
29	605	480	900	890	---	568	464	1250	1500	1050	970	1010
30	589	510	900	890	---	547	448	1260	1180	1060	1090	1070
31	581	---	900	890	---	554	---	1670	---	1070	1210	---
TOTAL	8681	15736	26340	27690	24920	28387	15321	26258	35336	28130	43265	33648
MEAN	280	525	850	893	890	916	511	847	1178	907	1396	1122
MAX	605	600	940	900	890	1380	640	1670	1740	1070	2460	1630
MIN	69	300	520	890	890	547	426	383	911	708	891	632
CFSM	.12	.23	.37	.39	.39	.40	.22	.37	.51	.39	.61	.49
IN.	.14	.25	.43	.45	.40	.46	.25	.42	.57	.45	.70	.54
AC-FT	17220	31210	52250	54920	49430	56310	30390	52080	70090	55800	85820	66740

CAL YR 1984 TOTAL 266654 MEAN 729 MAX 2150 MIN 69 CFSM .32 IN 4.31 AC-FT 528900
WTR YR 1985 TOTAL 313712 MEAN 859 MAX 2460 MIN 69 CFSM .37 IN 5.07 AC-FT 622200

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 upstream from highway bridge, 5 mi north of city of Thief River Falls, 7 mi upstream from mouth, and 9 mi downstream from Mud Lake National Wildlife Refuge.

DRAINAGE AREA.--959 mi^2.

PERIOD OF RECORD.--July 1909 to September 1917, April 1920 to September 1921, October 1922 to September 1924, October 1928 to September 1981, March 1982 to current year. 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.

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 above 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.--Estimated daily discharges: Oct. 30 to Nov. 3, Dec. 7-11, and Jan. 4 to Mar. 31. Records good except those for periods with ice effect, Oct. 30 to Nov. 3, Dec. 7-11, Jan. 4 to Mar. 31, which are poor. Some regulation by Thief and Mud Lakes.

AVERAGE DISCHARGE.--67 years (water years 1910-17, 1921, 1923-24, 1929-81, 1983-85), 166 ft^3/s, 120,300 acre-ft/yr; median of yearly mean discharges, 112 ft^3/s, 81,100 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,610 ft^3/s, May 13, 1950, gage height, 17.38 ft; no flow at times in some years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,130 ft^3/s, June 28, gage height, 11.27 ft; no flow Dec. 27 to Mar. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	135	10	.00	.00	.00	1040	519	1980	1900	201	1370
2	12	130	9.1	.00	.00	.00	1040	460	1860	1860	192	1350
3	11	130	6.2	.00	.00	.00	1040	390	1660	1800	175	1500
4	10	130	5.0	.00	.00	.00	1010	422	1510	1710	182	1510
5	5.7	120	3.9	.00	.00	.00	954	386	1390	1600	213	1410
6	6.8	117	3.1	.00	.00	.00	892	361	1320	1520	302	1310
7	5.4	113	3.0	.00	.00	.00	845	348	1220	1460	332	1240
8	4.2	110	3.0	.00	.00	.00	825	349	1120	1410	353	1170
9	3.5	106	3.0	.00	.00	.00	812	337	1030	1330	380	1110
10	2.5	103	3.0	.00	.00	.00	756	338	1000	1290	358	1070
11	2.2	101	3.0	.00	.00	.00	759	356	838	1270	343	980
12	1.9	103	2.8	.00	.00	.00	745	577	671	1250	339	734
13	1.8	100	2.2	.00	.00	.00	736	910	552	1210	338	684
14	1.9	67	1.7	.00	.00	.00	785	915	428	1190	351	510
15	4.2	25	1.4	.00	.00	.01	743	916	305	1180	354	475
16	18	10	1.6	.00	.00	.10	726	1230	296	1250	360	463
17	14	8.6	1.7	.00	.00	1.0	684	1330	296	1280	870	459
18	15	7.8	1.5	.00	.00	4.0	652	1290	296	1260	1460	508
19	65	6.2	1.2	.00	.00	10	615	1210	293	1230	1470	558
20	276	5.3	1.1	.00	.00	100	567	1120	290	1170	1460	1010
21	312	4.8	1.1	.00	.00	300	553	1030	290	1130	1400	1140
22	268	4.8	1.1	.00	.00	500	609	937	323	1060	1370	1020
23	209	5.0	.66	.00	.00	700	710	862	281	877	1450	947
24	161	5.3	.36	.00	.00	900	724	795	311	673	1740	946
25	119	6.5	.06	.00	.00	1000	705	765	607	613	1660	896
26	99	11	.01	.00	.00	1020	663	765	1850	558	1540	853
27	141	15	.00	.00	.00	1040	638	722	1910	541	1440	812
28	147	12	.00	.00	.00	1050	595	671	2100	522	1360	778
29	140	13	.00	.00	---	1050	554	629	2090	475	1330	760
30	140	12	.00	.00	---	1050	535	626	1960	343	1390	716
31	135	---	.00	.00	---	1040	---	1650	---	269	1380	---
TOTAL	2346.1	1717.3	70.79	.00	.00	9765.11	22512	23216	30077	35231	26093	28289
MEAN	75.7	57.2	2.28	.000	.000	315	750	749	1003	1136	842	943
MAX	312	135	10	.00	.00	1050	1040	1650	2100	1900	1740	1510
MIN	1.8	4.8	.00	.00	.00	.00	535	337	281	269	175	459
CFSM	.08	.06	.002	.000	.000	.33	.78	.78	1.05	1.19	.88	.98
IN.	.09	.07	.00	.00	.00	.38	.87	.90	1.17	1.37	1.01	1.10
AC-FT	4650	3410	140	.00	.00	19370	44650	46050	59660	69880	51760	56110

CAL YR 1984 TOTAL 54040.57 MEAN 148 MAX 1500 MIN .00 CFSM .15 IN 2.10 AC-FT 107200
WTR YR 1985 TOTAL 179317.30 MEAN 491 MAX 2100 MIN .00 CFSM .51 IN 6.96 AC-FT 355700

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 downstream from Soo Line Railroad bridge, 300 ft downstream from bridge on U.S. Highway 59, 0.9 mi northwest of railroad depot in Plummer, and 8 mi upstream from Hill River.

DRAINAGE AREA.--512 mi^2.

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

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

REMARKS.--Estimated daily discharges: Nov. 1-6 and Nov. 7 to Apr. 3. Records good except those for periods with ice effect, Nov. 1-6 and Nov. 7 to Apr. 3, which are fair. Since 1968, undetermined amounts of water diverted for the flooding of wild rice paddies upstream.

AVERAGE DISCHARGE.--43 years (water years 1940-79, 1983-85), 180 ft^3/s, 130,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,940 ft^3/s, Apr. 25, 1979, gage height, 12.31 ft; maximum gage height, 12.37 ft, Apr. 18, 1979 (backwater from ice); minimum discharge, 2.5 ft^3/s, May 16, 17, 1977, gage height, 1.71 ft.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 21	0515	557	5.28	June 30	0700	713	5.94
Mar. 21	---	650	ice jam	July 27	1115	665	5.73
Apr. 26	0600	509	5.11	Aug. 19	0445	*1,650	*8.59
May 17	1245	1,150	7.37	Aug. 24	1345	764	6.09
June 1	1415	560	5.31				

Minimum daily discharge, 15 ft^3/s, Mar. 13; minimum gage height, 2.41 ft, Oct. 1, 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	190	107	67	51	39	250	292	547	609	489	227
2	29	200	105	66	51	39	244	260	532	518	454	224
3	29	210	103	65	50	39	220	237	481	449	440	213
4	29	230	101	64	50	38	195	222	419	382	414	213
5	29	220	100	63	49	38	161	220	389	336	434	199
6	30	210	98	62	49	37	140	202	354	305	423	178
7	30	196	97	61	48	37	142	195	326	293	435	164
8	34	191	96	61	48	36	128	178	289	268	362	151
9	36	188	94	60	47	36	95	156	254	247	293	143
10	35	178	92	60	47	35	77	142	223	260	268	142
11	34	155	90	59	46	35	82	124	181	282	225	139
12	34	151	89	59	46	16	81	437	145	221	209	134
13	35	169	88	58	45	15	83	743	126	194	267	126
14	42	148	87	58	45	29	90	878	109	181	300	121
15	174	155	85	57	44	33	98	961	121	162	269	116
16	260	98	84	57	44	40	102	1100	133	159	264	136
17	231	130	82	56	44	70	90	1150	125	207	975	235
18	212	160	81	56	43	200	100	1120	105	203	1420	220
19	258	150	80	56	43	400	109	1020	106	201	1590	258
20	515	140	79	55	42	500	104	924	104	204	1240	368
21	551	135	78	55	42	600	139	807	92	202	846	315
22	501	130	77	55	42	580	272	669	177	198	546	256
23	408	130	76	55	41	520	268	586	158	201	492	206
24	349	125	75	54	41	480	384	504	154	316	742	175
25	347	125	74	54	40	430	496	436	159	515	622	154
26	321	120	73	54	40	380	505	371	245	625	425	138
27	313	117	72	54	40	350	499	340	368	659	325	128
28	309	114	71	53	40	320	473	282	550	608	263	117
29	282	111	70	53	---	290	434	276	670	558	236	113
30	248	109	69	52	---	260	350	246	699	515	229	108
31	216	---	68	52	---	250	---	374	---	500	213	---
TOTAL	5949	4685	2641	1791	1258	6172	6411	15452	8341	10578	15710	5417
MEAN	192	156	85.2	57.8	44.9	199	214	498	278	341	507	181
MAX	551	230	107	67	51	600	505	1150	699	659	1590	368
MIN	28	98	68	52	40	15	77	124	92	159	209	108
CFSM	.38	.31	.17	.11	.09	.39	.42	.97	.54	.67	.99	.35
IN.	.43	.34	.19	.13	.09	.45	.47	1.12	.61	.77	1.14	.39
AC-FT	11800	9290	5240	3550	2500	12240	12720	30650	16540	20980	31160	10740

CAL YR 1984 TOTAL 50530 MEAN 138 MAX 1820 MIN 16 CFSM .27 IN 3.67 AC-FT 100200
WTR YR 1985 TOTAL 84405 MEAN 231 MAX 1590 MIN 15 CFSM .45 IN 6.13 AC-FT 167400

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 upstream from mouth.

DRAINAGE AREA.--266 mi^2.

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

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

REMARKS.--Estimated daily discharges: Nov. 16 to Mar. 27. Records fair except those for period with ice effect, Nov. 16 to Mar. 27, which are poor.

AVERAGE DISCHARGE.--24 years, 75.6 ft^3/s, 54,770 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,210 ft^3/s, Apr. 11, 1969, gage height, 14.91 ft, from floodmark; maximum gage height, 16.72 ft, 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, present datum, Apr. 21, 1950, from floodmarks, discharge, 2,790 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,320 ft^3/s, Aug. 18, gage height, 15.03 ft; minimum daily, 4.1 ft^3/s, Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.1	76	27	5.6	5.4	6.2	222	113	587	177	213	74
2	4.5	54	25	5.6	5.4	6.4	198	91	367	158	206	71
3	5.3	87	23	5.6	5.4	6.8	177	78	229	129	183	70
4	6.6	87	21	5.6	5.4	7.2	158	72	177	109	207	67
5	8.3	65	19	5.6	5.4	7.8	151	66	141	97	195	59
6	9.4	71	18	5.6	5.4	8.8	133	61	123	87	181	52
7	12	71	17	5.4	5.4	10	132	60	134	80	151	45
8	12	77	16	5.4	5.4	12	123	47	90	66	132	42
9	14	78	15	5.4	5.4	14	119	44	169	58	118	40
10	14	71	14	5.4	5.5	16	113	43	98	53	86	39
11	14	53	13	5.4	5.5	20	104	101	38	40	74	36
12	14	71	12	5.4	5.5	27	96	437	34	34	89	30
13	15	71	11	5.4	5.5	39	104	764	28	32	110	31
14	33	57	10	5.4	5.5	50	103	630	29	31	106	32
15	52	27	9.6	5.4	5.5	70	107	517	30	27	100	30
16	122	50	9.2	5.4	5.5	120	106	622	27	25	78	39
17	127	56	8.8	5.4	5.5	170	103	593	25	92	1400	42
18	98	57	8.4	5.4	5.5	200	101	482	21	94	2240	67
19	188	56	8.0	5.4	5.5	270	93	367	27	78	1690	74
20	279	55	7.8	5.4	5.6	380	88	297	22	69	941	116
21	289	52	7.6	5.4	5.6	430	205	229	26	61	521	148
22	244	46	7.4	5.4	5.6	450	202	188	32	55	326	116
23	165	40	7.2	5.4	5.6	440	189	170	49	62	374	99
24	160	35	7.0	5.4	5.7	410	242	154	54	500	326	86
25	148	38	6.8	5.4	5.8	370	244	146	62	941	222	72
26	130	42	6.6	5.4	5.9	320	224	132	220	1020	156	62
27	121	38	6.4	5.4	6.0	275	183	122	201	710	101	61
28	108	35	6.2	5.4	6.1	247	159	113	275	535	87	56
29	98	32	6.0	5.4	---	257	141	122	347	381	86	52
30	93	29	5.8	5.4	---	246	121	150	255	293	88	49
31	90	---	5.8	5.4	---	222	---	399	---	254	80	---
TOTAL	2678.2	1677	365.6	168.6	155.5	5108.2	4441	7410	3917	6348	10867	1857
MEAN	86.4	55.9	11.8	5.44	5.55	165	148	239	131	205	351	61.9
MAX	289	87	27	5.6	6.1	450	244	764	587	1020	2240	148
MIN	4.1	27	5.8	5.4	5.4	6.2	88	43	21	25	74	30
CFSM	.33	.21	.04	.02	.02	.62	.56	.90	.49	.77	1.32	.23
IN.	.37	.23	.05	.02	.02	.71	.62	1.04	.55	.89	1.52	.26
AC-FT	5310	3330	725	334	308	10130	8810	14700	7770	12590	21550	3680

CAL YR 1984 TOTAL 16077.21 MEAN 43.9 MAX 582 MIN .09 CFSM .17 IN 2.25 AC-FT 31890
WTR YR 1985 TOTAL 44993.10 MEAN 123 MAX 2240 MIN 4.1 CFSM .46 IN 6.29 AC-FT 89240

RED RIVER OF THE NORTH BASIN

05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN

LOCATION.--Lat 47°53'15", long 96°16'25", in NW¼NE¼ sec.22, T.151 N., R.44 W., Red Lake County, Hydrologic Unit 09020305, on left bank 40 ft downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 mi upstream from mouth, and 3 mi downstream from Badger Creek.

DRAINAGE AREA.--1,370 mi^2, approximately.

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

REVISED RECORDS.--WSP 355: 1911-12. WSP 1438: 1910-11, 1917(M). WDR MN-84-1:1983.

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

REMARKS.--Estimated daily discharges: Oct. 1-16, Nov. 19-22, and Dec. 3 to Mar.22. Records good except those for periods of no gage-height record, Oct. 1-16, and periods with ice effect, Nov. 19-22 and Dec. 3 to Mar. 22, which are poor.

AVERAGE DISCHARGE.--58 years (1910-17, 1935-81, 1983-85), 320 ft^3/s, 231,800 acre-ft/yr; median of yearly mean discharges, 284 ft^3/s, 206,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,300 ft^3/s, Apr. 25, 1979, gage height, 12.38 ft; maximum gage height, 15.85 ft, Mar. 6, 1983, from high-water mark (backwater from ice); no flow Sept. 15, 1936, Sept. 14, 1939, Aug. 19-22, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,120 ft^3/s, Aug. 19, gage height, 9.86 ft; minimum daily, 36 ft^3/s, Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	379	196	100	73	60	729	687	1180	1210	1540	611
2	41	169	188	98	72	60	778	630	1290	1060	1410	597
3	45	295	185	96	72	60	843	588	1160	963	1310	593
4	45	365	180	94	71	60	751	552	1000	849	1240	583
5	45	385	178	93	70	60	644	534	906	749	1230	574
6	49	370	174	92	70	60	583	511	850	677	1160	547
7	52	354	170	91	70	60	547	485	769	625	1090	542
8	56	314	168	90	69	60	511	472	682	584	983	529
9	60	300	164	89	69	60	463	417	593	537	866	520
10	60	264	160	88	68	72	417	396	516	504	763	498
11	60	206	154	87	67	100	388	388	455	522	738	459
12	60	247	150	86	66	155	376	697	400	486	658	438
13	62	260	148	85	66	205	355	1860	359	409	658	400
14	70	266	144	84	65	287	347	2150	335	377	732	363
15	200	189	140	83	64	330	355	2160	316	348	722	343
16	500	118	138	82	64	400	359	2680	308	320	673	339
17	415	123	135	82	63	500	351	2560	304	518	3440	443
18	404	209	132	82	62	700	335	2330	283	594	6000	471
19	443	250	128	82	62	1000	355	2080	249	564	6720	500
20	898	255	125	81	62	1300	351	1860	251	526	5060	705
21	1080	245	122	80	61	1500	347	1660	246	525	3030	749
22	1030	235	120	79	61	1600	611	1450	266	498	1890	635
23	910	220	118	78	60	1570	822	1260	340	493	1440	524
24	763	207	115	78	60	1360	795	1130	332	1110	1870	435
25	701	211	113	77	60	1260	970	1010	353	2070	1840	371
26	696	233	112	77	60	1140	994	894	414	2250	1310	324
27	656	245	110	76	60	1070	964	828	664	2210	1000	292
28	628	230	108	76	60	937	906	748	888	1930	795	273
29	591	216	106	75	---	766	850	687	1170	1760	717	249
30	539	181	104	74	---	725	784	682	1270	1630	712	234
31	487	---	102	74	---	739	---	758	---	1560	682	---
TOTAL	11682	7541	4387	2609	1827	18256	17881	35144	18149	28458	52279	14141
MEAN	377	251	142	84.2	65.3	589	596	1134	605	918	1686	471
MAX	1080	385	196	100	73	1600	994	2680	1290	2250	6720	749
MIN	36	118	102	74	60	60	335	388	246	320	658	234
CFSM	.28	.18	.10	.06	.05	.43	.44	.83	.44	.67	1.23	.34
IN.	.32	.20	.12	.07	.05	.50	.49	.95	.49	.77	1.42	.38
AC-FT	23170	14960	8700	5170	3620	36210	35470	69710	36000	56450	103700	28050

CAL YR 1984 TOTAL 106891 MEAN 292 MAX 5170 MIN 18 CFSM .21 IN 2.90 AC-FT 212000
WTR YR 1985 TOTAL 212354 MEAN 582 MAX 6720 MIN 36 CFSM .43 IN 5.77 AC-FT 421200

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 100 ft upstream from Sargent Street bridge in Crookston, 0.3 mi downstream from Interstate Power Co.'s dam, 0.6 mi downstream from bridge on U.S. Highway 75, and 53 mi upstream from mouth.

DRAINAGE AREA.--5,280 mi^2, 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 above National Geodetic Vertical Datum of 1929. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft 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.--Estimated daily discharges: Nov. 20-23, and Dec. 2 to Apr. 8. Records good except those for periods with ice effect, Nov. 20-23 and Dec. 2 to Apr. 8, which are fair. Diurnal fluctuation prior to 1975 caused by powerplant 1,000 ft upstream. Runoff from 1,950 mi^2 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.--84 years, 1,144 ft^3/s, 828,800 acre-ft/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,580 ft^3/s, Aug. 19, gage height, 16.38 ft; minimum, 108 ft^3/s, Oct. 8, gage height, 2.76 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	325	1020	775	1040	970	900	2600	1800	4810	4760	2740	3280
2	290	664	800	1040	970	900	2400	1680	5590	4200	2560	3410
3	227	496	820	1030	970	900	2300	1590	5170	3820	2460	3520
4	199	997	840	1030	960	900	2200	1440	4280	3550	2410	3640
5	179	1060	880	1030	960	900	2100	1380	3690	3260	2360	3660
6	120	1260	950	1020	960	900	2000	1400	3360	3040	2390	3450
7	145	1290	1050	1020	960	900	1900	1300	3170	2980	2580	3190
8	119	1230	1100	1010	960	900	1800	1250	3010	2930	2450	2970
9	157	1110	1100	1010	960	950	1740	1410	2830	2820	2340	2800
10	143	1050	1100	1010	950	1000	1760	1450	2620	2660	2250	2630
11	175	986	1100	1010	950	1080	1700	1490	2530	2590	2160	2520
12	204	875	1100	1010	950	1180	1680	1560	2350	2550	2110	2380
13	188	953	1090	1010	940	1300	1690	2630	2110	2490	2080	2100
14	195	1010	1090	1000	940	1420	1630	3930	2010	2380	2130	1990
15	248	945	1090	1000	940	1600	1710	4060	1830	2330	2160	1770
16	290	696	1090	1000	940	1850	1660	4540	1700	2310	2190	1750
17	693	522	1080	1000	940	2020	1580	5230	1760	2550	3830	1750
18	839	547	1080	1000	930	2300	1580	5110	1740	2910	7350	2040
19	870	634	1080	1000	930	2600	1530	4610	1700	2740	9240	2390
20	1080	900	1080	1000	930	3000	1490	4170	1670	2670	9210	2960
21	2220	900	1070	990	930	3200	1430	3800	1730	2550	7640	3980
22	2460	900	1070	990	920	3500	1460	3480	1800	2450	6100	3900
23	2170	900	1070	980	920	3800	1910	3180	1880	2400	5240	3400
24	1800	906	1070	980	920	3900	2180	2970	1850	2920	5140	2760
25	1550	924	1060	980	920	3900	2260	2760	1900	3610	5970	2320
26	1420	912	1060	980	920	3880	2320	2600	2460	3720	5330	2080
27	1330	911	1060	980	910	3750	2230	2710	4070	3660	4390	2070
28	1280	921	1050	980	910	3400	2140	2730	4550	3470	3650	2090
29	1300	874	1050	980	---	3150	2050	2710	4970	3180	3270	2070
30	1320	864	1050	980	---	2900	1970	2600	5120	3070	3070	2040
31	1370	---	1040	980	---	2750	---	3010	---	2820	3120	---
TOTAL	24906	27257	31945	31070	26360	65630	57000	84580	88260	93390	119920	80910
MEAN	803	909	1030	1002	941	2117	1900	2728	2942	3013	3868	2697
MAX	2460	1290	1100	1040	970	3900	2600	5230	5590	4760	9240	3980
MIN	119	496	775	980	910	900	1430	1250	1670	2310	2080	1750
CFSM	.15	.17	.20	.19	.18	.40	.36	.52	.56	.57	.73	.51
IN.	.18	.19	.23	.22	.19	.46	.40	.60	.62	.66	.84	.57
AC-FT	49400	54060	63360	61630	52290	130200	113100	167800	175100	185200	237900	160500

CAL YR 1984 TOTAL 498941 MEAN 1363 MAX 14200 MIN 119 CFSM .26 IN 3.52 AC-FT 989600
WTR YR 1985 TOTAL 731228 MEAN 2003 MAX 9240 MIN 119 CFSM .38 IN 5.15 AC-FT 1450000

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 1962-66, 1968-69, 1973-76, 1979 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
17...	1600	775	460	419	8.5	8.2	10.0	10.0	6.2	729	10.3
NOV											
27...	1030	858	400	389	8.1	8.1	-2.0	0.0	8.0	724	14.0
FEB											
20...	1515	933	320	359	8.2	7.9	5.0	0.5	3.5	722	13.2
APR											
02...	1445	2490	310	321	7.6	7.6	8.0	1.0	70	722	10.2
JUN											
19...	1030	1660	360	359	8.2	8.0	16.0	18.0	4.5	741	8.5
AUG											
08...	1100	2440	415	397	8.3	7.8	23.0	22.0	17	735	7.9

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
17...	180	120	52	22	10	4.4	162	186	50	9.1	0.3
NOV											
27...	>600	240	49	18	5.3	2.6	171	176	23	3.7	<0.1
FEB											
20...	K6	K20	48	17	4.5	2.6	164	177	9.2	2.9	0.1
APR											
02...	K32	K2000	40	14	3.5	3.7	106	126	34	4.6	<0.1
JUN											
19...	40	530	47	17	3.7	2.4	159	165	30	2.8	0.1
AUG											
08...	99	180	53	19	4.2	3.0	177	182	34	3.8	0.2

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
17...	2.0	272	<0.10	0.01	0.9	0.08	0.08	0.04	16	94
NOV										
27...	4.2	217	0.16	<0.01	2.1	0.06	<0.01	<0.01	18	95
FEB										
20...	2.1	208	<0.10	0.08	0.8	<0.01	<0.01	<0.01	16	97
APR										
02...	6.7	209	0.97	<0.01	1.8	0.18	0.04	<0.01	397	97
JUN										
19...	3.2	238	<0.10	<0.01	1.3	0.09	0.02	<0.01	54	100
AUG										
08...	11	281	0.13	<0.01	1.3	0.04	0.02	0.02	82	100

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
17...	1600	20	2	62	<0.5	2	<1	<3	1	16	3
FEB											
20...	1515	<10	<1	59	0.9	<1	<1	<3	<1	6	<1
APR											
02...	1445	60	1	42	<0.5	<1	10	<3	5	160	<1
AUG											
08...	1100	10	4	59	2	<1	8	<3	5	20	<1

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
17...	13	13	<0.1	<10	2	<1	<1	130	<6	7
FEB										
20...	23	6	<0.1	<10	1	<1	<1	93	<6	42
APR										
02...	21	46	<0.1	<10	1	<1	<1	84	<6	18
AUG										
08...	12	4	<0.1	<10	4	<1	<1	120	<6	9

RED RIVER OF THE NORTH BASIN

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND

LOCATION.--Lat 47°56'34", long 97°03'10", in sec.2, T.151 N., R.50 W., Grand Forks County, Hydrologic Unit 09020301, on the right bank, 200 ft upstream from the DeMers Avenue bridge, 0.4 mi downstream from Red Lake River, and at mile 293.8.

DRAINAGE AREA.--30,100 mi^2, approximately, including 3,800 mi^2 in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1882 to current year. Prior to May 1901 monthly discharge only, 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 780.00 ft above National Geodetic Vertical Datum of 1929. Apr. 14, 1965, to Sept. 30, 1983, water-stage recorder 1.9 mi downstream at a datum of 778.35 ft. Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mi upstream at 778.35 ft datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

REMARKS.--Estimated daily discharges: Mar. 16-31 and May 4-5. Records good except those for estimated discharges, which are fair.

AVERAGE DISCHARGE.--103 years, 2,593 ft^3/s, 1,879,000 acre-ft/yr; median of yearly mean discharge, 2,360 ft^3/s, 1,710,000 acre-ft/yr.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 17,800 ft^3/s, May 19, gage height, 25.90 ft; minimum daily, 306 ft^3/s, Oct. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	634	3070	1710	1440	1400	1320	6790	4280	7140	9790	6680	5520
2	565	1980	1520	1380	1410	1330	6750	4200	8810	9520	6250	5800
3	530	1620	1150	1400	1400	1380	6850	4300	10300	8750	5860	5820
4	507	1960	983	1410	1380	1420	6750	4130	11400	7940	5610	5740
5	477	2210	850	1400	1370	1430	6790	3960	12300	7210	5330	5740
6	439	2340	694	1370	1360	1420	6640	3810	12400	6530	5150	5740
7	391	2550	759	1380	1330	1360	6140	3820	11700	6020	5120	5530
8	336	2930	990	1390	1310	1230	5750	3700	12000	5730	5250	5300
9	318	3030	1240	1410	1330	1340	5500	3540	10900	5520	5120	5110
10	306	2870	1580	1410	1370	1600	5200	3510	9200	5270	4880	4890
11	358	2520	1830	1390	1400	1720	4970	3550	7780	5000	4690	4770
12	375	2260	1900	1360	1440	1810	4760	5880	6900	4780	4600	4750
13	403	2090	1850	1390	1400	2170	4640	10300	6300	4590	4450	4630
14	420	2310	1760	1400	1420	2840	4510	14800	5900	4440	4370	4300
15	563	2540	1680	1370	1410	3700	4270	16700	5650	4290	4400	4040
16	602	1910	1590	1360	1400	4620	4200	17200	5350	4200	4530	3770
17	1120	1160	1560	1410	1370	5560	4110	17400	5150	4190	5230	3650
18	2500	1000	1590	1420	1360	7390	3940	17700	5110	4320	7140	3640
19	3220	1090	1590	1410	1330	8520	3830	17700	5130	4630	9030	3830
20	3250	1250	1510	1400	1330	9390	3650	16900	5010	4670	10200	4160
21	3630	1350	1380	1410	1310	10100	3600	15600	4940	4920	11200	4690
22	5370	1600	1450	1410	1310	10700	3390	14000	4930	5160	11200	5560
23	6150	1720	1540	1380	1290	11300	3340	12300	4920	5410	9600	5670
24	5930	1780	1560	1370	1310	11700	3810	10500	4970	5520	8100	5250
25	5600	1930	1560	1360	1320	11700	4230	9130	4970	5880	7520	4580
26	5230	2040	1510	1370	1310	13200	4440	8060	4950	6400	7830	4060
27	4760	2030	1500	1360	1310	12200	4620	7370	5480	6860	7670	3690
28	4310	1900	1490	1360	1320	11200	4620	6980	7360	7190	6800	3620
29	3830	1770	1490	1370	---	9900	4530	6680	8760	7350	6030	3610
30	3560	1740	1480	1370	---	8600	4320	6430	9520	7300	5550	3590
31	3340	---	1460	1380	---	7400	---	6320	---	7130	5270	---
TOTAL	69024	60550	44756	43040	38000	179550	146940	280750	225230	186510	200660	141050
MEAN	2227	2018	1444	1388	1357	5792	4898	9056	7508	6016	6473	4702
MAX	6150	3070	1900	1440	1440	13200	6850	17700	12400	9790	11200	5820
MIN	306	1000	694	1360	1290	1230	3340	3510	4920	4190	4370	3590
CFSM	.07	.07	.05	.05	.05	.19	.16	.30	.25	.20	.22	.16
IN.	.09	.07	.06	.05	.05	.22	.18	.35	.28	.23	.25	.17
AC-FT	136900	120100	88770	85370	75370	356100	291500	556900	446700	369900	398000	279800

CAL YR 1984 TOTAL 1551310 MEAN 4239 MAX 32200 MIN 306 CFSM .14 IN 1.92 AC-FT 3077000
WTR YR 1985 TOTAL 1616060 MEAN 4428 MAX 17700 MIN 306 CFSM .15 IN 2.00 AC-FT 3205000

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1949, 1956 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT					
30...	1320	3440	600	-6.0	2.5
DEC					
20...	1605	1520	640	-18.0	0.0
JAN					
25...	1535	1320	540	-10.0	0.0
FEB					
27...	1620	1320	400	2.0	0.0
MAR					
24...	1400	11700	330	14.0	0.5
26...	1230	13200	355	11.0	1.0
28...	1220	11200	365	-1.0	0.5
APR					
01...	1145	7150	430	10.0	1.0
29...	1215	4340	560	22.0	13.5
MAY					
15...	0945	16600	325	7.5	14.0
17...	1130	17400	400	17.0	14.5
20...	1115	17000	460	14.5	12.0
24...	1055	10600	545	17.0	18.5
JUN					
04...	1320	11400	455	12.0	16.0
17...	1150	5200	515	12.0	19.0
JUL					
22...	1435	5120	480	26.0	24.0
AUG					
21...	1305	10700	465	22.0	23.0
SEP					
24...	1635	4960	475	9.5	10.5

DATE	TIME	PH (STAND-ARD UNITS) (00400)	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)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
OCT								
30...	1320	8.3	65	30	17	6.4	0	160
APR								
01...	1145	8.3	45	19	11	5.6	2	160
SEP								
24...	1635	7.0	55	23	9.0	5.4	16	130

DATE	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)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3) (71851)
OCT						
30...	140	9.0	0.2	14	440	3.1
APR						
01...	61	11	0.1	8.0	199	1.0
SEP						
24...	67	13	0.1	12	296	1.0

DATE	TIME	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
OCT											
30...	1320	4	40	30	<1	23	10	<0.1	3	<1	240
APR											
01...	1145	3	50	50	<1	15	20	0.1	2	<1	120
SEP											
24...	1635	2	60	60	<1	14	10	0.1	1	<1	200

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, on left bank 30 ft upstream of bridge on County Highway 4 in Argyle and 14 mi upstream from mouth.

DRAINAGE AREA.--265 mi^2.

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

GAGE.--Water-stage recorder. Datum of gage is 828.53 ft above 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 downstream at datum 1.0 ft higher. Sept. 19, 1952, to June 28, 1982, recording gage at site 800 feet downstream at present datum. June 29, 1982, to Sept. 20, 1983, nonrecording gage at present site and datum.

REMARKS.--Estimated daily discharges: Oct. 20-23, Dec. 5 to Mar. 29, June 20 to July 9, and Aug. 1-13. Records fair except those for periods of no gage-height record, Oct. 20-23, June 20 to July 9, and Aug. 1-13, and period with ice effect, Dec. 5 to Mar. 29, which are poor.

AVERAGE DISCHARGE.--34 years (water years 1951-81, 1983-85), 41.4 ft^3/s, 29,990 acre-ft/yr; median of yearly mean discharges, 38 ft^3/s, 27,500 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,260 ft^3/s, July 3, 1975, gage height, 16.59 ft 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 present datum, site then in use, from floodmarks, discharge, 2,790 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 939 ft^3/s, June 29, gage height, 12.58 ft, from highwater mark; no flow Oct. 1-10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.43	.52	.17	.13	.20	92	28	79	500	3.7	21
2	.00	.39	.52	.17	.13	.21	100	23	377	370	3.4	20
3	.00	.39	.39	.17	.13	.22	74	21	670	280	3.2	19
4	.00	.43	.35	.16	.13	.24	86	20	683	220	10	54
5	.00	.43	.70	.16	.13	.26	113	16	535	180	20	146
6	.00	.43	.90	.16	.13	.28	92	16	397	135	16	156
7	.00	.44	.60	.15	.13	.30	76	17	270	110	14	139
8	.00	.50	.50	.15	.13	.35	70	17	191	90	12	103
9	.00	.48	.45	.15	.13	.40	62	14	150	75	10	81
10	.00	.46	.40	.14	.13	.50	50	13	124	54	9.0	56
11	.09	.44	.37	.14	.13	.65	43	9.6	100	44	9.4	43
12	.08	.41	.34	.14	.13	.90	42	10	82	35	9.8	33
13	.08	.41	.32	.13	.13	1.2	57	9.2	72	26	10	25
14	.08	.44	.31	.13	.13	1.7	122	12	62	20	10	19
15	.57	.52	.30	.13	.13	2.5	236	63	53	17	10	16
16	.48	.50	.29	.13	.14	4.0	224	83	45	13	9.2	14
17	.25	.46	.28	.13	.14	6.0	183	88	38	13	12	11
18	.25	.37	.27	.13	.14	10	147	125	34	11	39	7.3
19	.73	.39	.26	.13	.14	25	112	132	27	11	92	6.3
20	.70	.32	.25	.13	.15	45	85	114	24	9.6	94	7.0
21	.60	.30	.24	.13	.15	80	64	87	22	13	78	6.6
22	.55	.43	.23	.13	.15	130	54	71	30	16	63	7.5
23	.50	.50	.22	.13	.16	200	47	59	50	12	58	7.3
24	.44	.52	.21	.13	.16	240	43	48	70	9.6	50	7.8
25	.41	.66	.21	.13	.17	255	42	39	120	8.8	57	7.5
26	.32	.79	.20	.13	.17	260	39	34	300	8.0	49	7.5
27	.30	.76	.20	.13	.18	265	38	29	600	7.3	41	11
28	.37	.66	.19	.13	.19	195	36	24	800	6.3	34	16
29	.41	.57	.19	.13	---	170	34	21	900	5.4	31	14
30	.37	.55	.18	.13	---	132	33	20	700	5.4	30	14
31	.37	---	.18	.13	---	102	---	36	---	4.2	26	---
TOTAL	7.95	14.38	10.57	4.33	3.99	2128.91	2496	1298.8	7605	2309.6	913.7	1075.8
MEAN	.26	.48	.34	.14	.14	68.7	83.2	41.9	254	74.5	29.5	35.9
MAX	.73	.79	.90	.17	.19	265	236	132	900	500	94	156
MIN	.00	.30	.18	.13	.13	.20	33	9.2	22	4.2	3.2	6.3
CFSM	.001	.002	.001	.001	.001	.26	.31	.16	.96	.28	.11	.14
IN.	.00	.00	.00	.00	.00	.30	.35	.18	1.07	.32	.13	.15
AC-FT	16	29	21	8.6	7.9	4220	4950	2580	15080	4580	1810	2130

CAL YR 1984	TOTAL	8803.08	MEAN 24.1	MAX 492	MIN .00	CFSM .09	IN 1.24	AC-FT 17460		
WTR YR 1985	TOTAL	17869.03	MEAN 49.0	MAX 900	MIN .00	CFSM .19	IN 2.51	AC-FT 35440		

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 SE¼SE¼SE¼ 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 northeast of Drayton, and at mile 206.7.

DRAINAGE AREA.--34,800 mi^2, approximately, includes 3,800 mi^2 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 above National Geodetic Vertical Datum of 1929 (Minnesota highway benchmark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 mi upstream at datum 1.59 ft higher.

REMARKS.--Estimated daily discharges: Oct. 27 to Nov. 13 and Dec. 19 to Apr. 10. Records good except those for estimated daily discharges, which are fair. Some regulation by reservoirs on tributaries.

AVERAGE DISCHARGE.--36 years (1950-85), 3,846 ft^3/s, 2,786,000 acre-ft/yr; median of yearly mean discharges, 3,340 ft^3/s, 2,420,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 92,900 ft^3/s Apr. 28, 1979, gage height, 43.66 ft; minimum observed, 7.7 ft^3/s, Oct. 16, 1936, gage height, 1.75 ft, former site and datum.

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 17,700 ft^3/s, May 21, gage height, 28.12 ft, Mar. 26; minimum daily, 298 ft^3/s, Oct. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	781	3510	2000	1530	1300	1300	11000	4600	7500	10800	7500	6120
2	695	3140	1870	1500	1300	1300	9700	4470	8200	12200	7400	5750
3	697	2930	1770	1490	1300	1300	8600	4350	9600	12800	7300	6340
4	647	2640	1640	1450	1300	1300	7800	4270	10600	11800	6980	6830
5	600	2000	1410	1400	1300	1330	7600	4190	12200	11000	6710	7010
6	525	1760	1220	1380	1300	1370	7300	3990	12900	10100	6350	7090
7	488	1880	1100	1360	1290	1400	7200	3860	13300	9300	5960	7160
8	461	2090	1020	1340	1280	1440	7000	3760	13300	8500	5630	6980
9	415	2270	994	1320	1270	1490	6700	3650	12800	7600	5430	6450
10	369	2470	1070	1320	1260	1550	6790	3510	12000	7000	5340	5890
11	361	2630	1230	1310	1250	1520	6030	3470	11000	6330	5080	5330
12	319	2610	1450	1310	1300	1730	5450	3480	9900	5740	4880	4920
13	298	2460	1700	1310	1350	1990	5580	4590	9000	5310	4670	4670
14	299	2560	1850	1300	1400	2260	5810	8300	8100	4970	4530	4520
15	361	2480	1890	1300	1400	2800	5490	10800	7700	4720	4350	4260
16	441	2240	1870	1290	1400	3400	5250	13300	6860	4510	4280	3920
17	439	1800	1770	1290	1400	4300	4990	15100	6170	4390	4370	3570
18	543	1750	1700	1280	1400	5500	4650	16400	5730	4290	4900	3270
19	1060	1600	1650	1280	1400	7200	4350	16700	5520	4270	6200	3120
20	2350	1470	1650	1280	1400	8600	4130	17200	5420	4340	8600	3130
21	3290	1420	1620	1270	1350	9800	3940	17400	5360	4490	10000	3340
22	3610	1480	1590	1270	1300	10100	3800	17200	5290	4710	10800	3740
23	4670	1560	1490	1260	1300	11800	3640	16000	5220	4980	11900	4540
24	6080	1700	1470	1260	1300	12800	3540	14700	5150	5210	12100	5180
25	6660	1840	1470	1260	1300	13900	3620	13700	5200	5390	10800	5240
26	6480	1980	1540	1270	1300	16200	4000	12300	5250	5650	9900	4780
27	6090	2070	1570	1280	1300	16100	4350	10800	5220	6200	9500	4130
28	5720	2070	1550	1290	1300	15700	4890	10300	5660	6930	9200	3600
29	5090	2080	1550	1300	---	14700	4670	8700	7600	7100	8700	3270
30	4510	2070	1510	1300	---	13400	4650	8000	9800	7500	8000	3130
31	4110	---	1530	1300	---	12100	---	7600	---	7700	7300	---
TOTAL	68459	64560	47744	41100	37050	199680	172520	286690	247550	215830	224660	147280
MEAN	2208	2152	1540	1326	1323	6441	5751	9248	8252	6962	7247	4909
MAX	6660	3510	2000	1530	1400	16200	11000	17400	13300	12800	12100	7160
MIN	298	1420	994	1260	1250	1300	3540	3470	5150	4270	4280	3120
CFSM	.06	.06	.04	.04	.04	.19	.17	.27	.24	.20	.21	.14
IN.	.07	.07	.05	.04	.04	.21	.18	.31	.26	.23	.24	.16
AC-FT	135800	128100	94700	81520	73490	396100	342200	568600	491000	428100	445600	292100

CAL YR 1984 TOTAL 1656961 MEAN 4527 MAX 32400 MIN 298 CFSM .13 IN 1.77 AC-FT 3287000
WTR YR 1985 TOTAL 1753123 MEAN 4803 MAX 17400 MIN 298 CFSM .14 IN 1.87 AC-FT 3477000

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 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT					
16...	1235	422	650	6.5	12.0
DEC					
19...	1435	1640	770	--	0.0
JAN					
22...	1740	1280	615	-7.0	0.0
MAR					
27...	1520	16200	418	6.0	1.0
APR					
02...	1515	9600	490	12.0	2.5
MAY					
02...	1410	4460	665	--	14.5
17...	1135	15100	332	16.0	15.0
20...	1340	17200	460	13.0	15.0
24...	1225	14700	560	22.5	17.5
JUN					
05...	1345	12200	570	20.0	16.5
JUL					
24...	1050	5180	680	20.5	21.5
SEP					
11...	1320	5020	525	22.0	17.0

DATE	TIME	PH (STAND-ARD UNITS) (00400)	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)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)
OCT								
16...	1235	8.5	53	27	43	7.6	0	200
APR								
02...	1515	8.2	46	19	24	6.5	15	100
SEP								
11...	1320	7.3	57	25	19	5.0	15	160

DATE	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)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS NO3) (71851)
OCT						
16...	69	54	0.2	5.3	408	1.0
APR						
02...	64	31	0.2	2.3	197	1.0
SEP						
11...	64	27	0.2	12	335	1.0

DATE	TIME	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
OCT											
16...	1235	3	80	<10	<1	27	10	<0.1	1	<1	230
APR											
02...	1515	3	40	30	<1	20	10	0.1	1	<1	210
SEP											
11...	1320	2	60	50	<1	19	30	0.5	1	<1	230

RED RIVER OF THE NORTH BASIN

05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN

LOCATION.--Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., Kittson County, Hydrologic Unit 09020312, on left bank 70 ft upstream from culvert on U.S. Highway 59 at town of Lake Bronson and 3.4 mi downstream from dam at outlet of Bronson Lake.

DRAINAGE AREA.--444 mi^2.

PERIOD OF RECORD.--September 1928 to November 1936, April to September 1937, April 1941 to October 1943, April to December 1944, April 1945 to September 1947, October 1953 to September 1981, April to September 1985. Monthly discharge only for some periods, published in WSP 1308. October 1981 to March 1985, annual maximums only. Published as South Fork Two Rivers at Bronson prior to 1941.

REVISED RECORDS.--WSP 1308: 1929(M), 1931(M), 1936(M), 1944(M), 1947(M).

GAGE.--Water-stage recorder. Datum of gage is 928.53 ft above National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation bench mark). Prior to Nov. 23, 1953, nonrecording gage at bridge 100 ft downstream at datum 2.00 ft higher. Nov 23, 1953, to Oct. 5, 1963, water-stage recorder at same site at datum 2.00 ft higher.

REMARKS.--No estimated daily discharges. Records good. Flow partly regulated since 1937 by Bronson Lake, usable capacity, 3,700 acre-ft.

AVERAGE DISCHARGE.--40 years (water years 1929-36, 1942, 1943, 1946, 1947, 1954-81), 87.3 ft^3/s, 63,250 acre-ft/yr; median of yearly mean discharges, 56 ft^3/s, 40,600 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,410 ft^3/s, Apr. 5, 1966, gage height, 18.23 ft; no flow at times in 1937, 1941, 1960, 1973.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,790 ft^3/s, June 26, gage height, 12.16 ft; minimum (April to September), 6.0 ft^3/s, May 5, gage height, 3.47 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							360	47	53	2010	11	338
2							461	53	76	1850	12	331
3							580	37	179	1540	14	700
4							597	6.5	123	1310	184	1010
5							471	6.1	85	980	612	956
6							357	7.0	80	705	521	741
7							290	7.9	66	585	385	635
8							221	15	55	465	341	553
9							137	28	54	397	310	419
10							106	27	38	419	262	357
11							135	457	24	331	264	349
12							137	929	24	246	297	281
13							239	814	23	199	299	251
14							844	700	16	155	303	241
15							858	510	17	107	322	216
16							722	456	17	60	298	30
17							482	577	17	86	351	107
18							300	479	17	101	617	125
19							228	255	16	97	561	104
20							153	182	16	21	442	93
21							151	207	16	22	366	77
22							115	144	16	39	317	76
23							71	106	15	56	331	74
24							74	92	15	38	457	58
25							82	97	947	30	660	46
26							69	92	2710	21	607	48
27							66	89	2570	22	494	47
28							61	58	2510	21	411	45
29							30	20	2430	18	391	44
30							30	21	2260	11	376	33
31							---	45	---	11	352	---
TOTAL							8427	6564.5	14485	11953	11168	8385
MEAN							281	212	483	386	360	280
MAX							858	929	2710	2010	660	1010
MIN							30	6.1	15	11	11	30
CFSM							.63	.48	1.09	.87	.81	.63
IN.							.71	.55	1.21	1.00	.94	.70
AC-FT							16710	13020	28730	23710	22150	16630

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 downstream from Canadian National Railway bridge in Emerson, 0.8 mi downstream from international boundary, 3.6 mi downstream from Pembina River, and at mile 154.3.

DRAINAGE AREA.--40,200 mi^2, approximately, includes 3,800 mi^2 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 above 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. Records provided by Water Survey of Canada.

AVERAGE DISCHARGE.--73 years (water years 1913-85), 3,350 ft^3/s, 2,427,000 acre-ft/yr; median of yearly mean discharges, 2,850 ft^3/s, 2,065,000 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 95,500 ft^3/s, May 13, 1950, gage height, 90.89 ft; maximum gage height, 91.19 ft, May 1, 1979; minimum observed discharge, 0.9 ft^3/s, Feb. 6-8, 1937.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 16,700 ft^3/s, Mar. 29; minimum daily, 286 ft^3/s, Oct. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	809	3710	1760	1300	1140	1240	16200	5050	7170	12000	6570	6990
2	752	3250	1770	1290	1140	1250	15000	4940	7270	12900	6460	6460
3	699	2770	1750	1280	1140	1250	13200	4800	7910	13400	6180	6460
4	671	2560	1710	1270	1140	1260	11600	4700	9180	13500	6040	6990
5	639	2230	1670	1260	1130	1280	10700	4630	10600	12900	5860	7660
6	600	2010	1560	1250	1130	1300	9960	4520	11500	12000	6110	8050
7	562	1890	1390	1240	1140	1330	9290	4380	11900	10800	6390	8090
8	509	1810	1210	1230	1130	1360	8690	4270	12000	9500	6140	7950
9	463	1800	1050	1230	1140	1380	8050	4200	12000	8260	5760	7560
10	431	1760	924	1220	1140	1370	7420	4100	11800	7350	5620	7130
11	388	1720	882	1220	1140	1350	6890	4170	11200	6710	5470	6600
12	345	1700	950	1210	1140	1370	6390	4380	10300	6290	5370	6140
13	320	1670	1130	1210	1140	1470	6180	4940	9150	5900	5260	5860
14	286	1650	1380	1210	1150	1570	6390	6530	7980	5620	5120	5620
15	312	1620	1580	1200	1150	1660	6530	9390	7100	5330	5050	5470
16	360	1600	1690	1200	1150	1880	6600	11700	6460	5160	4940	5260
17	420	1590	1740	1200	1150	2500	6460	13100	6000	5010	5010	5010
18	438	1580	1720	1190	1150	3800	6180	14200	5650	4840	5160	4700
19	533	1560	1650	1190	1160	5560	5760	15100	5440	4800	5650	4450
20	830	1550	1590	1190	1160	7570	5400	15900	5260	4800	7310	4380
21	2060	1530	1550	1180	1160	9640	5160	16200	5190	4870	9040	4340
22	2980	1530	1530	1180	1160	11100	4940	16500	5160	4940	10100	4450
23	3330	1520	1500	1180	1160	12200	4770	16200	5050	5050	11100	4730
24	4130	1510	1470	1170	1160	13300	4630	15500	4980	5190	11800	5230
25	5090	1500	1440	1170	1180	14400	4520	14500	5160	5370	11900	5620
26	5440	1530	1410	1170	1200	15400	4590	13000	5400	5440	11300	5620
27	5370	1580	1390	1160	1210	16300	4800	11500	5930	5620	10700	5300
28	5190	1660	1370	1160	1220	16600	5010	9990	6780	5900	10200	4870
29	4870	1730	1350	1150	---	16700	5120	8860	8230	6180	9570	4520
30	4450	1750	1330	1150	---	16600	5120	8020	10300	6430	8650	4240
31	4060	---	1310	1150	---	16300	---	7450	---	6530	7770	---
TOTAL	57337	55870	44756	37410	32310	200290	221550	282720	238050	228590	227600	175750
MEAN	1850	1862	1444	1207	1154	6461	7385	9120	7935	7374	7342	5858
MAX	5440	3710	1770	1300	1220	16700	16200	16500	12000	13500	11900	8090
MIN	286	1500	882	1150	1130	1240	4520	4100	4980	4800	4940	4240
AC-FT	113700	110800	88770	74200	64090	397300	439400	560800	472200	453400	451400	348600

CAL YR 1984 TOTAL 1562547 MEAN 4269 MAX 30200 MIN 286 AC-FT 3099000
WTR YR 1985 TOTAL 1802233 MEAN 4938 MAX 16700 MIN 286 AC-FT 3575000

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DISCHARGE, IN CUBIC FEET PER SECOND (00060)	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	COLIFORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT											
23...	1420	3330	--	890	8.4	8.0	7.0	76	10.6	250	130
DEC											
18...	1330	1720	--	820	8.3	-20.0	0.0	5.3	12.0	K20	K30
MAR											
13...	1325	--	1480	535	7.8	6.0	0.0	4.8	11.7	--	--
MAY											
02...	1645	4940	--	655	--	21.0	15.0	54	9.0	--	--
JUN											
27...	1200	5930	--	570	7.5	12.0	16.0	170	9.2	16	K140
AUG											
13...	1645	--	5240	482	7.2	19.5	15.0	150	9.3	K40	370

DATE	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY FIELD (MG/L AS CACO3) (00410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
OCT										
23...	63	38	71	7.8	240	160	80	0.3	6.4	567
DEC										
18...	81	39	40	6.7	--	130	37	0.2	11	526
MAR										
13...	58	27	21	4.3	220	36	19	0.2	9.5	322
MAY										
02...	70	30	30	6.0	--	110	27	0.2	8.1	415
JUN										
27...	60	30	19	4.7	212	92	14	0.2	11	371
AUG										
13...	58	25	17	4.2	--	44	16	0.2	15	307

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA DISSOLVED (MG/L AS NH4) (71846)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	CYANIDE TOTAL (MG/L AS CN) (00720)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
23...	0.25	0.26	0.33	1.5	0.37	0.24	0.19	--	240	2000	100
DEC											
18...	0.43	0.21	0.27	1.5	0.20	0.14	0.12	--	--	--	--
MAR											
13...	0.46	0.10	0.13	1.1	0.08	0.06	0.06	<0.01	--	--	100
MAY											
02...	<0.10	0.05	0.06	1.2	0.16	0.03	0.02	<0.01	229	3080	100
JUN											
27...	0.67	0.07	0.09	1.9	0.38	0.15	0.12	--	--	--	--
AUG											
13...	<0.10	0.01	0.01	--	--	--	0.01	--	266	3760	100

05102500 RED RIVER AT EMERSON, MANITOBA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
OCT										
23...	1420	30	2	80	<0.5	<1	4	<3	4	11
MAR										
13...	1325	20	<1	69	<0.5	<1	<1	<3	<1	3
MAY										
02...	1645	10	2	66	<0.5	<1	1	<3	5	15
AUG										
13...	1645	50	5	240	<0.5	<1	<1	<3	8	39

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT									
23...	4	53	5	<0.1	<10	<1	<1	300	14
MAR									
13...	<1	22	10	<0.1	<10	1	<1	160	22
MAY									
02...	<1	31	5	<0.1	<10	4	<1	230	14
AUG									
13...	1	16	11	<0.1	<10	5	<1	170	57

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 downstream from South Fork and 1.5 mi northwest of Malung.

DRAINAGE AREA.--573 mi^2.

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, adjustment of 1912.

REMARKS.--Estimated daily discharges: March 21-31 and August 20. Records good except those for period of no gage-height record, Aug. 20, and period with ice effect, Mar. 21-31, which are fair. Some flow bypasses the gaging station through a natural overflow channel 0.8 mi upstream and returns to river 0.5 mi downstream. Overflow begins at stage of about 13.0 ft, discharge, 1,800 ft^3/s. These records include any flow in the overflow channel.

AVERAGE DISCHARGE.--39 years, 145 ft^3/s, 105,100 acre-ft/yr; median of yearly mean discharges, 114 ft^3/s, 82,600 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,750 ft^3/s, July 18, 1968, gage height, 22.32 ft; maximum gage height, 23.37 ft, 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, 5,170 ft^3/s, June 29, gage height, 21.14 ft; minimum, 0.11 ft^3/s, Oct. 1, gage height, 3.91 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.12	87	33	4.9	4.1	4.9	736	314	594	3430	20	263
2	.15	89	27	4.9	4.0	4.9	714	298	743	2560	19	254
3	.17	94	23	4.8	3.8	4.9	624	286	763	1820	17	565
4	.19	90	19	4.8	4.0	4.9	515	276	710	1360	112	761
5	.21	73	16	4.8	3.7	5.1	399	264	613	1050	159	807
6	.24	67	13	4.9	3.7	5.1	339	251	505	804	139	765
7	.26	62	11	4.9	3.6	5.3	288	233	400	596	137	677
8	.27	61	11	4.8	3.4	5.1	235	211	318	442	127	576
9	.30	56	12	4.9	3.4	5.1	188	193	260	339	114	457
10	.31	55	12	4.8	3.6	5.3	170	179	212	251	97	339
11	.34	53	12	4.6	3.6	5.5	164	201	175	198	88	275
12	.36	58	9.2	4.4	3.7	5.6	162	564	144	156	92	226
13	.38	56	7.9	4.6	3.8	5.7	446	889	122	127	106	187
14	.43	49	7.2	4.6	3.8	5.9	762	1140	104	106	116	162
15	1.8	38	6.9	4.3	3.8	5.9	765	1240	90	90	113	145
16	2.2	27	7.4	4.4	4.0	5.9	630	1300	82	78	109	131
17	4.6	33	7.4	4.6	4.0	6.3	513	1470	80	70	332	120
18	5.5	37	8.2	4.5	4.0	6.5	421	1660	76	64	582	112
19	9.5	28	8.5	4.4	4.0	6.9	341	1520	68	59	651	105
20	42	24	8.5	4.2	4.2	7.7	304	1250	60	55	640	112
21	129	22	8.7	3.9	4.2	13	286	978	57	51	620	170
22	175	22	7.9	4.0	4.3	30	320	751	68	46	610	272
23	197	21	7.7	4.0	4.3	70	465	599	95	38	590	304
24	192	22	6.7	4.0	4.4	130	532	499	121	34	713	301
25	173	23	5.9	4.0	4.6	220	545	420	688	32	708	277
26	156	29	5.3	4.1	4.6	350	540	372	1610	31	664	242
27	145	35	4.7	4.1	4.6	500	495	329	3120	32	590	212
28	139	38	4.9	4.0	4.9	620	435	291	4910	31	530	186
29	130	39	4.9	4.1	---	700	376	260	5010	27	473	166
30	123	39	4.9	4.0	---	750	340	243	4290	24	374	153
31	111	---	4.9	4.1	---	760	---	325	---	22	302	---
TOTAL	1739.33	1427	326.7	137.4	112.1	4255.5	13050	18806	26088	14023	9944	9322
MEAN	56.1	47.6	10.5	4.43	4.00	137	435	607	870	452	321	311
MAX	197	94	33	4.9	4.9	760	765	1660	5010	3430	713	807
CFSM	.10	.08	.02	.008	.007	.24	.76	1.06	1.52	.79	.56	.54
IN.	.11	.09	.02	.01	.01	.28	.85	1.22	1.69	.91	.65	.61
AC-FT	3450	2830	648	273	222	8440	25880	37300	51750	27810	19720	18490

CAL YR 1984 TOTAL 31916.79 MEAN 87.2 MAX 1200 MIN .06 CFSM .15 IN 2.07 AC-FT 63310
WTR YR 1985 TOTAL 99231.03 MEAN 272 MAX 5010 MIN .12 CFSM .48 IN 6.44 AC-FT 196800

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 upstream from Pine Creek, 3.8 mi downstream from Sprague Creek, and 7 mi northwest of Roseau.

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

GAGE.--Water-stage recorder. Datum of gage is 1,018.59 ft, 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, May 13, 1950; minimum observed, 1,019.75 ft, Aug. 16, 1941.

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

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,032.77 ft, July 2; minimum recorded, 1,021.69 ft, Oct. 19, but may have been less during period of no gage-height record, Oct. 24 to Mar. 20.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22.11					---	29.92	26.26	28.90	32.64	23.14	28.64
2	22.14					---	29.81	26.04	29.18	32.75	23.02	28.49
3	22.16					---	29.75	25.84	29.26	32.75	23.02	29.29
4	22.19					---	29.64	25.66	29.26	32.74	27.71	30.08
5	22.19					---	29.34	25.77	29.21	32.67	29.18	30.52
6	22.20					---	29.03	25.74	29.09	32.54	28.86	30.70
7	22.22					---	28.66	25.56	28.91	32.35	28.57	30.79
8	22.24					---	28.21	25.31	28.79	32.10	28.38	30.74
9	22.26					---	27.73	25.02	28.58	31.83	28.08	30.63
10	22.29					---	27.24	24.69	28.36	31.56	27.66	30.46
11	22.34					---	26.84	24.59	28.01	31.23	27.16	30.22
12	22.36					---	26.48	25.51	27.58	30.92	27.10	29.99
13	22.39					---	26.84	27.59	27.09	30.57	27.64	29.72
14	22.44					---	28.10	28.55	26.58	30.19	27.71	29.47
15	22.40					---	28.26	28.86	26.12	29.83	27.51	29.18
16	22.10					---	28.04	29.32	25.71	29.44	27.13	28.92
17	21.91					---	27.84	29.73	25.48	29.09	27.96	28.62
18	21.71					---	27.54	29.93	25.33	28.65	29.16	28.28
19	21.75					---	27.16	30.03	25.06	28.14	29.26	27.96
20	22.74					---	26.79	30.05	24.68	27.59	29.23	27.63
21	23.68					22.97	26.49	29.98	24.35	26.93	29.14	27.36
22	24.18					24.14	26.45	29.83	24.46	26.16	29.09	27.26
23	24.41					27.83	26.85	29.66	24.81	25.45	29.10	27.24
24	---					29.68	27.07	29.42	24.78	24.91	29.45	27.11
25	---					30.12	27.11	29.21	25.51	24.49	29.62	26.89
26	---					30.37	27.14	28.96	29.24	24.14	29.59	26.56
27	---					30.44	27.10	28.71	30.49	23.87	29.49	26.22
28	---					30.43	26.94	28.37	31.25	23.66	29.37	25.94
29	---					30.29	26.71	28.06	31.85	23.49	29.24	25.66
30	---					30.14	26.51	27.78	32.34	23.37	29.06	25.41
31	---					30.04	---	28.11	---	23.24	28.84	---
MEAN	---					---	27.72	27.68	27.68	28.69	28.05	28.53
MAX	---					---	29.92	30.05	32.34	32.75	29.62	30.79
MIN	---					---	26.45	24.59	24.35	23.24	23.02	25.41

RED RIVER OF THE NORTH BASIN

05107500 ROSEAU RIVER AT ROSS, MN

LOCATION.--Lat 48°54'37", long 95°55'18", in NE¼SE¼ sec.27, T.163 N., R.41 W., Roseau County, Hydrologic Unit 09020314, on left bank 300 ft downstream from highway bridge, 0.2 mi north of Ross, and 2.3 mi downstream from Pine Creek.

DRAINAGE AREA.--1,220 mi^2, 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, adjustment of 1928 (levels by Geodetic Survey of Canada). Prior to Mar. 13, 1929, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 1 to Apr. 3. Records good except those for period with ice effect, Nov. 1 to Apr. 3, which are poor. High flow affected by natural storage in Roseau Lake.

AVERAGE DISCHARGE.--57 years, 265 ft^3/s, 192,000 acre-ft/yr; median of yearly mean discharges, 239 ft^3/s, 173,200 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,560 ft^3/s, May 12, 1950, gage height, 18.25 ft; 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 in 1896. Other outstanding floods reached the following stages, from information by local residents: flood of July 1919, 17.5 ft; flood of 1927, about 16 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,010 ft^3/s, July 5, gage height, 13.27 ft; minimum, 1.8 ft^3/s, Oct. 2, 3, gage height, 0.97 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	180	67	11	8.2	7.0	1300	562	987	1760	111	969
2	1.9	170	62	11	8.1	7.0	1320	528	1050	1860	105	945
3	2.0	160	46	11	8.0	7.0	1290	499	1080	1940	112	1070
4	2.2	150	37	11	8.0	7.0	1190	471	1090	1990	792	1200
5	4.9	140	31	10	8.0	7.0	1150	489	1090	2010	1050	1300
6	8.1	130	27	10	8.0	7.1	1100	482	1080	1990	1020	1370
7	9.3	120	24	10	8.0	7.2	1030	459	1050	1950	972	1410
8	9.6	115	22	10	8.0	7.2	950	422	1020	1880	934	1420
9	9.9	105	21	10	7.9	7.3	846	377	974	1800	870	1410
10	11	98	19	10	7.8	7.4	748	335	938	1720	792	1380
11	12	93	18	10	7.7	7.6	675	319	874	1620	702	1330
12	14	85	18	10	7.6	7.6	611	424	795	1530	677	1280
13	15	80	17	10	7.5	7.9	650	738	709	1440	759	1210
14	17	74	16	10	7.4	8.0	846	911	625	1340	778	1150
15	31	69	16	10	7.4	8.3	881	972	547	1250	747	1090
16	34	64	15	9.8	7.4	8.5	856	1040	485	1160	684	1020
17	33	60	15	9.8	7.3	8.9	821	1090	448	1080	786	951
18	33	55	14	9.6	7.3	9.5	774	1140	425	983	993	883
19	33	51	14	9.5	7.2	10	711	1180	387	880	1040	815
20	67	46	13	9.4	7.2	12	647	1230	336	775	1050	751
21	180	43	13	9.3	7.2	14	597	1250	292	660	1040	698
22	274	39	13	9.2	7.2	40	585	1250	300	539	1040	669
23	300	37	13	9.1	7.2	74	644	1220	344	431	1060	659
24	304	37	12	9.0	7.1	150	679	1170	344	353	1120	636
25	292	39	12	8.9	7.1	230	691	1120	417	291	1150	596
26	267	46	12	8.8	7.1	410	696	1070	965	240	1160	549
27	245	52	12	8.7	7.0	580	692	1010	1150	197	1150	500
28	235	60	12	8.6	7.0	750	668	949	1260	171	1130	456
29	226	68	12	8.5	---	1000	632	886	1390	149	1100	416
30	205	70	11	8.4	---	1150	600	829	1580	134	1060	382
31	189	---	11	8.3	---	1250	---	875	---	122	1010	---
TOTAL	3066.9	2536	645	298.9	210.9	5807.5	24880	25297	24032	34245	26994	28515
MEAN	98.9	84.5	20.8	9.64	7.53	187	829	816	801	1105	871	951
MAX	304	180	67	11	8.2	1250	1320	1250	1580	2010	1160	1420
MIN	1.9	37	11	8.3	7.0	7.0	585	319	292	122	105	382
CFSM	.08	.07	.02	.008	.006	.15	.68	.67	.66	.91	.71	.78
IN.	.09	.08	.02	.01	.01	.18	.76	.77	.73	1.04	.82	.87
AC-FT	6080	5030	1280	593	418	11520	49350	50180	47670	67920	53540	56560

CAL YR 1984 TOTAL 60516.95 MEAN 165 MAX 1240 MIN .32 CFSM .14 IN 1.85 AC-FT 120000
WTR YR 1985 TOTAL 176528.20 MEAN 484 MAX 2010 MIN 1.9 CFSM .40 IN 5.38 AC-FT 350100

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 downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mi west of Caribou.

DRAINAGE AREA.--1,570 mi^2, 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, 1928 datum, (levels by Geodetic Survey of Canada). Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mi upstream at datum 0.95 ft lower.

REMARKS.--Estimated daily discharges: Oct. 31 to Dec. 17, Dec. 20-30, Jan. 19-21, and Feb.3 to Apr. 2. Records good except those for those periods with ice effect, Oct. 31 to Dec. 17, Dec. 20-30, Jan. 19-21, and Feb. 3 to Apr. 2, which are poor. Satellite telemeter at station. 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.--28 years (water years 1921-30, 1933, 1937, 1941-43, 1973-85), 289 ft^3/s, 209,400 acre-ft/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,080 ft^3/s, May 19, 1950, gage height, 11.81 ft; 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 at former site.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,490 ft^3/s, July 16-18, gage height, 7.37 ft; maximum gage height, 8.93 ft, Apr. 2 (backwater from ice); minimum discharge, 0.23 ft^3/s, Oct. 4, 5, 11,12; minimum gage height, 1.18 ft, Oct. 11, 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.35	200	75	12	7.1	5.2	1000	622	989	1080	218	1090
2	.35	190	75	11	7.1	5.2	1130	589	985	1100	181	1100
3	.31	180	65	11	7.0	5.2	1170	555	990	1130	160	1150
4	.27	170	55	11	6.9	5.2	1170	532	995	1150	441	1230
5	.27	160	40	11	6.8	5.2	1170	526	999	1180	845	1260
6	.31	150	35	11	6.7	5.2	1180	531	1010	1210	966	1250
7	.35	140	30	11	6.6	5.2	1170	521	1010	1250	989	1240
8	.35	130	25	11	6.5	5.3	1130	490	1010	1290	991	1250
9	.31	120	22	11	6.5	5.4	1110	458	1000	1320	986	1260
10	.31	115	20	10	6.4	5.5	1100	417	1010	1350	970	1280
11	.27	110	19	10	6.3	5.6	1050	385	997	1380	948	1300
12	.27	105	18	10	6.2	5.8	986	365	989	1420	946	1310
13	.31	100	18	10	6.1	6.2	922	444	970	1440	928	1330
14	.39	95	17	11	6.0	6.4	869	640	939	1460	896	1360
15	.94	85	16	10	6.0	6.7	902	795	897	1480	881	1380
16	3.0	65	16	9.2	5.9	7.0	916	895	835	1480	854	1390
17	19	80	15	8.8	5.8	7.5	914	928	759	1490	873	1400
18	20	70	15	8.8	5.7	8.0	892	953	683	1490	875	1390
19	25	60	14	8.7	5.6	9.0	854	977	622	1470	902	1390
20	24	55	14	8.3	5.5	10	799	997	566	1450	919	1390
21	45	50	14	8.0	5.4	15	732	1020	511	1410	935	1360
22	164	45	14	7.7	5.4	20	668	1040	466	1370	948	1340
23	248	42	14	7.4	5.3	30	631	1050	451	1310	985	1310
24	290	40	13	7.4	5.3	50	644	1050	468	1230	1030	1270
25	308	40	13	7.4	5.2	100	673	1060	481	1110	1030	1230
26	299	45	13	7.4	5.2	200	690	1060	561	947	1040	1180
27	286	50	13	7.4	5.2	300	696	1050	776	744	1050	1120
28	258	60	13	7.3	5.2	500	691	1030	995	556	1050	1050
29	246	70	12	7.1	---	700	678	1020	1030	421	1060	973
30	233	75	12	7.1	---	800	655	1010	1050	326	1070	876
31	220	---	12	7.1	---	900	---	1010	---	264	1080	---
TOTAL	2693.36	2897	747	286.1	168.9	3739.8	27192	24020	25044	36308	27047	37459
MEAN	86.9	96.6	24.1	9.23	6.03	121	906	775	835	1171	872	1249
MAX	308	200	75	12	7.1	900	1180	1060	1050	1490	1080	1400
MIN	.27	40	12	7.1	5.2	5.2	631	365	451	264	160	876
CFSM	.06	.06	.02	.006	.004	.08	.58	.49	.53	.75	.56	.80
IN.	.06	.07	.02	.01	.00	.09	.64	.57	.59	.86	.64	.89
AC-FT	5340	5750	1480	567	335	7420	53940	47640	49670	72020	53650	74300

CAL YR 1984 TOTAL 70711.45 MEAN 193 MAX 1200 MIN .27 CFSM .12 IN 1.68 AC-FT 140300
WTR YR 1985 TOTAL 187602.16 MEAN 514 MAX 1490 MIN .27 CFSM .33 IN 4.45 AC-FT 372100

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 1973 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
23...	1145	246	540	496	8.2	7.7	3.0	4.0	7.8	734	10.4
JAN											
15...	1030	10	--	599	7.3	7.3	-15.0	0.0	6.0	728	3.8
MAY											
21...	1015	992	320	318	7.9	7.7	9.0	13.0	10	732	5.9
AUG											
20...	1045	919	360	338	7.8	7.4	18.0	15.5	5.5	741	6.4

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
23...	K420	K960	53	26	17	4.0	185	206	50	16	0.2
JAN											
15...	K4	K16	85	34	12	2.6	283	317	25	6.4	0.2
MAY											
21...	--	68	45	14	3.6	2.1	114	152	17	3.5	0.1
AUG											
20...	82	220	43	17	4.0	3.5	151	151	24	5.5	0.2

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
23...	8.5	328	0.57	0.03	1.0	0.24	0.11	0.11	59	98
JAN										
15...	21	410	<0.10	0.28	1.4	0.05	0.05	0.02	24	88
MAY										
21...	12	237	<0.10	0.02	1.1	0.05	<0.01	<0.01	48	96
AUG										
20...	10	232	0.23	0.04	1.0	0.14	0.11	0.06	46	100

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
23...	1145	10	3	48	<0.5	<1	<1	<3	2	30	<1
JAN											
15...	1030	10	2	70	<0.5	1	10	<3	2	170	2
MAY											
21...	1015	40	1	42	<0.5	<1	20	<3	2	93	3
AUG											
20...	1045	10	5	40	<0.5	<1	10	<3	2	94	<1

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
23...	12	9	<0.1	<10	2	<1	<1	140	<6	5
JAN										
15...	13	420	0.1	<10	1	<1	<1	180	<6	20
MAY										
21...	11	17	0.1	<10	7	<1	<1	81	<6	11
AUG										
20...	11	15	<0.1	<10	<1	<1	<1	95	<6	6

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 upstream from South Kawishiwi River, 2.2 mi southwest of Fernberg Lookout Tower and 14 mi east of Ely.

DRAINAGE AREA.--253 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,450 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--No estimated daily discharges. Records good.

AVERAGE DISCHARGE.--19 years, 216 ft^3/s, 11.59 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,720 ft^3/s, Apr. 24, 1976, gage height, 5.92 ft; minimum, 4.5 ft^3/s, Jan. 30 to Feb. 2, 1977, gage height, 2.14 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 669 ft^3/s, May 12-16, gage height, 4.78 ft; minimum, 16 ft^3/s, Nov. 21, gage height, 2.50 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	19	19	34	61	51	46	453	463	334	114	64
2	21	18	18	35	61	50	46	487	463	339	110	62
3	19	18	18	36	60	48	50	512	459	341	107	64
4	19	18	18	38	60	55	51	546	454	354	106	65
5	19	18	18	39	60	55	49	573	453	340	110	65
6	19	18	18	39	60	55	48	597	448	326	115	64
7	19	18	18	42	60	55	48	616	438	305	113	64
8	19	18	18	44	60	54	47	627	425	287	104	62
9	19	18	18	46	61	53	47	637	405	266	98	59
10	18	18	18	46	60	51	47	635	385	247	96	57
11	18	18	18	47	61	51	48	651	367	232	92	56
12	18	18	18	50	60	48	51	662	348	217	91	53
13	18	18	18	51	59	50	63	669	334	207	94	52
14	18	18	18	54	58	49	68	669	319	194	88	50
15	18	19	18	54	57	48	77	668	303	189	85	50
16	18	18	24	54	57	48	84	665	292	182	82	50
17	20	18	26	55	55	46	86	663	293	172	84	58
18	20	17	26	56	55	46	87	649	290	169	85	58
19	21	17	26	57	57	46	91	633	277	167	84	60
20	21	17	26	57	57	45	99	610	266	163	79	65
21	21	17	26	60	57	44	115	585	256	156	77	59
22	21	17	27	60	56	44	131	568	255	148	74	58
23	21	17	26	60	54	44	168	547	239	143	76	66
24	20	17	26	60	53	45	212	522	225	139	77	85
25	20	17	26	60	53	45	253	502	220	141	77	86
26	20	17	26	60	53	45	292	489	245	135	73	87
27	20	18	27	60	52	46	326	468	266	132	72	86
28	22	20	29	60	52	46	361	446	296	126	69	88
29	21	19	32	61	---	47	392	429	318	121	68	88
30	20	19	32	61	---	46	428	418	331	118	66	97
31	20	---	33	61	---	45	---	449	---	116	65	---
TOTAL	610	537	709	1597	1609	1501	3911	17645	10133	6506	2731	1978
MEAN	19.7	17.9	22.9	51.5	57.5	48.4	130	569	338	210	88.1	65.9
MAX	22	20	33	61	61	55	428	669	463	354	115	97
MIN	18	17	18	34	52	44	46	418	220	116	65	50
CFSM	.08	.07	.09	.20	.23	.19	.51	2.25	1.34	.83	.35	.26
IN.	.09	.08	.10	.23	.24	.22	.58	2.59	1.49	.96	.40	.29
AC-FT	1210	1070	1410	3170	3190	2980	7760	35000	20100	12900	5420	3920

CAL YR 1984	TOTAL	63360	MEAN 173	MAX 946	MIN 17	CFSM .68	IN 9.32	AC-FT	125700	
WTR YR 1985	TOTAL	49467	MEAN 136	MAX 669	MIN 17	CFSM .54	IN 7.27	AC-FT	98120	

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued
(Hydrologic bench-mark station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years, 1966 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
03...	1145	19	28	29	6.2	6.5	11.0	11.0	1.0	718	9.4
FEB											
06...	1215	60	28	33	6.8	6.7	-12.0	0.0	0.5	723	12.8
APR											
30...	1415	447	31	31	6.8	7.2	13.0	11.0	1.0	732	10.9
SEP											
04...	1000	66	29	32	6.8	6.6	15.0	16.5	0.7	720	7.2

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
03...	K1	K1	3.2	1.4	2.2	0.3	9	10	3.2	0.7	<0.1
FEB											
06...	K1	K4	3.3	1.5	1.1	0.3	25	13	3.0	0.8	<0.1
APR											
30...	K4	26	2.9	1.3	0.9	0.3	10	10	3.8	0.8	<0.1
SEP											
04...	K6	140	3.0	1.4	1.0	0.3	9	10	3.7	0.8	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
03...	3.8	27	<0.10	0.02	0.3	<0.01	<0.01	<0.01	4	53
FEB										
06...	3.8	43	0.14	0.02	0.6	0.02	<0.01	<0.01	2	88
APR										
30...	3.3	22	6.00	0.03	0.4	<0.01	<0.01	<0.01	4	94
SEP										
04...	2.9	39	<0.10	0.13	0.5	0.04	0.02	<0.01	3	100

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
FEB											
06...	1215	80	1	12	<0.5	<1	<1	<3	1	250	1
APR											
30...	1415	40	1	12	<0.5	<1	10	<3	2	160	2

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
FEB										
06...	12	8	<0.1	<10	2	<1	<1	13	<6	7
APR										
30...	<4	10	<0.1	<10	1	<1	<1	11	<6	<3

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	URANIUM DISSOLVED, EXTRACTION (UG/L) (80020)	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)
APR									
30...	1415	0.04	<0.6	<0.4	1.5	<0.4	1.3	<0.4	<0.02

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 upstream from culverts on Forest Route 181, also known as Spruce Road, 0.8 mi upstream from mouth, and 10 mi southeast of Ely.

DRAINAGE AREA.--9.66 mi^2.

PERIOD OF RECORD.--October 1974 to September 30, 1985 (discontinued).

REVISED RECORDS.--WDR MN-79-1: 1975-76, 1978.

GAGE.--Water-stage recorder. Elevation of gage is 1,440 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Nov. 18 to Apr. 17. Records fair except those for period with ice effect, Nov. 18 to Apr. 17, which are poor.

AVERAGE DISCHARGE.--11 years, 7.56 ft^3/s, 10.63 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 426 ft^3/s, Sept. 13, 1980, gage height, 8.87 ft; no flow at times most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 99 ft^3/s, Apr. 24, gage height, 6.84 ft; maximum gage height, 7.17 ft, Feb. 4 (backwater from ice); minimum discharge, 0.17 ft^3/s, Aug. 31, gage height, 4.62 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.35	1.7	1.2	.65	.40	.34	1.2	25	52	23	1.0	.35
2	.74	1.3	1.1	.64	.40	.34	1.1	41	48	27	.74	.35
3	.46	1.8	1.0	.63	.40	.34	1.1	25	38	24	.59	.82
4	.35	2.4	.94	.61	.39	.34	1.1	17	30	25	.52	1.2
5	.40	2.4	.88	.60	.39	.34	1.1	15	27	26	.82	1.3
6	.35	1.8	.84	.58	.39	.33	1.1	15	22	22	.90	1.3
7	.40	1.3	.79	.57	.39	.33	1.1	17	18	17	.82	1.2
8	.40	1.7	.74	.56	.38	.33	1.1	17	15	14	.66	1.0
9	.46	1.8	.70	.54	.38	.33	1.2	15	13	11	.59	.82
10	.35	1.5	.66	.53	.38	.33	1.4	14	10	8.3	.82	.66
11	.35	1.2	.64	.52	.38	.32	1.9	21	9.0	5.7	.90	.59
12	.35	1.2	.62	.51	.38	.32	2.4	24	7.4	4.3	1.0	.46
13	.35	1.1	.62	.50	.37	.32	3.1	29	6.6	3.2	1.3	.35
14	.40	1.1	.62	.49	.37	.32	4.5	27	5.2	2.7	1.3	.35
15	.40	1.1	.72	.48	.37	.32	6.0	24	4.3	2.7	1.0	.35
16	1.3	1.1	.90	.47	.37	.31	8.5	24	4.1	1.9	.82	.59
17	2.2	1.1	1.3	.46	.37	.31	13	24	6.0	1.5	1.0	2.5
18	2.4	1.1	1.8	.46	.36	.31	18	22	7.4	2.5	1.2	2.9
19	2.5	1.1	1.3	.45	.36	.32	19	20	7.1	3.2	1.3	2.9
20	4.5	1.0	1.1	.45	.36	.36	20	19	5.7	3.1	1.0	3.6
21	3.4	1.0	1.0	.44	.36	.40	20	16	5.0	3.2	1.0	3.2
22	2.5	.98	.96	.44	.36	.50	28	14	6.0	3.6	.90	3.2
23	1.9	.98	.90	.43	.35	.66	61	12	6.6	3.2	.66	7.4
24	1.3	.98	.86	.43	.35	.86	89	11	6.0	2.9	1.0	15
25	1.5	1.0	.82	.42	.35	1.1	91	10	4.5	3.1	1.0	16
26	1.2	1.1	.78	.42	.35	1.2	76	13	8.6	2.9	.82	14
27	1.7	1.2	.76	.41	.35	1.3	59	14	18	2.1	.66	12
28	1.9	1.3	.74	.41	.34	1.3	46	12	28	1.8	.30	11
29	2.9	1.4	.72	.41	---	1.3	36	10	28	1.2	.30	9.0
30	3.1	1.3	.70	.40	---	1.3	34	10	25	.90	.30	10
31	1.9	---	.67	.40	---	1.2	---	29	---	1.0	.25	---
TOTAL	42.31	40.04	27.38	15.31	10.40	17.68	647.9	586	471.5	254.00	25.47	124.39
MEAN	1.36	1.33	.88	.49	.37	.57	21.6	18.9	15.7	8.19	.82	4.15
MAX	4.5	2.4	1.8	.65	.40	1.3	91	41	52	27	1.3	16
MIN	.35	.98	.62	.40	.34	.31	1.1	10	4.1	.90	.25	.35
CFSM	.14	.14	.09	.05	.04	.06	2.24	1.96	1.63	.85	.09	.43
IN.	.16	.15	.11	.06	.04	.07	2.49	2.26	1.82	.98	.10	.48
AC-FT	84	79	54	30	21	35	1290	1160	935	504	51	247

CAL YR 1984 TOTAL 2084.42 MEAN 5.70 MAX 66 MIN .14 CFSM .59 IN 8.03 AC-FT 4130
WTR YR 1985 TOTAL 2262.38 MEAN 6.20 MAX 91 MIN .25 CFSM .64 IN 8.71 AC-FT 4490

LAKE OF THE WOODS BASIN

05127000 KAWISHIWI 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 Co., just upstream from Fall Lake, and 1.8 mi east of Winton.

DRAINAGE AREA.--1,229 mi^2.

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.--No estimated daily discharges. 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 Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE (unadjusted).--66 years (water years 1906, 1916-17, 1919, 1924-85), 1,035 ft^3/s, 11.44 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16,000 ft^3/s, May 18, 1950; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 3,760 ft^3/s, Apr. 28; minimum daily, 32 ft^3/s, Oct. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	142	811	464	367	367	333	681	3670	2630	2600	770	443
2	118	953	367	367	367	495	718	3720	2890	2630	962	443
3	150	792	399	399	334	463	660	3440	2750	2610	865	443
4	118	760	464	367	334	459	549	3170	2610	3170	962	528
5	128	727	302	399	334	631	572	3040	2740	2970	1030	484
6	97	727	399	367	302	484	521	2900	2820	2950	930	549
7	65	727	367	399	367	549	425	2980	2890	2930	833	484
8	85	663	399	399	353	516	445	2830	2820	2780	791	484
9	150	646	367	334	321	484	410	2530	2600	2250	695	484
10	150	428	399	367	321	484	370	2410	2490	2100	398	516
11	118	462	334	399	303	452	402	2710	1940	2000	463	699
12	150	462	399	353	367	452	295	2600	1700	1690	458	701
13	32	462	367	199	334	484	423	2760	1730	1500	551	715
14	65	463	320	333	366	452	383	2810	1540	1600	666	483
15	150	527	167	367	352	483	286	2620	1540	1360	612	484
16	150	430	515	399	287	451	380	2760	1520	1250	516	516
17	329	430	399	334	287	418	338	2840	1820	962	516	790
18	168	398	399	367	302	418	226	3030	1660	994	452	765
19	364	463	367	353	398	418	129	3030	1390	962	484	946
20	331	431	399	190	430	451	97	2920	1130	962	425	819
21	266	464	399	400	172	418	129	2530	1230	1030	443	792
22	266	367	399	367	352	417	346	2420	1410	997	485	698
23	266	431	367	367	289	417	836	2310	1730	903	484	794
24	348	399	399	367	354	417	1180	2200	1650	1150	452	963
25	334	399	367	332	399	385	1760	2250	1470	1040	484	865
26	565	431	334	372	398	553	2490	2160	1470	1020	484	930
27	637	399	399	199	366	598	3180	2300	2120	963	452	930
28	900	464	334	335	398	666	3760	2160	2300	899	464	962
29	793	431	385	334	---	795	3740	2030	2550	866	443	1090
30	1020	399	199	367	---	697	3690	1750	2530	962	443	1250
31	1060	---	368	367	---	696	---	2170	---	962	378	---
TOTAL	9515	15946	11543	10866	9554	15436	29421	83050	61670	51062	18391	21050
MEAN	307	532	372	351	341	498	981	2679	2056	1647	593	702
MAX	1060	953	515	400	430	795	3760	3720	2890	3170	1030	1250
MIN	32	367	167	190	172	333	97	1750	1130	866	378	443
†	+96	-84	-13	-112	-149	-247	+578	+45	+5	-27	-72	+98
MEAN ‡	403	448	359	239	192	251	1559	2724	2061	1620	521	800
CFSM ‡	.33	.36	.29	.19	.16	.20	1.27	2.22	1.68	1.32	.42	.65
IN. ‡	.38	.41	.34	.22	.16	.24	1.42	2.56	1.87	1.52	.49	.73

CAL YR 1984 TOTAL 353304 MEAN 965 MAX 4530 MIN 21 MEAN ‡ 954 CFSM ‡ .78 IN ‡ 10.57
WTR YR 1985 TOTAL 337504 MEAN 925 MAX 3760 MIN 32 MEAN ‡ 934 CFSM ‡ .76 IN ‡ 10.32

† Change in contents, equivalent in cubic feet per second, Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, Farm, South Farm, and Garden Lakes.

‡ Adjusted for change in reservoir contents.

LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN

(International gaging station)

LOCATION.--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 northeast of Winton].

DRAINAGE AREA.--1,740 mi^2, 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, 1928 datum, (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 higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft higher.

REMARKS.--No estimated daily discharges. Records good. Satellite telemeter at station. Some regulation by powerplant on Kawishiwi River at Winton, 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.--57 years (water years 1926, 1927, 1931-85), 1,399 ft^3/s, 10.92 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,600 ft^3/s, May 24, 1950, gage height 9.94 ft, present datum; minimum, 55 ft^3/s, Nov. 18, 1976, gage height, 1.67 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,550 ft^3/s, May 19, gage height, 5.19 ft; minimum, 185 ft^3/s, Oct. 15, 16, gage height, 2.18 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	219	298	470	523	469	469	618	2140	3080	2860	1570	768
2	214	313	470	516	469	469	645	2390	3080	2910	1530	763
3	206	330	466	510	469	469	674	2600	3130	3020	1500	757
4	207	342	469	506	469	469	693	2810	3190	3260	1480	748
5	202	357	469	503	469	469	712	2940	3250	3350	1500	740
6	199	372	471	503	469	469	724	3080	3290	3430	1500	739
7	198	390	469	509	469	469	720	3170	3320	3460	1470	725
8	196	410	469	510	469	469	717	3220	3360	3470	1440	713
9	192	427	467	510	469	469	710	3230	3340	3440	1420	692
10	191	440	467	510	469	469	701	3250	3360	3390	1400	670
11	191	447	464	510	469	469	693	3340	3340	3310	1360	656
12	189	451	463	510	469	486	688	3340	3250	3210	1340	645
13	189	452	463	510	469	494	731	3380	3140	3080	1280	636
14	189	455	460	503	469	495	726	3410	3010	2940	1200	632
15	191	453	460	503	469	495	719	3430	2870	2800	1170	630
16	190	451	516	498	469	495	708	3460	2760	2700	1130	666
17	211	446	546	495	469	495	705	3480	2680	2570	1140	764
18	205	444	546	488	469	503	692	3510	2630	2460	1090	767
19	228	440	546	488	469	500	682	3520	2560	2340	1060	782
20	230	439	546	488	469	502	681	3530	2500	2240	1030	783
21	227	440	546	488	469	503	688	3530	2450	2140	1000	803
22	226	436	538	488	469	503	727	3500	2370	2040	983	813
23	223	438	538	482	469	503	850	3450	2280	1960	980	855
24	222	438	530	482	469	503	964	3380	2250	2000	956	950
25	224	438	530	478	469	505	1040	3350	2280	1970	929	970
26	226	439	530	475	469	505	1090	3300	2340	1910	908	985
27	235	458	530	475	469	510	1200	3240	2430	1860	880	994
28	248	473	530	475	469	520	1390	3170	2560	1780	846	991
29	259	475	530	475	---	553	1630	3100	2670	1720	830	1000
30	269	473	530	474	---	575	1880	3040	2770	1670	809	1040
31	289	---	530	469	---	597	---	3090	---	1620	792	---
TOTAL	6685	12665	15559	15354	13132	15401	25398	99380	85540	80910	36523	23677
MEAN	216	422	502	495	469	497	847	3206	2851	2610	1178	789
MAX	289	475	546	523	469	597	1880	3530	3360	3470	1570	1040
MIN	189	298	460	469	469	469	618	2140	2250	1620	792	630
CFSM	.12	.24	.29	.28	.27	.29	.49	1.84	1.64	1.50	.68	.45
IN.	.14	.27	.33	.33	.28	.33	.54	2.12	1.83	1.73	.78	.51
AC-FT	13260	25120	30860	30450	26050	30550	50380	197100	169700	160500	72440	46960

CAL YR 1984 TOTAL 481290 MEAN 1315 MAX 5010 MIN 189 CFSM .76 IN 10.29 AC-FT 954600
WTR YR 1985 TOTAL 430224 MEAN 1179 MAX 3530 MIN 189 CFSM .68 IN 9.20 AC-FT 853300

LAKE OF THE WOODS BASIN

05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO

(International gaging station)

LOCATION.--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 east of Campbell's Camp].

DRAINAGE AREA.--5,170 mi^2.

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.--Estimated daily discharges: Oct. 18 to Nov. 2, Feb. 28 to Mar. 6, and Aug. 3-13. Records good except those for periods of no gage-height record, Oct. 28 to Nov. 2, Feb. 28 to Mar. 6, and Aug. 3-13, which are fair. Satellite telemeter at station.

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

AVERAGE DISCHARGE.--63 years (water years 1923-85), 3,830 ft^3/s, 10.06 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,200 ft^3/s, May 31 to June 2, 1950, elevation, 1,193.30 ft; minimum, 535 ft^3/s at times in February, March and April 1924, elevation, 1,181.50 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,700 ft^3/s, July 7, elevation, 1,187.54 ft; minimum, 1,080 ft^3/s, Nov. 16, elevation, 1,182.24 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1450	1160	1220	1580	1590	1470	1370	4790	8500	10100	6740	3850
2	1390	1160	1230	1580	1590	1470	1370	4930	8450	10200	6570	3840
3	1380	1160	1230	1600	1580	1460	1370	5070	8450	10300	6430	3760
4	1370	1130	1230	1600	1580	1450	1370	5260	8370	10500	6290	3730
5	1360	1140	1240	1610	1560	1450	1370	5410	8320	10600	6140	3680
6	1330	1150	1250	1620	1560	1450	1380	5600	8290	10600	6040	3620
7	1310	1150	1260	1630	1550	1450	1390	5740	8170	10600	5900	3550
8	1290	1140	1260	1630	1550	1450	1380	5900	8140	10500	5760	3470
9	1270	1130	1260	1620	1550	1430	1390	6060	7890	10400	5620	3390
10	1260	1130	1260	1620	1570	1430	1370	6260	8000	10300	5470	3290
11	1250	1120	1270	1650	1560	1410	1390	6550	7970	10200	5330	3220
12	1240	1120	1260	1660	1550	1420	1400	6910	7880	10100	5230	3160
13	1230	1130	1270	1670	1550	1410	1430	7330	7840	9950	5090	3050
14	1220	1120	1270	1660	1540	1400	1440	7600	7790	9780	5000	2960
15	1220	1120	1280	1660	1530	1400	1460	7830	7740	9620	4960	2910
16	1210	1110	1350	1670	1530	1390	1480	8070	7700	9500	4910	2910
17	1270	1120	1410	1670	1520	1380	1510	8260	7640	9350	4870	2990
18	1290	1120	1430	1660	1510	1380	1540	8410	7580	9200	4740	2980
19	1310	1120	1440	1640	1520	1370	1570	8480	7510	8980	4700	3000
20	1290	1120	1470	1640	1520	1370	1610	8600	7420	8790	4650	3000
21	1280	1120	1480	1650	1510	1360	1670	8670	7500	8550	4610	3060
22	1260	1120	1460	1650	1500	1370	1840	8730	7790	8410	4550	3040
23	1240	1130	1470	1650	1490	1360	2300	8750	8070	8230	4530	3070
24	1250	1130	1490	1650	1490	1350	2830	8710	8260	8220	4440	3200
25	1250	1130	1510	1630	1480	1360	3240	8780	8480	8070	4360	3320
26	1240	1140	1520	1640	1480	1350	3630	8750	8800	7890	4290	3410
27	1210	1150	1540	1640	1480	1350	3970	8700	9100	7730	4200	3480
28	1180	1200	1540	1630	1470	1360	4270	8620	9480	7450	4130	3530
29	1170	1210	1560	1630	---	1370	4510	8560	9740	7280	4060	3630
30	1170	1210	1560	1610	---	1370	4660	8500	9950	7100	4000	3690
31	1160	---	1560	1600	---	1370	---	8530	---	6920	3950	---
TOTAL	39350	34190	42580	50650	42910	43410	61510	228360	246820	285420	157560	99790
MEAN	1269	1140	1374	1634	1533	1400	2050	7366	8227	9207	5083	3326
MAX	1450	1210	1560	1670	1590	1470	4660	8780	9950	10600	6740	3850
MIN	1160	1110	1220	1580	1470	1350	1370	4790	7420	6920	3950	2910
CFSM	.25	.22	.27	.32	.30	.27	.40	1.43	1.59	1.78	.98	.64
IN.	.28	.25	.31	.36	.31	.31	.44	1.64	1.78	2.05	1.13	.72
AC-FT	78050	67820	84460	100500	85110	86100	122000	453000	489600	566100	312500	197900

CAL YR 1984	TOTAL	1381300	MEAN	3774	MAX	10400	MIN	1110	CFSM .73	IN 9.94	AC-FT	2740000
WTR YR 1985	TOTAL	1332550	MEAN	3651	MAX	10600	MIN	1110	CFSM .71	IN 9.59	AC-FT	2643000

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 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 above National Geodetic Vertical Datum of 1929. October 1913 to July 1915, nonrecording gage at Tower, 2 mi southwest of present gage, at datum about 1,354.60 ft. July 1941 to November 1942, and June 1946 to June 1951, nonrecording gage approximately 13 mi northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations above National Geodetic Vertical Datum of 1929.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,359.52 ft, May 16, 1950; minimum observed, 1,356.02 ft, Jan. 29, 1942; minimum, 1,355.96 ft, Dec. 14, 1976, result of wind action.

EXTREMES OUTSIDE PERIOD OF RECORD.--Elevation on June 6, 1913 was 1,359.94 ft, determined from reference point set by local observers.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,358.63 ft, July 5, result of wind action; maximum daily, 1,358.55 ft, May 19; minimum, 1,356.59 ft, Oct. 15, result of wind action; minimum daily, 1,356.66 ft, Oct. 15.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Oct. 31 ..... 1,357.07	Feb. 28 ..... 1,356.99	June 30 ..... 1,358.37
Nov. 30 ..... 1,357.11	Mar. 31 ..... 1,357.02	July 31 ..... 1,357.82
Dec. 31 ..... 1,357.12	Apr. 30 ..... 1,358.25	Aug. 31 ..... 1,357.31
Jan. 31 ..... 1,357.04	May 31 ..... 1,358.39	Sept.30 ..... 1,357.47

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 NE¼NE¼ sec. 30, T.67 N., R.17 W., St. Louis County, Hydrologic Unit 09030002, in Superior National Forest, on left bank 350 ft downstream from bridge on Forest Route 491, 3.5 mi upstream from mouth, and 3.5 mi west of village of Crane Lake.

PERIOD OF RECORD.--August 1979 to current year.

GAGE.--Water-stage recorder. Elevation of gage is 1,180 ft above National Geodectic Vertical Datum of 1929, from topographic map.

REMARKS.--Estimated daily discharges: Oct. 1-8. Records fair.

AVERAGE DISCHARGE.--6 years, 634 ft^3/s.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,360 ft^3/s, Apr. 25, 1985, gage height, 15.20 ft; minimum, 38 ft^3/s, Aug. 13, 14, 1980, gage height, 3.68 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1979 reached a stage of 15.15 ft, from high-water mark, discharge, about 4,600 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum 4,360 ft^3/s, Apr. 25, gage height, 15.20 ft; minimum, 45 ft^3/s, Oct. 15, gage height, 3.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	408	285	248	152	160	351	2640	2110	2980	821	401
2	58	362	282	245	150	157	346	2440	2190	2810	785	390
3	57	354	278	242	146	158	377	2280	2190	2620	755	396
4	52	366	267	245	148	160	389	2170	2130	2460	723	395
5	49	368	264	244	152	163	392	2090	2060	2330	710	386
6	47	356	253	241	159	169	392	2020	1980	2220	700	393
7	48	345	249	238	168	173	399	1970	1910	2140	698	383
8	49	354	247	233	158	176	399	1940	1830	2070	665	372
9	49	356	244	227	150	178	385	1900	1760	1970	656	364
10	48	354	242	221	156	179	388	1830	1660	1870	629	357
11	48	341	241	218	163	179	425	1840	1580	1780	601	349
12	46	330	238	217	165	181	458	2060	1500	1710	590	342
13	47	323	227	217	164	182	578	2400	1430	1640	615	336
14	47	323	222	217	160	183	722	2560	1360	1570	595	335
15	46	330	221	208	156	181	839	2630	1300	1500	559	327
16	51	304	264	205	157	182	919	2800	1250	1430	538	334
17	94	298	307	202	158	183	879	2880	1220	1360	557	381
18	123	287	321	201	158	186	823	2820	1200	1310	549	446
19	230	276	319	190	157	198	766	2700	1190	1270	520	502
20	404	268	316	180	158	210	775	2560	1170	1220	502	625
21	491	261	312	183	159	215	763	2470	1170	1170	488	670
22	529	257	300	185	157	240	1020	2350	1360	1110	473	680
23	536	252	284	187	157	266	2260	2200	1520	1070	467	692
24	517	249	273	187	154	286	3750	2070	1570	1110	460	907
25	484	249	263	183	156	300	4300	1980	1640	1130	448	1040
26	468	256	258	176	158	340	4260	1980	2400	1130	440	1060
27	455	264	256	172	153	408	3930	1980	2980	1090	431	1060
28	440	288	261	170	158	455	3560	1960	3200	1040	409	955
29	427	289	264	169	---	454	3220	1910	3210	973	400	841
30	419	289	260	168	---	414	2890	1870	3120	915	394	754
31	402	---	252	160	---	377	---	1920	---	866	391	---
TOTAL	6821	9357	8270	6379	4387	7293	40955	69220	55190	49864	17569	16473
MEAN	220	312	267	206	157	235	1365	2233	1840	1609	567	549
MAX	536	408	321	248	168	455	4300	2880	3210	2980	821	1060
MIN	46	249	221	160	146	157	346	1830	1170	866	391	327
AC-FT	13530	18560	16400	12650	8700	14470	81230	137300	109500	98910	34850	32670

CAL YR 1984 TOTAL 207338 MEAN 566 MAX 2080 MIN 46 AC-FT 411300
WTR YR 1985 TOTAL 291778 MEAN 799 MAX 4300 MIN 46 AC-FT 578700

LAKE OF THE WOODS BASIN

05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN

LOCATION.--Lat 48°31'28", long 93°04'29", in SW¼NE¼ sec.30, T.70 N., R.21 W., St. Louis County, Hydrologic Unit 09030003, on right bank in bay at head of Gold Portage Outlet from Kabetogama Lake, 9.8 mi northeast of Ray.

PERIOD OF RECORD.--October 1982 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,100 ft, adjustment of 1912 (U.S. Army Corps of Engineers bench mark), water surface transfer.

REMARKS.--Estimated daily discharges: Dec. 2-11. Records good. Flow completely regulated by outlet dam on Namakan Lake.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 863 ft^3/s, June 25, 1985, gage height, 19.22 ft; no flow from approximately the middle of January to the first of May each year; minimum gage height, 10.54 ft, Apr. 2, 8, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 863 ft^3/s, June 25, gage height, 19.22 ft; no flow Jan. 25 to Apr. 25; minimum gage height, 10.78 ft, Apr. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	337	220	134	59	.00	.00	.00	24	422	804	603	571
2	323	243	130	56	.00	.00	.00	27	433	785	608	582
3	312	257	125	57	.00	.00	.00	33	449	776	615	572
4	319	238	120	55	.00	.00	.00	41	456	755	628	569
5	316	234	120	52	.00	.00	.00	43	460	740	632	580
6	305	243	118	45	.00	.00	.00	48	475	734	635	575
7	300	249	115	40	.00	.00	.00	52	468	732	630	576
8	295	238	108	36	.00	.00	.00	57	473	706	650	576
9	290	234	102	31	.00	.00	.00	60	424	678	645	576
10	288	231	95	27	.00	.00	.00	71	454	678	630	572
11	286	232	90	24	.00	.00	.00	96	473	682	642	573
12	282	232	83	21	.00	.00	.00	117	477	690	665	578
13	276	232	85	18	.00	.00	.00	148	488	688	632	574
14	272	232	85	13	.00	.00	.00	171	501	672	601	567
15	283	206	83	12	.00	.00	.00	193	523	660	618	570
16	262	200	83	9.7	.00	.00	.00	213	551	675	620	572
17	268	208	82	6.7	.00	.00	.00	231	565	670	648	586
18	282	203	82	4.6	.00	.00	.00	254	584	662	606	586
19	288	198	81	3.8	.00	.00	.00	260	608	652	615	615
20	280	193	80	2.7	.00	.00	.00	278	635	662	622	652
21	276	190	80	1.3	.00	.00	.00	299	662	645	618	690
22	272	180	74	.80	.00	.00	.00	311	645	658	615	685
23	273	175	73	.40	.00	.00	.00	319	685	668	610	650
24	276	169	69	.02	.00	.00	.00	330	742	665	605	650
25	282	164	69	.00	.00	.00	.00	358	809	662	606	670
26	282	157	68	.00	.00	.00	.47	375	801	650	608	670
27	272	148	67	.00	.00	.00	4.4	386	790	655	590	665
28	255	146	64	.00	.00	.00	10	398	806	628	591	638
29	265	144	62	.00	---	.00	16	416	817	620	590	632
30	251	138	62	.00	---	.00	19	422	817	615	586	615
31	268	---	60	.00	---	.00	---	424	---	608	591	---
TOTAL	8836	6134	2749	576.02	.00	.00	49.87	6455	17493	21175	19155	18187
MEAN	285	204	88.7	18.6	.000	.000	1.66	208	583	683	618	606
MAX	337	257	134	59	.00	.00	19	424	817	804	665	690
MIN	251	138	60	.00	.00	.00	.00	24	422	608	586	567
AC-FT	17530	12170	5450	1140	.00	.00	99	12800	34700	42000	37990	36070

CAL YR 1984 TOTAL 79354.09 MEAN 217 MAX 607 MIN .00 AC-FT 157400
WTR YR 1985 TOTAL 100809.89 MEAN 276 MAX 817 MIN .00 AC-FT 200000

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 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 current year, 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 National Geodetic Vertical Datum of 1929 (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 mi 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 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, July 5, 1950; minimum observed, 1,101.26 ft, Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,109.04 ft, July 3; maximum daily elevation, 1,109.00 ft, July 6, 7; minimum, 1,104.81 ft, Apr. 12; minimum daily, 1,104.82 ft, Apr. 11.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

Oct. 31 ..... 1107.21	Feb. 28 ..... 1105.69	June 30 ..... 1108.85
Nov. 30 ..... 1107.27	Mar. 31 ..... 1105.03	July 31 ..... 1108.20
Dec. 31 ..... 1106.78	Apr. 30 ..... 1106.84	Aug. 31 ..... 1107.85
Jan. 31 ..... 1106.32	May 31 ..... 1108.55	Sept.30 ..... 1108.13

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 upstream from highway bridge, 0.6 mi downstream from East Branch Sturgeon River, and 11.5 mi north of Chisholm.

DRAINAGE AREA.--187 mi^2.

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 above National Geodetic Vertical Datum of 1929. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft downstream at different datum. Aug. 25, 1944, to Sept. 30, 1975, at present site at datum 1.00 ft higher.

REMARKS.--Estimated daily discharges: Nov. 15 to Mar. 23. Records good except those for period with ice effect, Nov. 15 to Mar. 23, which are fair.

AVERAGE DISCHARGE.--43 years, 125 ft^3/s, 9.08 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,630 ft^3/s, May 7, 1950, gage height, 7.41 ft, present datum, from rating curve extended above 1,600 ft^3/s, on basis of slope-area measurement of peak flow; minimum daily, 3.8 ft^3/s, Jan. 31 to Feb. 3, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 25	1030	*1,480	*5.84
May 13	0300	723	4.28
June 2	2230	548	3.92

Minimum daily discharge, 16 ft^3/s, Feb. 9 to Mar. 7; minimum gage height, 1.76 ft, Aug. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	95	50	33	18	16	117	449	441	213	49	113
2	18	89	49	32	18	16	112	397	523	184	47	103
3	19	84	49	32	18	16	116	359	533	162	44	112
4	20	86	48	31	17	16	113	331	463	233	43	115
5	20	84	48	31	17	16	115	325	363	308	45	106
6	20	81	47	30	17	16	109	335	303	339	45	108
7	22	79	47	30	17	16	113	343	255	330	43	98
8	23	80	46	29	17	17	101	336	221	271	40	88
9	26	79	46	28	16	17	89	311	200	212	42	83
10	27	78	45	28	16	18	85	293	179	169	41	76
11	29	78	45	27	16	19	88	352	161	143	39	68
12	29	75	44	27	16	20	90	670	145	123	41	62
13	31	74	44	26	16	21	117	712	136	108	45	56
14	32	72	43	26	16	22	149	663	126	95	45	53
15	35	70	43	25	16	23	175	601	116	85	43	50
16	43	65	58	25	16	25	184	550	109	77	40	50
17	142	63	62	24	16	28	179	509	105	71	38	57
18	150	62	60	24	16	32	178	474	102	71	38	57
19	205	61	57	23	16	40	169	444	98	67	36	59
20	215	60	54	23	16	50	183	390	92	63	34	71
21	233	59	51	22	16	60	208	349	88	62	36	70
22	233	58	48	22	16	80	277	308	98	57	37	70
23	210	57	46	21	16	110	678	275	96	53	42	94
24	183	56	44	21	16	146	1230	256	89	61	63	167
25	156	55	42	21	16	171	1460	246	97	65	64	190
26	138	54	40	20	16	190	1330	237	158	61	60	196
27	128	53	38	20	16	213	1030	264	201	59	55	175
28	124	52	37	20	16	208	790	238	245	56	49	153
29	119	51	36	19	---	190	632	210	258	53	46	136
30	112	50	35	19	---	159	515	218	243	52	43	134
31	104	---	34	19	---	137	---	326	---	51	66	---
TOTAL	2864	2060	1436	778	459	2108	10732	11771	6244	3954	1399	2970
MEAN	92.4	68.7	46.3	25.1	16.4	68.0	358	380	208	128	45.1	99.0
MAX	233	95	62	33	18	213	1460	712	533	339	66	196
MIN	18	50	34	19	16	16	85	210	88	51	34	50
CFSM	.49	.37	.25	.13	.09	.36	1.91	2.03	1.11	.68	.24	.53
IN.	.57	.41	.29	.15	.09	.42	2.13	2.34	1.24	.79	.28	.59
AC-FT	5680	4090	2850	1540	910	4180	21290	23350	12380	7840	2770	5890

CAL YR 1984	TOTAL	39399	MEAN 108	MAX 777	MIN 14	CFSM .58	IN 7.84	AC-FT 78150			
WTR YR 1985	TOTAL	46775	MEAN 128	MAX 1460	MIN 16	CFSM .68	IN 9.30	AC-FT 92780			

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 upstream from bridge on State Highway 217, 2.8 mi upstream from Beaver Creek, and 19 mi upstream from mouth.

DRAINAGE AREA.--1,730 mi^2, 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 above 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 downstream at datum 10.53 ft lower; Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, nonrecording gage at site 1.18 mi downstream at datum 10.53 ft lower.

REMARKS.--Estimated daily discharges: Oct. 21-29 and Dec. 6 to Apr. 13. Records good except those for period of no gage height record, Oct. 21-29, and period with ice effect, Dec. 6 to Apr. 13, which are fair.

AVERAGE DISCHARGE.--62 years (water years 1912-16, 1929-85), 1,065 ft^3/s, 8.36 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,000 ft^3/s, Apr. 18, 1916, May 11, 1950, gage height, 37.00 ft, site and datum then in use; minimum observed, 21 ft^3/s, Aug. 26, 27, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 19,900 ft^3/s, Apr. 26, gage height 22.25 ft; minimum, 99 ft^3/s, Oct. 13, 14, gage height, 1.96 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	125	1350	539	200	110	101	1050	5900	4080	6340	682	552
2	123	925	502	195	105	102	1000	5250	5090	4920	602	640
3	120	952	457	190	105	103	1000	4480	4800	3750	546	955
4	117	1250	452	185	105	104	1000	3860	4150	3550	505	1140
5	118	1470	452	180	105	105	1000	3500	3480	4530	515	1110
6	120	1320	450	175	105	105	1000	3260	3030	4540	536	1050
7	118	1260	440	170	104	105	1000	3180	2630	4210	552	970
8	109	1170	430	165	103	105	970	3140	2260	3560	530	895
9	104	1090	420	160	102	105	910	2980	2000	2890	500	825
10	101	1120	410	155	101	105	840	2750	1740	2360	495	736
11	107	870	400	150	100	105	810	5030	1560	1930	465	652
12	107	878	390	148	100	105	880	8120	1420	1630	430	590
13	100	984	370	144	100	105	1000	10400	1300	1400	430	536
14	101	892	360	140	100	105	1530	11200	1190	1220	445	480
15	104	849	340	138	100	110	1980	10200	1090	1080	455	445
16	106	676	355	135	100	110	2010	9820	1010	962	455	421
17	159	491	395	132	100	110	2140	8740	964	860	506	500
18	217	436	445	130	100	110	2010	7330	1050	812	636	618
19	826	580	470	128	100	115	1860	6130	1150	780	634	780
20	1970	656	470	125	100	120	1850	5180	1140	766	589	4070
21	2500	636	425	122	100	130	1880	4370	1100	742	550	3710
22	2710	671	380	120	100	140	3550	3740	1290	712	507	2850
23	2910	624	350	118	100	160	7560	3180	1800	700	473	2360
24	2980	580	315	116	100	190	13700	2750	1950	799	495	2480
25	2800	566	290	115	100	240	17900	2520	3110	1190	646	3580
26	2600	555	275	114	100	350	19600	2440	7210	1380	748	3740
27	2200	551	260	112	100	800	19100	2300	10300	1400	718	3320
28	1950	542	240	110	100	1350	15300	2130	10300	1240	646	2790
29	1780	544	230	110	---	1300	9750	2000	9700	1040	574	2350
30	1630	555	220	110	---	1200	7120	1980	8040	867	520	2060
31	1490	---	210	110	---	1100	---	2400	---	760	500	---
TOTAL	30502	25043	11742	4402	2845	9095	141300	150260	99934	62920	16885	47205
MEAN	984	835	379	142	102	293	4710	4847	3331	2030	545	1574
MAX	2980	1470	539	200	110	1350	19600	11200	10300	6340	748	4070
MIN	100	436	210	110	100	101	810	1980	964	700	430	421
CFSM	.57	.48	.22	.08	.06	.17	2.72	2.80	1.93	1.17	.32	.91
IN.	.66	.54	.25	.09	.06	.20	3.04	3.23	2.15	1.35	.36	1.02
AC-FT	60500	49670	23290	8730	5640	18040	280300	298000	198200	124800	33490	93630

CAL YR 1984 TOTAL 373290 MEAN 1020 MAX 9300 MIN 78 CFSM .59 IN 8.03 AC-FT 740400
WTR YR 1985 TOTAL 602133 MEAN 1650 MAX 19600 MIN 100 CFSM .95 IN 12.95 AC-FT 1194000

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1962-63, 1967, 1969, 1971 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
30...	1530	1550	120	104	7.7	7.1	-4.0	3.0	5.6	733	11.9
JAN											
23...	1600	118	220	253	7.2	7.1	-5.0	0.0	6.0	725	9.2
APR											
17...	0830	2180	115	117	7.6	7.0	4.0	3.0	17	723	11.4
AUG											
21...	1315	554	165	147	7.9	7.5	18.0	16.5	4.0	736	8.9

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
30...	36	33	13	4.8	2.3	1.6	34	36	12	3.6	0.1
JAN											
23...	K3	K12	31	11	5.2	2.4	109	110	12	3.7	0.2
APR											
17...	K16	27	15	4.9	2.0	1.8	41	49	12	2.6	<0.1
AUG											
21...	K10	220	20	6.6	2.1	0.9	67	71	<0.2	2.2	<0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
30...	8.4	92	0.17	0.12	0.9	0.07	0.01	0.01	33	97
JAN										
23...	12	201	0.25	0.06	0.3	0.04	0.03	<0.01	12	87
APR										
17...	5.7	91	1.40	0.13	0.8	0.33	0.27	0.24	107	96
AUG										
21...	6.2	133	<0.10	0.03	1.3	0.04	0.04	<0.01	22	99

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
30...	1530	180	1	23	<0.5	<1	1	<3	2	540	<1
JAN											
23...	1600	50	3	38	<0.5	<1	9	<3	1	640	<1
APR											
17...	0830	70	2	21	<0.5	<1	10	<3	7	310	2
AUG											
21...	1315	60	2	25	<0.5	<1	7	<3	2	410	3

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
30...	<4	15	<0.1	<10	1	<1	<1	35	<6	16
JAN										
23...	5	31	1.8	<10	1	<1	<1	85	<6	7
APR										
17...	<4	33	<0.1	<10	5	<1	<1	33	<6	21
AUG										
21...	8	25	<0.1	<10	1	<1	<1	47	<6	6

LAKE OF THE WOODS BASIN

05132000 BIG FORK RIVER AT BIG FALLS, MN

LOCATION.--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 mi downstream from bridge on U.S. Highway 71, and 4.8 mi upstream from Sturgeon River.

DRAINAGE AREA.--1,460 mi^2, approximately.

PERIOD OF RECORD.--August to November 1909, April to November 1910, April 1911 to September 1912 (gage heights and discharge measurements only), June 1928 to September 1979. October 1979 to September 1982, annual maximums only. October 1982 to current year.

REVISED RECORDS.--WSP 1308: 1935(M).

GAGE.--Water-stage recorder. Datum of gage is 1,144.71 ft above National Geodetic Vertical Datum of 1929. Prior to June 10, 1911, nonrecording gage at railroad bridge about 0.4 mi upstream at different datum. June 10, 1911, to Sept. 30, 1912, and June 22, 1928, to Dec. 17, 1937, nonrecording gage at site 200 ft upstream at same datum. October 1979 to September 1982, crest-stage gage at same site and datum.

REMARKS.--Estimated daily discharges: Nov. 13 to Mar. 31. Records good except those for period with ice effect, Nov. 13 to Mar. 31, which are fair. Prior to 1971, a powerplant, located 0.3 mi upstream, caused some diurnal fluctuation at low flows.

AVERAGE DISCHARGE.--54 years (water years 1929-79, 1983-85), 729 ft^3/s, 6.78 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,800 ft^3/s, May 8, 9, 1950; maximum gage height, 17.08 ft, May 8, 1950; minimum discharge recorded, 7 ft^3/s, Aug. 7, 1939.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,100 ft^3/s, Apr 25, gage height, 13.12 ft; minimum daily discharge, 160 ft^3/s Mar. 4-20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	216	1240	640	346	199	162	1190	3590	2380	3520	1200	1050
2	213	1010	630	340	196	162	1020	3260	2480	2770	1050	1110
3	212	846	620	334	194	162	990	2980	2340	2240	951	1160
4	211	954	610	328	192	160	1040	2770	2120	2480	885	1160
5	207	1060	600	322	190	160	1090	2630	1920	2470	921	1110
6	207	1010	580	316	188	160	1190	2530	1850	2230	951	1050
7	208	1040	570	310	186	160	1200	2480	1720	1920	954	1020
8	208	1210	560	305	184	160	1180	2370	1570	1740	891	1040
9	207	1210	550	300	182	160	1120	2260	1470	1480	891	988
10	214	1080	540	295	180	160	1070	2120	1350	1270	912	938
11	221	860	526	290	178	160	1080	3470	1250	1120	861	906
12	225	793	518	285	176	160	1170	5810	1160	998	833	871
13	233	800	508	280	174	160	1100	7170	1070	900	884	821
14	243	900	498	275	172	160	1130	7570	997	837	909	777
15	265	940	488	270	172	160	1150	6680	959	784	954	757
16	287	850	480	265	172	160	1240	5910	934	746	923	768
17	406	840	472	260	170	160	1270	5150	940	687	1040	927
18	561	820	464	255	170	160	1280	4570	993	657	1160	971
19	1010	800	456	250	170	160	1220	4090	1010	638	1190	1340
20	1790	780	448	245	170	160	1260	3610	959	616	1230	3200
21	2240	770	440	240	168	170	1310	3200	898	606	1230	2940
22	2370	760	432	235	168	200	2320	2890	1130	589	1130	3640
23	2290	740	423	231	168	250	4740	2630	1510	566	1020	3010
24	2070	730	414	227	168	350	7760	2410	1640	825	1070	2550
25	1860	710	405	223	166	700	9850	2250	1780	1890	1120	2280
26	1700	700	396	219	166	1000	9310	2190	3380	3070	1120	2020
27	1570	680	387	215	164	1500	7480	2090	5540	3290	1070	1800
28	1500	670	378	211	164	1850	5810	1970	5960	2810	983	1640
29	1430	660	370	208	---	1700	4720	1880	5320	2160	931	1540
30	1380	650	362	205	---	1500	4050	1850	4420	1700	890	1450
31	1310	---	354	202	---	1300	---	2030	---	1400	873	---
TOTAL	27064	26113	15119	8287	4947	13726	80340	106410	61050	49009	31027	44834
MEAN	873	870	488	267	177	443	2678	3433	2035	1581	1001	1494
MAX	2370	1240	640	346	199	1850	9850	7570	5960	3520	1230	3640
MIN	207	650	354	202	164	160	990	1850	898	566	833	757
CFSM	.60	.60	.33	.18	.12	.30	1.83	2.35	1.39	1.08	.69	1.02
IN.	.69	.67	.39	.21	.13	.35	2 05	2.71	1.56	1.25	.79	1.14
AC-FT	53680	51800	29990	16440	9810	27230	159400	211100	121100	97210	61540	88930

CAL YR 1984 TOTAL 330525 MEAN 903 MAX 6460 MIN 184 CFSM .62 IN 8 42 AC-FT 655600
WTR YR 1985 TOTAL 467926 MEAN 1282 MAX 9850 MIN 160 CFSM .88 IN 11.92 AC-FT 928100

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 west of Indus.

DRAINAGE AREA.--19,400 mi^2, 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 U.S. Army Corps of Engineers. Published as "near Birchdale" 1932-34.

GAGE.--Water-stage recorder. Datum of gage is 1,062.48 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 10, 1934, nonrecording gage at site near Birchdale, 7 mi. downstream at different datum.

REMARKS.--Estimated daily discharges: Nov. 16 to Mar. 18. Records good. Satellite telemeter at station. 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.--57 years, 12,920 ft^3/s, 9.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,600 ft^3/s, May 12, 1950, gage height, 21.04 ft; minimum daily, 928 ft^3/s, Dec. 26, 1929.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 61,300 ft^3/s, June 28,29, gage height, 18.98 ft; minimum, 3,810 ft^3/s, Oct. 9-13, gage height, 1.75 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4490	8210	9650	7600	9000	8600	11200	32600	38300	53900	20800	12300
2	4460	7770	9800	6200	9000	8400	11200	30700	39600	49700	20700	12600
3	4500	7300	9400	6200	9000	8000	11400	29400	40100	46000	20400	12200
4	4360	7280	9400	6200	8900	7900	11100	28400	39300	43700	20200	13000
5	4060	6970	9000	6200	8900	8400	10900	27900	38100	43200	19800	13200
6	3930	6900	9150	6200	8950	8000	11000	27600	36900	42900	17100	12700
7	3870	6830	8400	7000	8950	8100	10900	27700	35800	42100	13600	12800
8	3830	6990	8650	8900	9000	8100	10800	27700	34900	40700	11900	12800
9	3820	7300	9100	8900	8950	8200	10700	28400	33900	39100	11500	12700
10	3820	7100	9250	8900	8950	8300	10600	30100	33300	37500	12000	12400
11	3840	6630	9050	9100	8900	8400	10700	34500	32600	36100	12600	12200
12	3820	6110	9050	9150	8900	8500	10800	42900	31800	34900	12600	11900
13	3830	5940	9000	9150	8500	8500	11000	48900	31100	33900	14700	11700
14	3880	6230	8400	9150	9100	8500	11300	52400	29500	33100	16400	11500
15	3920	7190	8400	9150	8200	8400	12200	53200	27100	32400	16400	11400
16	3930	7450	8350	9150	8500	8450	12700	53400	26000	31900	16200	11400
17	4460	7050	8100	9150	8900	8450	12700	52400	25600	31400	17100	11900
18	4640	6700	8200	9150	8500	8500	12600	50200	23200	30900	17600	12200
19	5810	6600	8150	9100	9100	8780	12500	47200	22000	30400	18100	12500
20	10200	6750	8550	9100	8700	8760	12400	44800	17700	29100	18300	14300
21	13600	7050	8000	9100	8400	8720	12400	42700	15200	28300	20900	19600
22	15300	6800	7750	9100	7700	8850	13900	40900	16800	27500	22000	20700
23	14700	6900	8400	9100	8300	9100	19500	39500	17500	21500	22100	21000
24	14000	6750	8500	9050	8600	9420	28600	38300	17900	15700	22400	24500
25	13200	6700	7900	9050	8400	10000	36900	37700	23700	14200	22500	26300
26	12300	6700	6650	9050	7600	11000	42300	37800	43600	15100	22500	30000
27	11600	7600	7600	9050	8400	11700	45900	37400	54000	18800	22300	33100
28	11200	8100	7550	9050	8700	12100	46200	36800	60400	19900	21800	33100
29	10700	8000	8350	9000	---	12100	41400	36400	60700	19600	16500	32500
30	10300	8600	8500	9000	---	11900	35400	36400	58000	18900	13000	31800
31	9140	---	9100	9000	---	11500	---	36900	---	20400	12100	---
TOTAL	225510	212500	265350	263200	243000	283630	551200	1191200	1004600	982800	546100	520300
MEAN	7275	7083	8560	8490	8679	9149	18370	38430	33490	31700	17620	17340
MAX	15300	8600	9800	9150	9100	12100	46200	53400	60700	53900	22500	33100
MIN	3820	5940	6650	6200	7600	7900	10600	27600	15200	14200	11500	11400
CFSM	.38	.37	.44	.44	.45	.47	.95	1.98	1.73	1.63	.91	.89
IN.	.43	.41	.51	.50	.47	.54	1.06	2.28	1.93	1.88	1.05	1.00
AC-FT	447300	421500	526300	522100	482000	562600	1093000	2363000	1993000	1949000	1083000	1032000

CAL YR 1984 TOTAL 4427380 MEAN 12100 MAX 42900 MIN 3820 CFSM .62 IN 8.49 AC-FT 8782000
WTR YR 1985 TOTAL 6289390 MEAN 17230 MAX 60700 MIN 3820 CFSM .89 IN 12.06 AC-FT 12480000

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 1969-70, 1977 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
OCT											
30...	0915	10300	--	109	96	7.7	7.2	-5.0	2.0	3.0	732
JAN											
23...	1000	9100	--	80	94	7.0	7.1	-10.0	0.0	2.0	725
MAR											
07...	0900	8100	--	68	74	7.1	7.1	-2.0	0.5	1.5	722
APR											
17...	1130	--	12700	125	101	7.5	7.0	8.0	3.5	7.1	719
MAY											
30...	1100	--	36900	70	68	7.3	6.9	18.0	13.0	2.5	723
AUG											
21...	0900	--	20800	76	67	7.5	7.2	15.0	15.5	2.5	738

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	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)
OCT											
30...	12.5	K1200	84	11	3.5	3.8	1.0	43	32	9.7	5.3
JAN											
23...	11.0	100	K7400	9.7	2.8	3.7	0.8	30	31	4.8	4.5
MAR											
07...	12.7	--	74	8.2	2.4	3.7	0.7	23	27	5.6	4.5
APR											
17...	11.1	K1500	K52	12	4.1	2.9	1.0	39	33	5.8	4.0
MAY											
30...	9.3	K7600	K20	8.5	2.7	2.0	0.7	33	28	7.8	2.2
AUG											
21...	8.6	K410	520	7.6	2.3	2.2	0.7	34	25	3.4	3.0

DATE	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)	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-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
30...	<0.1	4.3	74	<0.10	<0.01	1.1	0.05	0.01	<0.01	18	90
JAN											
23...	<0.1	3.5	62	0.14	0.09	0.2	0.03	0.02	0.01	7	86
MAR											
07...	<0.1	3.1	63	<0.10	<0.01	0.6	<0.01	<0.01	<0.01	2	100
APR											
17...	<0.1	4.0	56	0.14	0.07	0.4	<0.01	<0.01	0.01	37	88
MAY											
30...	0.1	2.9	51	<0.10	0.13	0.6	<0.01	<0.01	<0.01	13	79
AUG											
21...	<0.1	3.0	54	0.10	0.06	1.1	0.03	0.03	0.01	9	97

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
OCT											
30...	0915	80	1	18	<0.5	<1	1	<3	1	210	1
MAR											
07...	0900	20	1	15	<0.5	1	8	<3	32	62	1
APR											
17...	1130	20	2	19	<0.5	<1	10	<3	1	130	1
AUG											
21...	0900	50	1	17	<0.5	<1	6	<3	2	100	7

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT										
30...	<4	11	<0.1	<10	1	<1	<1	27	<6	5
MAR										
07...	<4	6	0.4	<10	<1	<1	<1	23	<6	12
APR										
17...	<4	16	<0.1	<10	<1	<1	<1	29	<6	11
AUG										
21...	<4	3	<0.1	<10	1	<1	<1	21	<6	4

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 upstream from bridge on State Highway 72, 1.2 mi downstream from North Branch Rapid River, and 12 mi south of Baudette.

DRAINAGE AREA.--543 mi^2.

PERIOD OF RECORD.--October 1956 to September 1985 (discontinued).

GAGE.--Water-stage recorder. Datum of gage is 1,093.92 ft above National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation bench mark).

REMARKS.--Estimated daily discharges: Nov. 3 to Apr. 8, June 28 to July 7, and Aug. 17, 18. Records good except those for periods of no gage-height record, June 28 to July 7, Aug. 17, 18, and period with ice effect, Nov. 3 to Apr. 8, which are fair.

AVERAGE DISCHARGE.--29 years, 326 ft^3/s, 8.15 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,580 ft^3/s, June 26, 1985, gage height, 22.78 ft; 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, from information by local residents and Minnesota Department of Transportation, discharge, about 7,500 ft^3/s.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,580 ft^3/s, June 26, gage height, 22.78 ft; minimium, 5.3 ft^3/s, Oct. 1, gage height, 1.89 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	707	140	18	9.3	8.8	475	947	1170	3200	373	686
2	5.8	589	115	17	9.3	8.8	455	938	1250	2700	363	697
3	7.6	560	95	17	9.3	8.8	445	892	1180	2400	356	779
4	8.1	510	85	16	9.0	8.8	435	849	1060	2000	434	842
5	7.6	470	78	16	9.0	8.8	425	804	938	1700	984	812
6	7.6	420	72	15	9.0	8.8	415	755	817	1500	1190	767
7	7.3	390	67	14	9.0	8.8	400	741	736	1250	1340	706
8	6.6	360	62	14	8.8	9.0	390	723	672	1020	1330	628
9	6.3	330	57	13	8.8	9.0	379	690	602	863	1160	561
10	6.0	310	53	13	8.8	9.2	349	656	560	698	1020	513
11	5.8	290	49	13	8.8	9.5	316	617	516	572	900	472
12	5.6	270	46	13	8.8	9.6	321	592	488	466	811	436
13	8.9	250	43	12	8.8	9.7	515	564	478	386	817	398
14	113	230	40	12	8.8	9.8	698	730	478	327	830	367
15	241	210	38	12	8.8	10	724	2350	480	307	793	340
16	330	200	36	11	8.8	11	683	3110	485	290	745	350
17	605	185	34	11	8.8	12	621	2980	486	285	900	573
18	718	170	32	11	8.8	13	573	2660	486	287	1100	714
19	1480	160	31	11	8.8	14	547	2320	483	289	1180	802
20	2090	150	29	10	8.8	15	542	2500	478	285	1240	1120
21	2090	140	28	10	8.8	20	543	2560	512	287	1230	1140
22	1930	135	27	10	8.8	35	646	2460	859	289	1100	1030
23	1770	135	26	9.7	8.8	60	965	2280	1040	309	977	915
24	1630	150	25	9.7	8.8	100	1640	2000	922	573	1200	802
25	1480	180	24	9.7	8.8	250	1660	1730	4730	650	1250	698
26	1360	210	23	9.7	8.8	500	1470	1480	7460	634	1200	609
27	1260	235	22	9.7	8.8	560	1320	1200	6000	633	1080	543
28	1150	240	21	9.5	8.8	560	1180	1000	5600	622	951	493
29	1040	205	20	9.5	---	550	1060	818	4600	563	827	458
30	936	175	19	9.5	---	520	971	735	3800	468	733	431
31	833	---	18	9.5	---	490	---	914	---	404	664	---
TOTAL	21144.8	8566	1455	375.5	248.7	3847.4	21163	43595	49366	26257	29078	19682
MEAN	682	286	46.9	12.1	8.88	124	705	1406	1646	847	938	656
MAX	2090	707	140	18	9.3	560	1660	3110	7460	3200	1340	1140
MIN	5.6	135	18	9.5	8.8	8.8	316	564	478	285	356	340
CFSM	1.26	.53	.09	.02	.02	.23	1.30	2.59	3.03	1.56	1.73	1.21
IN.	1.45	.59	.10	.03	.02	.26	1.45	2.99	3.38	1.80	1.99	1.35
AC-FT	41940	16990	2890	745	493	7630	41980	86470	97920	52080	57680	39040

CAL YR 1984 TOTAL 104524.2 MEAN 286 MAX 2090 MIN 4.4 CFSM .53 IN 7.16 AC-FT 207300
WTR YR 1985 TOTAL 224778.4 MEAN 616 MAX 7460 MIN 5.6 CFSM 1.13 IN 15.40 AC-FT 445800

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 downstream from Canadian National railroad bridge, 1,000 ft downstream from bridge on State Highway 11, and 4,000 ft upstream from mouth of Warroad River.

DRAINAGE AREA.--27,200 mi^2.

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, 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, Sept. 12, 1978; maximum daily, 1,061.84 ft, Sept. 12, 1978; minimum elevation recorded, 1,055.94 ft, Sept. 4, 1980; minimum daily recorded, 1,056.52 ft, Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,062.20 ft, July 3; maximum daily, 1,061.79 ft, July 6, 9, 10; minimum, 1,057.76 ft, Oct. 16; minimum daily, 1,058.34 ft, Apr. 10.

ELEVATION, IN FEET (LAKE OF THE WOODS DATUM) WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1058.92	1058.52	1059.16	1059.06	1058.89	1058.61	1058.40	1059.34	1060.84	1061.63	1060.96	1061.00
2	1058.82	1059.25	1059.14	1059.06	1058.89	1058.63	1058.39	1059.40	1061.04	1061.63	1060.85	1061.16
3	1058.93	1059.33	1059.12	1059.04	1058.86	1058.65	1058.39	1059.50	1061.08	1061.72	1060.91	1061.12
4	1059.30	1059.24	1059.12	1059.01	1058.88	1058.64	1058.41	1059.66	1060.88	1061.72	1061.13	1061.07
5	1059.00	1059.28	1059.12	1059.03	1058.89	1058.58	1058.41	1059.53	1061.06	1061.77	1061.12	1061.14
6	1058.92	1059.32	1059.13	1059.04	1058.87	1058.60	1058.39	1059.63	1060.97	1061.79	1061.05	1061.05
7	1058.92	1059.40	1059.10	1059.00	1058.86	1058.55	1058.37	1059.71	1060.99	1061.78	1061.04	1061.28
8	1058.91	1059.22	1059.11	1059.02	1058.88	1058.53	1058.36	1059.64	1060.88	1061.75	1061.11	1061.27
9	1058.88	1059.36	1059.10	1059.02	1058.89	1058.51	1058.37	1059.79	1060.85	1061.79	1060.85	1061.23
10	1058.88	1059.39	1059.12	1059.00	1058.84	1058.51	1058.34	1059.95	1061.16	1061.79	1061.03	1061.00
11	1058.80	1059.23	1059.09	1058.97	1058.84	1058.50	1058.36	1060.09	1061.20	1061.66	1061.07	1060.94
12	1058.80	1059.26	1059.09	1058.99	1058.85	1058.51	1058.39	1059.97	1061.08	1061.66	1061.16	1060.93
13	1058.75	1059.28	1059.11	1058.98	1058.82	1058.46	1058.38	1060.06	1061.06	1061.68	1060.21	1060.74
14	1058.92	1059.33	1059.11	1058.97	1058.79	1058.47	1058.39	1060.30	1061.03	1061.61	1060.61	1060.70
15	1059.24	1059.00	1059.10	1059.00	1058.82	1058.48	1058.38	1060.67	1061.06	1061.61	1060.99	1060.71
16	1058.57	1059.13	1059.13	1058.98	1058.78	1058.42	1058.40	1060.70	1060.89	1061.57	1061.11	1060.67
17	1058.60	1059.23	1059.16	1058.97	1058.77	1058.44	1058.42	1060.64	1060.94	1061.60	1061.02	1060.67
18	1059.11	1059.23	1059.14	1058.96	1058.76	1058.41	1058.42	1060.66	1061.14	1061.59	1061.03	1060.77
19	1060.03	1059.23	1059.14	1058.94	1058.78	1058.39	1058.43	1060.78	1060.93	1061.47	1061.18	1060.96
20	1059.27	1059.24	1059.16	1058.93	1058.76	1058.41	1058.44	1060.88	1060.91	1061.59	1061.12	1060.52
21	1059.16	1059.23	1059.12	1058.92	1058.72	1058.39	1058.49	1060.82	1060.97	1061.48	1061.12	1060.59
22	1059.14	1059.19	1059.10	1058.93	1058.73	1058.39	1058.57	1060.88	1060.67	1061.46	1061.17	1060.58
23	1059.06	1059.19	1059.09	1058.94	1058.70	1058.40	1058.64	1060.90	1060.88	1061.32	1061.20	1060.62
24	1059.29	1059.20	1059.07	1058.92	1058.70	1058.42	1058.71	1060.95	1061.04	1061.43	1061.22	1060.30
25	1059.43	1059.21	1059.06	1058.92	1058.69	1058.42	1058.80	1061.09	1061.06	1061.29	1061.17	1060.39
26	1059.19	1059.20	1059.06	1058.94	1058.67	1058.43	1058.89	1061.02	1061.09	1061.25	1061.07	1060.51
27	1059.27	1059.19	1059.06	1058.91	1058.67	1058.41	1058.98	1061.01	1061.52	1061.14	1061.16	1060.31
28	1059.18	1059.14	1059.07	1058.93	1058.62	1058.44	1058.98	1060.99	1061.41	1061.07	1061.21	1060.55
29	1059.23	1059.16	1059.07	1058.92	---	1058.41	1059.09	1061.03	1061.53	1061.07	1061.20	1060.77
30	1059.24	1059.17	1059.06	1058.90	---	1058.42	1059.35	1061.10	1061.57	1061.02	1061.10	1060.80
31	1059.33	---	1059.06	1058.91	---	1058.40	---	1061.14	---	1061.00	1060.96	---
MEAN	1059.07	1059.21	1059.11	1058.97	1058.79	1058.48	1058.54	1060.38	1061.06	1061.51	1061.04	1060.81
MAX	1060.03	1059.40	1059.16	1059.06	1058.89	1058.65	1059.35	1061.14	1061.57	1061.79	1061.22	1061.28
MIN	1058.57	1058.52	1059.06	1058.90	1058.62	1058.39	1058.34	1059.34	1060.67	1061.00	1060.21	1060.30

CAL YR 1984 MEAN 1059.38 MAX 1060.75 MIN 1058.34
WTR YR 1985 MEAN 1059.75 MAX 1061.79 MIN 1058.34

05140521 LAKE OF THE WOODS AT SPRINGSTEEL ISLAND NEAR WARROAD, MN

LOCATION.--Lat 48°56'45", long 95°18'24", in SW¼SW¼ sec.9, T.163 N., R.36 W., Roseau County, Hydrologic Unit 09030009, at Springsteel Resort on Springsteel Island, 2.8 mi north of Warroad.

DRAINAGE AREA.--27,200 mi^2.

PERIOD OF RECORD.--Record June to September 1985.

GAGE.--Water-stage recorder. Datum at gage is 1000.00 ft, Lake of the Woods datum; gage readings have been reduced to elevations based on Lake of the Woods datum.

REMARKS.--Satellite telemeter at station. Water level subject to fluctuation caused by changes in direction and velocity of wind and seiches.

EXTREMES FOR CURRENT PERIOD .--June to September 1985: Maximum elevation during period, 1,062.12 ft, July 3; maximum daily, 1,061.81 ft, July 6, 7; minimum, 1,059.48 ft, June 8; minimum daily, 1,060.26 ft, Aug. 13.

ELEVATION, IN FEET (LAKE OF THE WOODS DATUM), WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									---	1061.62	1060.95	1061.02
2									---	1061.64	1060.86	1061.17
3									---	1061.73	1060.91	1061.13
4									---	1061.72	1061.13	1061.08
5									1061.08	1061.78	1061.11	1061.16
6									1061.01	1061.81	1061.04	1061.06
7									1061.01	1061.81	1061.01	1061.23
8									1060.90	1061.77	1061.09	1061.22
9									1060.84	1061.79	1060.84	1061.19
10									1061.15	1061.77	1061.01	1061.00
11									1061.19	1061.64	1061.06	1060.95
12									1061.08	1061.65	1061.15	1060.94
13									1061.07	1061.67	1060.26	1060.78
14									1061.05	1061.59	1060.59	1060.73
15									1061.07	1061.59	1060.96	1060.75
16									1060.91	1061.57	1061.08	1060.72
17									1060.93	1061.58	1061.02	1060.71
18									1061.11	1061.58	1060.97	1060.76
19									1060.95	1061.46	1061.13	1060.91
20									1060.94	1061.55	1061.10	1060.52
21									1060.97	1061.44	1061.11	1060.61
22									1060.67	1061.44	1061.16	1060.59
23									1060.87	1061.33	1061.19	1060.58
24									1061.04	1061.39	1061.20	1060.29
25									1061.10	1061.27	1061.17	1060.40
26									1061.07	1061.24	1061.08	1060.51
27									1061.40	1061.14	1061.15	1060.33
28									1061.37	1061.04	1061.19	1060.54
29									1061.49	1061.06	1061.19	1060.73
30									1061.56	1061.01	1061.12	1060.75
31									---	1060.99	1061.00	---
MEAN									---	1061.51	1061.03	1060.81
MAX									---	1061.81	1061.20	1061.23
MIN									---	1060.99	1060.26	1060.29

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 discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at high-flow stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

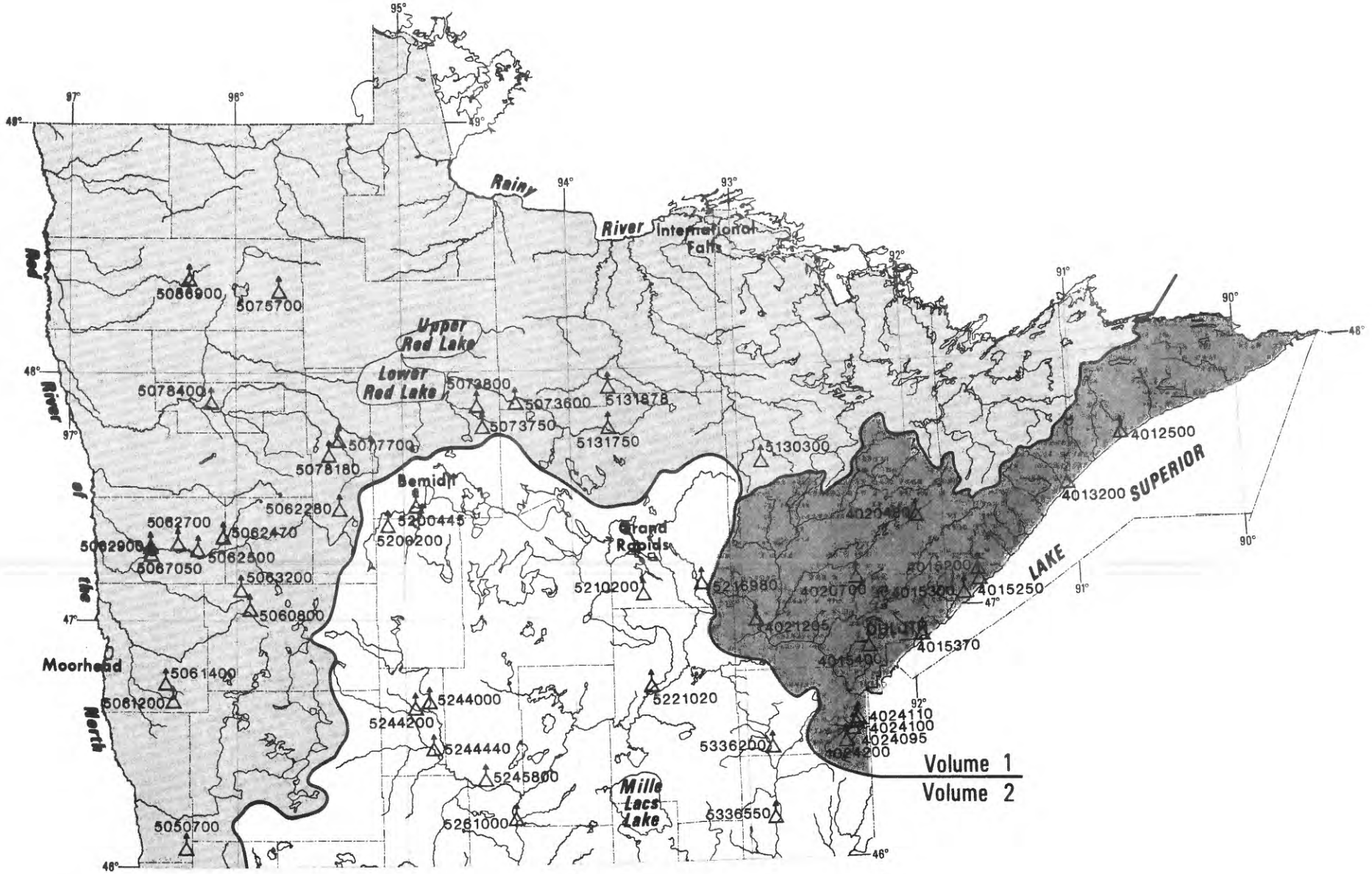
Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same site.

Discharge measurements made at low-flow partial-record stations during water year 1985

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Streams tributary to Lake Superior				
04015260	Silver Creek near Two Harbors, MN	Lat 47°03'52", long 91°36'18", in SE¼NE¼ sec.21, T.53 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on U.S. Highway 61, 4.3 miles northeast of Two Harbors.	a25	1911, 1984-85	8-08-85	1.27
04015310	Stewart River near Two Harbors, MN	Lat 47°02'53", long 91°37'49", in SW¼NE¼ sec.29, T.53 N., R.10 W., Lake County, Hydrologic Unit 04010102, at bridge on U.S. Highway 61, 0.2 miles upstream from mouth, and 1.5 miles northeast of Two Harbors.	-	1974, 1985	8-08-85	11.1

[a] Approximate

HIGH-FLOW PARTIAL RECORDS


Rainy River
International Falls
Red River
Upper Red Lake
Lower Red Lake
Bemidji
Grand Rapids
Moorhead
Mille Lacs Lake
SUPERIOR
LAKE
5066900
5075700
5078400
5073800
5073600
5131878
5073750
5131750
5077700
5078180
5130300
4012500
4013200
5062700
5062470
5062900
5062500
5067050
5062280
5200445
5200200
5063200
5060800
5210200
5216980
4020700
4015300
4015250
4021295
4015370
4015400
5061400
5061200
5244000
5244200
5244440
5245800
5221020
5336200
4024110
4024100
4024095
4024200
5261000
5336550
5050700
Volume 1
Volume 2

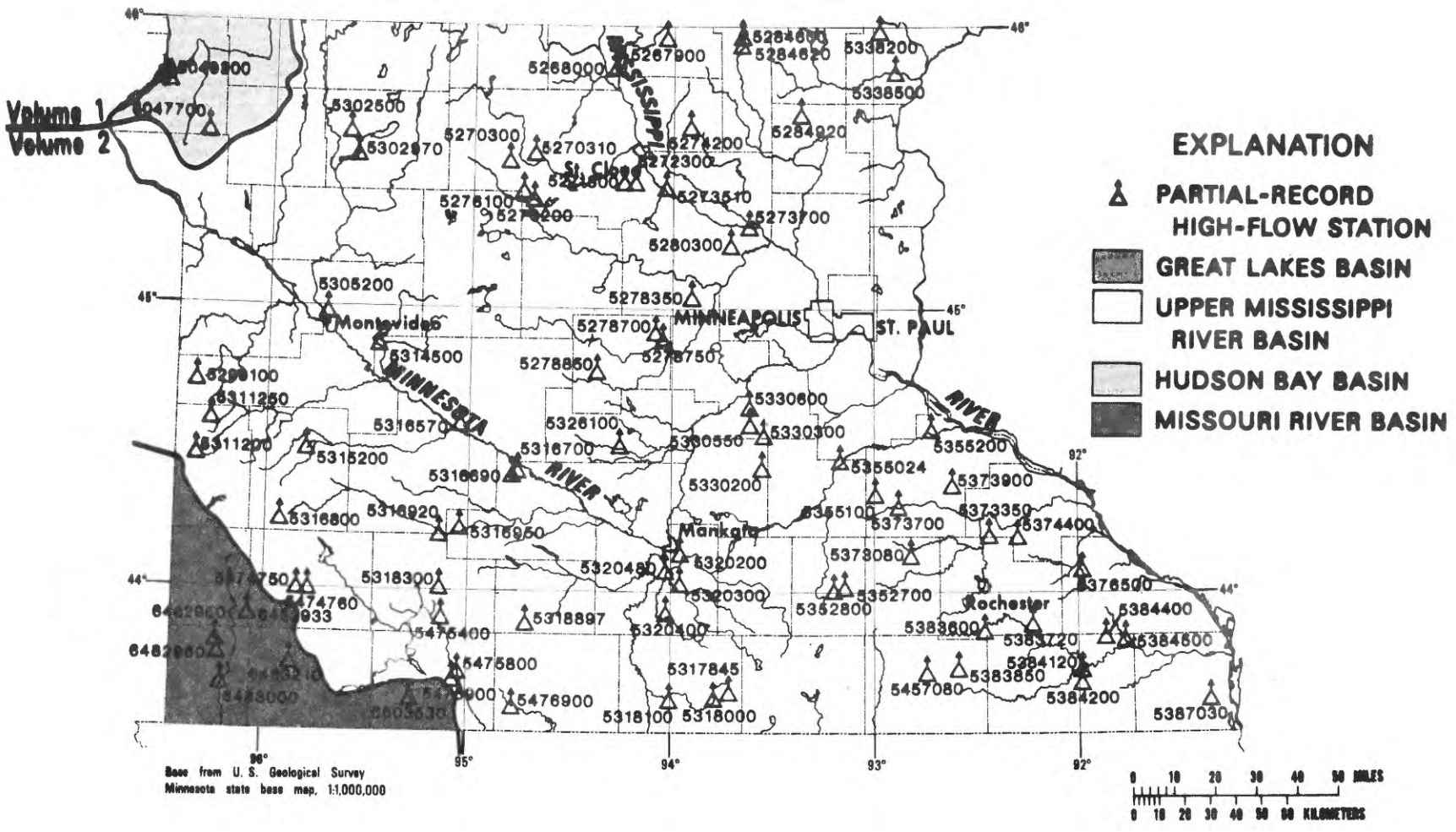


Figure 11.--Location of high-flow partial-record stations

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

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 1985

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Streams tributary to Lake Superior					
04012500	Poplar River at Lutsen, MN	Lat 47°38'23", long 90°42'31", in SW¼NE¼ 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, 0.3 mile upstream from mouth.	112	1912-17#, 1928-47#, 1952-61#, 1972-85	5-31-85	4.48	500
04013200	Caribou River near Little Marais, MN	Lat 47°27'51", long 91°01'50", in NW¼SE¼ 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	1961-85	5-31-85	11.66	205
04015200	Encampment River tributary at Silver Creek, MN	Lat 47°07'01", long 91°36'04", in NE¼SE¼ 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, 1.4 miles upstream from mouth.	.96	1960-85	6-25-85	8.65	†
04015250	Silver Creek tributary near Two Harbors, MN	Lat 47°04'40", long 91°36'49", in SW¼NE¼ 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, 4.5 miles northeast of Two Harbors.	3.72	1965-85	5-31-85	5.86	335
04015300	Little Stewart River near Two Harbors, MN	Lat 47°03'52", long 91°40'03", in SE¼NE¼ sec.24, T.53 N., R.11 W., Lake County, Hydrologic Unit 04010102, at culvert on county highway, 2.0 miles upstream from mouth, 2.7 miles north of Two Harbors.	5.54	1960-85	6-25-85	9.65	†
04015370	Talmadge River at Duluth, MN	Lat 46°53'20", long 91°55'21", in SE¼NE¼ 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, 0.5 mile northeast of Duluth city limits.	5.79	1964-85	5-31-85	13.83	158
04015400	Miller Creek at Duluth, MN	Lat 46°49'01", long 92°10'42", in SE¼NE¼ 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	1960-85	9- 3-85	-	420

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Annual maximum Gage height (feet)	Annual maximum Discharge (ft^3/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, 0.7 mile west of Fairbanks.	17.1	1979-85	4-24-85	a12.95	157
04020700	Bug Creek at Shaw, MN	Lat 47°06'40", long 92°21'03", in SW¼SE¼ 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	1979-85	4-24-85	b14.30	352
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, Hyrologic Unit 04010201, at bridge on County Highway 835, 500 ft west of State Highway 73, and 2 miles north of Floodwood.	198	1972-85	4-25-85	b15.92	701
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	1972-85	9- 3-85	17.38	4,420
04024100	Rock Creek near Blackhoof, MN	Lat 45°32'10", long 92°22'12", in SW¼SE¼ 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, 4.4 mile east of Blackhoof.	4.94	1961-65, 1967-85	9- 3-85	38.95	2,350
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, 4.5 miles east of Blackhoof.	.20	1961-85	9- 2-85	24.32	115
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, 2.0 miles northwest of Holyoke.	19.4	1961-85	9- 3-85	11.26	424
		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	1964-85	10-19-84	7.69	41

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
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, 2.0 miles southwest of Wheaton.	68.5	1965-68, 1970-85	4- 3-85	c9.56	510
05050700	Rabbit River near Nashua, MN	Lat 46°04'30", long 96°18'24", in SE¼NE¼ 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	1979-85	5- 9-85	13.34	960
05060800	Buffalo River near Callaway, MN	Lat 47°01'17", long 95°54'43", in SW¼SE¼, 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	1960-85	5-12-85	17.13	†
05061200	Whiskey Creek at Barnesville, MN	Lat 46°39'35", long 96°23'54", in SE¼SW¼ 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, 1.0 mile northeast of Barnesville.	25.3	1961-64, 1965-66#, 1967-85	5-31-85	7.12	660
05061400	Spring Creek above Downer, MN	Lat 46°44'37", long 96°25'12", in NW¼NW¼ 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	1961-85	5-31-85	d7.45	53
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	1961-85	3-24-85	b8.92	32
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, 5.2 miles west of Mahnomen.	11.9	1961-85	5-12-85	b12.74	250
05062500	Wild Rice River at Twin Valley, MN	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 upstream from highway bridge 0.8 mile northeast of village of Twin Valley.	888	1909-17#, 1930-83#, 1985	5-13-85	11.42	4,100
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, 4.1 miles northwest of Twin Valley.	4.72	1961-85	5-12-85	12.70	140

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1985--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
05062900	Wild Rice River near Ada, MN	Lat 47°17'29", long 96°26'09", in SE¼NE¼ sec.13, T.144 N., R.46 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24, 3.2 miles southeast of Ada.	-	1985	5-14-85	b22.12	4,580
05067050	Marsh River Ditch near Ada, MN	Lat 47°17'46", long 96°26'09", in NE¼NE¼ sec.13, T.144 N., R.46 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24, 3.5 miles southeast of Ada.	-	1985	5-13-85	b15.42	630
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	1963-85	5-11-85	d6.98	47
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, 3.1 miles upstream from Battle Lake.	2.80	1960-85	8-17-85	b15.77	105
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, 3.2 miles upstream from mouth.	7.96	1960-85	4-23-85	18.70	260
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	1960-85	6-26-85	b7.86	67
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	1979-85	6-28-85	17.19	1,330
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, 4.8 miles east of Gonvick.	45.2	1960-78#, 1979-85	5-13-85	4.91	281
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	1960-85	5-11-85	12.69	194

"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 1985--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
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, 5.3 miles southwest of Plummer.	6.51	1961-85	5-12-85	11.84	†
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	1979-85	6-27-85	b16.16	610
		Lake of the Woods basin					
05130300	Boriin Creek near Chisholm, MN	Lat 47°36'14", long 92°51'58", in SE¼SE¼ 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, 7.8 miles north of Chisholm.	13.7	1959-85	4-23-85	a12.84	250
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	1973-85	4-24-85	13.93	2,010
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 wingwall of bridge on State Highway 6, 2.4 miles upstream from mouth, 7.0 miles west of Craigville.	25.0	1979-85	6-27-85	14.40	540

‡ Operated as a continuous-record gaging station.
† Discharge not determined.
a Affected by beaver dam.
b Affected by shifting control.
c Backwater from ice.
d Backwater from aquatic growth and debris.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

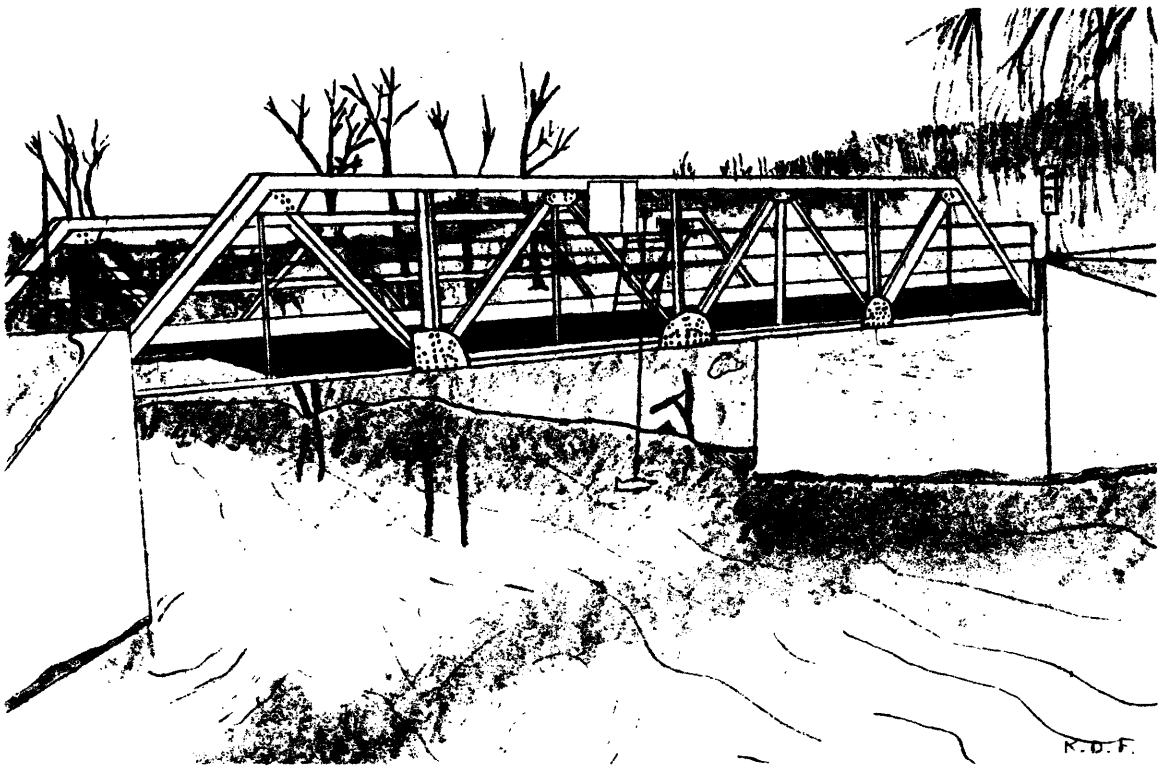
Measurements of streamflow points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1985

Stream	Tributary to	Location	Drainage area (mi2)	Measured previously (water years)	Measurements Date	Measurements Discharge (ft^3/s)
		Red River of the North Basin				
Otter Tail River	Red River of the North	Lat 46°59'55", long 95°36'46", in SE¼NW¼ sec.27, T.141 N., R.39 W., Becker County, Hydrologic Unit 09020103, upstream of bridge on township road, near Flat Lake Mounds Historic Site, in Tamarac National Wildlife Refuge, 10 miles east of Richwood, 1.8 south of County Road 143.	-	1984	10-25-84	23.6
					4- 8-85	65.5
					5-16-85	275
					6- 4-85	157
					7- 1-85	145
					7-17-85	87.3
					8-15-85	73.5
Otter Tail River	Red River of the North	Lat 46°50'12", long 95°41'57", in NE¼SW¼ sec.23, T.139 N., R.40 W., Becker County, Hydrologic Unit 09020103, upstream from Highway bridge, 5 miles downstream from Height of Land Lake, 7.5 miles east of City of Detroit Lakes (05030000).	270	1937-71#, 1984	10-25-84	30.6
					4- 9-85	50.3
					5-15-85	177
					7- 1-85	224
					7-17-85	180
					8-16-85	177
					9-16-85	175
					11- 7-85	141
Buffalo River	Red River of the North	Lat 46°58'25", long 95°49'02", in NE¼NE¼ sec.2, T.140 N., R.41 W., Becker County, Hydrologic Unit, 09020106, downstream from culvert on County Highway 34, .25 mile east of Richwood at outlet to Buffalo Lake.	-	1984	10-19-84	13.6
					4- 8-85	21.6
					5-16-85	41.3
					6- 5-85	38.2
					7- 1-85	38.9
					7-18-85	47.6
					8-15-85	22.4
					9-17-85	20.3
Buffalo River	Red River of the North	Lat 46°57'50", long 96°02'56", in SE¼SE¼ sec.1, T.140 N., R.43 W., Becker County, Hydrologic Unit 09020106, 300 ft upstream of bridge on gravel township road, 0.9 mile east of County Highway 9, 5 miles northeast of Lake Park.	-	1984	10-19-84	30.1
					4- 9-85	7.8
					5-16-85	278
					7- 1-85	84.3
					7-18-85	64.8
					8-15-85	40.5
					9-17-85	34.3
Wild Rice River	Red River of the North	Lat 47°17'10", long 96°05'52", in NW¼SE¼ sec.14, T.144 N., R.43 W., Norman County, Hydrologic Unit 09020108, at bridge in Faith, MN, 1.45 miles west of Norman-Mahnomen County line, 2.75 miles south of U.S. Highway 59, 5.5 miles west of Mahnomen.	-	1984	10-16-84	254
					4- 8-85	234
					5-16-85	2,100
					7- 2-85	547
					7-18-85	358
					8-15-85	249
					9-17-85	134
Marsh Creek	Wild Rice River	Lat 47°19'03", long 93°05'15", in NW¼SW¼ sec.1, T.144 N., R.43 W., Norman County, Hydrologic Unit 09020108, 50 ft upstream of culvert on County Highway 40, .5 mile south of State Highway 200, 8.5 miles northeast of Twin Valley, 5 miles above mouth.	-	1984	10-15-84	116
					4- 8-85	146
					5-15-85	534
					7- 2-85	100
					8-15-85	69.6
					9-17-85	9.4
Wild Rice River	Red River of the North	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 from highway bridge, 0.8 mile northeast of village of Twin Valley, and 2 miles upstream from tributary (05062500).	888	1909-17#, 1930-83#, 1984	10-18-84	326
					5-13-85	3,790
					6-20-85	402
					8-14-85	449
					9-17-85	171
South Branch Wild Rice River	Wild Rice River	Lat 47°02'07", long 96°04'03", in NE¼NE¼ sec.13, T.141 N., R.43 W., Becker County, Hydrologic Unit 09020108, near culvert on County Road 105, 2 miles east of State Highway 7, 10 miles north of Lake Park.	-	-	10-19-84	30.1
					5-16-85	167
					7- 1-85	21.2
					8-15-85	4.45
					9-16-85	8.06

Operated as a continuous-record gaging station.

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 hydrological analyses.



DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

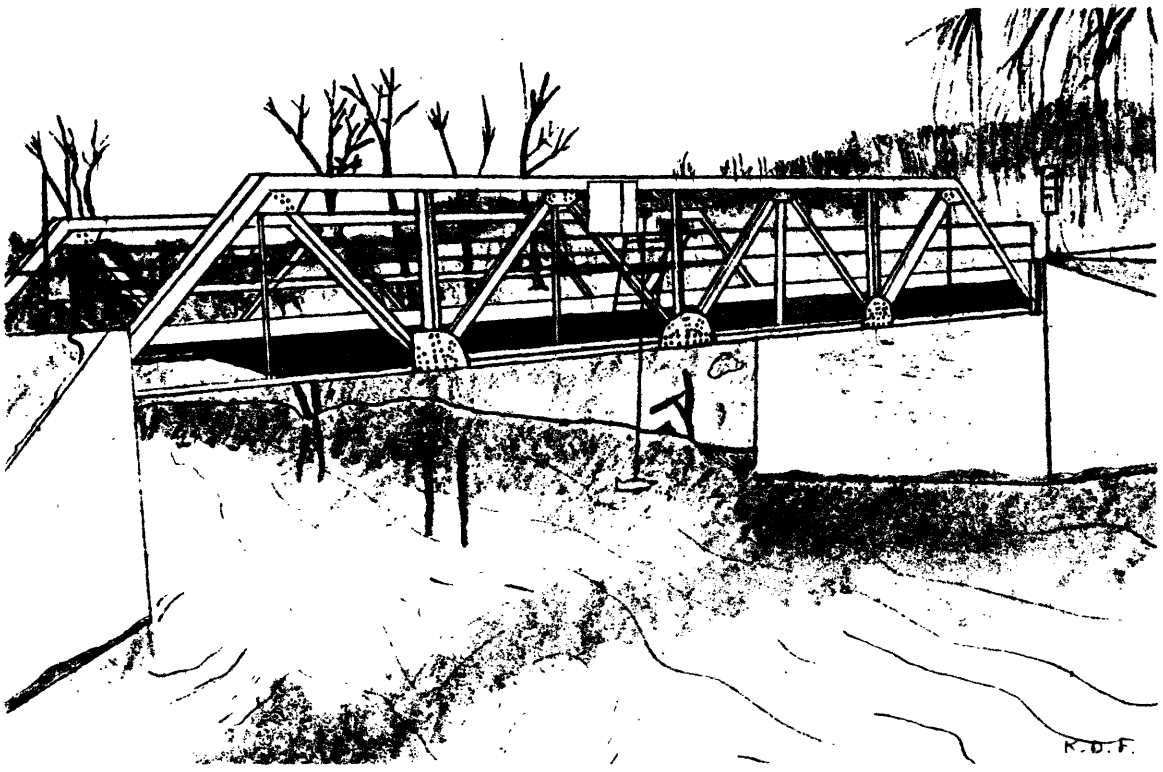
Measurements of streamflow points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1985

Stream	Tributary to	Location	Drainage area (mi2)	Measured previously (water years)	Measurements Date	Measurements Discharge (ft^3/s)
		Red River of the North Basin				
Otter Tail River	Red River of the North	Lat 46°59'55", long 95°36'46", in SE¼NW¼ sec.27, T.141 N., R.39 W., Becker County, Hydrologic Unit 09020103, upstream of bridge on township road, near Flat Lake Mounds Historic Site, in Tamarac National Wildlife Refuge, 10 miles east of Richwood, 1.8 south of County Road 143.	-	1984	10-25-84 4- 8-85 5-16-85 6- 4-85 7- 1-85 7-17-85 8-15-85	23.6 65.5 275 157 145 87.3 73.5
Otter Tail River	Red River of the North	Lat 46°50'12", long 95°41'57", in NE¼SW¼ sec.23, T.139 N., R.40 W., Becker County, Hydrologic Unit 09020103, upstream from Highway bridge, 5 miles downstream from Height of Land Lake, 7.5 miles east of City of Detroit Lakes (05030000).	270	1937-71#, 1984	10-25-84 4- 9-85 5-15-85 7- 1-85 7-17-85 8-16-85 9-16-85 11- 7-85	30.6 50.3 177 224 180 177 175 141
Buffalo River	Red River of the North	Lat 46°58'25", long 95°49'02", in NE¼NE¼ sec.2, T.140 N., R.41 W., Becker County, Hydrologic Unit, 09020106, downstream from culvert on County Highway 34, .25 mile east of Richwood at outlet to Buffalo Lake.	-	1984	10-19-84 4- 8-85 5-16-85 6- 5-85 7- 1-85 7-18-85 8-15-85 9-17-85	13.6 21.6 41.3 38.2 38.9 47.6 22.4 20.3
Buffalo River	Red River of the North	Lat 46°57'50", long 96°02'56", in SE¼SE¼ sec.1, T.140 N., R.43 W., Becker County, Hydrologic Unit 09020106, 300 ft upstream of bridge on gravel township road, 0.9 mile east of County Highway 9, 5 miles northeast of Lake Park.	-	1984	10-19-84 4- 9-85 5-16-85 7- 1-85 7-18-85 8-15-85 9-17-85	30.1 7.8 278 84.3 64.8 40.5 34.3
Wild Rice River	Red River of the North	Lat 47°17'10", long 96°05'52", in NW¼SE¼ sec.14, T.144 N., R.43 W., Norman County, Hydrologic Unit 09020108, at bridge in Faith, MN, 1.45 miles west of Norman-Mahnomen County line, 2.75 miles south of U.S. Highway 59, 5.5 miles west of Mahnomen.	-	1984	10-16-84 4- 8-85 5-16-85 7- 2-85 7-18-85 8-15-85 9-17-85	254 234 2,100 547 358 249 134
Marsh Creek	Wild Rice River	Lat 47°19'03", long 93°05'15", in NW¼SW¼ sec.1, T.144 N., R.43 W., Norman County, Hydrologic Unit 09020108, 50 ft upstream of culvert on County Highway 40, .5 mile south of State Highway 200, 8.5 miles northeast of Twin Valley, 5 miles above mouth.	-	1984	10-15-84 4- 8-85 5-15-85 7- 2-85 8-15-85 9-17-85	116 146 534 100 69.6 9.4
Wild Rice River	Red River of the North	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 from highway bridge, 0.8 mile northeast of village of Twin Valley, and 2 miles upstream from tributary (05062500).	888	1909-17#, 1930-83#, 1984	10-18-84 5-13-85 6-20-85 8-14-85 9-17-85	326 3,790 402 449 171
South Branch Wild Rice River	Wild Rice River	Lat 47°02'07", long 96°04'03", in NE¼NE¼ sec.13, T.141 N., R.43 W., Becker County, Hydrologic Unit 09020108, near culvert on County Road 105, 2 miles east of State Highway 7, 10 miles north of Lake Park.	-	-	10-19-84 5-16-85 7- 1-85 8-15-85 9-16-85	30.1 167 21.2 4.45 8.06

Operated as a continuous-record gaging station.

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 hydrological analyses.



ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461254096090001 ORWELL LAKE SITE 1 NEAR FERGUS FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)
APR									
18...	1515	386	401	8.3	7.9	12.5	3.5	0.8	747
MAY									
15...	1540	390	403	8.1	7.9	16.0	5.1	0.7	747
JUN									
18...	1700	378	391	8.2	8.1	19.5	2.5	0.9	755
JUL									
24...	1620	356	368	8.2	8.0	23.0	2.9	1.2	747
AUG									
29...	1530	359	376	7.9	8.0	20.0	2.5	1.2	757
SEP									
24...	1630	360	392	8.0	8.1	13.0	1.7	1.2	756

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	ALKALINITY, CARBONATE IT-FLD (MG/L - CAC03) (99430)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
APR									
18...	9.6	188	<0.10	0.05	0.6	0.08	0.03	3.20	<0.10
MAY									
15...	8.0	187	0.24	0.25	1.0	0.06	0.05	3.10	<0.10
JUN									
18...	9.0	188	<0.10	0.04	0.9	0.07	0.03	1.70	<0.10
JUL									
24...	7.9	190	<0.10	0.03	0.2	0.04	0.02	9.80	<0.10
AUG									
29...	8.2	190	0.13	<0.01	0.4	0.06	<0.01	2.30	<0.10
SEP									
24...	9.8	181	<0.10	0.17	0.6	0.05	0.05	84.0	<0.10

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
APR							
18...	1520	2.0	386	8.3	12.5	747	9.6
18...	1521	4.0	386	8.2	12.0	747	9.0
18...	1523	5.0	386	8.2	12.0	747	9.0
MAY							
15...	1541	1.0	390	8.1	16.0	747	8.0
15...	1542	3.0	390	8.1	16.0	747	8.1
15...	1543	6.5	390	8.1	16.0	747	8.0
JUN							
18...	1701	1.0	378	8.2	19.5	755	9.1
18...	1702	5.0	378	8.2	19.5	755	9.0
18...	1703	10.0	378	8.2	19.5	755	8.8
18...	1704	15.0	379	8.2	19.5	755	8.8
18...	1705	20.0	379	8.2	19.0	755	8.3
JUL							
24...	1611	1.0	356	8.2	23.0	747	8.2
24...	1612	3.0	356	8.2	23.0	747	7.9
24...	1613	9.0	356	8.2	23.0	747	7.8
24...	1614	15.0	356	8.2	23.0	747	7.7
24...	1615	17.0	356	8.2	23.0	747	7.7
AUG							
29...	1520	1.0	360	7.9	20.0	757	8.8
29...	1521	3.0	359	7.9	19.5	757	8.2
29...	1522	6.0	359	7.9	19.5	757	8.0
29...	1523	9.0	358	7.9	19.5	757	7.9
29...	1524	12.0	358	7.9	19.5	757	7.8
29...	1525	15.0	359	7.8	19.5	757	7.7
SEP							
24...	1635	1.0	360	8.0	13.0	756	9.8
24...	1636	5.0	358	8.0	13.0	756	9.8
24...	1637	10.0	358	8.0	13.0	756	9.7

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461254096090001 ORWELL LAKE SITE 1 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1515		1540		1700		1620		1530		1635	
TOTAL CELLS/ML	2700		2600		1300		1400		1400		2700	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA (DIATOMS)												
.BACILLARIOPHYCEAE												
..ACHNANTHALES												
...ACHNANTHACEAE												
....ACHNANTHES												
.....A.CLEVEI	--		--		12	<1	--		--		--	
.....A.EXIGUA	--		--		--		11	<1	--		--	
.....A.LANCEOLATA	--		26	1	23	2	45	3	--		25	<1
.....A.MINUTISSIMA	--		--		--		--		28	2	--	
....COCCONEIS												
.....C.PEDICULUS	27	1	26	1	--		--		14	1	--	
.....C.PLACENTULA	53	2	150	6	12	<1	11	<1	56	4	51	2
..BACILLARIALES												
...NITZSCHIACEAE												
....NITZSCHIA												
.....N.ACICULARIS	--		51	2	12	<1	--		--		51	2
.....N.AMPHIBIA	--		26	1	--		--		14	1	--	
.....N.DISSIPATA	27	1	150	6	--		11	<1	56	4	--	
.....N.FONTICOLA	--		26	1	--		--		--		--	
.....N.FRUSTULUM	27	1	26	1	--		--		14	1	--	
.....N.PALEA	--		77	3	12	<1	23	2	--		--	
..EPITHEMIALES												
...EPITHEMIACEAE												
....EPITHEMIA												
.....E.SOREX	--		51	2	--		--		--		--	
..EUPODISCALES												
...COSCINODISCACEAE												
....CYCLOTELLA												
.....C.KUTZINGIANA	--		51	2	70	5	120	9	42	3	--	
.....C.MENEGHINIANA	80	3	26	1	35	3	--		56	4	100	4
.....C.OCELLATA	27	1	--		--		--		--		--	
.....C.PSEUDOSTELLIGERA	--		--		--		120	9	84	6	510	19
....MELOSIRA												
.....M.AMBIGUA	27	1	51	2	12	<1	--		--		--	
.....M.GRANULATA	27	1	51	2	23	2	34	2	56	4	25	<1
.....M.VARIANS	--		51	2	--		--		28	2	51	2
....STEPHANODISCUS												
.....S.ASTREA V.MINUTULA	--		26	1	--		--		84	6	150	6
.....S.HANTZSCHII	110	4	& 210	8	82	6	--		14	1	51	2
..FRAGILARIALES												
...FRAGILARIACEAE												
....ASTERIONELLA												
.....A.FORMOSA	27	1	--		--		--		--		--	
....DIATOMA												
.....D.TENUE V. ELONGATUM	--		26	1	--		--		--		--	
.....D.VULGARE	27	1	--		23	2	--		14	1	--	
....FRAGILARIA												
.....F.CAPUCINA	--		--		--		--		28	2	--	
.....F.CAPUCINA V.MESOLEPTA.	--		--		--		--		14	1	--	
.....F.CONSTRUENS	--		51	2	--		--		--		25	<1
.....F.CONSTRUENS V.VENTER	--		150	6	--		--		42	3	25	<1
.....F.CROTONENSIS	--		--		23	2	--		--		--	
.....F.PINNATA	--		26	1	--		--		--		--	
.....F.VAUCHERIAE	27	1	--		--		--		--		25	<1
....SYNEDRA												
.....S.PARASITICA	--		--		12	<1	--		14	1	--	
.....S.RADIANS	& 770	29	51	2	--		--		--		76	3
.....S.RUMPENS	--		--		35	3	--		14	1	--	
.....S.ULNA	53	2	26	1	--		11	<1	--		--	
..NAVICULALES												
...CYMBELLACEAE												
....AMPHORA												
.....A.OVALIS	27	1	--		--		--		--		--	
.....A.PERPUSILLA	27	1	51	2	23	2	23	2	42	3	25	<1
....CYMBELLA												
.....C.AFFINIS	--		--		--		--		--		25	<1
.....C.MINUTA	--		--		23	2	--		14	1	--	
.....C.TUMIDA	--		26	1	--		23	2	--		--	
...GOMPHONEMACEAE												
....GOMPHONEMA												
.....G.ANGUSTATUM	--		26	1	12	<1	23	2	--		--	
.....G.OLIVACEUM	130	5	130	5	23	2	11	<1	56	4	--	
.....G.SUBCLAVATUM	--		26	1	--		--		14	1	--	
...NAVICULACEAE												
....NAVICULA												
.....N.ANGILICA	--		--		12	<1	--		14	1	--	
.....N.CAPITATA	27	1	--		23	2	11	<1	--		--	
.....N.CRYPTOCEPHALA	--	&	210	8	23	2	34	2	42	3	25	<1

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461254096090001 ORWELL LAKE SITE 1 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1515		1540		1700		1620		1530		1635	
TOTAL CELLS/ML	2700		2600		1300		1400		1400		2700	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA--Continued												
.....N.CRYPTOCEPHALA V.VENETA	27	1	150	6	47	4	--		42	3	25	<1
.....N.DECUSSIS	--		26	1	--		23	2	28	2	--	
.....N.GRACILOIDES	--		--		--		--		--		25	<1
.....N.GREGARIA	--		--		12	<1	--		--		--	
.....N.LANCEOLATA	27	1	26	1	--		--		--		--	
.....N.MENISCULUS V.UPSALIEN.	--		51	2	--		--		--		--	
.....N.MINIMA	--		--		23	2	--		70	5	25	<1
.....N.MINUSCULA	--		--		12	<1	--		--		--	
.....N.TRIPUNCTATA	--		51	2	--		--		--		25	<1
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...HYDRODICTYACEAE												
....PEDIASTRUM	--		--		--		--		14	1	--	
...OOCYSTACEAE												
....ANKISTRODESMUS	--		--		12	<1	79	6	28	2	25	<1
....OOCYSTIS	--		--		--		11	<1	--		--	
....SELENASTRUM	--		--		--		--		14	1	--	
....TETRAEDRON	--		26	1	12	<1	11	<1	--		--	
...SCENEDESMACEAE												
....CRUCIGENIA	--		--		23	2	11	<1	--		--	
....SCENEDESMUS	--		--		35	3	45	3	--		--	
..TETRASPORALES												
...PALMELLACEAE												
....SPHAEROCYSTIS	--		--		12	<1	11	<1	--		--	
CHRYSOPHYTA (YELLOW-GREEN ALGAE)												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	--		51	2	--		--		--		--	
..PENNALES												
...ACHNANTHACEAE												
....RHOICOSPHENIA												
.....R.CURVATA	--		100	4	35	3	11	<1	28	2	--	
...FRAGILARIACEAE												
....SYNEDRA	--		--		--		11	<1	--		--	
...GOMPHONEMATACEAE												
....GOMPHONEMA	--		--		12	<1	--		14	1	--	
...NAVICULACEAE												
....CALONEIS	--		--		--		11	<1	--		--	
....NAVICULA	27	1	--		47	4	11	<1	14	1	25	<1
...NITZSCHIACEAE												
....NITZSCHIA	--		52	2	35	3	--		28	2	25	<1
.CHRYSOPHYCEAE												
..CHROMULINALES												
...CHROMULINACEAE												
....CHRYSOCOCCUS	160	6	--		--		--		28	2	--	
....KEPHYRION	720	27	--		23	2	--		--		100	4
...OCHROMONADACEAE												
....OCHROMONAS	--		--		12	<1	--		--		--	
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..OSCILLATORIALES												
...NOSTOCACEAE												
....ANABAENA	--		--		--		79	6	--		--	
EUGLENOPHYTA (EUGLENOIDS)												
.CRYPTOPHYCEAE												
..CRYPTOMONIDALES												
...CRYPTOCHRYSIDACEAE												
....CHROOMONAS	53	2	--		--		79	6	98	7	25	<1
....RHODOMONAS	130	5	77	3 &	390	30	190	14 &	110	8 &	1100	41
...CRYPTOMONODACEAE												
....CRYPTOMONAS	--		150	6	23	2 &	240	17	56	4	76	3
.EUGLENOPHYCEAE												
..EUGLENALES												
...EUGLENACEAE												
....TRACHELOMONAS	53	2	--		--		--		--		--	
PYRRHOPHYTA (FIRE ALGAE)												
.DINOPHYCEAE												
..DINOKONTAE												
...CERATIACEAE												
....CERATIUM	--		--		--		--		--		25	<1
...PERIDINIACEAE												
....PERIDINIUM	--		--		--		23	2	--		--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461302096080802 ORWELL LAKE SITE 2 NEAR FERGUS FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)
JUN									
18...	1625	376	--	8.1	8.0	19.5	1.5	1.1	755
JUL									
24...	1545	357	369	8.2	7.9	23.0	4.5	1.2	747
AUG									
29...	1500	360	372	7.9	7.7	20.0	2.0	1.0	757
SEP									
24...	1600	348	393	8.0	8.0	13.0	1.5	1.5	756

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	ALKALINITY, CARBONATE IT-FLD (MG/L CAC03) (99430)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
JUN									
18...	9.5	191	<0.10	0.02	1.1	0.07	0.03	1.80	<0.10
JUL									
24...	7.6	190	<0.10	0.05	0.3	0.04	0.03	4.30	<0.10
AUG									
29...	8.0	190	0.11	<0.01	0.5	0.06	<0.01	0.90	<0.10
SEP									
24...	10.2	185	<0.10	0.20	0.5	0.08	0.04	2.90	<0.10

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
JUN							
18...	1630	1.0	376	8.1	19.5	755	9.5
18...	1631	3.0	376	8.1	19.5	755	9.1
18...	1632	6.0	377	8.2	19.5	755	9.0
18...	1633	9.0	377	8.2	19.5	755	9.0
18...	1634	13.5	377	8.2	19.5	755	9.0
JUL							
24...	1536	1.0	356	8.2	23.0	747	7.6
24...	1537	3.0	357	8.2	23.0	747	7.6
24...	1538	6.0	358	8.2	23.0	747	7.8
24...	1539	9.0	358	8.2	23.0	747	7.5
24...	1540	12.0	362	8.1	23.0	747	7.3
AUG							
29...	1450	1.0	360	7.9	20.0	757	8.4
29...	1451	3.0	360	7.9	19.5	757	8.0
29...	1452	6.0	361	7.9	19.5	757	7.7
29...	1454	9.0	362	8.0	19.5	757	7.7
29...	1455	11.0	363	7.9	19.5	757	7.3
SEP							
24...	1610	1.0	348	8.0	13.0	756	10.2
24...	1611	4.0	352	8.0	13.0	756	10.1
24...	1612	7.0	355	8.0	13.0	756	10.1

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461302096080802 ORWELL LAKE SITE 2 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1630		1545		1500		1610	
TOTAL CELLS/ML	1400		1400		2000		1500	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA (DIATOMS)								
.BACILLARIOPHYCEAE								
..ACHNANTHALES								
...ACHNANTHACEAE								
....ACHNANTHES								
.....A.CLEVEI	24	2	12	<1	--		--	
.....A.EXIGUA	12	<1	--		--		--	
.....A.HUNGARICA	12	<1	--		--		--	
.....A.LANCEOLATA	--		12	<1	19	<1	57	4
.....A.LINEARIS	--		--		19	<1	--	
.....A.MINUTISSIMA	12	<1	--		--		--	
....COCCONEIS								
.....C.PEDICULUS	--		--		19	<1	--	
.....C.PLACENTULA	86	6	37	3	130	7	57	4
..BACILLARIALES	12	<1	--		--		--	
...NITZSCHIACEAE								
....NITZSCHIA								
.....N.ACICULARIS	12	<1	12	<1	--		14	<1
.....N.AMPHIBIA	--		12	<1	--		--	
.....N.COMMUNIS	12	<1	12	<1	--		--	
.....N.DISSIPATA	24	2	12	<1	56	3	--	
.....N.FRUSTULUM	24	2	--		--		14	<1
.....N.LINEARIS	12	<1	--		--		--	
.....N.PALEA	--		--		56	3	--	
.....N.TRYBLIONELLA	--		12	<1	--		--	
..EPITHEMIALES								
...EPITHEMIACEAE								
....EPITHEMIA								
.....E.SOREX	--		--		19	<1	--	
..EUPODISCALES								
...COSCINODISCACEAE								
....CYCLOTELLA								
.....C.KUTZINGIANA	49	3	160	11	19	<1	--	
.....C.MENEGHINIANA	--		--		130	7	--	
.....C.PSEUDOSTELLIGERA	--		150	11	150	8	260	17
....MELOSIRA								
.....M.AMBIGUA	37	3	--		37	2	43	3
.....M.GRANULATA	49	3	62	4	37	2	14	<1
....STEPHANODISCUS								
.....S.ASTREA V.MINUTULA	12	<1	--		19	<1	--	
.....S.HANTZSCHII	37	3	37	3	--		--	
..FRAGILARIALES								
...FRAGILARIACEAE								
....ASTERIONELLA								
.....A.FORMOSA	--		--		19	<1	--	
....FRAGILARIA								
.....F.CAPUCINA	--		37	3	--		--	
.....F.CONSTRUENS	37	3	49	3	56	3	14	<1
.....F.CONSTRUENS V.VENTER	--		--		--		29	2
.....F.CROTONENSIS	12	<1	--		--		--	
.....F.PINNATA	37	3	--		19	<1	14	<1
.....F.VAUCHERIAE	12	<1	--		37	2	--	
....SYNEDRA								
.....S.PARASITICA	--		12	<1	--		--	
.....S.RADIANS	--		--		19	<1	--	
.....S.RUMPENS	24	2	--		--		--	
.....S.ULNA	--		--		37	2	14	<1
..NAVICULALES								
...CYMBELLACEAE								
....AMPHORA								
.....A.COEFFEIFORMIS	--		--		--		14	<1
.....A.OVALIS	12	<1	--		--		--	
.....A.PERPUSILLA	73	5	37	3	& 170	9	14	<1
....CYMBELLA								
.....C.AFFINIS	49	3	--		--		--	
.....C.MINUTA	--		25	2	--		--	
.....C.TUMIDA	--		--		--		14	<1
...GOMPHONEMACEAE								
....GOMPHONEMA								
.....G.ANGUSTATUM	12	<1	--		--		--	
.....G.OLIVACEUM	61	4	--		19	<1	14	<1
.....G.PARVULUM	--		12	<1	--		--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461302096080802 ORWELL LAKE SITE 2 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1630		1545		1500		1610	
TOTAL CELLS/ML	1400		1400		2000		1500	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA--Continued								
...NAVICULACEAE								
....NAVICULA								
.....N.ANGILICA	12	<1	--		--		--	
.....N.CAPITATA	24	2	12	<1	--		--	
.....N.CRYPTOCEPHALA	73	5	--		56	3	29	2
.....N.CRYPTOCEPHALA V.VENETA	37	3	--		--		14	<1
.....N.DECUSSIS	12	<1	12	<1	--		29	2
.....N.GREGARIA	--		12	<1	--		14	<1
.....N.MINIMA	37	3	25	2	37	2	--	
.....N.MOURNEI	--		--		19	<1	--	
.....N.PUPULA	--		--		19	<1	--	
.....N.TRIPUNCTATA	37	3	--		--		14	<1
....NEIDIUM								
.....N.AFFINE	12	<1	--		--		--	
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...OOCYSTACEAE								
....ANKISTRODESMUS	--		74	5	37	2	71	5
....OOCYSTIS	12	<1	25	2	--		14	<1
....SELENASTRUM	--		--		--		29	2
...SCENEDESMACEAE								
....CRUCIGENIA	--		12	<1	74	4	43	3
....SCENEDESMUS	24	2	12	<1	37	2	14	<1
..TETRASPORALES								
...PALMELLACEAE								
....SPHAEROCYSTIS	--		12	<1	--		--	
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	12	<1	--		19	<1	--	
..ZYGNEMATALES								
...DESMIDIACEAE								
....COSMARIUM	--		--		--		14	<1
....STAURASTRUM	--		12	<1	--		--	
CHRYSOPHYTA (YELLOW-GREEN ALGAE)								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	--		12	<1	--		--	
..PENNALES								
...ACHNANTHACEAE								
....RHOICOSPHENIA								
.....R.CURVATA	24	2	12	<1	37	2	29	2
...CYMBELLACEAE								
....CYMBELLA	12	<1	--		--		--	
...FRAGILARIACEAE								
....SYNEDRA	--		--		38	2	--	
...GOMPHONEMATACEAE								
....GOMPHONEMA	12	<1	--		37	2	--	
...NAVICULACEAE								
....NAVICULA	12	<1	--		37	2	28	2
...NITZSCHIACEAE								
....NITZSCHIA	12	<1	12	<1	37	2	43	3
.CHRYSOPHYCEAE								
..CHROMULINALES								
...CHROMULINACEAE								
....CHRYSOCOCCUS	--		--		19	<1	--	
....KEPHYRION	--		37	3	--		42	3
...OCHROMONADACEAE								
....OCHROMONAS	12	<1	--		--		--	
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE	--		--		--		14	<1
..OSCILLATORIALES								
...NOSTOCACEAE								
....ANABAENA	--		--		19	<1	--	
EUGLENOPHYTA (EUGLENOIDS)								
.CRYPTOPHYCEAE								
..CRYPTOMONIDALES								
...CRYPTOCHRYSIDACEAE								
....CHROOMONAS	--		86	6	130	7	--	
....RHODOMONAS	& 230	16	160	11	130	7	& 330	22
...CRYPTOMONODACEAE								
....CRYPTOMONAS	--	&	200	14	110	6	100	7

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461307096092803 ORWELL LAKE SITE 3 NEAR FERGUS FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
APR									
18...	1440	397	411	8.2	7.8	11.0	1.6	0.5	747
MAY									
15...	1610	390	406	8.1	8.0	16.0	1.1	0.6	747
JUN									
18...	1730	380	391	8.3	8.1	19.0	4.3	0.9	755
JUL									
24...	1740	362	376	8.3	7.9	23.5	2.5	1.0	747
AUG									
29...	1640	364	380	7.9	7.9	20.0	1.5	1.2	757
SEP									
24...	1725	360	393	8.1	8.1	13.5	1.5	1.0	756

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L - CAC03) (99430)	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 DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
APR									
18...	10.3	192	<0.10	0.07	0.6	0.07	0.02	5.20	<0.10
MAY									
15...	7.8	184	0.17	0.13	3.0	0.07	0.04	4.80	<0.10
JUN									
18...	9.1	194	<0.10	0.02	0.6	0.06	0.02	1.10	<0.10
JUL									
24...	8.0	190	<0.10	0.05	0.4	0.05	0.04	8.50	<0.10
AUG									
29...	8.5	190	<0.10	<0.01	0.4	0.07	0.04	8.00	<0.10
SEP									
24...	10.1	190	<0.10	0.20	0.6	0.07	0.04	7.90	<0.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461307096092803 ORWELL LAKE SITE 3 NEAR FERGUS FALLS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
APR							
18...	1445	2.0	397	8.2	11.0	747	10.3
18...	1446	4.0	397	8.2	11.0	747	10.3
18...	1447	6.0	397	8.2	11.0	747	10.3
18...	1448	8.0	397	8.2	11.0	747	9.3
18...	1449	10.0	398	8.2	10.5	747	7.9
MAY							
15...	1611	1.0	390	8.1	16.0	747	8.6
15...	1612	3.0	390	8.1	16.0	747	7.7
15...	1613	6.0	390	8.1	16.0	747	7.6
15...	1614	9.0	390	8.1	16.0	747	7.3
15...	1615	10.5	390	8.1	16.0	747	7.6
JUN							
18...	1731	1.0	378	8.3	19.0	755	9.2
18...	1732	5.0	381	8.3	19.0	755	9.0
18...	1733	10.0	380	8.3	19.0	755	9.1
18...	1734	15.0	381	8.3	19.0	755	9.0
18...	1735	20.0	381	8.3	19.0	755	9.1
18...	1736	25.0	380	8.3	19.0	755	9.0
JUL							
24...	1729	1.0	360	8.3	23.5	747	8.2
24...	1730	3.0	362	8.3	23.5	747	8.0
24...	1731	6.0	362	8.3	23.5	747	7.8
24...	1732	12.0	363	8.3	23.5	747	7.7
24...	1733	18.0	363	8.2	23.5	747	7.5
24...	1734	23.0	364	8.0	23.5	747	5.7
AUG							
29...	1626	1.0	362	8.0	20.0	757	8.9
29...	1627	3.0	363	7.9	20.0	757	8.6
29...	1628	6.0	364	7.9	20.0	757	8.1
29...	1629	9.0	366	7.9	19.5	757	8.1
29...	1630	12.0	366	7.9	19.5	757	8.1
29...	1631	15.0	366	7.9	19.5	757	8.1
29...	1632	18.0	369	7.9	19.5	757	7.7
SEP							
24...	1730	1.0	360	8.1	13.5	756	10.1
24...	1731	4.0	360	8.1	13.5	756	10.1
24...	1732	10.0	360	8.1	13.5	756	9.9
24...	1733	15.0	362	8.1	13.5	756	9.7
24...	1734	16.0	362	8.1	13.5	756	9.7

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461307096092803 ORWELL LAKE SITE 3 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1445		1610		1730		1740		1640		1730	
TOTAL CELLS/ML	3700		3000		2700		2000		2500		4100	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA (DIATOMS)												
.BACILLARIOPHYCEAE												
..ACHNANTHALES												
...ACHNANTHACEAE												
....ACHNANTHES												
.....A.CLEVEI	--		--		--		16	<1	--		--	
.....A.EXIGUA	29	<1	--		--		--		--		--	
.....A.HUNGARICA	--		--		--		--		--		38	<1
.....A.LANCEOLATA	--		29	<1	--		--		21	<1	--	
.....A.MINUTISSIMA	--		29	<1	--		--		--		--	
....COCCONEIS												
.....C.PEDICULUS	29	<1	29	<1	--		--		--		--	
.....C.PLACENTULA	29	<1	87	3	23	<1	--		21	<1	--	
..BACILLARIALES												
...NITZSCHIACEAE												
....NITZSCHIA												
.....N.ACICULARIS	--		29	<1	140	5	16	<1	21	<1	--	
.....N.AMPHIBIA	--		--		23	<1	--		--		--	
.....N.DISSIPATA	29	<1	120	4	23	<1	--		--		38	<1
.....N.FRUSTULUM	29	<1	29	<1	--		--		--		--	
.....N.LINEARIS	--		--		--		--		--		38	<1
.....N.PALEA	--		58	2	--		--		21	<1	77	2
..EUPODISCALES												
...COSCINODISCACEAE												
....CYCLOTELLA												
.....C.KUTZINGIANA	--		29	<1	370	14	130	7	--		--	
.....C.MENEGHINIANA	29	<1	180	6	69	3	33	2	86	3	77	2
.....C.PSEUDOSTELLIGERA	--		29	<1	92	3	280	14	130	5	1200	29
....MELOSIRA												
.....M.AMBIGUA	290	8	200	7	140	5	49	2	--		120	3
.....M.GRANULATA	230	6	180	6	120	4	99	5	--		38	<1
....STEPHANODISCUS												
.....S.ASTREA V.MINUTULA	86	2	29	<1	23	<1	--		--		310	8
.....S.HANTZSCHII	430	12 &	350	12 &	410	15	33	2	43	2	270	7
.....S.SUBSALSUS	--		--		--		16	<1	--		--	
..FRAGILARIALES												
...FRAGILARIACEAE												
....DIATOMA												
.....D.VULGARE	57	2	29	<1	--		--		--		--	
....FRAGILARIA												
.....F.BREUISTRIATA	--		--		--		--		21	<1	--	
.....F.CAPUCINA	--		29	<1	--		16	<1	--		--	
.....F.CONSTRUENS	29	<1	--		--		33	2	--		--	
.....F.CONSTRUENS V.VENTER	--		58	2	--		--		--		--	
.....F.PINNATA	--		58	2	--		--		--		--	
.....F.VAUCHERIAE	29	<1	--		--		16	<1	--		--	
....SYNEDRA												
.....S.DELICATISSIMA	--		--		23	<1	--		--		--	
.....S.PARASITICA	--		--		--		--		21	<1	38	<1
.....S.RADIANS &	770	21	58	2	69	3	--		--		--	
.....S.ULNA	29	<1	29	<1	23	<1	--		--		--	
..NAVICULALES												
...CYMBELLACEAE												
....AMPHORA												
.....A.OVALIS	29	<1	--		--		--		--		--	
.....A.PERPUSILLA	140	4	58	2	23	<1	--		21	<1	--	
....CYMBELLA												
.....C.AFFINIS	--		--		23	<1	--		--		--	
.....C.SINUATA	--		29	<1	--		--		--		--	
...GOMPHONEMACEAE												
....GOMPHONEMA												
.....G.ANGUSTATUM	--		29	<1	23	<1	--		--		--	
.....G.OLIVACEUM	110	3	87	3	46	2	16	<1	43	2	--	
...NAVICULACEAE												
....NAVICULA												
.....N.CAPITATA	--		--		--		16	<1	--		--	
.....N.CRYPTOCEPHALA	--		120	4	23	<1	16	<1	43	2	77	2
.....N.CRYPTOCEPHALA V.VENETA	29	<1	120	4	23	<1	--		--		--	
.....N.DECUSSIS	29	<1	--		23	<1	16	<1	43	2	--	
.....N.GREGARIA	--		--		--		--		21	<1	--	
.....N.LANCEOLATA	29	<1	--		--		--		--		--	
.....N.MENISCULUS V.UPSALIEN.	--		--		23	<1	--		--		--	
.....N.MINIMA	--		29	<1	--		--		--		--	
.....N.PUPULA	--		--		--		16	<1	--		--	
.....N.RHYNCHOCEPHALA	--		58	2	--		--		--		--	
.....N.SEMINULUM	--		29	<1	--		--		--		--	
.....N.TRIPUNCTATA	--		29	<1	46	2	--		--		--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461307096092803 ORWELL LAKE SITE 3 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1445		1610		1730		1740		1640		1730	
TOTAL CELLS/ML	3700		3000		2700		2000		2500		4100	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...HYDRODICTYACEAE												
....PEDIASTRUM	--		--		23	<1	--		--		--	
...OOCYSTACEAE												
....ANKISTRODESMUS	--		29	<1	120	4	130	7	43	2	150	4
....CHODATELLA	--		--		23	<1	--		--		--	
....SELENASTRUM	--		--		--		16	<1	--		--	
...SCENEDESMACEAE												
....ACTINASTRUM	--		--		23	<1	--		--		--	
....CRUCIGENIA	--		--		--		--		21	<1	--	
....SCENEDESMUS	--		29	<1	92	3	81	4	63	3	38	<1
..TETRASPORALES												
...PALMELLACEAE												
....GLOEOCYSTIS	--		29	<1	--		--		--		--	
..VOLVOCALES												
...CHLAMYDOMONADACEAE												
....CHLAMYDOMONAS	--		29	<1	--		16	<1	--		--	
CHRYSOPHYTA (YELLOW-GREEN ALGAE)												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	57	2	120	4	--		--		--		--	
..PENNALES	29	<1	--		--		--		--		--	
...ACHNANTHACEAE												
....RHOICOSPHENIA												
.....R. CURVATA	29	<1	58	2	46	2	16	<1	43	2	--	
...NAVICULACEAE												
....NAVICULA	29	<1	29	<1	23	<1	16	<1	--		76	2
...NITZSCHIACEAE												
....NITZSCHIA	--		58	2	69	3	--		21	<1	--	
.CHRYSOPHYCEAE												
..CHROMULINALES												
...CHROMULINACEAE												
....CHRYSOCOCCUS	170	5	29	<1	--		--		--		--	
....KEPHYRION	710	19	29	<1	23	<1	33	2	21	<1	--	
...OCHROMONADACEAE												
....OCHROMONAS	--		--		--		16	<1	--		--	
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..OSCILLATORIALES												
...NOSTOCACEAE												
....ANABAENA	--		--		--		& 380	19	--		--	
...OSCILLATORIACEAE												
....OSCILLATORIA	--		--		--		--		21	<1	--	
EUGLENOPHYTA (EUGLENOIDS)												
.CRYPTOPHYCEAE												
..CRYPTOMONIDALES												
...CRYPTOCHRYSIDACEAE												
....CHROOMONAS	--		87	3	--		130	7	220	9	--	
....RHODOMONAS	110	3	150	5	370	14	130	7	& 1100	44	& 1300	32
...CRYPTOMONODACEAE												
....CRYPTOMONAS	--		29	<1	69	3	66	3	260	10	190	5
.EUGLENOPHYCEAE												
..EUGLENALES												
...EUGLENACEAE												
....EUGLENA	--		--		--		16	<1	21	<1	--	
....TRACHELOMONAS	29	<1	--		--		49	2	43	2	--	
PYRRHOPHYTA (FIRE ALGAE)												
.DINOPHYCEAE												
..DINOKONTAE												
...CERATIACEAE												
....CERATIUM	--		--		--		33	2	110	4	--	
...PERIDINIACEAE												
....PERIDINIUM	--		--		--		16	<1	--		38	<1

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461308096102804 ORWELL LAKE SITE 4 NEAR FERGUS FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)
APR									
18...	1355	394	411	8.3	7.9	11.5	7.3	0.5	747
MAY									
15...	1635	388	402	8.1	8.0	16.0	7.1	0.6	747
JUN									
18...	1755	380	394	8.3	8.1	19.0	2.7	1.0	755
JUL									
24...	1815	362	381	8.4	8.1	23.5	2.0	1.0	747
AUG									
29...	1710	369	391	8.0	7.9	20.0	2.0	1.2	757
SEP									
24...	1745	354	393	8.1	8.1	14.0	2.0	1.1	756

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	ALKALINITY, CARBONATE IT-FLD (MG/L - CAC03) (99430)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
APR									
18...	10.9	190	<0.10	0.04	1.1	0.05	0.02	6.50	<0.10
MAY									
15...	7.5	185	0.13	0.15	0.7	0.07	0.05	6.00	<0.10
JUN									
18...	9.1	192	<0.10	<0.01	0.6	0.06	0.01	6.20	<0.10
JUL									
24...	8.7	200	0.17	0.05	0.3	0.04	0.04	21.0	<0.10
AUG									
29...	9.0	180	0.11	<0.01	0.7	0.07	<0.01	8.90	<0.10
SEP									
24...	9.4	188	--	--	--	0.07	--	11.0	<0.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461308096102804 ORWELL LAKE SITE 4 NEAR FERGUS FALLS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
APR							
18...	1400	2.0	394	8.3	11.5	747	10.9
18...	1402	4.0	395	8.4	11.5	747	10.9
18...	1403	6.0	395	8.4	11.5	747	10.9
18...	1404	7.0	397	8.4	11.5	747	10.9
MAY							
15...	1636	1.0	387	8.1	16.0	747	7.6
15...	1637	6.0	387	8.1	16.0	747	7.5
15...	1638	15.0	388	8.1	16.0	747	7.6
15...	1639	18.5	388	8.1	16.0	747	7.4
JUN							
18...	1800	1.0	380	8.3	19.0	755	9.1
18...	1801	5.0	380	8.3	19.0	755	9.1
18...	1802	10.0	380	8.3	19.0	755	9.1
18...	1803	15.0	381	8.3	19.0	755	9.0
18...	1804	26.0	381	8.3	19.0	755	9.0
JUL							
24...	1800	1.0	361	8.4	23.5	747	8.9
24...	1801	3.0	362	8.4	23.5	747	8.7
24...	1802	6.0	365	8.4	23.5	747	8.5
24...	1803	12.0	364	8.4	23.5	747	8.5
24...	1804	18.0	365	8.4	23.5	747	8.4
24...	1805	24.0	365	8.4	23.5	747	8.3
24...	1806	32.0	378	8.0	23.0	747	2.3
24...	1807	28.0	369	8.2	23.5	747	6.4
AUG							
29...	1657	1.0	368	8.0	20.0	757	9.6
29...	1658	3.0	369	8.0	20.0	757	9.3
29...	1659	6.0	369	8.0	19.5	757	8.3
29...	1700	9.0	369	7.9	19.5	757	8.1
29...	1701	15.0	369	7.9	19.5	757	8.1
29...	1702	21.0	369	7.9	19.5	757	8.0
29...	1703	27.0	368	7.9	19.5	757	7.4
SEP							
24...	1750	1.0	354	8.1	14.0	756	9.4
24...	1751	5.0	356	8.1	14.0	756	9.8
24...	1752	10.0	360	8.1	14.0	756	9.6
24...	1753	15.0	360	8.1	14.0	756	9.7
24...	1754	20.0	360	8.1	14.0	756	9.6
24...	1755	25.0	361	8.1	14.0	756	9.6
24...	1756	27.0	361	8.1	14.0	756	9.5

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461308096102804 ORWELL LAKE SITE 4 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1400		1635		1800		1815		1710		1750	
TOTAL CELLS/ML	3400		3400		3000		2200		2100		5000	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA (DIATOMS)												
.BACILLARIOPHYCEAE												
..ACHNANTHALES												
...ACHNANTHACEAE												
....ACHNANTHES												
.....A.LANCEOLATA	--		32	<1	--		--		--		87	2
.....A.LINEARIS	--		--		--		19	<1	--		44	<1
.....A.MINUTISSIMA	--		32	<1	--		--		--		--	
....COCCONEIS												
.....C.PEDICULUS	--		--		26	<1	--		--		--	
.....C.PLACENTULA	29	<1	96	3	26	<1	--		19	<1	--	
..BACILLARIALES												
...NITZSCHIACEAE												
....NITZSCHIA												
.....N.ACICULARIS	--		--		--		--		39	2	130	3
.....N.AMPHIBIA	--		--		26	<1	38	2	--		--	
.....N.COMMUNIS	--		32	<1	--		--		--		--	
.....N.DISSIPATA	29	<1	64	2	--		--		--		--	
.....N.FRUSTULUM	--		32	<1	--		--		--		44	<1
.....N.LINEARIS	29	<1	--		--		--		19	<1	44	<1
.....N.PALEA	--		130	4	--		--		39	2	--	
..EUPODISCALES												
...COSCINODISCACEAE												
....CYCLOTELLA												
.....C.GLOMERATA	--		96	3	--		--		--		--	
.....C.KUTZINGIANA	--		130	4	280	9	77	3	--		--	
.....C.MENEGHINIANA	--	&	390	11	--		19	<1	77	4	310	6
.....C.OCELLATA	29	<1	--		--		--		--		--	
.....C.PSEUDOSTELLIGERA	--		--		51	2	150	7	230	11	& 1500	30
....MELOSIRA												
.....M.AMBIGUA	200	6	190	6	180	6	19	<1	39	2	--	
.....M.GRANULATA	200	6	130	4	210	7	--		39	2	44	<1
.....M.VARIANS	29	<1	--		--		--		--		--	
....STEPHANODISCUS												
.....S.ASTREA V.MINUTULA	--		96	3	--		--		58	3	440	9
.....S.HANTZSCHII	290	9	350	10	& 670	22	19	<1	120	6	220	4
..FRAGILARIALES												
...FRAGILARIACEAE												
....ASTERIONELLA												
.....A.FORMOSA	29	<1	32	<1	--		--		--		--	
....DIATOMA												
.....D.VULGARE	29	<1	64	2	--		--		--		--	
....FRAGILARIA												
.....F.CONSTRUENS V.VENTER	--		32	<1	--		--		--		--	
.....F.PINNATA	--		--		--		--		--		44	<1
.....F.VAUCHERIAE	--		32	<1	--		--		--		87	2
....SYNEDRA												
.....S.DELICATISSIMA	--		32	<1	--		--		--		--	
.....S.RADIANS	& 800	24	64	2	26	<1	--		--		--	
.....S.RUMPENS	--		--		--		--		--		44	<1
.....S.ULNA	57	2	--		--		--		--		--	
..NAVICULALES												
...CYMBELLACEAE												
....AMPHORA												
.....A.OVALIS	29	<1	--		--		--		--		--	
.....A.PERPUSILLA	--		96	3	26	<1	--		19	<1	44	<1
....CYMBELLA												
.....C.MINUTA	--		32	<1	--		--		--		--	
...GOMPHONEMACEAE												
....GOMPHONEMA												
.....G.ANGUSTATUM	--		64	2	--		--		--		--	
.....G.OLIVACEUM	57	2	--		--		19	<1	--		--	
...NAVICULACEAE												
....DIPLONEIS												
.....D.OCULATA	--		32	<1	--		--		--		--	
....NAVICULA												
.....N.CAPITATA	--		32	<1	--		--		--		--	
.....N.CRYPTOCEPHALA	--		96	3	--		--		19	<1	--	
.....N.CRYPTOCEPHALA V.VENETA	29	<1	64	2	--		--		--		--	
.....N.DECUSSIS	--		--		--		--		19	<1	--	
.....N.GREGARIA	--		32	<1	--		--		--		--	
.....N.MINIMA	--		32	<1	--		--		19	<1	--	
.....N.MUTICA	29	<1	--		--		--		--		--	
.....N.PUPULA	--		32	<1	26	<1	--		--		--	
.....N.RHYNCHOCEPHALA	29	<1	--		--		--		--		--	
.....N.TRIPUNCTATA	29	<1	32	<1	26	<1	--		--		--	
....NEIDIUM												
.....N.AFFINE	--		--		--		--		19	<1	--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461308096102804 ORWELL LAKE SITE 4 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	APR 18, 85		MAY 15, 85		JUN 18, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	1400		1635		1800		1815		1710		1750	
TOTAL CELLS/ML	3400		3400		3000		2200		2100		5000	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...OOCYSTACEAE												
....ANKISTRODESMUS	--		--		100	3	120	5	58	3	130	3
....CHODATELLA	--		--		--		--		--		44	<1
....OOCYSTIS	--		32	<1	--		--		--		--	
....SELENASTRUM	--		--		26	<1	--		--		--	
....TETRAEDRON	--		--		26	<1	--		--		--	
...SCENEDESMACEAE												
....CRUCIGENIA	--		--		--		19	<1	19	<1	44	<1
....SCENEDESMUS	--		130	4	150	5	38	2	--		87	2
..TETRASPORALES												
...COCCOMYXACEAE												
....ELAKATOTHRIX	29	<1	--		--		--		--		--	
...PALMELLACEAE												
....GLOEOCYSTIS	--		32	<1	--		--		--		--	
..VOLVOCALES												
...CHLAMYDOMONADACEAE												
....CHLAMYDOMONAS	--		--		--		--		--		44	<1
CHRYSOPHYTA (YELLOW-GREEN ALGAE)												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	--		96	3	--		--		--		--	
..PENNALES												
...ACHNANTHACEAE												
....RHOICOSPHENIA												
.....R.CURVATA	--		32	<1	--		--		19	<1	--	
...FRAGILARIACEAE												
....SYNEDRA	--		--		--		--		19	<1	--	
...NAVICULACEAE												
....NAVICULA	29	<1	32	<1	26	<1	--		38	2	44	<1
...NITZSCHIACEAE												
....NITZSCHIA	--		32	<1	--		19	<1	--		88	2
.CHRYSOPHYCEAE												
..CHROMULINALES												
...CHROMULINACEAE												
....CHRYSOCOCCUS	290	9	--		--		--		--		--	
....KEPHYRION	710	21	64	2	26	<1	19	<1	38	2	44	<1
...OCHROMONADACEAE												
....DINOBRYON	--		--		--		--		19	<1	--	
....OCHROMONAS	--		--		26	<1	--		--		--	
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..OSCILLATORIALES												
...NOSTOCACEAE												
....ANABAENA	--		--		--		& 1200	55	--		--	
EUGLENOPHYTA (EUGLENOIDS)												
.CRYPTOPHYCEAE												
..CRYPTOMONIDALES												
...CRYPTOCHRYSIDACEAE												
....CHROOMONAS	--		64	2	130	4	38	2	130	6	--	
....RHODOMONAS	290	9	160	5	620	21	210	10	& 680	32	960	19
...CRYPTOMONODACEAE												
....CRYPTOMONAS	86	3	96	3	330	11	19	<1	250	12	440	9
.EUGLENOPHYCEAE												
..EUGLENALES												
...EUGLENACEAE												
....TRACHELOMONAS	57	2	--		--		38	2	--		--	
PYRRHOPHYTA (FIRE ALGAE)												
.DINOPHYCEAE	--		--		--		--		19	<1	--	
..DINOKONTAE												
...CERATIACEAE												
....CERATIUM	--		--		--		77	3	77	4	--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461215096100205 ORWELL LAKE SITE 5 NEAR FERGUS FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
APR									
18...	1245	1100	1110	8.4	7.7	15.0	6.0	--	747
JUN									
19...	0827	520	388	8.1	8.0	18.0	3.5	0.9	750
JUL									
24...	1650	496	514	8.0	7.4	23.0	3.0	0.8	747
AUG									
29...	1600	730	774	8.1	7.5	19.5	3.7	0.5	757
SEP									
24...	1700	567	633	8.2	7.8	11.5	2.0	1.5	756

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L - CAC03) (99430)	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 DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
APR									
18...	11.2	200	<0.10	<0.01	0.9	0.09	0.01	--	--
JUN									
19...	7.8	210	<0.10	<0.01	1.1	0.18	0.11	8.20	<0.10
JUL									
24...	4.2	220	<0.10	0.07	0.7	0.13	0.03	35.0	<0.10
AUG									
29...	9.0	270	<0.10	<0.01	0.9	0.27	0.15	83.0	<0.10
SEP									
24...	12.5	240	<0.10	0.15	1.9	0.21	0.10	5.70	<0.10

DATE	TIME	SAM-PLING DEPTH (FEET) (00003)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
JUN							
19...	0828	1.0	520	8.1	18.0	750	7.8
19...	0829	3.0	521	8.0	17.5	750	7.8
JUL							
24...	1645	1.0	496	8.0	23.0	747	4.5
24...	1646	3.0	496	8.0	23.0	747	4.2
24...	1647	6.0	496	8.0	23.0	747	4.0
24...	1648	8.0	497	8.0	23.0	747	3.8
AUG							
29...	1554	1.0	725	8.1	19.5	757	10.1
29...	1555	3.0	732	8.1	19.0	757	7.9
29...	1556	4.5	734	8.0	19.0	757	5.3
SEP							
24...	1705	1.5	567	8.2	11.5	756	12.5

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461215096100205 ORWELL LAKE SITE 5 NEAR PERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	JUN 19, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	0827		1650		1600		1705	
TOTAL CELLS/ML	1500		5000		7000		7300	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
BACILLARIOPHYTA (DIATOMS)								
.BACILLARIOPHYCEAE								
..BACILLARIALES								
...NITZSCHIACEAE								
....NITZSCHIA								
.....N.AMPHIBIA	42	3	--		180	3	67	<1
.....N.LINEARIS	14	<1	--		--		--	
.....N.PALEA	--		--		60	<1	330	5
..EUPODISCALES								
...COSCINODISCACEAE								
....CYCLOTELLA								
.....C.KUTZINGIANA	--		& 950	19	120	2	--	
.....C.MENEGHINIANA	14	<1	370	7	840	12	670	9
.....C.PSEUDOSTELLIGERA	--		120	2	180	3	670	9
....MELOSIRA								
.....M.GRANULATA	190	13	--		--		--	
....STEPHANODISCUS								
.....S.ASTREA V.MINUTULA	--		120	2	1300	19	& 1500	21
.....S.HANTZSCHII	130	9	250	5	360	5	270	4
..FRAGILARIALES								
...FRAGILARIACEAE								
....DIATOMA								
.....D.TENUE V. ELONGATUM	14	<1	--		--		--	
....FRAGILARIA								
.....F.CAPUCINA	28	2	--		--		--	
.....F.VAUCHERIAE	--		--		--		67	<1
..NAVICULALES								
...NAVICULACEAE								
....NAVICULA								
.....N.CRYPTOCEPHALA	--		--		60	<1	67	<1
..SURIRELLALES								
...SURIRELLACEAE								
....SURIRELLA								
.....S.ANGUSTA	--		--		60	<1	--	
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...OOCYSTACEAE								
....ANKISTRODESMUS	150	10	460	9	120	2	1000	14
....CHODATELLA	--		170	3	--		--	
....SELENASTRUM	150	10	210	4	60	<1	67	<1
...SCENEDESMACEAE								
....ACTINASTRUM	--		41	<1	--		--	
....CRUCIGENIA	69	5	--		--		130	2
....SCENEDESMUS	& 290	19	540	11	360	5	540	7
....TETRASTRUM	--		--		60	<1	--	
..TETRASPORALES								
...PALMELLACEAE								
....SPHAEROCYSTIS	69	5	--		--		--	
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--		250	5	--		67	<1
..ZYGNEMATALES								
...DESMIDIACEAE								
....STAURASTRUM	28	2	--		--		--	
CHRYSOPHYTA (YELLOW-GREEN ALGAE)								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....COSCINODISCUS	--		--		--		130	2
..PENNALES								
...NAVICULACEAE								
....NAVICULA	14	<1	--		60	<1	--	
....PINNULARIA	14	<1	--		--		--	
...NITZSCHIACEAE								
....NITZSCHIA	--		41	<1	240	3	--	
.CHRYSOPHYCEAE								
..CHROMULINALES								
...CHROMULINACEAE								
....KEPHYRION	42	3	--		--		67	<1
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..OSCILLATORIALES								
...NOSTOCACEAE								
....ANABAENA	55	4	83	2	120	2	--	
....APHANIZOMENON	--		41	<1	--		--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

461215096100205 ORWELL LAKE SITE 5 NEAR FERGUS FALLS, MN--Continued

PHYTOPLANKTON ANALYSES, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	JUN 19, 85		JUL 24, 85		AUG 29, 85		SEP 24, 85	
TIME	0827		1650		1600		1705	
TOTAL CELLS/ML	1500		5000		7000		7300	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
EUGLENOPHYTA (EUGLENOIDS)								
.CRYPTOPHYCEAE								
..CRYPTOMONIDALES								
...CRYPTOCHRYSIDACEAE								
....CHROOMONAS	14	<1	370	7	120	2	--	
....RHODOMONAS	97	6	--		120	2	130	2
...CRYPTOMONODACEAE								
....CRYPTOMONAS	42	3	170	3	--		270	4
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....EUGLENA	--		--		60	<1	67	<1
....PHACUS	--		--		360	5	--	
....TRACHELOMONAS	28	2	120	2	120	2	67	<1
PYRRHOPHYTA (FIRE ALGAE)								
.DINOPHYCEAE								
..DINOKONTAE								
...CERATIACEAE								
....CERATIUM	--		620	12	& 2000	29	1100	15
...PERIDINIACEAE								
....PERIDINIUM	--		41	<1	--		--	

& Biological organism estimated as dominant.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

470405095420001 STRAWBERRY LAKE NEAR PONSFORD, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG						
27...	1430	0.3	299	8.60	21.0	9.4
27...	1431	3.30	298	8.60	19.5	9.4
27...	1432	6.60	297	8.60	19.0	9.5
27...	1433	9.80	297	8.60	19.0	9.5
27...	1434	13.1	297	8.60	19.0	9.4
27...	1435	16.4	296	8.60	19.0	9.3
27...	1436	19.7	296	8.60	19.0	9.2
27...	1437	23.0	296	8.60	19.0	9.1
27...	1438	26.2	297	8.60	19.0	8.5
27...	1439	29.5	297	8.50	19.0	8.1
27...	1440	32.8	298	8.50	18.5	7.6
27...	1441	36.1	298	8.50	18.5	7.5
27...	1442	39.0	301	8.30	18.5	5.6

DATE	TIME	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH LAB (STANDARD UNITS) (00403)	TURBIDITY (NTU) (00076)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)
AUG										
27...	1400	300	8.1	0.8	27	22	2.9	159	6.4	1.4

DATE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
AUG									
27...	178	<0.10	0.06	0.6	0.4	0.05	0.04	8.2	0.4

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG							
27...	1400	2	57	40	<1	<10	2

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG						
27...	<3	2	<1	0.9	<1	8

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

470730095450001 WHITE EARTH LAKE NEAR WHITE EARTH, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG						
27...	1600	0.3	306	8.60	20.5	9.6
27...	1601	3.30	306	8.60	20.0	9.7
27...	1602	9.80	306	8.60	19.5	9.6
27...	1603	16.4	306	8.50	19.5	9.3
27...	1604	32.8	309	8.30	18.5	7.2
27...	1605	49.2	309	8.20	18.5	6.2
27...	1606	52.5	309	8.10	18.5	5.9
27...	1607	55.8	310	8.00	18.0	5.1
27...	1608	59.0	316	7.70	17.0	1.9
27...	1609	62.3	327	7.60	13.0	0.2
27...	1610	64.0	328	7.50	12.5	0.2

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH LAB (STANDARD UNITS) (00403)	TURBIDITY (NTU) (00076)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)
AUG										
27...	1545	--	311	8.0	1.0	32	21	2.3	167	3.7
27...	1630	75	329	7.4	1.0	33	21	2.4	173	3.3

DATE	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
AUG										
27...	1.7	186	<0.10	0.02	0.5	0.9	0.06	0.04	8.0	0.2
27...	1.9	191	<0.10	0.26	0.8	0.5	0.07	0.05	7.3	0.2

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG							
27...	1545	1	65	30	<1	<10	2
27...	1630	2	70	30	<1	<10	1

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG							
27...	3	2	<1	0.3	<1	<1	6
27...	33	1	370	0.1	<1	<1	4

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

474626094541001 MUD RIVER ABOVE REDBY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
AUG 20...	1145	340	332	7.9	7.6	22.0	13.0	1.0	8.8	45

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY FIELD (MG/L AS CACO3) (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
AUG 20...	17	1.6	187	175	<0.5	<0.2	1.8	221	2

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG 20...	<0.10	0.07	0.9	0.8	0.05	0.04	19	0.2	<0.01

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG 20...	1145	3	67	<20	<1	<10	<1

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG 20...	290	2	51	0.3	<1	<1	16

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

475043095133101 SANDY RIVER NEAR RED LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
AUG										
08...	0930	440	421	8.1	7.9	26.0	17.5	1.5	8.7	59
15...	1630	--	--	--	--	--	--	--	--	--

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY FIELD (MG/L AS CACO3) (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
AUG									
08...	22	2.0	227	233	--	3.8	1.6	273	5
15...	--	--	--	--	<0.5	--	--	--	--

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG									
08...	<0.10	0.03	0.7	0.6	0.02	<0.01	15	0.4	<0.01
15...	--	--	--	--	--	--	--	--	--

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG							
08...	0930	4	110	40	1	<10	2

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG							
08...	160	<1	52	<0.1	<1	<1	9

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

475236095010301 PIKE CREEK AT RED LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
AUG 15...	1500	480	459	8.0	7.8	14.5	0.7	9.1	110	90

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	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)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 15...	66	22	1.5	253	<0.5	1.5	5.1	294	4

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	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-PENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG 15...	<0.10	0.01	0.6	0.5	<0.01	<0.01	10	0.3	<0.01

DATE	TIME	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)
AUG 15...	1500	1	110	20	<1	<10	8

DATE	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)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
AUG 15...	46	1	33	<0.1	<1	<1	6

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

475254094541601 MUD RIVER AT MOUTH AT REDBY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
AUG 15...	1230	410	408	8.0	7.8	14.5	15	9.4	59

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	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)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 15...	19	2.3	214	225	<0.5	1.2	2.4	283	4

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	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-PENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG 15...	0.11	0.04	0.9	0.8	0.03	<0.01	15	0.3	<0.01

DATE	TIME	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)
AUG 15...	1230	4	110	30	1	<10	5

DATE	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)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
AUG 15...	240	3	69	<0.1	<1	<1	19

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

480000095000001 LOWER RED LAKE NEAR RED LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG						
07...	1402	10.0	256	7.50	22.0	8.3
07...	1403	15.0	256	7.50	21.5	8.0
07...	1404	20.0	256	7.40	21.5	7.7
07...	1405	25.0	256	7.40	21.5	7.4
07...	1406	30.0	257	7.30	21.5	6.7

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)
AUG									
07...	1330	31.0	256	276	7.5	7.9	22.0	2.5	1.1

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
AUG								
07...	8.3	38	12	2.0	142	6.2	1.9	176

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG								
07...	5	0.11	0.03	0.6	0.6	<0.01	<0.01	<0.01

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG							
07...	1330	10	52	30	<1	<10	7

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG							
07...	19	2	8	0.1	<1	<1	9

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

480013094403501 NORTH BRANCH BATTLE RIVER NEAR REDBY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)
AUG 21...	1300	12	295	283	8.0	7.7	21.0	13.0	0.4	9.7

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	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)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 21...	43	13	0.4	162	151	<0.5	6.3	1.3	214	2

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	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-PENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG 21...	<0.10	0.08	1.1	0.8	0.06	0.05	30	0.2	<0.01

DATE	TIME	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)
AUG 21...	1300	1	36	<20	1	<10	<1

DATE	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)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
AUG 21...	100	3	32	0.3	<1	<1	12

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

480430094351001 SHOTLEY BROOK NEAR SHOTLEY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)
AUG 22...	1330	24	240	225	8.1	7.7	25.0	14.5	1.0	10.0

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFIDE TOTAL (MG/L AS S) (00745)	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)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 22...	33	9.8	0.3	118	118	<0.5	<0.2	1.4	162	2

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	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-PENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG 22...	<0.10	0.03	0.7	0.4	0.04	0.04	27	0.1	<0.01

DATE	TIME	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)
AUG 22...	1330	2	29	<20	<1	<10	1

DATE	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)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
AUG 22...	110	1	28	<0.1	<1	<1	9

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

480730094523001 UPPER RED LAKE NEAR RED LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG						
07...	1100	2.00	212	8.00	22.0	8.9
07...	1101	5.00	212	8.00	22.0	8.7
07...	1102	8.00	212	8.00	22.0	8.7
07...	1103	11.0	213	7.90	21.5	8.2
07...	1104	14.0	214	7.80	21.5	8.0
07...	1105	16.0	214	7.80	21.5	7.8

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	TRANSPARENCY (SECCHI DISK) (M) (00078)
AUG									
07...	1200	17	212	233	8.0	8.0	22.0	6.5	0.8

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
AUG								
07...	8.7	32	10	1.8	119	5.1	1.6	159

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CYANIDE TOTAL (MG/L AS CN) (00720)
AUG								
07...	26	<0.10	0.02	1.1	0.6	<0.01	<0.01	<0.01

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)
AUG							
07...	1200	1	40	30	<1	10	10

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
AUG							
07...	35	<1	9	2.6	<1	<1	8

WATER QUALITY DATA AT STREAMFLOW STATIONS

Field determinations of water temperature and specific conductance are made at many streamflow station 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 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
04010500 PIGEON RIVER AT MIDDLE FALLS NEAR GRAND PORTAGE, MN							
OCT. 11, 1984	63	10.5	96	MAY 08	1810	8.0	60
NOV. 27	147	.5	95	MAY 09	1480	8.0	---
JAN. 10, 1985	121	.0	---	JUNE 26	724	14	65
JAN. 21	100	.5	---	JULY 17	537	18	---
FEB. 13	96	.5	90	AUG. 06	1190	20	81
MAR. 08	84	.5	---	SEPT. 11	266	13.5	77
MAR. 27	172	1.0	95				
04014500 BAPTISM RIVER NEAR BEAVER BAY, MN							
OCT. 10, 1984	21	11.0	106	MAY 07	418	9.0	60
NOV. 28	171	.5	85	JUNE 25	149	14.0	60
JAN. 08, 1985	27	.0	110	AUG. 07	67	22.0	75
FEB. 12	9.8	.5	90	SEPT. 10	116	15.0	75
MAR. 26	82	.5	82				
04015330 KNIFE RIVER NEAR TWO HARBORS, MN							
OCT. 12, 1984	17	11.0	178	MAY 09	80	17	100
NOV. 26	28	.0	145	JUNE 27	786	---	---
JAN. 09, 1985	4.1	.0	180	AUG. 08	18	19	170
FEB. 14	4.1	---	---	SEPT. 12	27	12.5	140
APR. 02	96	.0	92				
04015475 PARTRIDGE RIVER ABOVE COLBY LAKE NEAR HOYT LAKES, MN							
OCT. 02, 1984	31	9.5	195	APR. 25	517	3.5	43
NOV. 15	37	1.0	103	MAY 01	341	10.5	62
DEC. 19	30	.0	175	JUNE 11	101	15.5	---
FEB. 05, 1985	1.5	.0	200	JULY 24	85	20.5	88
MAR. 21	8.8	.5	200	AUG. 29	34	17	120
MAR. 20	37	.5	---				
04016500 ST. LOUIS RIVER NEAR AURORA, MN							
OCT. 02, 1984	45	8.0	375	APR. 03	94	0.5	119
NOV. 15	102	1.0	53	MAY 01	1010	13.5	65
DEC. 20	95	.0	109	JUNE 11	388	15	54
FEB. 05, 1985	22	.0	250	JULY 24	280	20.5	68
MAR. 21	75	0.5	360	AUG. 29	119	16	120

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
04018750 ST. LOUIS RIVER AT FORBES, MN							
OCT. 01, 1984	17	9.0	377	MAR. 22	79	---	---
NOV. 14	338	1.0	247	MAY 02	2320	11	160
DEC. 20	268	.0	---	JUNE 10	1160	17	141
FEB. 07, 1985	98	.0	360	JULY 26	634	20	195
MAR. 19	213	.5	370	SEPT. 03	511	15	320
04024000 ST. LOUIS RIVER AT SCANLON, MN							
OCT. 09, 1984	703	11.5	158	MAY 06	5390	14	140
NOV. 20	2010	.0	171	JUNE 24	2000	19	125
JAN. 07, 1984	1900	.0	157	JULY 30	1840	22	120
FEB. 11	1360	0.5	150	SEPT. 09	2910	17.5	210
MAR. 26	2990	1.0	148				
04024098 DEER CREEK NEAR HOLYOKE, MN							
DEC. 18, 1984	5.64	0.5	310	JULY 17	1.87	17.0	300
MAR. 21, 1985	19.5	1.0	95	SEPT. 04	24.7	---	120
MAY 14	8.31	10.5	220				
05046000 OTTER RAIL RIVER BELOW ORWELL DAM NEAR FERGUS FALLS, MN							
OCT. 26, 1984	238	8.0	450	MAY 15	994	16.0	420
DEC. 11	265	---	540	JULY 17	1060	24.0	390
FEB. 13, 1985	269	.0	520	SEPT. 30	831	10.0	400
MAR. 25	607	4.0	440				
05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SOUTH DAKOTA							
OCT. 26, 1984	273	9.0	1030	MAR. 29	837	3.5	640
DEC. 11	80	---	1480	MAY 15	157	12.5	1380
FEB. 13, 1985	.0	---	---	JULY 17	27	23.0	1180
MAR. 25	429	6.0	690	SEPT. 25	5.0	---	---
05061000 BUFFALO RIVER NEAR HAWLEY							
NOV. 15, 1984	36	---	920	MAY 13	959	14.5	460
FEB. 28, 1985	33	.0	---	JUNE 25	144	19.5	620
MAR. 22	224	3.0	540	AUG. 28	38	16.5	620
05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN							
OCT. 15, 1984	29	12.0	900	MAY 13	214	15.0	750
NOV. 15	24	.0	1130	JUNE 03	1230	15.0	530
FEB. 28, 1985	1.9	.0	---	JULY 18	1.3	23.0	890
MAR. 22	271	4.0	530	AUG. 28	5.0	17.5	930

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
05062000 BUFFALO RIVER NEAR DILWORTH, MN							
OCT. 15, 1984	256	13	520	MAY 13	767	15.0	510
NOV. 15	62	.0	940	MAY 16	1550	13.0	580
DEC. 21	32	.0	950	JUNE 03	1450	15.0	430
JAN. 29, 1985	24	.0	860	JUNE 25	216	20.0	710
FEB. 28	35	.0	---	JULY 18	83	23.0	590
MAR. 22	930	2.0	440	AUG. 28	60	18.0	630
APR. 18	137	14.0	750	SEPT. 24	128	10.0	740
05064000 WILD RICE RIVER AT HENDRUM, MN							
OCT. 18, 1984	831	---	---	MAY 14	4830	14	320
NOV. 28	185	.0	650	JUNE 18	680	---	---
MAR. 26, 1985	1140	2.0	---	AUG. 13	456	19	507
APR. 03	654	---	---	SEPT. 17	217	17	550
05067500 MARSH RIVER NEAR SHELLY, MN							
MAY 15, 1985	1120	12.5	340	AUG. 09	1.5	22.0	456
JUNE 18	6.4	17.0	730	SEPT. 18	5.6	11.0	550
05069000 SANDHILL RIVER AT CLIMAX, MN							
OCT. 18, 1984	39	8.0	590	MAY 14	860	13.5	320
NOV. 27	61	.0	700	JUNE 19	73	19.5	600
MAR. 26, 1985	350	1.0	---	AUG. 08	260	---	---
APR. 03	170	2.0	480	SEPT. 18	91	17.0	570
05074500 RED LAKE RIVER NEAR RED LAKE, MN							
OCT. 26, 1984	172	4.5	300	MAY 24	663	16	260
DEC. 06	884	.0	320	JULY 24	996	21.5	280
JAN. 18, 1985	809	---	---	AUG. 13	876	17	270
MAR. 06	769	---	300	SEPT. 23	118	12	285
APR. 11	312	5.0	335				
05075000 RED LAKE AT HIGH LANDING NEAR GOODRIDGE, MN							
OCT. 25, 1984	354	4.0	---	MAY 22	884	15	280
DEC. 06	720	.0	350	JULY 11	823	19	295
JAN. 17, 1985	889	.5	310	AUG. 15	1180	17	270
MAR. 08	927	.0	300	SEPT. 23	710	10	355
APR. 10	494	6.0	260				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN							
OCT. 25, 1984	123	2.5	---	MAY 22	889	17	450
DEC. 05	4.2	.0	960	JUNE 01	2000	16	360
JAN. 17, 1985	.0	---	---	JULY 10	1300	23	415
MAR. 07	---	---	---	AUG. 15	350	16	480
MAR. 27	1040	1.0	290	SEPT. 24	983	7.0	750
APR. 11	760	2.0	320				
05078000 CLEARWATER RIVER AT PLUMMER, MN							
OCT. 17, 1984	245	9.0	740	APR. 08	128	2.5	385
NOV. 26	120	.0	530	MAY 21	850	14	475
JAN. 07, 1985	61	.0	420	JUNE 17	122	20	450
FEB. 19	43	.5	520	AUG. 07	469	21	590
MAR. 14	29	.5	380	SEPT. 18	208	17	720
APR. 02	244	7.0	330				
05078230 LOST RIVER AT OKLEE, MN							
OCT. 15, 1984	51	14.0	570	APR. 07	228	1.5	420
OCT. 16	121	11.0	860	APR. 08	118	2.0	380
NOV. 26	41	.0	780	MAY 21	245	13.0	550
JAN. 07, 1985	5.4	1.0	781	JUNE 17	27	19.0	600
FEB. 19	5.5	.0	709	AUG. 06	174	23.0	473
MAR. 14	50	---	---	SEPT. 19	67	15.5	790
05078500 CLEAR WATER RIVER AT RED LAKE FALLS, MN							
OCT. 17, 1984	424	.9	640	APR. 02	771	2.0	380
NOV. 26	240	.0	550	MAY 21	1760	15	500
JAN. 08, 1985	92	.0	340	JUNE 18	280	16	490
FEB. 20	62	.0	540	AUG. 07	1090	22	500
MAR. 14	287	---	---	SEPT. 18	437	17	520
05079000 RED LAKE RIVER AT CROOKSTON, MN							
OCT. 17, 1984	775	10.0	460	APR. 02	2490	1.0	310
NOV. 27	858	.0	400	MAY 21	3940	16.5	365
JAN. 08, 1985	1010	0.5	185	JUNE 19	1660	18.0	360
FEB. 20	933	0.5	320	AUG. 08	2440	22.0	415
MAR. 27	3770	1.0	270	SEPT. 18	2020	16.5	395

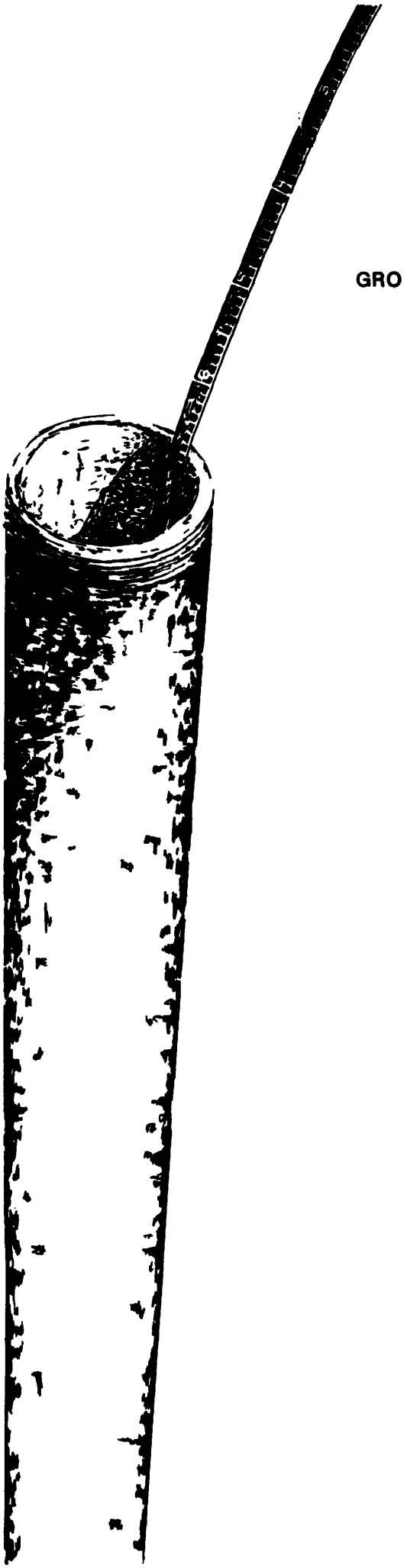
WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
05087500 MIDDLE RIVER AT ARGYLE, MN							
OCT. 24, 1984	.47	4.0	660	APR. 10	50	3.0	365
DEC. 05	.66	.0	780	MAY 23	59	17.0	580
JAN. 16, 1985	.13	---	---	JULY 10	58	22.0	545
MAR. 07	.30	.0	680	AUG. 14	11	16.5	510
MAR. 27	280	1.0	255	SEPT. 24	8.6	9.0	680
05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN							
MAY 23, 1985	113	17.0	425	AUG. 14	298	15.0	380
JULY 10	417	25.0	390	SEPT. 24	45	11.0	540
05104500 ROSEAU RIVER BELOW SOUTH FORK RIVER NEAR MALUNG, MN							
OCT. 24, 1984	186	4.0	336	MAY 20	1360	15.0	285
DEC. 04	20	.0	490	JULY 09	340	23.0	315
JAN. 14, 1985	4.7	---	---	AUG. 21	609	16.0	280
MAR. 12	5.6	---	---	SEPT. 25	284	8.0	355
APR. 09	194	1.0	225				
05107500 ROSEAU RIVER AT ROSS, MN							
OCT. 23, 1984	305	4.0	430	APR. 09	793	1.0	215
DEC. 04	36.0	.0	440	MAY 21	1200	14.0	320
JAN. 15, 1985	10	.0	630	JULY 09	1780	23.0	325
MAR. 12	7.6	0.5	610	AUG. 21	1010	15.0	320
MAR. 28	742	0.5	215	SEPT. 25	598	8.0	390
05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN							
OCT. 03, 1984	32	9.0	---	MAY 21	992	13.0	320
OCT. 23	246	4.0	540	JUNE 04	1000	15.0	---
DEC. 04	55	.0	485	JULY 09	1290	25.0	325
JAN. 15, 1985	10	.0	320	AUG. 02	221	21.0	---
MAR. 13	6.2	0.5	559	AUG. 20	919	15.5	360
MAR. 28	498	0.5	190	SEPT. 10	1270	16.0	---
APR. 09	1160	1.0	225	SEPT. 25	1190	9.0	385
05124480 KAWISHIWI RIVER NEAR ELY, MN							
OCT. 03, 1984	19	11.0	28	APR. 30	447	11.0	31
OCT. 24	21	8.5	---	JUNE 12	354	16.0	30
DEC. 19	27	.0	35	JULY 25	141	21.0	29
FEB. 06, 1985	60	.0	28	SEPT. 04	66	16.5	29
MAR. 20	46	1.0	---				

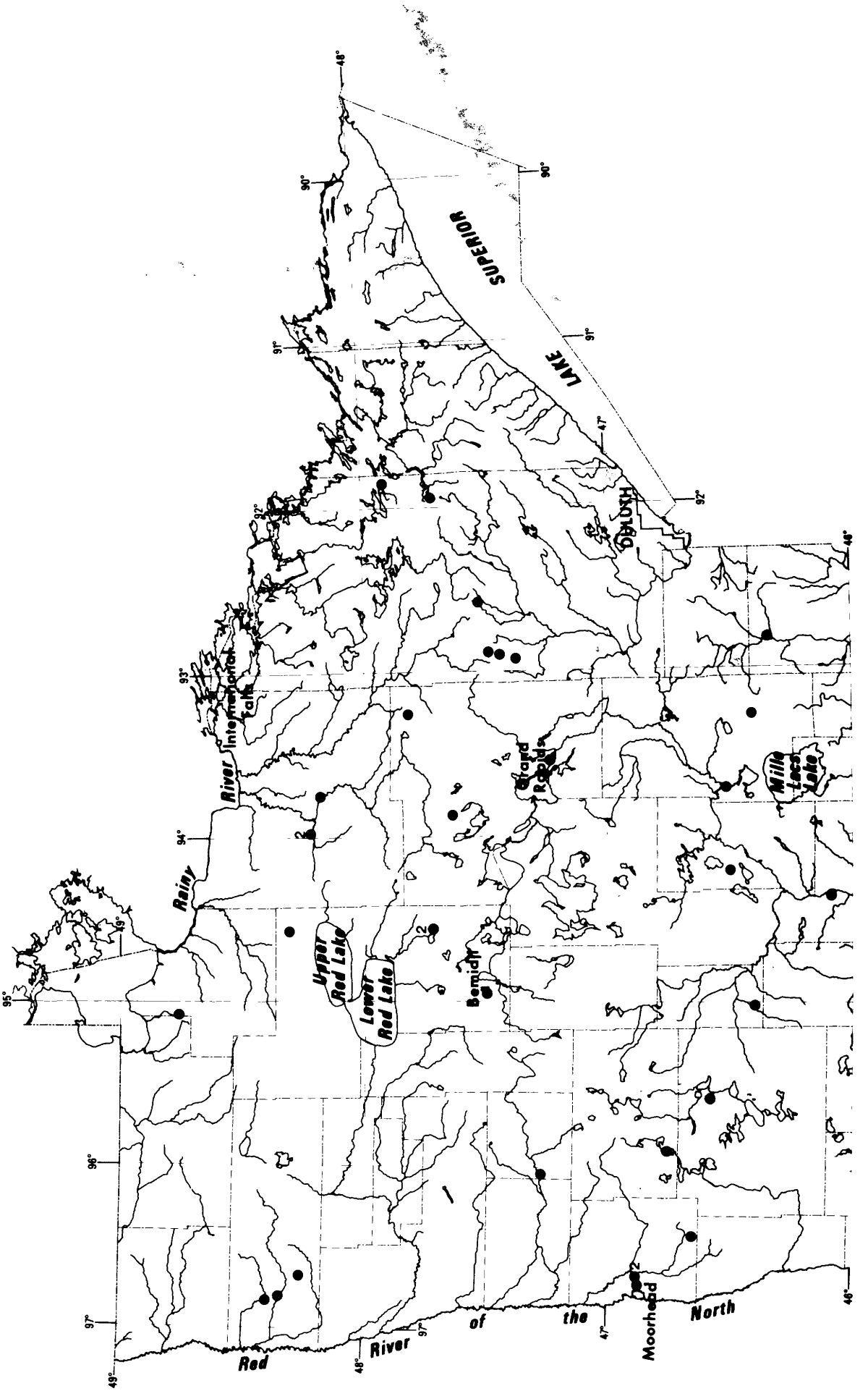
DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
05124990 FILSON CREEK NEAR ELY, MN							
OCT. 04, 1984	.33	9.0	32	APR. 25	92	3.0	50
NOV. 14	1.2	2.0	38	APR. 30	33	8.5	32
DEC. 18	1.8	.0	45	JUNE 13	6.8	12	28
FEB. 06, 1985	.39	.0	54	JULY 24	3.0	19.5	33
MAR. 20	.36	.5	--	SEPT. 04	1.4	15	30
APR. 03	1.1	.0	30				
05127000 KAWISHIWI RIVER NEAR WINTON, MN							
OCT. 04, 1984	320	11	44	SEPT. 05	393	16	50
JUNE 12, 1985	1390	16	48				
05127500 BASSWOOD RIVER NEAR WINTON, MN							
OCT. 23, 1984	228	---	---	AUG. 27	880	---	---
JUNE 19, 1985	2580	15	---				
05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO							
MAY 07, 1985	5540	9.0	---	AUG. 14	4930	---	---
JULY 03	10200	17.0	---				
05129115 VERMILLION RIVER NEAR CRANE LAKE, MN							
OCT. 09, 1984	47	13.0	83	APR. 24	3700	5.5	39
NOV. 16	311	.5	45	APR. 29	3190	10.0	40
DEC. 17	305	.0	97	JUNE 19	1180	18.5	71
FEB. 04, 1985	149	.0	91	JULY 23	1120	22.0	69
MAR. 19	199	---	---	AUG. 26	440	18.0	75
APR. 16	940	2.5	50				
05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN							
OCT. 31, 1984	282	2.0	97	MAY 29	418	15.0	87
JAN. 24, 1985	.05	.0	121	JUNE 27	778	16.0	90
APR. 30	20	---	---	AUG. 26	607	19.0	---
05130500 STURGEON RIVER NEAR CHISHOLM, MN							
OCT. 01. 1984	17	7.0	155	APR. 23	772	4.5	50
NOV. 13	73	1.0	90	APR. 25	1480	4.0	65
DEC. 17	62	.0	132	APR. 29	636	10.0	90
FEB. 08, 1985	17	.0	150	JUNE 18	98	16.0	79
MAR. 18	31	.5	190	JULY 23	53	20.0	97
MAR. 28	211	.0	---	AUG. 29	48	17.0	105

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROSIEMANS)
05131500 LITTLE FORK RIVER AT LITTLEFORK, MN							
OCT. 30, 1984	1550	3.0	120	APR. 16	2050	---	---
DEC. 12	387	.0	80	APR. 26	19100	5.0	---
JAN. 23, 1985	118	.0	220	MAY 29	2080	15.0	105
MAR. 08	105	0.5	280	JUNE 27	9950	14.0	130
APR. 11	822	0.5	100	AUG. 21	554	16.5	165
05132000 BIG FORK RIVER AT BIG FALLS, MN							
OCT. 29, 1984	1400	3.5	166	APR. 24	8020	6.0	115
DEC. 11	526	.0	250	MAY 28	2060	16.5	175
JAN. 22, 1985	234	.0	96	JULY 17	696	---	---
MAR. 06	160	---	---	AUG. 22	1120	15.0	---
APR. 10	1100	1.0	160				
05133500 RAINY RIVER AT MANITOU RAPIDS, MN							
APR. 10, 1985	10300	1.0	120	JUNE 18	22700	15.0	---
MAY 30	36900	13.0	70				
05134200 RAPID RIVER NEAR BAUDETTE, MN							
DEC. 03, 1984	95	.0	360	MAY 31	926	---	---
DEC. 13	43	.0	260	JUNE 26	7460	16.0	150
JAN. 25	9.7	.0	480	JUNE 27	6010	16.0	145
MAR. 11	9.5	.5	415	JULY 08	1070	22.0	145
MAR. 29	551	---	---	AUG. 19	1180	14.0	255
APR. 17	614	6.0	140				



GROUND-WATER RECORDS


SUPERIOR
LAKE
DULUTH
Rainy River
International Falls
Grand Rapids
Mille Lacs Lake
Upper Red Lake
Lower Red Lake
Bemidji
Red River of the North
Moorhead
92°
93°
94°
95°
96°
97°
46°
47°
48°
49°

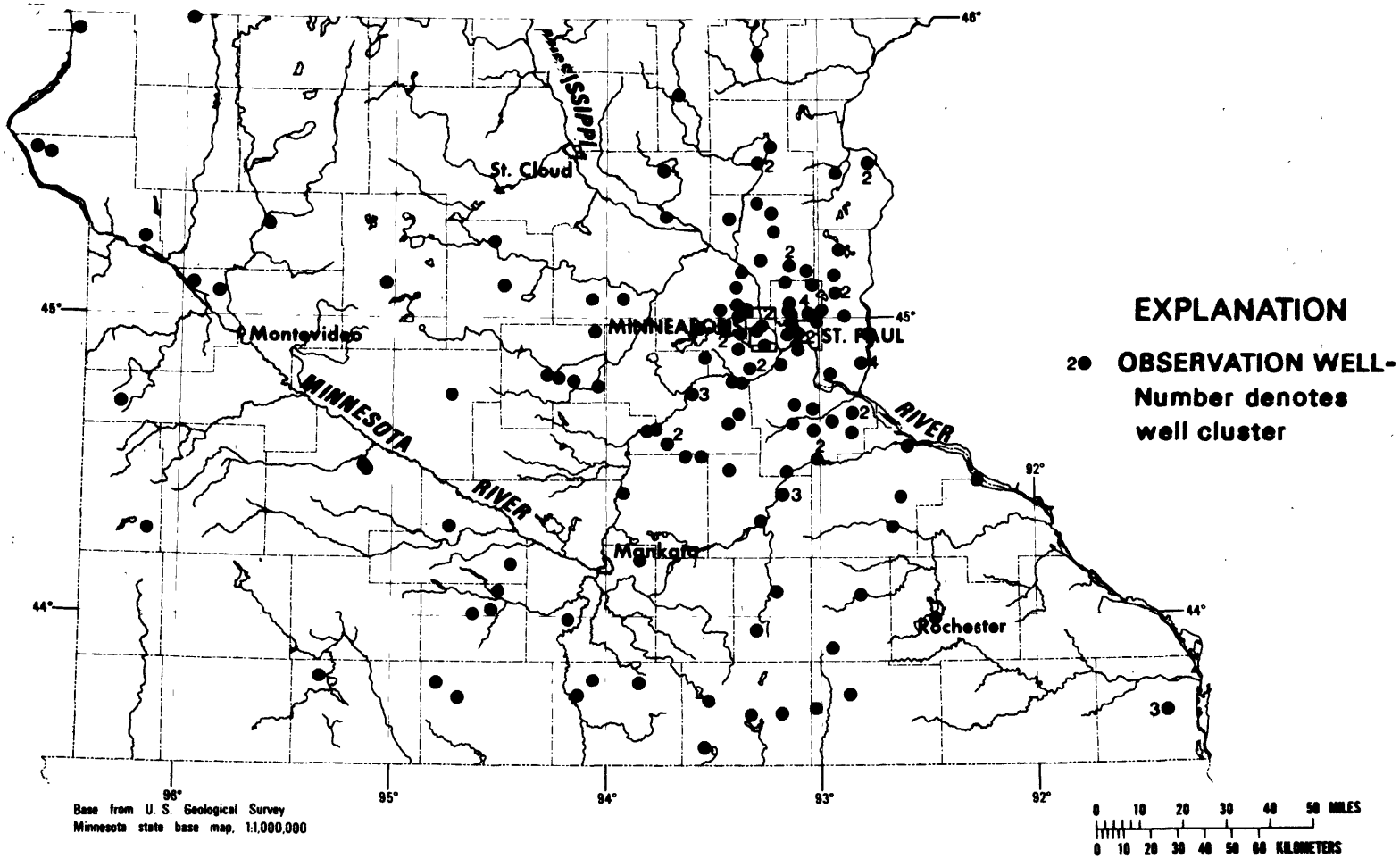


Figure 12.--Location of ground-water wells

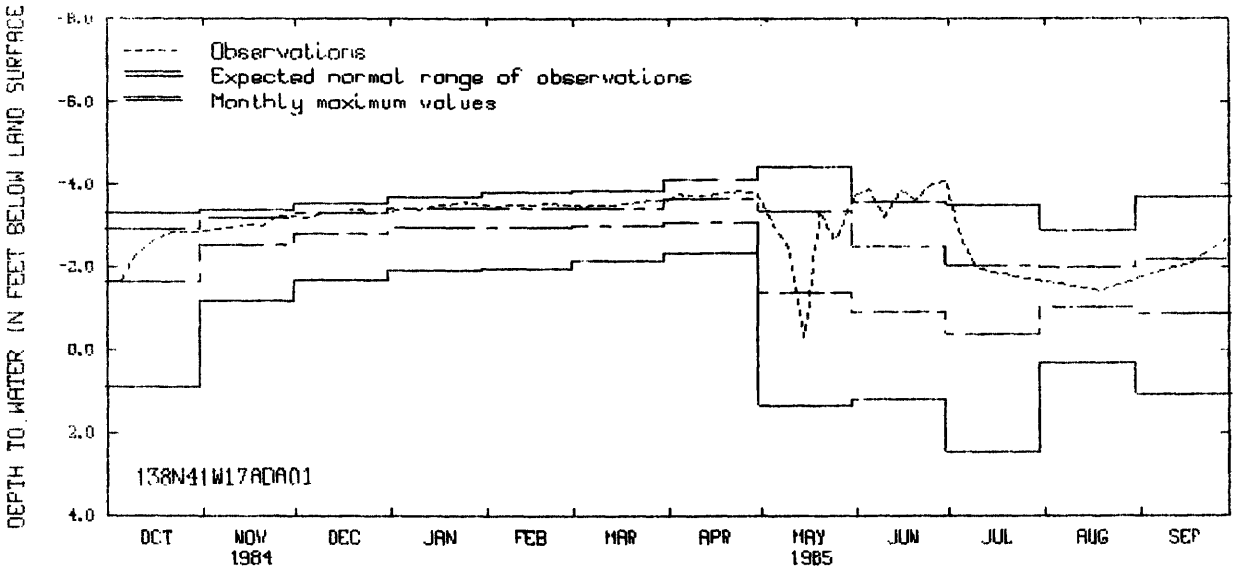
BECKER COUNTY

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 1984 TO SEPTEMBER 1985
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	1.70	2.92	3.18	3.42	3.47	3.46	3.75	3.00	3.89	2.70	....	....
10	2.31	2.97	3.29	3.39	3.49	3.51	3.73	2.48	3.20	2.00	....	....
15	2.60	3.03	3.29	3.48	3.50	3.51	3.74	0.30	3.86	1.87	....	....
20	2.82	3.01	3.39	3.50	3.53	3.53	3.81	3.38	3.63	....	1.43	2.13
25	2.84	3.23	3.32	3.56	3.51	3.60	3.83	2.64	3.96	....	....	....
EOM	2.86	3.22	3.32	3.49	....	3.61	3.77	3.70	4.10	....	....	....

WTR YEAR 1985 HIGHEST 4.11 JUN 25, 1985 LOWEST 1.45 JUL 17, 1985



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 1,450.0 ft (442.0 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 1	101.67	JAN 27	102.02	APR 18	102.35	MAY 31	102.57	JUL 11	101.07	AUG 19	102.12
DEC 13	101.76	MAR 15	102.26								

BELTRAMI COUNTY-Continued

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 1,448.8 ft (441.6 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, 27.42 ft (8.35 m) below land-surface datum, Apr. 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

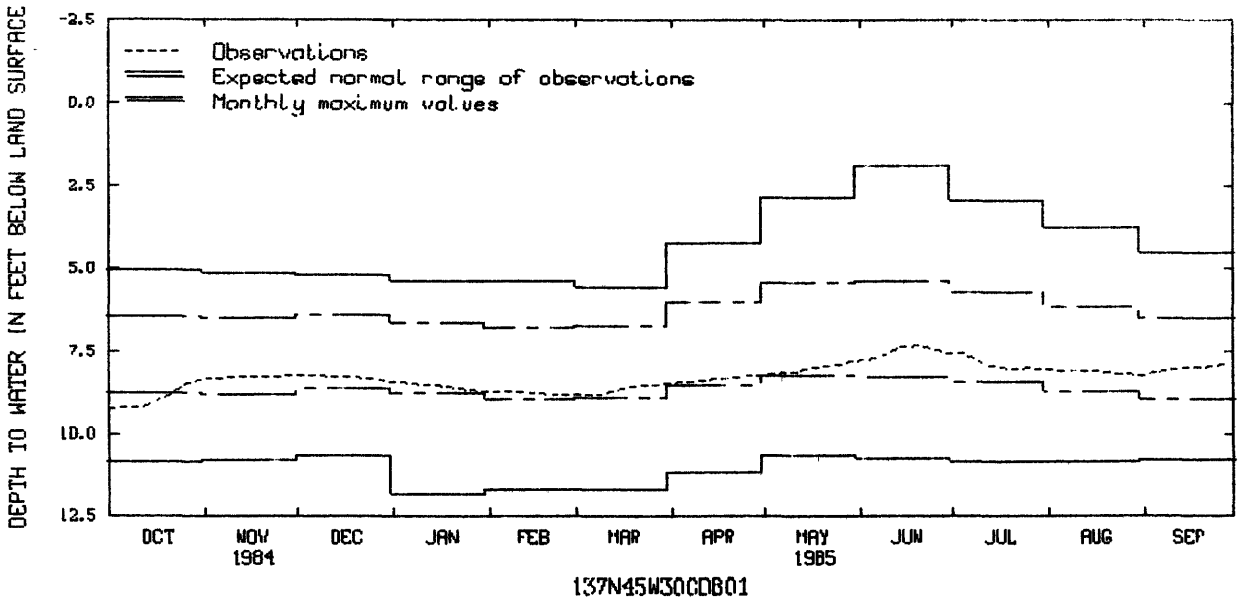
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	24.52	JAN 27	26.07	APR 18	27.42	MAY 31	24.78	JUL 11	22.91	AUG 19	22.53
DEC 13	25.23	MAR 15	27.13								

CLAY COUNTY

463854096250701. Local number, 137N45W30CDB01.
LOCATION.--Lat 46°38'54", long 96°25'07", in NW¼SE¼SW¼ sec.30, T.137 N., R.45 W., Hydrologic Unit 09020106, in Barnesville.
Owner: City of Barnesville, well 3.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 10 in (0.25 m), depth 73 ft (22.2 m).
DATUM.--Altitude of land-surface datum is 1,022 ft (312 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--January 1949 to January 1975, May 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.86 ft (0.57 m) below land-surface datum, June 9, 1962; lowest, 11.86 ft (3.61 m) below land-surface datum, June 3, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	9.20	DEC 7	8.24	FEB 15	8.76	MAY 3	8.18	JUN 28	7.54	AUG 31	8.23
12	9.19	14	8.29	22	8.80	10	8.14	JUL 5	7.57	SEP 14	7.99
19	8.89	21	8.30	MAR 1	8.80	17	8.00	12	7.90	21	8.00
26	8.47	28	8.37	8	8.82	24	7.91	19	8.05	28	7.88
NOV 2	8.33	JAN 11	8.52	15	8.65	31	7.79	26	8.00		
9	8.29	18	8.55	22	8.53	JUN 7	7.70	AUG 9	8.10		
16	8.26	25	8.68	29	8.49	14	7.36	16	8.08		
23	8.26	FEB 1	8.72	APR 26	8.25	21	7.33	23	8.18		
30	8.24	8	8.69								



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, 31.59 ft (9.63 m) below land-surface datum, Aug. 3, 1984.

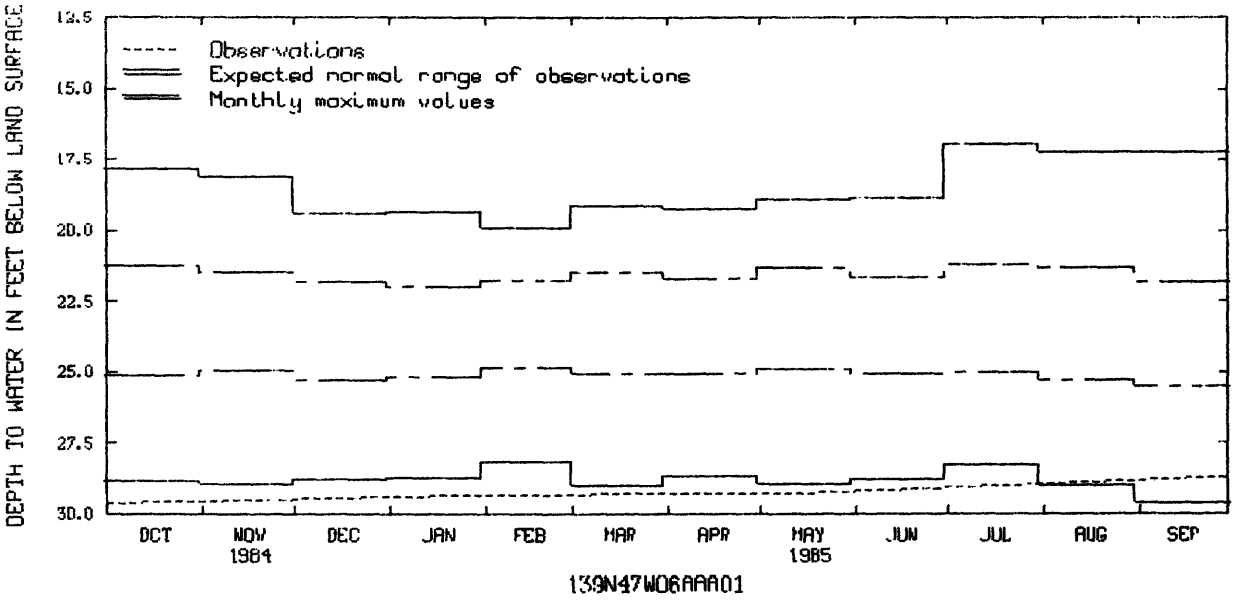
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	31.34	JAN 29	30.51	MAY 13	30.20	JUL 18	30.35

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.
CAQUIFER.--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, 29.62 ft (9.03 m) below land-surface datum, Sept. 24, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	29.52	JAN 29	29.33	MAY 13	29.28	JUL 18	29.01



CLAY COUNTY--Continued

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, 131.2 ft (39.98 m) below land-surface datum, July 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

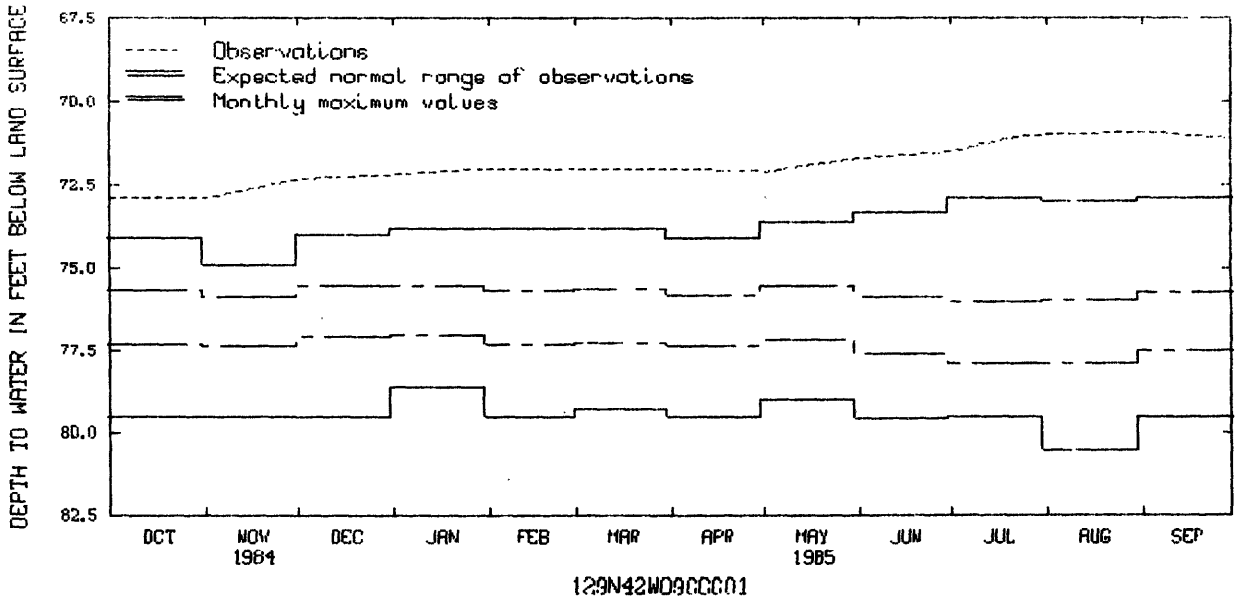
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	129.63	JAN 29	127.21	MAY 13	128.20	JUL 18	131.24

GRANT COUNTY

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, 70.90 ft (21.61 m) below land-surface datum, Sept. 3, 1985; 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 1	72.90	DEC 31	72.20	FEB 28	72.00	MAY 2	72.10	JUL 1	71.50	SEP 3	70.90
DEC 3	72.30	JAN 29	72.00	APR 1	72.00	31	71.70	25	71.00		

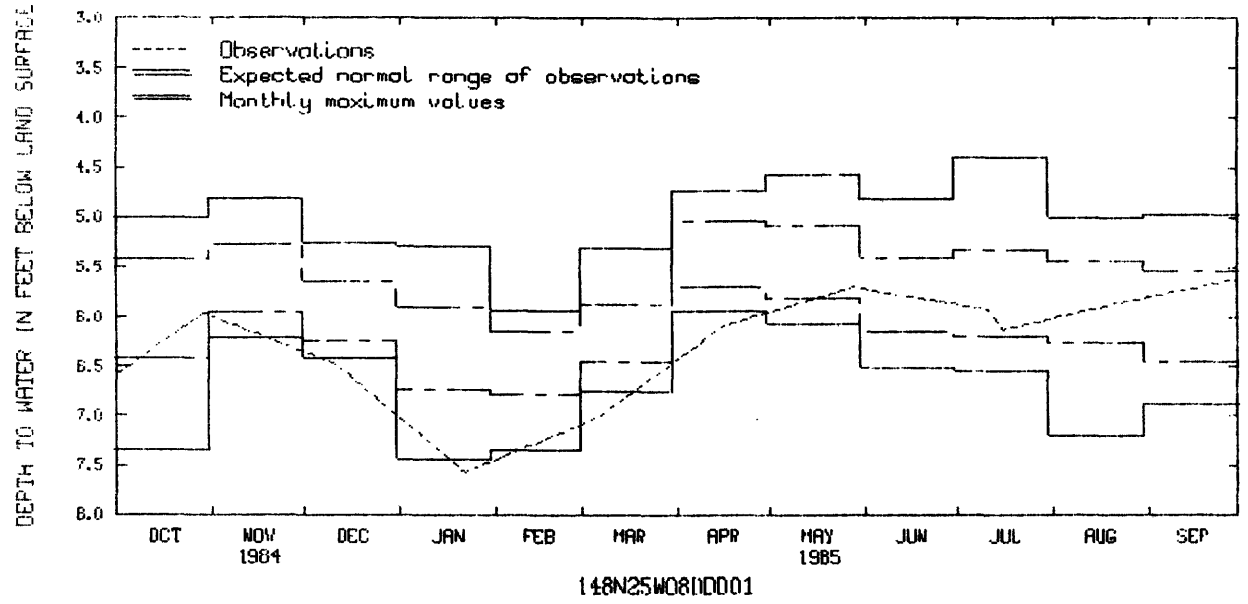


ITASCA COUNTY

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 1¼ 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, 7.57 ft (2.30 m) below land-surface datum, Jan. 22, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	5.96	JAN 22	7.57	APR 16	6.08	JUL 11	5.92	JUL 16	6.12	AUG 22	5.86
DEC 11	6.48	MAR 6	7.02	MAY 28	5.70						



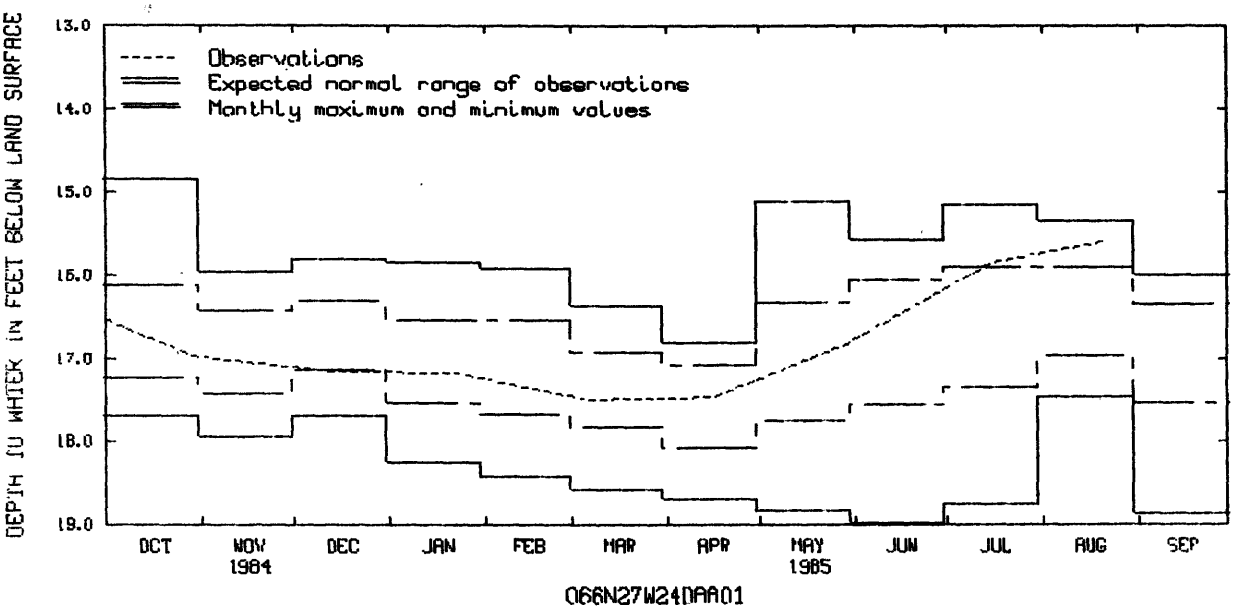
KOOCHICHING COUNTY

481148093445601. Local number, 066N27W24DAA01.
LOCATION.--Lat 48°11'48", long 93°44'56", in NE¼NE¼SE¼ sec.24, T.66 N., R.27 W., Hydrologic Unit 09030006, 2.5 mi (4.0 km) east of Big Falls.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 22 ft (6.7 m), casing perforated near bottom.
DATUM.--Altitude of land-surface datum is 1,234 ft (376 m). Measuring point: Top of casing, 3.12 ft (0.95 m) above land-surface datum.
PERIOD OF RECORD.--December 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.85 ft (4.53 m) below land-surface datum, Oct. 4, 1979; lowest, 18.98 ft (5.78 m) below land-surface datum, June 13, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	16.97	JAN 23	17.18	APR 16	17.47	MAY 28	16.85	JUL 16	15.85	AUG 22	15.59
DEC 11	17.15	MAR 6	17.50								

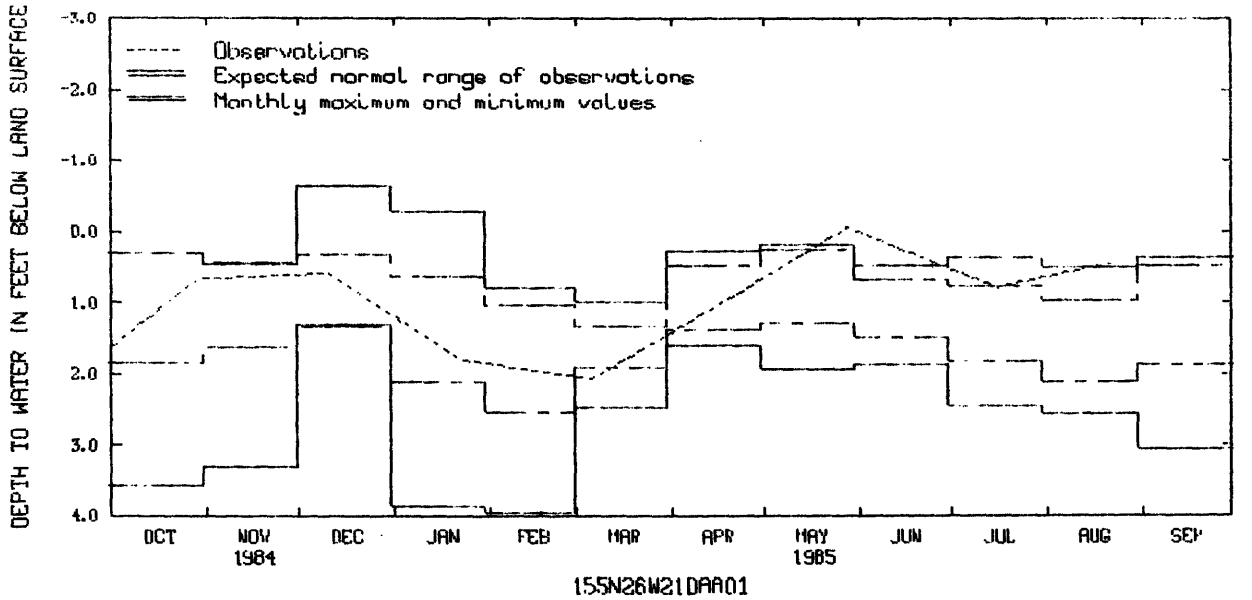
KOOCHICHING COUNTY--Continued



481345093582801. Local number, 155N26W21DAA01.
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 Forest.
Owner: U.S. Geological Survey.
AQUIFER.--Till of Pleistocene Age.
WELL CHARACTERISTICS.--Driven observation artesian well, diameter 1¼ in (0.03 m), depth 11 ft (3.4 m), screened 8 to 11 ft (2.4 to 3.4 m).
DATUM.--Altitude of land-surface datum is 1,208 ft (368 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level subject to freezing during winter periods.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.65 ft (0.20 m) above land-surface datum, Dec. 8, 1975; lowest, 3.97 ft (1.21 m) below land-surface datum, Feb. 7, 1977.

WATER LEVEL, IN FEET BELOW OR ABOVE (+) LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	0.67	JAN 22	1.80	APR 16	1.04	MAY 28	+0.05	JUL 16	0.79	AUG 22	0.45
DEC 11	0.59	MAR 6	2.08								



KOOCHICHIG 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.
REMARKS.--Water level usually freezes during winter periods.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.40 ft (0.43 m) above land-surface datum, June 20, 1983; lowest, dry below land-surface datum, Oct. 4, 1976 to Mar. 21, 1977; Aug. 25, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

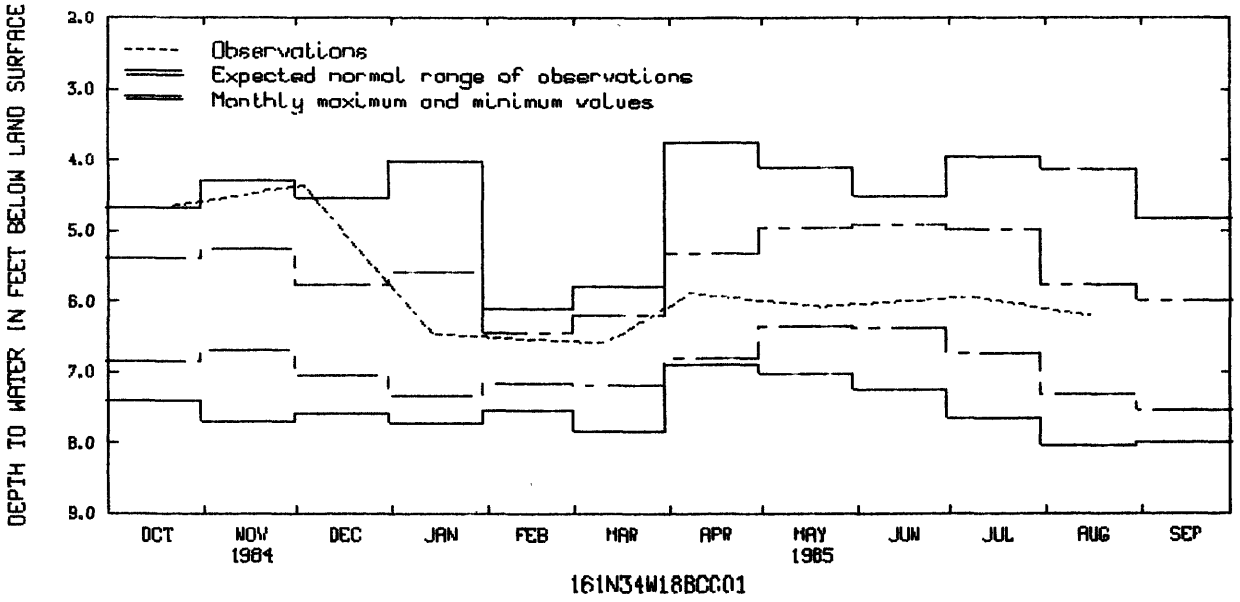
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 29	0.32	DEC 11	1.00	MAY 28	0.08	JUL 16	0.50	AUG 22	0.28

LAKE OF THE WOODS COUNTY

484552095052401. Local number, 161N34W18BCC01.
LOCATION.--Lat 48°45'52", long 95°05'24", in SW¼SW¼NW¼ sec.18, T.161 N., R.34 W., Hydrologic Unit 09030009, 2.4 mi (3.9 km) south of Roosevelt.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 11 ft (3.4 m), screened 9 to 11 ft (2.7 to 3.4 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top of casing, 4.60 ft (1.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.76 ft (1.15 m) below land-surface datum, Apr. 27, 1978; lowest, 8.05 ft (2.45 m) below land-surface datum, Aug. 25, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	4.65	JAN 14	6.46	APR 8	5.89	MAY 20	6.08	JUL 8	5.94	AUG 16	6.22
DEC 3	4.36	MAR 11	6.59								

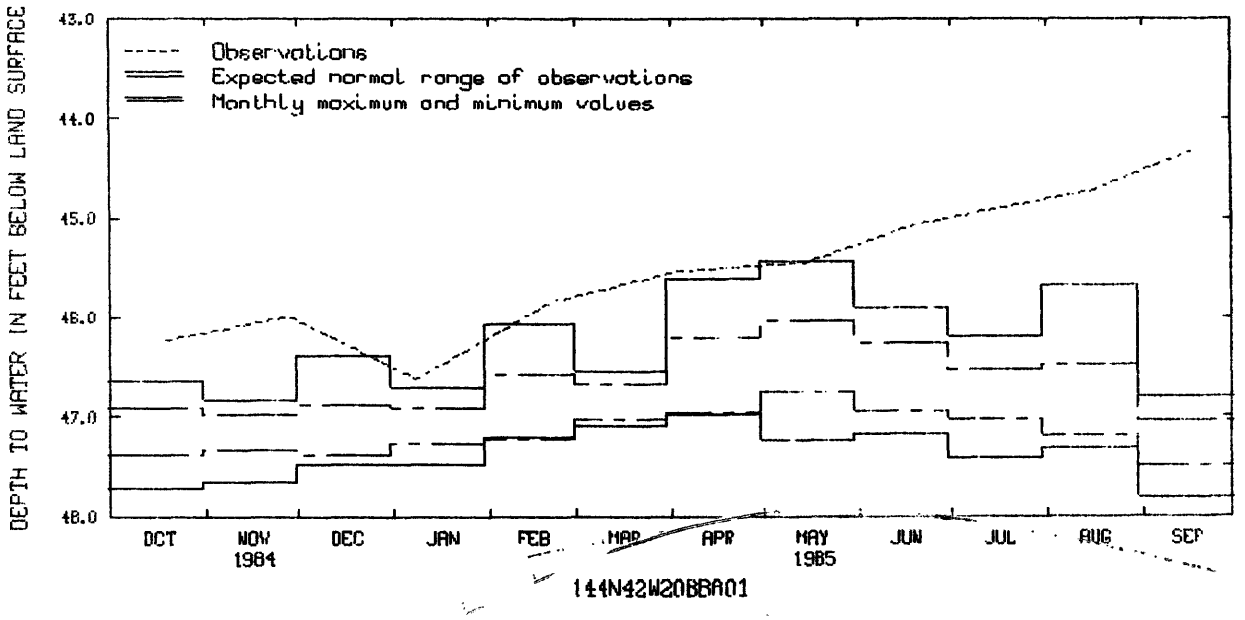


MAHNOMEN COUNTY

471653096020301. Local number, 144N42W20BBA01.
LOCATION.--Lat 47°16'53", long 96°02'03", in NE¼NW¼NW¼ sec.20, T.144 N., R.42 W., Hydrologic Unit 09020108, about 3 mi (4.8 km) southwest of Mahnomen.
Owner: Tom Wendt.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in (0.10 m), depth 130 ft (39.6 m).
DATUM.--Altitude of land-surface datum is 1,197 ft (365 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--August 1964 to September 1969, August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 44.33 ft (13.51 m) below land-surface datum, Sept.17,1985; lowest, 47.81 ft (14.57 m) below land-surface datum, Sept. 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 19	46.23	JAN 8	46.62	APR 3	45.54	JUN 20	45.06	SEP 17	44.33
NOV 28	45.99	FEB 21	45.85	MAY 15	45.45	AUG 15	44.73		

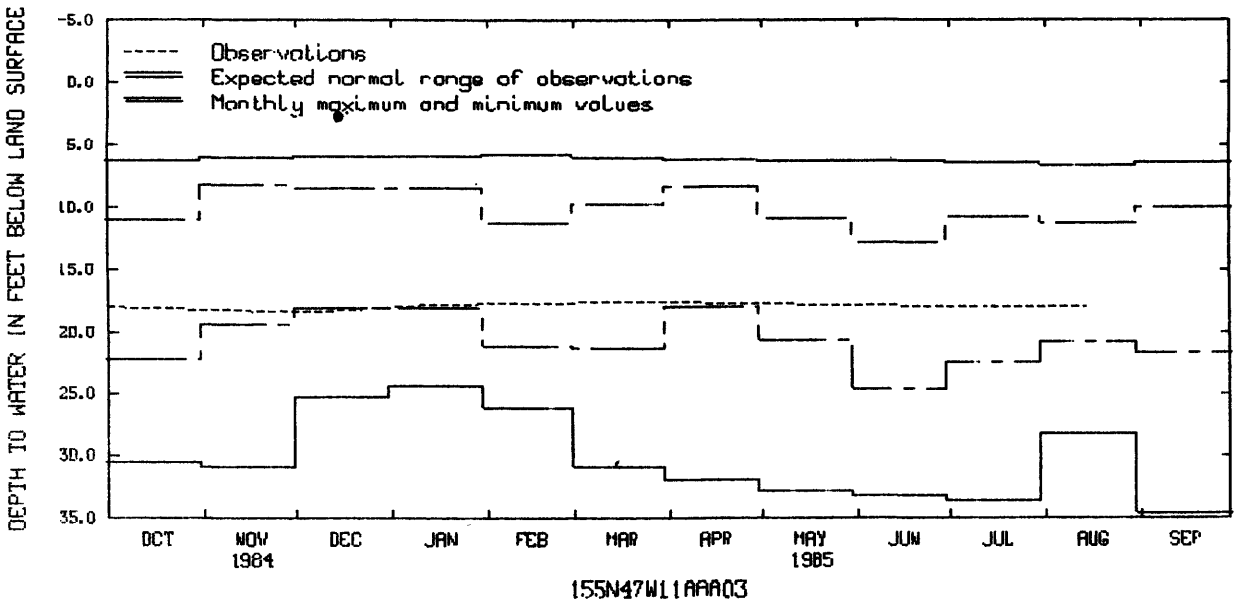


MARSHALL COUNTY

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.
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 1984 TO SEPTEMBER 1985

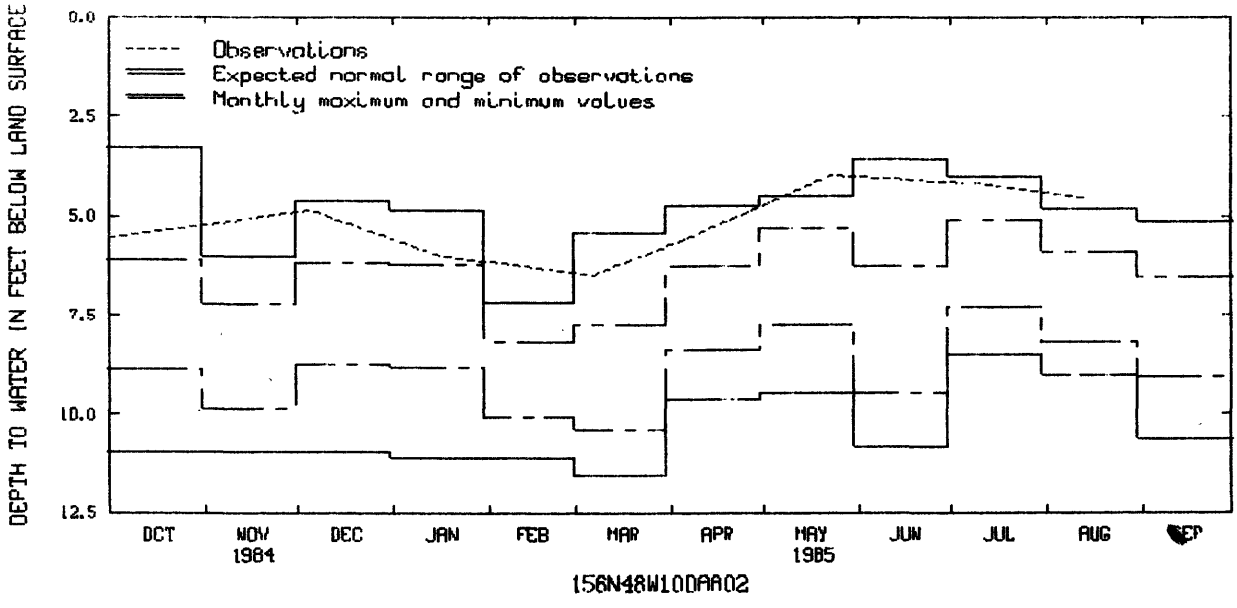
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 5	18.41	MAR 7	17.62	APR 10	17.64	MAY 23	17.82	JUL 10	17.99	AUG 14	18.02
JAN 16	17.83										



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 1¼ 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, 3.28 ft (1.00 m) below land-surface datum, Oct. 28, 1982; 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 5	4.85	MAR 7	6.48	APR 10	5.44	MAY 23	3.98	JUL 10	4.18	AUG 14	4.55
JAN 16	5.99										



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 1¼ 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, 1.46 ft (0.44 m) below land-surface datum, July 10, 1985; 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 1984 TO SEPTEMBER 1985

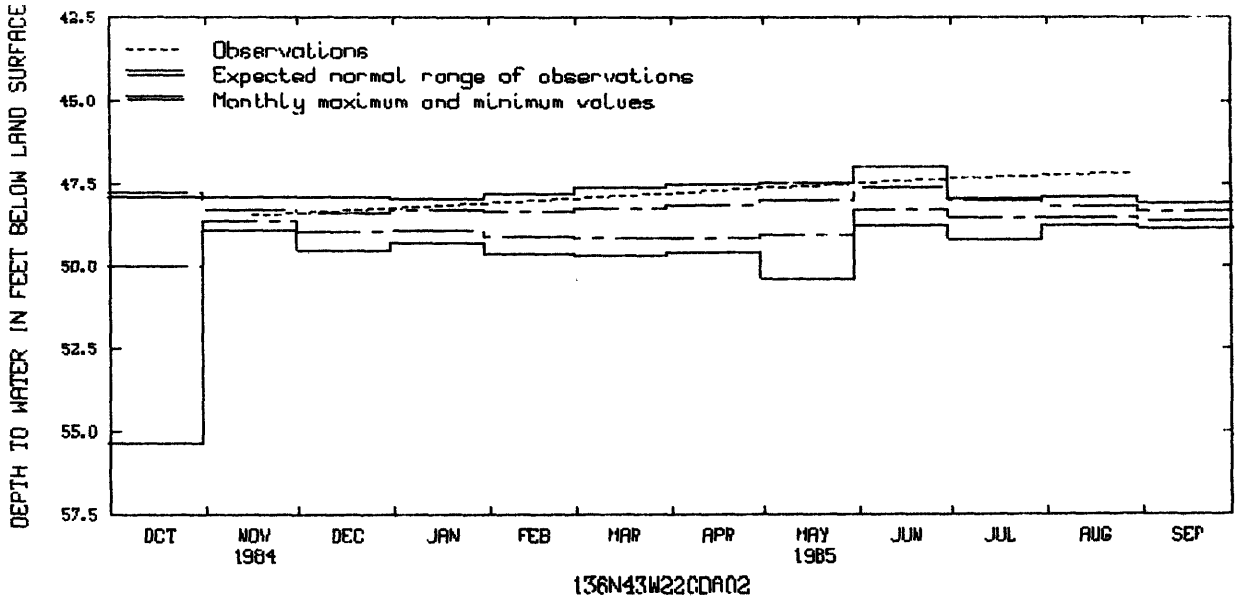
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 5	1.81	MAR 7	3.32	APR 10	3.60	MAY 23	2.82	JUL 10	1.46	AUG 14	2.30
JAN 16	2.38										

OTTER TAIL COUNTY

463430096050201. Local number, 136N43W22CDA02.
LOCATION.--Lat 46°34'30", long 96°05'02", in NE¼SE¼SW¼ sec.22, T.136 N., R.43 W., Hydrologic Unit 09020103, at Pelican Rapids.
Owner: City of Pelican Rapids, well 2.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in (0.25 m), depth 113 ft (34.4 m), screened 87 to 113 ft (26.5 to 34.4 m).
DATUM.--Land-surface datum is 1,354 ft (412.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Bottom lip of access pipe, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--March 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.97 ft (14.32 m) below land-surface datum, June 20, 1979; lowest, 55.33 ft (16.86 m) below land-surface datum, Oct. 13, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 16	48.44	AUG 28	47.15
JUN 25	47.35		

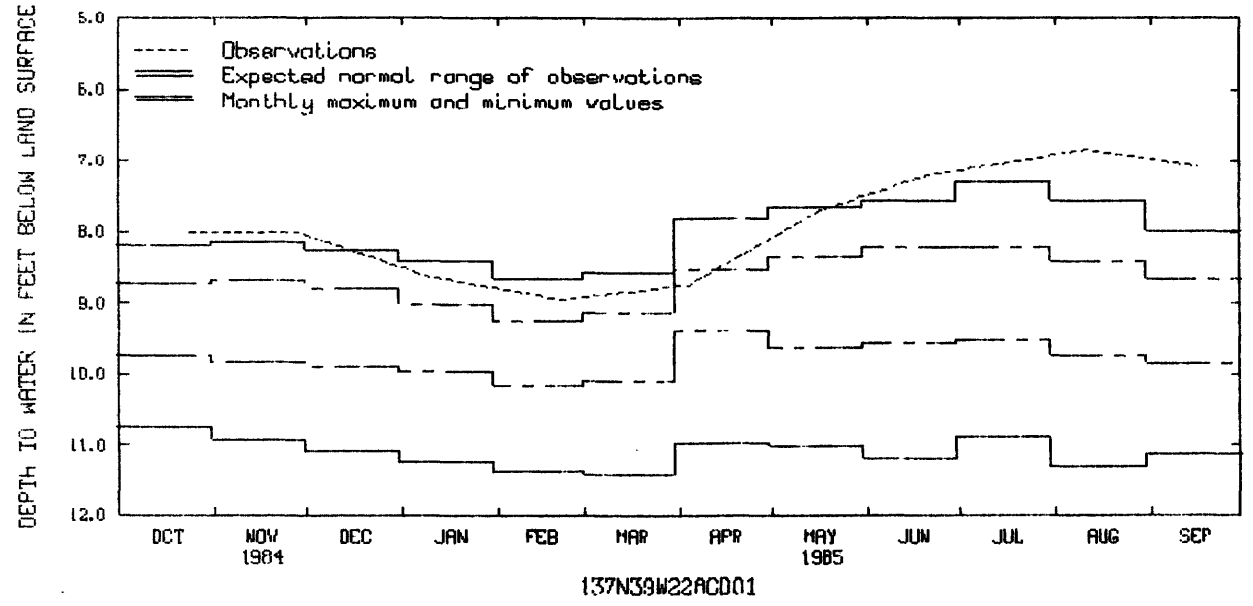


OTTER TAIL COUNTY--Continued

463956095352601. Local number, 137N39W22ACD01.
LOCATION.--Lat 46°39'56", long 95°35'26", in SE¼SW¼NE¼ sec.22, T.137 N., R.39 W., Hydrologic Unit 09020103, 4.5 mi (7.2 km) north of Perham.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.10 m), depth 24 ft (7.3 m), screened 21 to 24 ft (6.4 to 7.3 m).
DATUM.--Altitude of land-surface datum is 1,370 ft (418 m). Measuring point: Top of casing, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--December 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.84 ft (2.08 m) below land-surface datum, Aug. 12, 1985; lowest, 11.41 ft (3.48 m) below land-surface datum, Mar. 10, 15, 1977.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	8.00	JAN 9	8.62	APR 4	8.74	JUN 20	7.21	AUG 12	6.84	SEP 16	7.07
NOV 28	8.01	FEB 21	8.95	MAY 16	7.72						



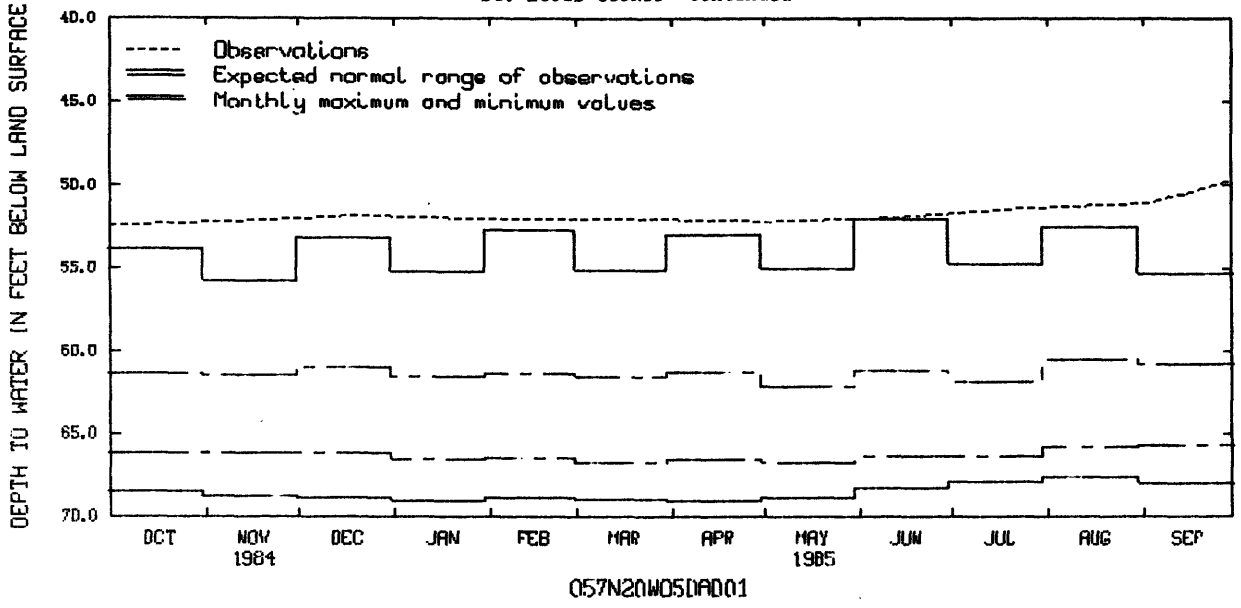
ST. LOUIS COUNTY

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, 51.07 ft (15.56 m) below land-surface datum, Sept. 3, 1985; 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	52.46	DEC 21	51.84	MAR 18	52.01	JUN 13	51.94	JUL 23	51.37	SEP 3	51.07
NOV 13	52.18	FEB 7	52.07	MAY 2	52.19						

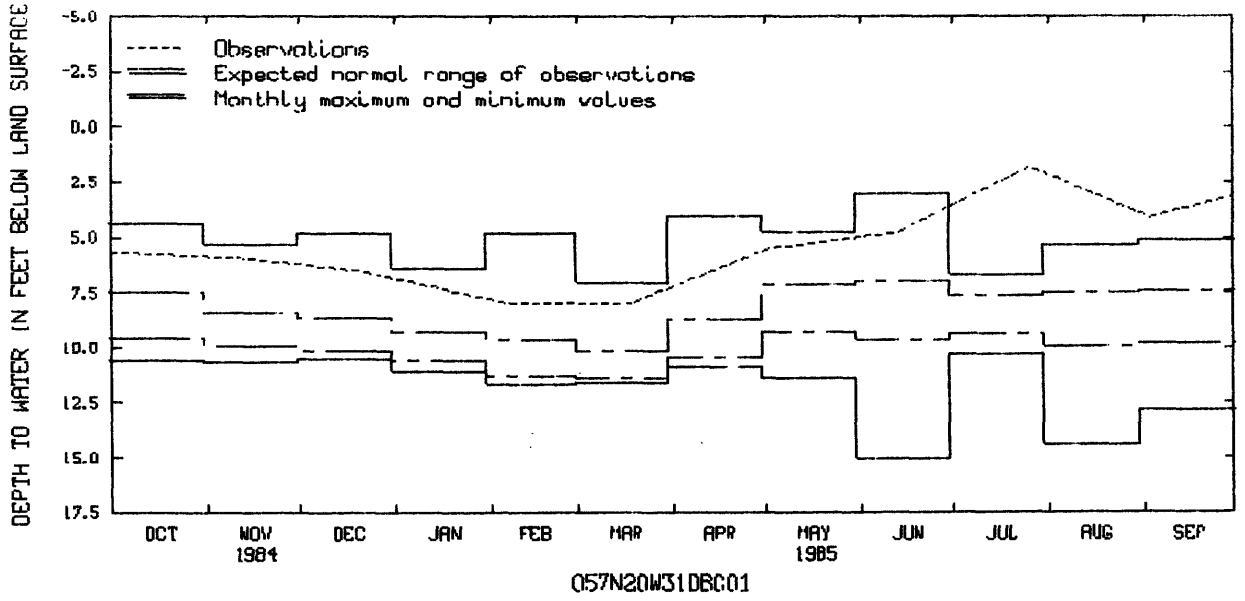
ST. LOUIS COUNTY--Continued



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, 1.82 ft (0.55 m) below land-surface datum, July 26, 1985; 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 1984 TO SEPTEMBER 1985

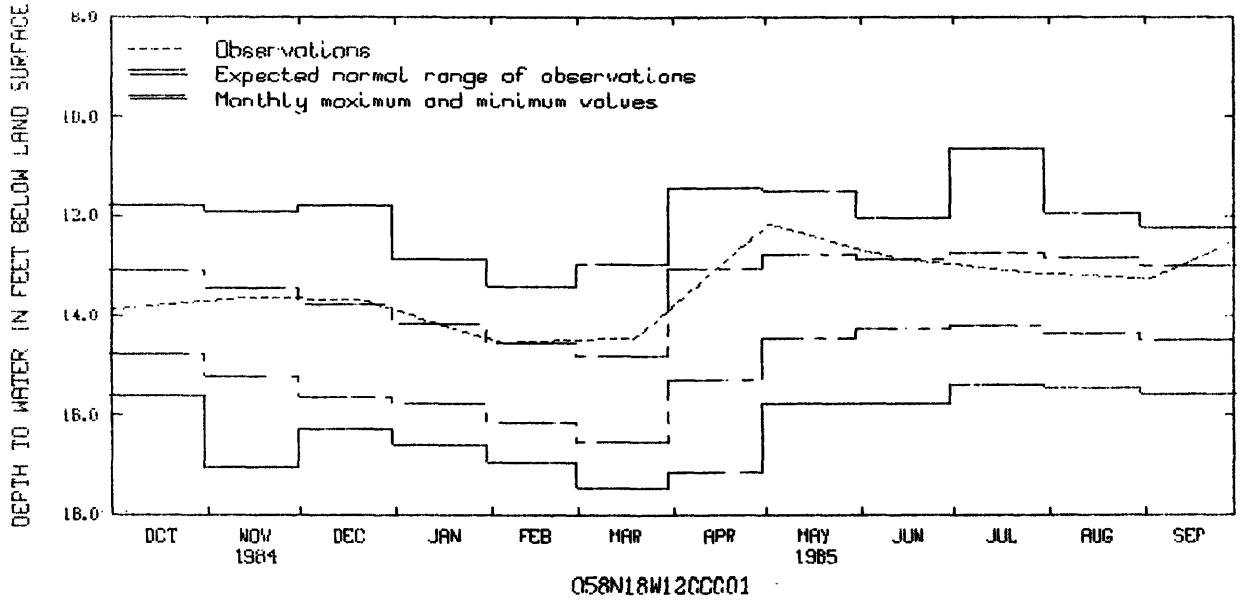
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	5.66	DEC 21	6.52	MAR 18	7.99	JUN 13	4.77	JUL 26	1.82	SEP 3	4.07
NOV 13	5.94	FEB 7	8.02	MAY 2	5.49						



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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	13.88	DEC 20	13.68	MAR 20	14.43	JUN 11	12.85	JUL 25	13.14	SEP 3	13.27
NOV 13	13.64	FEB 4	14.54	MAY 2	12.17						

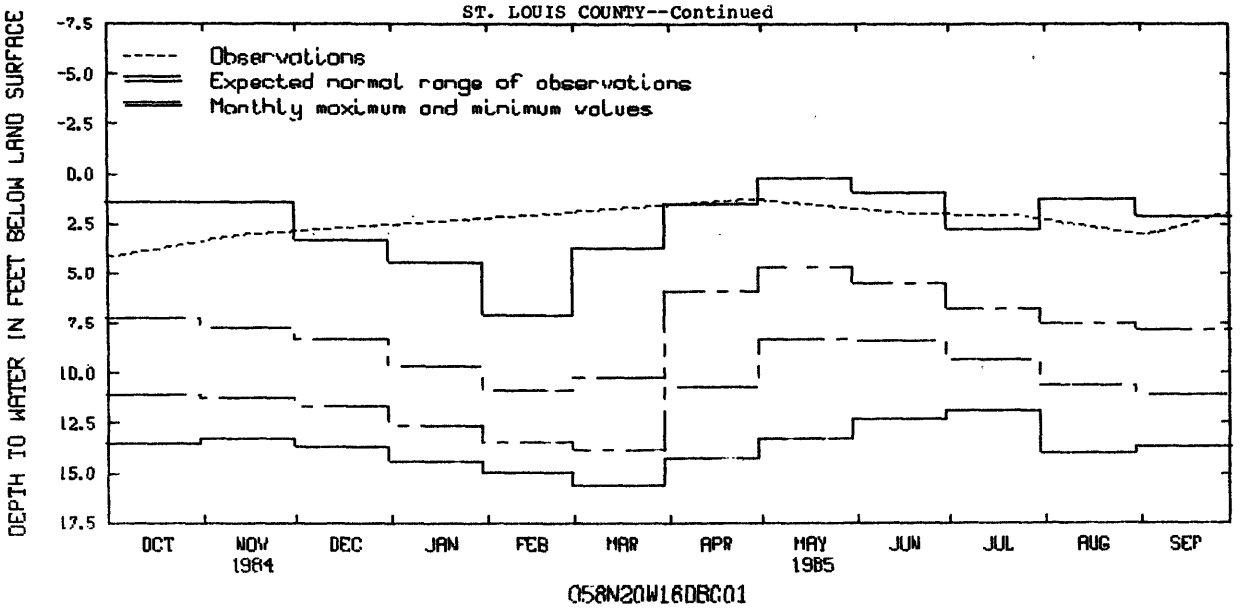


473011092524301. Local number, 058N20W16DBC01.
LOCATION.--Lat 47°30'11", long 92°52'43", in SW¼NW¼SE¼ sec.16, T.58 N., R.20 W., Hydrologic Unit 04010201, in Chisholm.
Owner: City of Chisholm.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	4.21	APR 28	1.23	JUL 23	2.05	SEP 3	3.06
NOV 13	3.06	JUN 18	1.97				

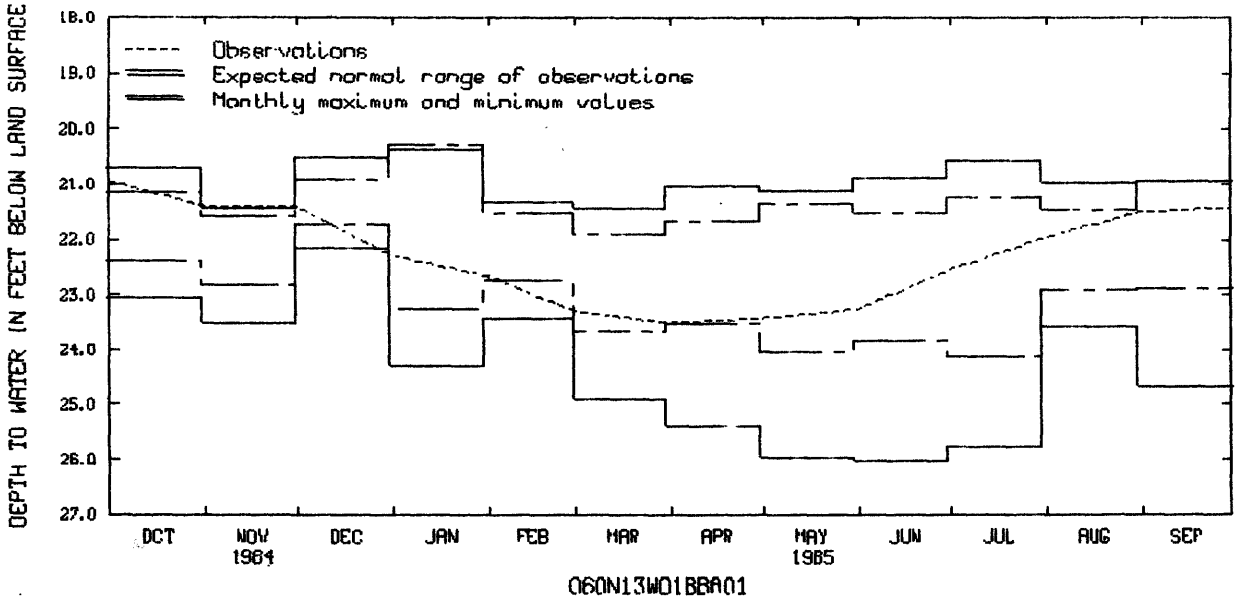
ST. LOUIS COUNTY--Continued



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, 20.38 ft (6.21 m) below land-surface datum, Jan. 1, 1983; 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 1	21.40	JAN 1	22.29	MAR 1	23.30	MAY 1	23.42	JUL 1	22.54	SEP 1	21.50
DEC 1	21.42	FEB 1	22.66	APR 1	23.50	JUN 1	23.25	AUG 1	21.96		

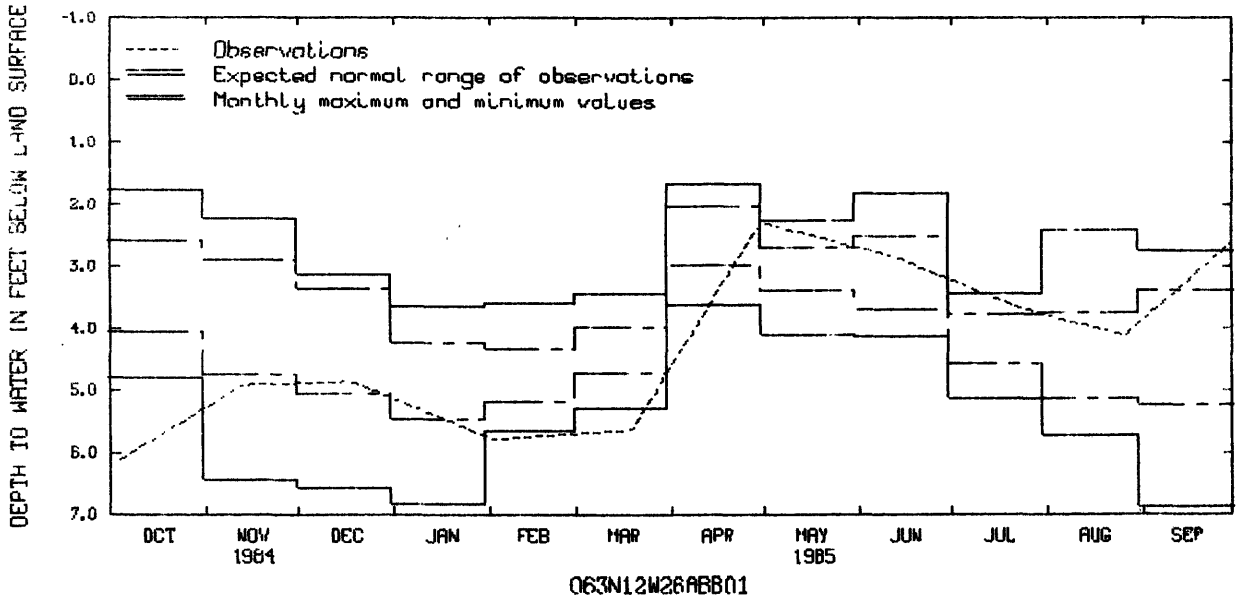


ST. LOUIS COUNTY--Continued

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 1¼ 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 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	6.10	DEC 18	4.86	MAR 19	5.63	JUN 13	2.86	JUL 23	3.67	AUG 23	4.12
NOV 13	4.92	FEB 2	5.78	APR 30	2.29						

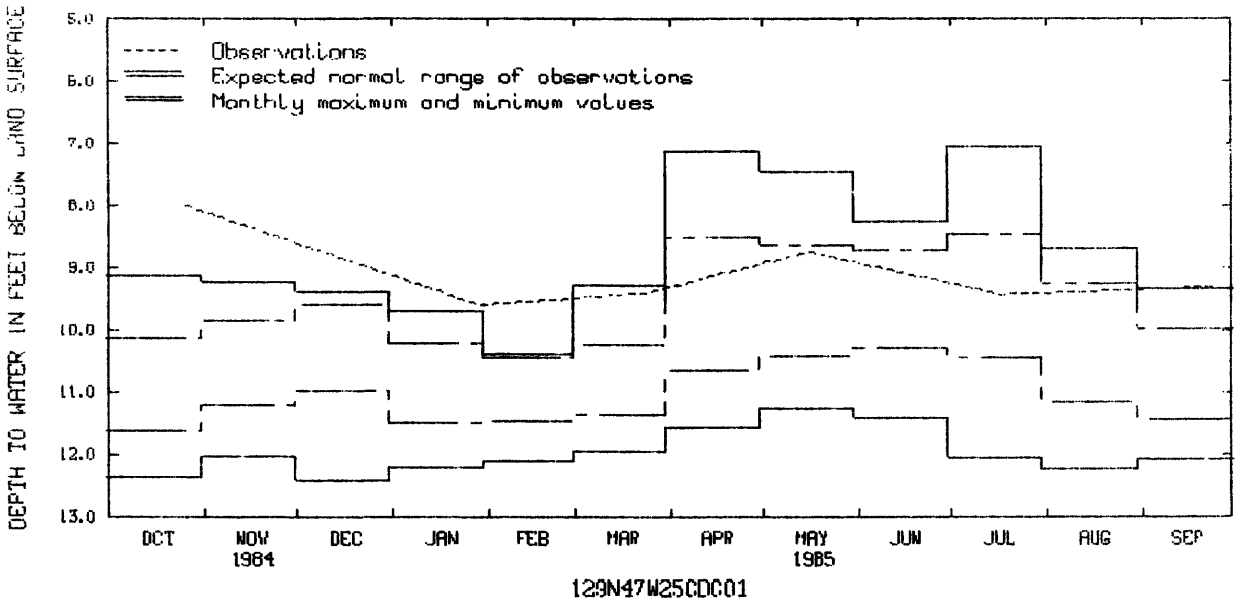


TRAVERSE COUNTY

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 1¼ 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, 12.42 ft (3.79 m) below land-surface datum, Dec. 2, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	8.01	JAN 29	9.60	MAR 25	9.40	MAY 16	8.75	JUL 17	9.43	SEP 24	9.31



WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

BECKER COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH LAB (STAND-ARD UNITS) (00403)
470405095425808	142N40W35C OBS WELL	112OTSH	09-05-85	1030	401	7.3
470500095423007	141N40W02B SEEPAGE SAMPLE	112OTSH	09-05-85	1400	687	7.0
470504095423006	142N40W35C SEEPAGE SAMPLE	112OTSH	09-05-85	1500	507	7.2
470506095423005	142N40W35C SEEPAGE SAMPLE	112OTSH	09-06-85	1000	838	7.0
470507095423004	142N40W35C SEEPAGE SAMPLE	112OTSH	09-06-85	0900	595	7.2
470508095423001	142N40W35C SEEPAGE SAMPLE	112OTSH	08-28-85	1100	487	6.8
470508095423002	142N40W35C SEEPAGE SAMPLE	112OTSH	08-28-85	1700	300	7.8
470509095423003	142N40W35C SEEPAGE SAMPLE	112OTSH	09-05-85	1200	844	7.6

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	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)
09-05-85	<1	<1	59	15	2.5	215	2.1	2.7
09-05-85	--	--	93	33	3.0	381	<0.2	5.1
09-05-85	--	--	62	28	2.5	263	9.8	2.6
09-06-85	--	--	130	32	4.1	457	<0.2	11
09-06-85	--	--	69	35	3.4	325	<0.2	2.7
08-28-85	K4	K8	46	20	3.7	257	27	3.9
08-28-85	--	--	26	22	2.9	159	6.4	1.4
09-05-85	--	--	120	43	2.4	439	21	11

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	BORON, DIS-SOLVED (UG/L AS B) (01020)
09-05-85	230	0.51	0.02	0.2	0.2	0.19	0.18	30
09-05-85	274	<0.10	0.55	1.9	1.3	0.08	0.05	30
09-05-85	324	<0.10	0.64	1.4	1.0	0.18	0.15	30
09-06-85	396	<0.10	1.50	2.7	1.8	0.12	0.06	20
09-06-85	346	<0.10	0.23	1.0	0.7	0.06	0.06	30
08-28-85	312	0.15	2.70	4.8	3.1	0.16	0.04	50
08-28-85	174	<0.10	0.03	0.6	0.6	0.06	0.04	40
09-05-85	374	0.65	0.14	0.7	0.3	0.06	0.06	<20

OTTER TAIL COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)
462100095414501	133N40W11BCC01	112OTSH	05-15-85	1700	20	420
462715095323001	134N39W01ACD02	112OTSH	05-15-85	1530	60	520
463245095331501	136N39W35DAD02	112OTSH	05-15-85	1500	68	575
463500095331501	136N39W14DDD01	112OTSH	05-15-85	1430	40	560

DATE	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	ALKA-LINITY FIELD (MG/L AS CACO3) (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
05-15-85	437	7.6	7.3	10.5	289	16	3.2	5.60	<0.01
05-15-85	515	7.4	7.4	9.5	392	26	13	<0.10	0.28
05-15-85	578	7.4	7.5	8.0	455	15	4.7	5.10	<0.01
05-15-85	538	7.5	7.7	9.0	299	30	29	9.60	<0.01

K. Non-ideal colony count

INDEX

October 1, 1978

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
	Length	
inches (in)	2.54×10^{1}	millimeters (mm)
	2.54×10^{-2}	meters (m)
feet (ft)	3.048×10^{-1}	meters (m)
miles (mi)	1.609×10^{0}	kilometers (km)
	Area	
acres	4.047×10^{3}	square meters (m^2)
	4.047×10^{-1}	square hectometers (hm^2)
	4.047×10^{-3}	square kilometers (km^2)
square miles (mi^2)	2.590×10^{0}	square kilometers (km^2)
	Volume	
gallons (gal)	3.785×10^{0}	liters (L)
	3.785×10^{0}	cubic decimeters (dm^3)
	3.785×10^{-3}	cubic meters (m^3)
million gallons	3.785×10^{3}	cubic meters (m^3)
	3.785×10^{-3}	cubic hectometers (hm^3)
cubic feet (ft^3)	2.832×10^{1}	cubic decimeters (dm^3)
	2.832×10^{-2}	cubic meters (m^3)
acre-feet (acre-ft)	1.233×10^{3}	cubic meters (m^3)
	1.233×10^{-3}	cubic hectometers (hm^3)
	1.233×10^{-6}	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	2.832×10^{1}	liters per second (L/s)
	2.832×10^{1}	cubic decimeters per second (dm^3/s)
	2.832×10^{-2}	cubic meters per second (m^3/s)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
	6.309×10^{-2}	cubic decimeters per second (dm^3/s)
	6.309×10^{-5}	cubic meters per second (m^3/s)
million gallons per day	4.381×10^{1}	cubic decimeters per second (dm^3/s)
	4.381×10^{-2}	cubic meters per second (m^3/s)
	Mass	
tons (short)	9.072×10^{-1}	megagrams (Mg) or metric tons

*U.S. Government Printing Office: 1987-555-474

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
INT 413

U.S. DEPARTMENT OF THE INTERIOR
Geological Survey
702 Post Office Building
St. Paul, MN 55101

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

SPECIAL 4TH CLASS BOOK RATE